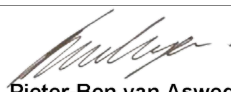


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APPROVAL & DISTRIBUTION

	NAME	SIGNATURE & DATE
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1 EXECUTIVE SUMMARY

South African Nuclear Energy Corporation SOC Ltd (Necsa) has built induction furnaces for the smelter with the purpose of reducing the volume of uranium contaminated scrap metals, by melting the scrap and concentrating the uranium into a slag. The type of material to be processed are ferrous and non-ferrous scrap metals stored on the Necsa Pelindaba site.

The full Scope of Works of the Furnace Smelter includes the scope of the Emergency Cooling Water and Collection Systems. Whereas the scope of the Emergency Cooling Water System is for information only and does not form part of this document, the focus of the design and construction of the Water Collection System scope is to be done in consideration of the requirements described in the System Design Description Document: NLM-DP-00003.

2 PURPOSE AND SCOPE

2.1 Purpose

The URS is to cover all of Necsa's civil, structural, piping and mechanical requirements and basis for the detailed design and Implementation of the scope of the Emergency Cooling Water Collection System of the Smelter Project.

This document's purpose is to enable the potential suppliers and contractors to understand Necsa NLM's Area 26 Smelter Facility's Emergency Cooling Water Collection System's scope and requirements, and from this to be able to offer a comprehensive price and technical solutions.

The criterion establishes the basis for design of the works associated with the emergency cooling water collection system's scope of work only.

2.2 Preamble


- The URS shall be read in conjunction with the relevant Necsa Standards and Specifications which shall be issued as a part of the tender enquiry.
- The standards, codes and guidelines listed below (Section 4) are given to provide minimum requirements; deviations from the standards shall be subject to prior motivation and approval by Necsa's Engineering Services Department.
- Design principles will be in line with the governing acts and regulations, i.e., Occupational Health and Safety Act as amended, where applicable.
- The scope of design, manufacture, supply, features and operation of equipment must be in compliance with all current South African Legislations.
- Where there are discrepancies, the most stringent requirement shall apply.

2.3 Scope

The scope of supply shall include, but not be limited to taking site measurements to determine the full scope of works, the layout, design, detailing, manufacturing, corrosion protection, delivery, construction, testing, and commissioning of the Emergency Cooling Water Collection System Facility, at the designated NLM Smelter area.


The input in determining the full of scope of works can be found in the following documents:

- NLM-DP-00003: System Design Description: Smelter Emergency Cooling Water Collection System
- NNDD-V-26-Y-PRPID-0006: Emergency Cooling Water P&ID
- NNDD-V-26-C-BUNDE-0002: Building V26 Emergency Cooling Water Bund

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The details of the scope shall include a 15000-litre emergency cooling water collection tank, delivery and suction piping, fittings and valves, pipe supports, suction pump, a bund, hose connector spuds, a 10-m hose cooling water with a suitable connector for the discharging of water into a road tanker. The road tanker scope of work, does not form part of the Emergency Cooling Water scope of works.

- It includes a concrete slabs, foundations for the pump, and a bunded area sufficient for the full size plus 10% of the emergency water collection tank.
- It includes stairways, access platforms or ladder, if needed, based on the supplier's design requirements.
- It includes the fitting of automatic and other devices (operative in the event of physical damage to the installation) for the purpose of ensuring maximum security, for the storage of water from a design point of view, and for limiting the escape of liquid through normal pressure relief fittings.
- It includes drain and bleeding valves.
- It includes an approved coat corrosion protection system.
- It includes the supply of all equipment, valve and special material lists complete with the brochure, indicating make and technical specification of the equipment.
- It includes provision of documentation and drawings proving compliance with all relevant safety codes and standards.
- It includes an allowance by the supplier and contractor of a period of 5 days for medicals, inductions, and trainings prior to site establishment and an additional 1-day for exit medicals.
- To be excluded from the cost, are the medicals costs. These shall be performed at Necsa medical station on-site.
- It includes a submission by the supplier and contractor of the safety file that will contain a risk assessment, and approval period of 2-weeks by Necsa from date of submission.
- It includes both a fixed-cost and time-related cost (based on hourly rates) for management, supervision, labour, plant, equipment, and tools for the duration of the construction period.
- It shall also include a sum for the supply, fabrication and installation of gaskets, including U-bolts, holding down bolts, welding, bolting and pipe supports.

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3 REFERENCES AND ABBREVIATIONS

3.1 References

This document refers to the following documents:
[1] NLM-DP-00003: System Design Description: Smelter Emergency Cooling Water Collection System
[2] NNDD-V-26-Y-PRPID-0006: Emergency Cooling Water P&ID
[3] NNDD-26-C-BUNDE-0002-R02_1 Sht 1 of 5
[4] SHEQ-INS-0205: Document Numbering Requirements
[5] SHEQ-INS-0206: Requirements for Document Control
[6] SHEQ-INS-0207: Drawing Numbering Requirements
[7] SHEQ-INS-0208: Requirements for Control of Records
[8] SHEQ-INS-0233: Design Control
[9] SHEQ-INS-0825: Requirements for Construction
[10] SHEQ-INS-0234: Requirements for External Design Organisations
[11] NLM-DP-00003S: System Design Description Document
[12] SHEQ-INS-0206:-Necsa requirement for document controlSHEQ-INS-4130: Necsa 's Safety, Health and Environmental Policy
[13] SHEQ-INS-0200: NECSA quality policy
[14] NLM-DP-00003: System Design Description: Smelter Emergency Cooling Water Collection System
[15] NNDD-V-26-Y-PRPID-0006: Emergency Cooling Water P&ID

3.2 Abbreviations

Abbreviation	Description
ANSI	American National Standard Institute
ASME	American Society of Mechanical Engineering
ASTM	American Society for Testing and Materials
AWS	American Welding Society
NLM	Nuclear Liability Management
OHSA	Occupational Health and Safety Act
SANS	South African National Standards
URS	User Requirement Specification

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4 LEGISLATIONS, CODES, STANDARDS AND GUIDELINES


The following, but not be limited legislations, codes and standards shall form part of the minimum requirements. The International Standards will also be followed, where they are referenced in the local Standards and Specifications.

- Occupational Health and Safety Act, Act 85 of 1993 and Regulations
- National Environmental Management Act, Act 107 of 1998 and Regulations
- International Standard Organization ISO 9001:2015
- SANS 10329 Construction of steel tank
- And other relevant mechanical, process, civil and electrical design standards identified by the NECSA design engineers

5 TECHNICAL REQUIREMENTS

5.1 General requirements

- 5.1.1 The design of mechanical, civil and infrastructural work shall be performed by, or under the direction, control and supervision of a registered person, who shall accept legal accountability for the design. Such registered person shall have appropriate knowledge and appropriate experience in the analysis and design of structural civil and infrastructure works and concrete structures in the particular application and shall comply with all the requirements of the SANS and Necsa standards.
- 5.1.2 The latest editions of the applicable standards, codes and regulations at the time of the contract shall be considered with as a minimum requirement for the design, materials, manufacture, installation, testing and commissioning of all equipment otherwise noted in this specification.
- 5.1.3 In the absence of an applicable South African Standard, the latest edition of the relevant and appropriate international Standards or Standard Code of Practice shall govern the quality of design, materials, and construction, except where otherwise indicated, which is to be approved by Necsa's Engineering Services Department Prior to implementation.
- 5.1.4 In the event of different requirements between standards and codes, the strictest requirement shall apply. Any deviation which require clarification shall be brought to the attention of Necsa's Engineering Services Department as a form of concession application, which must be reviewed and approved by Engineering Services Department.
- 5.1.5 All works are to be designed for a "life-of- Necsa's Smelter Plant" or a minimum of 20 years.
- 5.1.6 Plant and equipment must be designed and specified for optimal reliability and life cycle cost over the expected life of the plant.
- 5.1.7 The design will be done with the consideration of procuring local equipment as far as possible. This will simplify the critical spares on site as well as to ensure adequate supply of spares in the stores.
- 5.1.8 All equipment and structures shall be designed to facilitate easy access, inspection, cleaning, operating and maintenance.
- 5.1.9 Standardization of equipment and spares will be considered in the design phase.
- 5.1.10 Access platforms shall be provided to all inaccessible equipment that requires regular maintenance.
- 5.1.11 Design codes, assumptions and GA sketches used in the design shall be recorded on the first sheet of calculations.


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- 5.1.12 Design calculations shall be indexed, and pages numbered.
- 5.1.13 All designs shall be based on proven industry technologies. The supply of materials and workmanship throughout shall be in accordance with the best and modern practices. Only equipment with proven service in similar applications shall be offered. Such applications shall be identified by the supplier.
- 5.1.14 Sufficient space to get access for maintenance or inspection doors to be added for maintenance from the outside.
- 5.1.15 The initial inspection, testing and certification of storage vessels shall be under the supervision of an approved inspection authority who shall furnish each storage vessel with a certificate providing the date of the test, the pressure at which the storage vessel was tested, any other data considered necessary, and the stamp of the approving authority.
- 5.1.16 The supplier and contractor are to demonstrate in their submission knowledge of the relevant and applicable requirements to qualify to tender.
- 5.1.17 Provision of a detailed pricing structure that includes clear breakdowns of the cost components, such as design and engineering costs, labour costs, management and supervision costs, plant and equipment costs, transportation and any other relevant fees shall be submitted by the tenderer to qualify.
- 5.1.18 The supplier and contractor shall as a minimum requirement provide evidence of their experience, certifications, and a track record of successful scope of design, supply and installation projects. Joint Ventures/partnerships shall be allowed.
- 5.1.19 A Level 3 schedule and programme shall be submitted in MS Projects indicating a detailed WBS at tender including all activities from design to acceptance of the facility and monthly service and maintenance schedule for the period and duration of the agreement/contract.
- 5.1.20 All Construction activities are to comply with NECSA's SHEQ-INS-0825 and The Occupational Health and Safety Act 83 of 1993.
- 5.1.21 The supplier and contractor shall indicate their exclusions, site requirements and NECSA's obligations and responsibilities in their tender submission for effective and efficient performance of their activities including site construction activities.
- 5.1.22 A Data Pack to be approved by NECSA prior to commencement of the works shall form part of the Handover Documentation on completion of the works.

5.2 Engineering Disciplinary Requirements


5.2.1 Mechanical and Materials

- 5.2.1.1 All equipment with stored energy shall have a lock out procedure.
- 5.2.1.2 All openings where equipment is removed for maintenance shall be temporarily closed and barricaded.
- 5.2.1.3 All equipment shall be earthed electrically according to the electrical standards of the project.
- 5.2.1.4 Equipment shall be provided with corrosion protection to withstand the external environment with regular splashing and washing by cooling water. The corrosion protection shall last the life of the equipment, excluding abrasion and wear.
- 5.2.1.5 Welding electrodes shall conform to the E70 series AWS A5.1 unless otherwise specified.
- 5.2.1.6 Minimum welding specified for welded connection shall be 6mm continuous fillet welding

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in accordance to AWS D1.1.

- 5.2.1.7 Tanks will consist of a bitumen mix bedding (50mm thick) before being located directly on a concrete base.
- 5.2.1.8 Pump components in contact with the fluid, shall be made of corrosion and abrasion-resistant material compatible with the fluid being pumped.
- 5.2.1.9 The adjusting bolts for the motors assembly to be stainless steel.
- 5.2.1.10 Pumps will be mounted onto a base plate with complete assembly (motors, couplings, mating flanges, guards, V-belts and pulleys).
- 5.2.1.11 All impellers shall be balanced statically and dynamically to minimize vibration.
- 5.2.1.12 Flushing and draining points shall be added to the system.
- 5.2.1.13 Easy access to the pump will also be considered for when bund wall flooding occurs.
- 5.2.1.14 Pipework shall be sufficiently supported to ensure that there is minimum loads.
- 5.2.1.15 Manually operated valves will be located at a safe working platform with easily accessible locations.
- 5.2.1.16 Only high-quality and approved valves will be used on the project. NECSA Lead Engineer shall be consulted when selecting valves to ensure standardization where possible.
- 5.2.1.17 All valves will be flanged type, rated at 150 pounds (150 lb).
- 5.2.1.18 Manufacturer's Data/Name plate shall be fixed to the shell of the Tank with the following details:
 - a. Name of Manufacturer
 - b. Country or origin
 - c. Year of manufacture
 - d. Manufacturer's serial number
 - e. Name, number and date of the standard of design
 - f. Design gauge pressure in Pascal
 - g. Maximum permissible operating pressure in Pascal's
 - h. Operating temperature
 - i. Capacity in cubic meters
 - j. Where applicable all design calculations shall be made on standard design sheets.
- 5.2.1.19 The materials and components of all plant and equipment forming part of the contract works shall be suitable for continuous operation in an exposed outdoor and harsh environment.
- 5.2.1.20 All Materials that will be used for the project shall be new, free from any defects and imperfections such as cracks, tears or porosity.
- 5.2.1.21 The materials and components of all plant and equipment forming part of the contract works shall be suitable for continuous operation in an exposed outdoor and harsh environment.
- 5.2.1.22 Care shall be taken to avoid galvanic corrosion where two components of different materials are mated or bolted together.
- 5.2.1.23 The equipment will be designed "fit for purpose" to carry out the duties specified. Vendors must identify any special requirements with respect to dust, temperature, moisture or humidity for the equipment. The equipment will be regularly hosed down with process water.
- 5.2.1.24 The equipment and component data sheets shall be used as a standard for the design. All materials shall be supplied with material certificates with heat numbers corresponding

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to the heat numbers on the material supplied


- 5.2.1.25 The materials and components of all plant and equipment forming part of the contract works shall be suitable for their application, of rugged, heavy-duty design and suitable for operation in a harsh and abrasive environment.
- 5.2.1.26 The equipment shall be capable of operational requirements, when requested, with downtime only for normal maintenance. The equipment shall operate without excessive noise and vibration, wear, overheat, stress and deflection.
- 5.2.1.27 All relevant certifications on the material of construction as well as NDT results (If applicable) will be included in the Equipment Data Book.
- 5.2.1.28 All the weather conditions and elements will be considered when selecting materials for the project.
- 5.2.1.29 In the case where different materials are used and combined, the designer will ensure that there is no galvanic corrosion at that point.
- 5.2.1.30 Steel plate for pressure vessels and tanks will be selected in accordance with the appropriate code for design and construction of pressure vessels and tanks.
- 5.2.1.31 Valves shall have easy access points by means of ladders, stairs and platforms.
- 5.2.1.32 Tank work shall comply with the confined space requirements.
- 5.2.1.33 All modifications done after corrosion protection, shall be repaired accordingly.
- 5.2.1.34 Steel plate for pressure vessels and tanks will be selected in accordance with the appropriate code for design and construction of pressure vessels and tanks.
- 5.2.1.35 All bolts, nuts and washers shall be minimum M20 grade 8.8 (U.O.N) for all structural connections, with hardened washers under the head and nut.
- 5.2.1.36 Bolts for mechanical plate-work and hand-railings shall be a minimum M16, Grade 8.8.
- 5.2.1.37 Washers of the same grading shall be used on all bolting requirements.
- 5.2.1.38 Washers shall not be used as structural items to cover up any manufacturing discrepancies.
- 5.2.1.39 Bolts shall not be used to help with the alignment issues on improperly manufactured parts and sections, or brining missed align sections together.
- 5.2.1.40 All bolted connections shall have at least two clear threads projecting beyond the nut when tightened.
- 5.2.1.41 Visual inspection in accordance with AWS D1.1.
- 5.2.1.42 Bolts for mechanical plate-work and hand-railings shall be a minimum M16, Grade 8.8.
- 5.2.1.43 Washers of the same grading shall be used on all bolting requirements.
- 5.2.1.44 Washers shall not be used as structural items to cover up any manufacturing discrepancies.
- 5.2.1.45 Bolts shall not be used to help with the alignment issues on improperly manufactured parts and sections or bringing misaligned sections together.
- 5.2.1.46 Flame cutting will not be used for manufacturing and making fastener holes or slotted holes on site.
- 5.2.1.47 Square washers are to be used on slotted holes.
- 5.2.1.48 All bolted connections shall have at least two clear threads projecting beyond the nut when tightened.
- 5.2.1.49 Taper washers to be used on flanges of tapered rolled sections.
- 5.2.1.50 Equipment shall be supplied to prevent exposure of any person to noise at or above the noise-rating limit as defined in the Occupational Health and Safety Act and Mines Health and Safety Act and measured in accordance with SANS 10083.

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- 5.2.1.51 All equipment shall be limited to an instantaneous peak sound pressure of 120 dB(A) at 1m under any operating condition for a maximum of 20 minutes. All reasonable measures shall be taken to reduce the exposure to operating sound levels to below 85 dB(A). Areas with noise levels that exceed 85 dB(A) shall be clearly marked with signage, indicating the requirements for hearing protection. Each individual item exceeding 85dB(A) at 1m shall be submitted for approval via the Project Concession Request process.
- 5.2.1.52 Equipment which requires a dust-free environment shall be so specified by the vendor and shall be adequately insulated and or supplied with pressurized enclosures.
- 5.2.1.53 All rotating non-reversing equipment will be marked to indicate rotating direction.
- 5.2.1.54 All rotating and movable equipment shall be guarded.
- 5.2.1.55 Couplings will be rated higher than motor start up torque (150 %of motor start-up torque).
- 5.2.1.56 Stainless or carbon steel guards will be used on all high and low speed couplings and around the submersible pump.
- 5.2.1.57 The number of service hours at a constant speed and rated load that 90% of the bearings of the pumps shall provide before showing evidence of fatigue shall be 60,000.

5.2.2 Civil and Structural

- 5.2.2.1 All actions on structures will be determined in accordance with the requirements of SANS 10160:1-8 were applicable, and the values provided in a report.
- 5.2.2.2 All castings shall be clean and free from flaws, cracks, blow holes, cold laps and other imperfections.
- 5.2.2.3 No modifications or repairs should be done on castings without the required engineering approval.
- 5.2.2.4 In the case of moisture/water build up, a drain shall be designed at the low point to ensure drainage.
- 5.2.2.5 Handrails, knee rails and stanchions are to be to be hollow bar of Mentis "Type" or equivalent.
- 5.2.2.6 Handrail joints are to be continuously welded and ground off smooth.
- 5.2.2.7 All handrails shall be corrosion protected as per NECSA Specification.
- 5.2.2.8 Hand and knee rails will be mounted to the stanchions.
- 5.2.2.9 The content (100 % full) of all piping and tank will be considered as live load. Weight of process piping shall be evaluated in full conditions.
- 5.2.2.10 Permanent actions shall include the weight of the structure, or vessel and all permanent loads supported by the structure, or vessel.
- 5.2.2.11 The below lists represent the densities, units and symbols and language that will be used for the project. The content of all piping and tank shall be considered as live load and being 100% full of fluid. Weight of piping shall be evaluated in the full and maximum SG condition.
- 5.2.2.12 General guidance is given in the relevant codes of practice for ultimate limit state and serviceability limit state, but the designer should use judgement based on the accuracy of the assessment of loads. It should be noted that partial safety factors given in codes of practice include factors accounting of tolerances and analytical inaccuracies, in addition to unfavourable variations of loads.
- 5.2.2.13 Any structure and its parts shall be designed for the applicable loads acting independently or in combination.
- 5.2.2.14 The load combinations and partial factors for load combinations shall conform to Clause 7.3, SANS 10160-1.

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- 5.2.2.15 In the event of specialised structures being constructed that are dependent on the strength of the fill material (such as mechanically stabilised earth retaining walls), the fill material specified shall be sourced and compacted in accordance with strength requirements of the design.
- 5.2.2.16 Terrace slopes are to be defined to prevent ponding of water behind the bund walls and other obstacles.
- 5.2.2.17 Minimum material quality requirements for mass concrete and blinding - 10 MPa.
- 5.2.2.18 Minimum material quality requirements for light structures - 30 MPa
- 5.2.2.19 Minimum material quality requirements for heavy and process structures and water retaining structures - 35 MPa.
- 5.2.2.20 50mm thick blinding is to be provided under foundations.
- 5.2.2.21 250-micron PVC sheeting in accordance with SANS 952-1985 Type C to be provided under all ground slabs forming buildings with internal people spaces.
- 5.2.2.22 High yield reinforcement (SANS 920) should be used.
- 5.2.2.23 Cover to reinforcing (including links and clips) shall be:
- For permanent structures subject to normal environments - 50mm.
 - For permanent structures subject to severe environments - 75mm, careful attention needs to be paid to reinforcement detailing, reinforcement stress and crack widths in water retaining structures to ensure water tightness and longevity.
 - Where concrete is cast directly against earth - 75mm.
- 5.2.2.24 No chemical holding down bolts to be used on site in lieu of holding down bolts unless pre-authorisation has been obtained from NECSA Lead Engineer.
- 5.2.2.25 Grout to structural bases plates and equipment supported on concrete to be non-shrink propriety cementitious grout.
- 5.2.2.26 Grout to be generally 30mm thick, but not less than 20mm thick. Should grout be more than 80mm thick, it is to be bulked with 9mm or 13mm stone.
- 5.2.2.27 All areas must be accessible by a stairway, or walkway. Stairs are to be a minimum 30° and maximum 45° incline.
- 5.2.2.28 Walkways are to be minimum 750mm width.
- 5.2.2.29 Spatial access around equipment is to be minimum 750mm, or greater if specified by the vendor.
- 5.2.2.30 Minimum headroom of 2100mm is required where piping is.
- 5.2.2.31 Concrete treats to have minimum 200mm going, preferably 250mm.
- 5.2.2.32 Nosing of treads to be rounded to 3mm radius to prevent chipping.
- 5.2.2.33 Bunded areas surface bed shall receive a wood float finish.
- 5.2.2.34 All exposed concrete corners to have a 25mm chamfer unless otherwise directed.
- 5.2.2.35 All gaskets material and class shall be included in the design in line with the system pressure ratings.
- 5.2.2.36 All welding shall be performed by certified and qualified welders; qualified and coded to the relevant and required standard, code and regulations.
- 5.2.2.37 Performance of NDT shall be performed by an experienced, competent and approved personnel with a minimum Level 2 certification; shall be recorded and proven to the applicable standards and codes.
- 5.2.2.38 Quality Control/ Inspection Test Plan shall be submitted by the supplier and contractor and approved by NECSA prior to commencement of activities.


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- 5.2.2.39 Concrete bases, holding down bolts, mountings and supports shall be so designed that they comply with the requirements of the standard in accordance with which the storage vessel is designed to.

6 REVISION HISTORY

This document has been revised in accordance with the following schedule:

Rev. No.	Date approved	Nature of Revision	Prepared
1.0	N/A	First issue.	J Methi
2.0	See cover page	Second issue, updating document to applicable latest standards.	M Nteo

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