

Road Safety Factsheet

February 2017

Tyre Safety

Safe tyres are vital!

In 2015, 14 people were killed and 112 people were seriously injured in road traffic accidents where illegal, defective or under-inflated tyres were deemed to be a contributory factor to the accident¹.

Tyres are the vehicle's only point of contact with the road. The actual area of contact between the car and the road through the tyres is small, roughly equivalent to four size eight men's shoes. Bald tyres - 'slicks' - may be fine for a race car on a dry track, but are no good at all for road vehicles on a wet road surface. Tyres treads are designed to pump water from the road surface and provide maximum grip. By the time the tread is worn down to the legal limit they will be unable to perform this task efficiently and **MUST** be replaced. Currently, the penalty for illegal tyres is a fine of up to £2,500 and three penalty points for each illegal tyre.

RoSPA recommends that worn tyres are replaced with an equivalent new unit well before the legal minimum tread limit of 1.6mm is reached - ideally as soon as they reach 3mm.

The Right Tyres for the Vehicle

Motor vehicle manufacturers choose the type, make, size, profile, load carrying capacities and speed ratings to match their vehicles, adjusting the tyre pressures to give the optimum grip, ride and handling characteristics. You should only change the type of tyres on your vehicle based on expert advice from the vehicle manufacturer, or tyre manufacturer.

The law

Tyre pressures

Tyre pressures must be maintained at or within a very close tolerance of the recommended pressures.

Tyre tread depth and damage

When tyres become worn or damaged they must be replaced. There must, by law, be at least 1.6mm of tread depth across the centre 3/4 of the width of the tread throughout the entire circumference of the tyre. There must be no damage to the tyre body - sidewalls or tread, no bulges or cuts.

A quick and easy way to see if your tyre tread depth is safe and above the legal limit is to take the 20p test. To do this, insert a 20p coin into the main tread grooves of your tyre. If the 'outer band' of the 20p coin is obscured when it is inserted (and you can see less than half of the number 20 at the bottom of the coin), your tread is above the legal limit. It is important to carry out this test on at least three locations around each tyre. If the outer band of the coin is visible, your tyres may be illegal and must be checked by a qualified tyre professional. It is recommended that you perform this test at least once a month²

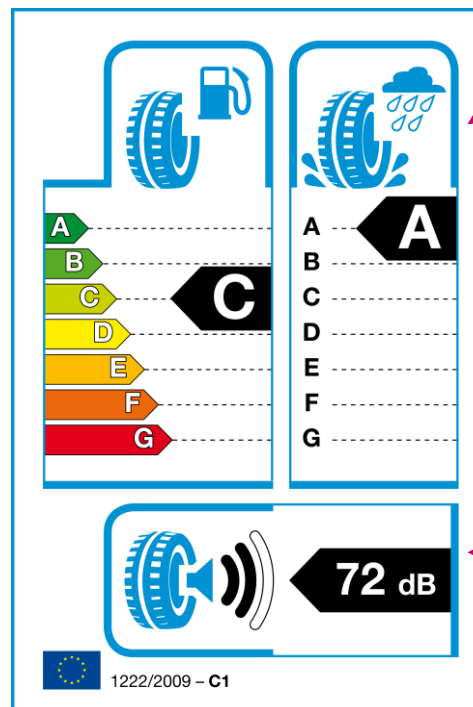
Tyre Labelling^{3, 4}

From 1st November 2012, all new tyre labels have to be labelled according to their performance in three key areas. This is shown below:

Fuel efficiency

The energy lost when a tyre is moving is known as 'rolling resistance'. A lower rolling resistance reduces fuel consumption and CO2 emissions.

Fuel efficiency is rated from category A to G. Category A is the most fuel efficient, meaning you will use the least amount of fuel for your journey.



Wet braking performance

Wet braking performance is also categorised in 7 classes. An A rated tyre provides the shortest braking distances on wet roads and a G-rated tyre has longer braking distances.

Exterior noise emission

This is the amount of noise made by a tyre when it rolls along the road surface.

This is shown by a number of waves. Three black waves indicate that the tyre makes the most noise.

Tyre Markings⁵



A shows the **tyre size**. The code shows the tyre's width (205mm), height (45% of the width) and rim diameter (17 inches).



C shows the **speed symbol**. The letter shows your tyre's maximum speed. (V=149mph).



B shows the **load index**. The code indicates the maximum weight your tyres can carry (88=560kg).



D shows the **production date** of the tyre. (1915= week 19 of 2015).



Tyre types

It is illegal to mix tyres of a different construction (such as cross-ply; bias belted or radial) on the same axle. Cross-ply and bias-belted tyres are seldom used on production cars, and are not widely available in the UK. Cross-ply and radial tyres should never be mixed on the same vehicle. Where a mix is necessary, radial tyres MUST only ever be used on the rear axle and cross-ply tyres on the front. This mix of tyres will produce 'understeer' whereas the opposite will produce 'oversteer'. (Oversteer refers to the car turning more tightly into a corner than it is steered; understeer indicates that the vehicle turns at less of an angle than it is steered). Of the two conditions, understeer is generally accepted to be easier to control.

Tyre maintenance

Tread depth

Pay special attention to the amount of tread remaining on your tyres, and measure the tread depth regularly (details of minimum legal tread depths is provided below). Always replace tyres before they reach the legal limit.

Pressures

The vehicle's handbook provides guidance on how to look after your tyres. It will also contain information about vehicle loading and the required adjustments to tyre pressures which should be followed for safety. Tyre pressures should always be checked and corrected (if necessary) when they are cold. It is vital that tyre pressures are maintained at the levels recommended by the manufacturer to ensure maximum tyre life, safety, the best ride and handling characteristics.

Over or under-inflating tyres is likely to seriously impair their performance and increase risk. Over-inflation increases overall tyre diameter, decreases the amount of tread in contact with the road, decreases sidewall flexibility and affects road-adhesion. Under-inflation decreases overall tyre diameter, increases sidewall flexion, generates higher tyre operating temperatures and leads to difficult vehicle handling characteristics. Running an under-inflated tyre may cause premature tyre failure. Both over and under-inflation adversely affect tyre life.

Cleaning treads

Keep tyre treads clean of stones and other foreign bodies, and check regularly for damage to the tread and sidewalls. It is vitally important that any damage is checked out by a tyre expert and any necessary repairs or replacements are carried out immediately.

Tyre valves

Check tyre valves carefully. Ensure the caps are in place and that there is no evidence of cracking or damage to the valve stem.

Tyre ageing

Rubber compounds used in tyres contain anti-oxidising chemicals that help to slow down the natural ageing process of untreated rubber. However, tyres do deteriorate with age, which increases the risk of tyre failure. There will also be a deterioration of the ride quality caused by vibrations through the tyre, which may signify the tyre's performance has been affected by age and should be investigated as soon as possible.

There is no law governing the maximum age at which tyres may be used on the roads for cars. Tyre manufacturers do not seem to have a consistent recommendation because the roadworthiness of a tyre depends on many factors, including the condition in which they are stored, the use to which they are put, road conditions, how well they are maintained and the driver's driving style.

RoSPA's recommendation to motorists is to ask their tyre manufacturer for the age at which they recommend tyres should be changed, and to regularly check their tyres for age-related defects, such as

- Cracking/crazing on the side wall of the tyre, caused by its flexing
- Distortion of tyre tread
- Deformation of the carcass of the tyre

Tyres that display these signs of ageing should be removed and not put to further use.

Vehicles which are stored for significant periods (motorhomes, caravans, ice cream vans, classic cars, etc) are more likely to need to replace their tyres at a younger age even though the tread may well have hardly been touched. This is because tyres have agents in their compound which are squeezed through the rubber when in use to inhibit the ageing process; if unused for some time, these agents do not work, thus increasing the speed of the ageing process. Tyres fitted as spare wheels or used on caravans and trailers may age prematurely.

If tyres on caravans or trailers are not in regular use, they should be inspected before each journey. Tyres used predominantly in coastal areas will age at a greater rate due to the saline conditions, and several cleaning products may also harm the chemicals in the rubber.

In most circumstances tread depth can be used as a suitable indication of when tyres should be replaced, as tyre treads generally wear out before their age effects their performance. However, the age of a tyre will affect its safety and increase the risk of failure, and so tyres should be inspected for the signs of ageing regularly.

Part-worn tyres

What are part-worn tyres?

'Part-worn' tyres are those which have been used previously - in other words they are 'second-hand'. Most part-worn tyres are imported, mainly coming from continental Europe.

What are the potential problems with part-worn tyres?

Road Safety factsheet: Tyre Safety Factsheet

Part-worn tyres are usually sold with about 50% or less of their original tread remaining (legal minimum is 2mm) and may have a few thousand miles more motoring in them. However, despite their remaining tread, it must be appreciated part-worn tyres are nevertheless USED TYRES. As such their purchase and use should be treated with a degree of healthy scepticism. In many cases, such tyres will be perfectly sound. However, it is possible that they have been bumped up and down kerbs and over other obstacles. They may have been run over or under-inflated, and may have sustained irreparable and invisible damage to their structure.

The cost of part-worn tyres reflects their second-hand state and this no doubt contributes to their attractiveness to motorists. The purchase and use of part-worn, instead of new, tyres may enable some owners to afford to keep their vehicles on the road. The tyre industry continues to express concern about the sale and use of part worn tyres. However, it is important to consider the issue objectively and make a reasoned judgement about the real risks of using such tyres.

RoSPA's advice, like that of Trading Standards Officers, is 'let the buyer beware'. Whether the purchase of part-worn tyres is a good economic proposition or not, there can be little argument that a tyre which is only half worn but is in all other aspects sound, is likely to be safer than a tyre worn to the legal limit.

Before purchasing part-worn tyres always ask to see them inflated before they are fitted to the vehicle and check for any lumps or bulges. Part worn tyres should also be checked for signs of tyre ageing as described elsewhere in this fact sheet. If they show signs of ageing then you should not purchase them.

Retread tyres

What is a retreaded tyre?

A retreaded tyre – also known as a remould – is made from a used tyre. Old tyres which are not sound should never be used as components for retread tyres. The essential building block for a retreaded tyre is a used tyre whose tread is worn-out but whose carcass (basic structure) is sound. Retreading involves stripping away both the remaining tread and sidewall of the used tyre. The final part of the process moulds new rubber to the old carcass.

What standards govern the production of retreaded tyres?

In the past, retread tyres have been manufactured in accordance with BS AU 44e. However, this standard did not specify a type approval test for retreaded tyres, which would guarantee a standard tyre quality.

On 1st January in 2004, ECE Regulations 108 and 109 came into effect, making it mandatory for retreaded tyres to be subject to a type approval test. This ensures that retread manufacturers must meet a specified basic standard in terms of the tyres' suitability for retreading prior to the process, and their performance after it. It is now illegal to sell retreaded tyres that do not have the "e" mark.

Are there any problems with retreaded tyres?

Road Safety factsheet: Tyre Safety Factsheet

In the majority of cases, retreaded tyres perform satisfactorily, provided the manufacturer's guidance about maximum vehicle loadings and maximum speeds is followed. Like all tyres; overloading, sustained high speeds, and under or over-inflation all contribute to increased tyre wear and/or premature failure.

Never buy a retreaded tyre without the "e" mark.

Winter tyres

What are winter tyres?

Winter tyres use a type of rubber with high silica content and a tread pattern which is designed to remain flexible when temperatures drop below 7 degrees Celsius. These tyres provide benefits such as better braking and handling performance on snow and ice and on wet roads in cold conditions⁶. They are different to summer or all season tyres in a number of ways:

- they use a softer rubber compound (usually by including more natural rubber in the mix)
- the surface of the tread blocks is covered with little jagged slits, called sipes and;
- they generally have deeper tread grooves than conventional summer tyres⁷.

Winter tyres are not suitable to be used all-year round and therefore if you plan to use winter tyres you will also need all season or summer tyres for when temperatures rise and roads are dry⁷.

For tips on driving safely during winter, read RoSPA's [Winter Driving Tips](#) factsheet.

Do I need to use winter tyres?

Winter tyres are not mandatory in the UK. However, they can be a useful investment, particularly if you live in a remote location which is at risk of being cut off in periods of bad weather without the use of a functioning vehicle⁸.

Do I need to inform my insurer if I plan to use winter tyres?

Many motor insurers will not charge an additional premium when their insured customers wish to use winter tyres, provided that they meet the vehicle manufacturer's specifications and are in a roadworthy condition. However, some motor insurers may require that you contact them to let them know if you are planning to fit winter tyres.

The Association of British Insurers guide, [Motor Insurance Commitment for Winter Tyres](#), provides information on each insurer and their policy on winter tyres, including a list of insurers who do not charge additional premiums for the use of winter tyres and whether you will need to contact them if you plan to use winter tyres⁸. If your insurer is not included in this list, it is best to contact them directly.

Tyre pressure monitoring systems

Tyre Pressure Monitoring Systems (TPMS) are a way of warning a driver that a tyre is incorrectly inflated. From 1st November 2012, all types of new motor vehicles and mobile homes sold in the EU must be equipped with a TPMS. On January 1st 2015, new legislation was also introduced stating that an inoperative or faulty TPMS sensor would result in MOT failure⁹.

It is difficult to spot an under inflated tyre visually, especially without a fully inflated tyre as a comparison. Due to the rigidity of current tyre walls, a drop in pressure will only lead to slight increased flexing of the wall when the tyre is viewed at rest. This is why TPMS can be advantageous, it can warn drivers that their vehicle has an under inflated tyre despite the tyre looking normal.

There are many dangers of having under inflated tyres, because they are designed for use at their recommended pressure. Under inflation can lead to increased deformation in the tyre wall as it concentrates the load upon the tread shoulders, and this reduces the amount of surface contact the tyre has with the road. This can have many consequences:

- Increased wear of the tyres treads, which will lead to a higher chance of aquaplaning in the wet.
- Reduced handling characteristics and a reduced control of the vehicle.
- Longer stopping distances.
- Higher chance of the tyre delaminating, which could lead to a sudden tyre failure.

How they work

There are three types of Tyre Pressure Monitoring Systems.

Direct Tyre Pressure Monitoring Systems

The most accurate and reliable form of TPMS is the direct system; this uses sensors to monitor the tyres' pressure and has the advantage that it can take into account factors, such as the tyres temperature, when calculating the pressure. These systems provide the most accurate feedback to drivers on their tyre's pressure.

Indirect Tyre Pressure Monitoring Systems

Indirect TPMS is an addition to the wheel speed sensors used as a component of the Antilock Brake System (ABS). A decrease in tyre pressure will lead to a decrease in the wheel's radius; this means it will rotate faster compared to the other tyres and the speed sensors detect this change. This system has the major advantage that it is much cheaper to implement and quicker to introduce onto new vehicles, but has major disadvantages due to the fact that it cannot detect a slow and equal decrease in pressure on every tyre. The system also needs to be calibrated more frequently, which could be a difficult for users.

Hybrid Tyre Pressure Monitoring Systems

The concept of a Hybrid TPMS is to combine the advantages of both systems – the accuracy of the direct system and some of the cost savings of the indirect system. The pressure sensors are on two of the vehicles wheels instead of four, and the wheel speed sensors compare the differences in speed to these wheels to detect a dip in pressure.

Tyre pressure monitoring systems and your vehicle

When driving a car with TPMS, make sure that you know how it will communicate a drop in tyre pressures to you. There may be several different ways, such as a light on the dashboard, an audio signal or a diagram of the car with the tyre suffering the decreased pressure highlighted. If it is by a light on the dashboard then make sure you understand what it looks like as there have been several ways developed to communicate a decrease in tyre pressure.

Find out if the TPMS in your car is direct or indirect, as this will give you some idea of its accuracy and in what situations it will alert you to under inflated tyres.

Although TPMS is a very useful tool in reminding drivers that tyres of a vehicle need frequent checks, it should not be seen as a replacement. A driver should still perform regular tyre checks of his vehicle, which involve testing the pressure with an accurate gauge, checking the tyre wall for damage, and making sure that the tread is not worn. A tread depth of 1.6mm is the legal minimum, although 3mm and above provides significantly greater safety benefits.

Filling tyres with nitrogen

Some tyre specialists now offer to inflate tyres with nitrogen rather than compressed air. It is claimed that there are a number of benefits of this, including:

- Less corrosion- because unlike air, there is no moisture in nitrogen.
- Slower rate of tyre pressure loss- because nitrogen molecules are larger than the oxygen molecules they replace¹⁰.

Although nitrogen leaks through the tyre liner more slowly than compressed air, the tyre pressure must still be checked regularly. Ideally, you should keep your tyres topped up with nitrogen to a minimum of 95%. You are able to top up your tyres with compressed air after having them inflated with nitrogen, but this will dilute the nitrogen content of your tyres¹¹.

Run-flat tyres

Run-flat tyres are becoming a common accessory on new vehicles. In conventional tyres, the pressurised air contained within the tyre supports the weight of the car. However, run-flat tyres are able to support the weight of the car by themselves, for a short period of time. They have been developed to minimise the risks associated with a tyre puncture, which can cause a driver to lose control of the vehicle due to the deflated tyre's loss of shape and structure.

In everyday operating conditions, run-flat tyres work like conventional tyres. They still contain air; to reduce the load that the run-flat system has to bear, to spread the weight of the vehicle evenly on the road surface, and to maximise the contact patch between the car and the road. The advantage is that they can operate without air in them, for a relatively short distance and low speeds, as their basic shape is kept by rigid components. This rigidity helps a driver maintain control of the vehicle if the tyre loses pressure, and removes the need to change a tyre immediately.

There are currently two different types of run-flat tyre:

Reinforced sidewall

One way that a tyre can be adapted to support the weight of the vehicle is to increase the thickness and strength of the sidewall. Although the tyre will bulge outwards without pressurised air inside, it will not completely collapse and become unseated from the rim, as a conventional tyre can.

Internal support ring

The internal support ring is a less common design of run-flat tyre. When the tyre becomes deflated, it rests upon the internal ring, which supports the vehicle and maintains both the tyre's shape, and its contact with the road.

Run-flat tyres and your vehicle

Run-flat tyres offer a better level of safety than conventional tyres if they have a puncture, but need to be treated with care so as not to lose this benefit. Drivers should not travel long distances or at high speeds, on a punctured run-flat tyre, and should ensure they know the maximum speed and distance for their tyres, which can be found on the sidewall of the tyre or by contacting the tyre manufacturer. If a run-flat tyre suffers a puncture, it should be replaced as soon as possible, as damage can occur to the tyre, which may not always be visible. Run-flat tyres that have been used whilst deflated should always be replaced, rather than repaired, if they have suffered damage.

As many run-flat tyres offer good ride comfort whilst deflated, it is often hard for the driver to feel that a tyre is deflated, so they should only be used on vehicles that have a Tyre Pressure Monitoring System (TPMS), which can warn the driver if the tyre is deflated. Drivers should seek advice from their vehicle manufacturer or tyre manufacturer before retrofitting a run-flat tyre.

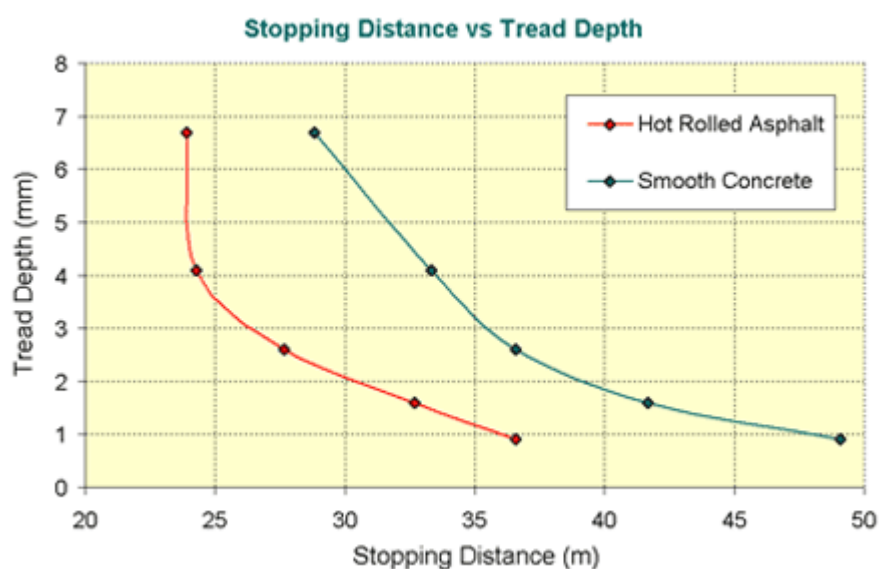
It is still vital to check tyre pressures regularly to ensure they are inflated to the manufacturer's recommended pressure, and to check for damage. The chances of needing the run-flat capabilities of the tyre are much reduced if the tyre is well maintained.

Tyre Tread Depth and Wet Weather Stopping Distances

Lower tyre tread depth can impair a tyre's performance during cornering, and straight line braking in the wet because the tyre is unable to deal with the same volume of water on the road, which means that the tyre is unable to transmit traction and braking forces to the road as effectively.

In 2003, the British Rubber Manufacturers Association (BRMA) commissioned MIRA to study the effects of tread depth on stopping distances. The study was carried out on MIRA's test track, and 5 different tread depths were tested - 6.7mm, 4.1mm, 2.6mm, 1.6mm (the legal minimum) and 0.9mm. The tests were carried out on two different surfaces, hot rolled asphalt and smooth concrete, which have different water retention properties.

The stopping distance from 80kmph was recorded at each of these tread depths and the points plotted on a graph of stopping distance versus tread depth. A line was drawn through the points to show the trend between stopping distance and tread depth, from which information could be taken.



From the graph of results, it can be seen that the stopping distances in the wet start to increase dramatically at tread depths of below 3mm. At the legal minimum tread depth of 1.6mm, the stopping distance increased by 36.8% on the hot rolled asphalt and 44.6% on the smooth concrete

Recommendations

Drivers should change their tyres once the tread depth reaches 3mm in depth.

Drivers should check their tyre pressures regularly, as well as inspecting the tyre for damage.

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