



Safety and service recommendations for wheels

Developed by EUWA - Association of European Wheel Manufacturers

Members of Euwa represent the main manufacturers of wheels, for all types of vehicles

The wheel makers are continuously improving the design and the manufacture of their products in order to obtain the highest degree of accuracy, strength and reliability. It is however essential that the people charged with wheel / tyre servicing are properly trained and will follow the established procedures.

This paper, most of whose content is taken from the published Euwa Standards, is therefore addressed to all operators working in the field of “wheels”, drawing their attention to the risks connected with inadequate checks, insufficient maintenance, replacement with wrong components, carelessness of safety norms, and so on.

Through the wide diffusion of these “safety and service recommendations” agreed by qualified experts of the Euwa members, we intend to prevent possible problems in service attributable to an improper use, unsafe mounting / demounting or other dangerous operations.

1 - SAFETY IS IMPORTANT

The wheel is a highly stressed component of the vehicle that in service may be subjected to extreme forces. Therefore it is absolutely necessary to check the wheels periodically and to pay particular attention to their mounting, removal and maintenance in order to ensure safe operations and to prevent any possible risk.

The following recommendations refer to all types of wheels, made of steel or of light alloy for: passenger cars, agricultural tractors, off-the-road machines, industrial vehicles, but especially to the wheels of commercial vehicles (trucks, buses and road trailers, where high capacity loads and inflation pressures are involved).

Particular care has to be used to handle the wheels having multipiece rims.

Improper or unsafe wheel / tyre servicing practices can lead to serious accidents.

Therefore, all service operations must be performed only by qualified personnel, appropriately trained: they have to use correct procedures, proper equipment and tools, and safety precautions.

2 - GENERAL SAFETY AND MAINTENANCE RECOMMENDATIONS

2.1 - WHEELS AND WHEEL COMPONENTS

Never use wheels or wheel components which cannot be well identified, even if they appear to have the correct dimensions and the same correct function.

The identifications impressed on the bolt hole area of the wheel disc and/or on the rim/rings –see picture No.1- will help to ensure the correct replacement with another component having identical characteristics and performance, as required by the vehicle manufacturer.

The geometric characteristics of the wheel disc must correspond exactly to the matching vehicle parts (axle hub and brake) in order to guarantee the proper fitting and an effective load transmission.

The use of the correct replacement part becomes particularly important for the removable rings of a multipiece rim, since the ring of a given rim size may not be interchangeable with the one belonging to another rim type.

For the proper choice of the component to be mounted as replacement, careful attention has to be paid to these items: size of ring - system of assembly - execution details (shape and dimensions).

Even small differences may in fact be critical. Consequently for safety reasons, in the case of multipiece rims, the origin of the components must be the same.

Mismatched or wrong rings mounted on a multipiece rim can cause serious mounting or service accidents or, at the least, the wheel failure, without any prior warning.

2.2 - REMOVAL OF WHEEL AND TYRE DEMOUNTING

The personnel responsible for the wheel mounting / demounting operations must be qualified and have proper training.

In the case of divided (bolted) wheels, wheels with multipiece rims of both single and twin mounting, or similar, **it is a mandatory rule for safety reasons that, before starting to unbolt the tyre-wheel assembly from the vehicle axle, that the tyre must be fully deflated** even when a low inflation pressure is involved.

Unseen damages could cause the explosion of the assembly during removal, if the tyre still contains air under pressure.

To ensure a complete tyre deflation, remove the valve core.

Remove, disassemble and inspect a tyre-rim assembly that has been operated in a run-flat or in under-inflated condition (that is 80% or less of the recommended pressure). To carry out these operations, use suitable tools and follow the demounting procedure prescribed by the vehicle or tyre / wheel manufacturer. For mounting / demounting a tyre from a wheel with a multipiece rim, see picture No. 2.

For detailed tyre mounting / demounting instructions of commercial vehicle wheels equipped with 15° drop centre rims and protected valves, see Annex "A".

For the similar procedure for the TRILEX[®] wheel system, see Annex "B".

2.3 - IDENTIFY A DAMAGED RIM / WHEEL

Periodically check the wheel conditions: a complete cleaning of all surfaces before inspection will help in finding more easily and surely possible defects.

Check closely all components after removal, to ensure that they are in good condition and look for any possible non conformity - see picture No. 3.

In order to avoid damage to tyres, during mounting or while in use, any sharp edges, burrs or uneven areas which might have occurred during service should be deburred and covered with a suitable paint to protect against corrosion.

The matching surfaces between the wheel and the vehicle as well as those of the components in a multipiece rim must be cleaned and protected against corrosion, also.

The wheel as a safety part, must not show fractures, deformations, distortions, severe corrosion, excessive wear, buckled or twisted rings (where existing) or other similar defects. Such pieces must not be reused, but destroyed and scrapped. Also in the event of a suspected damage or if in doubt about the suitability of a wheel/rim component, the involved part must be replaced.

The replacement has to be carried out with new pieces having completely identical characteristics.

In the event that the correct removable rings are not available, a new complete rim / wheel should be fitted.

Typical defects that require the parts replacement, are:

- cracks in the wheel disc face, in particular the bolt holes area and the ventilation holes can be concerned
- deformations or abnormal imprints in the seats of the bolts / studs fixings
- leaks in tubeless tyres derived by micro-cracks in the rim or by wear and tear marks on the rim-tyre matching surface
- bent rim flanges (generally due to impacts against obstacles)
- circumferential cracks on the rear flange or at the gutter in the base of multipiece rims
- broken, buckled side/kombi ring or excessive corrosion on rings of multipiece rims
- twisted rings, in particular lock and 'kombi' rings

It is not allowed to perform any technical modification on the wheel.

The repair of a damaged rim or disc by heating, by welding, by addition or removal of material is absolutely forbidden.

No guarantee on repaired parts is acceptable since such changes may introduce additional stresses in critical, high stressed areas.

Wear on rim flanges (top of the flanges) can be tolerated up to a maximum of 10 % of the initial thickness of the rim material.

2.4 - MOUNTING OF TYRE ONTO WHEEL RIM

This operation must be carried out by trained personnel only.

Be sure that the rim size and diameter are the right ones for the tyre to be mounted. Inspect the wheels and its components to verify that all parts are in good conditions.

Do not use damaged, worn out or cracked parts and do not try to repair them.

Do not fit a inner tube to a tubeless tyre to overcome a problem of air leakage.

Check all matching surfaces i.e. hub, studs, nuts, disc attachment face - and in case of multipiece rims all contact surfaces for a correct ring seating - removing dirt, rust, scratches and other similar surface defects.

To clear such surfaces, hand or electric wire brushes or sand blasting may be used. In particular, drop centre rims fitted with tubeless tyre must have the bead seat areas free from rust and rubber deposit, in order to ensure air-sealing.

Especially for tubeless tyres, inspect the valve and replace the stem, if necessary.

Use a neutral non-aggressive mounting paste to lubricate the outside of both rim seats and tyre beads. Do not use solvent-based lubricants as these could damage the tyre, nor starting flammable fluids to lubricate or seal the beads.

On wheels with drop centre rims (single piece), place the tyre over the small bead seat side of the rim, push the lower bead over the rim flange and then, progressively, into the rim well. Using the first lever to keep in place the upper tyre bead, work by short steps with the second lever to complete the fitting of the tyre -see picture No. 4.

On the multipiece rims, the correct positioning of the removable 'kombi' ring or of the side/lock rings has to be carefully checked prior to inflation and later on after having applied about 0.3-0,5 bar of air pressure. Never stand in front of the wheel.

An inflated tyre, even with low air pressure, must never be worked on with a hammer while trying to correct an improper position of the rings. In such a case, all air has to be let out of tyre before the necessary correction can be done.

For detailed instructions concerning the tyre mounting / demounting on commercial vehicles wheels having 15° drop centre rims and protected valves, see Annex "A".

For the TRILEX[®] wheel system, refer to Annex "B".

To complete the tyre inflation use a "safety cage", designed with suitable strength - see picture No. 5 - or at least put safety chains round the wheel, always avoiding to stay in the potentially dangerous areas.

Particular precaution must be taken by the operator, and any other people present whenever handling an inflated tyre/wheel assembly or while checking the pressure of a tyre mounted on the vehicle, and never to remain in front of the wheel. This especially if it is a large dimension with high inflation pressure - see picture No. 6.

Extreme care should be taken: the sudden release of the air contained in the tyre can cause serious injury.

Always use an air gauge to measure the tyre pressure. The correct value, specified for the tyre, must be maintained to avoid damage to tyre or fracture of the wheel / rim

2.5 - MOUNTING OF WHEEL TO THE VEHICLE - STUDS AND NUTS

The tyre/wheel assembly must be correctly positioned relative to the hub when mounting on the vehicle.

Be sure that: the diameter of pilot hole - diameter of stud holes - number and shape of stud holes - wheel offset or inset - type and kind of bolts / studs and nuts correspond to the characteristics of the vehicle axle hub.

All mounting parts such as studs, spherical or conical nuts, nuts with captive washer, special parts for steel and light alloy wheels, must fit exactly to the wheel being mounted.

Any incorrect combination of parts (different type, different shape of radius/angle, different length) may cause nut loosening or the wheel failure.

To prevent rusting, small amounts of oil may be applied to the wheel nut and stud threads. Care must be taken not to over lubricate.

Studs and nuts of all disc wheels have to be fastened in accordance with the vehicle manufacturer's instructions, either using a torque spanner or by means of a tool designed to reach the torque value specified by the vehicle manufacturer.

As far as the recommended amount of the torque is concerned, the instructions of the vehicle producer must be followed. The torque specified by the agricultural tractor manufacturer, must also be applied to the bolts connecting the disc to the rim lugs, for the case of wheels having variable track.

The correct tightening sequence is crosswise for the wheel disc, that is to tighten one nut then the opposite one or the farthest away - see some examples in picture No. 7. However, for the TRILEX[®] wheel system the correct tightening sequence is around the wheel spider, for example tighten the adjacent nuts in a clockwise direction (i. e. do not tighten crosswise). Tighten progressively to the final torque, not in one go.

Excessive nut tightening may cause deformation of wheel disc or of bolt/stud failure. An insufficient tightening may cause the wheel loosening.

On a new vehicle and always after a wheel / tyre replacement, it is imperative to verify the mounting torque after approximately 50-100 km of operation and, where necessary, to re-tight the wheel nuts to the correct value. It is recommended to periodically check the nut torque.

2.6 - WHEEL MAINTENANCE

Burrs, marks and rust must be removed before mounting the tyre, to avoid damage to the tyre.

When repainting, it must be borne in mind that on the wheel mounting contact areas the total thickness of coating, including the base coat, should not exceed 50 microns, except where stated differently by the vehicle manufacturer.

On the TRILEX[®] wheel system, however, the 15/18° cones of rim and spoke head must not be painted at all.

In any event, avoid to paint the countersink of bolt seats (where existing) and in general the nut contact area, on the wheel disc.

Before installing on vehicle and periodically during the use, all parts must be inspected to ensure that they are clean and free from rust and deposits.

Do not load and inflate the tyre / wheel / axle system beyond the rating of the lowest rated component. Regular checks of the tyre inflation pressure are to be made.

The type of balance weights, when used, must be in accordance with the profile of the rim flange.

Follow the vehicle or rim / wheel manufacturer's current manuals for installation instructions, recommendations and any other additional information.

2.7 – MAINTENANCE OF WIRE SPOKE WHEELS

Particular attention must be devoted to the wheels with wire spoke for passenger cars and motorcycles.

The wire spoke is the most critical component, therefore a careful check is recommended after an initial short running and then at periodical intervals.

When one damaged wire spoke is replaced, the relevant nipple must be replaced, too; moreover the qualified charged personnel must verify the efficiency and tensioning of all other spokes.

For replacements, always original spare parts must be used.

Similar care must be given to the coupling parts between the wheel centre member and the vehicle axle, both in the “Rudge” system (locking through a conical nut and connecting teeth) and in the types having bolts on a conventional fixing.

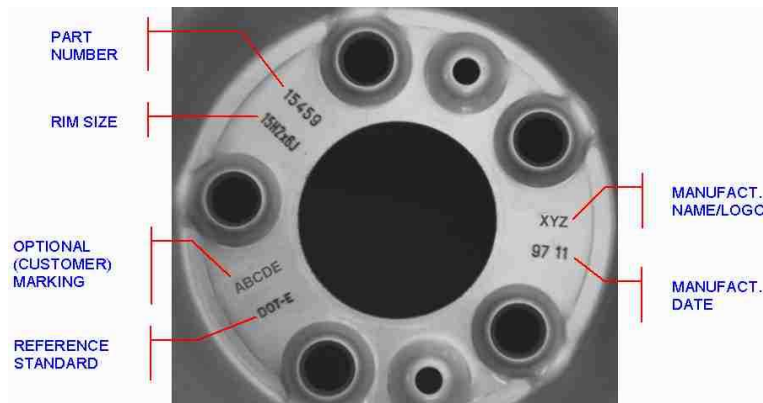
Attention has to be paid on the thread directions (right wheel, left thread and vice-versa).

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Picture No.1 - Typical stampings to identify the wheel

(i.e. rim size, manufacturer's name/logo, manufacturing date, part number and possible other additional markings of interest).

Similar markings also may appear on the rim and rings, where existing.

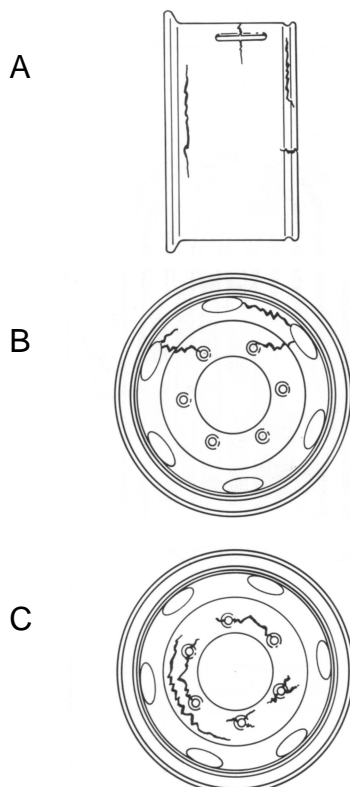


Picture N. 2 - Mounting / demounting a tyre from a wheel with **multi-piece rim**

The example refers to a commercial vehicle wheel with a 2-piece rim ('kombi' type rim).

DEMOUNTING - Before demounting the wheel assembly from the vehicle, completely deflate the tyre. By means of suitable levers free both tyre beads from rim flanges, then progressively remove the 'kombi' (or lock / side rings) from the fitting groove. Disassembly the rings, then the tyre.

MOUNTING operation - carefully clean and check all matching surfaces. After mounting, ensure that the ring/rings are placed in their correct position. Inflate to max. 0,3-0,5 bar and again verify the assembly. Never stand in front of the wheel. In case of improper position of the ring/rings, all air has to let out of tyre and a corresponding correction has to be made. Put the wheel in a safety cage and inflate the tyre to the recommended pressure.



Picture No. 3 - Examples of rim / wheel damages

specifically referring to truck/trailer wheels with multi-piece rim

A - cracks in rim shoulder and gutter

B - cracks involving disc ventilation holes

C - cracks in the bolt holes area

D - broken (continuous) side ring

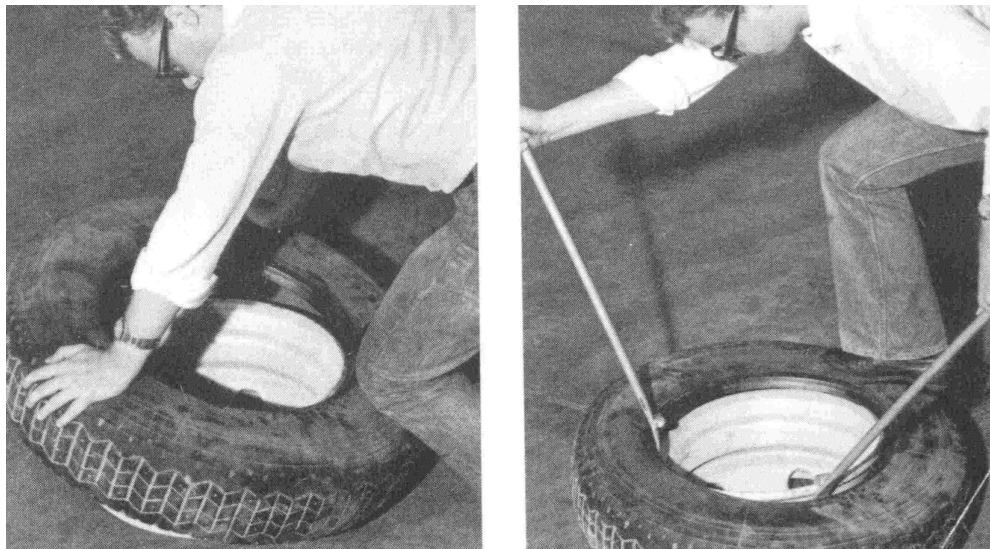
E - buckled ('kombi' - side) ring



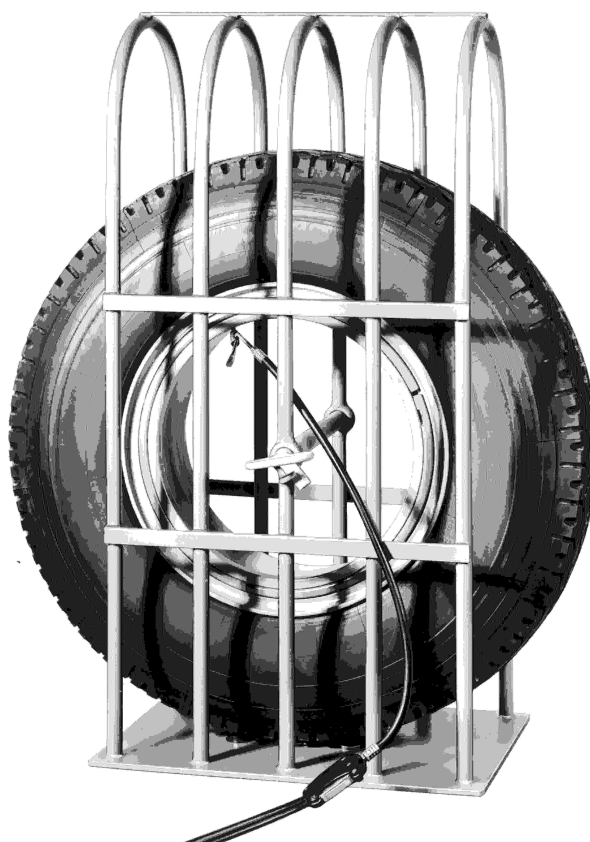
Picture No. 4 - Mounting a tyre on a wheel with drop centre rim

The picture shows the manual mounting of a commercial vehicle wheel with 15° drop centre rim.

Differently from the photos, presently the mounting / demounting operations of the tyre are no longer carried out manually but on special machines. In any event, carefully clean and check all matching surfaces. Inspect with attention the valve. Properly lubricate the tyre bead seats. Inflate the tyre, whenever it is possible, in a safety cage. Periodically check the tyre pressure.



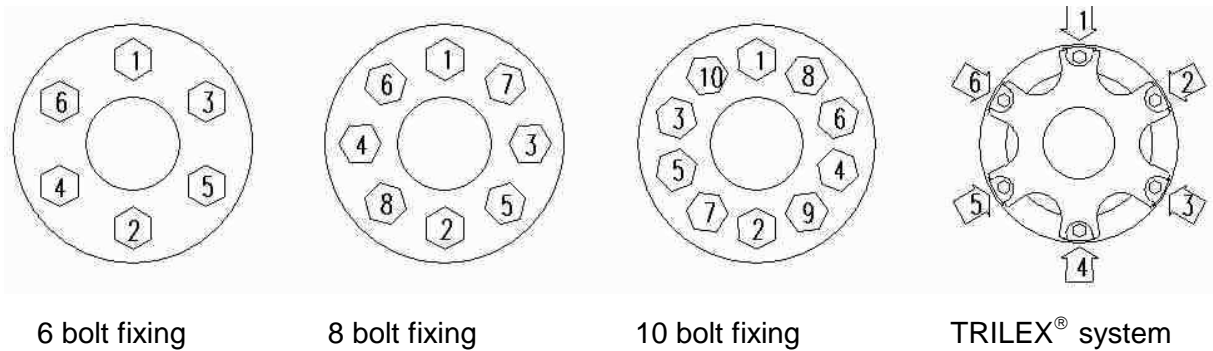
Picture 5 - Safety cage, to be used when inflating a tyre-wheel assembly



Picture No. 6
Trajectory (danger zone) to be avoided when handling multipiece rim wheels



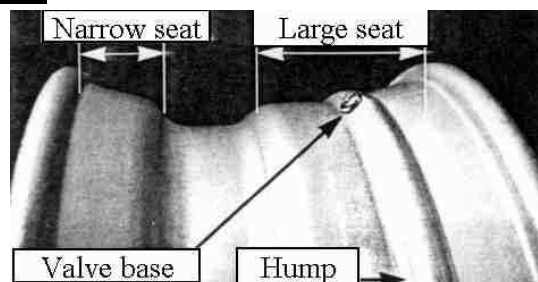
Picture No. 7 - Examples of nut tightening sequence related to commercial vehicle disc wheels having 6, 8, 10 bolt fixing and to the TRILEX[®] wheel system.



Specific tyre mounting-demounting procedure for wheels with 15° D. C. rim and protected valve.

The “45° valve” types used for these wheels must have a spherical valve base. This is required in order:

- > to avoid risk of tyre damage caused by the valve base during mounting / demounting.
- > to ensure the tyre inflation after mounting.

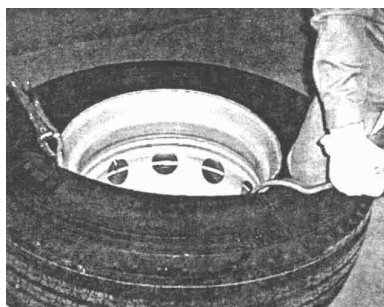


MOUNTING Lubricate the whole rim surface as well as the tyre bead. Place the wheel on a wooden block, with disc downwards i.e. the narrower rim bead seat at the top.



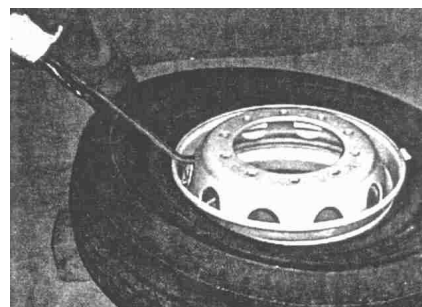
Mounting first tyre bead

Place the tyre concentrically on the rim flange. First press the adjacent bead over the rim flange into the rim well. Then press progressively the whole bead over the flange. In event of difficulties use a suitable bent lever.



Mounting second tyre bead

Press the bead in the valve area over the rim flange into the rim well and lock it by means of pliers on the rim flange. Then fit progressively the whole bead using a bent lever.



Pressure lock - Inflation

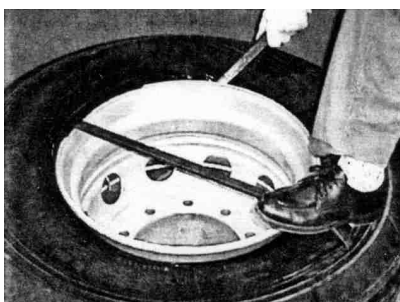
Ensure that the valve core is removed. Place the assembly vertically and start inflation following the safety rules. In case of difficulty (tyre bead has not overcome the valve base) place the wheel on the ground with the disc upward. Lift the bead in the valve area using a lever. When the tyre is correctly positioned fit the valve core and inflate the tyre to the prescribed air pressure.

DEMOUNTING



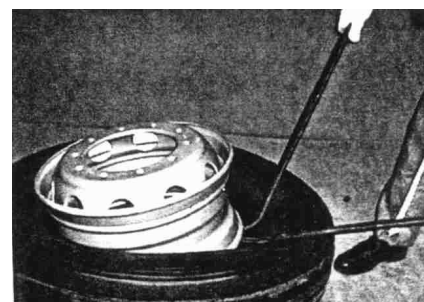
Demounting - Unlocking

Deflate the tyre completely by removing the valve core. Starting with the narrow seat side, apply pressure with a tool to push the bead over the bead seat. Then unlock the opposite bead. Lubricate freely the areas previously in contact (tyre bead and rim seat).



Demounting the first tyre bead

To be carried out on the rim narrower seat using suitable tools. Place the wheel on an appropriate floor, wheel disc downwards. Engage 2 flat levers spaced at about 20 cm. on each side of the valve. Keeping in position one lever, use the other in small steps in order to ease the bead completely over the rim flange.



Demounting the second bead

Turn the assembly over the floor (disc upwards) with the tyre bead positioned at the bottom of the rim well. Lift the wheel with the help of a lever, then complete the demounting of the second tyre bead with the use of a second lever.



TRILEX® RIM DEMOUNTING

Completely deflate the tyre by removing valve core and using a draining valve.

Before opening the rim, the tyre bead has to be made completely free, by pushing down from the rim.

Open the rim by using a suitable double-ended lever.

ASSEMBLING OF THE TRILEX® RIM SEGMENTS INTO TYRE

Lubricate tyre beads and flap. This will ease assembling work and prevent sticking of tyre. Clean rust pitted rims and coat with rust-resisting paint (zinc dust paint). Remove burrs, if any, at segments ends by filing. Round off transition rim base / rim flange



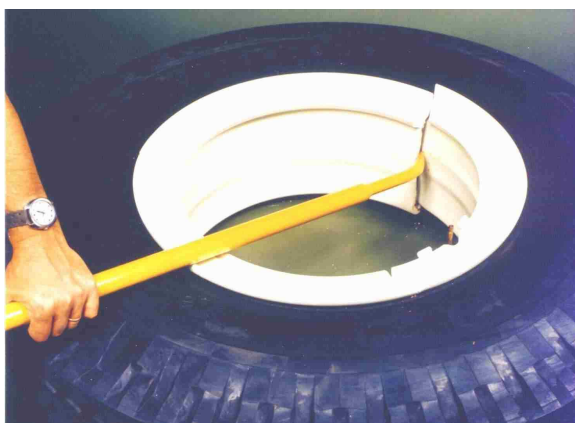
Place tyre on the ground, valve pointing upwards. Insert valve segment, right side first, as illustrated.

Seen from above, valve rests against left side of valve slot.

Rim base to rest all along against tyre bead. Retreated tyres, having generally a large bead width, may have to be compressed until play between tyre bead and rim flange is obtained on both sides.



Third segment is joined to valve segment.



Slide the segment, now in front of valve segment, along into locking position. Check position of valve ! As seen from above, valve must rest against left side of the valve slot.

Close rim by using double lever steadily along rim mounting bevel (do not pull upwards). Once rim is locked, valve to be located in the centre of the valve slot.