



Procedure

Material Preservation Management & Storage Procedure

Asset Management & Procurement and Logistics

2 March 2021

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1. DOCUMENTATION AND RECORDS MANAGEMENT

This Procedure and all supporting documents will be managed as per Fortescue Document Governance Standards.

The following documents must be read in conjunction with this procedure:

Table 1: Policy, Standard, Procedures, Work Instructions, Forms (Templates)

Document ID	Title of Document
100-ST-DC-0002	Document Governance Standard
45-ST-LG-0002	Warehouse Standards
100-ST-CP-0005	Packing, Marking and Documentation Standard
100-MA-SA-0004	Health and Safety Management System
100-SP-ST-0004	Standard Engineering Specification, Protective Coating Systems - Painting
45-ST-LG-0001	Inventory Management Governance Standard
CO-00082-GU-EG-0001	Transport Frame Management Guideline
100-ST-EG-0006	Transport Frames and Workboxes Specification
100-PR-OP-0017	Rotable Repair Procedure
100-ST-EG-0005	Asset and Inventory Criticality Standard
100-ST-RK-0014	Standard 4 - Risk Assessment Criteria
100-PR-PC-1016	Disposal Management
TBA	Materials and Inventory Procedure
45-13016-WI-EL-0001	Electric Motors and Power Transformers Long Term Storage Procedure
100-SW-EG-0027	Electric Motors Refurbishment
530P-00000-SP-PC-0001	Principal Specification – Packing, Marking & shipping
100-SP-ME-0005	Standard Engineering Specification: Conveyor and Shuttle Drives
100-SW-EG-0026	Engineering Scope of Works - Gearbox Refurbishment
100-PR-OP-0016	Asset Warranty Management Process

2. PURPOSE

The procedure outlines the specific storage and preservation requirements of equipment / spares, as identified through the OEM and/ or Owner, to ensure that:

- They are packaged, stored, and maintained to protect against mechanical and electrical deterioration due to environmental and transport conditions.
- They are regularly inspected and preserved during storage to assure the availability for installation as well as the expected reliable performance once installed to maximise life of assets
- Preservation and inspection activities are planned, scheduled, and tracked in FMG ERP system.

3. DEFINITIONS

Table 2: Definitions

Word/Term	Definition
OEM	Original Equipment Manufacturer
Vendor	Company who provide material, parts, or services (Not always the OEM)
BER	Beyond Economical Repair (Refer Rotables Repair Procedure for full definition)
Material Criticality	Level of impact and importance of an item to the business, based on potential loss of output, safety, or environmental factors
FIFO	“First In First Out” stock rotation is an accounting and inventory management methodology to arrange the oldest materials in inventory so they are consumed before the newer purchased materials.

Insurance Spare	<p>Insurance spares are spare parts that you hold in your spare parts inventory that you would not expect to use in the normal life of plant and equipment but if not available when needed would result in significant losses. Source Wikipedia</p> <p>A typical insurance spare would be a replacement transformer because a rebuild of a failed one could take up to 6 months and therefore an insurer might request you hold a complete spare, rather than spare parts alone.</p>
Capital Spare	<p>Capital spares are spare parts which, although acknowledged to have a long life or a small chance of failure, would cause a long shutdown of equipment because it would take a long time to get a replacement for them. Source Wikipedia</p> <p>A capital spare is typically a high cost insurance spare purchased with capital funding.</p>
ERP	Enterprise Resource Planning – Planning and data management program (Currently SAP/ S4Hana)
Spare	Replaceable component/ sub assembly, identical and interchangeable to the original component
Storage (Minor) Preservation	Preservation activities required to prevent degradation and does not take special knowledge or input from a SME to carry out. i.e. applying Denso Tape, CI Sprays, Re-wrap, etc.
Technical (Major) Preservation	Preservation activities required to prevent degradation and requiring specialist knowledge or input from a SME to carry out. i.e., injection of preservation gas, shaft rotation, changeout of components, etc.
Compliance Audit	A comprehensive review of an organisation’s adherence to policy, standards, and procedure.
HPGR	High Pressure Grinding Roll

SME	Subject Matter Expert
SMF	Sealed Maintenance Free
Storage Profile	The storage profile is where a material will be stored dependent on specific criteria. e.g. sensitive to hot temperatures then the storage profile will be a cool room.
VCI	Volatile Corrosion Inhibitors
VSI	Vapour Space Inhibitor
Short Term Storage	Storage up to 3 months
Long Term Storage	Storage beyond 3 months

4. ROLES AND RESPONSIBILITY

Table 3: Roles & Responsibility

Role	Accountable to	Responsibilities
Principal – Reliability Engineering	Manager - Asset Management & Reliability	<ul style="list-style-type: none"> Responsible for the governance of the Material Preservation and Storage Procedure Provide a central focus for expert knowledge, collaboration, and industry best practices. Assist mine sites in the development of inspection schedules and preventative maintenance.

		<ul style="list-style-type: none"> • Ensure warehouse storage compliance audits are carried out in conjunction with W&L Manager and non-conformances addressed. • Chair periodic meetings with stakeholders to review adequacy and compliance of this procedure and identify areas for improvement.
Manager - Asset Management & Reliability	GM Asset Management and Reliability	<ul style="list-style-type: none"> • Accountable for providing structure for the PM02 Work Order structure for preservation • Accountable for Work Instruction structure for preservation. • Accountable for technical support of the preservation program • Aid in budgeting and strategy for preservation
GM Asset Management and Reliability	Director of Operations	<ul style="list-style-type: none"> • Accountable for Asset and spare inventory criticality allocation. • Joint owner of Material Preservation and Storage Procedure
GM Procurement & Logistics	Chief Financial Officer	<ul style="list-style-type: none"> • Accountable for spare inventory criticality allocation and maintenance in ERP system. • Joint owner of Material Preservation and Storage Procedure
Site General Manager	Director of Operations	<ul style="list-style-type: none"> • Support the implementation and management of the warehouse storage procedure on site. • Accountable for setting up framework to support this procedure.

		<ul style="list-style-type: none"> Accountable for Asset and spare inventory criticality allocation. Ensure warehouse storage compliance audits are carried out and non-conformances addressed.
Reliability Superintendent	Plant Manager	<ul style="list-style-type: none"> Carry out criticality assessment of spares in accordance with Asset and Inventory Criticality Standard: 100-ST-EG-0005. Accountable for identifying critical and insurance spares. Inspect and report in accordance with this Standard and accompanying procedures and work instructions. Accountable for preventative maintenance in accordance with site schedules, procedure, and quality requirements.
Maintenance Superintendent	Plant Manager	<ul style="list-style-type: none"> Ensure that maintenance personnel have relevant competency and training to carry out inspection and preventative maintenance.
Materials Management Manager	GM Procurement & Logistics	<ul style="list-style-type: none"> Responsible for correct master data and allocation of criticality of spares in ERP system. Manage catalogued materials in accordance with the Inventory Management Governance Standard.
Warehouse & Logistic Manager	GM Procurement & Logistics	<ul style="list-style-type: none"> Accountable for preservation budget

		<ul style="list-style-type: none"> • Accountable for auditing, access, and availability of storage (minor) preservation consumables or kits. • Accountable for the audit/ gap analysis of materials not preserved as per the preservation standard and action plan across warehouses • Accountable for warehouse inductions of resources providing preservation activities
Warehouse Superintendent	Warehouse & Logistic Manager	<ul style="list-style-type: none"> • Accountable for ensuring spares are accessible for preventative maintenance. • Owner and champion of inspection and minor maintenance of spares in storage. • Accountable for production of periodic performance reports. • Accountable for rotatable spare management in storage and logistics. • Accountable for storage of spares in accordance with this standard. • Accountable for receipt and delivery of spares. • Ensure audit, inspection and corrective works are carried out in accordance with site schedules, procedure, and quality requirements, • Accountable for <ul style="list-style-type: none"> ○ Adhering to storage, identification, and rotation practice in accordance with the requirement specified in this standard.

		<ul style="list-style-type: none"> ○ Maintaining (minor maintenance) spares including critical & insurance spares while in storage.
Offsite Repairs Manager	Manager - Asset Management & Reliability	<ul style="list-style-type: none"> ● Accountable for vendor preservation activities through the rotables process if on-site preservation is not possible or as per advice from OEM
Preservation Coordinator	Warehouse & Logistic Manager	<ul style="list-style-type: none"> ● Responsible for the admin of the Preservation Procedure ● Coordinate with the vendor to perform preservation activities through the rotables process if on-site preservation is not possible or as per advice from OEM ● Responsible for the action of preservation and inspection PM02 Work Orders

Table 4: Australian Standards & Regulation

Site Data Sheet	Title of Document
AS 1940	The storage and handling of flammable and combustible liquids standard
AS 2676.1	Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings - Vented cells
AS 2676.2	Guide to the installation, maintenance, testing and replacement of secondary batteries in buildings - Sealed cells

AS 3011.1	Electrical installations - Secondary batteries installed in buildings - Vented cells
AS 3011.2	Electrical installations - Secondary batteries installed in buildings - Sealed cells
AS 3780-2008	The Storage and Handling of Corrosive Substance
AS/NZS 4804:2001	Occupational Health and Safety Management System
AS/NZS 4360:2004	Risk Management
AS 1210: 2010	Pressure Vessels Standard
1995	Western Australian Mines Safety and Inspection Regulations

NOTE: If there is any conflict between standards, regulations and this standard then the more stringent will apply.

5. GENERAL STORAGE REQUIREMENTS

The following general storage requirements will apply to all spares/ equipment managed by Warehouses, unless otherwise specified by the Original Equipment Manufacturer (OEM) and/ or Owner.

- Spares / Equipment can be stored indoors in a ventilated, clean, dry area, away from direct sunlight, dust, or corrosive substance, under suitable undercover storage or yard space (awning/domes/ hard stand, etc.) depending on storage profile. All storage areas must be vibration free. Vibration causes grease to be forced out and false brinelling.
- Storage profile is dependent on:
 - Paint specification

- Size for the spare/ equipment
 - Weight of the spare/ equipment
 - Wrapping
 - Packaging (e.g. Transport Fame, Box, Pallet, Cradle, etc)
 - Corrosion Inhibitor
 - Sensitivity to environment (sunlight/ moisture/ dust/ temperature)
- The use of plastics and plastic waste must be considered in deciding the storage profile of materials in line with Fortescue’s environmental responsibility
 - New spares / equipment will be stored and maintained in accordance with the OEM requirements where applicable to ensure warranties are maintained.
 - If manufacturer’s/ Vendor’s recommendation is not available, this procedure will be used as a minimum requirement in conjunction with the packaging standard.
 - Any Liquids or chemicals must be stored as per OEM or business owner instruction
 - An inspection and preventative maintenance program will be initiated and maintained during storage.
 - Temporary (3 months or less) protective covering will allow free air circulation to prevent humidity condensation and collection of water inside the cover.
 - Plastic wrapping will have re-sealable access panels to view condition of the equipment, perform preservation activities and verify data plates. Desiccant pouches (Silica Gel) will be added to the wrapping to stop corrosion caused by moisture.
- (i) **Wrapping:** Drive shaft access and grease point access (photos below as example). These accesses are necessary for inspections during the storage.

NOTE: A durable label with the FMG material number is to be displayed on the external wrap with a waterproof document pouch.



Photo 1: An example of preservation wrap

- All machined surfaces, carbon and low alloy steel will be protected with a corrosion inhibitor to prevent corrosion from moisture.

6. GENERAL INSPECTION & PRESERVATION REQUIREMENTS

Items stored at warehouses will be inspected periodically. The inspection interval of the items depends on the criticality listed in SAP against each item.

Table 5: Inspection Frequency

Criticality of Item	Frequency of Inspection
A	Quarterly and as part of the Stock Take/ Cycle Count Process
B & C	Half Yearly and as part of the Stock Take/ Cycle Count Process
D & E	Annually and as part of the Stock Take/ Cycle Count Process

- When inspection and preservation activities are being completed applicable gloves will be worn. The natural oils in the human body will cause corrosion and affect performance of parts.
- External machine surfaces will be inspected for corrosion. If the corrosion can't be fixed by applying corrosion inhibitor, touch-up paint, wire brush without further damaging the surface, etc then the part/equipment might have to be returned to the OEM or Vendor for refurbishment dependent on the cost of the refurbishment and replacement value.
- The surface protection (Corrosion Inhibitor) must be inspected for deterioration, damage or missing and re-applied.
- Where inspections identified damaged packaging, wrapping or frame then further in-depth check need to be completed for function and corrosion impact to the equipment.
- Where rotation of equipment is required, make sure that internal components are lubricated prior to rotation.

- Desiccant Pouches will be checked every 3 months and replaced if there is a change in colour.
- Painted surfaces do not require additional protection but should be examined periodically for any sign of corrosion. Chips and scuffs can be fixed with touch-up paint, but severe corrosion (paint bubbling/ flaking) will be sent off site for sand blast and re-paint.
- Preventative maintenance frequencies depend on item criticality listed in SAP, storage profile and OEM requirements.
- All warehouses will be flagged as a maintainable site in SAP. Recurring PM02 Work Orders will be raised by Asset Management & Reliability (AMR) to trigger preventative tasks for each material group and frequencies detailed in this document. Where preservation tasks will be completed on warehouse premises then the Preventative Maintenance Program will be managed by the Warehouses.
- Basic inspection and preservation tasks will be performed by Warehouse personnel (e.g. replace desiccant pouches, re-apply Denso Tape or Corrosion Inhibitor spray). Technical preservation will be done by either using internal or external (vendor) SME resources (e.g. replenish vapour space inhibitors).
- Shafts requires rotation during storage to provide surface protection of the internal components, prevent static corrosion and prevents false brinelling.
- Shafts will be turned once every 3 months, wherever possible. Each 90° turn must be marked with a colored dot and dated.
 - Red = Jan to March
 - Blue = April to June
 - Green = July to September
 - Yellow = October to December
- Where rotation of equipment is not possible or unable to reinstate integrity of preservation packaging then warehouse personnel will make necessary arrangement for condition assessment and depending on condition report, OEM or Business Owner advise, send the item offsite for preservation.

- If leaks are observed check if plugs/ caps are tight. If leaks persist then change seals/ O-rings. Where the system is closed, or leaks keep persisting then return to Vendor or OEM for remediation.

7. CORROSION INHIBITOR

The external machine metal surfaces susceptible to corrosion must be protected using:

- Components stored Outdoor with:
 - (i) Shell Ensis, Black Bear Par-Al-Ketone, Houghton Rust Veto 342, Daphne Ever Coat No. 1, Tectyl 506 or equivalent. or
 - (ii) “Denso Densyl Tape” and “Denso PVC SA tape”.
- Components stored Indoor - Valvoline ‘Tectyl’ 502C or equivalent
- The corrosion inhibitor used is normally compatible with service lubricants.

The internal of a compartment will be protected against corrosion by application of vapour space inhibitor such as Shell VSI 8235, Fuchs Anticorit VCI UNI 0-40 or equivalent.

The vapour space inhibitor will be replaced as recommended by OEM or as directed by owner.

8. EQUIPMENT STORAGE & PRESERVATION REQUIREMENTS

The following section outlines the requirement of storage of components and preventative maintenance while in storage.

8.1 Batteries

Batteries are classified as a corrosive substance.

8.1.1 HSE Requirement

Face shields, aprons, and rubber gloves will be provided for handling acids or batteries.

8.1.2 Storage

Batteries should be stored on banded pallets, indoor, in well ventilated dry and cool area. The exposed terminals will be protected with approved caps to prevent short circuiting and electrical injury.

When racks are used for the support of batteries, they will be made of materials non-conductive to spark generation or be coated or covered with a non-conductive material.

Tools and other metallic objects will be kept away from the top of uncovered batteries.

Storage location will be at a safe distance (at least 1.8m) away from any potential ignition source.

8.2 Bearings

8.2.1 Storage

Most rolling element bearings can be stored in their original packages, depending on type of grease, between 2 to 5 years, but the storage facility and mode of storage must be correct. To prevent corrosion, bearings will be preserved and packaged according to the bearing manufacturer's standard. Humidity and temperature should be control as much as possible during storage, handling, and packaging.

Any bearings or equipment with bearings must be stored in areas with minimal or no vibration to prevent false brinelling and grease being shaken out.

Loose bearings must be laid down flat on the storage shelves. The weight of the rings and rolling elements in the standing position may cause the bearing to deform.

Bearings supplied in housings (e.g. pillow blocks, flange units, etc.) should be stored flat on their bases, but the bearing inner rings should be rotated at a frequency based on the material criticality.

Bearings will be stored indoors away from direct sunlight, moisture, dust, and vibration.

Bearing should not be used if it has passed the recommended shelf life as stated in the section 8.2.2 Shelf life of Bearings. A condition assessment of bearings should be made prior to reuse. If the bearing fails after assessment, then it will be disposed or refurbished depending on economic benefit.

8.2.2 Shelf Life

- **Non-sealed, non-lubricated bearings:**

For rolling element bearing where bearing bore (“d”) is more than or equal to 10 mm or the diameter (“D”) is less than or equal to 420mm, the nominal shelf life of the bearing under ideal condition of 20° C and 75% relative humidity is as follows:

- (i) 5 years for bearing in a single package.
- (ii) 2 years for all bearing in bulk rolls or cassette.

Bearings having outside diameter of more than 420mm can generally be stored under the above conditions for ten years.

- **Sealed or Shielded, lubricated for life bearing:**

Bearings filled with greases have a shelf life of 3 years. The shelf life is only applicable to singularly packaged bearing. Industrial packages, bulk rolls and cassette have a shelf life of 2 years.

Long-term storage (over 2 years) of capped (sealed or shielded) bearings is not recommended.

- **Slew Bearing:**

Slew bearings will be stored in vendor’s packaging. The bearings must be stored indoor and placed on a stable floor away from vibration, direct sunlight, and moisture.

Inspection of the bearing should be carried out as per OEM recommendation or as per the criticality listed in SAP.

If the warehouse does not have a proper storage facility; an arrangement can be made to store slew bearing at Vendor’s warehouse.

8.2.3 Preservation

No special maintenance required during the storage life of the bearing except checking the integrity of the packing material of the bearing.

If any packing materials found compromised, then a preservative bag/ shrink wrap with a desiccant pouch will be used to fix the breach. A quarterly inspection of the bearing to be carried out to assess the condition of desiccant and replace as required.

8.3 Blower / Fan Assemblies

8.3.1 Storage

Blowers and fan assemblies will be stored as follows:

- The assembly should be installed on a custom-built transport/ storage frame that ensures easy access to the input/output shaft for rotating purposes, where practical. Where a custom-built frame is not available, the assembly will be strapped to a wooden pallet.
- Internal components will be sealed and protected from the environment. If the unit is stored outdoors, corrosion inhibitors will be used to protect exposed surface, bearings and then covered with wrapping or ventilated cover.
- Shafts will be wrapped with Denso tape or equivalent.

8.3.2 Inspection & Preservation

Inspection to check corrosion should be conducted once every 3 months.

Check integrity of the protective cover and make sure there is no standing water or moisture present inside blower components.

Shafts need to be rotated as per OEM instruction or as a minimum detailed in section 6 of this document.

8.4 Centrifugal Pumps

8.4.1 Storage

Centrifugal pumps will be strapped onto a wooden pallet or engineered transport frame.

Visually inspect the exterior of the mechanical seal for damage if fitted. Do not remove or adjust any parts.

To prevent hardening of gland packing; loosen all glands to release all pressure on the gland packings.

If stored outdoors, protect the pumps from direct sunlight, temperature, humidity, dust, and vibration. Cover the pumps with a UV resistant protective cover that will prevent water entering the pump and allows air circulation.

The suction and discharge flange openings must be covered to prevent moisture entering the pumps while in storage.

8.4.2 Inspection & Preservation

Remove transport clamps from pumps if fitted. Turn each pump shaft at least ten revolutions once every 3 months or as required by OEM.

Purge the labyrinth (if fitted) with grease every six months to prevent dirt and/or moisture, contamination of the bearings.

All external exposed machined surfaces will be coated with a corrosion inhibitor if surface protection is missing or damaged. The condition of the painted surfaces to be checked during every inspection and touched up if required.

8.5 Compressors

8.5.1 Storage

Compressor will be stored in vendor packaging and periodically inspected as per material criticality and storage profile.

Please ensure that the intake and outlet manifold is covered to prevent moisture entering the compressor.

Where a compressor has a reservoir then the drain valve must be left open to ensure water does not pool.

Please follow manufacturer's recommendation for long term storage.

Note: Pressure vessel documents must be kept secure and ideally with the compressors, including test certificates for the pressure vessels and relief valves as per WA Mines Safety & Inspection Regulation 1995.

8.6 Conveyor Belts and Splice Kits

8.6.1 Storage - Conveyor Belts

Conveyor belt must be stored upright in a transport frame in original factory packaging and undercover if possible. If storing conveyor belt undercover is unavoidable, it must be protected with suitable cover/ wrapping from direct sunlight.

Conveyor belt must protected from direct sources of heat such as direct sunlight, boiler or any other sources which can emit heat.

Conveyor belt will be protected from contact with harmful material such as caustic soda, acids, oils, grease, paint, or other chemical solvents.

Conveyor belt must be protected from damage by water, grit, mud etc.

In case of prolonged storage in open air the cut edge at the start and end of the steel cord belt must be protected from moisture by coating the cut edge with cold splicing cement.

No periodic maintenance is required for conveyor belt except for inspecting the integrity of the protective cover.

8.6.2 Storage - Splice Kit

Splice kits will be stored in cool rooms according the manufacturer instructions.

Splice kits have a limited shelf life and inventory must be managed on an oldest batch (Earliest Expiration Date) out first stock rotation system. Batches and Expiration dates will be recorded in SAP through shelf life and batch functionality. Splice kits will not be accepted from the vendor if there is less than 80% available on the shelf life.

The splice kit will be removed from stock and disposed if it has passed its use-by-date, stocking strategy review and re-stocked if required.

8.7 High Pressure Grinding Roll (HPGR)

The HPGR must be transported and stored in a suitable frame. The tension screws will be engaged to prevent false brinelling of the bearings during storage and transport. The unit will be stored away from direct sunlight, in a vibration free and well-ventilated area free from moisture. If indoor storage of HPGR roll is not possible; it will be stored outdoor covered with a suitable UV resistance protective cover.

8.7.1 Storage

Short Term

No maintenance is required if HPGR roll is stored less than 3 months. Inspection of surface protection will be carried out every 3 months

Long Term

After the first 3 months then both shafts will be rotated 3-monthly by 90° starting on the 3rd month. The tension screw must be loosened prior to rotation. The roll can be rotated with the help of a rope placed around the roll and using a hand lever grab winch. The tension screw must be re-applied to lock the bearing once rotation has been completed.

The HPGR can be stored on site or per arrangement with a Vendor.

If HPGR is stored for more than 3 years; the bearing grease must be replenished with new grease. The bearing cavity will be filled with grease as per OEM recommendations.

8.7.2 Inspection & Preservation

The surface of the conical bore must be protected with corrosion inhibitor. The external surface protection will be checked every 3 months and restored if missing or damaged.

8.8 Screen Panels

Screen panels must be protected from direct sunlight, temperature extremes, and mechanical damage. Screen panels should be store under cover to prevent deterioration. The use of screen panels, which are stored under the sun without any cover may fail prematurely after installation.

No preventive maintenance required if screen panels are stored under cover.

8.8.1 Storage

The polyurethane and rubber screen panels and its components should be stored under cover away from direct sunlight.

Small aperture screen panels (less than 2 mm) will be stored under cover to prevent deterioration. Small aperture screen panel exposed to the sun for more than 6 months must be avoided. Panels exposed for more than 6 months must be identified and will not be used.

Any other screen panels, which are exposed to the sun more than six months or undefined time should be identified and be reassessed for use by a SME (OEM/ Process or Reliability Engineer, Vendor).

8.9 Conveyor Pulleys

8.9.1 Storage

It is recommended that conveyor pulleys are stored indoors. If pulleys are stored outside then the pulley, bearing, and other components must be protected from the harsh environment (water, temperature, etc.) by suitable protective cover and/ or wrapping.

Pulleys must be stored and transported in an engineered frame. Pulleys stored with bearing/plumber blocks will not be supported via bearings.

Exposed metals external to the pulley will be protected from the environment. Shafts for coupling or bearing connections will be wrapped with Denso tape or corrosion inhibitor.

Exposed lagging will be protected against direct sunlight.

Coupling components must be secured to the shaft and protected against corrosion.

8.9.2 Inspection & Preservation

For pulleys wrapped with shrink wrap, periodic inspection must be carried out to check the integrity of the wraps. The shrink wrap should be restored if the integrity is compromised.

The condition of the silica gel will be checked every 3 months and replaced if there is a change in colour.

Bearings must be filled with lubricant, purging from the seals.

The shafts should be rotated as per the OEM instruction or every quarter for a minimum of:

- 5.25 full turns for pulleys less than 8t
- 10.25 full turns for pulleys between 8t and 15t

If a rotation of pulley during storage is not possible then the pulley should be sent to offsite vendor to check condition of bearings and lagging after two years of storage.

The corrosion inhibitor must be checked every 3 months and re-applied if damaged or degraded.

8.10 Electric Motor (LV & HV)

This preservation strategy is applicable for motors with a nameplate rating of 55kW and higher. However, motors under 55kW must still be kept in original packaging and stored indoors in a clean, dry and vibration free area.

8.10.1 Storage

Electric motors should be stored indoors in a clean, dry and vibration free area and mounted on a transport frame if possible. Motors should be stored where relative humidity is below 75%. The temperature of the motor should be kept above the dew point if possible, to prevent moisture from condensing inside the motor. If the motor comes with anti-condensing heaters, they must be energised only during damp weather conditions (Winter/ Cycle Season/etc.). Where anti-condensation heaters are energised a caution sign / tag “Unplug electric connection before moving motor” must be displayed. All breathers and drains must be operable while on storage and the, moisture drain plugs removed. Motors must be stored so the drain is at the lowest point.

If anti-condensation heaters are not installed, then space heaters will be used to prevent condensation.

When indoor storage is not possible:

- the motor should be covered with a UV resistant cover. The cover must extend to the ground; however, it should not wrap tightly around the motor. This will allow the captive air space to breath, minimising formation of condensation and corrosion (Short Term) or,
- Motors wrapped with UV resistant shrink wrap (Long Term) will have desiccant pouches (silica gel) placed inside to prevent moisture build up. The pouches will be checked every 3 months and replaced if there is a change in colour.
- The motor will not make ground contact or placed in near or on standing water. Care must be taken to protect the electric motors from flooding or from harmful chemical vapour.

Some motors have a shipping brace attached that holds the shaft firmly against the bearing to prevent damage during transport. The brace should only be removed during preservation activities to rotate the shaft. The shaft will be locked in place prior to any movement of the motor. Shaft will remain locked and anti-vibration mounts placed under the feet of the motor if the storage area is susceptible to vibration.

Make sure that all external machined surfaces, including shaft extensions are coated with corrosion inhibitor.

Flange mount motors will be stored vertically.

Where motors are equipped with a mechanical released braking system, the brake must be in the released position to avoid joining of the trimmings. No lubricants or other products will be applied to the braking surfaces.

DC electric motors, wound rotor motors, and some synchronous electric motors are fitted with carbon brushes. For long-term storage, the brushes should be lifted away from the commutator/slip rings to prevent a chemical reaction. The springs should be in the relaxed state, when practical, to avoid slow weakening of the springs. The commutator should be wrapped with suitable material such as cardboard paper to protect against damage.

8.10.1.1 Greasing

Greasing is only required if there is sign of motor losing grease. Motors with grease lubricated anti-friction bearings are shipped with the correct amount of grease in the bearings and do not generally require lubrication during storage periods up to 12 months. Source of the loss must be investigated and corrected.

8.10.1.2 Bearing Re-lubrication

Grease lubricated bearing cavities must be filled with lubricant during storage. Clean the areas around the relief and fill fittings. Remove the drain plug and fill bearing cavity with grease until grease begins to purge from the drain opening.

Grease the bearing with a calculated amount of grease. Slowly add grease (10-12 seconds for each stroke) to minimize excessive pressure build-up in the grease cavity. Keep in mind that the standard manual grease gun can produce pressures up to 15,000 psi while most seals can pop at 500 psi.

Avoid excess greasing, which can lead to cavity overfill, resulting in surplus grease build-up between the shaft, the inner bearing cap, and inside of the motor, which can cause both winding insulation and bearing failures.

Tag the stored motor with the date of last lubrication and the lubricant type.

Motors with marked as “**Do Not Lubricate**” on the nameplate do not need to be greased before or during storage.

Sleeve bearing (oil lube) motors are drained of oil prior to shipment. The oil reservoirs must be refilled to the indicated level with the lubricant stated in the manual provided with the motor before storage.

- (i) Remove grease drain plug if supplied, at the bottom of each bracket prior to lubricating the motor.
- (ii) The motor with grease-able bearing should be greased as stated in the OEM manual
- (iii) Replace the grease drain plug after re-greasing, if fitted
- (iv) Motor gland box will be checked for openings to prevent ingress of contamination, moisture etc.

8.10.2 Inspection & Preservation

- **Visual check**

Check for corrosion and dents. If the motor is wrapped, inspect for physical damage to outer wrap. If damage is observed, repair area with preservation tape and notify warehouse supervisor.

For motors without preservation wrap, check condition of the motor frame, earth bond, lifting points and accessories. Confirm all termination boxes are sealed closed, the cable entry gland plate is secure and cable entry holes are covered by bungs.

For slip ring motors, the slip ring enclosure to be inspected for signs of water and dust ingress and sign of corrosion on slip rings and connections.

- **Shaft Rotation**

In the case of large electric motors with heavy rotors and long frames, regular rotation of the shaft is critical to prevent shaft distortion cause by rotor sag. This is a consideration for electric motor approximately 1500 hp (1000 Kw) and larger. These motors need to be rotated monthly.

Motor above 55kW must have the shaft rotated quarterly to ensure the maintenance of a coating lubricant film on the bearing races and journals (if applicable). Motors less than 55kW do not need the shaft to be rotated at periodic intervals.

Unless otherwise specified motor shafts will be rotated as a minimum of 15 times every 6 months. Refer to Section 6 of this document.

If any motor that can't be rotated or does not need to be rotated at all during storage; the motor will be sent offsite to check condition of motor after two years of storage.

- **Insulation Resistance**

If an electric motor is in storage for more than 12 months then insulation resistance (IR) readings corrected to a standard temp (40° C) must be taken, then repeated every 6 months after that. A log for measuring insulation resistance should be maintained for each individual motor.

The minimum insulation resistance (Rm) can be determined from the following formula:
Minimum resistance of motor winding insulation is 5 MΩ or the calculated minimum, whichever is greater.

Minimum resistance is calculated as follows: $R_m = kV + 1$

Rm = Minimum insulation resistance in MΩ at 40°C of the entire machine winding

KV = Rated machine potential in kilovolts.

Example: For a 400VAC rated motor $R_m = 1.40 \text{ M}\Omega$ (use 5 MΩ).

For a 6600VAC rated motor $R_m = 7.6 \text{ M}\Omega$.

If the IR fails, please refer to 100-SW-EG-0027 Electric Motors Refurbishment.

8.10.3 Electrical Drive Wheel Motors (HME)

HME electric drive wheel motors and alternators must be stored in OEM delivered packaging to prevent moisture ingress, stored indoors where possible and meet all other outdoor covering requirements if not.

No greasing, rotating or oil maintenance is required to store these items, and they must not be opened or tampered with. Routine inspection of OEM wrapping to be conducted every 3 months to ensure integrity

8.11 Variable Speed Drive (VSD)

Variable Speed Drives (VSD) will be stored as follows:

Indoors, protected from environment, in a temperature controlled dry clean room. The drive will be protected from moisture, heat, and direct sun light.

The VSD should be kept in original packaging. If the original packaging was destroyed, the VSD should be placed in a UV resistant bag. Desiccant will be added in the bag to remove moisture.

A periodic inspection will be carried out to check the integrity of the packaging and desiccant. The desiccant will be inspected every 3 months and replaced if there is a change in colour.

VSD's in storage for over 12-months require the DC bus capacitors to be recharged (reformed) before use. Power up in incremental voltage steps until full voltage is reached then hold for a period depending on OEM recommendation then power off.

Variable Speed Drives can be stored up to two years as per requirements stated above. If drives and drive modules have exceeded the 2-year storage deadline then they can be sent to OEM for conditional assessment prior to use or if facilities available on site then site can action.

8.12 Electrical Equipment & Switchgear

Electrical equipment and switchgear will be stored on shelves or in a cabinet that are electrically grounded away from mechanical vibration, moisture, and heat.

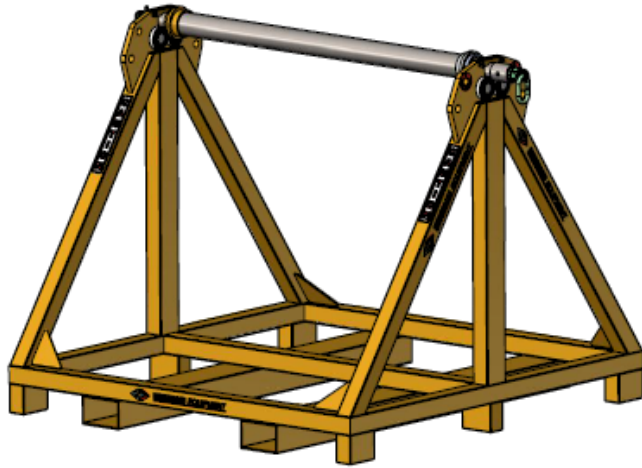
Switch gear will be kept in its original packaging where practical. Vacuum wrap or bubble wrap should be used in accordance with anti-static handling procedure.

For expensive electronic equipment, (e.g. PC boards, pressure, and flow cards. etc.) where original packaging is not suitable for long storage periods; equipment should be stored in heavy-duty anti-static bags.

Desiccant gel will be placed in the storage bag to remove moisture. The desiccant will be inspected every 3 months and replaced if there is a change in colour.

8.12.1 Cable Storage Guidelines

- Select a site for storage that is level and dry, preferably indoors with a concrete surface, with no risk of falling objects, chemical spills (oil, grease, etc.) open flames and excessive heat. If concrete hard storage is not available, select a well-drained surface that will prevent the reel flanges sinking into it.
- If cable drums are stored outdoors, they must be supported off the ground and protected with a suitable weatherproof material. Use a cable drum stand as shown below:



- The drums must always be stored with their flanges vertical.
- Leave enough space between stored drums for air circulation.
- All cable drums should be stored in such a way so as to allow easy access for lifting and moving, away from construction activities, falling or lying objects, sources of high heat, open flames, chemicals or petroleum products, etc. that may cause damage to the cable. It is also recommended to use fences or any other suitable barriers to protect cables and reels against damage by vehicles or other moving equipment in the storage area.
- The bolts should be tightened at regular intervals.
- During storage, the drums should be rolled to an angle of 90° every three months.
- When only a portion of the cable is used, the open end of the cable remaining on the drum should immediately be re-sealed to prevent the entrance of moisture. Once it has been re-sealed, the cut end should be fixed to the inside edge of the drum flange to prevent the end from extending beyond the flanges during drum movement.
- When it is required to rewind the cable on to another drum, always consider that the diameter of the new drum barrel should be at least the same size of the original drum barrel diameter.

8.13 Gearbox

8.13.1 Storage

The Vendor must supply the gearbox in a packaged and preserved condition to last for a minimum of 12 months in an indoor, clean, dry, vibration free, low humidity environment allowing for normal temperatures. The gearbox must be on a suitable pallet, skid or transport frame with a device fitted (Block/brake/clamps) to prevent involuntary movement of the gearbox internals or “bounce” of the shaft against the bearings during transport.

All exposed unpainted surfaces to be coated with corrosion inhibitor. Corrosion inhibitor must last for a minimum of 24 months in an outdoor environment.

Prior to shipping from the vendor/factory, the rust preventative shell VSI 8235 or equivalent is sprayed into the reducer and the air vent is replaced with a red sealing plug to prevent corrosion.

The gearbox internals will be preserved with appropriate vapour space inhibitor (VSI).

If a gearbox has not already been treated for long term storage, the warehouse must make arrangement to preserve the gearbox for long term storage by either returning the gearbox to the vendor or engaging 3rd party vendor to repack and preserve the gearbox.

8.13.2 Inspection & Preservation

No special periodic maintenance required except for shaft rotation and to check the condition of desiccant. Desiccant will be inspected every 3 months and replaced if there is a change in colour

The shaft will be hand rotated for the number of turns that is equivalent to the reducer’s ratio, which is avail on the equipment name plate. For example, if the ratio is 35, rotate the shaft 35 complete turns. The rotation of the shaft should be carried out at frequency dictated by criticality, OEM, and storage profile of the item.

Wipe seal face with approved grease (refer to lubrication section for grease recommendations) to help protect against dry rot.

The VSI will be replaced at the end of 1st year of storage and then every two years respectively.

8.14 Couplings (Low & High Speed)

8.14.1 Storage

If the coupling is stored outside it will be boxed, shrink wrapped or covered to prevent moisture ingress, and a corrosion inhibitor applied.

8.14.2 Inspection & Preservation

The condition of desiccant pouches must be checked every 3 months. A 3-monthly inspection of coupling must be carried out to check the condition of the shrink wrap or cover. Corrosion Inhibitor must be checked 3 monthly and replaced/ reapplied if any degrading of the inhibitor is detected.

8.15 Exciter

8.15.1 Storage

Exciters are secured by transport clamps in a transport frame that prevent movement of the exciter shafts during transport. The transport clamps prevent damage to the exciter bearings and gears whenever an exciter is transported.

If the exciter is stored outside, it will be shrink wrapped or covered with desiccant pouches to prevent moisture ingress and damage.

All bare or machined surfaces will be protected with a corrosion inhibitor.

If exciters are stored at warehouse more than 2 years, the exciters will be sent to the OEM/ vendor to assess the condition of the bearings.

8.15.2 Inspection & Preservation

Exciters are treated with corrosion inhibitor prior delivery to site. The corrosion inhibitor will be effective for 12 months if exciters stored in a dry room with temperate climate. When stored in humid locations, the protection period is reduced; in tropical climates protection may last up to 3 months.

The condition of desiccant must be checked every 3 months and changed out if it has changed colour.

The condition shrink wrap/ cover and corrosion inhibitor must be inspected every 3 months and fixed or reapplied if damaged.

The exciter's cavity spaces will be filled with recommended quantity of vapour space inhibitor. The VSI will to be replaced after 12 months of arrival in storage then every 2 years thereafter. The exciter shaft will be rotated few times after the VSI has been applied. The exciter can be lifted in vertical position to rotate shafts.

The vent and drain to be replaced with red sealable plug. The VSI needs to be replaced every 2 years to maintain its effectiveness.

The shafts must be rotated 90° every 3 months.

8.16 Girth Gear

Where indoor storage is not possible each gear segments should be covered with suitable cover. This covering should be visually inspected on a 3 monthly basis to ensure that no damage has occurred, and the gear remains protected.

For long term storage the girth gear should be stored as follows:

The gear segments should be stored on stable solid ground such as concrete pad. The segment rims are to be supported with trestles and ensure that the segment remains flat. Store the gear segments in a horizontal position.

Coat unprotected surfaces with shell bitumen compound.

Cover each segment with wood to protect gear teeth, joint faces, and flanges from damage.

Coat loose bolts, nuts, and washer with Valvoline Tectyl 506 EH or equivalent and store in a container to prevent corrosion.

Inspect gear segments on a 3 monthly basis and replace or touch up the corrosion inhibitor coating.

8.17 Hydraulic and Pneumatic Cylinder

Hydraulic or pneumatic cylinder mountings must be protected against corrosion, damage, and dirt. The piston rod will be in a fully retracted position where possible and the piston restrained from extending through gravity or other means. Exposed chrome surface will be protected with a rust inhibitor coating (Shell Ensis or Denso Tape).

8.17.1 Storage

It is preferred that cylinders are stored in a vertical position. If it is not possible, lay cylinders horizontally on support banks where the cylinder and piston rod are supported separately to prevent the rod putting pressure on the cylinder seal, warping, or damaging it. Rotate the cylinder 90° every 3 months to prevent seal from drying or deforming.

A cover must be placed over the cylinder rod end to prevent seal failure by sunlight and dirt.

Any fitting or hose attached to the cylinder must have the appropriate full pressure, tight fitting sealed end cap to prevent ingress of dust or water (ie no tape / rags / temporary seals etc). Any signs of oil leakage from any component to be investigated by maintenance teams.

Clevis bush bores to have corrosion inhibitor applied from vendor and inspected for integrity onsite during storage every 3 months

8.18 Hydraulic Hoses

8.18.1 Hoses

The hoses must be stored indoors in a clean, cool, and dry area. The hoses must not be stored in direct sun light or exposed to moisture. The ultraviolet light will deteriorate the rubber over time. Storage of hoses should be avoided near high powered electrical equipment as the ozone release from electrical equipment will deteriorate the rubber on the hose. The hoses must not be stored near corrosive chemicals. The hoses must be stored horizontally on a dedicate hose rack.

The hoses will be sealed against dirt/dust ingress by fitting tightly sealed end caps.

8.18.2 Fittings

Hose fittings must be stored in clearly marked closed containers or the original manufacture's packaging.

A stock rotation system (FIFO) should be in place so that a shelf life of 2 years is not exceeded for fittings with O-rings as they will degrade as a result of normal environmental conditions, leading to possible system leaks or contamination.

8.19 Hydraulic Pumps and Motors

Hydraulic pumps and motors should be stored as follows:

- All ports and openings must be plugged with appropriate full pressure fittings or plates.
- Pumps and motors must be placed in UV resistance plastic bag / shrink wrap containing desiccant.
- Exposed external machined surface to the pump/motor must be protected from the environment with an anti-corrosive agent.

8.20 Sizer

The sizer shaft assembly will be stored on a transport frame in a vibration free, well ventilated area free from moisture. The sizer shaft will be locked to prevent movement.

8.20.1 Storage

- **Short Term Storage**

The Sizer shaft will be cover with UV resistant tarpaulin to prevent contact with sunlight and moisture.

- **Long Term Storage**

If stored for long term, the shaft will be locked to prevent movement. The shaft will be rotated 90°. The gearbox will be stored as stated in section 8.13.

8.20.2 Inspection & Preservation

Exposed external machined surfaces will be coated with a corrosion inhibitor. Exposed threads, grease nipples and couplings must be protected with a suitable protective coating.

Gearboxes will be fitted with desiccant breather and to be checked every 3 months. The desiccant breathers will be replaced if there is a change in colour.

Condition of desiccant pouches in the cover must be inspected every 3 months and replaced if it has changed colour.

Small metallic components and hardware not protected by paint are to be wrapped up with water repellent vapor phase rust-inhibitor paper and sealed with pressure sensitive tape.

8.21 Power Transformers

8.21.1 Storage

Indoor transformers must be stored indoors in a clean and dry environment. Outdoor Transformer may be stored either indoors (Indoors is the preferred option) or outdoors, provided desiccant breather is fitted and monitored. The transformer must be stored in an area free of risk in damaging the transformer and covered/ wrapped to prevent moisture damage.

Transformers are usually filled with dried nitrogen when delivered to avoid any humidity from entering the main tank. Storing a transformer filled with nitrogen is possible, for a period of 3 months. For longer periods of storage, it should be filled with oil.

The foundation for the storage location must be flat, even, and stable. The ground must be able to carry the weight of the oil filled transformer without deformation and not be susceptible to subsidence over the duration of the storage period and under all weather conditions.

In cases where anti vibration pads are not included or the foundation does not meet the necessary flatness criteria, then the transformer should be placed on suitable beams (e.g. good quality, constant thickness railway sleepers). The beam supports are to be assessed to ensure that they are suitable for the proposed storage period without deterioration. The placement of the beams is to ensure the arrangement is stable.

Since the transformer is to be stored in an oil filled condition, consideration must be made for suitable oil bunding. This should consider the transformer oil volume, duration of storage and any specific site requirements to manage the risk of oil spillage.

Transformer fitted with conservator will have desiccant breather fitted on it. Ensure that the HV and LV cable boxes have vents fitted to allow crossflow breathing. Special attention will be given during storage of the transformer.

Where possible, Auxiliary AC supply shall be connected in such a way that the thermostat is in the circuit to the anticondensation heater for both the marshalling kiosk and the tap changer motor drive units (if available).

8.21.2 Inspection & Preservation

Hermetically sealed transformer can be stored without much maintenance.

- 3-monthly inspections will be carried out to check:
 - (i) Tank, radiator, gasket joints and valves for oil leaks
 - (ii) External surfaces for paint damage and corrosion, which must be re-touched before the damage spreads
 - (iii) Dehydrating breather's desiccant colour has changed then the desiccant will be changed.
 - (iv) Loose accessories to be tightened
 - (v) Ensure the A.C. supply to cubicles and check the operation of the anti-condensation heaters
 - (vi) Condition of auxiliary panel (no contamination, all connections tight). Where anti-condensation heaters are fitted, they will be energised and fitted with a tag to state "Unplug before moving".
- 12-monthly inspections will be carried out to check:
 - (i) In addition to 3 monthly checks, oil analysis will be carried out to check electrical breakdown, strength, and moisture content of the insulating oil.

8.22 Turbines

8.22.1 Storage

In addition to the OEM's recommendations, turbines will be stored as follows:

Small general-purpose turbines will be fogged with rust preventative concentrate through the opening in the top case as the rotor is being rotated. This must be carried out on a 3-monthly schedule or as dictated by the material criticality, storage profile and owner. If site personnel cannot perform fogging, it will be outsourced to a vendor.

8.22.2 Inspection & Preservation

Every 3 months, the turbine will be fogged with vapour space Inhibitor through the opening in the top case while the shaft is being rotated.

Check for integrity of the packaging especially at the intake and exhaust manifold. Restore integrity of packaging if damaged.

A 3-monthly inspection of the turbine internals must be carried out by using a borescope to check the condition of the internals through the inspection hole. The inspection can be done prior to fogging with VSI.

Manufacturer's field service engineer may be engaged to inspect turbines during periodic inspection (quarterly) to maintain warranty.

8.23 Valves

8.23.1 Storage

The preferred location of storing valves is in a clean, dry, sheltered environment. If valves are to be stored outside, then the valve must be wrapped or covered to keep it clean and dry.

The valves can be stored either in a vertical or horizontal position. Valves can be stored in its original supplier packaging but if it is not weatherproof them the packaging will be required to be wrapped or covered.

Non painted surfaces will be protected with a corrosion inhibitor from the environment. Damaged paint surfaces can be touched up with suitable protective paint or corrosion inhibitor.

Store knife gate valves in open position to prevent damage to the lip seals.

The supply ports of pneumatic and hydraulic cylinder actuators must be plugged with pipe plugs to prevent contamination.

If a valve will be stored long term, then the requirement needs to be checked with the OEM to back of the gland packing to prevent damage.

8.23.1.1 Electric Motor Operated Gate Valve

The preferred storage position is with the valve stem and motor shaft in the horizontal position, and the actuator limit switch compartment cover vertically up.

An alternate position is with the valve stem vertical, the motor shaft horizontal and the limit switch compartment cover either facing to the side or vertically up.

The valve assembly should be stored on a suitable skid and will be covered with an unsealed dust cover with the bottom open and air holes in the side.

For storing valves between 1 and 2 years, spray electric contacts with CRC #2-26.

For storing valves between 2 and 5 years, spray electric contacts with CRC Lectra Shield spray coating and this coating must be removed with a suitable cleaner, such as any standard petroleum solvent, prior to making electrical connections.

Cover flange faces with suitable covers such as plastic bungs or plywood.

8.23.1.2 Valves (non-hydraulic and high precision)

Non-hydraulic and high precision valves should be stored as follows:

Non painted surfaces will be protected with a corrosion inhibitor from the environment.

Valve internals will be sealed and protected from the environment. A smearing of assembly grease will be applied to all internals.

Valves will be placed in a re-sealable plastic bag with desiccant, if applicable.

Valves will be plugged with plastic bungs.

Large valves should be strapped to a wooden pallet or purpose-built pallet to reduce damage to actuators.

8.24 Vehicle Engines (Diesel)

No maintenance is required if engine is stored less than 3 months. Vendor packaging is sufficient to store the engine at warehouses. Ensure that the engine intake and exhaust are covered.

Bare metal surfaces or machined surfaces will be painted/sprayed with a corrosion inhibitor.

If a diesel engine is not in use, the lubricating oil from cylinder wall, piston rod, journal bearing etc. can run off and can cause corrosion of the parts due to lack of lubrication. The engines will be preserved as per manufacture instruction if not used for more than 3 months. Routine inspection of the OEM external wrapping to be conducted if the diesel engine is stored on site longer than 3 months to ensure it is still integral and preventing water entry.

Wrapping must be tight fitting, durable and contain details of the engine externally to minimise the need to open. Any packaging opened to remove / inspect / change components will be returned to the same integrity as delivered (sealed with adhesive tape / patch etc)

Most of the operating and maintenance manuals will provide instruction on preserving engines.

If the warehouses are unable to achieve OEM stated preservation standards the Vendor needs to be engaged and the engine sent offsite to preserve for long term storage.

8.25 Wheel and Axle Assemblies

Wheel and axle assemblies must be stored as follows:

Warehouses will ensure that axle assemblies are transported on a dedicated transport frame. Oil lines will be blanked off to prevent contamination, corrosion, and oil pollution.

Bare metal or machined surfaces will be protected from the environment with a corrosion inhibitor. Coupling shafts or bearing journals must be wrapped with Denso tape to prevent corrosion.

The protective coating will be checked every 3 months dependent on storage profile and criticality of the item.

If the protective coating is missing or damaged, it must be restored/ re-applied as defined by OEM or as a minimum with corrosion inhibitors.

8.26 Fiberglass Reinforced Plastic (FRP) Riser

Fiberglass reinforced plastic may cause glass itch, a temporary irritation. Care should be taken to handle fiberglass reinforced risers with the correct PPE.

FRP Risers should be stored as follows:

- (ii) The pipe must be handled and stored with care to ensure the sealing faces are protected and the pipe surface is not damaged.
- (iii) No heavy items will be placed on top of the pipe and the pipe must not to be dropped.

- (iv) Short term storage less than four weeks, under sunlight and exposure to high humidity is permitted provided it remains strapped in bundles as delivered by the Vendor and stored in storage bins.
- (v) A tarpaulin or black plastic sheeting is the minimum covering required if stored outside for periods greater than 3 months.
- (vi) Plastic strapping should be used to strap the pipes together, if metal strapping is used it will not be in direct contact with the pipe surface. A protective material (Rubber, nylon, plastic, etc.) must be used to insulate the two surfaces.
- (vii) Pipe must be stored in pack sizes as detailed by the Vendor to prevent own weight crushing. As a minimum pipe must be stored off the ground with a 40mm x 40mm gluts equally spaced at 4 points along the length of the pipe with a maximum of 400mm overhanging the outer most gluts. Between each row of pipe gluts of the same dimensions need to be used to keep the pack rigid.

8.27 High Density Polyethylene (HDPE) Pipe

HDPE Pipe must be stored as follows:

- (i) Storage area should be smooth and level.
- (ii) Pipe lengths stored individually should be stacked in a pyramid of not more than 2 meters in height, or 3 times diameter if that is greater.
- (iii) The bottom layer should be fully restrained by wedges and should be laid on timber battens spaced out in 2m intervals.

Due to the flexibility of smaller diameter pipes with lengths greater than 12m, spreader bars must be used when moving pipe to prevent scuffing of the ends on the ground.

No special preventative maintenance required if the above storage conditions are met.

8.28 Rubber/ Elastomeric Components

8.28.1 Storage

Components must be stored without tension, compression, or any other deformation, as the stress can cause damage as lasting deformation (Flat spots) and the development of cracks.

Components should be stored in a clean and dry environment between +5°C and +25°C with a humidity less than 70% away from direct sunlight. The components must be kept in original packaging or UV resistant preservation bags.

Ozone can be very damaging to elastomeric components and should be stored away from electrical equipment, mercury vapour lamps, etc.

Direct contact with certain metals, e.g. manganese, iron and particularly copper and its alloys, e.g. brass and compounds of these materials are known to have deleterious effects on some rubbers. Elastomeric seals should not be stored in contact with such metals.

Because of possible transfer of plasticisers or other ingredients, rubbers must not be stored in contact with PVC. Different rubbers should preferably be separated from each other.

Components must not be contaminated with solvents, oils, greases, or any other semi-solid materials at any time during storage, unless so packed by the manufacture

V-belts, cog belts, gaskets containing rubber compounds, and O-rings have shelf lives which must be managed on a first-in-first-out basis.

8.28.2 Inspection & Preservation

Components must be inspected for cracks and deformities every 6 months and disposed if found.

If it is found that the corrosion inhibitor/ protective barrier has degraded then components can be treated with a silicone or lithium grease, spray, or rubber lubricant to protect from drying out, moisture and heat as per OEM instructions.

8.29 Transport Frames and Workboxes

8.29.1 Storage

Transport frames will be stored in line with the specific equipment requirements, as listed in this document, that are contained in the frame or box

8.29.2 Inspection & Preservation

All transport frames will be visually inspected by personnel prior to each use or in line with the inspection schedule of the equipment contained in the frame/ box to ensure there are no significant damage or wear and markings are legible. If any defects are detected, then the frame/ box will immediately be withdrawn from service and tagged "Out of Service".

If any of the following defects are visible, the transportation frame will be withdrawn from service and referred to a competent person:

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- 1) Markings that have become detached or illegible. In such cases the lifting device may
- 2) be returned to service after being assessed by a competent person that it —
 - i) Is in good condition; and
 - ii) Has been remarked following verification of its identity and capacity.
 - iii) Regulatory requirements may require results to be entered on an inspection record.
- 3) Cuts, nicks, gouges, cracks, excessive corrosion, heat damage, bent or distorted components or any other defects.
- 4) Signs of overloading, such as any visible deformation of components.

NOTE: Shallow and rounded indentations in areas of low tensile stress may not affect the structural integrity, but deep nicks in high-tension areas and sharp transverse nicks could affect the structural integrity.

As a minimum, Transport Frames and Work boxes will be re-certified annually by a 3rd party inspector (e.g. Nobles, DNV, Rigging Shed, etc) and the data plate stamped with the inspection date. Any defects identified by the re-certification process will be correct as per 100-ST-EG-0006 Transport Frames and Workboxes Specification.

Any bare metal surfaces, pins, bolts, connection points between equipment and frame, etc will be sprayed with a corrosion inhibitor and reapplied on inspections where found deteriorated.

8.30 Hydrocarbons and Lubricants

8.30.1 Storage

Each site must provide a separate area for storage for new Lubricant and Maintenance Fluid and products ready for dispensing.

Lubricant and Maintenance Fluid storage areas must comply with the requirements of “The storage and handling of flammable and combustible liquids” standard **AS1940** and any relevant environmental requirements as specified in the Chemical and Hydrocarbon Management Plan 100-PL-EN-0011 as a minimum. Pipework used for the distribution and storage of Lubricants and Maintenance Fluid must comply with the FMG Piping and valve engineering specification 100-SP-PI-0001.

The size of the facility should be appropriate for its intended use. There should be adequate storage for the types and quantities of Lubricant and Maintenance Fluid, consumables, equipment; required for short term use. Adequate room for handling and dispensing of lubricants is also required; this may include provision of space for lifting equipment if applicable. The facility may be in a DGM container, shed or other enclosed facility, subject to available space. Shelving, racking and cabinets should be provided to allow all items to be neatly stored and easily accessed.

Drums must be stored upright in an approved bunded area. Where possible, drums shall be covered to prevent water collecting on the top of drums that may cause corrosion. For drum stored outside the cover must be UV resistant to prevent degradation. Drums shall be checked regularly for signs of corrosion and leaks.

Drums shall be moved using an approved drum lifting device, on pallets or using a drum trolley. If a forklift is used, forklift tines must not be used for moving drums to avoid the possibility of the drums being damaged. In addition to being in a bunded area, these drums are to be stored in one of the following ways:

- (i) Off the ground on stands.
- (ii) In drip trays; and
- (iii) On concrete floors

All relevant storage areas shall be regularly inspected to ensure Lubricant and Maintenance Fluid materials are being adequately controlled. This must form part of a fortnightly inspection regime as a minimum. Storage environment where Lubricant and Maintenance Fluid are used must be clean and uncluttered to reduce the chances of contaminating equipment being serviced.

All Lubricant and Maintenance Fluid drums, containers, lubricated equipment, and associated parts shall be kept inside the original packaging until they are ready to be used or installed. The following are recommended where practicable.

- (i) Return parts to storage in packaging
- (ii) Protect in-process components
- (iii) Where practicable, wash the components before assembly

The Lubricant and Maintenance Fluid storage area should be separated from dangerous goods (e.g. flammable, oxidizing agents & poisons) and protected from contamination sources as far as practicable.

Storage area must be positioned as far as possible from dusty areas. The drums and containers must be stored in an enclosed area protected from sun, wind, and rain.

Lubricant and Maintenance Fluid stock shall be marked so that product is used on a 'first-in, first-out' basis. The Storage area also must be supplied with the appropriate number of Spill Kits and Fire Extinguishers as well as current MSDS as per AS 1940.

8.30.1.1 Shelf Life

New Lubricants and service fluid under storage conditions of around 20°C, away from direct external climatic effects and direct sunlight, may reasonably be guaranteed by the manufacturer to have a shelf life of 3 years from the year of manufacture. However, the following factors will affect the actual shelf life of Lubricant and Maintenance Fluid:

Temperature Fluctuation

Fluctuations will cause thermal siphoning between the air space above the Lubricant and Maintenance Fluid and the atmospheric air; this air movement causing air, moisture and air-borne particle ingress into the container leading to contamination and subsequent reduction in quality. Such action is caused even with nominally sealed drums. Of particular concern is with partially used drums since the air space is larger, leading to a larger volume of air movement for a given temperature change.

Temperature extreme

Lubricant and Maintenance Fluid life can be reduced due to chemical action caused by exposure to extreme temperatures. The life of a lubricant is governed by the Arrhenius rate equation; application of which predicts that an increased storage temperature of 10°C will double the rate of oxidation leading to a reduction in the lubricant's life by one-half.

Some additives are prone to a reduction in performance if exposed to extreme temperature; for example, rust preventative additives experience a significant reduction in performance after only 6-months if inappropriately stored. However, storage between 10°C to 50°C will present the rust preventative additive with no issues. Rust

preventative additives have poor solubility in base oils and are therefore prone to precipitate during storage; accelerated greatly if exposed to extreme cold storage. The main concern with rust preventative additives is when they make contact with water; the additive goes into a water phase, as designed, resulting in oil with rust preventative additive with performance greatly reduced being used in equipment.

Humidity

Petroleum-based lubricants have a high affinity for water. This absorption of airborne moisture will degrade the additive package and will cause the base stock to oxidise at an accelerated rate once the oil is put into service.

To factor in these conditions inventory levels will be maintained at appropriate levels to ensure, where possible a turnover of between 12–18 months assuming that the fluids are stored as per the requirements in this document.

Refer to the table below for recommended storage times for different Lubricant and Maintenance Fluid:

Table 6: Recommended Storage Times

Lubricant and Maintenance Fluid	Recommended Storage Time (Months)
Lithium Grease	12
Calcium Complex Grease	6
Lubricating Oils, Hydraulic Oil & Coolant	12
Emulsion-type Fire-resistant Fluids	6
Soluble Oils	6
Custom-blended Soluble Oils	3
Wax Emulsions	6

The Lubricant and Maintenance Fluid vendors shall be contacted by the Asset Management Lubrication Specialist periodically to maintain the currency of shelf-life predictions. Samples may be taken to confirm if Lubricant and Maintenance Fluid are still good for service after the recommended storage times have passed.

9. STORAGE, INSPECTION & PRESERVATION QUICK REFERENCE

Table 7: Packaging & Storage Requirements

Component	Packaging	Storage
Battery	<ul style="list-style-type: none"> • Bundled pallet • Open terminals covered w/- caps 	<ul style="list-style-type: none"> • Indoors, cool/ dry area • Racking – insulated • ≥ 1.8m from ignition source • Well ventilated area to avoid build-up of potential gasses
Bearing	<ul style="list-style-type: none"> • Original packaging or preservation bags 	<ul style="list-style-type: none"> • Vibration free, clean/ dry area away from direct sunlight • Loose bearing – laid flat
Blower / Fan	<ul style="list-style-type: none"> • Transport Frame or Strapped to Wooden, chocked pallet 	<ul style="list-style-type: none"> • Indoors – clean/ dry with corrosion inhibitor • Outdoors – UV Wrapped with corrosion inhibitor and desiccant
Centrifugal Pump	<ul style="list-style-type: none"> • Transport Frame or Strapped to Wooden, chocked pallet • Flange openings covered/capped 	<ul style="list-style-type: none"> • Indoors – clean/ dry with corrosion inhibitor • Outdoors – UV Wrapped with corrosion inhibitor and desiccant
Compressor	<ul style="list-style-type: none"> • Original factory packaging • Manifold openings covered/capped 	<ul style="list-style-type: none"> • Indoors – clean/ dry with corrosion inhibitor • Outdoors – UV Wrapped with corrosion inhibitor and desiccant
Conveyor Belt	<ul style="list-style-type: none"> • Original factory packaging • Transport Frame • Cut ends protected with cold splicing cement 	<ul style="list-style-type: none"> • Indoors – clean/ dry • Outdoors – UV Wrapped/ cover protected from moisture
Splice Kit	<ul style="list-style-type: none"> • Original factory packaging 	<ul style="list-style-type: none"> • Indoors – Cool Room

Screen Panel	<ul style="list-style-type: none"> Original factory packaging on pallets 	<ul style="list-style-type: none"> Indoors or under cover (Awnings, et) away from direct sunlight Outdoors – UV wrapped or cover
Conveyor Pulley	<ul style="list-style-type: none"> Transport Frame with UV Protected Cover/ Wrapping 	<ul style="list-style-type: none"> Indoors or under cover away from direct sunlight Outdoors – UV wrapped or cover
Electric Motor	<ul style="list-style-type: none"> Transport Fame 	<ul style="list-style-type: none"> Indoors – dry, clean, cool below 75% humidity (Preferred Option) Outdoors – UV Wrap or cover.
Variable Speed Drive	<ul style="list-style-type: none"> Original factory Packaging or UV Resistant bag 	<ul style="list-style-type: none"> Indoors – cool, dry, temp and humidity-controlled room
Elec Equip & Switchgear	<ul style="list-style-type: none"> Original factory Packaging. Anti-static Vacuum sealed or Bubble wrap 	<ul style="list-style-type: none"> Indoors - Shelves or cabinets – Clean, dry, grounded, vibration and moisture free away from heat
Gearbox	<ul style="list-style-type: none"> Original factory Packaging pallet/skid/ transport frame c/w Brake/Block/ Clamp 	<ul style="list-style-type: none"> Indoors - Clean, dry, grounded, vibration and moisture free at normal temperatures
Exciter	<ul style="list-style-type: none"> Transport Frame with clamps 	<ul style="list-style-type: none"> Indoors or under cover away from direct sunlight Outdoors – UV wrapped or cover
Girth Gear	<ul style="list-style-type: none"> Original factory Packaging – Flat on custom skid/ Pallet 	<ul style="list-style-type: none"> Indoors – On a hard stand (e.g. Concrete Slab) Outdoors - On a hard stand (e.g. Concrete slab) with UV resistant cover
Hyd/ Pneumatic Cylinder	<ul style="list-style-type: none"> Transport frame or skid where cylinder and rod is supported separately 	<ul style="list-style-type: none"> Indoors – vertical in custom racking or in transport frame skid Outdoor – Transport frame including UV resistant cover.
Hydraulic Hose	<ul style="list-style-type: none"> Original factory Packaging with sealed end caps 	<ul style="list-style-type: none"> Indoors – Flat in a custom hose rack. In a clean and dry area away from heat, electrical equipment (Ozone)
Hyd Pumps/Motor	<ul style="list-style-type: none"> Original factory Packaging with all ports & openings sealed 	<ul style="list-style-type: none"> Indoors – dry, clean, Outdoors – UV Wrap or cover.
Transformer	<ul style="list-style-type: none"> Original factory Packaging in fame or on skid/ pallet 	<ul style="list-style-type: none"> Indoor Transformers must be stored indoors in a clean, dry area away from heat

		<ul style="list-style-type: none"> Outdoor Transformers can be stored indoors or outdoors where outdoors require UV wrap and desiccant breather on a hard stand on beams, evenly spread
Turbine	<ul style="list-style-type: none"> Original factory Packaging in fame or on skid/ pallet 	<ul style="list-style-type: none"> Indoors – clean/ dry Outdoors – UV Wrapped/ cover protected from moisture
Valves	<ul style="list-style-type: none"> Original factory Packaging in fame or on skid/ pallet 	<ul style="list-style-type: none"> Vertically or Horizontally Indoors – Clean/ Dry Outdoors - UV Wrapped/ cover protected from moisture
Vehicle Engines (Diesel)	<ul style="list-style-type: none"> Original factory Packaging in fame or on skid/ pallet with engine exhaust and inlet covered 	<ul style="list-style-type: none"> Indoors – clean/ dry Outdoors – UV Wrapped/ cover protected from moisture
Wheel & Axel	<ul style="list-style-type: none"> Transport Fame with blanked oil lines 	<ul style="list-style-type: none"> In or Outdoors with Denso Tape and corrosion inhibitor
FRP Riser	<ul style="list-style-type: none"> Vendor Packaging in bundles with plastic straps 	<ul style="list-style-type: none"> Sealing Faces protected Less than 3-months storage no cover required. More than 3 moths covered with a tarp or black plastic sheeting On 4 gluts evenly spaced apart, at least 40mm from the ground, no more than 400mm overhang from end gluts
HDPE Pipes	<ul style="list-style-type: none"> Vendor Packaging in bundles with plastic straps 	<ul style="list-style-type: none"> Stacked in a pyramid of not more than 2 meters in height, or 3 times diameter if that is greater. The bottom layer restrained by wedges Laid on timber battens spaced out in 2m intervals.
Rubber Components	<ul style="list-style-type: none"> Vendor packaging or preservation bags 	<ul style="list-style-type: none"> Without tension, compression, or any other deformation Away from electrical equipment (Ozone), certain metals and PVC Clean and dry between +5°C and +25°C below 70% humidity

Transport Frames & Workboxes	<ul style="list-style-type: none">• NA	<ul style="list-style-type: none">• Stored as per the equipment requirements contained in the frame or box
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Table 8: Inspection and Preservation Tasks & Frequency

Component	Inspection Interval	Inspection Task	Preservation Interval	Preservation Tasks
Battery	3mth	<ul style="list-style-type: none"> • Check Charge Indicator • Top of battery is clean • Check high temp grease coating • Check for damage or warping of the casing • Check electrolyte levels if not SMF battery 	3mth	<ul style="list-style-type: none"> • Recharge if below stabilised voltage • Clean battery • Coat poles connectors w/- grease • Dispose of battery • Fill battery covering the battery plates with distilled water
Bearing	3mth	<ul style="list-style-type: none"> • Check packaging • Check corrosion inhibitor • Check desiccant • Check cleanliness 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Re-apply corrosion inhibitor • Change desiccant if changed colour • Clean bearing
Blower / Fan	3mth	<ul style="list-style-type: none"> • Check packaging • Check corrosion inhibitor • Check desiccant • Check cleanliness • Check there is no moisture or standing water in the blower 	As required 3mth	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Re-apply corrosion inhibitor/ Denso Tape • Change desiccant if changed colour • Clean bearing • Rotate shaft as per OEM or General Preservation Requirements
Centrifugal Pump	3mth	<ul style="list-style-type: none"> • Check packaging • Check corrosion inhibitor • Check desiccant • Check cleanliness • Check there is no moisture or standing water in the blower 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Re-apply corrosion inhibitor/ Denso Tape • Change desiccant if changed colour • Remove transport clamps & turn pump shaft min. 10 revolutions • Purge labyrinth (if fitted) with grease

	6mth	<ul style="list-style-type: none"> Check labyrinth grease 	6mth	
Compressor	3mth	<ul style="list-style-type: none"> Check intake and outlet manifold Check packaging Check corrosion inhibitor Check desiccant Check cleanliness 	As per OEM	<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply Re-apply corrosion inhibitor/ Denso Tape Change desiccant if changed colour
Conveyor Belt	6mth	<ul style="list-style-type: none"> Check packaging Check corrosion inhibitor Check desiccant Check cleanliness 	6mth	<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply Re-apply corrosion inhibitor – Cold splicing cement on cut ends Change desiccant if changed colour
Splice Kit	3mth	<ul style="list-style-type: none"> Check expiration date Check packaging 	As required	<ul style="list-style-type: none"> Dispose if out of date or damaged beyond repair
HPGR	3mth	<ul style="list-style-type: none"> Check packaging Check corrosion inhibitor Check desiccant Check cleanliness 	As required 3mth 3yr	<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply Re-apply corrosion inhibitor Change desiccant if changed colour Loosen tension screws and rotate 90°, once done tighten screws Bearing grease replenish with new grease to 50% of bearing cavity
Screen Panel	3mth	<ul style="list-style-type: none"> Check packaging and UV protection if stored outside 	Not required	<ul style="list-style-type: none"> Maintenance generally not required but must be re-assessed if exposed to sun and heat more than 6 months
Conveyor Pulley	3mth	<ul style="list-style-type: none"> Check packaging Check corrosion inhibitor Check desiccant 	As required	<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply

		<ul style="list-style-type: none"> Check cleanliness 	3mth	<ul style="list-style-type: none"> Re-apply corrosion inhibitor/ Denso Tape Change desiccant if changed colour Remove bearing/ plumber blocks & turn shaft 90° Fill bearings with lubricant, purging from the seals
Electric Motor	3mth	<ul style="list-style-type: none"> Check packaging Check corrosion inhibitor Check desiccant Check cleanliness Check grease levels Check for lube leaks 	As required	<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply Re-apply corrosion inhibitor/ Denso Tape Change desiccant if changed colour Fill bearings with lubricant (grease) as per OEM only if evidence of lube loss
	1yr	<ul style="list-style-type: none"> Check IR 	1 mtn	<ul style="list-style-type: none"> Motor > 1000Kw rotated 15 rotations
			6mth	<ul style="list-style-type: none"> 40 to 1000Kw rotated 15 rotations < than 40Kw rotation not required.
			1yr	<ul style="list-style-type: none"> Test IR (Insulated Resistance & dispose if fail or send for recon.
			2yr	<ul style="list-style-type: none"> Send motor of site to vendor to assess condition
VSD	3mth	<ul style="list-style-type: none"> Check packaging Check desiccant Check cleanliness 	As required	<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply Change desiccant if changed colour
			2yrs	<ul style="list-style-type: none"> Send to OEM for condition assessment
Elec Equip & Switchgear	3mth	<ul style="list-style-type: none"> Check packaging Check desiccant 		<ul style="list-style-type: none"> Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply anti-static packaging

		<ul style="list-style-type: none"> • Check cleanliness 		<ul style="list-style-type: none"> • Change desiccant if changed colour 	
Gearbox	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness • Check corrosion inhibitor • Check the VSI 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour 	
			12mth	<ul style="list-style-type: none"> • Re-apply corrosion inhibitor/ Denso Tape • Rotate shaft the equivalent to the reducer ratio • Replace VSI and then every 2yrs subsequently 	
Couplings (LS & HS)	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape 	
Exciter	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape 	
		12mths	<ul style="list-style-type: none"> • Check VSI 	3mth	<ul style="list-style-type: none"> • Rotate shaft 90°
					1yr
				2yrs	<ul style="list-style-type: none"> • Return to OEM to be re-assessed.
Girth Gear	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape 	

Hyd/ Pneumatic Cylinder	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape
Hydraulic Hose		<ul style="list-style-type: none"> • Refer Rubber Components 		<ul style="list-style-type: none"> • Refer Rubber Components
Hyd Pumps/Motor	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape
Sizer	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape
Transformer	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor • Check for lube leaks • Check for loose parts 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape • Tighten loose parts • Fix leaks
	12mth	<ul style="list-style-type: none"> • Do oil analysis 	12mth	<ul style="list-style-type: none"> • If the oil analysis fail, then drain and replace
Turbine	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour

		<ul style="list-style-type: none"> • Check corrosion inhibitor • Check internals with bore scope through inspection hole 	3mth	<ul style="list-style-type: none"> • Re-apply corrosion inhibitor/ Denso Tape • Replace VSI through top case while rotating shaft
Valves	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape
Vehicle Engine (Diesel)	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape • Follow preservation requirements as per OEM manual
Wheel & Axel	3mth	<ul style="list-style-type: none"> • Check packaging • Check desiccant • Check cleanliness & moisture damage • Check corrosion inhibitor 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Change desiccant if changed colour • Re-apply corrosion inhibitor/ Denso Tape • Follow preservation requirements as per OEM manual
FRP Riser	3mth	<ul style="list-style-type: none"> • Check packaging • Check strapping 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Re-secure strapping
HDPE Pipes	3mth	<ul style="list-style-type: none"> • Check packaging • Check strapping 	As required	<ul style="list-style-type: none"> • Fix tears, holes, etc. if contaminated. Strip packaging, clean and re-apply • Re-secure strapping
Rubber Components	6mth	<ul style="list-style-type: none"> • Check for cracks and deformities • Check corrosion inhibitor/ protective barrier 	As required	<ul style="list-style-type: none"> • Replace or dispose of cracked or deformed parts • Re-apply corrosion inhibitor as per OEM

Transport Frames & Workboxes	Before each use or as per equip contained	<ul style="list-style-type: none"> • Check Certification is in date • Check for Cuts, nicks, gouges, cracks, excessive corrosion, heat damage, bent or distorted components or any other defects • Check vibration preventing surfaces (Rubber Linings/ Spray) • Check corrosion inhibitor 	12 months or as ID'd by checks	<ul style="list-style-type: none"> • Annual re-certification – Correct any defects as per report • Correct any observed defects • Apply corrosion inhibitor as required
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LIST OF APPENDICES

Appendix 1: Title of flowchart