

KINGDOM OF LESOTHO
LESOTHO HIGHLANDS WATER PROJECT
THE LESOTHO HIGHLANDS DEVELOPMENT AUTHORITY



LESOTHO HIGHLANDS WATER PROJECT

REQUEST FOR QUOTATION FOR

**INSTALLATION OF AN AUTOMATIC HYDRAULICALLY ACTUATED
TRASH RACK CLEANING MACHINE**

ANNEXURE 2: INSTALLATION SPECIFICATION

LHDA
LHDA Tower Building (Formerly Lesotho Bank Tower)
Kingsway
Maseru, Lesotho
SEPTEMBER 2025

1. Purpose of this document

This document specifies the installation specifications for the automatic hydraulic articulating trash rack cleaning machine (TRCM) for Matsoku Weir.

2. Reference Documents, Standards and Abbreviations

This document forms part of the Request for Quotation (RFQ) for the installation of the TRCM and its association rail system.

The TRCM must be installed in accordance with the TRCM Contractor's installation manual.

The Installation Contractor must comply with the Lesotho Occupational Health and Safety Act of 2024.

The Installation Contractor shall ensure that the installation works for the TRCM conform to the same international standards and industry best practices as those applied to the design and manufacturing of the TRCM. The Installation shall comply with the following:

Table 1. Relevant Zutari Standards

Standard No	Title
SPE-EE-0011	Low Voltage Cables

Table 2. Relevant South African Standards

Standard No	Title
SANS 808	Cable glands for use on flameproof enclosures
SANS 1339	Electric cables - Cross-linked polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV
SANS 1507-3	Electric cables with extruded solid dielectric insulation for fixed installations (300/500 V to 1 900/3 300 V) Part 3: PVC Distribution cable
SANS 1700	Fasteners
SANS 10104	Handrailing and balustrading (safety aspects)
SANS 10142-1	The wiring of premises Part 1: Low-voltage installations

Standard No	Title
SANS 10160	Basis of structural design and actions for buildings and industrial structures
SANS 10198	The selection, handling and installation of electric power cables of rating not exceeding 33 kV
SANS 10199	The design and installation of earth electrodes
SANS 10292	Earthing of low-voltage (LV) distribution systems
SANS 60099	Surge arresters
SANS 62305	Protection against lightning

Table 3. Relevant IEC Standards

Standard No	Title
IEC 11801	Information technology — Generic cabling for customer premises
IEC 60364	Low-voltage electrical installations
IEC 60144	Degrees of protection of enclosures for low-voltage switchgear and controlgear
IEC 60909	Short-circuit currents in three-phase AC systems – Calculations of currents
IEC 61156-6	Multicore and symmetrical pair/quad cables for digital communications - Part 6: Symmetrical pair/quad cables with transmission characteristics up to 1 000 MHz
IEC 61643-11	Low-voltage surge protective devices - Part 11: Surge protective devices connected to AC low-voltage power systems - Requirements and test methods

3. Site Information

Temperatures generally range between -15 °C and 35 °C. The site elevation is around 2100 masl and the surrounding area is subject to lightning strikes.

4. Installation specification

4.1. Rail system

The rail system must be installed as per the assembly instructions provided by the TRCM Contractor. Refer to document *Assembly Instructions, Technical Documentation, Rail System, Muhr*.

Anchor bolts and embedded parts shall be checked for position, projection, and thread condition before placement of the TRCM.

4.2. TRCM installation

All erection and installation work must comply with the TRCM Contractor's assembly instructions.

All work must be carried out using qualified personnel, calibrated tools, and certified lifting equipment.

Coating damage caused by the Installation Contractor shall be repaired in accordance with the TRCM Contractor's instructions.

All lifting, handling, and positioning must avoid damage to the existing structure.

4.3. Handrails

Handrails shall comply with SANS 10104 and the following minimum requirements:

- Existing handrails must be cut using appropriate cold-cutting or low-heat cutting tools to avoid damage to adjacent structures, coatings, or galvanizing.
- All cut edges must be ground to a smooth radius of not less than 2 mm to remove sharp edges and facilitate proper coating adhesion.
- Surfaces exposed by cutting must be prepared to Sa 2 (near-white metal blast) or mechanically cleaned to an equivalent standard, degreased, and thoroughly dried prior to coating.
- Following surface preparation, a two-pack zinc-rich epoxy or polyurethane coating must be applied to the exposed steel surfaces and comply with the Hot Dip Galvanizers Association requirements.

- The repair coating must overlap onto adjacent intact galvanizing by not less than 50 mm.
- The coating must be allowed to cure fully to the coating manufacturer's specified interval before further handling or installation.
- New handrail sections must be provided to match the existing geometry, including post spacing, handrail height, intermediate rails, and toe plates, and must be hot dip galvanized (HDG) to comply with the Hot Dip Galvanizers Association requirements prior to installation.

4.4. Steel platform

The steel platform must be a bolted assembly consisting of:

- A welded stainless-steel structural frame.
- A stainless steel RS40 rectagrid floor grating.
- Chemical anchor bolts fixing the steel platform to the weir structure

The structural frame must be fully constructed from stainless steel 304 or better.

The Installation Contractor may consider manufacturing the structural frame on site. All stainless steel components shall be pickle and passivated before installation.

4.5. Electrical

4.5.1. Cable Containment

Cable Protectors:

Cable protectors must be of the heavy-duty rubber channel, similar to *RPS Extreme Rubber Cable Protectors* sold by *Electriduct*, and must comply with the following minimum requirements:

- Cable protector must provide a minimum of one channel which must have a minimum channel cross section of 100 x 100 mm. Separate channels must be used for communication, power and earthing cables.
- Sections must be manufactured as single, integral molded pieces.
- Surfaces must be free from pores, scuffing, molding defects (such as underfilling) and recycled rubber inclusions.
- Each section must be securely connected to adjacent sections.

- Holes for expansion bolts must be counterbored, and cable protectors must be securely anchored to the structure.
- The outer surface of the cable protectors must be skidproof.
- The cable protectors must have a weight capacity of 20 tonnes.

The materials of the cable protectors must comply with the following minimum requirements:

- The colour of the cable protectors must be uniform throughout.
- The materials must withstand temperatures of -20 to 40 °C without discolouring, cracking, peeling or warping.
- The materials' shock elasticity must be no less than 20%.
- The materials' wear loss must be less than 0.5 cm³/km.
- The materials' shore hardness must be between 65 to 85.
- The materials must be resistant to solvents including petrol, diesel and vehicle lubricants.

Trunking

The installation of cabling in rigid metallic wireways must comply with SANS 10142-1 and the following minimum requirements:

- Trunking must be manufactured from stainless steel, be pickled and passivated, and free of surface defects.
- Trunking must be sturdily mounted to the external wall of the isolating gate operating chamber, using appropriate supports and fixings.
- Trunking must provide protection of the cables from direct sunlight, moisture ingress, and must allow for adequate drainage.
- Multiple compartments must be provided where it is expected for communication cables to run parallel to the power cables. Separate compartments must be provided for communication and power cables.
- Continuous earth links must be provided to ensure electrical continuity and equipotential bonding.

4.5.2. On-Site Cabinet (OSC)

The installation of the on-site cabinet (OSC) must comply with the following minimum requirements:

- All earth continuity conductors and earth busbars to the OSC must be connected to the main earth system.
- All cables must be glanded on gland plates at the bottom compartment of the OSC. Glands must comply with SANS 808.
- A comprehensively, neatly typed legend card identifying all the circuits is provided before the OSC is commissioned
- The OSC design is submitted to the Client for review and approval within the agreed upon time.
- The on-site cabinet must be securely mounted in the designated location, and it must be level.

4.5.3. Electric Power Cables

The power cables must comply SANS 1507-3, SANS 10198, and the following minimum requirements:

- All power cables must be PVC bedded SWA PVC sheathed 600/1000V Low Smoke Low Halogen (LH) (Blue Stripe) copper cables.
- All cables must be manufactured complete with screens, drain wires, insulation and outer sheath requirements.
- All power cables must be routed above ground along a combination of cable protectors and trunking between the mini-substation and TRCM

Cable Installation

The installation of all cables shall comply to the requirements of SANS 10142-1 and the following minimum requirements:

- All power cables must be made multicore with individually screened cores.
- Where a separate neutral is required, the neutral shall be made with the same cross-sectional area as the associated phase conductor.

Cable Joints

No cable joints shall be permitted except with special approval from the Consultant

4.5.4. Earth Bonding

Earthing continuity must comply with SANS 10142-1 and the following minimum requirements:

- Earthing cables used for continuity bonding must be 70 mm² or 16 mm² insulated (green/yellow) copper cable.
- The resistance between any metallic part of the installed TRCM and the main earthing point of the supply system shall not exceed 10 Ω.
- The final earth resistance must be not more than 1 Ω.

Installation

- Where no suitable earth clamp or earth bond equivalent has been identified by the Installation Contractor, a Cadmium bolt and washer system fixed against the exterior metal structure must be used.

4.5.5. Trash Rack Cleaning Machine

The installation of the trash rack cleaning machine (TRCM) must comply with the following minimum requirements:

- All installation work must be done in accordance with the original equipment manufacturer (OEM) recommendations.
- Sufficient clearance must be allowed for inspection, installation, testing and maintenance of the trailing cable and route.
- The rail system and the TRCM must be earth bonded prior to the installation of the TRCM.

4.6. Communication

The ethernet cable must be category 5e with 8P8C terminations and must comply with ISO/IEC 11801, IEC 61156-6 and the PROFINET guidelines.

5. General Specifications

The Installation Contractor shall comply with the general specifications detailed below as a minimum.

5.1. Materials

5.1.1. General

All materials used in the installation of equipment shall be new and unused. The Installation Contractor shall ensure that the materials are selected in accordance with the best engineering practice to suit the working conditions and environment.

5.1.2. Steel

Structural steel shall comply with the requirements of SANS 50025 (or similar approved) for grade S 355 JR or for grade S 355 JO.

5.1.3. Stainless Steel

Stainless steel shall be of EN Grade 1.4301 (304) or better and shall be clearly and permanently marked with the grade of stainless steel.

5.2. Fabrication of Carbon Steel and Stainless Steel

5.2.1. General

Welding shall comply with the clause "Welding".

Sharp edges, pits, inclusions, weld spatter, undercuts, indentations, or other surface defects are not acceptable.

Edges shall be rounded to a radius of at least 2 mm.

Designs shall avoid inaccessible pockets and hollows.

Sharp edges on items fabricated from thin sheets will not be acceptable and sharp edges shall preferably be avoided by good design.

Inspection of fabrications shall generally be done after fabrication is complete.

5.2.2. Carbon Steels

Structural steelwork shall be of grade S 355 JR or of grade S 355 JO in accordance with SANS 50025 (or similar approved).

The requirements of the Hot Dip Galvaniser's Association of South Africa shall be complied with if the item is to be hot dip galvanised. Designs shall provide proper access for safe and complete entry of the molten zinc into open spaces so that subsequent drilling at the galvaniser's yard is avoided.

Surfaces to be coated shall be accessible by blast and spray equipment. Inaccessible pockets, such as bad weld profile as well as hollow structures, are unacceptable and the angle of impact of blast material and sprayed coatings shall

not be less than 45 degrees. Edges shall be rounded for safety reasons and also to be suitable for the coating system to be applied.

5.3. Welding

5.3.1. Standards

Welding shall be in accordance with SANS 15614-1 or similar approved by the Employer.

Welders shall be experienced artisans approved in accordance with BS 4872 or equivalent approved by the Employer.

The Installation Contractor shall ensure that all structural welding, including all welding of pipework, is done in accordance with a welding procedure specification (WPS). The welding supervisor shall ensure compliance with the WPS. The document shall always be available for scrutiny.

5.3.2. Preparation

Wire brush and de-grease both surfaces to at least 30 mm from the weld.

Cleaning of stainless steel shall utilise non-chlorinated fluids only.

5.3.3. Continuous Welding and Elimination of Crevices

Welding shall be continuous on all sides of any joint. Designs which do not allow this shall be re-designed.

Crevice, including those arising from welding on one side only, shall be eliminated. This requirement applies to the welding of all metals and welding procedure shall be designed to prevent unacceptable deformation.

Welds which are only accessible from one side shall be prepared so that the root run provides an acceptable profile and prevents the formation of crevices.

Pipework shall be designed so that such welds can be inspected and, where applicable, pickled and passivated.

In special cases only, non-continuous welding might be accepted in writing by the Employer.

5.3.4. Welding Appearance

Welding shall be free of blowholes, projections, pinholes, splatter and undercuts and all welding flux, weld spatter and other sharp imperfections shall be removed. Weld beads with a surface irregularity exceeding 3 mm or with sharp crests having a radius under 2 mm shall be ground.

5.3.5. Site Welding

Site welding shall be kept to a minimum and shall only be undertaken with the acceptance of the Engineer.

5.4. Corrosion Protection

Hot-dip galvanising shall comply with SANS 121 and the guidelines of the Hot Dipped Galvanisers Association of South Africa.

5.5. Guard Rails

Guard railing shall be hot dipped galvanised and shall comply with SANS 10104 (or similar approved). The guard rails shall match the existing handrailing.

If the guard rails are welded or cut after hot-dip galvanising, they shall be returned to the galvaniser for re-galvanising.

All anchor fasteners, including nuts and washers shall be of EN Grade 1.4401 (316) stainless steel.

Fastener diameter shall not be less than M12.

5.6. Fasteners

Bolts and nuts shall be hexagon head type complying with SANS 1700 (or similar approved) with threads of the coarse pitch series.

All fasteners and anchors shall be of EN Grade 1.4301 (grade 304) or better.

Anchors shall be tensioned when their nuts are tightened, i.e. it is not acceptable to use a second nut below the baseplate to position it; and the holding down force shall be loaded into the concrete structure rather than the baseplate being held between two nuts.

Flat washers shall be provided under nuts and bolt heads. Spring washers shall be used on fasteners subject to vibration (other approved locking arrangements will also be acceptable on proprietary equipment).

Washers shall be of the same material as the fasteners.

Before assembly, stainless steel threads shall be treated with a nickel-based, anti-seize/corrosion protection compound such as Chesterton 725: Nickel Anti-Seize Compound, or equivalent. Copper based compounds are not acceptable.

A small amount of the compound shall be applied along the full length of the exposed thread before fastening. Excessive compound visible on the thread after

the nut has been applied is unacceptable and indicates that the compound has not been used correctly.

Bolt threads shall project no less than 1 thread and no more than 8 threads from the head of the nuts when fixed. Longer projections will only be allowed if the Installation Contractor can show that bolts of a more suitable length are not manufactured.