


# Road Wheel Procedure

## Inspection, Removal and Fitment





1	INTRODUCTION
2	WHY DO WHEEL FIXINGS LOOSEN?
3	TYPES OF WHEEL FIXINGS
4	WHEEL REMOVAL PROCEDURE
5	ROAD WHEEL INSPECTION PROCEDURE
6	WHEEL CLEANING PROCEDURE
7	WHEEL FITTING PROCEDURE
8	WHEEL TORQUE PROCEDURE
9	ADDITIONAL INFORMATION AND PAPERWORK CHECKS
10	TOOLS AND CALIBRATION PROCEDURE
11	APPENDICES

# INTRODUCTION

Lothian's aim is to maintain vehicles so that they are safe and reliable at all times.

Wheel detachment from vehicles has been a major cause for concern for operators for many years. When a wheel becomes detached from a heavy vehicle it may simply come to rest without causing any further damage or harm. However, in the wrong circumstance, when wheels become detached from a moving vehicle, they can accelerate up to around 150 km per hour, reaching a height of 50 metres before colliding with other vehicles or road users at an equivalent force of 10 tonnes. In some cases, this has resulted in fatalities, and according to research carried out by the Transport Research Laboratory (TRL) the typical annual frequency of fatalities resulting from wheel loss incidents is between three and seven cases per annum.

At Lothian we do not want any vehicle to suffer from wheel loss, therefore we have developed a robust wheel inspection, removal and fitment policy along with an effective recording system. This will ensure that we:

- **Maintain wheel security**
- **Reduce the likelihood of wheel detachment**
- **Reduce the likelihood of vehicles attracting prohibitions**

This procedure provides best practice guidelines and must be followed by vehicle maintenance staff at Lothian to prevent wheel loss.

The information within the attached procedure has been acquired from best practice, recommendations from vehicle manufacturers, tyre manufacturers and road transport associations.

It has been produced to establish best practice and must be followed by all Lothian Employees.

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**We as Lothian employees must  
follow this robust policy at all times!**

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# WHY DO WHEEL FIXINGS LOOSEN?

Road wheels on PSV vehicles are subject to a wide variety of forces from the vehicle itself, vibration, cornering, heat effects, acceleration, braking as well as extreme weather, poor road conditions and kerbing.

If one wheel nut loosens then these forces are distributed over the remaining nuts. The majority of the forces are spread to the adjacent nuts causing them to loosen as well. As more nuts become loose, the process accelerates as the overall clamping force decreases (clamping force being the loading that is created by the studs and wheel nuts compressing/pinching the wheel(s), hub and drum together). When the clamping force is less than the forces on the wheel, it will move relative to the hub. This results in side loading and a loosening of the remaining nuts which, if not spotted in time, leads to elongated stud holes, fatigue failure of studs, fretting fatigue cracks and wheel separation.

Relaxation of the wheel-clamping force can occur due to a loss of tension in the stud.

Laboratory test programmes have established that the sequence of events which precede wheel loss due to relaxation, is as follows:

- Settlement within the fixing leads to a reduction of clamping force
- Clamping force reduction continues as further wear and settlement takes place
- Some of the nuts may become so loose that they exert no effective clamping force on the wheel
- The nuts on the studs that have completely lost their clamping force may spin off over a period of time, or remain seized on the studs; in this eventuality the lack of clamping force will result in elongation of the stud holes, fatigue failure of studs, fretting fatigue cracks and wheel separation
- Insufficient clamping force is recognised as the main reason for wheels becoming detached. Insufficient clamping force can lead to movement at the wheel and hub interfaces causing wear and subsequent loss of stud/bolt tension. Inadequate clamping force can occur if the initial tightening torque is too low, or the applied tightening torque did not result in the intended clamping force possibly due to over-tightening or because mating faces are dirty or damaged

Wheel fixings can loosen due to a variety of reasons:

- The fixing is insufficiently tightened and thus allows the wheel to fret and wear
- The fixing is over-tightened, causing stretched/broken studs or causing studs to be pulled through the hub. It is often an unconscious act for drivers and maintenance staff to over-torque wheels, in the misguided belief that exerting extra pressure on a wheel fixing will prevent them from coming loose. Either way it will result in stud failure due to the fact the elastic limit of the material is exceeded
- Failure to regularly check tightness of wheel fasteners
- Fitment of incompatible wheels
- Fitment of unserviceable wheels and components
- Incorrect lubrication of threads and interfaces. Lack of initial clamping force can be due to high friction loss which can be resolved by the use of appropriate lubrication of the wheel nuts, studs and washers
- Excessive lubrication or incorrect lubrication, e.g., applied to the mating surfaces of wheels
- Severe corrosion and/or wearing of wheel studs
- Studs not pressed fully into the hub or loose back nuts
- Incorrectly assembled components
- Incorrect assembly, e.g., not following the correct torque and re-torque procedure
- Paint, rust/scale or dirt on mating surfaces
- Worn wheel spigots
- Fractured or seized wheel nuts washers
- Brake drum securing screws/bolts loose, holding wheel off the hub face
- Inaccurately calibrated torque wrench or calibration date expired
- Incorrect use of air impact tools. This is a common cause of both under-torquing and over-torquing because the actual torque applied depends on a wide range of variables and is not measurable. The power of air impact tools also often leads to problems such as cross-threading and cracked nuts and washers
- Incorrect tightening sequence
- Temperature effects. The clamp load can vary during service due to changes in temperature of the components
- Settlement from any other factor eventually causing the clamping load to become inadequate

In summary, the assembly can only accommodate a very small amount of settlement. The wheel studs are very stiff and the amount of extension caused by the tightening torque is limited, particularly if the stud tension is lower than intended in the first place. Nut movement can be indicated however settlement is difficult to detect visually.

Below is an example showing what can happen if the correct procedures are not followed when refitting wheels.

## Cracks Between Stud Holes

Caused by:

- Loose Wheel Nuts
- Paint on Mating Surfaces
- Corrosion on Mating Surfaces
- Over Tightened Wheel Nuts
- Wheel Nut Tightened in the wrong sequence

## Cracks between Ventilation Holes and Stud Holes

Caused by:

- Overloading
- Twin Tyres with Different Pressures
- Excessive Speed



Elongated Stud Holes



Cracked Rim



Wear To Studs

# TYPES OF WHEEL FIXINGS

Most European wheel manufacturers have standardised spigot type wheel fixings; although wheels designed for old type fixings are still in use. This can be an issue to fitters and technicians who may be confronted with a variety of non-compatible wheel fixings which, if not correctly matched, could result in damage to wheels, hubs and studs. Mismatching prevents correct mating and tightening of the wheel.

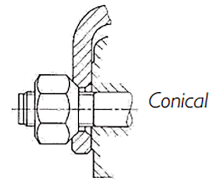
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## Different wheel fixing types are not interchangeable!

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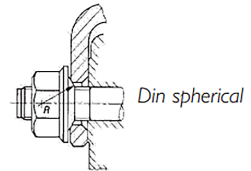
### Conical

This nut matches with a similarly shaped machining around the holes. This means that when it is tightened the two faces 'mate' together to both locate and secure the wheel.



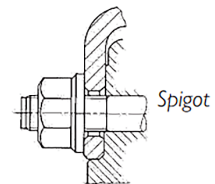
### Spherical

A plain nut is used with a washer that has a spherical facing. The washer matches a spherical shaped machining around the stud holes which, when tightened, locates and secures the wheel.



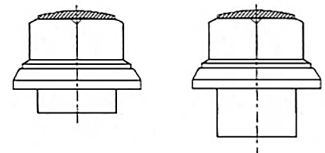
### Spigot

This type of fixing is the most commonly used on heavy vehicles. The design of fixing relies on an accurate fit of the wheel centre on the hub spigot for location purposes and on clamping pressure generated by the large surface area of the fixed washer for securing purposes.



### Sleeved

Some newer vehicles come with sleeve style nuts where the thread of the nut carries on inside the sleeve. This sleeve cannot be seen once fitted as it fits inside the stud hole of the wheel rim. Please note these nuts often have different length sleeves to fit single/twin rim set-ups. The nuts must not get mixed up.



# WHEEL REMOVAL PROCEDURE

Before removing any wheel, a **Wheel Removal Sheet (Appendix 1)** should be completed by the engineer carrying out the removal. The following details are required:

- Fleet number
- Position of the wheel being removed
- Wheel Type
- Endorsed by supervisor (Initials)
- Date/Time of removal
- Signatures of Mechanic and Supervisor

The supervisor should then add the wheel removal details to the tyre change section on the **Daily Vehicle Serviceability Report (Appendix 2)**. The wheel removal sheet should be stored at the **wheel torque station**.

If the wheel removal is carried out on an unsupervised shift, then the endorsed by section should be incomplete and the wheel removal sheet stored at the **wheel torque station**.

Then the wheel removal process should continue to the next stage.

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**Wheels should only be removed by a trained engineer.**

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## Wheel Removal Procedure:

### **SAFETY CRITICAL**

Vehicle on level ground



Immobilise vehicle and place VOR sign in drivers cab window  
(Ensure VOR sign is visible)



Ensure all wheel chocks are in position



Battery isolation switch must be turned off and  
**Do Not Start** steering wheel cover to be fitted



Jack up vehicle using the correct axle points until  
wheels are clear of the floor. Support vehicle on  
axle stands in the correct areas



Ensure vehicle is properly supported and  
chocked to prevent movement



Use appropriate equipment to remove wheel nuts  
(Do not use the wheel torque wrench to remove wheel nuts)



Remove road wheel, taking care not to damage hub odometer

### **Please Note:**

The vehicle should be supported on stands or blocks at all times  
when removing wheels.

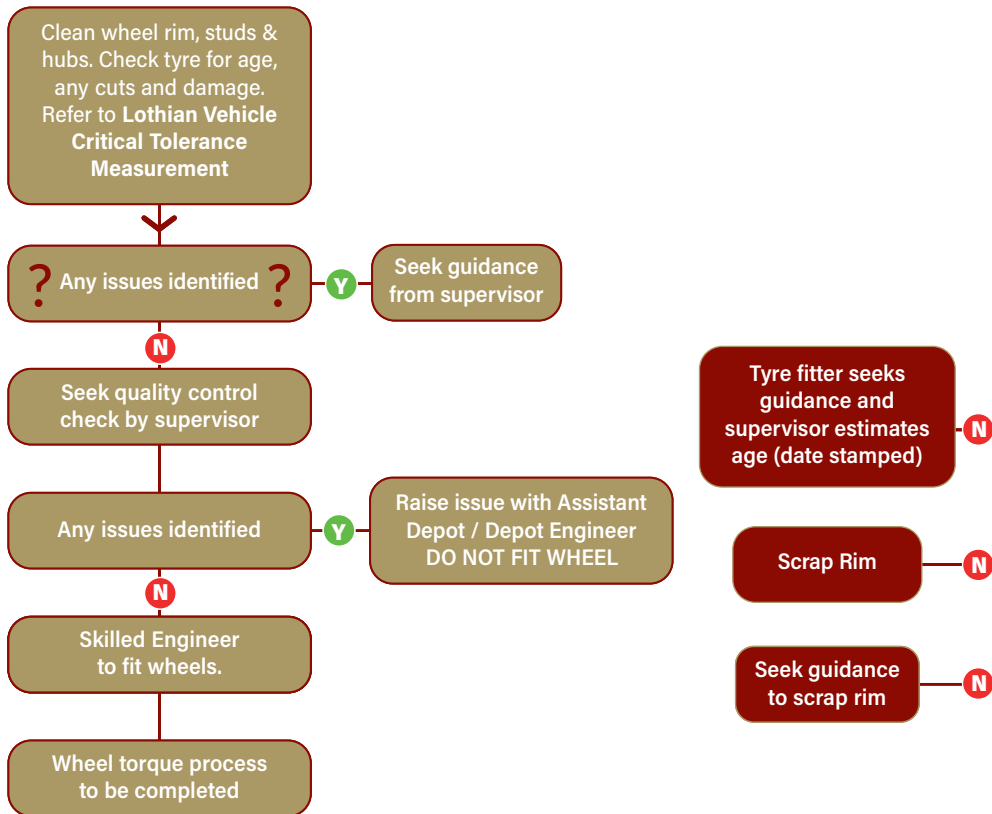
# Wheel removed



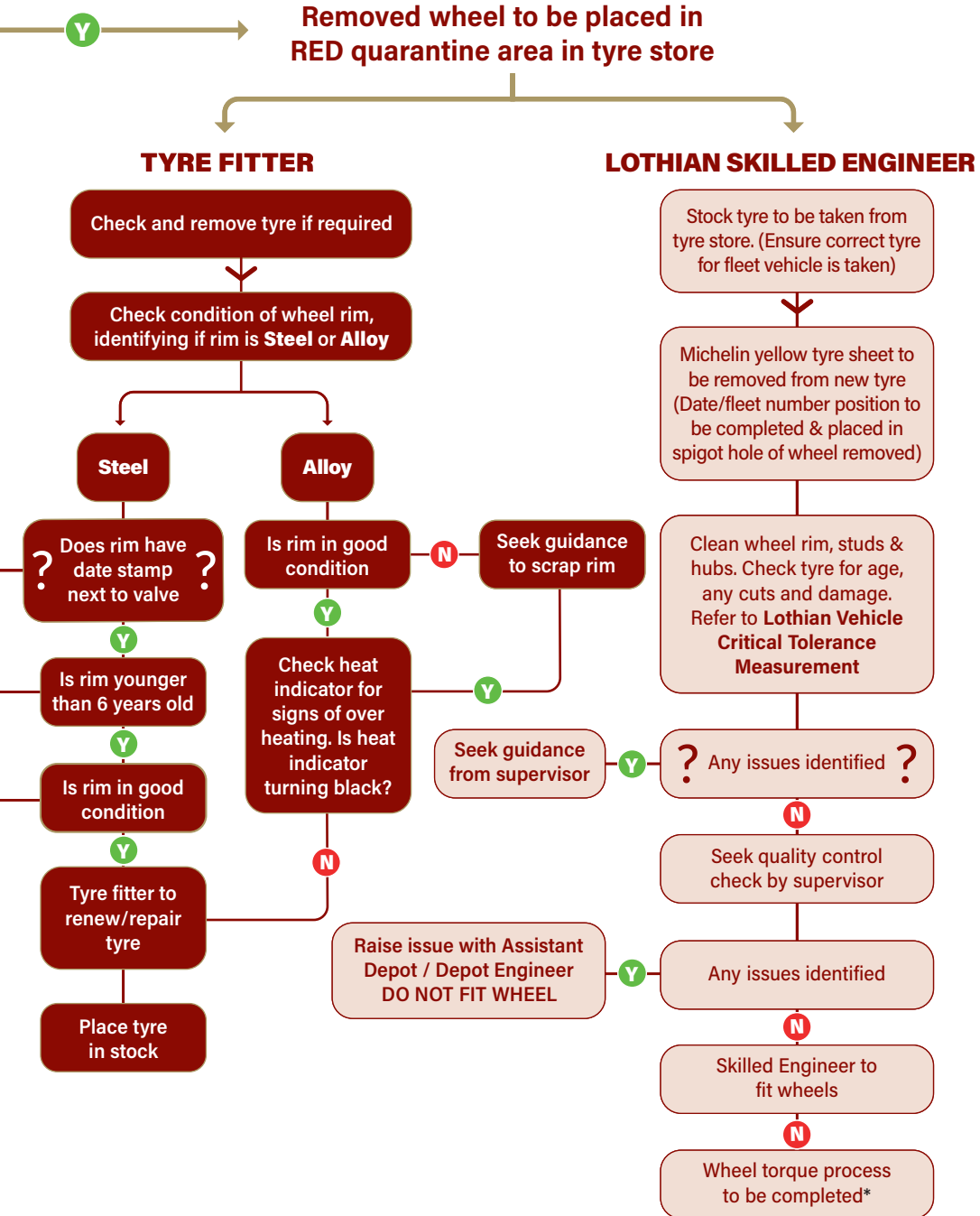
Tyre to be renewed/regrooved

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## LOTHIAN SKILLED ENGINEER



\*please see section Section 8 for wheel torque procedure.



# ROAD WHEEL INSPECTION PROCEDURE

## Inspection, Age Estimation, Cleaning and Fitment

To improve the condition of our wheel rims and to have a robust maintenance procedure on this safety critical area, any wheel rim gauged to be older than 6 years should be scrapped.

The procedure (flow diagram) on pages 10 and 11 should be followed any time a road wheel is removed.

It will be necessary for Engineering Supervisors and Managers to gauge an estimation of the age of each wheel rim whenever a tyre is removed if no stamp is visible at the valve area or rim face.

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**Quality inspection should  
be carried out by a supervisor.**

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## Tyre Age and Condition

DVSA does not permit the use of tyres aged over 10 years to be used on the front steered axle of a vehicle, to ensure full compliance Lothian vehicles at the time of fitment **does not permit tyres older than 8 years on any axle.**

Any vehicle fitted with tyres older than 8 years and less than 10 years should be replaced at the next wheel removal procedure. **No tyres over 10 years are permitted on any Lothian vehicle, if identified they should be removed immediately.**

No remoulded or remanufactured tyres should be fitted to steered axles.

Minimum tyre tread depth on a Lothian vehicle is **3mm.**

A cut or break in the tyre fabric, which is deep enough to reach the ply or cords, must not be greater than **20mm** in length or 10% of the section width (whichever is greatest)

If a tyre is found to be 85% or less than the recommended pressure do not inflate, remove the wheel from the vehicle and bring the tyre to the attention of the tyre fitter.

## Inspection Procedures

### WHEEL RIM:

Whenever the need arises to remove a wheel(s) all relevant components, e.g., studs, nuts, spigot, wheel etc, must also be inspected for serviceability.

### THE WHEEL(S):

If any of the following defects are found or any of the tolerances noted below are exceeded then the wheel should be discarded, so thoroughly inspect for:

The fixing holes on both side of the wheel rim must be inspected for wear and distortion. Wheels found with one or more worn stud holes **MUST** be discarded.

### Damage to look for:

1. Bore of the nave **fig. 1** (indentations caused by loose running) no damage is permissible.
2. Dents - A badly dented rim will not run true and also may not seal properly. Lothian Buses policy is to scrap damaged rims.
3. Cracks **fig. 2** - Cracks are most usually found between the stud holes, from stud holes to the ventilation holes or from the disc to the rim Lothian Buses policy is to scrap cracked rims.



Worn Wheel Bore



Cracked Rim

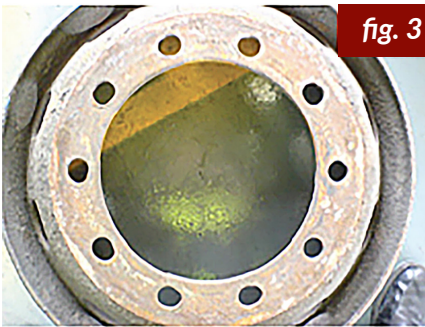
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**When working on twin wheel assemblies, both wheels should always be removed for inspection.**

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**THE WHEEL(S) Damage to look for (continued):**

4. Corrosion/Pitting - Surface corrosion can be wire brushed and cleaned. Flaking or badly pitted metal indicates a need to scrap the rim. Contact or mating surfaces must be clean and smooth and **NOT PAINTED**.
5. Worn stud holes and condition of the spigot mounting area - Spigot wheels. Check that the washer contact area around the stud holes is flat and unmarked. Also check that the rim centre is undamaged. When fitted to the hub, a maximum of 3mm clearance is allowed across the diameter of the spigots.  
**REMEMBER:** The spigots centralise the wheel to the hub, the studs and nuts clamp the wheel and hub together **fig. 3**. Worn stud hole, Max. diameter; spigot  $\varnothing$  +0.25mm.
6. Hub - Check the hub, drum, spigots and studs in the same way that you have checked the rim. If there are any signs that a wheel has run loose, the reason must be fully investigated and any damaged parts replaced. If a wheel stud has snapped, the whole set on that hub must be changed.
7. Metal displacement at the perimeter of the stud hole face due to nut over tightening, the wheel should be discarded if any ridge can be felt.
8. Elongation of the rim bore adjacent to stud hole – max. 0.25mm.



**fig. 3**

**Elongated Stud Holes**



**fig. 4**

**Rust bleed running from the fixing area**

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**On older vehicles and vans inspect the condition of the counter sunk holes, the wheel nut face, signs of corrosion and cracks to both the wheel rim and brake drums.**

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## WHEEL STUDS:

Wheel studs and their security.

Thoroughly inspect for:

- Damage including threads
- Corrosion **fig. 5**
- Elongation
- Excessive wear **fig. 6**
- Security within the hub
- Ovality, if the ovality of any stud exceeds 0.25mm, the wheels and studs must be discarded



Corrosion



Excessive Wear

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If any studs are found to be defective,  
the entire set must be replaced.

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## WHEEL NUTS:

Thoroughly inspect for:

- Damage
- Correct type for wheel
- Correct type for wheel material (see below)
- Washer condition and security **fig. 7** and **8**
- Washer moves freely
- Free from paint
- Thread damage
- Nut edges rounding off



Cracked Washer



Washer Detached

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**Be Aware — If any nuts are found to be defective the entire set for that wheel must be replaced.**

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## Spigot type wheel nuts for alloy and steel wheels

Early alloy wheels were generally manufactured with much lower hardness properties than conventional steel wheels, and the use of wheel nuts with washers designed with hardness properties suitable for steel wheels had a tendency to damage the softer alloy wheels. This resulted in the development of a standard which specified that the wheel nuts should be marked with 'O's to denote their hardness and compatibility with different wheel designs. The 'O' standard was never officially adopted, but many wheel nut manufacturers had already changed their tooling to accommodate the 'O' markings and therefore these markings may still be found on wheel nuts today. The following information relates to what the markings were intended to indicate and is for information only.

- A spigot wheel nut with one 'O' on the captive washer denoted that the captive washer had been hardened to a degree where it was suitable for steel wheels only
- A spigot wheel nut with two 'O's on the captive washer denoted that the washer had undergone a controlled process which allowed it to be used with both steel and aluminium wheels
- A spigot wheel nut with three 'O's on the captive washer denoted that the captive washer was suitable for use on alloy wheels only



Steel



Steel and Alloy



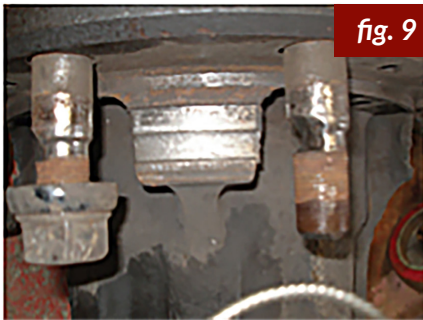
Alloy only

## HUB/DRUM:

Hub, Spigot and, where applicable, the Brake Drum.

Thoroughly inspect for:

- Damage
- Free from rust or paint
- Corrosion/Pitting
- The correct brake drum retaining bolts are fitted, so that they do not prevent the wheel from being flush against the brake drum
- Any wear **fig. 9** and **fig. 10**



**Worn Hub Spigot**

Wheels should not be refitted to hubs with any signs of worn spigots as the wheel will not centralise correctly. It will be located eccentrically, which will cause imbalance of the wheel in motion and may lead to loosening of the wheels. This principle also applies to the centre bore of the wheel.

It is vital that the cause of wear or damage to loose wheel nuts and associated components is established and rectified prior to re-fitting or re-tightening wheels.

Only when it has been established that all components are in a serviceable condition should the wheels be fitted to the vehicle. If any components are found to be excessively worn or damaged, they must be replaced. Never assume someone else, e.g., a tyre fitter/contractor, has examined the wheels which are to be fitted – it is the responsibility of the person fitting the wheels to carry out the inspection.

Also inspect tyre walls for damage and note tread depth over 3 points of the contact area and record the minimum depth and any uneven wear.

# WHEEL CLEANING PROCEDURE

## Preparation for Wheel Fitment

When preparing to fit road wheels to vehicles, it is essential that all mating surfaces are spotlessly clean and free from any damage.

### WHEEL RIMS:

With the wheel removed from the vehicle and in a well-ventilated area.

Ensure:

- You are wearing correct additional PPE (personally fitted mask)
- You are using company issued cleaning tools (Note: Do NOT use pneumatic tool to clean ALLOY wheels. Scotch pads should be used to clean ALLOY wheels)
- Mating faces are cleaned
- Wheel centre bore is cleaned
- Any dust and debris are cleaned away from the entire rim
- If any issues are found during cleaning, then discard rim or contact line manager

When cleaning these areas, care must be taken to ensure that the immediate area surrounding the mating faces is free from debris as road dirt, rust or other material may fall between the mating faces as the wheel is refitted resulting in a reduction of the clamping load. (This reduction in clamping load will be exacerbated greatly once the debris breaks free.) It is important to note that if debris falls between the mating faces of the wheel, the operation of tightening the wheels with a torque wrench may appear to be normal, however the correct clamping load for the wheel assembly will not have been achieved.

### HUB / RIM:

Ensure:

- You are wearing correct additional PPE (personally fitted mask)
- You are using company issued cleaning tool and/or abrasive equipment
- Surrounding area is clear
- Mating faces are cleaned
- Hub spigot is cleaned
- Drum securing bolts are not protruding
- Any dust and debris is cleaned away
- If any issues contact line manager

When cleaning these areas ensure the components are free from corrosion and debris, failure to do so may result in the wheel assembly not sitting correctly and, due to resistance between the wheel and the hub, the required clamp load for the wheel will not be achieved.

## **WHEEL STUDS:**

Ensure:

- You are wearing correct additional PPE (personal fitted mask)
- You are using company issued cleaning tool
- Surrounding area is clear
- The whole stud is cleaned (including thread)
- Use thread check tool if required to determine if the thread has decreased due to damage/wear

Corrosion and debris on the threaded area of wheel studs and nuts will cause frictional resistance. Any force that is required to turn the wheel nut will not be applied to the wheel mating face and the correct clamping load will not be achieved. The wheel nuts should move freely on the thread by hand action only. Using the stud cleaning tool may also highlight worn threads.

## **LUBRICATION:**

Lubricate between the hexagonal head of the nut and captive washer using light engine oil (unless otherwise instructed by the vehicle manufacturer) and lightly over the threads of the wheel studs.

# WHEEL FITTING PROCEDURE

Once the wheel(s), hub and studs are thoroughly clean, the wheel and tyre should be checked by a supervisor to ensure it is in a fit & legal condition to be fitted to the vehicle.

Once checked the mechanic should complete the **Wheel Fitment Sheet (Appendix 3)**, completing the following details:

- Fleet Number
- Wheel position
- Wheel type
- Plated axle weight (Kg)
- Wheel & Tyre Technical data
- Actual Wheel & Tyre Data
- Wheel Centres Clean
- Hub Clean
- Pressure wheel nuts torqued too
- Date & time
- Signature of fitter and supervisor

When completing the **Wheel Fitment Sheet**, the **Tyre and Wheel Rim Technical Information Sheet (Appendix 4)** should be referred to.

Following the supervisors check and completion of the **Wheel Fitment Sheet**, the supervisor should add the vehicle details to the **Supervisors Daily Wheel Removal Check Sheet (Appendix 5)**.

## RE-FITTING THE WHEEL

Fit the wheel(s): Please Note: Never be tempted to paint wheels before fitting

Ensure the wheel is the correct type for the vehicle

Check all wheel fixings, wheel stud threads and nuts have all been inspected for damage and wear

Carefully fit the wheels squarely over hub/studs avoiding damage to stud threads. On twin wheel fitments, ensure the tyre valves are correctly aligned

Fit wheel nuts by hand

Run up wheel nuts. If using power tools then only use for the initial phase of tightening with 1/2" nut runner (minimum air flow) to centralise rim only

Check the gap between the spigot mounted wheel and the hub. (PSV inspection manual IM6 states that no more than 3mm clearance should be present between a spigot mounted wheel and the hub)

Tighten the wheel nuts in the correct sequence illustrated in this policy (page 23) and adhere to any manufacturer torque settings

Torque wheels at ambient temperature. Ensure that the torque wrench is set to the final torque specified against the vehicle type and that the socket used is of the correct size and depth

Lower vehicle to ground from jack

Insert torque details to wheel fitting and re-torque record sheet and wheel torque card. Wheel torque card should then be placed in to holder in driver's cab

The wheels MUST then be re-torqued  
30 minutes / 50km road-test (coach only) after fitment  
(ensure details are added to wheel fitting and re-torque record sheet)

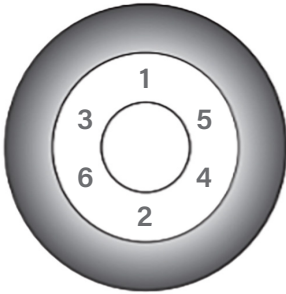
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**Do not exceed final torque, never be tempted to over-tighten as this will stretch the stud and will lead to loss of clamping force!**

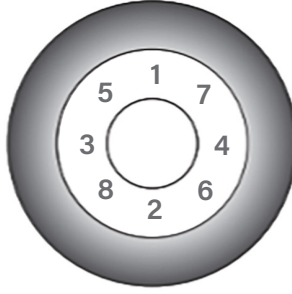
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# WHEEL TORQUE PROCEDURE

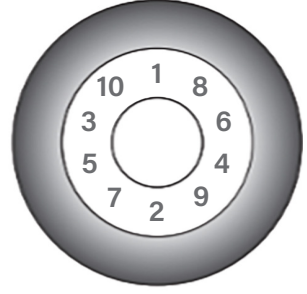
The tightening sequence **MUST** always be followed when fitting wheel nuts as it allows correct alignment and clamping force



6 Stud Wheel



8 Stud Wheel



10 Stud Wheel

## Initial Torque

Following the removal and subsequent re-fitting of a road wheel, the wheel **MUST** undergo an initial wheel torque as part of the wheel fitment process. This should be carried out by the engineer carrying out the wheel fitment. Once the wheel torque is carried out the engineer should input the details in to the **Daily Wheel Fitting & Re-torque Record Sheet (Appendix 6)** and also complete a **Wheels Removed Torque Card (Appendix 7)** and fit the card to the card holder in the vehicle cab.

## Wheel Re-Torque Procedure – 30 Minutes

Following the initial torque, a follow up re-torque should occur after the vehicle has stood for 30 minutes, this is required as the threaded fasteners are likely to settle and therefore require the tension to be restored as relaxation in clamping force is likely to occur, as the numerous components that are ‘sandwiched’ re-settle.

The re-torque procedure should be carried out to complete the wheel fitment procedure in one operation before the vehicle is returned to service.

Following completion of the 30-minute wheel torque the:

- Supervisor – Should complete the tyre change section of the Vehicle Serviceability Report to confirm the 30-minute torque has occurred and wheel fitment procedure completed
- Mechanic – Following the 30-minute re-torque, should initial the Daily Wheel Fitting & Re-torque Record Sheet at the appropriate vehicle details section and ensure the details on the Wheel Removed Torque Card fitted to the vehicle are correct

## **Wheel Re-Torque Procedure – 24-hour**

Lothian policy is to ensure a further re-torque **MUST** then be carried out within 24 hours. In some operations i.e., coaches, the vehicle may not be available within 24 hours, and may have covered considerable mileage before it is available for re-torque. In these circumstances, the vehicle must be road tested for 25-50 miles after the half hour re-torque and then re-torqued before it is used in service.

When carrying out the 24-hour re-torque the allocated mechanic should:

- Check the Daily Wheel Fitting & Re-torque Record Sheet for the position of the wheel fitted
- Locate the vehicle
- Check the Wheels Removed Torque Card in the driver's cab to ensure the wheel ticked as required for torque is the same as the details on the Daily Wheel Fitting & Re-torque Record Sheet
- Carry out the wheel torque
- Complete the date completed section and sign the Wheels Removed Torque Card
- Complete 24-hour check details on the Daily Wheel Fitting & Re-torque Record Sheet

If the vehicle due for 24 hour re-torque has not entered service since the wheel removal then the allocated mechanic should:

- Not torque the wheel, instead the re-torque details should be passed over to the following days Wheel Fitting & Re-torque Record Sheet (Appendix 6).
- The Wheels Removed Torque Card (Appendix 7) in the holder should be removed from the vehicle, 'Passover', initials and date should be added to the card and the card placed with the Wheel Fitting and Re-torque sheet for the previous day

- A new Wheels Removed Torque Card (Appendix 7) should be completed with the date the wheel torque is due added and the card fitted to the torque card holder in the drivers cab
- The wheel removal details should also be added to the Supervisors Daily Wheel Removal Check Sheet (Appendix 5) and 'Passover' added to the comments column

When re-torquing, **DO NOT SLACKEN THE NUTS**. Apply the same torque as for initial fitting and do not continue to tighten after that torque is reached.

Each morning, the previous days **Daily Wheel Fitting & Re-torque Record Sheet** should be reviewed by the allocated shift mechanic to ensure ALL wheel torques are completed. This should be confirmed with a signature on the **Daily Vehicle Serviceability Report** and followed up with supervisory endorsement. If any issues are highlighted the vehicle in question should be removed from service and issues reported to the engineering management team.

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**All wheel changes and re-torque follow ups must be recorded!**

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The records will form part of the maintenance system and as such will be subject to audit by the Vehicle Inspectorate.

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**Ensure that you set torque wrench scales in good light – be sure to check that you are using the correct imperial or metric scale!**

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Wheel removal, fitment and torque procedures on Lothian vehicles should only be carried out by trained Lothian engineering staff.

Following any wheel removals, the engineering personnel must ensure that the vehicle does not enter service until the half hour re-torque has been completed.

Wheel nut torque settings are also checked during the following:

- Up to 24 hours after the initial and half hour re-torque
- Every Safety inspection
- Every Ad hoc inspection

- Every Mid-Safety inspection
- 50 km road test  
(only when 24-hour re-torque has been unable to be carried out)
- Fleet Wheel Torque Intervals

## Wheel Re-torque Transfer

If a vehicle undergoes the wheel removal and fitment process at a location other than its allocated depot and the vehicle is then returned to its allocated depot prior to the 24 hour wheel re-torque a **Wheel Re-torque – Transferred Vehicles Sheet (Appendix 8)** is required to be completed by the removing depots management team and sent to the vehicles allocated depot management team.

Details to be confirmed on the sheet:

- Date
- Fleet Number
- Position of Wheels Removed
- Depot Engineer/Supervisor Signature & Date

Once received by the allocated depot:

- The details of the wheel removal should be added to the current days **Wheel Fitting & Re-Torque Record Sheet**
- The **Wheel Fitting & Re-Torque Record Sheet** number should be added to the **Wheel Re-torque – Transferred Vehicles Sheet**
- The **Wheel Re-torque – Transferred Vehicles Sheet** should then be signed and a copy returned to the issuing depot and original stored with the allocated depots **Wheel Fitting & Re-Torque Record Sheet**

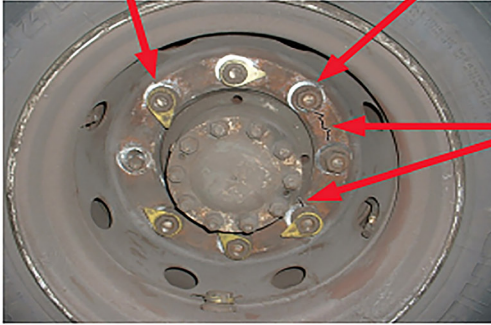
## Annual Inspection Wheel Re-Torque

Following the Annual Inspection (MOT) check by DVSA on a Lothian vehicle, the wheels on all axles should be torqued by an allocated mechanic and a **Wheels Removed Torque Card** completed and fitted to the vehicle card holder. The mechanic should also add the vehicle details to the **Wheel Fitting and Re-torque Record Sheet** and **Supervisors Daily Wheel Removal Check Sheet**.

# Defects to look out for during re-torque

Misaligned nut indicators

Bright or shiny metal around the seat of nut



Cracks in the nave radiating from the stud hole

Rust marks running from the fixing area



Under inflated tyre

Bulging / Sagging of tyre wall



Increased surface area in contact with road

# ADDITIONAL INFORMATION AND PAPERWORK CHECKS

## Unsupervised Shift - Wheel Procedure

Any wheel procedure carried out on an unsupervised shift should follow the wheel removal procedure with the following additional requirements:

### Wheel Removal - Unsupervised Shift

- **Wheel Removal Sheet** should be completed by the mechanic carrying out the wheel removal
- All details should be completed with the exception of the 'Endorsed by' and 'Signed Supervisor' section
- The **Wheel Removal Sheet** should be stored at the **wheel torque station**
- Once a supervisor returns, the Wheel Removal Sheet should be checked and initials added to the endorsed section and supervisor signature added to confirm the wheel removal

### Wheel Fitment - Unsupervised Shift

- Once the wheel is cleaned the mechanic should fit the wheel
- The **Wheel Fitment Sheet** should be completed and stored at the wheel torque station for a supervisor returning
- The mechanic should add the wheel removal details to the **Supervisors Daily Wheel Removal Check Sheet**. The 'Checked by' section should be left blank and their initials and unsupervised shift added to the comments section
- Once a supervisor returns, the paperwork should be checked, any unsupervised wheels removed should be identified and arrangements for a visual inspection of the fitted wheel should take place. Visual check should occur when the vehicle returns to the depot or if required the vehicle should be removed from service for the check to be carried out
- Once the visual inspection has been completed and confirmed satisfactory the supervisor should sign the **Wheel Fitment Sheet** and the 'checked by' section of the **Supervisors Daily Wheel Removal Check Sheet**

## Wheel Removal – Off-Site

Should a wheel removal and fitment procedure be carried out as an emergency off-site i.e., at a vehicle breakdown, the vehicle should be returned to the depot. Once returned the vehicle should undergo the wheel removal, fitment and re-torque procedure from the start of the process before the vehicle is declared fit to return to service.

Any wheels removed and fitted off-site should be torqued and then re-torqued after 30 minutes before the vehicle is driven back to the depot.

## Daily - Workload Handover

When passing the daily work load over from dayshift to backshift all outstanding wheel fitment procedures and required wheel torques should be discussed and a clear understanding of what is required provided. The following checks should be carried out:

- Wheel Fitting and Re-torque Record Sheet for that day should be checked for any outstanding work and matched against the Supervisors Daily Wheel Removal Check Sheet to ensure all wheel checks are accounted for
- All outstanding wheel fitment sheets should be checked to ensure paperwork is completed for the current stage of the process
- Wheel Fitting and Re-torque Record Sheet for the previous day should be checked to ensure all 24-hour wheel torques that are required for that night are checked and details correct

## Nightly - Backshift Paperwork Check

At the end of each backshift the 24-hour wheel torques required should be carried out by an allocated mechanic, once all torques are completed the paperwork for that shift should be checked by the Backshift Foreman/Supervisor or if an unsupervised shift the on-shift mechanic.

Paperwork to be checked is the **Wheel Fitting and Re-torque Record Sheet**, **Supervisors Daily Wheel Removal Check Sheet** any **Wheel Removal & Fitment Sheets** and the **Wheels Removed Torque Card** for the associated vehicles. All vehicle and wheel removal details should match and the sheets should be fully completed and signed. Once confirmed all is in order the Backshift Foreman/Supervisor should sign & date the **Wheel Fitting and Re-torque Record Sheet** and pass the paperwork to the Assistant/Depot Engineer for recheck.

If there are any issues identified then the information should be left for the Assistant/Depot Engineer and the relevant vehicle should be classed as VOR (Lothian VOR procedure should be carried out).

### **Daily - Dayshift Paperwork Check**

Each morning following the previous night's wheel torques the Assistant/Depot Engineer should check all paperwork relating to the previous days 24-hour wheel re-torques. Paperwork to be checked is the Wheel Fitting and Re-torque Record Sheet, Supervisors Daily Wheel Removal Check Sheet any Wheel Removal & Fitment Sheets and the Wheels Removed Torque Card for the associated vehicles. All vehicle and wheel removal details should match and the sheets should be fully completed and signed. Once confirmed all is in order the Depot/Assistant Engineer should sign & date the Wheel Fitting and Re-torque Record Sheet and store the paperwork.

Any issues identified should be investigated and reported to the Chief Engineer.

### **Inclement Weather – Emergency Procedure**

During periods of extreme adverse weather conditions, the SENIOR ENGINEER may initiate a TEMPORARY re-torque procedure that incorporates more frequent wheel nut re-torques at their discretion.

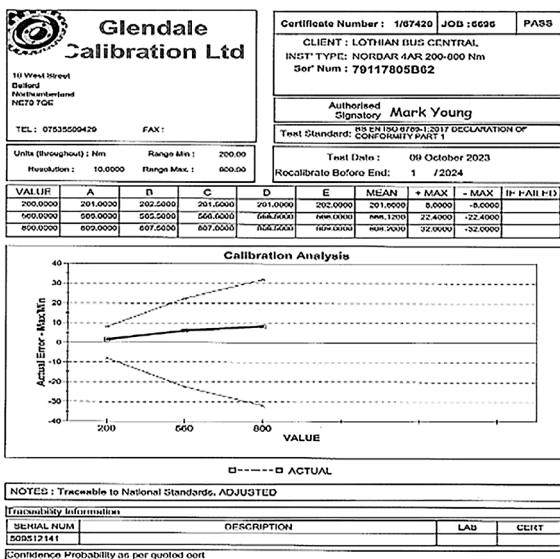
# TOOLS AND CALIBRATION PROCEDURE

ALL Lothian torque wrenches are calibrated at **3-month intervals** or earlier if found to be damaged.

Torque wrenches **DO NOT** require sending away for calibration. When a torque wrench is due calibration, this will be carried out on site by an authorised contractor who will also provide a calibration certificate (see below example) which will be displayed in the workshop notice board and an additional copy stored centrally at Engineering Head Office. This process will ensure each depot always has the required calibrated torque wrenches available on site.

Before use the torque wrench and sockets should be checked for any damage or worn parts. Any damaged torque wrenches or tools should be reported immediately to the engineering supervisory team and the damaged equipment removed from the workshop and sent to the stores for repair or replacement.

Torque wrenches and other wheel changing equipment must be stored and maintained properly at all times.



**Never use a torque wrench to  
slacken wheel nuts or any other items.**



# Wheel Removal Sheet

Fleet Number:						
Axle	Axle 1		Axle 2		Axle 3	
Wheel Position	N/F	O/F	N/R	O/R	N/R/R	O/R/R
Wheel Removed (✓)						
Wheel: Steel or Alloy						
Endorsed By: (Initials) <small>(Supervisor, AEM,EM)</small>						

- All wheel change details must be entered into the wheel torque book and relevant section endorsed on the inspection sheet.
- Any wheels removed unsupervised at the weekend must be followed up and checked by a supervisor.

Date: ...../...../.....

Time: .....

Signed (Mechanic): ..... Signed (Supervisor): .....





# Wheel Fitment Sheet

Wheel, Tyre & Hub Condition

<b>Fleet Number:</b>						
<b>Axle</b>	Axle 1		Axle 2		Axle 3	
<b>Wheel Position</b>	N/F	O/F	N/R	O/R	N/R/R	O/R/R
<b>Wheel Fitted (✓)</b>						
<b>Wheel: Steel or Alloy</b>						
<b>Plated Axle Weight Kg</b>						
<b>Wheel &amp; Tyre Technical Data</b>	Minimum Load Index					
	Tyre Size					
	Wheel Rim Size					
<b>Actual Wheel &amp; Tyre Data</b>	Load Index (Single or Dual)					
	Load Index Weight					
	Bonus Load					
	Wheel Rim Size					
	Legally Compliant					
<b>Wheel Centres (✓/✗)</b>						
<b>Hub (✓/✗)</b>						

- Guidance can be found in - Lothian Tyre Technical Information Guide and Lothian Road Wheel Inspection, Removal & Fitment Procedure.
- Load Index and Axle Load Change (Bonus Load), Refer to PSV Inspection Manual (Ch 07, Size and Type of Tyres)

Wheel Nuts torqued at ..... Nm

Date: ...../...../..... Time: .....

Signed (Mechanic): ..... Signed (Supervisor): .....







Appendix 7 – Wheels Removed Torque Card



# WHEELS REMOVED

FROM FLEET NO. \_\_\_\_\_

Bus No. \_\_\_\_\_ Reg No. \_\_\_\_\_

Wheels have been removed  
from this bus and will require  
to be retorqued on

DATE: \_\_\_\_\_

Do not move vehicle after the  
above date

## Wheel Position tick as required

NSF  OSF

NSR  OSR

Artic Only

NSR  OSR

Date Completed \_\_\_\_\_

Signed \_\_\_\_\_

FM-a0 582

## Appendix 8 – Wheel Re-torque – Transferred Vehicles Sheet



### Wheel Retorque – Depot Transfer Sheet

Depot Replacing Wheel:	
Allocated Vehicle Depot:	
Date of Fitment:	
Fleet Number:	

Axle:	Axle 1		Axle 2		Axle 3	
Wheel Position:	N/F	O/F	N/R	O/R	N/R/R	O/R/R
Wheel Removed (✓):						

Initial & ½ Hour Wheel Torque Completed

YES / NO

**Vehicle should not be transferred unless initial wheel torque and ½ hour torque have been completed.**

**Wheels will need to be retorqued 24 hours from initial fitment.**

Date Retorque Required:

Issuing Depot Engineer/Supervisor signature: \_\_\_\_\_ Date \_\_\_\_\_

Copy to be sent to allocated vehicle depot.

Allocated Vehicle Depot:  
ENTERED IN TORQUE BOOK NUMBER (\_\_\_\_)

Signed: \_\_\_\_\_ Date: \_\_\_\_\_

**Please return a copy of this completed sheet to the issuing Depot:**

1 COPY – Torque book & 1 COPY – Issuing depot torque book

