# Guide to tyre management and maintenance on heavy vehicles













### **Foreword**

Tyres are too often neglected or abused. As a vital element of vehicle roadworthiness, they deserve particular attention. And yet, the condition of tyres has overtaken braking systems as the most common defect found on heavy goods vehicles and trailers at the roadside. Tyres also vie for the top spot on bus and coach checks.

All operators are legally responsible for maintaining vehicles and trailers in a fit and serviceable condition. The Traffic Commissioners have regulatory powers over Licensed operators. Drivers also have a clear legal responsibility as the users of vehicles. Operators must establish an appropriate system of preventative maintenance inspections and driver daily walk round checks. Traffic





commissioners expect to see the likely risks assessed in line with your business and systems designed to address those risks, particularly where vehicles operate off-road.

This comprehensive guide and the companion drivers' poster provide authoritative practical advice expressing the standard of professionalism expected of operators with regard to their tyres. Traffic Commissioners welcome it and commend it to all operators of heavy commercial vehicles.

### **Kevin Rooney & Sarah Bell**

on behalf of the Traffic Commissioners for Great Britain



### 1. Introduction

This guide contains essential information necessary to the safe and efficient management of tyres fitted to heavy vehicles: trucks, trailers, buses and coaches. It is addressed to vehicle operators in the UK and reflects UK regulations and operating conditions. The guidance may not be applicable in countries outside the UK. Equally, not all the advice may be applicable to specialist vehicles such as cranes or mobile plant.

Tyres are a safety critical element of every vehicle on the road. They are also one of the most highly regulated automotive components. Tyre manufacturers exercise great care in producing safe, reliable and compliant products. However, the vehicle operator is responsible for the tyre's in-service condition. This responsibility is backed by legal obligations concerning not only the condition of the tyre but also the processes and procedures in place to ensure that tyres in use are fit for purpose at all times.

# 2. Tyre Management System

A robust tyre management system is essential for any professional vehicle operator and should ensure:

- That tyres in service are appropriate to the vehicle and operating conditions;
- That all tyre pressures are checked monthly or at least at the same inspection frequency as declared on the Operator licence, at ambient temperature with a calibrated gauge;
- That responsibility for regularly checking, reporting and maintaining tyre pressure to policy is explicitly defined between the vehicle lessor, lessee, maintenance garage, operator, etc., as applicable;
- That personnel responsible for tyre pressure maintenance have access to an airline capable of inflating a tyre to the highest pressure in the tyre inflation policy;
- That vehicle tyres are regularly and closely examined for damage and wear with mechanisms in place to address any identified issues;
- That tyre age is monitored and tyres fitted to the front steering axle are no more than 10 years old;

- That the location of trailers is tracked and the particular issues of inspecting and maintaining remote assets are addressed.
   Specific attention should be given to the condition of tyres on little-used trailers, mobile plant, etc.
- That a vehicle-specific tyre inflation pressure policy is established and periodically reviewed in light of operating experience;
- That processes exist to distribute best practice in tyre management throughout the fleet;
- That staff dealing with tyre management are properly trained and empowered to act with sufficient authority;
- That any technician dealing with tyre inspections or repairs is properly trained and qualified;
- That drivers are properly trained and equipped to recognise and report tyre issues;
- That any on-site tyres are properly stored.

Should you identify any discrepancies or shortcomings between the contents of this guide and your internal procedures you must address them immediately.

# 3. Tyre Choice and Fitting

### **APPLICABLE REGULATIONS**

Tyres are subject to extensive European and International regulations. Compliance is verified at type approval. It is illegal to sell tyres in the UK without the required type approval marking ("E-mark") on the sidewall.

<u>UK Construction and Use Regulation 27</u> require that tyres fitted on the same axle are of the same size and construction (radial, cross-ply, etc) and that the load index and speed symbol must at least match the vehicle plated weight and the maximum legally permissible speed for the vehicle.

### **RECOGNISED GUIDANCE**

BS AU 50-2.7b: 2017 Code of practice for the selection and care of tyres and wheels for commercial vehicles.

Recommendations published by the European Tyre and Rim Technical Organisation (ETRTO) cover many aspects of tyre specification, use and management.

#### **BASIC PRINCIPLES**

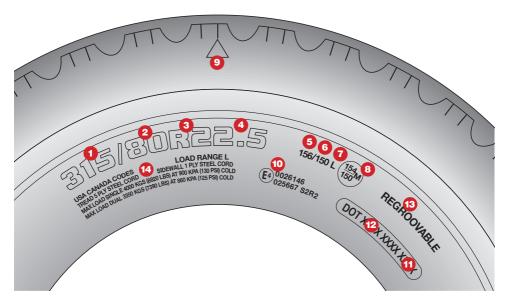
Briefly, the requirements of a tyre are:

- To support the maximum authorised load at the vehicle's legal maximum speed;
- To grip the road for control of the vehicle in all conditions;
- To give the best possible ride and longevity subject to the two criteria above.

A tyre is defined by the following characteristics:

- Size designation comprising section width, aspect ratio and rim diameter;
- Construction normally radial but less frequently cross ply or bias belted;
- Type of tread pattern according to individual manufacturer's designation;
- Load index and speed symbol (service description).

The operator must ensure that tyres are responsibly sourced and endorsed for UK and European use. Any tyre chosen as a replacement should normally be of the same size, construction, and service description as the original equipment. Particular care must be taken to ensure that the tyre load capacity is equal to or greater than the axle plated weight. Prior written approval is now required from the vehicle manufacturer before using a tyre with a different specification from the vehicle's original equipment.



### PRINCIPAL TYRE MARKINGS

- 1 Tyre Section width
- 2 Aspect ratio
- 3 Construction (R=radial)
- 4 Rim diameter (inches)
- 5 Load Index (single tyre)
- 6 Load Index (dual mounted)
- 7 Speed symbol
  - 8 Additional service description / Unique point
  - 9 Location of tread wear indicator
- 40 Approval numbers

- 11 Manufacturing date code
- 12 DOT manufacturing site code
- Regroovable tyre
- 14 Data not applicable to European markets

### **TYRE CHOICE**

Steering axle: It is generally not recommended to fit tyres designated for drive axle use on the steering axle of a vehicle as the handling may be adversely affected. It is strongly recommended that only new tyres or re-grooved new tyres should be fitted to steering axles and this is a requirement of Tempo 100 certification.

On rear/ drive axles care should be taken to ensure that only tyres of the same type,

size, service description and wear are twinned together. The difference between the remaining tread pattern depths on twinned tyres should not generally be greater than 4mm at the same stage of tyre life (i.e. new, regrooved or retreaded). It is not recommended to twin regrooved tyres with un-regrooved tyres. Equally, twinning different brands of tyre is not recommended as casing characteristics may differ, possibly causing accelerated wear to one tyre.

Winter use: Historically, tyres offering improved winter mobility have been marked "M + 5". This reflected the manufacturer's assessment of the tyre's performance on snow. More recently the snow grip pictogram (Alpine or 3PMSF symbol) has been introduced. This identifies that the tyre meets an objective performance standard contributing to improved winter mobility.

Rolling resistance: Tyres account for 20-30% of the fuel consumption and CO2 emissions of a heavy commercial vehicle. In order to reduce their environmental impact many new vehicles are fitted with low rolling resistance tyres. To maintain this performance replacement tyres should be of the same rolling resistance class as the original equipment.

Many passenger carrying vehicle (PCV) operators will have to register Local Service Buses with the Traffic Commissioner. In those cases, the vehicles can be fitted with "J" speed rated tyres, limited to a maximum speed of 100 km/h. This enables the fitment of especially robust urban bus tyres.

#### **FITTING**

Tyres should only be fitted by suitably qualified personnel using appropriate equipment and following correct procedures. Correct tyre fitting will ensure that the tyre is mounted concentrically on the rim and that the bead area has not been distorted,

stretched, or damaged. Care must also be taken when removing a tyre from the rim not to damage the bead area or casing plies in any way.

If circumstances permit it is preferable to remove the wheel from the vehicle before replacing the tyre. This will enable both the condition of the wheel rim and the correct fitting of the tyre to be thoroughly checked. It will also reduce the risk of working on a jacked and propped vehicle.

### **DIRECTIONAL TYRES**

Directional tread patterns allow optimised tread wear performance. The use of a directional tyre in the opposite direction does not constitute an unsafe condition: although not optimal, performance and handling will not be compromised. If a directional tyre shows an irregular wear profile, (for example, a sloped wear pattern) it may be turned on the rim and run in the opposite direction with no detriment to other performance criteria.

In such cases, it is recommended that all tyres on the same axle should be turned on the rim so that all rotational arrow markings face in the same direction. When turning these tyres on the rim or moving them from side to side on a vehicle, they should be treated in all other respects in the same way as any other tyre.

# 4. Tyres in Service

#### **APPLICABLE REGULATIONS**

Construction and Use Regulation 27 requires that a tyre shall be suitable to its application and correctly inflated. The regulation also specifies limits to acceptable damage and the minimum requirements regarding tread depth.

Tread depth on heavy vehicles must not be less than 1mm at any point across a continuous band covering at least 75% of the width of the tread around the circumference of the tyre. (The minimum depth for vehicles up to 3.5 Tonnes GVW is 1.6mm). The tread pattern must also be visible across the remainder of the tread. For this purpose, the measurement area of the tread is in contact with the road surface when the tyre is correctly inflated and under normal use.

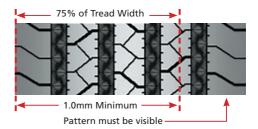
### **RECOGNISED GUIDANCE**

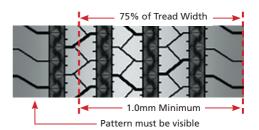
Detailed guidance regarding in-service issues is contained in the <u>recommendations</u> published by ETRTO.

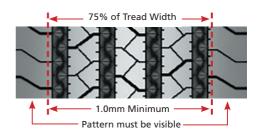
### **IRREGULAR TREAD WEAR**

Tyre wear should be checked frequently because once a wear pattern becomes firmly established it becomes difficult to stop, even if the underlying cause is corrected.

Tyres on steering axles, particularly on the nearside, often wear more on one shoulder than the other. This can be due to the road camber, the continuous





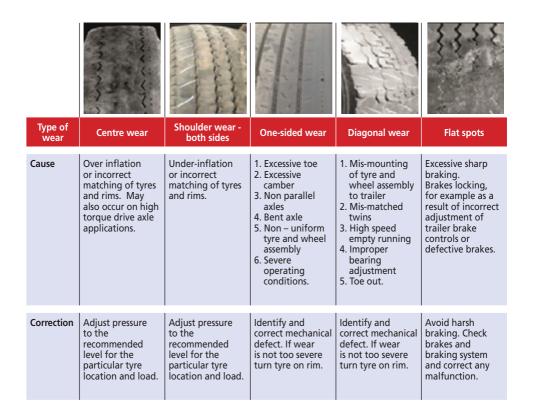


cornering and roundabouts on UK roads, misalignment or sometimes, under inflation. Equally, drive axle tyres frequently wear faster on the inner edge of the inner tyres. Turning the tyre on the rim, if carried out at the correct time, can considerably extend tyre life and provide cost savings. A tyre should be turned on the rim early enough to equalise the wear. A difference greater than 3mm from one shoulder to the other should instigate a turn on rim.

### SIDEWALL ABRASION

When the sidewall lettering (or sidewall wear indicator, if applicable) starts to disappear, the vehicle operator should turn the tyre on the rim or move it to a less aggressive position on the vehicle so that the worn sidewall is protected from further damage.

To demonstrate legal compliance the size and service description markings must be legible on at least one side of the tyre. Tyres with severe kerbing damage must be removed from service: it is illegal for the reinforcement plies to be exposed.



### WHEEL ALIGNMENT

It is important that a vehicle's wheels are correctly aligned. Poor alignment will affect:

- Tyre wear
- Vehicle handling
- Fuel economy

TOE-OUT: inside shoulders



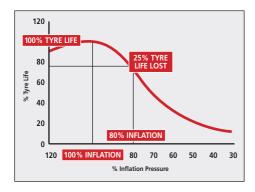
TOE-IN: outside shoulders

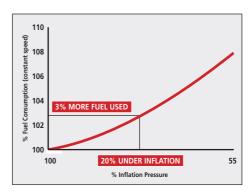


### **CORRECT INFLATION**

The maintenance of correct tyre pressures is extremely important, not only from the performance and safety aspects but also from the tyre life point of view. Furthermore, correct tyre pressures produce the best ride and handling of the vehicle.

Under-inflation can seriously reduce tyre service life and increase fuel consumption:





Optimal inflation pressure is influenced by operating conditions (load, speed, etc) and vehicle and tyre characteristics. The vehicle operator should procure and follow the specific pressure recommendations provided by the tyre manufacturer for the vehicle type and application.

Tyre pressures should be checked when the tyre is at ambient temperature. Tyre inflation equipment should be regularly calibrated in line with the manufacturer's guidelines.

The valve cap is the primary air seal and must always be fitted (the valve allows the tyre to be inflated and deflated; it should not be treated as a seal). High pressure valve caps should always be used and replaced as necessary.



Tyre pressure maintenance is widely neglected on the inner tyres of twin wheels. This is a major cause of accelerated wear and premature tyre failure. Ensuring that the inner and outer valves are fitted

180° opposite to each other and fitting a good quality valve extension to the inner wheel will facilitate regular tyre pressure maintenance.

### **RESPONSES TO UNDER-INFLATION**

0 - 10% under-inflation	Examine for external damage before re-inflation Re-inflate as soon as possible
10 - 20% under-inflation	Examine for external damage before re-inflation Re-inflate immediately Monitor for continuing deflation
20% + under-inflation	Remove tyre from rim and inspect for possible internal damage Take extra care on re-inflation: increased risk of sidewall <u>"zipper" failure</u> Monitor for continuing deflation

# RETRO-FIT TYRE PRESSURE MONITORING SYSTEMS (TPMS)

A wide range of products is available at increasingly competitive prices. Proven benefits include a significant reduction in tyre-related breakdowns, longer tyre life and improved fuel consumption. Some systems will link to vehicle telematics allowing the communication to the operating centre of alerts highlighting issues to be addressed.

# AXLES FITTED WITH KINETIC ENERGY RECOVERY SYSTEMS

Kinetic Energy Recovery Systems (KERS) offer improved fuel economy by conserving braking energy and releasing it as the vehicle accelerates. In this context the KERS axle contributes to driving the vehicle forward. As such, it should be fitted with a tyre suitable for a drive axle. "Trailer use only", "Trailer use" and "FRT" tyres are not suitable for use on KERS-equipped axles.

# Other Tyre Conditions: CUTS & TEARS

Cuts & tears could permit water to reach the casing or bracing plies, causing corrosion that may weaken the structure of the tyre if the exposure is prolonged. In addition to being potentially illegal, such damage could render the tyre unacceptable for retreading. Repair in accordance with BS AU 159g:2013 should be pursued as soon as possible.

#### BULGES

Sidewall undulations can result from normal manufacturing processes or a satisfactory repair. However, a bulge can indicate internal separation or partial failure of the tyre structure. A bulge due to a repair will be solid, feeling firm to hand pressure and will not deflect as would a bulge associated with casing separation. If in doubt a qualified tyre technician should be consulted.

### OIL, PETROL, DIESEL

Many industrial chemicals and solvents, including oils, petrol and diesel, can damage tyres. These contaminants should be removed using plenty of water and a mild detergent. Severe contamination may render the tyre unusable.

# OBJECT TRAPPED BETWEEN TWINNED TYRES

Any object trapped between twinned tyres should be removed. It may be necessary to deflate the tyres or dismount the outside wheel in order to do so. Both tyres may have been damaged and should be thoroughly inspected by a competent tyre technician before re-entering service.

### **AGEING**

Tyres can deteriorate with age: this may show as cracking or crazing on the sidewall or in the grooves of the tread pattern. Similar damage can be caused by overheating resulting from under inflation or overloading. In severe cases, either cause can lead to separation of the inner components of the tyre.

Tyre ageing is not a function of the passage of time alone but rather the cumulative exposure to adverse environmental and operational factors. Prolonged exposure to ozone or ultra-violet light can affect the natural and synthetic rubbers used in tyres. Tyre manufacturers incorporate additives to reduce this phenomenon. The flexing of the tyre in normal use helps the diffusion of these additives to the surface of the tyre where they act against the adverse effects of exposure to ozone and ultra-violet light. This diffusion process is greatly reduced in tyres fitted to vehicles that are used infrequently. Consequently, such tyres are more susceptible to degradation caused by adverse environmental factors than tyres on vehicles that are used frequently. Spare wheels are a case in point.

If a tyre is showing signs of ageing its condition should be assessed by a competent tyre technician. Some tyre manufacturers recommend that tyres over 10 years old should be withdrawn from service.

# AGEING: APPLICABLE REGULATIONS

From 1st February 2021 Construction and Use Regulation 27 will not permit the use of tyres in excess of 10 years of age on the front steered axle(s) of heavy goods vehicles, buses and coaches. It will also be a requirement for all tyres on these vehicles to display a date code. Detailed provisions are contained in the Regulations.

The date of manufacture of a new tyre can be determined from the DOT code marked on the sidewall. The final four digits show the calendar week and the year of manufacture. The tyre in the photograph was manufactured in week 08 of 2020. On retreaded tyres the most recent date of remanufacture is shown. Consult the remanufacturer for details of the relevant marking.



# 5. Tyre Repairs

It is vital that any repair is undertaken by a trained operative. All tyre repairs should follow the recommendations contained within BS AU 159g:2013.

Prior to affecting a repair, the following important points should be borne in mind:

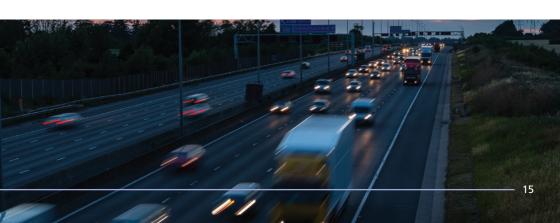
- External plugging (string repair) is for short-term temporary repairs only, eg to get the vehicle into a position where it can be jacked safely. A string repair is not suitable to return the vehicle into normal service.
- Temporary repairs should not be applied to sidewall damage.
- A permanent repair requires the removal of the tyre from the rim in order to allow an internal examination by a competent tyre technician and the application of suitable repair materials from the inside of the tyre.
- The insertion of a tube to affect a 'repair' to a minor penetration is not recommended.
- Liquid tyre sealants are not considered to be a permanent repair in accordance with BS AU 159g:2013.

 Tyre filler should only be used for localised cosmetic repairs where there is no penetration or ply damage. Tyres with damage that extends to the reinforcement cords should be assessed by a qualified repair technician and, where appropriate, only repaired in accordance with BS AU 159g:2013.

### **MAJOR REPAIRS**

Heavy vehicle tyres with major repairs conforming to the British Standard must be marked by the repair agent, radially in line with each repair at a point just above the area covered by the rim flange. The marking must be permanently legible with the number of the British Standard, i.e. BS AU 159g:2013, and with the repairer's name or identification mark. The minimum height of the characters must be 4mm.

It is recommended that tyres that have been subject to a major repair as defined in BS AU 159g:2013 should be fitted to a rear axle position only.



# 6. Regrooving

### **APPLICABLE REGULATIONS**

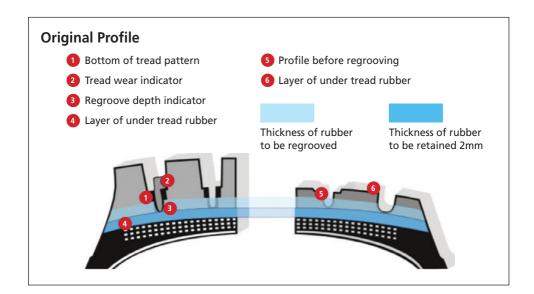
Construction and Use Regulations <u>24</u> and <u>27</u> apply. Only tyres identified on the sidewall as regroovable may legally be regrooved. This applies to both new and retreaded tyres. It is also a legal requirement that any regrooving must follow the pattern specified by the manufacturer. If the tyre cords are exposed as a result of regrooving the tyre is no longer legal and must be withdrawn from service.

### **BASIC PRINCIPLES**

The regrooving operation consists of cutting into the tread of a tyre a tread pattern deeper than the original, so as to prolong the tyre's useful life. When regrooving, it is of fundamental importance to avoid exposing

the upper belts of the tyre, and to ensure that an adequate layer of rubber is left to protect them. Tyre manufactures supply specific instructions regarding the patterns and procedures to follow in the regrooving of tyre treads. These include recommended groove widths and the depth of rubber to remove from the base of the original grooves.

Regrooving should normally be carried out on the entire tread according to the recommended pattern and procedure. However, where a tyre has worn abnormally, it may be possible to regroove just that part of the worn tyre, provided a sufficient portion of the original groove is visible before regrooving. Clearly, this precludes further re-grooving later in the tyre's life.





# 7. Retreading

Retreaded heavy vehicle tyres offered for sale in Europe must comply with <u>UN ECE</u>

Regulation 109. This ensures that retreaded tyres meet the same standard for structural integrity under endurance testing as new tyres.

Retreading involves the remanufacturing of a worn tyre casing to "as new" condition. In all cases it involves the replacement of tread rubber and may include the renovation of the shoulder and sidewalls. The safety, performance and structural integrity of a retreaded tyre depend largely on the condition of the original tyre casing. All tyre casings selected for retreading are subjected to extensive examination and non-destructive testing to establish the casing's structural integrity and suitability for continued use.

Recent research by Highways England into the source of roadside tyre debris concluded

that retreaded tyres are no more likely to fail in service than first life tyres.

Although in all respects modern retreaded tyres are equivalent to new tyres, there is a long-standing industry convention generally to not fit retreaded tyres to front steer axles, except in certain low speed applications. This was born out of historical prudence before the introduction of present-day non-destructive testing methods. Since tyres cannot be retreaded indefinitely, there is also the practical necessity to introduce new tyres into the retreading cycle.

Including retreaded tyres in an integrated tyre management programme offers improved lifecycle costs and greatly reduced environmental impact.

## 8. Tyre Storage

Detailed guidance regarding the storage of tyres is contained in the <u>ETRTO</u> recommendations.

Tyres should be kept in a cool, dry, and moderately ventilated environment away from any possible contact with oil or hydrocarbon solvents or lubricants. They should be kept away from sources of heat such as pipes or radiators and be protected from exposure to sunlight and strong artificial lighting. Avoid storage near any electrical equipment which may produce sparks, such as arc welding equipment.

Tyres should be stored in a relaxed condition free from tension, compression or other deformation, ideally arranged vertically.

### 9. Wheels

All the issues relating to the care and maintenance of wheels and correct wheel nut re-torquing are covered comprehensively in the IRTE / Logistics UK guide "Wheel security" and BS AU 50-2.7b:2017.

# 10. Training

Operators must ensure that they provide sufficient training to enable their staff to carry out competently the duties they are assigned. A range of appropriate training courses will be necessary according to the roles or duties concerned.

#### **DRIVER TRAINING**

It is a duty of the driver of a PCV or LGV (Large Goods Vehicle) to ensure that the tyres on the vehicle they will be driving are fit for purpose and safe to use. Each driver must carry out a thorough vehicle walk around check before undertaking their journey / duty. The driver must be competent enough to identify if a tyre fulfils legal requirements. Driver induction training should include a module detailing tyre inspection and defect recognition and reporting procedures. This training should be refreshed at least every 5 years.

Drivers and Operator licence holders are also reminded that the first use driver check forms part of a preventive maintenance programme and is an essential part of Operator licence obligations.





Regular checks and audits must be carried out by Transport Managers and / or supervisory staff to ensure that checks are thorough and effective. Appropriate training will be needed to deliver this responsibility. Records of audits should be kept as evidence – failure to have a robust system in place will jeopardise your Operator's licence.

A first user check-list for tyres is <u>available</u> <u>here.</u> Tyre checks are also included in the <u>DVSA video guidance</u> for daily walkaround checks on HGV and PSV.

### **VEHICLE MAINTENANCE STAFF**

Any person who undertakes vehicle maintenance must be competently trained to identify tyre irregularities and staff must be able to prevent premature tyre failures by identifying wear patterns and changes in vehicle characteristics. They should have received formal training such as City & Guilds / NVQ / IMI / Irtec in vehicle maintenance.

Staff must also be aware of manufacturers' / operators' tyre pressure maintenance

guidelines and any other relevant policy relating to wheels and tyres. Maintenance facilities should have policies and guidelines on clear display and have sufficient clean tools and work areas to enable effective inspection and repairs to be carried out.

### **TYRE TECHNICIANS**

It is now common practice for many PCV or LGV Operators to use tyre manufacturers or appointed agents to maintain their fleet tyres under a maintenance contract. Operators have realised the benefits of using an appointed tyre expert over recent years. There are obvious benefits to road worthiness compliance, safety, efficiency and not least, financial performance.

If operators choose to maintain their own tyres, they must ensure that the tyre technician has adequate recognised training, accreditation and experience relevant to their particular fleet. Many tyre manufacturers offer training packages from basic awareness to thorough accredited technician status award.

# 11. Acknowledgements

This revised guide is the result of collaboration between the British Tyre Manufacturers' Association and the Imported Tyre Manufacturers' Association with the support of the Driver and Vehicle

Standards Agency. Thanks are also due to the Confederation of Passenger Transport, Logistics UK and the Road Haulage Association for their useful contributions.

### 12. Useful Contacts

CONTACT	PHONE
enquiries@dvsa.gov.uk	0300 123 9000
Info@btmauk.com	01787 226995
operations@cpt-uk.org	020 7240 3131
www.itma-europe.com	08453 700145
enquiry@logistics.org.uk	0371 711 2222
info@ntda.co.uk	01296 482128
www.rha.uk.net	01274 863100
soe@soe.org.uk	020 7630 1111
Bsuk.technical@bridgestone.eu	01926 488580
administrator.technical@conti.de	01788 566240
tyre.techuk@goodyear.com	08453 453453
technical@eu.giti.com	01565 831910
info@hankooktire.com	01327 304100
business.michelin.co.uk	0845 366 1598
	enquiries@dvsa.gov.uk Info@btmauk.com operations@cpt-uk.org www.itma-europe.com enquiry@logistics.org.uk info@ntda.co.uk www.rha.uk.net soe@soe.org.uk Bsuk.technical@bridgestone.eu administrator.technical@conti.de tyre.techuk@goodyear.com technical@eu.giti.com info@hankooktire.com

Several of the professional bodies listed above offer training courses relevant to tyre management. In addition, many tyre manufacturers offer specialist training courses covering numerous aspects of tyre use and management.