

Scope of Work for the Installation of a Variable Speed Drive (VSD) System for the Ship Loader Cable Reel at Saldanha Iron Ore Terminal

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Site:
Saldanha Iron Ore Terminal

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1. DEFINITIONS

Commissioning:

The process of assuring that all systems and components of a building or industrial plant or product designed, installed, tested, operated, and maintained according to the operational requirements of the owner or final client.

Contract

An agreement with specific terms between two or more parties or entities based on mutual consent, which has legal effects and involves transfer of consideration – usually financial or some other type of benefit.

Contract Manager

Transnet employee who is authorised to represent Transnet in terms of the contract and appointed to supervise and/or liaise with the contractor to ensure that the specifications of the contract met (with special emphasis on technical specifications, inspection of quality, on health and safety, environment and quantity of work). A contract manager has the role of executing the plan to achieve the deliverables. This person receives all his authorisations from the project initiator and the stakeholders.

Contract Owner

The person who requires a specific product, goods or services and who is responsible to provide the budget and approval.

Contractor

An employer (organisation) or a person performing any work and has entered into a legal binding business agreement contract to supply a product or provide services to Transnet. This applies to the Suppliers, Vendors, and Consultants, Service providers and Contractors.

Contractor Execution Plan

A site, activity or project specific documented plan in accordance with the client's project requirements. The Contractor to Transnet submits a plan for approval prior to mobilization on site. The Contractor Execution Plan includes, inter alia: Health and Safety, Environmental, Energy, Quality, Delivery plans etc.

Contractor Compliance File a file or other record containing the information in writing required by Transnet.

NB: A file must be submitted for each discipline where applicable e.g. health and safety, environment file etc.

Job Owner:

Any permanent employee of BTS who been trained, tested and found competent, and appointed in writing for the purpose of carrying out or supervising work on plant, machinery and equipment.

Risk Assessment

A risk assessment in this procedure means the process where all risks associated with the contract and its execution identified, mitigated and managed.

Specification

A detailed prescription of the Integrated Management System (IMS) requirements to which equipment, construction, product or service has to comply with this includes various models, drawings and documents. It noted that the specification might even comprise of a multitude of different elements.

Lockout:

The fitting of a padlock (or calliper and padlocks) to an isolator switch so that it cannot be returned to an operating condition.

Permit Acceptor:

Any person who has been appointed in writing to receive a Permit to Work for the purposes of carrying out or supervising work on equipment.

Permit Issuer:

The operations shift manager will be responsible for the issuing of permits.

Permit Number:

A number issued by CCR that logs the work performed, the person responsible for the work and the approximate duration. Note: This is not the same as the sequential number on the Permit to Work.

Permit to Work:

A written document indicating the equipment to work on, the potential hazards, how and where these hazards negated, signatures indicating that equipment is safe and the names of all persons working on the equipment.

Responsible Supervisor:

The Operations and Maintenance Supervisor who been assigned responsibility for the operation and maintenance of a particular section/s of the plant.

2. ABBREVIATIONS

IMS:	Integrated Management System
ISO:	International Organization for Standardization
OHSAS:	Occupational Health and Safety Assessment Series
POM:	Policy Manual
PROC:	Procedure
SOP:	Safe Operating Procedure
QMS:	Quality Management System
SANS:	South African National Standard
SMS:	Safety Management System / Service Management System
TCC:	Transnet Corporate Centre which is the Transnet Head Office
SLD:	Saldanha
TPT:	Transnet Port Terminals
WI:	Work Instructions

3. BACKGROUND

The Saldanha Iron Ore Terminal relies on ship loaders to transfer iron ore from yard conveyor to vessel hatches for export. A ship loader is a large machine that travels on a rail track to unload bulk material onto the hatches of vessels. These mobile machines can travel forward or in reverse on a designated pathway to reach different stockpiles. The cable reeling system provides a fixed electrical supply from the fixed electrical point to the ship loader. As the machine travels between different hatches, the cable is reeled on or off the cable reeling system as required to accommodate the machine's movement.

Currently, the cable reeling system is driven by various electrical and mechanical components. The primary components used to rotate the cable reeling drum are two electrical motors, a magnetic clutch, and a splitter-gearbox. The magnetic clutch, a central part of the system, has been found to be the root cause of various breakdowns. These breakdowns result in repetitive stoppages, negatively impacting the plant's production targets. To minimize these breakdowns and for the precise control of the cable reeling system, the terminal decided to replace the twin motor and magnetic clutch system with a Variable Speed Drive (VSD) arrangement to improve the reliability of the cable reeling system.

Only bidders with the capability and capacity to perform the services defined in the scope of work will be considered.

4. PURPOSE AND OBJECTIVES

The purpose of this scope is to procure services for designing, installing, and commissioning a Cable Reel Drum Variable Speed Drive during the **2025 annual shutdown**.

The objective is to replace magnetic clutch systems with a Variable Speed Drive system for precise control and improved reliability of the cable reeling system. VSDs offer better control over the motor's speed and torque. This precise control allows for smoother operation of the cable reeling drum, reducing mechanical stress and wear on the system components.

5. SCOPE AND SPECIFIC WORK REQUIREMENTS

This scope covers the supply, complete installation, and commissioning of a VSD-controlled cable reeling system for ship loader 1 (SL1) and ship loader 2 (SL2).

5.1 **Current Cable Reel System Components and Operation**

The current cable reeling system at both ship loaders, consists of two 4kW, 400V, 6-pole, squirrel cage induction motor, magnetic clutch, a splitter gearbox, and a mono-spiral cable reel. In this setup, two motors act as inputs to a splitter gearbox, which then drives a single output shaft connected to the cable reeling drum. Magnetic clutches allow for controlled engagement of each motor, providing flexibility and precise control over the reeling and unreeling process. The control system and sensors ensure efficient operation and maintain optimal cable tension and speed.

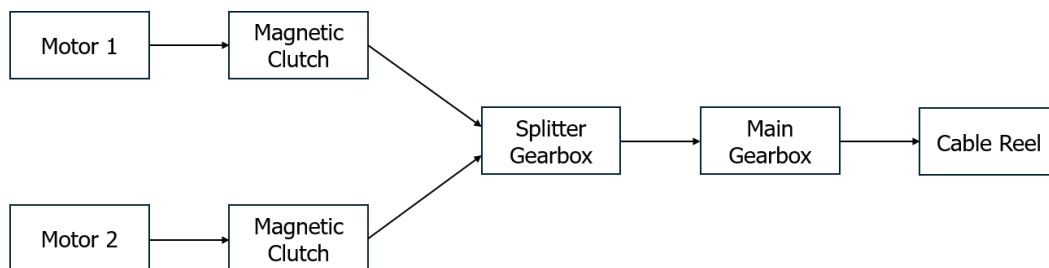


Figure 1: Cable reeling system components.

5.2 **Cable reel operation**

The ship loader moves along a rail system, reeling and unreeling the cable using a motor, magnetic clutch, and gearbox. The torque required to operate the cable reel varies with the load on the cable drum. The figure below illustrates the cable reel's operation under different load conditions.

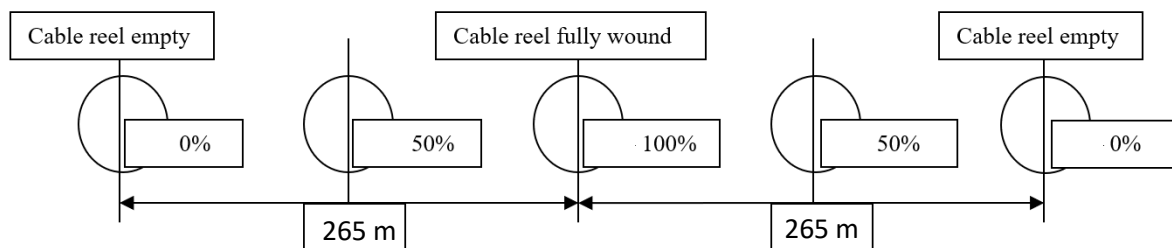


Figure 2: Cable reel 0 – 100% varying load conditions under operation for Ship loader 1.

As the ship loader travels, the torque needed for reeling the cable changes proportionally with the load on the cable reel. At 0% load, the cable reel is empty. As the machine travels and winds the cable, the load and required torque gradually increase. The load reaches 100% (fully wound) after the machine has travelled 265 meters, the midpoint. As the machine continues to travel, it unrolls and unwinds the

cable, decreasing the load and torque. When the machine travels another 265 meters, the cable reel is empty again. This process repeats as the machine moves back and forth.

For Shiploader 2, the process is the same, but the midpoint is at 290 meters.

5.3 ***Modifications to the existing cable reeling system***

The modifications constitute the removal of the two motors, the magnetic clutches and the splitter gearbox and be replaced with a VSD controlled system without affecting the operation of the ship loader.

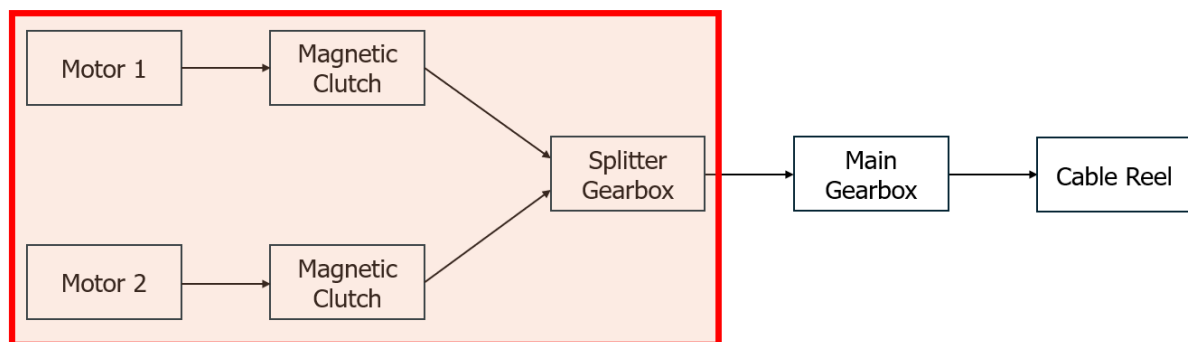


Figure 3: System components which must be replaced,

5.4 ***New components that need to be supplied and installed.***

- 5.4.1 A suitably sized Totally Enclosed, Fan Cooled (TEFC), IP65, 6-pole, 400V, 3-phase, 50Hz, squirrel cage motor to satisfy the torque requirements/demand of the existing cable reel. The motor must fit directly to the existing cable reel gearbox.
- 5.4.2 The motor must be fitted with an electro-magnetic brake with a micro-switch for brake release indication.
- 5.4.3 A suitable encoder must be fitted to the motor shaft.
- 5.4.4 A rotary cam switch, which can provide incremental adjustments to indicate the machine's positions via electrical signals to the VSD control unit, must be fitted to the Reeling Drum System. Position feedback for incremental position indication to the VSD unit in the original prototype was realized using this rotary cam switch.
 - 5.4.4.1 The minimum requirements for the rotary cam switch must have a suitable gear ratio that accommodate the full rotation of the cable reeling

drum for the entire cable length and sufficient switch poles and throws for end and intermediate positions, indicating cable load conditions.

- 5.4.5 A suitable VSD unit with enough electrical inputs to read the outputs from the rotary cam switch. The VSD unit must be equipped with a microprocessor to process input data from the rotary cam switch, determining torque requirements, direction of rotation, rotational speed, and machine position. The microprocessor must send required signals to the inverter on the VSD output section, performing Pulse Width Modulation (PWM) to generate the required motor torque for the cable reeling drum, based on current load conditions.

5.5 *Installation Requirements.*

5.5.1 Electrical Enclosure

- 5.5.1.1 Supply and install a wall-mounted electrical enclosure for the VSD, switchgear, and control circuitry. Minimum of 4 fixing lugs for mounting.
- 5.5.1.2 The electrical enclosure must be manufactured from rust-free mild steel, minimum thickness 2 mm. Painted electrical orange according to the Transnet corrosion protection specification. Access door with pad-lockable handles for access control. Rated IP65.

5.5.2 Power Distribution

- 5.5.2.1 Use the existing feeder bucket in the LT substation for power.
- 5.5.2.2 Install a 2.5mm² multi-core PVC insulated cable using the existing festoon arrangement.
- 5.5.2.3 Confirm cable distances prior to installation.
- 5.5.2.4 Provide wiring diagrams and general arrangement drawings.

5.5.3 PLC and SCADA Software

- 5.5.3.1 Update SCADA alarms and ensure software changes adhere to existing standards.
- 5.5.3.2 Obtain approval for software changes and use accredited programmers.

5.5.4 Integrate the limit switches cable payout limit (full and empty), slack cable limit, over-tension limit into the new system correctly.

6. GENERAL REQUIREMENTS AND CONDITIONS

- 6.1 The minimum requirements set by Transnet Port Terminals regarding the work do not release the contractor (service provider) from their responsibility or the need for sound engineering design and manufacturing practices. Any deficiencies or subpar elements in this specification must be communicated to Transnet Port Terminals during the tender stage, and optional pricing for rectifying such issues must be included. **A site visit will be required prior to quoting.**
- 6.2 The contractor must determine the torque requirements for each ship loader and configure the VSD controller, rotary cam switch, and control circuitry based on the found load conditions.
- 6.3 The contractor is required to:
- 6.3.1 Remove and hand over redundant equipment to Transnet.
 - 6.3.2 Wire the electrical panel.
 - 6.3.3 Label new cables according to drawings.
 - 6.3.4 Blank off unused gland holes.
 - 6.3.5 Use CCG Posi Flex corrosion guard cable glands.
 - 6.3.6 Fully commission all installed or re-used equipment.
 - 6.3.7 Ensure sufficient earthing for critical equipment.
 - 6.3.8 Use stainless steel for electric panel, bolts, nuts, washers, painted as per corrosion protection specifications (Annexure 2 - EEAM-Q-008 CORROSION PROTECTION).
 - 6.3.9 Ensure electrical enclosures are rated IP65.
 - 6.3.10 Complete fabrication/manufacturing/preparation work within three months.

7. TESTING & COMMISSIONING

7.1 Conduct commissioning checks and tests, including:

- 7.1.1 Tensile stress pulls on the reeling drum cable.
- 7.1.2 Setting of tension limit switches.
- 7.1.3 Setup and adjustment of torque settings.
- 7.1.4 Provide a commissioning report on the installation and operational status of new and existing equipment.
- 7.1.5 Ensure installation and commissioning downtime is within three days.
- 7.1.6 Commit to the required installation timeframe.

8. SAFETY REQUIREMENTS

- 8.1 Design and install equipment to ensure safety for TPT personnel.
- 8.2 Provide necessary safety equipment, covers, and guards.
- 8.3 Maintain a safety file and adhere to safety protocols during installation.

9. QUALITY AND SERVICE

- 9.1 The Service Provider shall be required to visit the site prior to quoting.
- 9.2 All services supplied and delivered to Transnet must be of excellent quality in compliance with the specifications. Should the goods or service(s) not be in conformity with the specifications, Transnet reserves the right to reject them, obtain the goods or service(s) from other sources of its free choice and debit the difference in cost, if any, to the Service Provider.
- 9.3 The Service Provider shall be fully responsible to Transnet for the acts and omissions of persons directly or indirectly employed by them.
- 9.4 The Service Provider must have roadworthy and licenced vehicles.

- 9.5 The Service Provider must have a permanently manned telephone (place of business/cell phone) and fax machine, to ensure that immediate contact can be made in case of emergency.
- 9.6 Transnet quality control officer(s) to inspect the work during the installation process and on completion thereof. Upon award of the purchase order, the service provider shall provide TPT with a Quality Control Plan for the task, which shall be reviewed and approved by TPT.
- 9.7 To ensure the highest quality of service, we kindly request information about your company's qualifications, relevant experience, and any certifications that demonstrate your expertise in the installation of cable reeling systems.

10. GENERAL SAFETY AND COMPLIANCE SPECIFICATIONS

- The Contractor must submit a detailed Contractor Execution Plan (CEP) to the Contractor Manager for approval as per **TRN-IMS-GRP-GDL 014.5 Contractor Execution Plan minimum requirements**.
- Contractor must submit **TRN-IMS-GRP-TMP 014.3 Employee Personal Profile Dossier** to contractor Manager for approval before induction training confirmed. Approved Employee Profile Dossiers includes certified copies of medicals, identity documents, competencies etc. submitted via email correspondence to **TPTSLD-Induction-booking@transnet.net**.
- Contractor Compliance SHE File within accordance with File Contractor Compliance File **TRN-IMS-GRP-TMP-014.11** and in line with relevant applicable specifications as per respective **TRN-IMS-GRP-GDL 014.2 Contractor Specification Guidelines, TRN-IMS-GRP-GDL 014.4 Contractor Environmental and Sustainable Specification Guideline, TRN-IMS-GRP-GDL 014.6 Contractor Quality Specification Guideline** and **TRN-IMS-GRP-GDL 014.5 Contractor Security Specification Guidelines**

- Principle Contractor approve **Mandatory Agreement** in terms of **section 37(2) TRN-IMS-GRP-TMP-014.1** of the Occupational Health and Safety Act (OHS Act) and submit to Contractor Manager to agree.
- The Principle Contractor must **submit written request** to the Contractor Manager for permission for sub-contract to provide any work or services to TPT and ensure that all **37.2 Agreement between Principle contractor and Sub Contractor** submitted to Contractor Manager.
- Contractor must **submit** completed **SHE File Electronic** to Contractor Manager for approval.
- Contractor undergoes induction training prior to handing over the site to the Contractor as **TRN-IMS-GRP-GDL 014.6 Contractor Induction Minimum Requirements**.
- SITE ESTABLISHMENT:

All relevant permits and authorisations is as per **TRN-IMS-GRP-TMP 014.7 List of Legal Permits and Authorisations** shared and completed prior to site access. **Contractor appointed** within accordance with **TRN-IMS-GRP-TMP-001.1** prior to site access by TPT.

- Contractor Manager will conduct **TRN-IMS GRP TMP 014.8 Pre-site handover inspection** prior to Site Access grated with Service Provider.
- **No work will commence with approved TRN-IMS-GRP-TMP-014.10 Operational Safe Work Permit** issue to the contractor by Contractor Manager.
- CLOSE OUT PHASE

Contractor Manager and the Contractor must co-sign the **TRN-IMS-GRP-TMP-014.13 Final Handover and Closeout Inspection Checklist**.

- TESTING AND COMMISSIONING:

The Contractor Manager will **develop a test and commissioning plan of the project** and communicate it to the contractor.

- The Service Provider will be responsible for obtaining Hot work permit from TNPA (phone no: 022 703 4331) within conjunction with Fire Safety Management Manual GRM/SHEQ/MAN 001.
- The Service Provider must have a Fire watch on duty during Hot Work and a Fire extinguisher as per required within Fire Safety Management Manual GRM/SHEQ/MAN 001.

- Service Provider will ensure compliance to **TPT SLDT SHEQ-RS PRO 021_Lock Out Procedure** and lock out and isolation done by Trained and competent employees with conjunction with TPT competent.
- Service Provider shall implement and maintain applicable Health, Safety, Quality and Environmental regulations and other relevant standards and regulation, example: applicable SANS codes; OHS Act of 1993, other legislation, ISO 9001, ISO 14001 and ISO 45001, etc.
- Service Provider to ensure that all employees involved in activity is informed of the Hazards and risk they exposed to and all other relevant applicable Safety Work Procedures, Fall protections Plans, Environmental Plans, Emergency Plans and any other relevant procedures, etc. proof to be submitted as part of the SHE File.
- Service Provider will ensure that On the Job HIRAS is completed prior to start of activity to ensure that any additional Risks been identified.
- Service Provider must ensure that when required to off-load or load any heavy equipment and machinery on the plant that they comply with that equipment or machinery will not be physically operated by an employee when required to off-loaded or load from any flatbed or low bed.
- Principle Contractor will be responsible to ensure that Sub Contractor SHE File compiled within conjunction with TPT Requirements and Approved prior to submission to Contractor Manager.
- Service Providers are liable to collect and remove all waste generated during the contract/project. Generated Waste will not allowed being disposed within TPT waste skips. Removal of Hazardous waste will be contractor's responsibility and Disposal Certificate submitted to SHEQ after waste has been disposed safely.

Contact the following employees at SHERQ Department:

SHERQ Manager: Werner Labuschagne

Email: Werner.Labuschagne@transnet.net

Contact number: 022 703 4945

11.ANNEXURES

1. Transnet Reeling Drum (by Powermite)
2. EEAM-Q-008 CORROSION PROTECTION

Compiled by: Engineering Technician	Supported by: Engineer in Training
Recommended by: Engineering Manager	