

TYRE SAFETY



NOTE

The sections in this booklet dealing with employer and employee responsibilities, which originally referred to the Factories and Commercial Premises Act 1981, have been updated in line with the Health and Safety in Employment Act 1992. No other amendments have been made to the booklet's contents. This booklet has been superseded by the *Health and Safety Guidelines for Tyre Fitters*.

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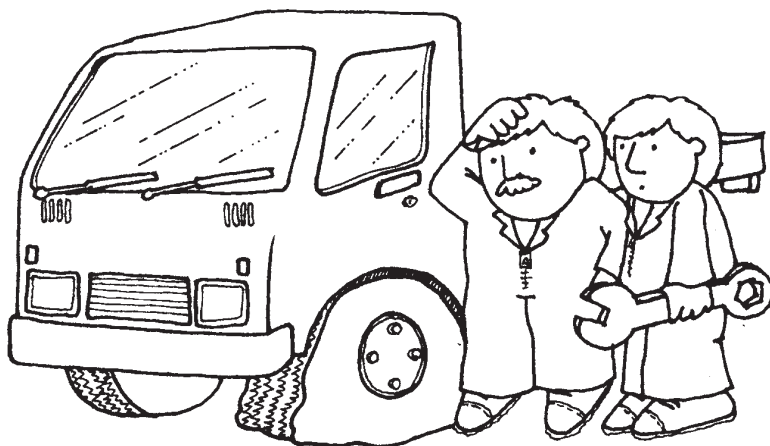
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I. Introduction

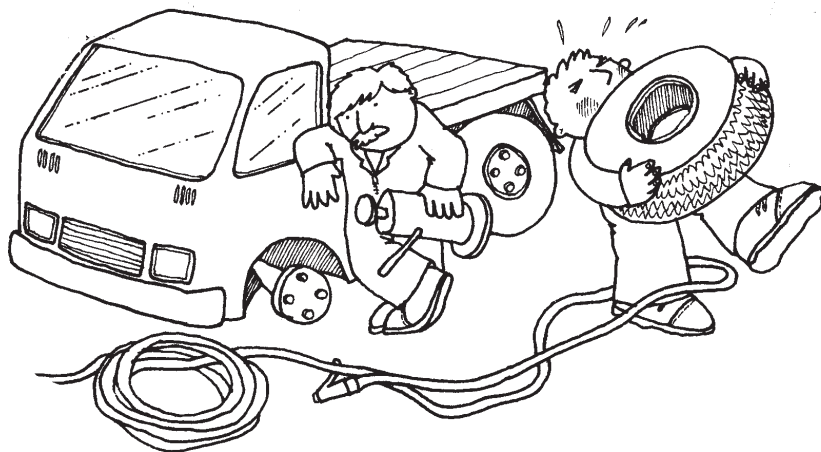
This booklet has been produced by the Department of Labour as part of its continuing drive to reduce the incidence and severity of industrial accidents.

It is a guide to safe work methods and practices wherever motor vehicle or industrial tyres are inflated by compressed air. It is not a technical guide or a recommendation to use particular brands of tyres or equipment.

Many people in the motor industry fail to realise that accidents while inflating tyres tend to be serious, because of the high air pressures and the heavy objects involved. All too often apprentices or inexperienced workers are asked to work with tyres without adequate training or even knowing the risks involved.

The Department of Labour reminds employers that it is their responsibility to ensure that every operator is adequately trained, and knows, understands and uses the correct procedures and equipment.

Operators also are reminded that it is their responsibility to use the correct procedures and equipment.



2. Hazards and How to Avoid Them

If you work with tyres, there are three major sources of hazard.

Compressed Air

Your eyes are particularly at risk, both from high-velocity air and from particles of dust, metal, oil, etc., which may be propelled by the air. Always wear suitable eye protection.

The rest of your body is also at risk from compressed air. Suitable overalls will protect the skin from light particles of dust, metal, oil, etc., provided they are not blown at a high velocity. However, no overalls can protect you against high-velocity air at close range. Particles may be blown right through your overalls and skin and into your body.

The air can be blown straight into your bloodstream, causing swelling and intense pain, particularly if you have any cuts, punctures or sores which make entry easier. The air may be carried to the small blood vessels of the brain and cause them to burst, resulting in death.

To avoid such injuries:

1. Always deflate all tyres before removing them from vehicles.
2. Always remember to store equipment, air lines, etc. properly. Don't leave them lying around where they can cause accidents or get damaged.
3. Never point an air hose at yourself or anyone else.
4. Never use damaged air hoses or fittings.
5. Never leave unattended air lines attached to tyre assemblies.
6. Never use an air line that is not fitted with a pressure gauge or a pressure control device.

All pressure gauges and control devices must be checked against a master pressure gauge at least once a month. Your life may depend on it.

Remember, air under pressure expands with an increase in temperature. Never apply heat from a welding torch or any other source to a rim or tyre which is under pressure. Fatal explosions have been caused by this.

Heavy Objects

Tyre and wheel assemblies of large vehicles are often too heavy to be handled safely by one person. Even the strongest person can suffer a hernia, slipped disc, sprain or broken bone when handling loads that are too heavy.

Such injuries can be very painful and limiting. Avoid them by using lifting tackle or by getting help from someone else.

When you are lifting manually:

1. Crouch as close to the load as possible.
2. Bend at the knees and keep your back fairly straight, not arched.
3. When you have a firm grip on the object with both hands, lift by straightening your legs.
4. Don't jerk or twist your body when lifting or carrying.
5. If it is too heavy to lift easily, get help.

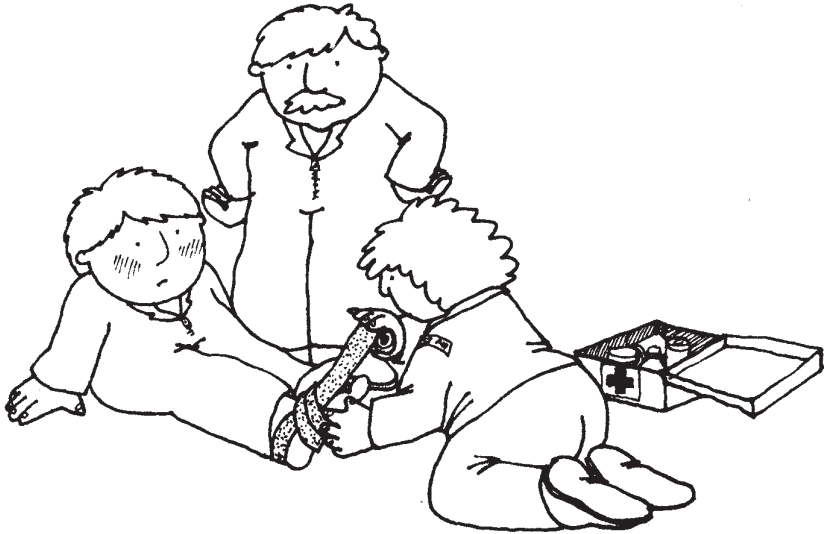
When rolling or bowling wheels, always keep them under control. Don't roll or bowl them in an uncontrolled manner across the workshop floor, endangering fellow workers.

Exploding Wheels

Large tyres and wheel assemblies are heavy objects, but when they explode they are thrown violently by the force of the escaping compressed air. An exploding wheel is a high-speed projectile which can kill or seriously maim anyone in its path.

Divided wheels, split rims and locking rings are especially likely to explode because of poor maintenance, incorrect fitting, and assembly or disassembly while inflated. The commonest faults are over-inflation, removal of the wrong nuts, failure to ensure correct seating of split rims or tyre beads, and the use of damaged parts. All of these have caused serious and fatal accidents.

Because of the risk of explosion, you should use cage guards, or other suitable restraining devices, at all times (as shown in Appendix 2).



3. Accident Cases

Below are some typical accidents that have occurred to people inflating tyres or working with compressed air:

1. Brushing down with compressed air

A worker received a small puncture in the palm of his hand from a metal spike. Soon after he used a compressed air gun to blow dirt and blood from his hand. The air enlarged the puncture and blew up his hand like a small balloon. He suffered severe pain and needed hospital treatment.

2. Skylarking with compressed air

Two employees were using a compressed air hose to blow dust from their clothing. One man pushed a hose between the legs of a fellow worker from behind. The victim's lower bowel was torn open, his abdomen ballooned with air and he died from his injuries.

NOTE: This incident occurred in a carpenter's workshop, but the message is relevant to the tyre industry.

3. Air hose left unattended

A tyre fitter left an open-ended air line attached to the valve of a tractor tyre while he went to answer the telephone. The conversation took longer than expected, and when he returned he realised the tyre was dangerously over-inflated. As he removed the chuck from the valve, the tyre exploded and he was thrown against the ceiling and killed instantly.

4. Tyre bead not seated at low pressure

A mechanic was inflating a tractor tyre he had just fitted to the wheel rim. He had difficulty getting the bead to seat against the rim and asked an experienced workmate to help him. The tyre was marked “Warning: never exceed 35 psi when seating bead”.

As the man was leaning over to examine it, the tube burst and the tyre was forced over the rim, throwing him a metre in the air. He was struck by the rim and died from his injuries. There was a suitable tyre cage metres away.

The pressure gauge fitted to the air line was not working and it was assumed later that the tyre may have been inflated to a pressure of 80 psi.

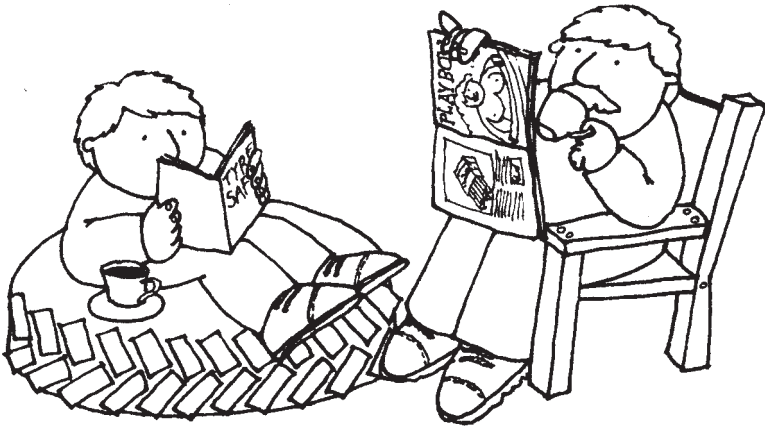
5. Wheelbarrow tyre caused injury

A car tyre or even a wheelbarrow tyre is a potential killer. A tube burst while a wheelbarrow tyre was being inflated and the rim flew up, striking the worker on the head and injuring him.

6. Divided wheel flew apart

A worker was replacing the outside wheel of a dual-wheel assembly on a forklift. He noticed that the nuts of the six bolts holding the two halves of the divided wheel together were round the wrong way and the wheel couldn't fit properly. He attempted to remove the bolts one at a time without deflating the tyre. The rim blew off and struck him on the forehead and he died in hospital 9 hours later. The wheel had a warning about this practice stamped on it.

In the last four of these accidents, death or serious injury would have been avoided by the use of a cage guard or other suitable restraining device.



4. General Safety Rules

Here are the general safety rules you should observe at all times:

1. Where possible, deflate all tyres before removing them from vehicles. Some rims are extremely dangerous if they are removed before the tyre is deflated, i.e. divided rims and multi-piece rims.
2. Don't start any job for which you have not been trained, unless you are being directly supervised by a person who is both competent and authorised to train you.
3. Don't start any job with damaged or unsatisfactory equipment. If any of the gear to be used, such as air hoses, gauges, mallets, tyre levers, box spanners, safety glasses, etc., is not in good working condition, STOP! Tell your supervisor of the problem immediately, and have it put right.
4. Before starting any repair, be sure in your own mind just what you are working on:

Is it a farm, truck, bus, car or industrial tyre. Is it tubeless or tube-type? Is the rim of a drop centre, semi-drop centre, divided, two-piece, three-piece type? By this stage you should know whether or not you have the necessary experience to do the job safely. If not, STOP! Tell your supervisor that you are not familiar with the particular tyre. Your supervisor should either refer you to the correct manuals or wall charts, or provide someone to instruct you.

5. Correct manuals or wall charts should always be available. Refer to them whenever you have any doubts. If still in doubt, tell your supervisor.
6. Never skylark or play practical jokes in a work area. It is dangerous and will make you liable should anyone be in the urea.
7. Compressed air must not be used for any purpose other than inflating tyres and operating air-powered machinery. It must never be used for cleaning overalls or work areas. A vacuum cleaner is more effective and much safer.
8. Keep all electrical leads and air lines clear of walkways at all times. They should be coiled and stored away when not in use. They should be inspected each time before use and not used if there is any sign of damage.
9. Always use a cage guard or other suitable restraining device when one is available, even for small tyres such as car and wheelbarrow tyres. Although not as dangerous as large tyres and multi-piece units, they have still been known to cause serious injuries. Large tyres, such as truck, bus, grader, tractor tyres, etc., and multi-piece units, must always be restrained in a suitable device during inflation.
10. Waste bins for rubber or other flammable refuse should have close-fitting lids, and should not be used as ashtrays.
11. When inflating tyres stand well aside. This can be done by using a long-stem inflator.



5. Wheel and Tyre Identification

Always be sure that a tyre is mounted on to the correct size and type of rim. It is dangerous to install a tyre of one rim diameter on a rim of a different diameter. Also, you should never mount or use damaged tyres, tubes or rims.

Always replace a tyre on a rim with another tyre of exactly the same rim diameter designation and suffix letters. For example a 16" tyre goes with a 16" rim. You should never mount a 16.5" diameter tyre on a 16" rim. It may be possible to pass the tyre over the lip or flange of the rim but the tyre cannot be inflated enough to position itself against the rim flange.

If you attempt to seat the tyre bead by inflation, it will break with explosive force and could cause serious injury or death.

Rims of different diameters and tapers cannot be interchanged. (Diagrams in Appendix 1 illustrate the difference between rims of two different tapers and diameters).

Passenger Car Tyres

In general, tyres have two basic size markings. These indicate the section width of the tyre (when fitted to its design rim) and the rim diameter on which it fits.

Crossply car tyres are normally designated in inches, e.g. a 6.50—13 is a tyre nominally 6.50" wide fitting a 13" rim .

Radial car tyres are normally designated in millimetres and inches, e.g. a 175—13 is a tyre nominally 175mm wide fitting a 13" rim.

This marking alone, however, does not indicate the shape which a tyre takes up on the rim, and it is this factor which has changed considerably in recent years. Tyres have become smaller in diameter but at the same time much wider in section, i.e. more 'squat'.

Great care should be taken when selecting tyres to ensure that the correct size and type are being fitted.

Truck Tyres

These are normally marked in a similar manner to car tyres but imported tyres sometimes use an 'Alpha' system.

e.g. 10.00-20 is a crossply tyre but a 10.00R20 is a radial ply tyre. Both have a nominal section marking of 10" and fit a 20" rim.

11—22.5 is a crossply tyre but a 11R22.5 is a radial ply tyre. Both have a nominal section marking of 11" and fit a 22 1/2" rim.

The '22.5' tyres are of tubeless construction and have a tubed tyre counterpart.

e.g. 9.00R20 and a 10R22.5 have similar outside dimensions and the same load capacity, but one is a tubed type and one a tubeless.

Rear Tractor Tyres

These come in two types of markings or a combination of both, the difference being a change in nominal section width when tyres started to be fitted to wider rims.

e.g.	14—30	where 14	Section marking
		30	Rim diameter
or	16.9—30	where 16.9	Section width on wide-base rim
		30	Rim diameter
or	16.9/14—30		Dual size marking

Intermixing

Ideally tyres should be in complete sets of the same type and construction. Some intermixing, however, is allowable while other combinations are not recommended.

The basic rules are outlined below:

Passenger Cars

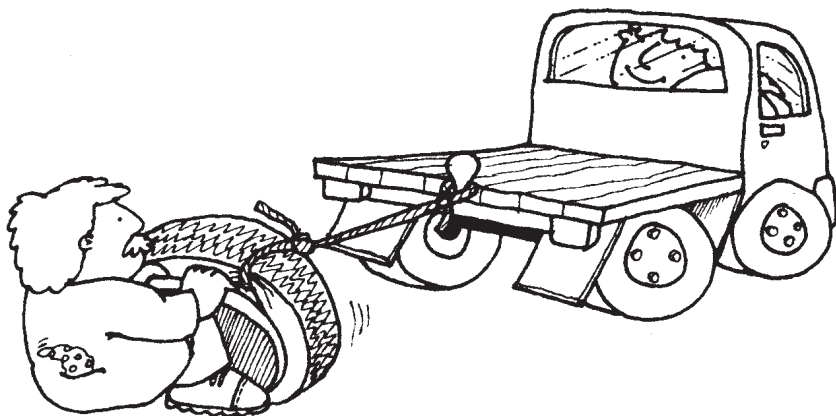
1. Different tyre types must be in pairs on the same axle.
2. When mixing crossply and radial tyres, the radial must be fitted to the rear axle.
3. Steel- and fabric-belted radials may be intermixed but the steel-belted tyres should preferably be on the rear axle.
4. If 82% H/W tyres are mixed with '70' Series of similar gearing, the '70' Series must be on the rear axle.

These recommendations apply whether the vehicle is front or rear-drive or front- or rear-engined.

Trucks

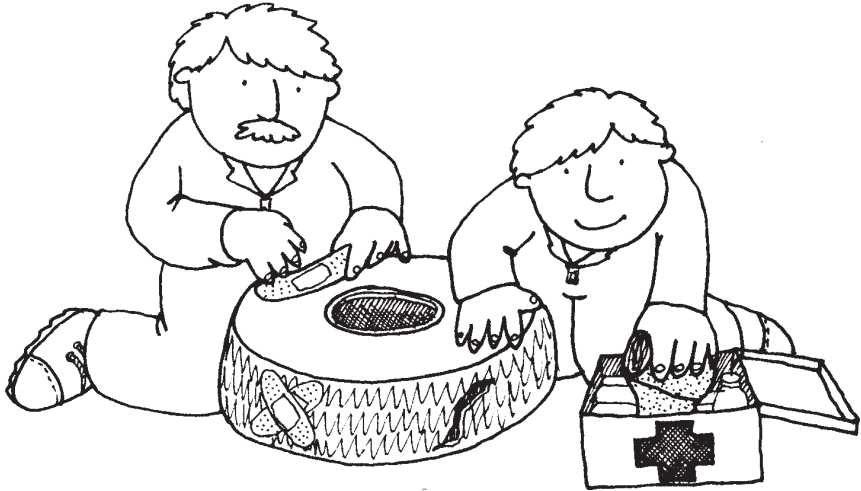
1. Radial tyres may be fitted on the front axle, of a two-axle vehicle, with crossply on the rear provided the rear wheels are duals.

NOTE: Care should be taken to ensure that any interchanging of wheels does not result in incorrect fitments.



6. Demounting Tyres

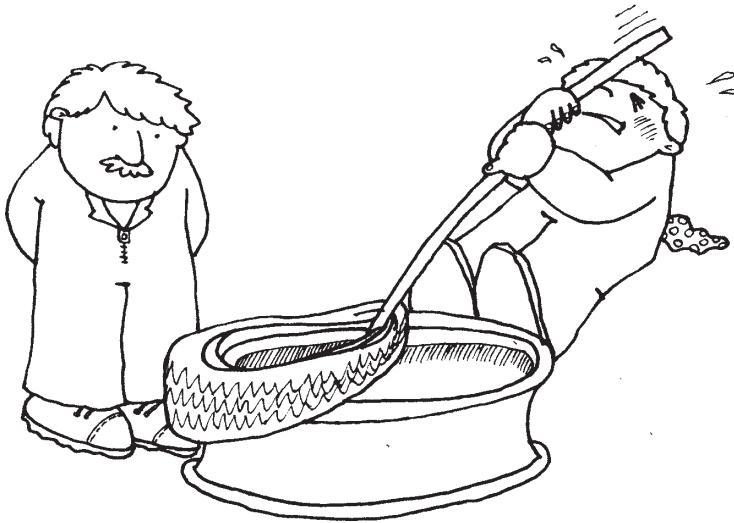
1. When any wheel or tyre is in a damaged condition, remove the valve core completely to deflate the tyre before you take the wheel off the vehicle.
2. Don't remove any tyre from a wheel rim unless you have removed the valve core and are sure the tyre is fully deflated. Remove both valve cores from a dual assembly.
3. Always exhaust all air from a single tyre, and from both tyres of a dual assembly, before you remove any rim or wheel components such as nuts and rim clamps.
4. Always check the valve stem, by running a piece of wire through the stem to be sure that it is not plugged.
5. Always wear suitable eye protection while removing tyres from rims.



7. Repairing Tyres

1. Clean and carefully examine all flanges, locking rims and rim gutters. Reject any that are damaged, distorted, cracked or broken. They must not be reused under any circumstances.
2. Check that the tyre is in sound condition, both inside and outside, and be sure to use only the correct size and type of tube, flap, flange and locking ring.
3. Don't interchange rim parts. Although they may look alike, variance between rims of different types makes part-mixing dangerous. Side rings, flanges and lock rings of different types may appear to be correctly seated but actually have wide gaps which make them dangerous.
4. Always use an approved tyre bead lubricant when fitting tyres.
5. After assembling a wheel and tyre, check the positioning of loose flanges and the locking ring. Don't inflate until they are right.

6. Before inflating be sure that you know the correct pressure for the size and ply rating of the tyre. Don't guess.
 7. Use a cage guard or suitable restraining device.
 8. Wear suitable eye protection before starting assembly. This important.
 9. If you have any doubts about what to do or about what you have done, ask your supervisor, or check the appropriate manual or wall chart before inflating.
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8. Mounting Tyres

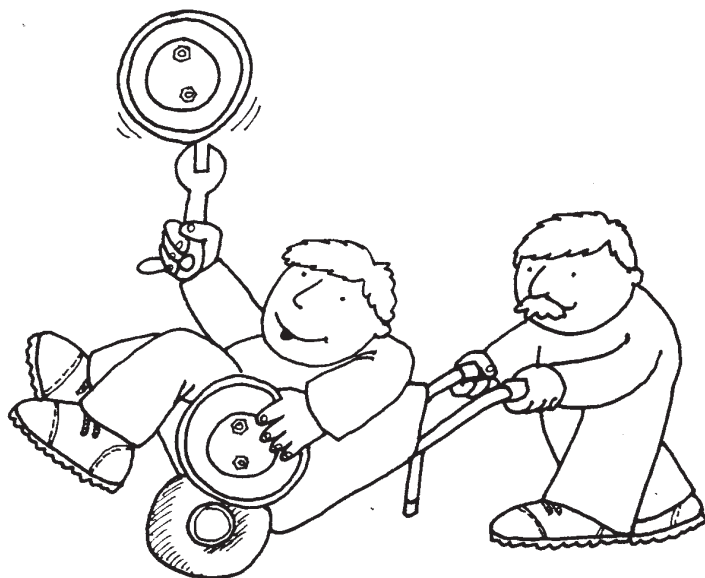
Compressed air lines must have a press button or similar type of hand control. There must be at least 2 metres of air line between the hand control and the chuck which clips on to the tyre valve. This is essential for your safety: it keeps you out of the most dangerous area should anything go wrong.

Follow these steps for your own safety:

1. Inflate to about 20 kPa (3psi), but definitely not above 35 kPa (5 psi). Then check that the tyre is properly centred on the rim and that flanges and locking rims are correctly seated. Be sure, by a thorough examination, that it is safe to proceed to full inflation.
2. Now, place the tyre/wheel assembly into a safety cage or suitable restraining device (as shown in Appendix 2 of this booklet), before inflating to full pressure. This is the stage where most accidents and the most serious injuries occur. In every accident notified to the Department of Labour, the dead or injured person has not correctly used a suitable cage guard or restraining

device. If inflating on the vehicle use a long-stem inflator so that you can stand well clear.

3. Attend to the air line the whole time that the tyre is inflating. Never leave an unattended air line attached to a valve; even if your attention is needed elsewhere for a minute or less, remove the air line from the valve.
 4. Never hammer on an inflated or partially inflated tyre/rim assembly. It could fly apart and kill or seriously injure you or someone else.
 5. After running the vehicle for a short distance, locking rim or wheel nuts should be checked for tightness. Parts will seat naturally and torque on nuts will drop, requiring them to be tightened to the correct specifications.
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9. Divided Wheels

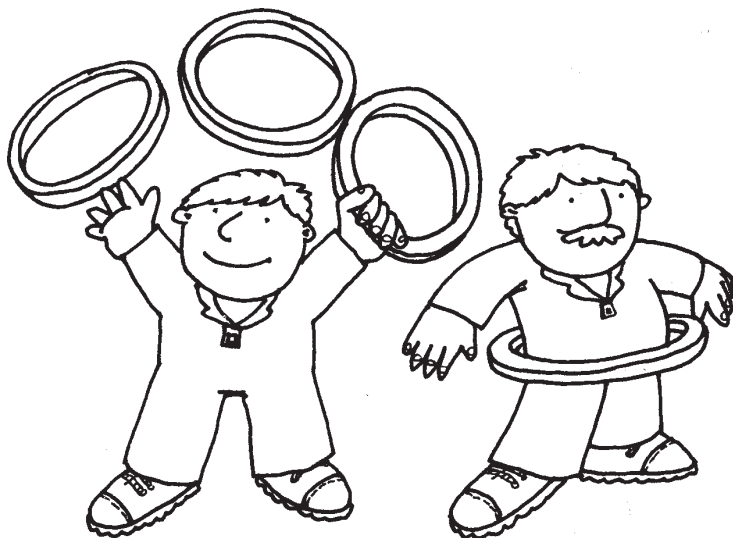
Divided wheels are those wheels in which the rim is in two halves which are bolted together. They are most often fitted to barrows, trolleys, implements or trucks. However, there are some models of small Japanese cars which has divided wheel rims.

Particular care must be taken not to unfasten the rim clamping nuts while the tyre is still inflated. The clamping nuts are generally painted red, but this may not always be so.

It is essential that every divided wheel has the tyre fully deflated and the valve removed before being removed from the vehicle. This is to prevent any chance of the wrong nuts being undone.

Several accidents reported to the Department of Labour have occurred because the wrong nuts were removed from inflated wheels, resulting in serious injury.

Similarly, when inflating a tyre, you should be certain that the clamping nuts are fully tightened first.



10. Multi-Piece Rim Wheels

A multi-piece rim is any rim with two or more parts, one of which is a locking (side) ring that holds the inflated tyre on the rim by interlocking components.

They account for many accidents in the tyre industry, through failure to deflate properly before working on tyre/wheel assembly, improper mounting, use of damaged parts, mismatching of component parts, over-inflation of tyre, or striking the rim components with a hammer.

If you work with multi-piece rims, always follow these steps:

- 1 Deflate the tyre(s) before removing the wheel from its axle. This applies to both tyres on a dual assembly. Remove the valve core and run a piece of wire run through the valve stem to ensure that it is not plugged.
2. Remove the wheel, then tyre, and repair according to the manufacturer's instructions.
3. Apply rubber lubricant to the bead and rim mating

surfaces before assembling the wheel and inflating the tyre.

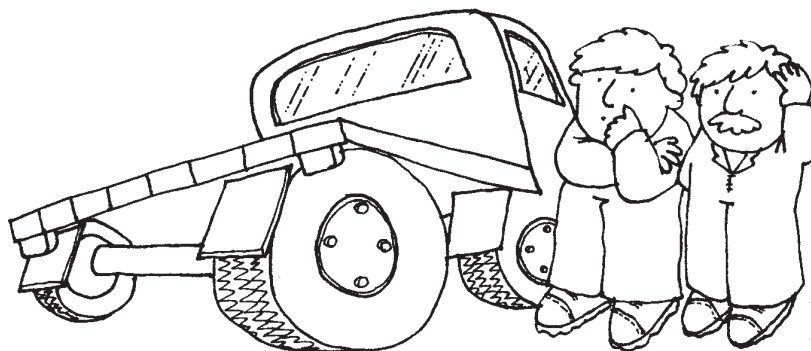
4. Seat the locking ring and round out the tyre while it is partially inflated and without a restraining device. But make sure the air pressure in the tyre doesn't exceed 35 kPa (5 psi).
5. Before inflating the fitted tyre(s) above 35 kPa (5 psi) place it in a cage guard or other suitable restraining device.
6. The assembly must be kept in the restraining device while it is inflated to the recommended pressure and until the tyre, rim and rings are seen to be properly seated and locked.

If they are not, then deflate the tyre by removing the valve core. The assembly may then be removed from the restraining device and the components relubricated and repositioned. You should again inflate it to about 35 kPa (5 psi), check it, and then place it in the restraining device for inflation to the recommended pressure.

7. Never exceed the maximum pressure recommended by the tyre and rim manufacturers.
8. Never attempt to correct the seating of the side and locking rings by hammering, or by forcing the components while the tyre is pressurised.
9. Discard damaged components. Don't try to repair or modify them—it could kill you or those using the vehicle.

Multi-piece rim wheels also require special care because of their weight. You should:

10. Be careful that loose flanges do not drop on to your fingers when lifting.
- 11 Remember that when rolling, they are liable to veer off suddenly. Also, the loose flange may move violently from one side of the rim to the other, so keep your fingers clear.



11. Removal and Fitting of Common Assemblies

This section gives removal and fitting instructions for some common types of wheel/tyre assemblies. It is not intended to duplicate the excellent manuals and wall charts available from tyre and wheel rim manufacturers and technical institutes.

However, there are times when such instructions are not available. If you have some skill and experience but do this work infrequently you will find these notes refresh your memory.

Untrained and unsupervised workers should not work with tyres. Proper manuals, instructions and/or wall charts should always be used when available.

CAR, VAN AND FRONT TRACTOR TYRES — WELL-BASE RIMS

Removal

1. Deflate the tyre. Remove the valve core.
2. Use an approved tyre bead lubricant to assist in breaking the tyre beads from their seats, and when fitting to rims.

3. When using pneumatic, hydraulic or mechanical equipment in removal and fitting, be sure to follow the instructions supplied.
4. Be careful not to damage the tyre beads by using excessive leverage.
5. Check that rim bead seats and flanges are in good condition and not damaged or distorted.
6. Be sure the tyre casing is undamaged and that there is no foreign matter left inside the tyre.

Fitting

1. Before inflating, be sure of the correct pressure for the size and ply rating of the tyre. Never exceed the maximum pressure shown on page 37 of this booklet.
2. Use a cage guard or other suitable restraining device.
3. If the tyre beads have not seated correctly at the recommended pressure, STOP! Deflate the tyre. Free the beads and relubricate them. Reinflate the tyres.

REAR TRACTOR TYRES—WIDE WELL-BASE RIMS

Removal

As for car, van and front tractor tyre well-base rims.

Fitting

1. Before inflating be sure of the correct pressure for the size and ply rating of the tyre.
2. Inflate to 35 kPa (5 psi) only, then check that the tyre is properly centred on the rim. Don't check the seating of the bead by standing over the wheel, but from one side.
3. You must put the assembly into a safety cage or other suitable restraining device. If you don't, and the assembly comes apart during inflation, you are likely to be killed or seriously injured.
4. If the tyre beads have not been seated correctly on the rim at a pressure of 105 kPa (15 psi), deflate, lubricate the bead, and reinflate.
5. Never inflate any rear tractor tyre beyond the

maximum pressure of 245 kPa (35 psi).

NOTE: When fitting tractor or large earth-moving machinery tyres (off the road) follow specific manufacturer's instructions, especially where water is used.

TUBED TRUCK TYRES—WIDE-BASE AND FLAT-BASE RIMS

Removal

1. Deflate the tyre and remove the valve core. This must always be done before removing a wheel from a vehicle or before removing a tyre from a wheel.
2. Follow the instructions supplied with equipment when using pneumatic, hydraulic or mechanical equipment to break the bead seats.
3. Use an approved tyre bead lubricant to assist the bead breaking operation.
4. Be careful to use the correct levers and not to distort loose flanges and locking rings when removing the tyre from the rim.
5. Clean all flanges, locking rings and rim gutters with a wire brush. Examine them to see that they are fit for reuse, rejecting any that are damaged, distorted, cracked or broken.
6. If the rim is a 4-piece flat-base type, ensure that the inner loose flange has not adhered to the bead of the old tyre.

Fitting

1. Before you start, be sure that the flanges and locking rings are the right size and are in good condition. If the rim is a 4-piece flat-base type, ensure that the inner loose flange has been fitted.
3. Use only an approved tyre bead lubricant.
4. After reassembling wheel and tyre, check that the loose flanges and locking rings are correctly positioned before inflating.
5. Before inflating a divided wheel, ensure that the clamping nuts are fully tightened.

6. Check the correct pressure for the size and ply rating of the tyre.
7. Inflate to no more than 35 kPa (5 psi) and check that the tyre is properly centred on the rim, and that the loose flanges and locking rings are correctly seated.
8. Don't stand over the wheel. Check the seating of the parts from the side.
9. Don't inflate above 35 kPa (5 psi) until you have placed the tyre/wheel assembly in a cage guard or other suitable restraining device.
10. Be sure that the locking ring has seated properly before removing the assembly from the cage. If you are in any doubt, remove the assembly from the cage, reposition the flange and reinflate to 35 kPa (5 psi).
11. Return the assembly to the cage guard and inflate to full pressure. Check again that the locking ring and flange are positioned correctly before removing from the cage.

TUBED TRUCK TYRES—SEMI-DROP CENTRE

Removal

1. Deflate the tyre and remove the valve core.
2. Always start removal with the tyre and wheel on the floor, side ring uppermost.
3. Use only approved tyre bead lubricant.
4. Be careful not to bend the side ring when removing it.
5. Clean and inspect the rim and parts. Replace where necessary.

Fitting

1. Use only approved tyre bead lubricant.
2. Before inflating, be sure of the correct pressure for the size and ply of the tyre.
3. Inflate to a maximum pressure of 35 kPa (5psi). Check to ensure the side ring has engaged properly. Don't stand on the assembly but stand to one side.
4. Place the tyre/wheel assembly in a safety cage or other suitable restraining device before inflating above 35kPa (5psi).

TUBELESS TRUCK TYRES — 15° DROP-CENTRE RIMS

Removal

1. Deflate the tyre and remove the valve core.
2. Always start removal (or fitting) with the narrow bead seat uppermost.
3. Use only approved tyre bead lubricant.
4. Keep your feet and hands well clear when turning the assembly over.
5. Clean the rim bead seats and flanges thoroughly.

Fitting

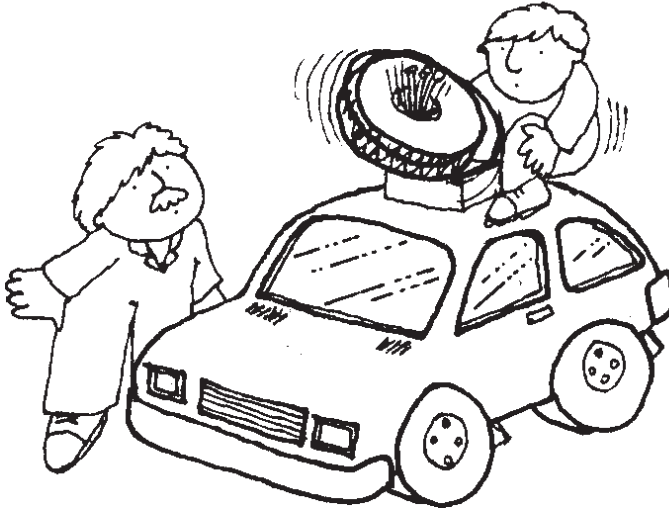
1. Before inflating, be sure of the correct pressure for the size and ply of the tyre.
 2. Inflate to a maximum pressure of 35 kPa (5 psi) with the valve core removed, to obtain an air seal. Don't stand over the assembly but check the seating of the beads from one side.
 3. Before you inflate above 35 kPa (5 psi), screw the valve core into the valve. You must place the tyre/wheel assembly in a safety cage or other suitable restraining device.
 4. Check that the tyre beads are correctly seated before removing the assembly from the cage.
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12. Off-the-Car Wheel Balancing

1. Ensure the balancing machine adaptor is correctly and securely fixed to the tyre/wheel assembly. This is particularly important for wire wheel adaptors.
2. Carefully lift the tyre/wheel assembly on to the balancing machine spindle.
3. Securely tighten the adaptor collet.
4. Check the machine before starting and ensure that there are no loose parts or tools on it.
5. Remove any stones or extraneous materials from the tyre tread as they may fly out when the wheel is rotated. (The machine should be guarded to protect the operator).
6. Don't wear any loose clothing or jewellery that could be entangled when the wheel is rotated.
7. Don't allow anyone near the machine while the tyre/wheel assembly is rotating.
8. Don't touch the tyre/wheel assembly while it is rotating.

9. Be sure that balance weights are securely clipped or stuck to the rim before checking any residual imbalance.
 10. If magnetic weights are used to determine static imbalance, remove them before starting the machine.
 11. Switch off the power supply before removing the tyre/wheel assembly from the machine.
-



13. On-the-Car Wheel Balancing

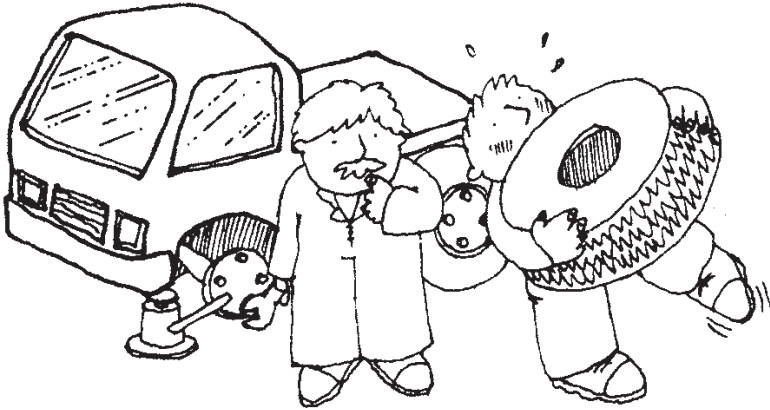
Excessive speed in a free-running, unloaded tyre can cause it to explode from extreme centrifugal force. If drive wheels must be balanced on the car, follow these precautions:

1. Chock the wheels to prevent the vehicle from moving.
2. Be sure the wheel is properly supported so that vibration will not dislodge the axle support and allow the vehicle to fall.
3. Make sure people are clear of the areas in front of and behind the vehicle.
4. On vehicles with a standard differential, put the transmission in top gear or “drive” and spin the wheel by gradual acceleration to a maximum of 65 km/h (40 m.p.h.) on the speedometer.

Because of the differential, this is 130 km/h (80 m.p.h.) wheel speed with one wheel off the floor, or double the speedometer reading.

Never “rev” the engine.

5. If vibration indicates a need for balancing this will be indicated at speeds in the 50-65 km/h (30-40 m.p.h.) range on the speedometer, i.e. 100-130 km/h (60-80 m.p.h.) road speed. This is the maximum speed for dynamic balancing.
 6. If the vehicle has a limited slip differential, keep both wheels off the floor. Gradually accelerate to a maximum of 130 km/h (80 m.p.h.) on the speedometer, which is also 130 km/in (80 m.p.h.) wheel speed.
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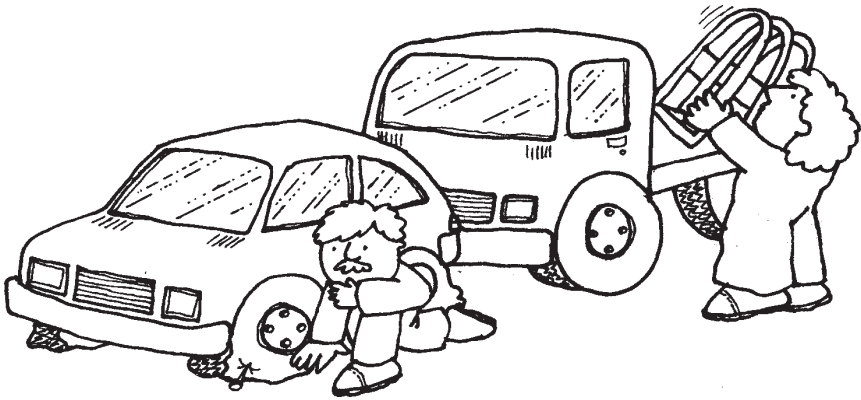


14. Balancing Truck Assemblies

The following procedures must be followed when handling truck assemblies:

1. Handle truck assemblies carefully when lifting them on and off the balancing machine. They are often too heavy for one person to lift.
2. Remove any stones or other loose material from the tread of the tyre. It could fly out when the machine is started.
3. Secure the adaptor plate to the balancing machine spindle. Place the lock pin in position.
4. Roll the assembly on to the lifting frame and lift carefully.
5. Secure the assembly to the wheel adaptor plate while the weight is still fully supported by the lifting frame.
6. Remove the lifting frame to a safe place where it is not an obstruction.
7. Secure new balance weights on the rim flange.

8. Place the balance arm mechanism in a safe place.
 9. Place the lock pin in position before attempting to loose any wheel adaptor nuts.
 10. Support the weight of the assembly on the lifting frame while removing the wheel adaptor nuts.
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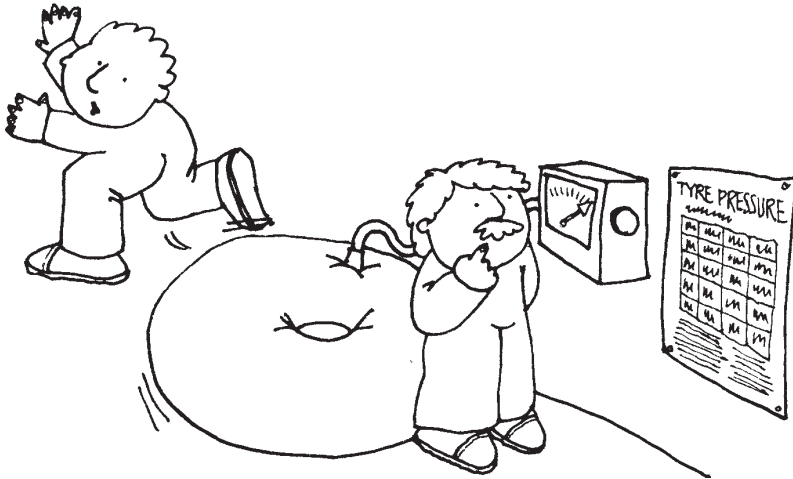


15. Outside Repairs

It is best if tyre repairs are carried out in a fully equipped workshop but there are times when they must be done at a another work site or on the roadside. It is very important never to take chances with safety in such situations.

1. If the work site does not have a suitable cage guard or restraining device then one must be taken to the site or roadside (A suitable guard is shown in Appendix 2).
2. Chock wheels on the opposite side of the vehicle before you place the jack in position.
3. Regardless of how hard or firm the ground appears, put hardwood blocks under the jack.
4. Use axle stands where possible.
5. Always wear your eye protection.
6. Stand clear when deflating. Ensure tyre is properly deflated by removing the valve core.
7. Stand to one side when you use hydraulic pressure demounting tools.

8. Be particularly careful to clean all dirt and rust from lock rings and gutters, otherwise lock rings will not seat properly.
 9. Discard any components that are cracked, badly worn, damaged, bent, repaired or pitted from corrosion. When the condition of any component is in doubt replace it— even if this means a delay in obtaining new parts.
Remember, if weakened parts give way during inflation you are likely to be killed or seriously injured.
 10. When the inner wheel of a dual assembly has to be removed for repair, then the outer wheel, where possible, should also be deflated before removal from the vehicle. Fatal accidents have occurred when this has not been done.
 11. Never introduce a flammable substance before, during or after mounting.
 12. Don't sit on, stand in front of, or stand over a tyre and rim assembly that is being inflated.
 13. Drivers required to change wheel assemblies by the roadside should take extra care by following the points set out in 2,3,4,5 (if available) 6 and 9 above.
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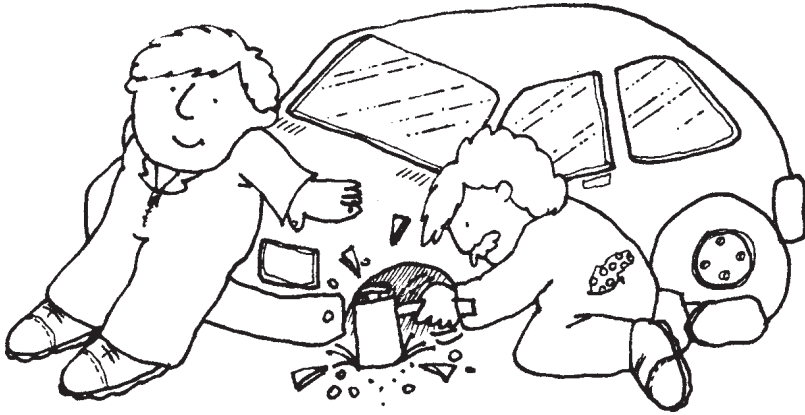
16. Inflation Pressures

Never inflate above the pressures recommended by the tyre and wheel rim manufacturers.

Any reputable garage, service station or tyre dealer will have charts giving recommended maximum permissible pressures for each size and ply rating of tyre and wheel rim type.

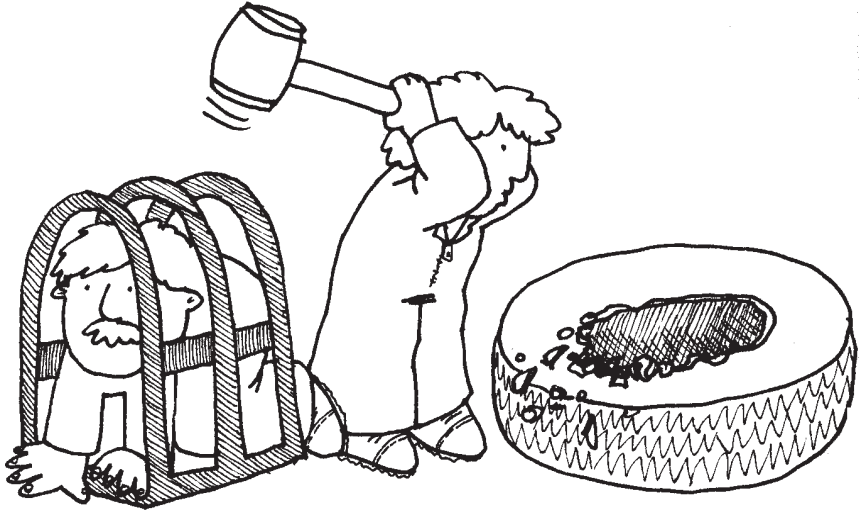
In practice, the following maximum pressures should not be exceeded:

All car tyres	280 kPa	(40 psi)
All van tyres except 8-ply	420 kPa	(60 psi)
Light truck	560 kPa	(80 psi)
Tractor, front	280 kPa	(40 psi)
Tractor, rear	245 kPa	(35 psi)



17. Use of Jacks

1. All jacks must be checked for safe and efficient operation at least once a month.
2. Always jack vehicles on a hard flat surface, never on soft or uneven ground.
3. If you are working on the front wheels, chock the wheels and put the handbrake on.
4. Always use the jack safety catch.
5. When a wheel is removed, axle stands or blocks must be placed under the axle. Always use axle stands where practicable. If using hardwood blocks, use only clean blocks of a regular shape—not dirty, greasy, misshapen or split blocks.
6. Attach a warning card to the vehicle's steering wheel.
7. Make sure no one is inside a vehicle being jacked up and no one enters or leans against it while raised.
8. Keep bottle jacks upright at all times.



18. Cage Guards

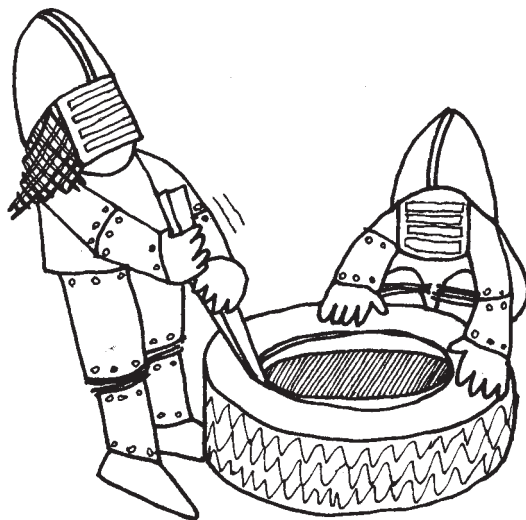
All tyres on split-rim wheels, and detachable flange wheels, must be contained by a cage guard or other suitable restraining device when being inflated after being dismantled or repaired.

All truck, bus, grader, tractor, forklift and other tyres which have a large volume, or are inflated to high pressures, must be contained by a cage guard or other suitable restraining device when being inflated after being repaired or otherwise removed from the wheel.

It is strongly recommended that all tyres, including ordinary car tyres and wheelbarrow tyres, be inflated within a suitable guard. There have been serious accidents even with these smaller types of tyres.

A design for a cage guard is shown in Appendix 2. Department of Labour factory inspectors can always help with designs for cage guards for particular applications.

Cage guards or restraining devices showing damage or excessive corrosion should be repaired or replaced.



19. Protective Clothing and Equipment

Employers have a duty to provide suitable protective clothing and equipment. Workers have a duty to wear and use it.

The minimum requirements when working with or fitting tyres are:

1. Industrial overalls, which should be close-fitting (particularly around wrists) and worn fastened to the neck. Sleeves should be kept down, not rolled up.
2. Eye protection, which is essential. Various types of goggles, visors, etc., may be satisfactory, but if safety spectacles are used, they should be fitted with side shields.
3. Safety footwear with protective toecaps, which is necessary when handling heavy items such as truck, grader, bus, or other large vehicle wheels and tyres. Even where only light car wheels and tyres are handled, footwear must be adequate. Wearing thongs, sandals, sandshoes or other similar footwear is unsafe and may cause unnecessary injuries.

4. Other equipment or clothing may be necessary in particular circumstances. Only the correct hammers, levers, lubricants, bolts, etc. are to be used. Never use equipment that you know, or suspect, to be inadequate or defective. Report the matter to your supervisor.

New Zealand Standards

No protective clothing or equipment is suitable unless it provides adequate protection from the particular hazards likely to be met.

The New Zealand Standards Association has produced a range of standards and specifications for protective clothing and equipment. The Department of Labour recommends that all clothing and equipment comply with the relevant standard where one exists. There are New Zealand Standards for eye protection, overalls, safety footwear, industrial gloves, and many other types of equipment.

All products accepted as complying with the New Zealand Standard, or a suitable overseas standard accepted for use in New Zealand, will bear a Standard Certification Mark.

Further information may be obtained from the Standards Association of New Zealand.



20. The Employer's Responsibilities

The Health and Safety in Employment Act 1992 requires employers to take all practicable steps to ensure the safety of employees while at work. In particular, employers are required to take all practicable steps to:

- (a) Provide and maintain a safe working environment;
- (b) Provide and maintain facilities for the safety and health of employees at work;
- (c) Ensure that machinery and equipment is safe for employees;
- (d) Ensure that working arrangements are not hazardous to employees; and
- (e) Provide procedures to deal with emergencies that may arise while employees are at work.

Employers have responsibilities with regard to significant hazards in the workplace.

- (a) Where practicable, the hazard must be eliminated.
- (b) If elimination is not practicable, the hazard must be isolated.

- (c) If it is impracticable to eliminate or isolate the hazard completely, then employers must minimise the likelihood that employees will be harmed by the hazard.

Where the hazard has not been eliminated or isolated, employers must, where appropriate:

- (a) Ensure that protective clothing and equipment is provided, accessible and used;
- (b) Monitor employees' exposure to the hazard;
- (c) Seek the consent of employees to monitor their health; and
- (d) With informed consent, monitor employees' health.

To summarise important points in the motor industry, employers must ensure that:

1. Every employee is adequately trained and/or supervised for every particular job.
2. Unsafe practices are stopped immediately.
3. All employees are supplied with suitable eye protection, overalls, hearing protection, safety footwear and any other items necessary to protect them from the hazards involved in their work.
4. Suitable tools and equipment are supplied for every particular job. They must be of the correct type and in good condition. This includes cage guards or other suitable restraining devices for tyre inflation.
5. Manuals, wall charts, or other written instructions are available at all times and cover the type of work being undertaken. Only methods set out and approved by the tyre/wheel manufacturers or distributors are to be used.

Simply supplying these items is not enough. Employers must also ensure that they are used or worn. Don't allow anyone who either works for you, or who is on your premises, to take chances with safety.



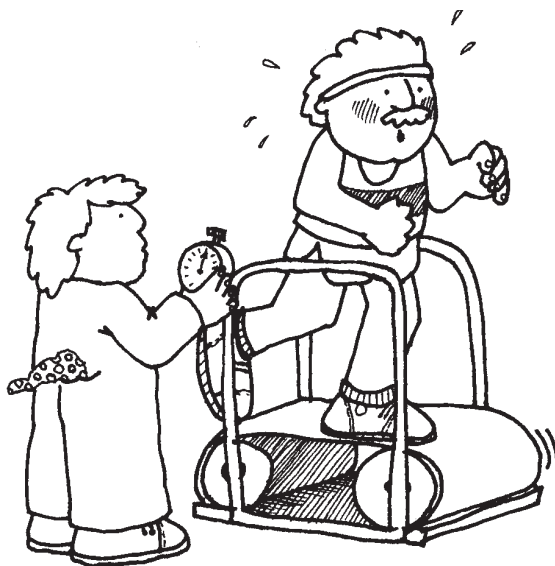
21. The Employee's Responsibilities

Under the Health and Safety in Employment Act, employees must take all practicable steps to ensure their safety at work, and that no action or inaction causes harm to any other person. Employees are also required to use the protective clothing and equipment supplied for the job.

Everyone who installs or repairs tyres should follow these guidelines:

1. Don't attempt any job unless you already know how to do it correctly and safely. Don't bluff, or you may cause an accident. Ask your supervisor for instructions—that's what he or she is there for.
2. Use only the correct tools, clothing and equipment for the job. If gear is damaged, don't use it. If in doubt, see your supervisor and ask him or her to examine it, and to replace them if necessary.
3. Safety laws oblige you to observe safe work methods. If you are unsure, stop and ask.

4. Never take chances or let anyone else take chances with safety. In particular, always wear your eye protection and always use tyre cage guards or other suitable restraining devices when inflating tyres removed from vehicles for any reason.
 5. If you see anyone else not wearing or using safety clothing or equipment, remind them to do so. You could save their eyesight or their life.
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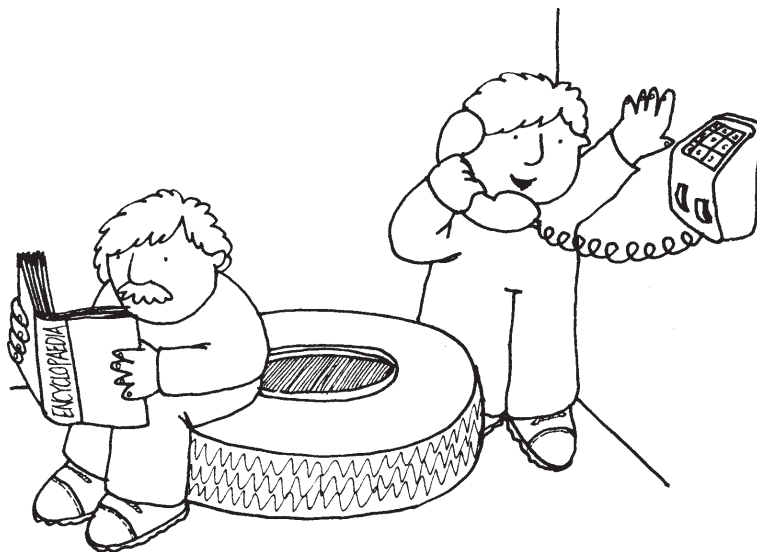
22. Training Schedule

Every employer has an obligation to ensure that employees are adequately trained in the safe use of all plant, objects, substances and protective clothing and equipment they are required to use. If they have not been trained, they must be supervised by a person with the requisite knowledge and experience.

This is particularly important in the tyre industry, where many injuries are serious. It is recommended that employers complete and maintain a training schedule for each worker. The training schedule can be used to prepare a list showing each worker's level of competence in specific tasks. This list should be made available to both supervisors and workers and be posted in a prominent position in the workplace so that those seeking assistance are directed to a suitably trained person.

The chart opposite is one way of expressing this information, although the format and information shown is likely to vary from one business to another. The list of skills shown is, of course, incomplete.

	Joe							
PUNCTURE REPAIR	✓	✓	✓	✓	✓	✓	✓	✓
CAR TYRES	✓	✓	✓		✓	✓	✓	✓
USE OF JACKS	✓	✓	✓		✓			✓
OFF-WHEEL BALANCING	✓	✓	✓	✓				
ON-VEHICLE BALANCING	✓	✓	✓					✓
DIVIDED RIMS	✓	✓	✓					✓
TUBELESS TRUCK TYRES	✓	✓						✓
WIDE-BASE RIMS	✓	✓						✓
H.T. LICENCE	✓	✓						✓
OUTSIDE REPAIR UNIT	✓		✓					✓
COMPRESSOR		✓	✓					



23. Where to Get Advice

If you have any doubts or questions about safety, ask your supervisor first. If this is not possible, or the matter is not properly dealt with, you should approach either your firm's safety officer or your union delegate. If there is no safety officer or union delegate and you are still not satisfied that the job is safe, then contact a factory inspector at your nearest Occupational Safety and Health Service office.

Employers who have any questions concerning safety or safety legislation should also contact their nearest Occupational Safety and Health Service office.

Technical matters should be referred to the Manufacturers' Federation, the Tyre Manufacturers' Association, or individual tyre manufacturers.

Any enquiries regarding standards should be referred to the Standards Association of New Zealand.

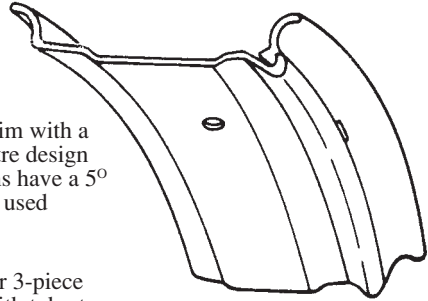
Appendix 1: Rims and Tyres

There are four types of rims for truck tyres:

- Semi-drop centre
- Flat-base
- Drop-centre
- Wide-base (super-single)

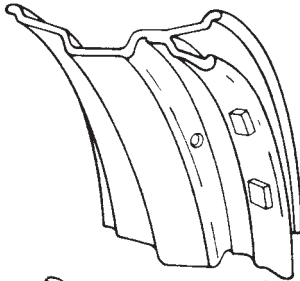
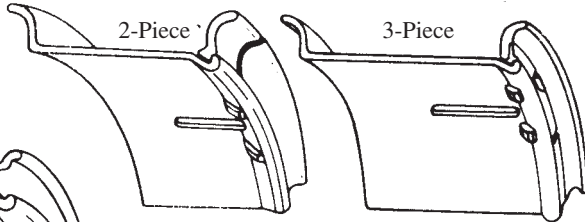
SEMI-DROP CENTRE RIM

The semi-drop centre rim is a 2-piece rim with a base and side ring. The semi-drop centre design makes tyre mounting easier. These rims have a 5° tapered head seat on both sides and are used primarily for light trucks.



FLAT-BASE RIMS

The flat-base rim is made in either 2- or 3-piece construction and is designed for use with tube-type tyres. This is the rim commonly used on medium and heavy trucks, trailers and buses.



DROP-CENTRE RIM

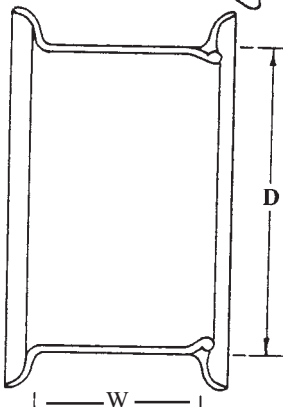
The drop-centre rim is of 1-piece construction with a 15° taper in the bead seats on both sides. This is the rim used for tubeless tyres and it can be mounted on medium and heavy trucks, commercial trailers and buses.

WIDE-BASE RIM

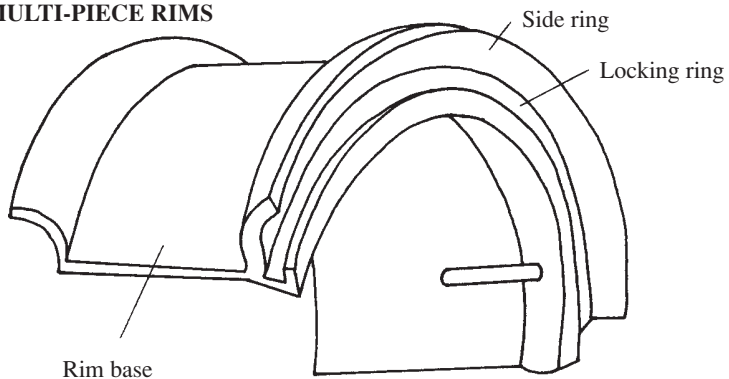
The wide-base rim also is of 1-piece construction with a 15° taper in the bead seats. It is made for the super-single type of tyres, where one unit replaces dual tyres. They are used on light, medium and heavy trucks and trailers.

The rim is measured in width (W) and distance (D). The width is that dimension between the side flanges, while the diameter is measured from where the heel of the head fits on the rim. It is absolutely imperative to use the right size rim for the tyre and to use a rim that has the load rating to carry the tyre that is to be used.

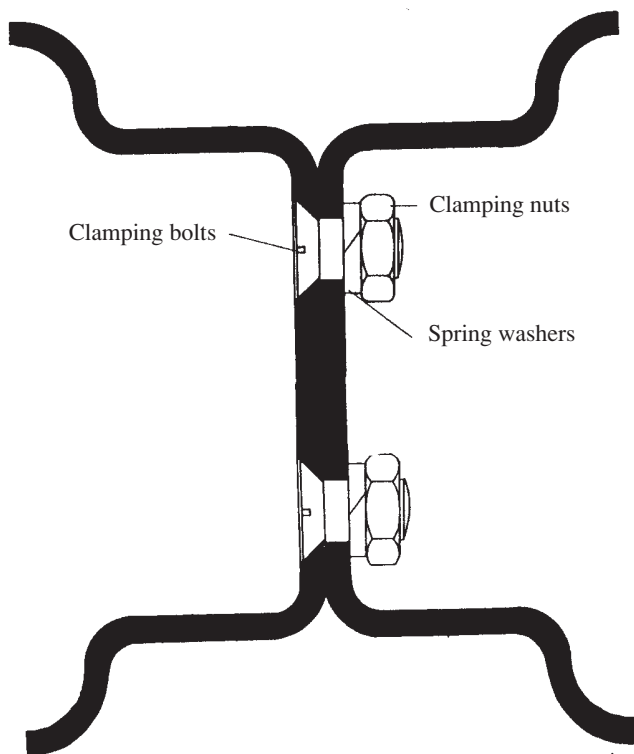
To be sure of this, always check the rim charts and load and inflation tables.



MULTI-PIECE RIMS

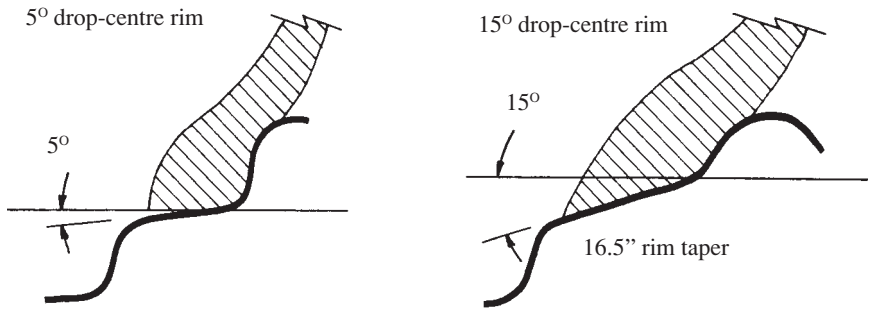


DIVIDED WHEELS

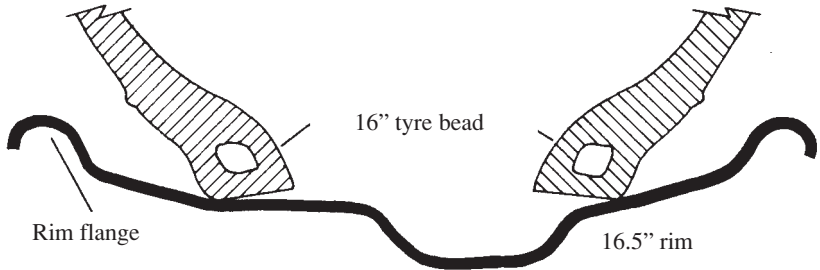


A divided wheel is one in which the rim is in two halves which are bolted together. They are usually fitted to barrows, trolleys, implements and trucks.

CORRECT SEATING OF TYRE BEADING

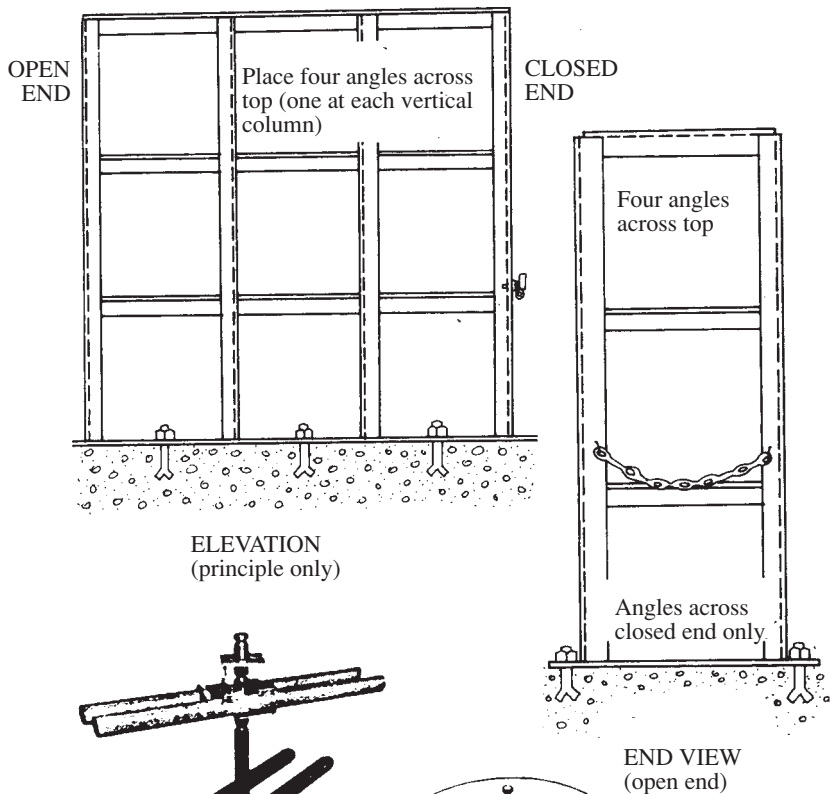


INCORRECT TYRE SIZE NOT ADEQUATELY SEATED



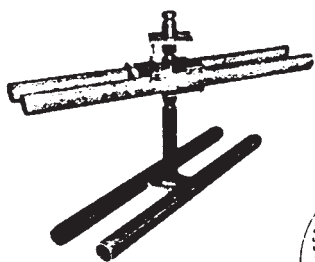
Appendix 2: Tyre Cage and Wheel Guards

TYRE CAGE GUARD



ELEVATION
(principle only)

END VIEW
(open end)



WHEEL GUARD
(for multi-piece rims only,
not for tubeless tyres)

