



**Oyu Tolgoi LLC**

## Health, Safety and Environment Management System Procedures

Element 10. Tyre and Rim Procedure  
(C3 Vehicles and Driving Safety Standard)

<b>Tyre and Rim Procedure</b>		
Effective Date: 2012.04.16	Document Number: OT-10-C3-PRC-0004-E	Version: 1.2

**1 PURPOSE**

The purpose of this document is to provide guidance to Operational areas and contractors in tyre and rim management and the management of the safety risks associated with tyres and rims.

**2 SCOPE**

This procedure applies to all tyres and rims of sizes 60cm/24 inches or greater fitted to industrial plant and vehicles used by Employees, Contractors and Visitors at Oyu Tolgoi.

**3 ROLES AND RESPONSIBILITIES**

Role	Responsibilities
Employees, Contractors and Visitors	•
Leaders	•
Control Room	•
Leader Once Removed (LOR) / Manager	•
Department General Managers	•
Fluor HSE Team Leader	•
Emergency Response Team Leader	•
Clinic Team Member / Clinic Interface Specialist	•
Training Department	•
Health / Safety / Security / Environment or Community Managers	•
VP HSS	•
OT President & Chief Executive Officer	•

**4 PROCEDURE**

**4.1 Tyre and Rim Selection**

4.1.1 Technical specifications of tyres and rims shall be recommended by the tyre manufacturer or OEM and be approved by person(s) who have the appropriate technical knowledge.

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**4.1.2** The tyre and rim selection and specification should consider future mine plan, weight studies, heat studies and TKPH analysis or other tyre monitoring systems.

**4.1.3** Tyres purchased must be properly matched to the correct rim size and machine type according to the tyre manufacturers' and OEMs' specifications.

**4.1.4** Requests for a changes to tyre and rim technical specifications shall be:

- Undertaken in conjunction with the OEM,
- Supported by a "Management of Change" request,
- Approved by a person who has the appropriate technical knowledge.
- Sanctioned by the C3 Standards Champion

**4.1.5** The use of alternate tyres purchased outside of the current Rio Tinto contract shall be:

- Supported by a "Management of Change" request, and
- Approved by a person who has the appropriate technical knowledge.

**4.1.6** Tyres not displaying an original manufacturer's serial number shall not be purchased.

## **4.2 Tyre and Rim/Wheel Handling Tools and Equipment**

**4.2.1** Tyre Handlers shall be:

- Capable of handling the largest tyre and rim assembly, required to be worked on by that equipment,
- Capable of manipulating rim/wheels and associated components,
- Fitted with fall-back arrestors. Where these arrestors pivot in and out of position the arms shall pivot forward not backwards,
- Fitted with a load weight indicator or display a load chart within the cab of each tyre handler,
- Fitted with hydraulic load locks to prevent unplanned movement in the event of hydraulic failure,
- Certified annually and certification documents held for reference. Where a forklift is used these inspections shall meet the intent and requirements of ISO5057:19931,
- All tyre handlers should have a maintenance program in place,
- Where forklifts are used with a jig, the forklift must be capable of handling the combined load of the jig and the tyre to be removed,

### **4.2.2 Jigs**

All Jigs used for tyre handling purposes shall be:

- Certified and display SWL on the jig and jig weight,
- Designed to enable compliance to tyre handling standards,
- Fitted with functional fall-back arrestors,
- Designed to secure the tyre to eliminate unplanned movement.

### **4.2.3 Lifting Slings**

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<sup>1</sup> ISO5057:1993 is equivalent to AS4973:2001 Industrial trucks - Inspection and repair of fork arms in service on fork-lift trucks.

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All slings used for tyre handling purposes shall be;

- Of a 4 leg cradle configuration designed for specific tyre size,
- Certified and display SWL on the sling,
- Designed to enable compliance to tyre handling procedures,
- Utilised with a fall-back prevention method.

#### **4.2.4 Tooling**

Operational areas shall consider the following tools for the handling tools and rims:

- Hydraulic bead breaking equipment shall be designed and suited to the rim/wheel configurations used on the site,
- Hydraulic hoses should have protective sheaths fitted at all times and where hoses are found to be damaged they should be discarded,
- Hydraulic tooling should be labelled and periodically tested. A register of tooling and maintenance requirements should also be kept.

#### **4.2.5 Rim Stands**

- Rim stands should be used during tyre assembly.
- Rims stands should securely hold the rim/wheel up off the ground with no potential to fall.
- Rim stands should periodically be visually inspected for weld cracking at stress points.

#### **4.2.6 Tyre Inspection Stands**

- Tyre inspection stands shall be certified to accommodate the largest tyre on site and provide adequate stability to prevent the tyre from falling.
- Tyre stands should be used for tyre inspections and preparation.
- Tyre stands should be placed on a maintenance register and periodically tested.

#### **4.2.7 Remote Inflation System**

A system shall be developed and employed to allow remote inflation of tyres. The system must allow the operator to be removed from the line of fire during the inflation process and include the following

- The operator must be a minimum of 5 metres from the nearest point of the tyre,
- A tap must be provided outside the line of fire to turn the air on and off,
- A dump valve must be provided so the air can be released without entering the line of fire,
- A point to enable the air pressure to be checked outside the line of fire must be provided,
- Gauges fitted inline should only include one unit of measure either KPA or PSI depending on the unit of measure used.

#### **4.2.8 Tyre Press**

- Sites operating a tyre press shall have in place training and competency programs to ensure operators are trained and competent,
- Safe work procedures must be provided for using the tyre press,
- The tyre press should be capable of working with the largest tyre at that worksite
- Tyre press shall have a maintenance program in place,
- Tyre press tooling shall be fit for purpose and easily identifiable for size and application.

#### **4.2.9 Rim/Wheel Handlers**

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Rim/wheel handling equipment should be designed and used in a manner that will not damage the rim/wheel during handling. Methods for handling rims/wheels are currently as follows:

- Rim/wheel lifting bar,
- Rim/wheel lifting adaptor on forklift,
- A section of lock ring attached to the tyre handler to allow the rim/wheel to be lifted in the lock ring groove.

### **4.3 Handling and Storage**

Sites handling and storing OTR tyres and rims shall have processes and procedures in the following areas:

#### **4.3.1 Receipt / Despatch**

- Ensure only properly trained personnel will receive / despatch site OTR tyres, rims/wheels and components.
- Incorporate the following inspection criteria for tyres, rims/wheels and components:
  - Verify that parts match the purchase order and shipping document
  - Check overall parts condition including damage, cleanliness, foreign materials and contaminants
  - Ensure parts are compatible and place into the correct storage areas.
  - Record the serial numbers for all OTR tyres and rims / wheels.
  - Document the storage area and date received / despatched for all OTR tyres.

#### **4.3.2 Loading / Unloading**

- Tyres should be handled in accordance to the manufacturer's recommendations, e.g. do not use the forklift tines to lift the beads.
- Ensure that the tyre handling equipment is capable of handling the weight of the tyre or rim / wheel.
- A corresponding tyre and rim weight chart must be posted in transport loading areas for estimating transport weights. The weight chart is to include:
  - Tyre size with corresponding weight for a tyre only.
  - Rim assembly with corresponding weight.
  - Combined weight of a rim and tyre assembled.

#### **4.3.3 Storage of Tyres and Rims**

OTR tyre and rim storage processes and procedures shall include the following:

- The tyres are stored on level ground, and supported in such a way that the tyres cannot fall or roll.
- If stored horizontally, tyres must not be stacked more than 3m high or 3 times the width. Loader tyres of greater than 45" rim diameter or greater should only be stacked 2 high,
- Bund walls should be considered for tyre storage areas where practical or a risk of tyre rolling away is present,
- Two-piece tyres shall be stored in a manner so as to prevent contaminants getting between the tread and the tyre,
- Bead separators are recommended,

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- Treads shall be stored according to the manufacturer's recommendation,
- OTR multi-piece wheel assemblies using 62cm (24 inch) rims or larger shall be stored at a maximum of 20psi (140kpa),
- Ensure rims and rim components are stored so that different sizes or styles are not mixed during assembly,
- Ensure rims and rim components are stored in the correct storage area and identified.

#### 4.4 Tyre and Rim/Wheel Mount & Dismount

4.4.1 Worksites mounting and dismounting tyres and rims/wheels shall have in place processes and procedures to:

- Demarcate the area for the task as an exclusion zone to prevent unauthorized access or injury to personnel,
- Ensure that the work area is clear of obstructions including extraneous material, equipment and personnel and there is adequate room to manoeuvre the tyre handling equipment,
- Control the risk of potential pinch points during mounting and dismounting,
- Use an inhibitor such as rim life, sealzit or potentially nitrogen inflation to prevent rim corrosion,
- Verify the condition and compatibility of the parts to be assembled, including:
  - Cleaning and inspecting rim/wheel components for cracks, defects and abnormal wear before use or storage,
  - Checking that the rim/wheel is within the crack test schedule period and a crack test will not be required during the expected life of the tyre,
  - Inspecting the tyre for any defects or abnormalities; this includes used and new tyres.
  - Ensuring the tyre does not have any foreign materials such as timber or rags inside the tyre prior to installation,
  - Lubricating prior to fitment with OEM recommended product. Tyres should not be mounted to rims/wheels without bead lubrication,
  - Checking that the lock ring is correct for the rim/wheel being fitted and that fitment is correct according to the OEM specification. If the lock ring does not fit correctly it shall be scrapped,
  - 'O' rings shall only be used once and then destroyed,
  - Any unsafe lock rings, damaged or discarded components shall be destroyed to prevent re-use,
  - Ensuring tyres are at zero pressure before attempting to dismount the tyre from the rim/wheel,
  - During assembly, do not exceed 5psi (35Kpa) until the lock ring has been seated. Once the lock ring has been seated then the wheel assembly can be further inflated until all components are seated. Then deflate to 20psi (140kpa) for storage and fitment,

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- To dismount the tyre from the rim/wheel bead braking equipment shall be used as opposed to the assembly being dropped from height for this to occur.

**4.4.2** For vertical mount/dismount the following items should be detailed in the safe work procedures and employed on each task;

- The restricted work zone & exclusion zone should be established and managed for each task,
- The mount/dismount area must be hard level ground. The preferred option to promote better health & safety is to have an undercover concrete pad designed to carry jacking loads.
- For routine vertical mount/dismount the work area should be demarcated from other active shop working environments and only people engaged in the tyre/rim work should be within the demarcated area
- When vertical mount/dismount is conducted in the general maintenance workshop area, the work area shall be demarcated to restrict access and only people engaged on the tyre/rim work shall be within the demarcated area
- All guidelines associated with mount/dismount should be followed during the vertical mount/dismount process

#### **4.5 Installation and Removal of Rim/Wheel Assemblies**

**4.5.1** Sites operating rubber tyre equipment shall have in place processes and procedures to eliminate injuries when performing tyre installation and removal, including:

- The area for installation and removal of rim/wheel assemblies must be of a hard level ground. Preferred option to promote better health and safety is to have an undercover concrete pad designed to carry the jacking loads.
- For all installation & removal of rim wheel assemblies restricted work zones & exclusion zones shall be established and managed during the task.
- For routine tyre mounting and dismounting, the work area shall be demarcated from other active shop working environments and only people engaged on the tyre/rim work shall be within the demarcated area.
- When tyre and rim assemblies are removed and installed in the general maintenance workshop area, the work area shall be demarcated to restrict access and only people engaged on the tyre/rim work shall be within the demarcated area.
- For inflation of tyres refer to section Inflation & deflation Pressure Maintenance
- For removal of wheel assemblies the minimum safety requirements shall include:
  - Articulated vehicles shall have articulation pins locked in position when isolating.
  - Checking for any damage on all components being removed and mark damaged areas. Any damaged components should be dealt with according to the guideline
  - Deflating damaged tyres to zero pressure (0psi / 0 Kpa)
  - Deflate multi-piece and wheel assemblies to 0psi / 0Kpa or a nominal pressure no greater than 5 psi / 35 Kpa.

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- For dual wheel assemblies the mating assembly shall be deflated to 0psi / 0 Kpa or a nominal pressure no greater than 5 psi / 35 Kpa.
- OTR tyres mounted on one piece wheels should be deflated to 0psi / 0Kpa or a nominal pressure not greater than 5psi / 35 Kpa.
- If the tyre is to be re-inflated (to a maximum of 20psi / 140Kpa) for handling purposes ensure that the lock ring is correctly seated, all retaining devices are removed and that remote inflation is performed. Before re-fitting the assembly the O-Ring shall be replaced and the rim / wheel cleaned and inspected.
- For installation of wheel assemblies the minimum safety requirements shall include:
  - Checking the hub & rim/wheel for damage and cleanliness to mating surfaces prior to installation.
  - Check the wheel studs for serviceability and replace missing, stretched or damaged studs.
  - Using only clean and serviceable components on installation.
  - Check the wheel assembly is at the correct pressure. OTR multi-piece rim and wheel assemblies, using (24 inch) rims or larger, shall only be installed with a maximum inflation pressure of 20psi or 140kpa.
  - Checking tyre size & specification. Tyres of the wrong specification are not to be fitted without Management of Change approval – wrong specification could cause tyre overheating.
  - Matching rear dual tyres for tread depth and/or circumference
  - For tyre inflation refer to section Inflation & Deflation of tyres
  - Apply re-torque procedures after each task.

#### **4.6 Inflation/Deflation of Tyres and Pressure Maintenance**

Worksites operating rubber tyre equipment should have in place pressure maintenance schedules and procedures for the task. Procedures & processes should also be in place for conducting any inflation or deflation of tyres on site.

**4.6.1** Pressure maintenance procedures & schedules should employ the following items as key components;

- Haul trucks, water trucks & large loaders (45” tyres & above) to be pressure checked at minimum weekly
- Ancillary equipment pressure checked at minimum monthly
- Sites should have in place a procedures to ensure cold pressure checks are obtained at every possible opportunity
- A system should be in place to track pressure maintenance and also its compliance to the schedule
- Clear guidelines for inflation pressures and ensure this is communicated to the tyre servicemen
- Guidelines for handling and adjusting hot tyre pressures



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- If an under inflated OTR tyre on an operating vehicle is found to have less than 80% of the specified cold inflation pressure, the tyre should not be inflated but deflated and removed from the rim/wheel for inspection. In a dual assembly the mating tyre should also be removed and inspected for damaged
- If an over inflated tyre on an operating vehicle is 40% or more above the specified cold inflation pressure for the tyre, an investigation into the cause of the heating should be initiated. Once the cause is determined actions should be taken as required. Over inflated tyres should be allowed to cool and if required removed for inspection. Tyres found to be in an over inflated state should not be deflated to compensate for the over inflation
- A process should exist to ensure bias ply tyres have the pressure rechecked 24 hours after original fitment as air can bleed from these tyres during this time causing under inflation.
- Pressure gauges should be checked on a calibrated master gauge prior to conducting pressure maintenance. The master gauge should be calibrated annually
- Pressure maintenance sheets should record both the actual pressure, the adjusted pressure and where possible the internal chamber temperature.
- Pressure maintenance procedures should include a thorough inspection of the tyre, rim/wheel and its components

**4.6.2** For tyre inflation all sites inflating tyres should have in place processes and procedures including the following items as a minimum to avoid injury to personnel;

- Remote inflation should be used for all tyre inflations to remove persons from the line of fire. Personnel should never enter the line of fire whilst the tyre is being inflated, air flow must be stopped before approaching the tyre
- Where the risk of ejection of components is present non-essential persons should be removed from the area. The area should be demarcated to warn and impede persons from entering the potential trajectory zone during the inflation. Consider barriers where required such as the tyre handler or a forklift
- Tyres & rims/wheels should be inspected prior to inflation to verify that they are compatible, not damaged and are correctly assembled
- All tyre inflations should be monitored and completed in one stage, do not leave the area with the tyre still inflating
- Sites should have in place a cold inflation pressure setting for each machine based on manufacturers recommendations, this should be available to all personnel working with tyres or who may inflate tyres
- Only trained and competent persons should conduct tyre inflations
- Tyres should be inflated using the correct inflation tool for the valve assembly

**4.6.3** All sites deflating tyres should have in place processes and procedures including the following items as minimum to avoid injury to personnel

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- All tyres should be deflated with noise muffling devices were possible
- Correct tools should be used for deflation purposes, not just removal of the valve core; for example on super large bore valves a super large bore inflator/deflator should be used in conjunction with an air muffler
- If the valve core or housing is to be released for deflation the valve stem must be secure to avoid it flapping about uncontrollably
- Correct deflation must be confirmed before commencing work on tyre & rim/wheel assemblies

### 4.7 Operations and Maintenance of Tyres

Worksites operating rubber tyre equipment shall have in place processes and procedures to eliminate injuries when performing maintenance of tyres, including:

**4.7.1** A tyre management plan to prevent premature or catastrophic failures, which shall include:

- Input from tyre suppliers and technical experts on the suitability of the product to the application
- A weekly tyre inspection that analyses tyre condition, damage and compliance to the site standard.
- A means of identifying and tracking all OTR tyres from purchase to disposal, including repairs, re-treading, tread depth and tyre life
- A method of determining when the tyre is no longer safe to operate and should be removed (refer to appendix f)
- A requirement for tyre repairs to be carried out by recognised repair organization or personnel, operating to an industry established standard.
- All repaired tyres shall be identified on the tyre by branding using a designated markings scheme that clearly identify the tyre is suitable for a designated fitment position.
- Tyres of unknown repair history shall not be used unless a risk assessment has been approved by a manager and controls have been undertaken.
- A tyre pressure monitoring programme that captures, records adjustments in pressure levels at a minimum weekly interval for all main haul truck and large loading fleet

**4.7.2** An operational control system to ensure the safety of operators, maintainers and equipment, shall include:

- A system that analyses TKPH running levels and intervenes prior to these levels being exceeded. This should include modular mining management systems, a tyre pressure / temperature monitoring device, tyre temperature testing, payload data and truck activity analysis.
- A programme for technical review of operating parameters, including a weight scale study, a heat study and a TKPH study by persons with the appropriate technical knowledge.

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- A detailed tyre awareness program targeted at operators, maintenance personnel and other groups exposed to a tyre environment. The program should cover as a minimum, tyre safety standards and associated hazards, inspection procedures, failure modes, hot tyres and tyre fires, effects on operational condition and expected levels of behaviour. The training should be accompanied by the site tyre handbook and be assessed for understanding.
- 4.7.3** Tyre maintenance programmes shall be developed to manage the risks associated with tyre pressure maintenance:
- If an under-inflated OTR tyre operating on a vehicle has 80% or more than the recommended cold pressure, the tyre may be inflated while the rim / wheel is on the vehicle provided remote inflation equipment is used.
  - If an under inflated operating OTR tyre operating on a vehicle has less than 80% of the recommended cold pressure, the tyre shall not be inflated but the tyre should be deflated and removed from the rim and inspected. The mating tyre and rim assembly should also be removed and inspected for possible damage and elevated temperatures, due to potential overloading.
  - If an over-inflated OTR tyre on an operating vehicle is 40%, or more, above the recommended pressure (cold) for the tyre, an investigation as to the cause shall be made using available equipment including pressure temperature devices.
- 4.7.4** For all machines operating tyre protection chains a chain management program should be in place and include;
- Ensuring the fitted chain is suitable for the application and recommended by the OEM.
  - Ensuring any tyre fitted with a chain is free from damage and is in as new a condition as possible to reduce the risk of tyre failure
  - A chain inspection program exists that identifies damage and chain maintenance requirements
  - A training program for chain maintenance personnel that identifies risks

### 4.8 Operations and Maintenance of Rims/Wheels

Worksites operating rubber tyre equipment shall have in place processes and procedures to eliminate injuries when performing maintenance of rims, including:

- 4.8.1** A rim/wheel component management plan, which shall include:
- Appropriate input from suppliers.
  - Appropriate input from operations and maintenance personnel.
  - A means of identifying and tracking all rims/wheels from purchase to disposal and including repairs
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- Ensure rim/wheel components are fitted only to compatible rims/wheels

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- Rim/wheel and components must be visually inspected by competent person at every tyre change and any components found cracked/excessively worn/sprung shall be disposed or sent to a repair specialist
- Checking rim dimensions are within specifications prior to fitment
  - A non-destructive testing (NDT) programme, using magnetic particle or ultrasonic techniques. The determined testing strategy should be in line with site operating conditions and consider performance and product history. Rims /wheels shall be complete with components when sent for testing. Until a NDT strategy is established, the minimum requirement shall be :
    - 10,000 hours for haul trucks and water trucks
    - 8,000 hours for loaders
    - 25,000 hours for graders and dozers
    - Components shall be grit blasted and inspected by a rim/wheel repair specialist to determine if still fit for purpose
- Rims / wheels without a unique identification number shall be subjected to non-destructive testing prior to fitment where these products are purchased or sourced other than new
- Crack testing shall only to be carried out by accredited companies
- Competent persons to carry out repairs on all rim/wheel and rim components, according to OEM or recognised Standards.
- Rim repair specialist to provide report on rim/wheel and component to certify refitment or scrap
- All rims/wheels determined as scrapped shall be rendered unusable and disposed
- All rims determined as scrapped must be returned to site or formally inspected by a site representative
- Bolted multi-piece 'divided' or 'split' rims (rims where inner and outer sections are assembled back to back and bolted together) shall be fully deflated prior to removing the retaining bolts.
- Under no circumstances shall heat be applied to a tyre and rim assembly (even when the tyre is deflated) because of the potential of an explosion. Heat can only be applied to rims when the tyre has been removed from the rim.

#### 4.9 Tyre Fires and Potential Tyre Explosions

The conditions for a tyre explosion may be initiated by numerous events. The most common of these are vehicles coming in contact with power lines, being struck by lightning, tyre fires, heat applied to rims, brake fires, tyre separations, foreign objects inside the tyre, (for example leaving packing timber inside assembled tyres) and under-inflated tyres.

Worksites should put in place processes and procedures for the prevention of tyre fires including TKPH control systems, product selection, lightning management systems and training in tyre fire understanding and management.

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These initiating events can set off a chemical reaction (pyrolysis) or diffusion of foreign material inside a tyre that causes the sudden increase of internal tyre pressure, which could result in a catastrophic event.

Worksites operating OTR tyres shall have in place processes and procedures managing tyre fires, and potential tyre explosions.

- 4.9.1** Personnel required to manage a suspected or actual tyre fire shall be trained and authorised.
- 4.9.2** In the event of an external tyre fire, except where obvious major structural tyre damage indicates pressure has been released, the tyre shall be treated as a potential for tyre explosion. The equipment shall be removed to the nearest safe location, not the tyre pad, maintenance workshop or crib hut. Once the equipment has been relocated it shall not be moved for 24 hours and follow procedures set out in 4.9.6.
- 4.9.3** In the event a piece of equipment is struck by lightning, the equipment shall not be moved for 24 hours and follow procedures set out in 4.9.6.
- 4.9.4** In the event a piece of equipment comes in contact with a power line, the power line should be de-energized prior to the operator exiting the cab and the operator evacuated. The equipment shall not be moved for 24 hours and follow procedures set out in 4.9.6.
- 4.9.5** Where no fire is present but there exists the potential for explosion, the equipment shall not be moved for 24 hours and follow procedures set out in 4.9.6.
- 4.9.6** Where there is a potential for a tyre explosion, procedures shall eliminate hazards and prevent exposing individuals and equipment to explosion. These procedures shall include:
- Evacuation of the operator and other personnel safely from the immediate vicinity.
  - An exclusion zone of minimum 300 metres (1000 feet) shall be established from the affected area with no unauthorized entry.
  - Specifying the fire fighting equipment that shall enter the area safely. The minimum acceptable equipment is a haul truck based water truck backed into the fire location. The water trucks must not enter the area without direction from a competent person
  - Positioned outside the exclusion zone and all functions should be tested prior to entering this area.
  - Once a piece of equipment is evacuated the operator shall not return until given authorization.
  - Regular inspection and testing of critical fire fighting equipment (water trucks) for proper operation
  - The water truck shall only reverse into a fire fighting position
  - Regular training for water truck operators for fighting tyre fires.
- 4.9.7** At the conclusion of the 24 hour period, a piece of equipment that has been quarantined shall have all suspect tyre/rim assemblies disassembled and inspected by a competent person. In the case of electrical contact (including contact with trailing cables) or lightning strikes, all tyres must be disassembled and inspected by a

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competent person. Front tyres subjected to these conditions must only be reinstalled on the rear positions.

#### **4.10 Storage and Disposal of Scrap Tyres**

Worksites with OTR tyres shall have in place processes and procedures for minimizing environmental issues related to storage and disposal of scrap tyres. Extending the life of a tyre by re-treading or repairing will minimise scrap rates over the long term. Other sustainability options should be considered wherever appropriate technology exists.

The leading practice environmental management for scrap tyres generated by mining activities follows a hierarchy of actions, which are (from most to least preferred):

- Recycling: explore opportunities to recycle scrap tyres on-site and locally through use in impact absorbing surfaces, bitumen and road construction, pastoral and agricultural use, and civil engineering applications.
- Waste-to-Energy: utilize any opportunities to recover the intrinsic energy value through waste-to-energy options.
- Disposal: burial or removal from the site.

Adoption and implementation of this hierarchy reflects the economic cost of handling and transporting large mine tyres and the considerable energy and material resource embedded in the tyres.

- 4.10.1** Methods for disposal of scrap tyres must comply with applicable Environmental Regulations.
- 4.10.2** Tyres stored awaiting disposal or transport for take-back, recycling, or waste-to-energy options should be stockpiled in volumes that are no more than three metres in height and two hundred square meters in any single area. Additional fire precautions should be taken, including removal of grass or other materials that may spontaneously combust from within a 10 metre radius of the scrap tyre storage area. Provide vehicle access to and around the perimeter of the stockpile.
- 4.10.3** Tyres stored vertically shall be positioned so they cannot fall or roll. Tyres should be stored in a manner that prevents water retention and minimizes mosquito-breeding events. Options may include holing sidewalls, covering with tarpaulins, spraying with a non-persistent insecticide, or reducing the stockpile during rain events.

### **5 Training and Competency Assessments**

Worksites shall have a programme to train/familiarize and/or assess all employees who are involved in the maintenance and operational aspects of OTR tyres and rims.

- 5.1.1** Sites shall conduct a training needs analysis to identify personnel and skills required for training in tyres and rims to safely perform their duties.  
Note: Recommended topics for competency training are given in Appendix B.
- 5.1.2** Personnel performing tyre fitting or maintenance work shall be assessed as competent, by a qualified assessor. If under training to perform tyre fitting or maintenance work, personnel must be under the direct supervision of a competent person.

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Note: Recommended topics for competency training are given in Appendix C.

- 5.1.3** Emergency Responders – all personnel responding to tyre and rim related emergencies shall be competent in:
- Basic safety awareness training for tyres and rims,
  - Emergency response requirements for tyres and rim incidents, and
  - Tyre fire procedures.
- 5.1.4** A record of competency shall be kept for each employee and contractor.
- 5.1.5** There shall be a system in place to ensure competencies are current and periodically reviewed.

**6 Audits/Reviews**

- 6.1.1** Sites with OTR tyres shall have in place an audit or review program to check compliance with the tyre guidance notes and Tyre and Rim Safety standards. The reviews / audits will be in the form;
- 6.1.2** Annual Self Audit – A self-audit using the provided audit tool, with the results identifying compliance levels and areas where support or changes are required.
- 6.1.3** Annual Audit with External Auditors – an independent audit that will identify any areas where improvement or change is required.

**7 DEFINITIONS**

**Competent Person** – A person formally assessed as competent to work with tyres including assembly, installation, removal, disassembly and inspection.

**Restricted area** – an area that must not be entered without proper authorization.

**Emergency Responder** – Emergency rescue personnel either trained on site or other emergency response personnel called from off site.

**Exclusion Zones** – A restricted area that prevents access to the tyre change area for those not involved with the task (see appendix E)

**Line of Fire** – A positioning of an individual in an area that increases risk of injury or incident where a release of energy was to occur.

**Maintainer** – Employees or contractors whose job is to provide maintenance on equipment.

**Mine Management** – Includes any persons in a supervisory or management role, including but not limited to operations/ maintenance/technical GMs, mine/ maintenance/technical/planning managers, safety staff, coordinators, planners, supervisors, schedulers, team leaders and foreman.

**NDT** – Non-destructive testing shall mean magnetic particle testing or ultra-sonic testing.

**OEM** – Original Equipment Manufacturer.

**OTR Tyre** – Off the road tyre of 24 inch (65cm) or greater diameter.

**PPE** – Personal Protective Equipment

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**Pressure Maintenance** – Routine check and adjustment of tyre pressures.

**Receiver (Tyre)** – Warehouse person or tyre fitter that actually receives and off-loads tyres and rims from a delivery vehicle.

**Remote Inflation Equipment** – Tyre inflation equipment which is operated outside the trajectory zone of the tyre and rim

**Restricted Work Zone** – a demarcated area that prevents access when the forklift is preparing for tyre fitment, tyre removal or tyre transfer (see appendix E)

**Supplier** – The tyre and rim manufacturer and their distributors.

**Tyre Shop Leader** – Person accountable for tyre and rim activities.

**TMPH/TKPH** – Ton mile or Tonne kilometre per hour. This is the manufacturer’s expression for the working capacity of a tyre and is a function of the maximum internal operating temperature of a tyre. The TMPH/TKPH represents the recommended load and average speed rating of the tyre.

## 8 REFERENCES AND RELATED DOCUMENTS

	<b>Name</b>	<b>Location</b>
<b>Legal and Other Requirements</b>	Rio Tinto C3 Vehicles and Driving Standard	Prospect
<b>Oyu Tolgoi HSE Management System</b>	Rio Tinto Light Vehicle Guideline	OT HSE Portal
	Element 10 – Operational Control	
	OT-10-PRC-0005-E-HSE Standard Notices and Signs Procedure	
	OT-10-C3-PRC-0005-E-Traffic Management Plan	
	OT-10-C3-PRC-0004-E-Tyre and Rims Management Plan	
	OT-10-C3-PRC-0006-E- Licencing Procedure	
	OT-10-C3-PRC-0002-E- Light Vehicle Procedure	
	OT-10-C3-PRC-0003-E- Heavy Vehicle Procedure	
	OT-10-C3-PRC-0001-E- Road Construction and Maintenance Procedure	
	C3 – Vehicles and Driving Guidance Document December 2005	
AM-01 Light Vehicle Procurement Procedure		



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**9 DOCUMENT CONTROL**

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1.0	2012.04.16	Jennifer Sutcliffe	Andrew Miller	First release
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## 10 APPENDIX A - PRINCIPAL RULES WHEN WORKING WITH TYRES & RIMS

### Summary

1. Only trained and authorised personnel are to perform tyre maintenance activities.
2. Never allow persons to enter the 'line of fire' during inflation – use remote inflation tools and processes. A tyre shall not be left unattended during inflation.
3. Never re-inflate a tyre that has less than 80% of operating cold pressure without removing and checking for damage.
4. Never remove the tyre and rim assemblies unless they are at zero pressure or a nominal pressure no greater than 5 psi. For dual assemblies both tyres shall be deflated.
5. Never apply heat sources to a tyre and rim assembly.
6. Never approach a vehicle within 24 hours of a lightning strike, contact with high voltage electricity or a tyre fire.
7. Never allow personnel to approach within a minimum of 300 metres of a tyre fire, except emergency service personnel shielded while fighting the fire.
8. All tyre handling shall be undertaken with the aid of restricted work zones and exclusion zones to remove the risk of personnel being crushed or injured.

### Background

#### 1. Only trained and authorised personnel are to perform tyre maintenance activities.

**Risk:** Inflated tyre and rim assemblies are vessels under pressure with very high energy store.

**Rule:** Tyre and rim assemblies must only be assembled by trained and authorised personnel using only properly matching components assembled according to the approved procedure.

#### 2. Never allow persons to enter the 'line of fire' during inflation – use remote to inflate.

**Risk:** The tyre inflation process has the potential to result in an uncontrolled release of energy through tyre failure or failure of components.

**Rule:** Tyres must only be inflated using remote controlled inflation devices where the person performing the inflation is >5 metres from the nearest point of the tyre. The trajectory area must also be demarcated to prevent persons entering the area during the inflation process.

#### 3. Never re-inflate a tyre that has less than 80% of cold operating pressure without removing and checking for damage.

**Risk:** An under inflated OTR tyre on an operating vehicle that has less than 80% of the recommended pressure may have suffered side wall or crown damage and could fail during inflation presenting high risk to surrounding personnel.

**Rule:** The tyre shall not be inflated but the tyre should be deflated and removed from the rim and inspected. The mating tyre and rim assembly on a dual wheel set up shall be deflated to zero pressure during this process. This tyre should also be inspected for possible damage and elevated temperatures, due to overloading, prior to re-inflation.

#### 4. Never remove the tyre and rim assemblies unless they are at zero pressure or a nominal pressure no greater than 5 psi. For dual assemblies both tyres shall be deflated.

**Risk:** The deflation requirements will prevent incidents, for example those resulting from removing the cleats of an inflated demountable tyre and rim assembly. This may cause the rim components to disassemble with explosive force if the rim gutter section fails due to damage (See appendix D). Two piece bolted split rims will also be subject to the same risk if not completely deflated prior to removing the retaining bolts.

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**Rule:** All OTR tyres on multi piece rims must be deflated to zero pressure or a pressure no greater than 5 psi before studs are loosened for wheel removal.

**5. Never apply heat sources to a tyre and rim assembly.**

**Risk:** External heat applied to an assembled tyre and rim can result in a tyre explosion.

**Rule:** External heat must never be applied to an assembled tyre and rim. Always remove the tyre before welding on the rim.

**6. Never approach a vehicle within 24 hours of a lightning strike, contact with high voltage electricity or a tyre fire.**

**Risk:** If a rubber tyre vehicle is struck by lightning or makes contact with a high voltage electrical source, pyrolysis can be initiated in the tyre/s on the vehicle which results in significant build up in internal pressure which could result in the tyre/s exploding.

**Rule:** After a rubber tyre vehicle is struck by lightning or makes contact with a high voltage source, the operator must be evacuated from the vehicle and the vehicle parked in a demarcated area for at least 24 hours.

**7. Never allow personnel to approach within a minimum of 300 metres of a tyre fire, except emergency service personnel shielded while fighting the fire.**

**Risk:** Many tyre fires have the potential to result in an explosion.

**Rule:** In the event of a tyre fire, except where obvious major structural damage to the tyre has occurred releasing the tyre pressure, the area must be demarcated for a radius of a minimum of 300 metres) around the vehicle to prevent unauthorised entry. Only trained tyre fire fighting personnel are to be permitted to enter the demarcated area for purposes of fire fighting with equipment which provides maximum protection to the fire fighters. Tyre fires should never be attempted to be extinguished by hand held fire extinguishers or devices.

**11 APPENDIX B – BASIC TYRE AWARENESS**

Tyre safety awareness training should be given to mine management, mine planning staff, procurement staff and store receivers, the training shall cover:

- 1.1 Basic tyre and rim knowledge including compounds, sizes, and nomenclature.
- 1.2 Statutory requirements related to tyre and rim maintenance.
- 1.3 Hazards associated with tyres and rims.
  - Crushing
  - Sudden ejection of parts
  - Explosions
  - Tyre fire
  - Lightning
  - Tyre failure in a critical situation
  - Storage.
  - Use of tools and equipment
- 1.4 What to look for in a tyre inspection.
- 1.5 Effect of operational conditions including road and mine plan design.
  - Key TMPH issues: Overload issues, haul distances, truck productivity
  - Road design and maintenance
  - Emergency parking
- 1.6 Emergency response requirements for tyres and rim incidents.
- 1.7 Inspection and identification of tyre and rim components as related to storage and handling.

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- 1.8 Receipt, acceptance and component identification guidelines.
- 1.9 For operators of rubber tyre equipment:
  - Effect of operational conditions including road and pit conditions and the impact on tyre and rim performance including life,
  - Tyre inspection procedures (truck shut down procedure),
  - Field pressure and temperature check procedure.

**12 APPENDIX C – MINIMUM COMPETENCY LEVELS & TRAINING FOR TYRE SERVICEMAN**

Minimum requirements should include a competency based training program including assessments that covers the areas set out in the MNC04 Coal training Package, sections MNCG1031A, MNCG1032A or equivalents that are relevant to the work scope, these documents can be sourced through the Rio Tinto Tyre Forum or from T&I Tyre personnel. Training shall also be aligned with the Rio Tinto Tyre & Rim Safety Standard to ensure all requirements within that standard are addressed. Training & competency requirements shall be assessed through a training needs analysis.

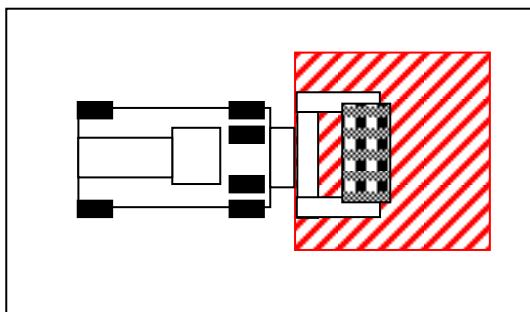
Additional minimum training & competency levels shall be required in the following areas;

- 1.1 Storage and handling of tyres and rims/wheels
- 1.2 Inflation and deflation of tyres
- 1.3 Operation of tyre handling equipment
- 1.4 Operation & inspection of hydraulic tooling
- 1.5 Record keeping
- 1.6 Pressure Maintenance
- 1.7 Emergency response Procedure - identify, respond & inspect tyres suspected of fire or over heating
- 1.8 Tyre end of life criteria and disposal
- 1.9 Responding and diagnosing potential tyre failures
- 1.10 Maintenance and management of tyre protection chains

**13 APPENDIX D – RESTRICTED WORK ZONE (RWZ) & EXCLUSION ZONE DETAIL**

The RWZ is identified as any of the following;

- the area between or under the grabs of the forklift tyre handler whilst tyre handling is in progress
- the area between the tyre and the equipment involved in the tyre change
- the forklift tyre handler travel path
- the fall zone of the tyre from the tyre grabs in any situation
- is demarcated by hard barriers



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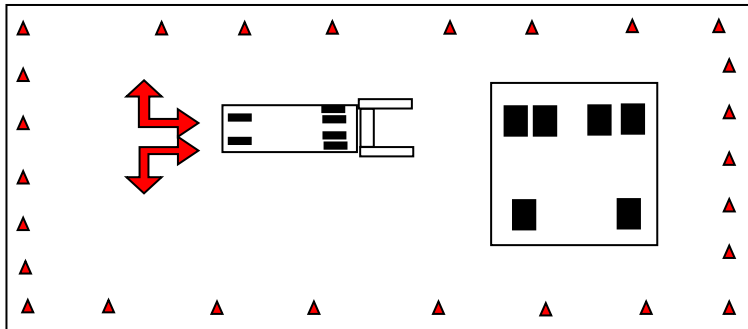
*Diagram 1: The area outlining as the RWZ and the no entry cones*

**For entry into the RWZ the following items should be in place and managed**

- the tyre assembly is secured by the grabs, OR the tyre is held in place by the grabs, AND
- the tyre is positioned on the hub OR lying flat on the ground, AND
- the forklift tyre handler park brake has been applied, AND
- the forklift tyre handler operator has exited the cab & closed the door, AND
- placed a “Do Not Operate” sign showing the names of the operator and serviceman and date has been attached to the door (magnetic), AND
- the forklift tyre handler tyres have been chocked with approved chocks

**The exclusion zone is identified as any of the following;**

The exclusion zone is identified as the area in which the tyre maintenance work is to be carried out. The area should be large enough to encompass the direct work area and the travel path of the tyre handler whilst conducting tyre removal or fitment. The exclusion zone maintained throughout the task and should be indicated by signage and a barrier (red & white hazard tape or chain). Once erected this area should only be accessed by the tyre servicemen. Permission must be granted by the tyre serviceman for others to enter this area.



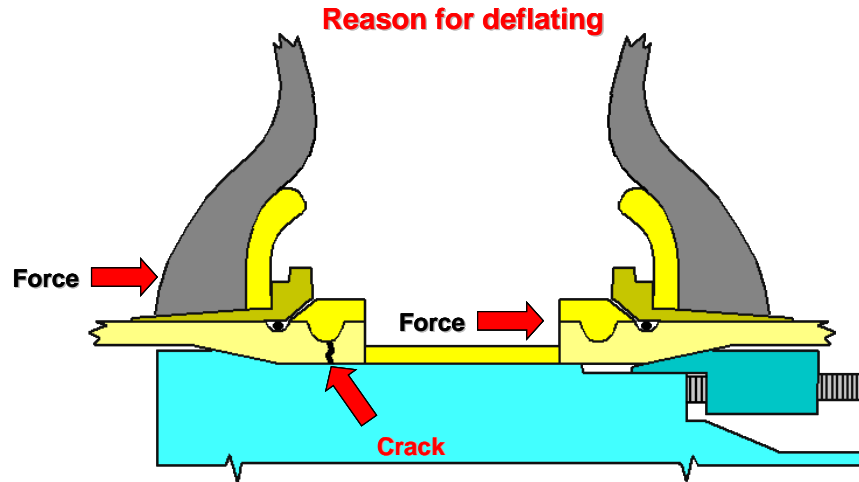
*Diagram 2: The area outlining as the exclusion zone and the no entry cones.*

**14 APPENDIX E – BACKGROUND REQUIREMENTS FOR RIM SEPARATIONS**

- A crack can develop on the inner rim in the position shown. The groove for the ‘lock ring’ is one of the high stress points of a rim and is subject to cracking over time.
- This crack on the inner wheel of a dual is difficult to detect because it is not visible and the tyre does not deflate to indicate a problem.

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If this condition exists and the inner tyre remains at full pressure then the wheel being removed can be unexpectedly blown off as shown below.



- Therefore always deflate both duals to zero pressure or a nominal pressure no greater than 5 psi prior to removal.

