

SUPPLY, INSTALLATION, TESTING, COMMISSIONING AND CERTIFICATION OF ELECTRIC CHAIN HOISTS FOR BAYHEAD WAGONS

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1. INTRODUCTION

Transnet Engineering requires complete design verification, supply, installation, testing, commissioning and certification of eighteen (18) industrial electric chain hoists and a new dedicated electrical distribution system at the Bayhead Wagons maintenance workshop. The installation serves six (6) workstations. Each station shall be equipped with two (2) 500 kg SWL electric chain hoists and one (1) 1,000 kg SWL electric chain hoist, giving a total of twelve (12) 500 kg hoists and six (6) 1,000 kg hoists.

The hoists are intended for an operational workshop where they may be available for service for approximately eight (8) hours per day. Hoists, motors, brakes, controls, gearboxes and electrical equipment shall therefore be industrial-duty equipment selected by the OEM for the declared load spectrum, starts per hour, operating time and required duty classification. The bidder shall not select equipment solely on motor kW rating.

A new dedicated hoist distribution board (DB) shall be installed approximately 5 m from the existing DB and shall provide eighteen (18) individually protected hoist ways: twelve (12) for 500 kg hoists and six (6) for 1,000 kg hoists, plus spare capacity specified herein.

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2. EXTENT OF WORK

The Service Provider shall be responsible for the complete design verification, supply, installation, testing, commissioning and certification of the electric chain hoists and associated electrical distribution infrastructure.

The principal works shall comprise:

- Supply and install twelve (12) complete 500 kg SWL electric chain hoists.
- Supply and install six (6) complete 1,000 kg SWL electric chain hoists.
- Provide a minimum 6 m vertical hook travel for each hoist, unless the verified station geometry requires a greater OEM chain length.
- Supply and install one new dedicated industrial hoist DB approximately 5 m from the existing DB.
- Provide a new DB sized and arranged for all six (6) stations and all eighteen (18) hoists, comprising twelve (12) 500 kg allocations and six (6) 1,000 kg allocations. All ways shall be clearly and permanently labelled by station, hoist capacity and circuit identification. Initial cable installation should prioritize the nine (9) hoists at Stations 4, 5 and 6.
- Provide the feeder from the existing DB to the new DB after confirming upstream capacity and protection coordination.
- Provide the underground conduit infrastructure for all six (6) stations, including approved drilling/core drilling through the existing concrete floor where required. As the initial installation priority, install and terminate hoist power cables to the three (3) stations furthest from the new DB, namely Stations 4, 5 and 6, while leaving the conduit system ready for future cables of Stations 1, 2 and 3.
- Provide all trenching or approved under-stand cable route works, sleeves/ducts, draw pits or access points if required, reinstatement, cable markers, glands, terminations, earthing, bonding and labels.
- Perform mechanical installation, electrical testing, functional testing, commissioning, statutory inspection/load testing, certification, operator familiarization and handover documentation.

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3. SITE LAYOUT, CABLE ROUTE AND VERIFICATION

The tender design basis shall use the following stated station arrangement. All dimensions shall be verified on site before manufacture, cable procurement or installation. Routes shall follow safe maintainable paths and shall not create trip, impact, pinch or maintenance hazards.

Location / segment	Design-basis distance
Existing DB to new dedicated hoist DB	Approximately 5 m
New DB / wall to Station 1	Approximately 10 m
Station 1 to Station 2	15 m
Station 2 to Station 3	6 m
Station 3 to Station 4	30 m
Station 4 to Station 5	6 m
Station 5 to Station 6	17 m

On a sequential trunk-route interpretation, the nominal route from the new DB to Stations 1 to 6 is approximately 10 m, 25 m, 31 m, 61 m, 67 m and 84 m respectively, before vertical rises, final flexible connections, bends and termination allowances. With three dedicated circuits per station, this corresponds to approximately 834 m of branch-circuit route length before allowances. These figures are for tender planning only; the Service Provider shall measure and price the actual routes.

The statement that the wall-to-station offset is approximately 10 m shall be verified on site. Where this represents a common transverse offset rather than the actual cable path, the contractor shall determine the true routed lengths and update cable-sizing and voltage-drop calculations accordingly.

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4. DESIGN AND REGULATORY BASIS

The installation shall comply with the Occupational Health and Safety Act requirements applicable to driven machinery and electrical installations, the Driven Machinery Regulations, 2015, the Electrical Installation Regulations, 2009, SANS 10142-1 as incorporated for low-voltage wiring, applicable lifting-machine requirements, and the selected OEM instructions. Where requirements conflict, the more stringent legally applicable requirement and OEM limitation shall apply.

The contractor shall be responsible for identifying all current editions and amendments applicable on the date of execution and for obtaining any approvals, registered-person services, LME/LMI inspection and certification required for placing the equipment into service.

5. COMMON TECHNICAL REQUIREMENTS FOR ALL HOISTS

Parameter	Minimum requirement
Quantity	18 total: 12 x 500 kg and 6 x 1,000 kg
Supply	400 V AC nominal, 3-phase, 50 Hz; equipment suitable for verified site voltage
Hook travel	6 m minimum
Lifting speed	Approximately 4 m/min minimum at rated load, unless approved otherwise
Service	Industrial repetitive lifting; available for operation approximately 8 h/day
Duty selection	OEM-declared FEM/ISO duty classification adequate for actual load spectrum and starts/hour; tenderer to state classification and supporting data
Motor insulation	Class F minimum; higher thermal class acceptable
Motor enclosure	IP55 minimum
Thermal protection	Required, OEM-integrated or coordinated external protection
Control voltage	24 V AC/DC preferred; maximum 48 V unless specifically approved
Controls	Wired pendant with UP, DOWN and latching emergency stop
Protection	Overload device plus upper and lower travel limits
Brake	Automatic fail-safe electromagnetic brake
Documentation	OEM datasheets, manuals, duty classification, motor FLC, starting data and certificates

Because the hoists will support an 8-hour workshop shift, a light intermittent-use consumer hoist is not acceptable. The tenderer shall submit the OEM duty group, permissible starts per hour and/or duty cycle and demonstrate that the selected hoist is suitable for the intended service. A nominal FEM/ISO class shall not be assumed without OEM confirmation against the actual operating profile.

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6. 1,000 KG ELECTRIC CHAIN HOISTS

Supply six (6) industrial electric chain hoists, each rated at 1,000 kg SWL. Each unit shall lift the full rated load through at least 6 m hook travel at approximately 4 m/min or better. Motor power shall be OEM-selected for the required performance and duty; 0.75 kW may be used as a tender reference only and shall not override the OEM selection. Each unit shall have a totally enclosed industrial gearbox, rated bearings, OEM lubrication, Class F minimum motor insulation, IP55 minimum motor protection, thermal protection, fail-safe brake, overload protection and upper/lower limits.

7. 500 KG ELECTRIC CHAIN HOISTS

Supply twelve (12) industrial electric chain hoists, each rated at 500 kg SWL. Each unit should provide at least 6 m hook travel and approximately 4 m/min or better lifting speed at rated load. Motor power shall be OEM-selected; 0.5 kW may be used as a tender reference only and shall not override the selected manufacturer's rating. Construction and protection requirements shall be equivalent to those specified for the 1,000 kg units.

8. LOAD CHAIN, HOOKS AND SUSPENSION

Load chain shall be calibrated high-strength alloy steel manufactured for powered hoists, heat-treated and matched to the load wheel and chain guide. Each hoist shall include a correctly sized chain container. Load hooks shall be forged, SWL-rated and fitted with positive safety latches. Suspension points, beams, trolleys, brackets or attachments shall be verified for the imposed static and dynamic loads by a competent person. No unauthorized welding, heating or modification of load-bearing parts is permitted.

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9. BRAKING, OVERLOAD AND TRAVEL PROTECTION

Each hoist shall have an automatic fail-safe brake that applies on release of the command, loss of power or emergency stop. Restoration of supply shall not cause automatic restart. OEM-approved overload protection shall prevent unsafe lifting above rated capacity. Independent upper and lower travel limiting shall prevent hook/body collision and excessive chain payout; travel limits shall not be routinely used as normal operational stops.

10. PENDANT CONTROL AND EMERGENCY STOP

Each hoist shall have a robust wired pendant with momentary UP and DOWN controls and a red mushroom-head-latching emergency stop requiring deliberate reset. Pendant control shall be 24 V AC/DC preferred and not exceed 48 V unless specifically approved. Pendants and flexible cables shall have strain relief and an ingress rating suitable for the workshop environment.

11. NEW DEDICATED HOIST DISTRIBUTION BOARD

The new DB shall be installed approximately 5 m from the existing DB at an accessible wall position. It shall be dedicated to the complete six-station electric-hoist installation and shall provide allocation for all eighteen (18) hoists, irrespective of the staged cable installation. The DB shall not supply unrelated workshop equipment without Employer approval. Every outgoing way shall be clearly and permanently labelled to identify the applicable station, hoist capacity and hoist circuit.

Recommended circuit identification: S1-500A, S1-500B, S1-1000 through to S6-500A, S6-500B and S6-1000. Unused/reserved circuits for Stations 1 to 3 shall be labelled RESERVED - FUTURE HOIST CIRCUIT and shall remain safely isolated until the corresponding cables and hoists are installed.

- Minimum IP55 industrial enclosure.
- 400/230 V AC, three-phase, neutral and earth, 50 Hz.
- Copper busbars rated for calculated maximum demand and prospective short-circuit level.

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- Eighteen (18) individual outgoing hoist ways: 12 designated 500 kg and 6 designated 1,000 kg.
- Minimum 20% spare physical capacity beyond the 18 operational ways, with at least four (4) spare three-phase ways recommended for tender layout.
- Four-pole lockable main isolator/incomer, final rating determined by calculated maximum demand, diversity permitted only where technically justified, starting duty and upstream capacity.
- Separate neutral and protective-earth bars; removable gland plates; permanent circuit schedule and engraved equipment identification.
- Protection coordination, fault-current withstand and breaking capacity to suit calculated site conditions.

A fixed 63 A DB incomer shall not be treated as mandatory unless calculations confirm it is adequate for the selected eighteen hoists. The successful contractor shall calculate the actual simultaneous load, motor starting conditions and upstream spare capacity and shall select the incomer, feeder and bus bars accordingly.

12. SUPPLY FROM EXISTING DB TO NEW DB

The existing DB, busbars, incomer, upstream cable, fault level, earthing system and available spare capacity shall be surveyed before connection. The new DB is approximately 5 m away. The feeder shall be a dedicated copper circuit with correctly rated short-circuit/overcurrent protection and isolation. Cable size shall be established from maximum demand, installation method, grouping, ambient temperature, voltage drop, short-circuit withstand and protective-device coordination. The original 4-core 10 mm² Cu SWA/PVC size may be used only as a preliminary tender reference where calculations demonstrate adequacy; it is not an unconditional final size for 18 hoists.

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13. OUTGOING HOIST CIRCUITS

The DB design shall provide a dedicated three-phase outgoing circuit allocation for each of the eighteen hoists. During the initial installation stage, power cables shall be installed, terminated, tested and commissioned for the nine (9) hoists at Stations 4, 5 and 6. The remaining DB ways for Stations 1, 2 and 3 shall remain reserved, protected against inadvertent energization, and clearly labelled for their intended future circuits. Minimum tender branch cable shall be 4-core 2.5 mm² copper SWA/PVC, 600/1000 V, subject to final engineering verification. Where the selected earthing arrangement or wiring method requires a separate protective conductor, it shall be provided and sized in accordance with the applicable installation standard. Cable size shall be increased where required by voltage drop, current capacity, grouping, fault level, route length, starting current or OEM instructions.

14. UNDERGROUND CABLE ROUTING AT STATION STANDS

Underground containment shall be provided from the new DB route for all six (6) station positions. The Service Provider shall drill/core drill through the existing concrete floor at approved positions where necessary to allow conduits, sleeves or ducts to pass below the floor and continue along/under the existing station stands. Before drilling, the Service Provider shall verify the slab construction and scan/locate embedded reinforcement, post-tensioning, electrical cables, pipes and other concealed services. Drilling locations and diameters shall be approved before execution and shall not compromise structural reinforcement or existing services. Direct loose laying under station stands is not acceptable.

The first cable-installation stage shall serve the three (3) stations furthest from the new DB: Station 4, Station 5 and Station 6. Each of these stations shall receive three (3) dedicated hoist circuits, comprising two (2) 500 kg circuits and one (1) 1,000 kg circuit, for a total of nine (9) initially cabled hoists. Conduit pathways shall be installed for Stations 1, 2 and 3 so that the remaining nine (9) hoists can be connected later without repeating major concrete-floor drilling or disrupting the completed underground route.

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- Use a suitable underground duct, sleeve, trench or mechanically protected route appropriate to the verified construction and workshop conditions.
- Provide draw/access points where required for pulling, inspection and replacement without dismantling structural station stands.
- Maintain manufacturer minimum bend radii and cable pulling limits.
- Seal duct entries and building/DB entries against water, debris and vermin where applicable.
- Provide cable route markers/identification and record the underground route on as-built drawings.
- Where cables emerge from underground, provide robust galvanized conduit, armored protection, guards or equivalent protection up to the local isolator.
- Do not drill, cut, weld or otherwise modify existing structural station stands without written approval and structural verification where required.
- Reinstates floors, trenches and finishes to a safe workshop standard following installation.

Concrete penetrations shall be sealed and reinstated after conduit installation using a durable method suitable for the floor construction and workshop environment. Finished work shall be flush/safe, maintain the required fire/water resistance where applicable, and present no trip hazard. Conduits for future Stations 1 to 3 shall be capped/sealed, draw-wired and permanently identified at accessible ends.

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15. HOIST CIRCUIT PROTECTION AND LOCAL ISOLATION

Each circuit shall have a three-pole motor-suitable protective device coordinated with the hoist motor full-load current, starting characteristics, branch cable and OEM protection. A provisional 10 A to 16 A range may be used for tender planning only; final ratings shall be justified by calculations and OEM data. Required short-circuit, overload and phase-failure/phase-sequence protection shall be provided either upstream or as part of the OEM control system with documented coordination.

Each hoist shall have a dedicated lockable local isolator, minimum 20 A, 415 V AC, three-pole, IP55, mounted in a readily accessible location associated with the hoist and permanently labelled to match the DB circuit schedule.

16. EARTHING, BONDING, TERMINATIONS AND IDENTIFICATION

The new DB, hoists, isolators, SWA armor and conductive containment shall be connected to the verified protective-earthing system. All SWA terminations shall use correctly sized glands and bonding accessories. Conductors shall terminate with suitable lugs/ferrules. Every cable shall be labelled at both ends and at accessible intermediate points where required. Identification shall uniquely link DB way, station number, capacity and hoist asset/serial number, e.g. S1-500A, S1-500B and S1-1000.

17. VOLTAGE DROP, MOTOR STARTING AND MAXIMUM DEMAND

The contractor shall calculate voltage drop from the upstream source through the approximately 5 m DB feeder and through each final branch route. Calculations shall include steady-state load and motor-starting performance. The longest circuits, including Station 6, shall receive particular attention. The installation shall operate without unacceptable voltage depression, contactor dropout, motor stalling or nuisance tripping during the agreed operating scenario.

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18. STRUCTURAL AND MECHANICAL INSTALLATION

Before installation, verify each suspension point and supporting structure for the selected hoist, rated load, dynamic effects and installation arrangement. Submit attachment details and calculations/certification where required. Hoists shall be installed at a level and aligned so that the chain hangs freely without side pull or interference. Safe access for inspection, lubrication, adjustment and replacement shall be maintained.

19. TESTING, LOAD TESTING AND COMMISSIONING

- Electrical insulation resistance, protective-conductor continuity, earthing/bonding continuity and phase sequence.
- Supply voltage, motor running current and applicable starting/operational checks.
- Operation of each circuit breaker/protective device and each local isolator.
- UP/DOWN controls, emergency stop, brake holding, overload protection and upper/lower limits for every hoist.
- Mechanical inspection of suspension, hooks, latches, chain, chain container and fasteners.
- Commissioning and statutory examination/load testing by appropriately authorized/registered lifting-machinery personnel/entity where required.
- Correction of all defects before handover and operational release.

The Driven Machinery Regulations apply to the design, operation, maintenance, inspection, testing and commissioning of driven machinery, and define a power-driven lifting machine as a machine intended to raise/lower or move a suspended load. The contractor shall ensure applicable lifting-machine inspection and testing obligations are met before the hoists enter service.

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20. ELECTRICAL CERTIFICATION

The completed electrical installation shall be inspected, tested and certified by appropriately registered persons in accordance with applicable South African electrical installation requirements. A valid electrical Certificate of Compliance and supporting test documentation shall be included in the handover file.

21. DRAWINGS AND AS-BUILT INFORMATION

- Design and as-built single-line diagram from existing DB through the new dedicated DB to all 18 hoists.
- DB general arrangement and final circuit schedule.
- Plan showing the verified underground cable route, station positions, access/duct points and cable identifiers.
- Cable schedule showing circuit ID, hoist rating, cable type/size, measured route length, protective device and isolator.
- Earthing arrangement and bonding details.

22. DOCUMENTATION AND HANDOVER

- OEM datasheets and manuals for every hoist type.
- Declared duty group/class, starts per hour/duty cycle, motor ratings, FLC, starting data, lifting speeds and serial numbers.
- Maximum-demand, feeder/branch cable sizing, voltage-drop, fault-level and protection-coordination calculations.
- Electrical CoC and test report.
- Individual inspection/load-test certificates traceable to serial number and applicable LME/LMI documentation.
- Commissioning sheets, warranty, maintenance plan, recommended spares list and operator familiarization records.

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23. WARRANTY

Provide a minimum twelve (12) month warranty from successful commissioning and formal acceptance, covering hoists, motors, brakes, controls, DB equipment, protective devices, cables, isolators, underground containment/protection, terminations and installation workmanship.

24. MINIMUM DESIGN RATINGS SUMMARY

Component / parameter	Minimum tender requirement
Hoists	18 total
500 kg hoists	12 units; 2 per station
1,000 kg hoists	6 units; 1 per station
Stations	6
Operational availability	Approximately 8 h/day; industrial duty selection required
Lifting travel	6 m minimum
Lifting speed	Approx. 4 m/min minimum at rated load
Supply	400 V AC nominal, 3-phase, 50 Hz
Motor rating	OEM-selected; 0.5 kW (500 kg) and 0.75 kW (1,000 kg) are tender references only
Motor insulation / enclosure	Class F minimum / IP55 minimum
New DB location	Approx. 5 m from existing DB
DB outgoing allocation	12 x 500 kg + 6 x 1,000 kg = 18 active ways
DB spare capacity	Minimum 20% physical spare capacity; 4 spare 3-phase ways recommended
DB incomer	Calculated; 4-pole lockable; not less than design demand
Branch cable	4-core 2.5 mm ² Cu SWA/PVC minimum tender basis, final calculation required
Feeder cable	Calculated for 18-hoist demand; original 4-core 10 mm ² basis only if proven adequate
Local isolator	20 A minimum, 415 V, 3-pole, lockable, IP55
Cable routing	Secure underground route along/under existing station stands with mechanical protection
Certification	Electrical CoC/test report plus applicable lifting-machine inspection/load-test certification

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25. STATION ALLOCATION SCHEDULE

Station	500 kg hoists	1,000 kg hoists	Nominal route from new DB
Station 1	2	1	10 m
Station 2	2	1	25 m
Station 3	2	1	31 m
Station 4	2	1	61 m
Station 5	2	1	67 m
Station 6	2	1	84 m

Sequential tender-route basis only. The service provider shall verify actual underground routes and all vertical/final connection lengths on site.

26. TENDER SUBMISSION REQUIREMENTS

- Make model and technical datasheet for each proposed hoist capacity.
- OEM duty classification and evidence that the equipment is suitable for the stated 8-hour/day workshop service.
- Motor FLC, starting current/method, brake and control data.
- Proposed DB rating, fault rating, feeder size and protection philosophy supported by preliminary calculations.
- Proposed underground cable-routing method with excavation/reinstatement assumptions and structural protection details.
- Programme, commissioning method, statutory inspection/testing approach and warranty statement.
- Schedule of deviations. Any deviation not declared at tender stage shall be deemed compliant with this specification.

27. FINAL ACCEPTANCE

Final acceptance shall occur only after all eighteen hoists and the complete electrical infrastructure are installed, labelled, inspected, tested, commissioned and certified, all defects are closed out, and the complete handover file is accepted by the Employer. No hoist shall be released for operational use until its circuit, suspension, chain, hooks, brake, controls, limits, overload protection and required certification have been verified.

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