VUL-SWP-072a-011-Inspections, Maintenance & Records

STANDARD WORK PROCEDURE (SWP)	
Description	*Inspections, Maintenance & Records*
Site	*Vulcan Mine*
Department	*Maintenance – Tyres*
Purpose	*The purpose of this SWP is to provide a documented way of working to achieve an acceptable level of risk. The steps outlined pertain to the titled task only. All other SHMS requirements such as SOPs must be followed e.g.: VUL-SOP-065-PPE, VUL-SOP-089-Dust etc.*

1. Inspections

Effective tyre inspections are critical to the ongoing safe operation of tyred equipment at the mine.

Tyres and Rims must be periodically examined for defects that could cause failure.

A visual inspection of both the tyres and rims will be included in routine plant maintenance - usually at 250 hour intervals.

Wear and damage are triggers for removal.

2. Tyre Inspections

Inspection of tyres is the first step in tyre maintenance. Documented frequency of inspections and recording and analysis of the results will assist in purchase of replacement tyres or confirm the choice of tyre in the application at the mine.

Tyre condition monitoring includes:

- Equipment operators visually inspecting tyres and rims during Prestart vehicle inspection process each shift
- examination for separation, delamination, and cuts
- routine tread wear measurements
- thorough external and internal inspection by tyre technicians at each tyre change.

Visual inspections carried out by operators and maintenance personnel may include:

- tyre inflation
- tyre leaks
- tyre wear
- cuts to side walls and tread area
- bulges or deformation
- stones or items imbedded in the tread
- exposed wire or carcass materials
- signs or smell of a hot tyre
- damaged/misplaced wheel or rim or components
- loose wheel or rim retaining bolts/nuts
- rocks caught between dual wheels; and
- damaged or bent rock ejectors.

Items considered to be unsafe or present a risk of machinery damage shall be reported to the supervisor.

Effective tyre inspection includes inspections of the tyre environment which involves looking for tyre damaging conditions in the loading area, roads, dump, and stockpile areas. The people conducting inspections should include area supervisors and operators of the vehicles working in those areas. Area inspections should also include examination of the tyre handler, crane, water truck and service vehicle operating areas.

All inspection records are to be documented and saved in the Tyre and Rim Register against each asset.

Mobile Plant Operators

All mobile plant operators are required to undertake prestart inspections on all plant and equipment prior to commencement of work in accordance with ***VUL-SOP-076-Using Mobile Plant***.
As a minimum, all tyres are to be checked for damage at shift commencement or where a change in the tyre's performance during shift operation is identified:

- Tread wear, cuts, separation, and cord exposure
- Side wall cuts
- Bubbles
- Valve damage; and
- Bead damage

All operators are required to undertake checks on wheel assembly components at shift commencement for any irregularities. For example:

- Wheel nuts / studs / clamps for security
- Lock rings and flanges are secure
- Gutter sections for signs of cracks / deformation; and
- Rim bases for signs of cracks

Where damage is identified, the operator shall notify the workshop Supervisor and document issues in the Prestart book. The vehicle / plant must not be taken to the tyre bay until the defect has been inspected by a competent and authorised person.

Competent Persons

Tyre inspections will be conducted by competent persons at every instance of the following:

- Prior to a tyre assembly being mounted
- Demounting a tyre assembly
- Where a tyre has been deemed as hazardous.

Tyre inspections involve an examination for damage, abnormalities, or foreign material in the interior of the tyre and the bead areas.
Rim inspections shall be undertaken by competent persons, e.g., Tyre Fitter, at every instance where the wheel assembly has been dismounted.
The competent person shall ensure all rim components are inspected for damage or abnormalities, including:

- Flanges
- Bead seat bands
- Lock rings, using profile gauge
- Lock ring groove, using profile gauge
- O-ring groove, using profile gauge
- All welds
- Cleats

Any damaged or deformed rim components shall be removed from service and destroyed.

The fitting or changeout of rims shall be recorded using ***FX Tyre Wheel Assembly Verification Form***.

Workshop Inspections

All equipment brought into the workshop for tyre work shall be washed prior to the commencement of work.

Where in-pit heavy equipment cannot be washed down, a JSA must be completed which includes a thorough inspection being completed to identify any material hang-up or other hazards where personnel may be located in close proximity, and identified suitable controls must be implemented to protect the worker.

All work shall be undertaken by competent and authorised personnel.

All workshop inspections are to be documented and saved in the Tyre and Rim Register against each asset.

Tyre, Wheel & Rim Support equipment checks and Inspections

Support equipment for tyre and rim management includes the following items:

- Forklifts
- Tyre handling equipment
- Jacks
- Stands
- Hand Tools
- Tyre inflator

Tyre specific support equipment shall be subject to planned inspections and servicing in accordance with the following schedule:

Equipment	Scheduled check or inspection
All equipment and tools	Pre-start check before each use
Pressure Gauge	Check before use against the master calibration gauge
Master calibration gauge	Calibrated or replaced each yearly
Torque wrenches	Checked by the user prior to each use

In the case a tyre inflator is tested in accordance with the above table and displays a variance of +/-2 PSI, against the Master calibration gauge, the tyre inflator will be tagged out and removed from service.

Tyre, Wheel & Rim Support equipment checks and Inspections are to be documented and saved in the Tyre and Rim Register against each asset.

3. Internal Tyre Components

After the tyre has been demounted, the inner surface of the tyre shall be inspected by a competent and authorised person.
Any damage identified shall be clearly marked and assessed by the OEM / tyre manufacturer representative or the tyre specialist to determine if the tyre is to be repaired or scrapped.

4. Deflated Tyre

Greater than 24”

The tyre, wheel or rim assembly shall be inspected in order to assess the reason for deflation and extent of damage. The inspection shall include, but not be restricted to, the following areas:

- The tyre, particularly in the area of the tread, sidewall and bead or rim line
- The rim, particularly in the area of the rim base, the gutter and lock-ring
- The valve, particularly the valve assembly, valve core, associated hoses, and couplings; and
- The other tyre in a dual assembly if fitted.

Further inspection to determine or confirm the cause of deflation and extent shall be made after the tyre and rim or wheel assembly has been removed from the machine.
A tyre which has been run flat or in a severely under-inflated condition shall not be fitted or inflated until the integrity of the tyre has been established. Where the tyre is part of a dual assembly then both tyres shall not be inflated until the integrity of the tyre and rim, or wheel assembly has been established.

Less than 24”

Where a tyre is identified as flat or partially deflated, the operator shall report the defect to the Maintenance Workshop Supervisor.
In all cases of a wheel assembly being changed, the operator of the vehicle will transport the vehicle to the workshop to be inspected by a competent person.

5. Tyre Pressure

Inflation pressure is vital to safe use of tyres. Pressure in a tyre is critical to its load carrying capacity and fatigue life Under or over inflation may lead to tyre failures and / or unsafe tyre or vehicle performance.

Pressures shall be maintained at the tyre manufacturer's recommended cold inflation pressure.

Inflation pressures not within the inflation pressure envelope for the tyre are to be adjusted as required. The correct pressure of a tyre is always taken 'cold'. The hot pressure must be confirmed as over inflated (greater than a normal hot pressure would be before pressure bleeding. Pressure bleeding can result in an under inflated tyre once the tyre cools. For accessibility the inner dual tyre shall have extended inner valve stems.
Tyres on plant observed operating with pressures that are greater than 80% and less than 100% of the recommended cold inflation pressure shall be adjusted to the recommended cold inflation pressure.

Tyres on plant observed operating with pressures 130% or greater of the recommended cold inflation pressure, shall be treated as a hot tyre in accordance with site procedures.

A tyre on plant that has been observed operating with a pressure that is less than 80% of the specified cold pressure shall be deflated and removed from service. The tyre, wheel and rim assembly shall be dismantled and inspected prior to reassembly.

Tyres subjected to a controlled deflation to zero psi can be re-inflated once the locking ring has been inspected.

- A tyre 30% over its cold inflation pressure will be treated as a suspected hot tyre and immediately isolated.
- Heavy Earth Moving tyres that have operated at less than 80% of cold inflation pressure must be taken out of service as soon as practical and inspected and assessed by a competent person. An internal inspection may also be required.
- Heavy Earth Moving tyres that have operated at less than 70% of cold inflation pressure must be taken out of service immediately. Tyres shall be removed and checked internally. The adjacent
- dual tyre should also be removed and inspected as it could have been overloaded and may have suffered structural fatigue or other damage.
- If a tyre is above normal hot tyre pressure, but below 20% over cold inflation pressure, the vehicle operation will be modified until tyre pressure and temperature have reduced to acceptable levels (e.g., redirected to slower or shorter cycle or lower payload).
- An inspection of both duals after an under-inflation event is required - check by inflating to 120% of cold inflation pressure after completion of a JHA.
- Pressure bleeding of a hot tyre can result in an under inflated tyre once it cools.

Scheduled Pressure – Routine Maintenance

The maintenance personnel shall inspect tyres during the scheduled service inspections. The tyre inspection shall include:

- tyre inflation pressures;
- tyre tread depths; and
- tyre condition.

Tyres pressures on Heavy Plant will be checked weekly as a minimum. More frequent monitoring will be undertaken when necessary.

Vulcan Mine schedule for tyre pressure readings on working plant requires:

- diameter of 24 inches and above checked at intervals no greater than seven days.
- diameter less than 24 inches checked when scheduled services are performed, and more frequently if required.
- Tyre pressures will be adjusted if, at time of inspection, the hot pressure is less than 20% above or below the cold inflation pressure.
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Pressures are to be recorded and monitored for trends that could indicate a rim crack.

The condition and depth of the tread will be included in the inspection and tyre condition must be recorded in the Tyre and Rim Register against the asset.

6. Tyre Master Gauge

A tyre master gauge system shall be available and maintained on site.

The tyre master gauge shall be recalibrated annually, and records kept. The date of the last recalibration shall be displayed on the tyre master gauge.

Field tyre pressure gauges should consist of a digital or analogue, preferably liquid filled, gauge with a length of hose that has an in-line filter.

Pencil type tyre pressure gauges shall not be used.

Prior to performing tyre pressure checks in the field, the field tyre pressure gauge should be checked for accuracy against the tyre master gauge. Field tyre pressure gauges found to be inaccurate (beyond +/- 2psi/13kPa) shall be recalibrated or disposed of.

Wheels

As with tyres, the first level of wheel and rim maintenance is inspection. Wheels should be examined for damage to the wheel stud holes, cracking of wheel spokes, corrosion, and damage.
Visual inspection by operators can identify initial defects, whilst maintenance schedules and tyre changes can highlight cracks, areas of wear, corrosion, and fretting.

Faults should be recorded in accordance with VUL-SOP-098-Reporting and Rectifying Defects and may require the wheel or rim to undergo further inspection, possibly non-destructive testing (NDT) to establish the competence of the wheel or rim.

7. Non-Destructive Testing (NDT)

Multi-piece rims and their components will be NDT examined at an interval of not more than 10,000 operating hours.
If 10,000 operating hours does not occur within 18 months of the last inspection, a close, careful visual inspection shall be carried out - NOT will still be required when 10,000 hours are accumulated.

Records of all these inspections and repairs shall be examined by the Maintenance/Asset Manager or delegate and filed with the Tyre and Rim Register.

The frequency of NDT may require adjusting depending on results of previous testing and component deterioration.
Passenger and light truck wheels and rims will not have NDT performed on them. These are considered consumable items and discarded if cracked, corroded, or worn beyond continued use.

8. Records

The Vulcan Mine 'Tyre and Rim Register' shall include the following information at a minimum for each asset:

- Tyre/wheel/rim details (e.g., TKPH)
- Pressure checks, manual and remote (TPMS, TTPMS)
- Tread history, damage, position, rotation history, hours (including uploading evidence – Tyre Change Record document)
- Audit and validation of TPMS (reliability and accuracy)
- Tyre tread wear
- Tyre condition (by exception)
- Inspection and calibration information for specialised tooling such as: Jacks, torque tools, stands, master gauges, and support equipment (i.e.) tyre manipulator, forklifts, HIABs, compressor(s), tyre bay work platforms, airlines, tyre service truck, Ute etc.
- Maintenance records including repair history
- Records of work performed
- Tyre, wheel, and rim work performed
- 'Checked by' information
- NDT tests, rim test methods and results;
- Records of the wheel assemblies being visually inspected.

The ***VUL-SOP-072a-R1-Tyre and Rim Register*** shall be updated, and maintenance requirements reviewed at least monthly.

9. Tyre and Rim Register

The ***VUL-SOP-072a-R1-Tyre and Rim Register*** shall be managed and maintained by the Asset Manager