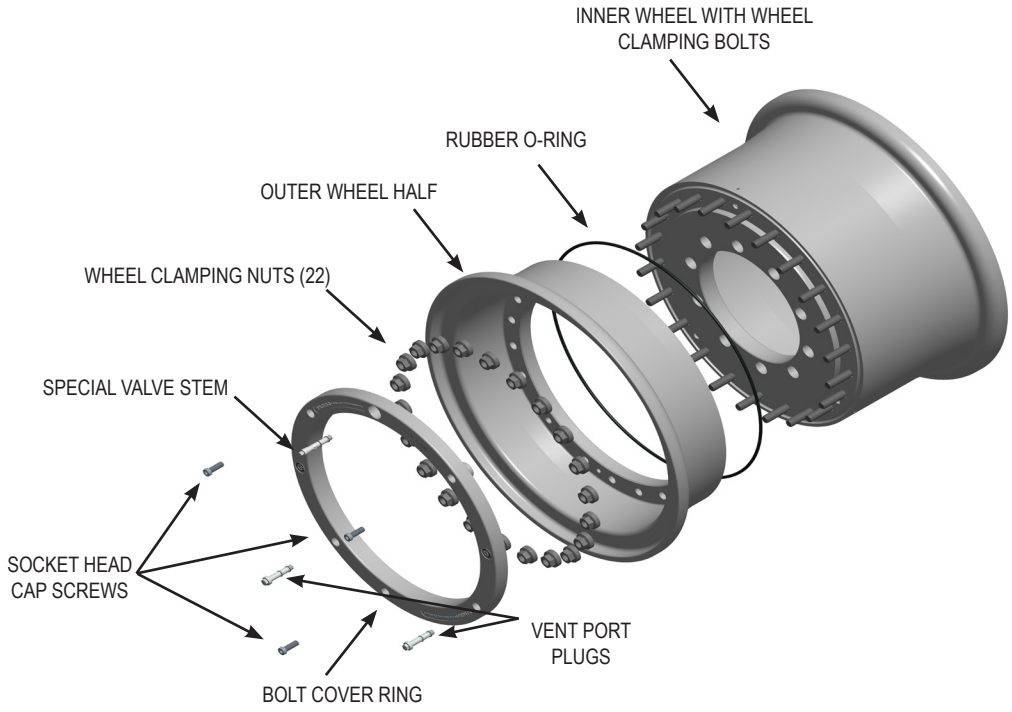
# ALUMINUM BOLT TOGETHER MOBILE CRANE WHEELS

PROCEDURE FOR ASSEMBLY & DISASSEMBLY
OF ALUMINUM BOLT TOGETHER MOBILE CRANE WHEELS
WITH OTR DEFLATION SYSTEM


OTR Wheel Engineering

# 1.0 SCOPE

- This document outlines the recommended steps for assembly and disassembly of OTR Wheel Engineering 2-piece bolt-together aluminum wheels for mobile crane type applications with the OTR deflation system (DS) feature.
- The deflation system provides a means to reduce the risk to the personnel using and servicing these tire and wheel assemblies. The system consists of:
  - 1 special valve stem assembly
  - 2 special venting port bolts
  - 1 Bolt cover ring (BCR)
  - 3 Socket Head Cap Screws
- The DS must be used at all times to reduce the risk to the personnel using and servicing these tire and wheel assemblies.

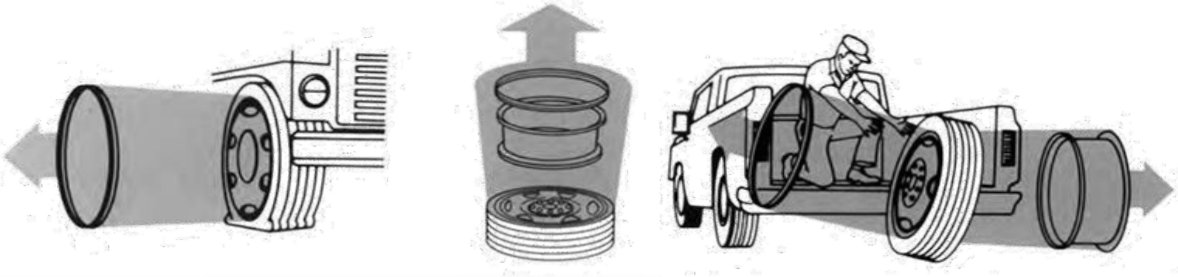



# 2.0 GENERAL

- Servicing of a tire and wheel assembly can be dangerous. Only qualified personnel should perform the servicing tasks and use the correct tools and procedures. Failure to observe and follow this warning could lead to serious injuries or death.
- Read and understand the instructions in this document. We highly recommend reading the documents below for all those involved with servicing tire and wheel assemblies.
- Department of Labor Occupational Safety and Health Administration (OSHA) 29 CFR part1910.177, titled “servicing of single piece and multi-piece rim wheels.
- OSHA Wall Charts 3401, 3402, 3403
- Association of European Wheel Manufactures (EUWA) publications:
  - ES 1.03 Safety and Maintenance Recommendations for Wheels
  - ES 1.04 Safety Recommendations for Divided Wheels
  - ES 1.07 Safety Instructions for the Use of Wheels in Tyre Shops
- Department of Labor, Mine Health and Safety Administration, MHSA IG 60 Tire and Wheel Safety Awareness Program

# GENERAL WARNINGS

- **NEVER** use starter fluid, ether, gasoline, or other flammable materials and/or accelerants to lubricate the beads of a tire. This practice can cause the explosive separation of the tire/wheel during servicing or during highway use, which may result in serious injury or death.
- **NEVER** inflate beyond 275 kPa [40 PSI] to seat any tire beads. Follow the tire manufactures recommended procedures for "seating" of the tire beads.
- **NEVER** stand, lean, or reach over the tire rim/wheel assembly in the restraining device during inflation. Even if a tire is in a restraining device, inflating beyond 275 kPa [40 PSI] when trying to seat the beads is a *DANGEROUS PRACTICE* that may break a tire bead or the rim/wheel with explosive force and possibly result in serious injury or death.
  - Any inflated tire mounted on a wheel contains explosive energy. The use of damaged, mismatched or improperly assembled tire and wheel components can cause the assembly to separate with explosive force. If struck by an exploding tire, wheel component, or the air blast, you or someone else may be seriously injured or killed.
- **ALWAYS** stand clear of wheel assembly trajectory as shown below:



- **ALWAYS** verify the condition of the parts being used and that they are the correct parts. Re-assembly and inflation with mismatched components on multi-piece tire and wheel assemblies can result in serious injury or death. Just because the components come in or fit together does not mean they are matched.
  - **ALWAYS** check the identification stamps for proper matching of all rim parts before assembling a multi-piece tire and wheel.
  - **NEVER** assemble a tire and rim unless you have positively identified and correctly matched the tire and rim diameter.
- **LOOK and FEEL** for any damage or evidence of being operated overloaded and/or in a run-flat condition (80% or less of the tires recommended operating inflation pressure).
  - Radial tires that have undulations or irregular sidewall distortions that could possibly have permanent sidewall structural damage (steel cord fatigue). Ply cords weakened by under-inflation and/or overloading may break one after another, until a rupture occurs in the upper sidewall with accompanying instantaneous air loss and explosive force. This can result in serious injury or death. Follow tire industry recommended inspection procedures for tires with these characteristics.
- **ALWAYS** remove rust/corrosion, dirt, or foreign material from all tire and rim/wheel mating surfaces.
- **NEVER** use any multi-piece rim parts that are worn, bent, cracked, or pitted by corrosion. Clearly mark and remove all unserviceable parts from the service area.
- **NEVER** rework, weld, heat or braze any rim parts or components for any reason.
- **ALWAYS** find the identification stamp on multi-piece rim components. Refer to the Multi-Piece Rim Matching (OSHA chart publication 3403) to verify that the parts are properly matched.
- **NEVER** use a rim part unless you can positively identify it from the markings stamped by the manufacturer. If you cannot identify a multi-rim component, **DO NOT USE IT!**
- **Examples of unserviceable parts:**


Sprung Lock Wheel


Bent Wheel


Corroded Wheel


Cracked Flange


Cracked Wheel Flange

# TOOLS FOR SERVICING THE TIRE & WHEEL ASSEMBLY

The following is the list of the basic tools that would be needed for assembly and disassembly of the 2-Pc aluminum bolt together mobile crane wheel with the OTR Wheel Engineering Deflation System.

### Personal Protective Equipment (minimum)

- Safety glasses with side shield – Complies with ANSI Z787.1, DIN EN 166 or similar standards
- Safety work shoes - Complies with ASTM F2413 , EN20345 or similar standards
- High visibility outerwear - Complies with ANSI Type R or P Class 2, EN 471 Class 2 or similar standards
- Work gloves - Complies with ANSI 138, EN 388 or similar standards
- Safety helmet - ANSI Z89.1, EN 397
- Additional PPE may be required by the specific work site

### Assembly of Tire & Wheel

- Lifting device (overhead crane, tire servicing boom, protective cage/barrier system as practical, etc.)
- Nylon Lifting slings
- Wheel spacer / risers

# 3.0 ASSEMBLY PROCEDURE

**1.0** Review the entire procedure before performing any of the work. If you have any questions regarding this procedure STOP immediately and contact the manufacture or their representative to answer your questions.

**2.0** Verify that you have the correct tools and material handling aides and they are in good working condition.

a. Verify that the torque wrench(s) to be used are:

- In good condition
- Have the correct capacity for the torque(s) required
- Have calibration certificate(s) that are current

**3.0** Verify that the servicing personnel have the correct worksite required personal protection equipment when performing the assembly or disassembly work.

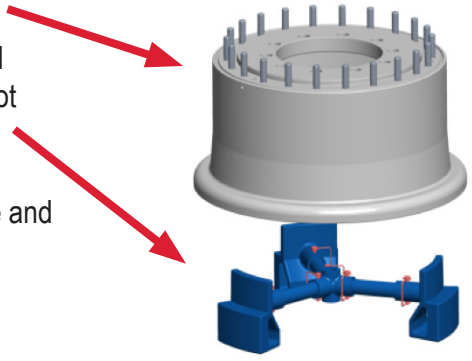
**4.0** Verify that you have the correct tire (size & type), wheel components, fasteners and Deflation System hardware. Verify that they are all in parts and components are in good condition for use!

**If you have any concerns or questions regarding the procedure STOP! Do not continue the assembly process. Contact the manufacture or their representative to resolve any concerns or questions.**

**5.0** Place the inner half of the wheel in a horizontal position on a level work surface. The wheel clamping bolts should be facing up. Care should be taken to avoid surface damage to the wheel when setting it on the work surface.

a. The inner wheel half may need to be raised off the ground so the tire can hang free on the inner wheel half and does not touch the work surface

b. Make certain that the rim is properly supported and stable and will not easily tip.

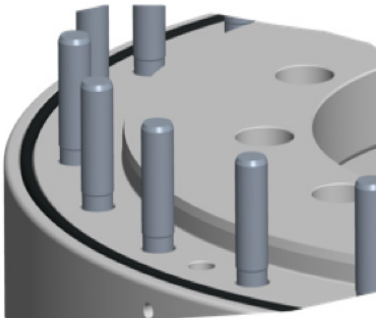


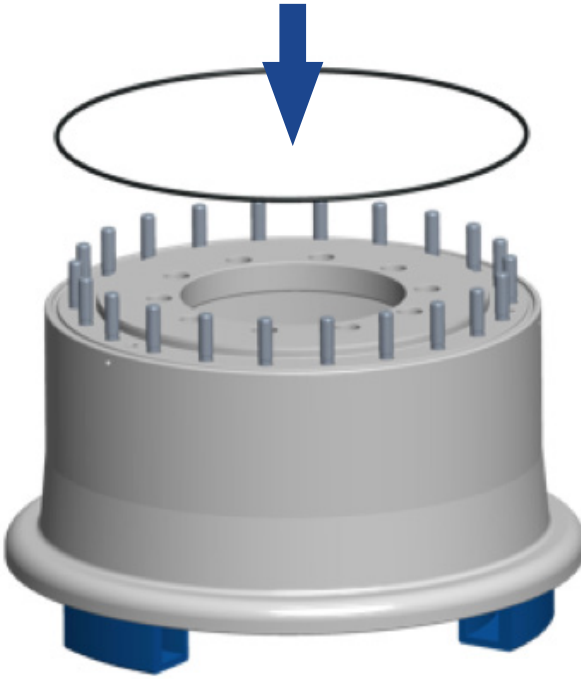
# 3.0 ASSEMBLY PROCEDURE

**6.0**

Place the O-Ring in the groove in the inner wheel.

A light coating of diluted tire lubrication can be applied to the top of the O-Ring. This will allow the O-Ring to slide in the mating surface of the outer wheel half.





**7.0**

Place the tire over the inner wheel half.

The bead seat surfaces of the tire and inner rim half should be lubricated to allow the tire to slide into position.
I. Follow the tire manufactures recommendations for lubricating the tire beads.
II. Only approved vegetable based tire lubricants should be used with the tire and O-Ring. Use of petroleum based lubricants will damage the rubber in the tire and O-Ring.
III. To avoid injury to the service personnel, lifting devices should be used to place the tire on the inner wheel half.

# 3.0 ASSEMBLY PROCEDURE

## 8.0

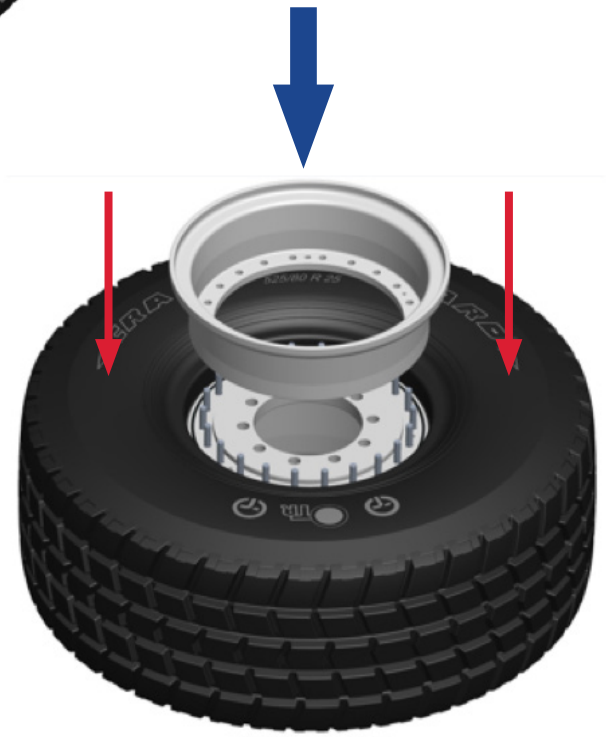
Press down on the sidewall of the tire to allow the outer wheel half to be placed on the assembly.

- Care should be taken to distribute the load to avoid damaging the sidewall of the tire.
- The tire should be depressed sufficiently to be able to place the outer half onto the inner wheel half.
- The sidewall of the tire must remain compressed until step 12 has been fully completed!

## 9.0

Place the outer wheel half onto the inner wheel half.

- The bead seat surface of the outer wheel half should be lightly lubricated.
- Care should be taken to avoid damaging the threads of the wheel clamping bolts when placing the outer onto the inner wheel half.
- Orient the venting holes of the outer wheel half with the holes in the inner wheel half.



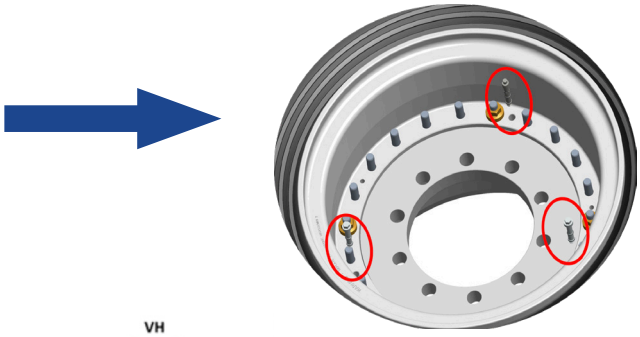
# 3.0 ASSEMBLY PROCEDURE

## 10.0

Place four wheel nuts in place as shown. The nuts should be hand tightened until just touching the surface of the outer wheel half.

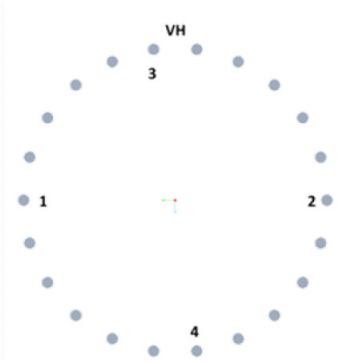
## 11.0

- Insert the valve stem assembly and venting port plugs into their respective holes and hand tighten.
    - If the items will not fit into the holes of the inner wheel, rotate the outer wheel half slightly until alignment is achieved and they can be threaded into place.



## 12.0

- Tighten the four wheel clamping nuts to 150 Nm. [110 Ft.-Lbs.]
- **Remove** the valve stem assembly and the venting port plugs. This is to eliminate the possibility of these items being damaged while installing and tightening the wheel clamping nuts.



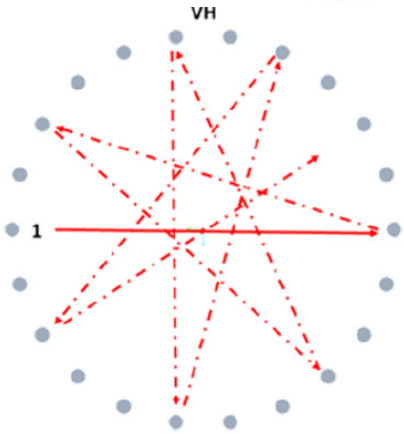
# 3.0 ASSEMBLY PROCEDURE

## 13.0

- Release the pressure on the sidewall of the tire. Allow the tire sidewall to move up and make contact with the outer wheel half

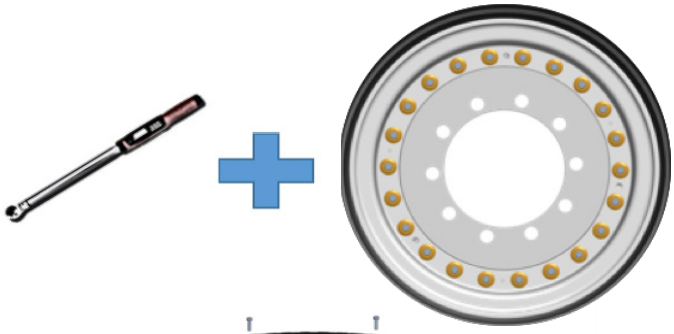
## 14.0

- With clear access to the wheelclamping bolts, install the remaining (18) nuts. Using a torque wrench tighten all of the wheel clamping nuts (22), using a star or crossing pattern, to an initial torque value of 150 Nm. [110 Ft .-Lbs.].




## 15.0

- Tighten the wheel clamping nuts (22) to the required torque value with a **calibrated** torque wrench. Use a star or crossing pattern, to the final torque value of 310 Nm – 360 Nm. [230 – 265 Ft.-Lbs.].
  - Mark each of the (22) nuts after tightening to denote that the final torque value was achieved.

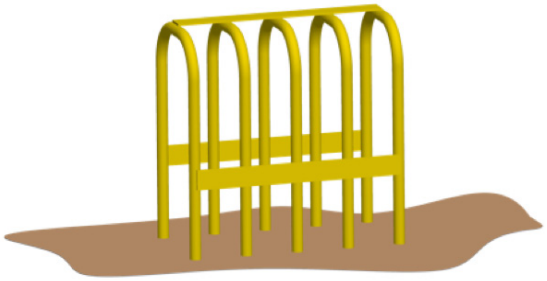


## 16.0

- Install the bolt cover ring (with 3 cap screws), the valve stem assembly and (2) venting port plugs. Tighten these to the following values :
  - Valve stem assembly: 10 – 14 Nm [95 – 125 In.-Lbs.]
  - Venting port plugs (2): 10 – 14 Nm [95 – 125 In.-Lbs.]
  - Bolt Cover Ring cap screws (3): 27 Nm – 34 Nm [20 – 25 Ft.-Lbs.]

## 17.0

- With a lifting aid, place tire and wheel assen safety cage.



# 3.0 ASSEMBLY PROCEDURE

## 18.0

- Inflate the tire and seat the tire beads **without the valve core in the valve stem assembly**. Follow the tire manufactures recommended practice for seating the tire beads and inflating to recommended tire pressure for the size, type and application

- **ALWAYS** inflate the tire rim/wheel assembly in a restraining device with the valve core removed. The airline assembly must consist of the following components:
  ✓a clip-on air chuck, an inline valve with a pressure gauge or presettable regulator
  ✓Sufficient hose length to keep the technician outside the trajectory zone during inflation. (See page 5)

- **WARNING - DO NOT** rest or lean any part of your body against the restraining device during inflation.

- **IMPORTANT!** Look for distortions, undulations, or other irregularities in the tire sidewall. Listen for any popping or snapping sounds.

- If ANY of these conditions are present — **STOP!** DO NOT approach tire. Before removing from restraining device, completely deflate tire remotely. Remove clip-on air chuck. Render tire unserviceable. Replace the tire if neccesary.

## 19.0

- Insert the valve core into the valve stem

  - Tighten the valve core to a torque value of 0.3 – 0.6 Nm [3.0 – 5.0 inch-Lbs.].
  - Inflate the tire to the tire manufacture's recommended pressure value for the tire size, type and application.

# 3.0 ASSEMBLY PROCEDURE

**20.0**

- Before removing the tire rim/wheel assembly from the restraining device, visually inspect for proper seating of the tire beads and all of the wheel parts.
  - ✓Check for any initial signs of air leakage

**21.0**

- The tire and wheel assembly must be quarantined for a minimum of **24 hours.**
  - ✓Mark or label the assembly for being quarantined so it is not placed into service
  - ✓Re-check the tire assembly for air leakage
  - ✓If air leakage has occurred investigate for the source and correct. Once corrected, repeat step 18.

**22.0** (After the quarantine period)

- Fully deflate the tire by removing the valve core & the valve stem and the vent plugs to ensure that all air has been removed from the tire.
  - ✓Remove the 3 cap screws from the bolt cover ring and the bolt cover ring itself

**Caution – Check the valve stem and venting port holes by running a piece of stiff wire through them to make sure that the orifices are not plugged with ice particles or other debris.**

**23.0**

- Using a calibrated torque wrench, retorque each wheel-clamping nut to the required value of 310 Nm – 360 Nm. [230 – 265 Ft.-Lbs.] Using the star or crossing pattern check each nut. Tighten as needed. Mark each of the (22) nuts that the torque value has been verified.
  - **Do Not** loosen the nuts when performing the re-torqueing procedure. Apply the torque in the tightening direction only.

**24.0**

- Re-install the Bolt Cover Ring (BCR) onto the outer half with the (3) socket head cap screws .
  - Align the holes in the Bolt Cover Ring with the holes in the outer half. Tighten the cap screws (3) to a torque value of 27 Nm – 34 Nm [20 – 25 Ft.-Lbs.]

# 3.0 ASSEMBLY PROCEDURE

**25.0**

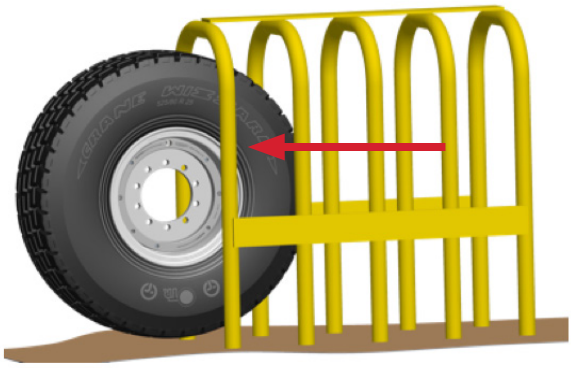
- Re-install the valve stem assembly and the venting port plugs.
  - Tighten these to a torque value of 10 – 14 Nm [95 – 125 In.-Lbs.]

**26.0**

- Inflate the tire in a safety cage as noted in steps 18 & 19 to the recommended tire pressure
  - Place the valve cap onto the valve stem. Hand tighten the cap

**27.0**

- Remove the assembly from the inflation cage. The assembly is ready to place in service



# 4.0 DISASSEMBLY PROCEDURE

**1.0**

Review the entire process before performing any of the work. If you have any questions regarding this procedure STOP immediately and contact the manufacture or their representative to answer your questions.

**2.0**

Verify that you have the correct tools and material handling aides and that they are available to assembly the tire and wheel.

**If you have any concerns or questions regarding the procedure STOP! Do not continue the disassembly process. Contact the manufacture or their representative to resolve any concerns or questions.**

- **NEVER** use a steel hammer to seat rim components — Use only rubber, plastic or brass-tipped mallets.
  - ✓Striking a rim/wheel assembly with a hard-faced hammer can damage the components and endanger the servic ing personnel.
  - ✓Use a steel duck bill hammer only as a wedge to unseat the beads of tube-type tires.

- **NEVER** strike the tire/wheel assembly with a steel duck bill hammer to unseat the beads
  - ✓Do not strike the head of the duck bill hammer with another hard-faced hammer
  - ✓Use a rubber mallet or plastic dead blow hammer.
  - ✓Slide impact tools and hydraulic bead unseating tools can also be used to unseat beads on tube- type tires.

- **ALWAYS** completely deflate the tire assembly before attempting to demount the tire and wheel assembly. Remove the valve core and venting port plugs. Insert a heavy wire down the valve stem and venting port plug holes to ensure complete deflation

- **NEVER** demount a tire from a rim unless you are sure it is completely deflated.

**3.0**

- Remove the tire and wheel assembly from the vehicle hub following the manufactures recommended procedures

**4.0**

- Remove the valve core from the valve stem and both venting port plugs from the wheel to vent all of the air pressure from the tire.

- **Verify** that all of the air pressure has been completely removed **before** removing any of the wheel clamping nuts.

  ✓Check the valve stem and venting port holes by running a piece of wire through them to make sure that is not plugged with ice particles or other debris.

**5.0**

- Place the tire and wheel assembly on a work surface with the outer wheel half facing up. This is to provide access to the fasteners and the BCR.
  - Lifting aids should be used to complete this step.

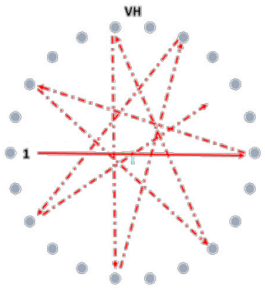
# 4.0 DISASSEMBLY PROCEDURE

**6.0**

- Removed the valve core and valve stem assembly, the venting port plugs, (3) socket head cap screws and the Bolt Cover Ring
  - Verify that the valve core and the venting port plugs have been removed from the wheel.
  - Verify that all of the air pressure has vented from the tire.

**7.0**

- Before the wheel clamping nuts are loosened and removed, the tire bead must be fully un-seated from the outer half of the wheel. This will allow the outer wheel half to be removed without the tire bead holding it back.

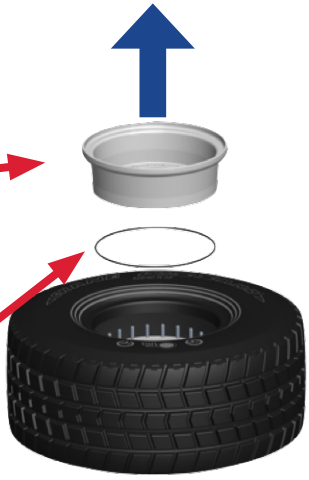



**8.0**

- Using a manual torque wrench or pneumatic torque wrench/ gun, remove each of the nuts (22).
  - A star or crossing pattern should be used to loosen the nuts.
  - The nuts may be re-used if there has been no damage to the nut while in use.

**9.0**

- Once the nuts have been removed the outer half can be lifted off the assembly. A lifting aid may be needed.
  - **Caution - The service personnel should ensure that the wheel-clamping bolt threads are not damaged during this step.**
  - Removed the O-Ring. Discard the O-Ring and replace with a new component.



**10.0**

- Turn tire assembly over to unseat the inner bead from the inner wheel half.
  - The servicing personnel should take precautions to avoid damaging the threads of the wheel clamping bolts
  - Once the tire has been un-seated from the inner wheel half, inner wheel half can be removed

Clean and inspect all of the wheel, tire and fastener components for wear and damage. Discard any component that is damaged or shows signs of wear. Replace with new components