Eskom	Specification	Peaking

Title:	**EV Project Pilot Phase at Sere Wind Farm Technical Specification**	Unique Identifier:	**480/61-M**
		Alternative Reference Number:	**EC numbers: 27083317**
		Area of Applicability:	**Peaking Engineering**
		Documentation Type:	**Specification**
		Revision:	**1.0**
		Total Pages:	**49**
		Next Review Date:	**N/A**
		Disclosure Classification:	**CONTROLLED DISCLOSURE**

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Date: 2024-11-14	Date: 2024-11-14	Date: 2024-11-14

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1. INTRODUCTION

Eskom Generation (Gx) has initiated a project to replace its Internal Combustion Engine (ICE) fleet of vehicles with Electric Vehicles (EVs). Sere Windfarm was identified as one of the sites chosen for the pilot phase of the project [51]. Sere Wind Farm is in the Western Cape province of South Africa and is one of the largest wind farms in Southern Africa with a production capacity of 105.8 MW.

The Technical Specification provides design information on the completed basic design phase for the supply point of connection for the EV charger, cable route and the identification of the position of the EV charger and EV parking bays and associated infrastructure, i.e., carports. This specification is required to ensure the scope is defined, adequately rated equipment and components are selected and specified. The Technical Specification also illustrates the interfaces to other disciplines. The Technical Specification will be an input to the Works Information documents (enquiry documents) which will be develop by Gx Engineering. The selected *Contractor* will be responsible for the final detailed engineering, installation, commissioning and maintenance of the charging infrastructure. A separate contract will be done for the procurement of EVs.

2. SUPPORTING CLAUSES

2.1 SCOPE

The document covers the specifications required for the EV charging system and associated infrastructure. The scope excludes the specification of the EV Charger and plinth.

2.1.1 Purpose

The purpose of this Technical Specification is to state the *Employer's* technical requirements and provide the *Contractor* with the necessary information to submit a comprehensive tender.

2.1.2 Applicability

This document applies to Peaking Generation, specifically Sere Wind Farm and is to be used as an input to the associated Gx Engineering Works Information.

2.2 NORMATIVE/INFORMATIVE REFERENCES

Parties using this document shall apply the most recent edition of the documents listed in the following paragraphs.

2.2.1 Normative

[1] 240-103414344 Summary of Corporate Identity Manual

[2] 240-56357424 MV and LV Switchgear Protection Standard

[3] 240-56227443 Requirements for Control and Power Cables for Power Stations Standard

[4] 240-56227516 Specification for LV Switchgear and Control gear Assemblies and Associated Equipment for Voltages up to and including 1 000 V AC and 1 500 V DC.

[5] 240-75655504 Corrosion Protection Standard for new Indoor and Outdoor Eskom Equipment, Components, Materials and Structures Manufactured from Steel Standard

[6] 240-56355815 Field Instrument Installation Standard for Junction Boxes and Cable Termination

[7] 240-56227426 Generation MV and LV Protection Philosophy for Eskom Power Stations, rev 1

[8] 240-56227589 List of Approved Electronic Devices to be used on Eskom Power Stations Standard

[9] 240-64685228 Generic specification for protective intelligent electronic devices (IEDs)

[10] 240-56356396 Earthing and Lightning Protection Standard

[11] 240-56356411 Fire Barrier Seals for Electrical Cable Installations at Power Plants Standard

[12] 240-54937450 Fire Protection and Life Safety Design Standard

[13] 240-54179170 Classification and designation of technical documentation and Documentation Management Standard, 32-644

[14] 240-100656734 Eskom Work Package Template

[15] 240-86973501 Engineering drawing standard – common requirements

[16] 240-62196227 The Life-saving rules are: Standard

[17] 240-109607942 Eskom RDS-PP Key Part Standard

[18] 240-73143217 Eskom RDS PP Coding Standard

[19] 240-62629353 Specification for panel labelling standard

[20] 32-6 Eskom Document and Records Management Procedure

[21] 32-727 SHEQ Policy

[22] 240-150642762 Eskom Generation Plant Safety Regulations

[23] 240-53114002 Engineering Change Management Procedure

These documents listed are indispensable for the application of this document, i.e., documents to be used together with this document.

2.2.2 Informative

[24] ISO 9001 Quality Management Systems.

[25] 240-53114002 Engineering Change Management Procedure

[26] OHS Act Occupational Health and Safety Act 85 of 1993.

[27] 240-150642762 Eskom Generation Plant Safety Regulations

[28] 32-644 Documentation Management Standard

[29] 240-105658000 Supplier Contract Quality Requirements Specification

[30] 240-54179170 Classification and designation of technical documentation

[31] 240-76991998 Electrical Hand-over Package Checklist

[32] SANS/IEC 61641 Enclosed low-voltage switchgear and control gear assemblies — Guide for testing under conditions of arcing due to internal fault

[33] SANS 10142-1 The wiring of premises Part 1: Low-voltage installations

[34] OHSAS 18001:2000 Occupational Health and Safety Management Systems

[35] R1010 Construction Regulations

[36] SANS 10400:The Application of the National Building Regulations

[37] TMH 16: South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual

[38] D-DT-0854 - LV Power Cable Trench Details

[39] 240-53113685: Design Review Procedure

[40] 240-53114002: Engineering Change Management Procedure

[41] 240-56364535 Architectural Design and Green Building Compliance Manual

[42] 240-56364545 Structural Design and Engineering Standard

[43] 240-57127955 Geotechnical and Foundation Engineering Standard

[44] 240-84418186 Road Specification Manual

[45] 32/421 Eskom Cardinal Rules

[46] 816-006 Parking bay size

2.2.3 Disclosure Classification

Controlled disclosure: controlled disclosure to external parties (either enforced by law, or discretionary).

2.2.4 Related and Supporting Documents

[47] 474-13318 SRD for the Gx Fleet Electric Vehicle Project

[48] 474-13306: Generation Fleet Electric Vehicle Project Engineering Management Plan

[49] 474-13433 - Power Stations Prioritization, Vehicles and Charger Selection and Site Scope of Work for the Pilot Phase of the Generation Electric Vehicle Project

[50] 480/61- A Sere Wind Farm Electric Vehicle Charging Station Investigation Report

[51] 480/61-L Basic Design Report for the EV Project Pilot Phase at Sere Wind Farm

3. DESCRIPTION OF THE *WORKS*

3.1 Executive overview

Eskom Generation (Gx) has initiated a project to replace its Internal Combustion Engine (ICE) fleet of vehicles with Electric Vehicles (EVs). The project objective is to achieve a more sustainable and environmentally friendly transportation system by reducing Eskom's vehicles CO_2 emissions contribution without compromising the respective vehicle requirements. This is planned to be achieved by transitioning from ICE vehicles to EVs and installing charging infrastructure at Gx Power Stations to support the transition [51].

Sere Wind Farm was identified as one of the sites chosen for the pilot phase of the project.

The *Contractor* makes available a supply point of connection within the 1 MVA 33/0.42kV Station Supply Mini-substation. The power supply from this mini substation will be sufficient to provide power for the installation of the EV charging station rated at 250 A, 400V (2 x 60 kW, 22 kW). The *Contractor* designs, supply and install a suitable adequately rated cable from the mini-substation to the charging station. The *Contractor* installs an EV charging station at a suitable position to charge two EV simultaneously. Refurbish the existing carports and extend the carport to provide protection to the EV charger and personnel against adverse weather conditions. The *Contractor* provides all civil and building work for a functional EV charging station.

The *Works* make provision for the detail design, manufacturing, factory acceptance tests, packaging, transportation and off-loading of the equipment for installation, site acceptance testing and commissioning of the *Works*. The *Works* makes provision for decommission of existing equipment and facilities. The *Works* are done as per the *Employer's* specifications as stipulated in this document.

3.2 *Employer*'s objectives and purpose of the *works*

3.2.1 *Employer's* objective

The *Employer's* objective is to install an EV charging system. The *Works* are completed within allocated time frames by the *Contractor.*

3.2.2 Purpose of the *works*

The purpose of the *Works* is to ensure a reliable, maintainable, designed to specification, fully functional EV charging system.

This document specifies *Contractor's* minimum requirements for engineering work, decommissioning, detail design, drawings, procurement, manufacture, inspect and test, factory acceptance tests, quality control & assurance, supply, delivery, installation, commissioning, testing and handing over of the EV Charging system.

3.3 Interpretation and terminology

The following definitions are used:

Definition	Description
as built	The Project Manager or Supervisor certifies that this drawing is checked against the actual wiring of the corresponding circuit in the Plant and Material as correct after final hot commissioning is completed.
as commissioned	The Project Manager or Supervisor certifies that this drawing is checked against the actual wiring and functional operation of the corresponding circuit in the Plant and Material as correct after installation and cold commissioning is completed.
as manufactured	the *Contractor* certifies that this drawing is checked against the actual wiring of the corresponding circuits in Plant and Material as correct after factory acceptance testing.
Busbar	A busbar to which one or several distribution busbars and/or incoming and outgoing units can be connected.
Charging Infrastructure	A system of charging stations or facilities to recharge electric vehicles
Electric Vehicles	Vehicles that use electricity as a source of power and electric motors for moving.
Feeder	Feeder in the power station context means a line or cable to the substation, power station or switchboard.
Guarantee inspection and testing	Guarantee inspection and testing takes place at the time when the guarantee period elapses, and the OEM then needs to conduct

Definition	Description
	inspections and tests on the *works* which include but not be limited to visual inspection and physical tests to prove to the *Employer* that the *works* are still in good standing and no abnormalities have emerged since commissioning and that it is fit for continued operation. All findings and recommendation are documented in a report to the *Employer*. Any deviation is listed, and a follow-up/remedial plan is submitted.
Incomer	The incomer of a switchboard is the circuit that is used for the power supply to the switchboard (also called the incoming circuit).
Maintenance	Maintenance is the function of restoring failed/worn components to a state where it is capable of meeting its design intent and performance expectations, by repair or rework achieved through the application of material and human resources in an efficient and cost-effective manner.
Miniature substation (or mini-substation)	A factory-assembled and tested free-standing unit that is suitable for use in an area accessible to the public, that comprises a transformer, an equipped medium-voltage compartment and an equipped low-voltage compartment and that is suitable for connection to underground cables (SANS 1029)
Overcurrent	A condition which exists on an electrical circuit when the normal load current is exceeded. Overcurrent takes on two separate characteristics: overloads and short circuits.
Outgoing circuit	The outgoing circuit/feeder at a switchboard is the circuit which is used for the power supply to a load or other switchboard.
Short-Circuit	Can be classified as an overcurrent which exceeds the normal full load current of a circuit by a factor many times (tens, hundreds or thousands greater).
Short-Circuit Current/Withstand Rating	The maximum short-circuit current an electrical component can sustain without the occurrence of excessive damage when protected with an overcurrent protective device e.g., a fuse.
Specification	The document/s forming part of the contract in which are described the methods of executing the various items of *works* to be done, and the nature and quality of the materials to be supplied and includes technical schedules and drawings attached thereto as well as all samples and patterns.
System	An integrated set of constituent pieces that are combined with an operational or support environment to accomplish a defined objective. These pieces include people, hardware, software, firmware, information, procedures, facilities, services and other support facets.
Voltage Rating	The maximum open circuit voltage in which a fuse can be used, yet safely interrupt an overcurrent. Exceeding the voltage rating of a fuse impairs its ability to clear an overload or short circuit safely.
Withstand Rating	The maximum voltage or current that an unprotected electrical component can sustain for a specified period of time without the occurrence of extensive damage to circuit.
Personal Protective Clothing (PPE)	All items including head, face, neck and chin protection, eye protection, hearing protection, body protection, hand and arm protection, foot and leg protection intended to protect a person against the thermal hazards of an electric arc.

The following abbreviations are used:

Abbreviation	Explanation
AC	Alternating Current
Aux	Auxiliary
CO_2	Carbon Dioxide
DC	Direct Current
DCP	Dynamic Cone Penetration
ECM	Engineering Change Management
EV	Electric Vehicle
FAT	Factory Acceptance Tests
kV	Kilo Volts
ICE	Internal Combustion Engine
IEC	International Electro-technical Commission
LV	Low Voltage
MCCB	Moulded Case Circuit Breaker
MV	Medium Voltage
NDT	Non-Destructive Testing
OEM	Original Equipment Manufacture
QA	Quality Assurance
QC	Quality Control
QCP	Quality Control Plan
SANS	South African National Standards
SAT	Site Acceptance testing
SCPD	Short Circuit Protection Device
SLD	Single Line Diagram
SRD	Stakeholders Requirements Definition
PPE	Personal Protective Clothing

4. MANAGEMENT AND START UP

4.1 Documentation control

The *Contractor* implements a comprehensive document management system for the control of all documents, revision status “as-designed”, “as-manufactured”, “as-commissioned” and “as-built” plant status for the EV Charging system. In this regard the *Contractor* ensures that the documentation supplied to the Project Manager as tie-in information, accurately reflects the Contract requirements.

The *Contractor* submits all documentation on a formal transmittal form to the Project Manager. All correspondence is sequentially numbered. All documentation and drawings standards to comply with the latest 240-86973501 - Eskom’s Engineering Drawing Standard Common Requirements; 240-54179170: Classification and designation of technical documentation and Documentation Management Standard, 32-644 and respectively.

The documentation and drawings supplied is in South African English and SI units are used. The *Employer* does not accept scanned electronic copies of documentation or drawings; however the original documentation with signature is scanned for electronic purposes.

The documentation is submitted in loose leaf binders to ISO format and normally A4 size. The use of oversize pages is kept to a minimum and does not exceed page height of an A4 unfolded. Fixings are “D” ring and are of the snap close type. Post binders or other fixings are not acceptable. Binders do not exceed 80 mm in overall thickness. The document identity appears on both the front cover and on the spine.

Documentation is of good quality, prepared by suitably qualified personnel and contain the general arrangement drawings, installation drawings and instructions, operating and maintenance instructions for all components.

Detailed parts lists are accompanied by exploded view type unitised drawings clearly detailing the part, technical descriptions of the plant and material and component parts, spare part ordering instructions and type test certificates.

4.2 Health and safety risk management

The *Contractor* takes every precaution to ensure safety and to protect the *Works* and temporary *Works*. The *Contractor* is responsible for the safety and security of his personnel, materials on Site and the *Works* at all times. The *Contractor* adheres to the safety regulations pertaining to Sere Wind Farm and Sub-*Contractor*’*s*.

The *Contractor* provides all the required safety and Personal Protective Equipment (PPE) to his staff for the duration of the contract. Safety barriers and access scaffolding is deemed as Equipment and is the responsibility of the *Contractor*.

The *Contractor* complies with the requirements of the Construction Regulation, 2014. R1010 of the Act and forwards proof of Notification of Construction *Works* to the Department of Labour as required in the Construction Regulations.

The *Contractor* and his personnel attend an induction meeting on Site and sign the attendance sheet provided as proof of attendance. Without prejudice to any other requirements of this *Works* Information or the Conditions of Contract, the *Contractor* must comply with the following:

a) Eskom Plant Safety Regulations 36-681

b) Eskom Operating Regulations for High Voltage Systems, ESKARAAG4

c) The Occupational Health and Safety Act No. 85 of 1993 and Regulations

d) The Compensation for Occupational Injuries and Diseases Act No.130 of 1993, amended by government notices to 30 April 2004 or Equivalent

e) Eskom Life-saving Rules

The Eskom Life-saving Rules complement our existing safety best practices and address safety procedures followed at all locations. Five Life-saving rules developed apply to all Eskom employees, agents, consultants, and *Contractor's*.

Life-saving rules are safety rules that describe such extreme behaviour that all reasonable employees agree that anyone knowingly and wilfully violating one of them are putting his/her life and any other lives in jeopardy and are dealt with seriously. The Life-saving rules are: Standard 240-62196227. The *Contractor* complies with the health and safety requirements contained in Eskom Standards.

4.3 Engineering quality assurance requirements

The *Contractor* submits a detailed Quality Management Programme (QMP) for acceptance within two weeks of the Contract Date. QMP includes activities but not limited:

a) Documentation and Detail Design

b) Procurement of components

c) Inspection and Test plan

d) Manufacturing of the equipment

e) Factory Acceptance Testing

f) Installation

g) Commissioning

h) Hand Over to *Employer*

The *Contractor* submits a schedule of orders to be placed and this is updated regularly. The *Contractor* is responsible for defining the level of QA/QC or inspection to be imposed on his Sub-*Contractor*s and suppliers of material. The QCP is submitted to the *Employer* for acceptance.

The *Contractor* utilises the *Employer's* QA documentation forms for requesting access, erection checks, etc. These request forms are submitted to the *Supervisor* at least one week prior to the requested activity. No work is allowed unless the Quality Assurance Programme (QAP) is accepted by the *Employer*.

Apart from any statutory data packages required, the *Contractor* also compiles a data package of the relevant drawings, components, test certificates etc. for each section of the *Works* which must be reviewed and signed off by the *Employer* at erection check stage prior to the commencement of the commissioning phase.

Documents submitted for review and acceptance by the Project Manager after contract award and prior to the commencement of work.

The *Contractor* submits on a two-weekly basis, the following QA returns:

a) A register of Defects with those older than 7 days being flagged and an explanation attached.

b) Inspections completed/ outstanding

c) Register of accepted Defects

d) Project Quality progress report

The *Contractor* is made aware all documents or designs submitted for review to the *Employer* for acceptance, requires a process of review for which turnaround times will be specified in the contract.

The *Contractor* ensures that co-ordinated and formally documented management system is in place for the assurance of quality. The *Employer* is to specify hold and witness points during installation and on-site testing stages of the project. The *Contractor* issues preliminary notification of such hold and witness points by ten working days in advance to the *Employer* and confirms such hold and witness points at least five working days prior to the activity.

Typical hold points are listed below:

a) Bill of Material & Specifications for ordering equipment
b) Detail Design Scope Freeze
c) Detail Design Review (Construction, layout and component approvals/acceptance. Design drawings and approvals/acceptance)
d) *Contractor* Safety files
e) Test certificates
f) Factory Acceptance Test
g) *Contractor* delivers equipment to site and verifies and inspect equipment delivered
h) *Employer* receives delivery at Site and witness verification and inspection of delivered equipment with *Contractor*
i) Installation
j) Site Acceptance Test
k) Commissioning
l) As built drawings and approvals/acceptance
m) All manuals and drawings (in the specified format)

4.4 Training workshops and technology transfer

The *Contractor* provides all necessary manuals, drawings and notes with regards to operation and maintenance of the EV Charging System. An instructor shall be provided once off by the *Contractor* to train *Employer's* personnel (see 7.2.9) on the documents as specified above and on how to operate and perform maintenance on the EV Charging System and accessories when required. The training takes place at Sere Wind Farm.

5. ENGINEERING AND THE *CONTRACTOR'S* DESIGN

5.1 *EMPLOYER'S* DESIGN REQUIREMENTS

5.1.1 The *Contractor* designs meets the following user requirements specifications:

5.1.1.1 General requirements

1. The EV Charging systems complies with the Basic Design, Technical Specification, relevant Eskom, SANS, OHS act and International Standard and specifications listed in 2.2 and forms part of the *Contractor's* design.
2. Where it is not possible to comply with the Basic Design and SRD, standards and specifications listed under 2.2, the *Contractor* will complete and submit a deviation request to the *Employer* for approval of such deviations.
3. The EV Charger System interfaces with the existing plant, building and facilities.

4. The EV Charger are pre-manufactured at the *Contractor's* factory to reduce execution and outage time. On completion factory acceptance test are conducted by the *Contractor* at the *Contractor's* factory and witnessed and accepted by the *Employer*.
5. The mini-substation supply is switched off for a certain time period (during a normal working day) at an agreed date between the *Employer* and *Contractor* for changes to occur.
6. *Contractor* provides *Employer* a component list, data sheets and type test certificates for all components used.
7. The equipment used in the design is easily obtainable and off the shelf without any long lead times.
8. Standardisation is accomplished by ensuring that power circuits are designed as per *Employe*r standard schematic circuit diagrams as a guide for the *Contractor* as a minimum. This is to ensure that operating personnel familiarise themselves with all aspects of one type of Low Voltage system.

5.1.1.2 Operating philosophy

The design offers quick diagnostic capability to reduce the unavailability of the EV charger. It is designed in such a way that it is safe to operate and reliable at all times ensuing production related issues can be attended to without delay. Safety of personnel and plant are the two main criteria that are not compromised. In case of failure, plant damages are minimized and the plant is returned to service at an earliest possible time.

5.1.1.3 Maintenance philosophy

The design of the EV Charger and material selection ensures low/minimal maintenance. Standardization is essential. The EV Charger supplier provides a maintenance plan for the Charger over its entire life.

5.1.1.4 Engineering Design philosophy

The engineering philosophy is ensuring the optimal performance and maintenance of the plant to meet the long-term health requirements of the plant. The engineering function is to ensure adherence to these envelopes, to resolve problems associated with the operation and maintenance of the plant and upgrade or modify plant design where applicable.

The plant is to be designed to improve safety, reliability, productivity, operation, minimise maintenance, training and life cycle costs, by means of appropriate engineering of:

Standardisation of components and plant with inter-changeability of

a) Equipment as a focus point;
b) Reduction of interfaces types (standardisation);
c) Correct human machine interfaces;
d) Advanced control concepts;
e) Quick effective effortless diagnostics

5.2 PARTS OF THE *WORKS* WHICH THE *CONTRACTOR* IS TO DESIGN

5.2.1 General requirements for the LV *Works*

The *Contractor* is responsible for the supply point of connection in the form of a protection device such as a Moulded Case Circuit Breaker (MCCB) as well as the LV cable, cable route, cable trench excavation and backfilling, EV Charger and plinth, EV Parking Bays, EV carports and complete installation of the *Works.*

The *Works* includes the refurbishment of the existing identified parking bay carports for the new EV Parking Bays, installation, site acceptance test, commissioning; and supply of as built drawings of a complete design verified EV Charger and EV Parking bays.

The Contractor uses information in the Low Voltage Switchgear and Control Gear Standards 240-56227516 and MV and LV Switchgear Protection Standard 240-56357424 and other related documents and standards listed in 2.2 to select and specify the correctly rated MCCB.

The LV cable and accessories complies with Eskom standard 240-56227443 Requirements for Control and Power Cables for Power Stations Standard.

The *Contractor* offers a design in accordance the electrical load of an EV charging station rated at 250 A, 400V (2 x 60 kW, 22 kW).

No components or equipment shall be mounted in the mini-substation LV compartment in any position where it is not visible and accessible to a viewer looking into the LV compartment when the door is open. The MCCB is placed and mounted in such a way that incoming and outgoing power cables can be easily terminated in the LV compartment. The EV charging feeder main circuit shall have a minimum rated insulation voltage of 1 000 V.

The *Contractor* offers a design in accordance with the typical Schematic Diagrams as provided in this Basic Design, Technical Specification and Technical Schedules A/B provided by the *Employer*.

The *Contractor* uses the information contained in this specification to build functionality into the EV charging System. The *Contractor* produces his own specific schematic diagrams representing his offer for the *works*.

The EV charger is to be specified for a corrosive environment.

5.2.2 The *Contractor* submits a detailed design proposal and provides the following solution as a minimum:

5.2.2.1 MCCB EV Charger Feeder circuit

The supply point of connection is made within the 1 MVA 33/0.42kV Station Supply Mini-substation in the LV compartment of the mini-substation by supplying and installing a suitable MCCB adequately rated for the cable and the charging station. The MCCB are mounted on the back plate in the LV compartment of the mini-substation. The physical position of the MCCB in the LV compartment shall be arranged in a logical manner to enable easy operation and maintenance. A general; layout drawing of the circuit shall be submitted by the *Contractor* for approval.

The *Contractor* supplies the MCCB with an integral electronic trip unit. The *Contractor* applies the correct settings on the MCCB and any downstream protection devices ensuring that protection grading is correct for exiting upstream and new downstream protection devices.

5.2.2.2 Protection System and devices

Protection devices are specified in Appendix A, Technical Schedule A&B.

The MCCB includes the following minimum protection elements and functions:

a) Earth fault protection

b) Instantaneous overcurrent protection

5.2.2.2.1 Engineering and Special Tools

The *Contractor* provides any special tools, that are required for maintenance or affecting adjustments. A detailed list of tools is supplied by the *Contractor* to the Project Manager before delivery. Should any special interfaces for connection to PC's be required it is regarded as special tools.

5.2.2.2.2 Cabling Scope

The *Contractor* designs, supply and install a suitable cable from the mini-substation to the charging station which is adequately rated for the electrical load stated in section 5.2.1. The cable will be buried in a trench which will be excavated by the *Contractor*. Cables crossing roads and paved, or concrete surfaces shall be installed in PVC pipes with suitably selected temporary barriers installed on the ends of the pipes to eliminate backfill from entering the pipes.

The selected LV cable route shall be the most practical and economical route available, refer to 5.2.6.3 The cable route will be evaluated and selected in-conjunction with the Station Site personnel including safety representative, *Contractor*, Civil Engineer and Project Engineer. Care should be taken during installation to avoid disrupting other services such as other power cables, telecommunication, water, and drainage services where practically possible. Where required, the *Contractor* will make provision to scan the cable route area to establish if any other services exist which could be affected by excavation. The cable trench will be excavated (approximately 500mm) on the outside from the fence of the station at a depth of 850mm as per D-DT-0854. Backfill all excavated trenches with same material and restore to surface to original condition. Cable markers installed above ground shall indicate the cable route.

During site clarification meeting the *Contractor* performs an evaluation of the cable route, EV charger position, EV parking bays and EV carports.

The power cable enters from the bottom of the mini-substation. The *Contractor* glands and terminates the cable within the mini-substation under the supervisor of the *Employer.* The *Contractor* labels the power cable with cable numbering at the source and load side, as provided by the *Employer*.

The *Contractor* uses the load schedule provided by the *Employer* to indicate and list the types, length sizes, current carrying capacity and price per meter (supply and install) of cables used for the *works*. The *Contractor* performs a cable assessment in terms of cable sizing and suitability for application and completes a power cable termination schedule during the detail design phase to identify any short comings and ensure that the cable lengths are adequate. No joined cables will be accepted. The *Contractor* uses approved and accepted cable accessories and lugs for the cable *works.*

Contractor ensures correctly sized lugs for in-coming and out-going cables are used. The *Contractor* ensures power cable gland holes are provided for the cable to enter the mini-substation LV compartment and perform cable gland sizing and supplying of glands. The *Contractor* performs glanding and terminates the power cable and performs cable termination at the source and load sides.

The new cable is of the flame-retardant type comprising of the red cable trace colour (flame retardant emission PVC bedding and sheath).

Cables comply with 240-56227443 Requirements for Control and Power Cables for Power Stations Standard. The cable will be multicore PVC insulated, wired armoured PVC sheeted.

The *Contractor* provides cable test certification for all cables.

5.2.3 Major Components

The *Contractor* supplies all major components with all other components to build functionality into the EV Charging system per Appendix A: Technical Schedule A&B:

1. Moulded Case Circuit Breakers
2. Cables and accessories
3. EV Charger
4. Tools

5.2.4 Earthing requirements

The *Contractor* ensures during the *Works* that all metal parts, other than those forming part of any electrical circuit, are connected to a hard drawn high conductivity copper earth bar located within the station. This earth bar is earthed at no less than two points to the station earth network; The earth bar is bolted to the main frame of the EV Charger bay. All earthing joints are tinned and bolted or performed using methods accepted by the *Employer*. Where the *Contractor* does not comply with the *Employer's* earthing requirements, any deviations must be clearly indicated, and acceptance approval requested form *Employer* for such deviation.

5.2.5 Fault currents

The MCCB and cable electrical ratings and specifications will be selected by the *Contractor* to withstand the fault Levels at the installation. The *Contractor* submits evidence to the *Employer* which substantiate the selection of the equipment.

5.2.6 Civil *Works*

The *Contractor* is responsible for the detailed design and construction of all the *Works* which have not been designed by the *Employe*r. This includes but is not limited to the following:

1. Reinforced Concrete Plinth.
2. Refurbish Existing Carports.

5.2.6.1 Reinforced Concrete Plinth

a) The *Contractor* shall design and construct a concrete plinth with suitable dimensions to support the charging station based on the charging station data sheet and requirements.

b) The *Contractor* shall determine a suitable size of the foundation based on the applicable dead and live loads acting on the structure.

c) All anchor bolts and or steel rods securing the charging station to the concrete plinth shall be made out of corrosion resistant material or hot dip galvanised and or equivalent.

d) The concrete cover of all reinforced concrete elements shall be no less than 60mm.

e) The *Contractor* shall ensure the concrete plinth supporting the charging station flushes with the existing surrounding surface to eliminate tripping hazard in and around the pedestrian walkway.

f) All exposed concrete finishes shall be coated with hydrophobic coating or equivalent to prevent and or manage reinforcement corrosion.

g) Any trenches required for the connection of the electrical cable to the charging station, the *Contractor* shall design and construct a suitable concrete cable gallery or sleeve that is compatible with existing Eskom infrastructure for electrical cables.

h) The *Contractor* shall backfill excavated trenches and restore the surface to its original condition.

i) The concrete mix design is to take into account the type of foundation, structures, elements, etc. for which it is intended. The cement, aggregates, sand, and water are to comply with requirements of SANS 2001 -CC1: 2007 and SANS 10100 Part 2.

j) Furthermore, the concrete mix is determined based on durability, taking into account the environment to which it will be subjected. The concrete class is as per the *Contractor*'s design, for acceptance by the Supervisor.

k) The *Contractor* takes samples of the concrete and prepares 9 No. cubes for compression strength testing. These tests are conducted such that 3 No. samples are tested at an independent accredited laboratory at 3, 7 and 28 days after crushing.

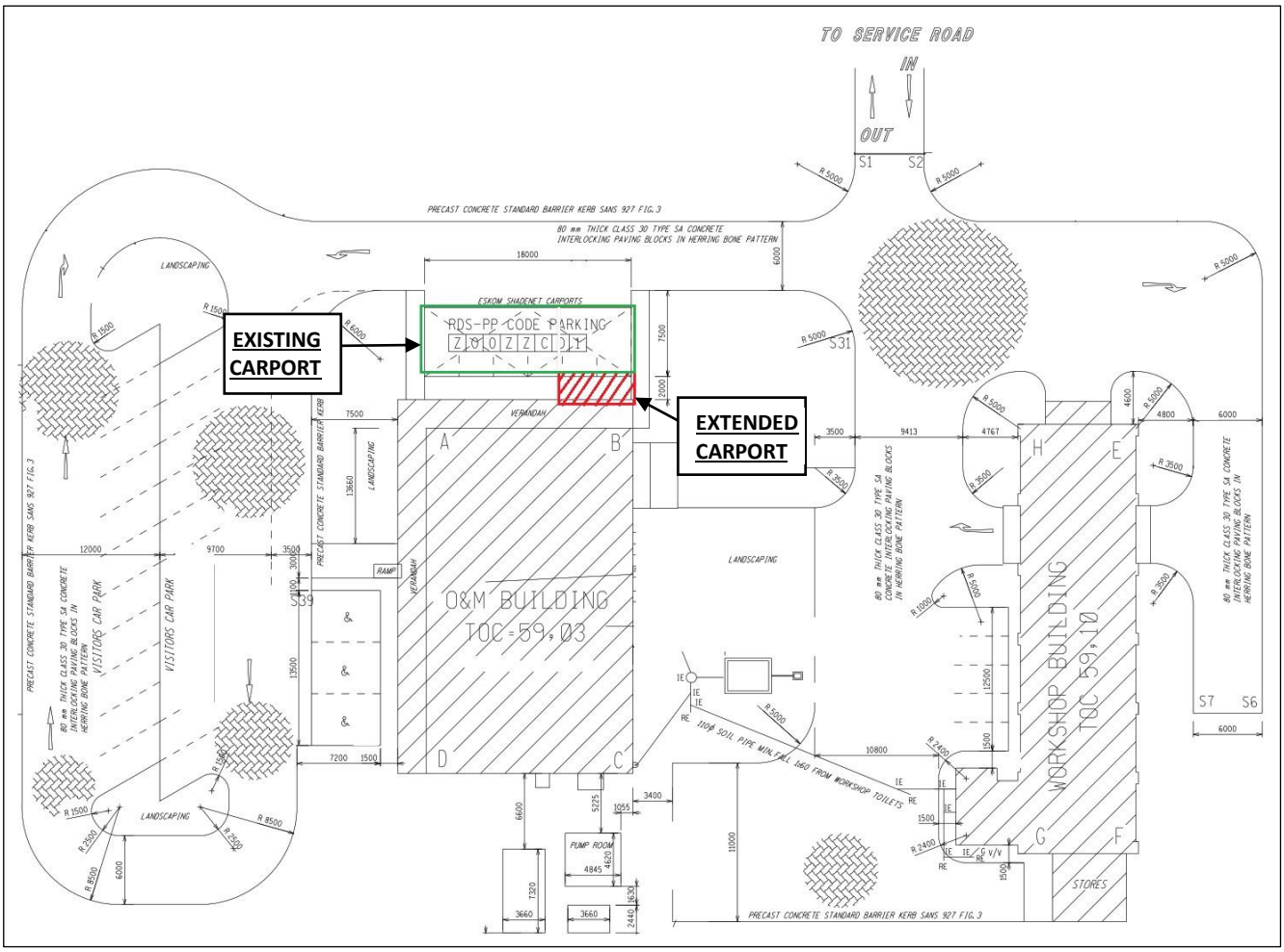
l) The *Contractor* shall undertake remedial actions to address all areas damaged as part of the *Works*.

m) All concrete control measures are to be as per relevant SANS Standards.

n) All new additions to the Sere Wind Farm shall be captured by the *Contractor* on new or existing drawings with sufficient details and submitted to the *Employer* for approval and records.

5.2.6.2 Refurbish Existing Carports

a) The *Contractor* shall refurbish the existing carports. The *Contractor* is also to design, fabricate and erect an extension to the existing carport at the location indicated in the layout below, including reviewing the impact of the extended carport on the existing carport foundations to establish whether the existing foundations still has adequate load-bearing capacity.



b) The extended carport shall completely cover the two parking bays and the EV charging station.

c) The design of the carport shall ensure the charging station is protected from the rainfall as well as stormwater runoff.

d) The Contractor will be responsible for the fabrication and/or supply and erection of all structural steelwork pertaining to the carport.

e) The carport including its supporting foundations shall be designed to resist a minimum wind speed of 40m/s. The design is to be based on the worst-case wind loading condition prevalent in the area.

f) All metal components and anchor bolts of the carport shall be hot dip galvanised and coated in accordance with the relevant SANS standards. In addition, all the exposed parts of the anchor bolts shall be Denso taped.

g) The roof of the extended carport shall connect to the existing carport structure and shall comprise a sufficient slope to ensure drainage of rainwater away from the pedestrian walkway and the charging station.

h) Where appropriate, suitable waterproof sealant or over covers shall be considered in the area between the existing pedestrian walkway and the new carport to ensure there is no ingress of water into the charging station.

i) The *Contractor* shall determine a suitable size of the foundations based on the applicable dead and live loads on the structure.

j) The existing shade net is to be removed and replaced with a waterproof and UV protective grade shade net inclusive of a 10-year guarantee on the newly installed shade net.

k) The existing shade net will be removed from all the existing carport structures and replaced with a waterproof and UV protective grade shade net also extending over the EV charging station for acceptance by the Supervisor.

l) It is a requirement of the *Contractor* that an unconditional 10-year guarantee is provided. The guarantee must be provided by the *Contractor* and the Suppliers. The comprehensive pro forma guarantee must be submitted with the tender. If an additional coating or any maintenance interventions are required to ensure that the system is UV stable, it should be stated as such. Any maintenance requirements for the above 10-year guarantee shall be clearly indicated in the *Contractor's* guarantee.

m) The proposed shade net waterproofing system must provide the following characteristics:

- Durable
- UV stable
- Maintainable
- Provide a guarantee

n) The new shade net shall consist of a suitable colour matching the painted parking bays for EV.

o) The parking bays shall be painted blue complying with 240-103414344 Summary of Corporate Identity Manual indicating that the area is designated for charging of electric vehicles. The *Contractor* to adhere to the following code when requesting the blue colour paint from suppliers:

Spot colour	Process colour (CMYK)	RGB colour values (for electronic applications)
PANTONE 287 C	100C 70M 0Y 10K	0R 56G 150B

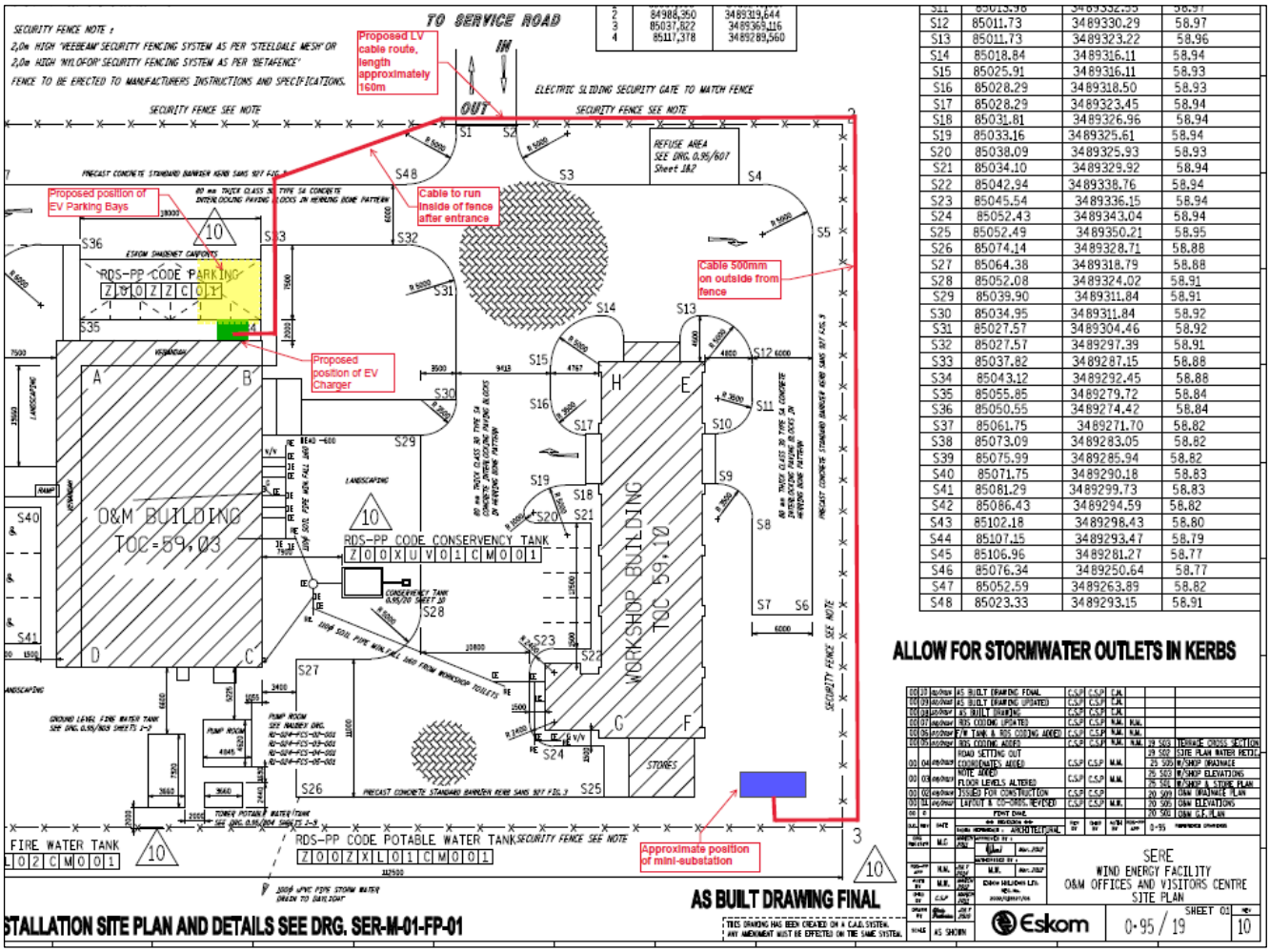
p) The paint will be of retro-reflective type and will be in accordance with SANS 731: Road Markings.

5.2.6.3 Cable route selection

The *Contractor* designs, supply and install a suitable cable from the mini-substation to the charging station which is adequately rated. The cable will be buried in a trench which will be excavated by the *Contractor*. Cables crossing roads and paved, or concrete surfaces shall be installed in PVC pipes.

The selected LV cable route shall be the most practical and economical route available. The *Employer* propose the route as indicated in Figure 1. The cable route will be evaluated and selected in-conjunction with the Station Site personnel including safety representative, *Contractor*, Civil Engineer and Project Engineer. Care should be taken during installation to avoid disrupting other services such as other power cables, telecommunication, water, and drainage services where practically possible. Where required, the *Contractor* will make provision to scan the cable route area to establish if any other services exist which could be affected by excavation. The cable route will be excavated 500mm on the outside from the station's boundary fence at a depth of 850mm as per D-DT-0854. Backfill excavated trenches with same

material and restore the surface to original condition. Cable markers installed above ground shall indicate the cable route as per cable marker drawing D-DT-8012.



S12	85011.73	3489330.29	58.97
S13	85011.73	3489323.22	58.96
S14	85018.84	3489316.11	58.94
S15	85025.91	3489316.11	58.93
S16	85028.29	3489318.50	58.93
S17	85028.29	3489323.45	58.94
S18	85031.81	3489326.96	58.94
S19	85033.16	3489325.61	58.94
S20	85038.09	3489325.93	58.93
S21	85034.10	3489329.92	58.94
S22	85042.94	3489338.76	58.94
S23	85045.54	3489336.15	58.94
S24	85052.43	3489343.04	58.94
S25	85052.49	3489350.21	58.95
S26	85074.14	3489328.71	58.88
S27	85064.38	3489318.79	58.88
S28	85052.08	3489324.02	58.91
S29	85039.90	3489311.84	58.91
S30	85034.95	3489311.84	58.92
S31	85027.57	3489304.46	58.92
S32	85027.57	3489297.39	58.91
S33	85037.82	3489287.15	58.88
S34	85043.12	3489292.45	58.88
S35	85055.85	3489279.72	58.84
S36	85050.55	3489274.42	58.84
S37	85061.75	3489271.70	58.82
S38	85073.09	3489283.05	58.82
S39	85075.99	3489285.94	58.82
S40	85071.75	3489290.18	58.83
S41	85081.29	3489299.73	58.83
S42	85086.43	3489294.59	58.82
S43	85102.18	3489298.43	58.80
S44	85107.15	3489293.47	58.79
S45	85106.96	3489281.27	58.77
S46	85076.34	3489250.64	58.77
S47	85052.59	3489263.89	58.82
S48	85023.33	3489293.15	58.91

Figure 1 : Position of Mini-substation, selected cable route and EV Charger position

5.2.6.4 Trenching requirements

LV cable trench details shall be in accordance with D-DT-0854. The Civil Engineer shall approve any variations from the depth specified in D-DT-0854. Where the presence of existing services makes it necessary to increase the depth of the trench, the trench shall be returned to nominal depth as soon as is practical. Where the presence of a number of services makes it necessary for deep trenching for a prolonged distance, measures shall be taken to ensure the required cable rating is maintained by back filling with soil having low thermal resistivity (that has been tested in accordance with SANS 10198-5 or by increasing the spacing between circuits.

Where a change in trench level is necessary, the bottom of the trench shall rise or fall gradually and smoothly. Trenches shall be kept as straight as possible and the radius of bends shall be tight, however never less than the minimum bending radius of the cable.

The material excavated from the trench shall be placed adjacent to the trench leaving a walkway of at least 500 mm on both sides of the trench. Where the topsoil is covered with gravel, the *Contractor* shall

make provision to keep the excavated material and the gravel separated. All surplus material, from whatever source, shall be disposed of by the *Contractor*.

Excavated trenches that are accessible or adjacent to public roads or thoroughfares, or where the safety of persons may be endangered, shall be adequately and effectively protected by a barrier or fence of at least one metre in height and as close to the excavation as is practicable. Warning or danger tapes are not acceptable. Warning illumination or any other clearly visible boundary indicators shall be provided at night or when visibility is poor.

Before installing bedding soil, the trench bottom shall be level, free of loose stones and lightly compacted.

The trench bedding and blanket soil around the cable shall be in accordance with SANS 10198-8 requirements for bedding.

The Clerk Of Works or Project Engineer is to inspect all trenches to confirm compliance with Standards and specification laid out in the document.

A sieve having a mesh size of no larger than 12 mm may be used to sift the excavated soil. Alternatively, suitable bedding and blanket soil having the specified soil thermal resistivity of less than or equal to 1, 2 Km/W shall be imported.

The trench backfilling shall be in accordance with SANS 10198-8.

NOTE: SANS 10198-5 contains descriptions of the various types of soils and their respective suitability for cable surround soil (bedding and blanket soil) and backfill material.

The bedding soil shall be installed and compacted prior to cable installation. Blanket soil shall be compacted using hand compaction tools. Backfill material shall be compacted in layers of maximum thickness 300 mm. The level of compaction (see D-DT-0854) shall be measured at appropriate intervals using an approved method.

NOTE: Initial testing of in-situ soil to be carried out by an accredited independent soil testing laboratory. There after a density gauge in conjunction with a dynamic cone penetrometer (DCP) may be used for further testing to ensure the adequate level of compaction is achieved when backfilling.

Any damages resulting from the *works* is repaired/made good by the *Contractor* at his own cost, to the satisfaction of the *Employer*. The *Contractor* supplies a method statement for the repair works to the *Employer* for review and acceptance prior to conducting the repair works.

5.3 PROCEDURE FOR SUBMISSION AND ACCEPTANCE OF *CONTRACTOR*'S DESIGN

5.3.1 Review process

The *Contractor* is made aware that all documents or designs submitted for review to the *Employer* for acceptance requires a process of review as stipulated in the Eskom Engineering Change Management Procedure (240-5331402). This process consists of:

a) Submission of the tender returnable
b) Technical Evaluation
c) Contract Award
d) Submission of Detail Design by *Contractor*
e) *Employers* Project team reviews
f) Updates Detail Design review by *Contractor*
g) Detail Design Scope Freeze review

h) Procurement of material
i) Manufacturing of the EV Charger
j) Factory acceptance tests
k) Delivery of EV Charger to Sere Wind Farm
l) Implementation
m) Commissioning
n) Handover and Final acceptance by the *Employer*

5.3.2 Time Required for Acceptance of Designs

Not later than four working weeks after receipt, the Project Manager returns one copy of the drawing marked “Accepted”; “Accepted as Noted” or “Not Accepted”, as may be appropriate. The notations “Accepted” and “Accepted as Noted” authorize the *Contractor* to proceed with the manufacture of the Plant covered by such drawings subject to the corrections, if any, indicated thereon. Where prints or drawings have been “Not Accepted” or “Accepted as Noted” the *Contractor* makes the necessary revisions on the drawings and submit further copies for acceptance in the same procedure as for the original submission of drawings. The contractor issues the *Employer* with a Design Review Sheet (DRS) to complete with every submission. Every revision shows by number, date and subject in the revision block on the drawing.

5.3.3 Other requirements of the *Contractor’s* design

The *Contractor* submits all technical documentation such as bill of materials, wiring diagrams, schematics, drawings and certificates etc. for acceptance by the *Employer* prior to manufacturing of the EV Charger. The *Contractor* submits two hardcopies plus an electronic copy of all documentation listed in section 5.3.3.1

5.3.3.1 Detail Design Phase

After *Contract* Award, the *Contractor* performs the Detail Design in accordance with *Employer’s* requirements presented by Typical Schematic Diagrams and Schedules. The designs are agreed with the *Employer* to achieve Design Freeze status.

5.3.3.2 Detail Design Freeze

The *Contractor* submits as a minimum the following data in neat files for acceptance by the *Project Manager* before the Detail Design Freeze status can be declared.

There are different engineering phases where the *Contractor* requires acceptance by the *Employer* before commencing to the next phase. Manufacturing acceptance will only be given to the *Contractor* upon completion of the Detail Design phase. These phases must be accepted by the *Employer* sequentially as listed below;

The *Contractor* submits the following as a minimum to achieve Detail Design phase:

The final accepted drawings of the complete EV Charger system including plant interfaces.

1. Completed Relevant Technical Schedules A and B
2. Deviation Schedule

3. General Arrangement Drawings of the EV Charger and component circuit layout and feeder circuit (this must include all the wire numbers, termination numbers and MCCB size);
4. Component Schedules or Bill of Material
5. Technical Data sheets of components
6. Technical Manuals
7. Test Certificates
8. Cable Schedule according to the *Employer* format;
9. RDS-PP coding, components descriptions, etc;
10. Termination schedules and cabling block diagram;
11. All calculations of all power cable requirements;
12. Design calculations of protection equipment;
13. Preliminary LV MCCB protection settings for commissioning; if available
14. FAT procedure to be used; if available
15. EV Charger Operating philosophy;
16. All system technical and functional descriptions;
17. Design calculations of reinforced concrete plinth;
18. Design calculations of carport structure;
19. Civil engineering drawings

(Note: All the requirements mentioned above in the detail design phases will be used for acceptance)

5.3.3.3 Implementation Phase

The *Contractor* submits the following as a minimum to achieve Implementation phase:

1. Completed and signed off FAT defects lists;
2. Two identical sets of marked up drawings to be used for site installation.
3. Completed and signed of FAT test reports;
4. Long lead items delivered to site;
5. Site establishment completed;
6. A complete on-site inspection check list to be completed immediately after delivery;
7. Authorised site acceptance testing procedures;
8. Equipment transporting & off-loading work packages;
9. EV Charger installation work package;
10. Cabling trenching, installation and testing work package;
11. Civil work package; method statement and QCP's
12. Cold Commissioning work packages;
13. Hot Commissioning work packages;

14. All relevant QCP steps signed off by the *Contractor* where applicable

5.4 OTHER REQUIREMENTS OF THE *CONTRACTOR*'S DESIGN

The *Contractor* provides all plant, equipment, materials and services needed to execute all work necessary to fulfil all requirements specified in this scope. Furthermore the *Contractor makes* provision for the following:

1. All plant materials are new;
2. All electrical installations of 220V and above are performed by a qualified electrician;
3. All new electrical cabling must be certified by the *Contractor's* electrician issuing a certificate to prove that it has been tested;
4. The *Contractor* provides a commissioning engineer during cold and hot commission of the LV system. The commissioning engineer ensures all relevant tests are performed to ensuring a successful handover to the *Employer*;
5. All existing plant interfaces are to be considered and verified during the design;
6. Newly installed equipment are labelled and codified according to *Employer's* requirements;
7. All arrangement drawings, schematics, wiring diagrams, operating and maintenance manuals, plant, equipment, cabling, panels and signals utilises the RDS-PP Key Part and Coding Standard. The system is applied from the design stage and cross referenced to all arrangement drawings, schematics, wiring diagrams, manuals and where practical to spare parts lists/manuals;
8. All codes are unique and verification by the *Employer* is done prior to hand over. The lists of RDS-PP coding keys are derivatives of the Key Part and Coding standards for Sere Wind Farm. The order of precedence is also in that order.

5.4.1 Configuration Management

All plant codification must be done in terms of the 240-109607942 Eskom RDS-PP Key Part Standard and 240-73143217 Eskom RDS PP Coding Standard. Coding of plant are finalised and completed during Detail Design phase.

5.4.1.1 Warrantee period

1. The *Contractor* clearly states, in writing, the warrantee period on their product and the components supplied.
2. It is to be clearly stated in writing what the limitations in product support are beyond the specified warrantee period and what options are available to be considered as well as the cost involved regarding support beyond the warrantee period;
3. Beyond the warrantee period, the *Contractor* still has the ability to do repairs on faulty components. If this is not possible then the *Contractor* provides an exchange policy to the

Employer where faulty equipment can be exchanged for new equipment at a discounted price to the *Employer*;

4. During and beyond the warrantee period the faulty equipment are to be investigated by the *Contractor* and a failure report provided to the *Employer* stating the reason for failure,
5. The *Contractor* plans for a visual inspection at a time suitable to the Employer, approximately one year after completion date;
6. The *Contractor* inspects the *Works* on or before the defects date and provides the *Employer* with an inspection report;
7. The *Contractor* liaises with the *Employer* three months prior to the defects date to confirm availability of the EV Charger system;
8. The *Contractor* corrects all defects and latent defects identified before the defects correction period.

5.5 USE OF *CONTRACTOR*'S DESIGN

The *Employer* may use and copy the *Contractor*'s design for any purpose connected with construction, use, alteration or demolition of the *works.*

5.6 DESIGN OF EQUIPMENT

N/A

5.7 EQUIPMENT REQUIRED TO BE INCLUDED IN THE *WORKS*

The *Contractor* provides all materials, tools, Equipment and or machinery in order to complete the *Works*.

5.8 AS-BUILT DRAWINGS, OPERATING MANUALS AND MAINTENANCE SCHEDULES

5.8.1 General

The original as built accepted version of all documents and drawings of the *Works* are handed over to the *Employer*. The *Contractor* provides documentation in the electronic media using Microsoft Office and "searchable" PDF format. The *Employer* allocates numbers to the documentation and drawings which the *Contractor* indicates on the documentation and drawings. The *Contractor* uses pre-approved templates provided by the *Employer* for all documentation and drawings required.

The *Contractor* submits all technical documentation and drawings for acceptance to the *Employer* prior to manufacture. The *Contractor* submits as per Schedule A hardcopy files plus an electronic copy of information on a hard drive of all documentation indicated in the paragraphs to follow.

5.8.2 Drawings

1. All drawings comply with the Eskom Engineering Drawing Standard 240-86973501– Common Requirements
2. In conjunction with the electronic DGN copies the *Contractor* also provides a merged set of *.pdf electronic copies upon first issue and each time drawing updates are required. All drawings are signed and the revisions noted as per *Employer's* specifications.

3. All detail design drawings have the pre-approved title blocks and borders as provided by the *Employer.* The *Employer* provides samples of the pre-approved title blocks to be used by the *Contractor*. The *Contractor* completes the title block information as per drawing standard listed.
4. All drawings are submitted to the Project Manager for acceptance.
5. The *Contractor* produces as build drawings within 4 weeks of site acceptance tests and submits to the Project Manager for his acceptance.
6. The *Contractor* produces the following types of drawings where applicable:
    a) Cover sheet
    b) Index sheet
    c) List of symbols
    d) List of components with values, tolerances, ratings, type numbers, purchasing specification numbers, manufacturer and circuit reference numbers
    e) General layout drawing of the proposed panels,
    f) Single line diagram,
    g) Block diagram of the system,
    h) Panel internal wiring drawing, including cross referencing with wire numbers
    i) Termination schedule (all connections are specified)
    j) Cable block diagrams where required,
    k) Updated redlined drawings of the *Employer* as per 7.2.

7. The *Contractor* is liable for updating drawings until the drawings reflect the as built status of the plant after the final commissioning of the last unit when the *Employer* has signed off and accepted the final “As Built” state of the drawings.
8. At Hand-over the *Contractor* provides two full sets of as-built documentation to the *Employer*
9. All documentation, including reports, manuals, etc. is in the English language.

5.8.3 Maintenance and operating manuals

1. All manuals are specific to Sere Wind Farm
2. All design information forming part of the Technical Specification is included in the manuals.
3. All documentation including drawings, operating and maintenance instruction manuals is uniquely identified and cross-referenced with all related documents.
4. The manuals are complete with:
    a) Power station name and order number;
    b) Content list;
    c) List of reference drawings;
    d) Details of all components.
5. The *Contractor* ensures that the manuals/files are complete making use of the following information represented as a minimum:
    a) Details and descriptions of all hardware and software
    b) Design calculation sheets
    c) Settings and configurations sheets
    d) Detailed product descriptions and features
    e) System control philosophy
    f) System parameters and models

g) Datasheets of all components used
h) Recommended spares lists
i) Operating, maintenance and testing requirements
j) Full system maintenance program
k) Installation procedures of each component
l) Alarm descriptions and responses procedures
m) Tests certificates
n) Certificates of compliance to international standards
o) Routine test results reports
p) Commissioning test results reports
q) Training information
r) Technical tender submission information

6. Any special instructions pertaining to storage of spare parts or to their shelf life are included in the manual.
7. All drawings required for component location, dismantling, and re-assembly for maintenance is provided in the manual.
8. All special tools required for maintaining and operating the plant and material are identified in a schedule and described in the manual.
9. Alarm response card needs to be populated by the *Contractor* for the *Employers* acceptance

6. PROCUREMENT

6.1 PLANT AND MATERIALS

6.1.1 Quality

The *Contractor* procures, fabricates and delivers all the material necessary to complete the *Works*. All structural and constructional material is new and of the best quality, of the class most suitable for the purpose specified and governed by the following internationally recognised standards: ASME, DIN, BS, IEC and SANS. Other standards are submitted to the *Project Manager* for approval. Furthermore, all such materials are capable of withstanding the variations of temperature arising under working conditions without distortion or deterioration or the setting up of undue strains in any part, such as to affect the efficiency and reliability of the EV Charger System. The material and the material inspection and test plans are based on the same standard.

6.1.2 Guarantee Inspection

Factory inspection test are performed and accepted by the *Employer* prior to delivery of the EV Charger System.

6.1.3 Product Support

The components provided within EV Charger System are supported by the OEM for the next 10 years as a minimum. Proof of OEM product support is submitted by the *Contractor* to the *Employer* for acceptance.

6.1.4 Defects correction

The Employer will inspect the EV Charger assembly prior to delivery to Sere Windfarm. Defects will be recorded by the *Employer* and handover to the *Contractor* for defects corrections. Defects are corrected within seven days, or as agreed with the *Employer,* by the *Contractor* at the *Contractor's factory or workshop.*

The Employer will inspect all structural steelwork (carport structure) manufactured off-site prior to delivery to Sere Wind Farm. Defects will be recorded by the *Employer* and handover to the *Contractor* for defects corrections. Defects are corrected within seven days by the *Contractor* at the *Contractor's factory or workshop.*

6.1.5 Plant & Materials provided "free issue" by the *Employer*

The *Contractor* is responsible for verifying that the work and necessities supplied by the *Employer* where available, are correctly installed for the *Works* to meet this Specification.

6.1.6 Plant availability

The outage times are included in the enquiry; however the *Contractor* is aware that these dates are subject to change. The *Employer* advises the *Contractor* of these changes 28 days before rescheduling. The *Employer* works on a twenty eight (28) day window in order to re-schedule an outage.

6.1.7 *Contractor*'s procurement of Plant and Materials

Contractor is responsible to procure all plant and materials that is required for them to complete the *Works.*

6.1.8 Spares and consumables

A critical and recommended spares list must be supplied and is priced separately where a fixed functional EV Charger assembly design is provided. All basic routine maintenance spares are locally available.

The *Contractor* ensures that all critical spares are available during commissioning to prevent any delays due to equipment failure.

The availability of spares is guaranteed for a minimum period of five years from completion of the whole of the *Works.*

A complete recommended spares list includes the following details:

- Description
- Part number
- Special storage requirements
- Replacement part or routine maintenance part
- Quantity
- Cost
- Lead time
- Supplier full contact details and address

A recommended Spare list is populated in the Schedule A; Appendix B, this makes reference to mandatory and recommended spares recommended by the *Contractor*.

6.2 TESTS AND INSPECTIONS BEFORE DELIVERY

The *Contractor* shall provide a testing / commissioning program and procedure to be submitted 4 weeks prior to the test/commissioning commencing for acceptance by the Project Manager. All tests will be witnessed by the Eskom Engineer and/or Supervisor and therefore the *Contracto*r ensures that the Project Manager is timeously informed of when and where the tests and inspections will occur. All tests and commissioning are conducted as per National and Eskom Standards.

6.2.1 Factory acceptance testing (FAT)

1. The *Contractor* must complete its own pre-checks and inspections before the *Employer* is notified for inspection/FAT. *Contractor* gives notice period of no less than ten (10) days (SA) prior to the date for the FAT unless agreed for an earlier date with the *Employer*.
2. The *Contractor* supplies one (1) copy of all test certificates/data sheets and a procedure prior to FAT.
3. This inspection entails a full system check (includes wiring checks) to ensure compliance with this specification, contract drawings and other applicable standards.
4. The system functionality is to be demonstrated by the *Contractor* to the Project Manager/Supervisor during Factory Acceptance Tests at the *Contractor's* facility for the Charger assembly.
5. The following tests (checks) are conducted by the *Contractor* as a minimum, but not limited to and witnessed by the Project Manager/ Supervisor, Lead Engineer and or site representative:
   a) Dielectric test of auxiliary wiring and control circuitry;
   b) Dielectric tests of power circuit, bus bars and cables.
   c) If applicable, current transformer test to prove the ratio, polarity, resistance and magnetising curves;
   d) Check the nameplates, connections, torque all bolts and nuts on power cabling that will not require loosing and refastening on site;
   e) Functional tests on circuitry, and the indication circuitry (checks include fuse/mccb ratings, labelling, ferrule numbers, crimping and tightness of all connections including lugs);
   f) Calibration checks of all voltmeters and ammeters to prove their operation and accuracy class;
   g) Power Supply checks
   h) Alarms and indication checks
   i) Power electronics checks and tests
   j) Breaker/contactor tripping and closing under off-nominal voltages
   k) Overload checks
   l) Interlocking checks
6. All pre-FAT tests confirmed above regarding the communication systems will be demonstrated to the *Employer.*

6.3 MARKING PLANT AND MATERIALS OUTSIDE THE WORKING AREAS

N/A

6.4 *CONTRACTOR*'S EQUIPMENT (INCLUDING TEMPORARY *WORKS*).

The *Contractor* is responsible for all temporary works.

6.5 CATALOGUING REQUIREMENTS BY THE *CONTRACTOR*

N/A

7. CONSTRUCTION

7.1 TEMPORARY *WORKS*, SITE SERVICES & CONSTRUCTION CONSTRAINTS

7.1.1 *Contractor's* equipment

1. The *Contractor* provides the *Employer* with a complete list of materials, tools, Equipment and or machinery before bringing it onto Site.
2. The *Contractor* provides and maintains all tests and measuring Equipment required for all tests to the required accuracy. The accuracy of test Equipment is required to be better than ± 0.1 %.
3. The type and class of *Equipment* used is subject to the Acceptance by the *Employer*.
4. The *Contractor's* measuring Equipment is accompanied by valid calibration certificates from an approved authority.
5. The Project Manager may at any stage during the *Works* require such Equipment to be checked by an approved laboratory or the South African Bureau of Standards.

7.1.2 Equipment provided by the *Employer*

The *Employer* does not provide any equipment towards completing the *Works.*

7.1.3 Site services and facilities

7.1.3.1 *Employer's* Site entry and security control, permits, and Site regulations:

Before work starts on Site, a Site inaugural meeting is held between the *Contractor* and the *Employer,* where details of the *Works* are discussed and clarified;

a) The *Contractor* complies to all Site rules, procedures and regulations.
b) The *Contractor* submits a safety file to the *Employer* for approval. Work may only commence after the safety file has been approved by the *Employer.*
c) The *Contractor's* Site Supervisor is on Site for the entire duration of the *Works*.
d) General access to the power station is controlled and Site induction has to be completed before work will be allowed to start.
e) It is mandatory that the *Contractor* adheres to all security regulations in force during the period of the contract.

f) Before entry to the Site will be allowed, everyone will undergo an alcohol breathalyser test which needs to be passed.

g) There are five Life-saving Rules to which the *Contractor* is required to adhere to at all times.

7.1.3.2 Other Electricity Supply for Construction

The nearest electrical power supply will be indicated by the *Employer* if available, but it is the *Contractor's* responsibility to arrange for all such services required in the execution of the *Works*. No warrantee is offered or given by the *Employer* that the existing electrical supply availability will be adequate for the *Contractors* purposes nor is that supply in any way guaranteed. The distribution of electricity is carried out by the *Contractor* strictly in accordance with the applicable laws and regulation. The *Contractor* verifies extension lead requirements and provides extension leads to provide the *Works.*

The *Contractor* provides everything else necessary for providing the *Works.*

7.1.3.3 Water Supply

All points of supply are provided in terms of availability and location. The *Employer* indicates which supply points may be used if available.

The *Contractor* to source and supply his own water and it is the *Contractor's* responsibility to arrange for all such services required in the execution of the *Works*. No warranty is offered or given by the *Employer* that the existing water supply availability will be adequate for the *Contractor's* purpose nor is such water supply in any way guaranteed. All water for construction purposes is clean, free from undesirable concentrations of deleterious salts and other materials.

7.1.3.4 Area for Site establishment and Storage

A Site Establishment and storage area is indicated to the *Contractor* by the *Employer*. Security to the *Contractor's* storage area and facility is the responsibility of the *Contractor*.

The area allocated to the *Contractor* is reinstated to its former condition on handover of the *Works*.

7.1.3.5 Sanitary facilities

Facilities are provided in the power station complex only. The *Contractor* provides everything else necessary for providing the Works.

7.1.3.6 Office Space

The *Employer* is not able to offer office space to *Contractors* for the period of work on Site. Parking space is available outside of the station building for the *Contractor* to utilise for temporary office space.

7.1.3.7 Telecommunications

Telephone connections are not available. The *Contractor* makes provision for his own Telecommunication requirements.

7.1.3.8 Restrictions to access on Site, roads, walkways and barricades

The *Contractor* satisfies himself and complies with the Site conditions presented during induction. The *Contractor* is required to comply with all Site restrictions pertaining to the Site's roads, walkways and barricades.

7.1.3.9 People restrictions on Site; hours of work, conduct and records

The *Contractor* makes provision to perform the *Works* during normal working hours as follows:

Monday to Thursday

07:00 – 16:15

Fridays

07:00 – 12:00

7.1.4 Facilities provided by the *Contractor*

The *Contractor* makes provision for accommodation, vehicles, kitchen - and office space (mobile container) and Equipment etc.

The *Contractor* removes all this Equipment and waste which was generated during the installation and commissioning within 24 hours after Completion.

No spoil areas are provided on site and the *Contractor* arrange for the disposal of waste. Construction waste to be disposed at a registered disposal facility.

7.1.5 Existing premises, inspection of adjoining properties and checking work of Others

The *Contractor* communicates disruptions and amount of time of the disruption to the *Employer* during the *Works*.

The *Contractor* is required to inspect the *Work* and ensure that it is safe before execution. The *Contractor* communicates with the *Employer* requirements regarding working times, construction methods, permits and down time requirements. No work commences pending the *Employer's* written instruction.

7.1.6 Survey control and setting out of the *Works*

Prior to any excavation work, the *Contractor* makes use of an appointed professional land surveyor to perform a survey to establish if any underground services exist in the affected area. Should the underground services exist in the affected area, the *Contractor* shall produce drawings depicting the location of the existing services as well as the new location of the services should they be rerouted, with all necessary details such as type of service detected, direction, length, location, etc.

The *Contractor* appoints a professional land surveyor to perform a Construction Survey which includes set-out of points, lines, levels, horizontal control, vertical control, and bench marking for the execution of the *Works*.

7.1.7 Excavations and associated water control

The *Contractor* ensures that excavations are done safely. The *Contractor* ensures that cable/pipe detection is conducted for areas where excavation is taking place to avoid breaking of live cables and water pipe bursts.

7.1.8 Underground services, other existing services, cable and pipe trenches and covers

The *Contractor* minimises interference of any nature with regards to existing services, cable and pipe trench covers. In the event that the *Contractor* damages one of the above, the repair cost would be for the *Contractor.*

7.1.9 Sequences of construction or installation

All activities are performed according to the *Contractors* Programme accepted by the *Employer*.

7.1.10 Hook ups to existing *works*

1. *Contractor* ensures third party inspector for the scaffolding where applicable.

7.2 COMPLETION, TESTING, COMMISSIONING AND CORRECTION OF DEFECTS

7.2.1 Work to be done by the Completion Date

On or before the Completion Date the *Contractor* shall have done everything required to Provide the *Works* except for the work listed below which may be done after the Completion Date but in any case before the dates stated. The Project Manager cannot certify Completion until all the work except that listed below has been done and is also free of Defects which would have, in his opinion, prevented the *Employer* from using the *works* and others from doing their work.

	Item of work	**To be completed by**
	Performance testing of the *works* in use as specified in 7.2.8 of this document.	See performance testing requirements.
	As built drawings	Within 30 days after Completion of the *Works*
	Commissioning of the *Works*	7.2.4

7.2.2 Use of the *works* before Completion has been certified

N/A

7.2.3 Materials, facilities and samples for tests and inspections

Samples of components may be requested by the *Employer* for pre-acceptance where deemed necessary.

7.2.4 Commissioning

The activities forming part of live testing, live commissioning or power up of any component is not embarked on until the Project Manager's acceptance of the Commissioning documentation. The Commissioning procedures to be submitted to the Project Manager for acceptance 4 weeks prior to the commissioning date. Commissioning will not start until the following documents, required for the commissioning of the equipment, has been signed off and submitted for acceptance by the Project Manager:

1. All relevant drawings
2. All relevant site acceptance test reports completed and signed
3. All installation related defects are cleared.
4. All QCP's signed at the relevant steps.

5. All safety clearance certificates signed.

7.2.4.1 Site Acceptance Tests

Site acceptance testing is done by the *Contractor* and witnessed by the Supervisor and/or *Employer*. The test procedure are prepared by the *Contractor* and submitted to the Project Manager 4 weeks prior to the execution of the tests and accepted by the Project Manager. . Execution of the tests can only commence once the procedure has been accepted by the Project Manager. All test equipment must be provided by the *Contractor*.

Steel components shall be checked for dimensional accuracy and conformity to drawings, to prove that the manufacturing process is working satisfactorily before galvanising of steel components.

Welders, welding operators and tack welders shall be qualified by a fabricator, steelwork erector or an independent testing agency.

Records of test results shall be kept by the fabricator or steelwork erector.

NDT tests shall be carried out on all welds in the form of the following:

Fillet welds are required to undergo magnetic particle inspection (20% of all welds).

All butt welds and full penetration welds are required to undergo ultrasonic non-destructive testing (100% of welds).

The permissible deviations for fabrication, foundations, and anchor bolts, and erected steelwork will be in accordance with tables 3 to 9 of SANS 2001-CS1.

7.2.4.2 Cold Commissioning Tests

The purpose of the cold commissioning is to ensure that all the Plant and Materials are correctly installed and ready for hot commissioning.

(a) Cold commissioning is done by the *Contractor* and witnessed by the *Employer*.

(b) The test procedure needs to be accepted by the *Employer*.

7.2.4.3 Hot Commissioning Tests

Hot Commissioning starts after cold commissioning is complete.

(a) The EV Charger assembly is commissioned by testing each piece of equipment for full functionality.

(b) *Contractor* performs hot commissioning of the EV Charger assembly as per the accepted procedure and witnessed by the *Employer*.

7.2.5 Start-up procedures required to put the *works* into operation

The *Contractor* is on site when the first live operation of the EV Charger commences.

7.2.6 Take over procedures

Take-over is when all testing, inspections and commissioning as specified in Section 7.2.1, 7.2.4, 7.2.5 are successfully completed.

7.2.7 Access given by the *Employer* for correction of Defects

The *Employer* will grant access to the *Contractor* for correcting defects , depending on availability of plant and Employer resources.

7.2.8 Performance tests after Completion

All commissioning tests must be submitted to the *Employer* for acceptance and if additional tests are required, it will be communicated by the Project Manager to the *Contractor*.

7.2.9 Training and technology transfer

7.2.9.1 General

1. Training provided by the *Contractor* is directly applicable to the actual Plant and Material supplied for the *works*;
2. Generalised training based on similar Plant and Material is not acceptable;
3. Engineering training is provided prior to the Factory Acceptance Testing of the new assembly;
4. All pre-FAT training is conducted at the *Contractor's* local test facility and all operating and maintenance training is conducted at Sere Wind Farm;
5. The local facilities for training provided by the *Employer* are a suitably sized air-conditioned room, to accommodate the required trainees as well as trainee and trainer desks, an overhead projector and flipchart or white board.
6. The *Contractor* submits to the Project Manager for acceptance a detailed training programme as well as a prospectus for each course one month before each training session.
7. The number of participants that are to be trained is as indicated in the table below.
8. The *Employer* bears the cost of salaries, accommodation, travelling expenses and other allowances of his personnel during the training, but all other training costs are for the *Contractor* account.
9. The training of the *Employer's* personnel in the engineering, operation and maintenance of the EV Charger system is done by the *Contractor* and the training is structured in 1 phase as listed below and section 7.2.9.2.
    a) Training phase 1 - Engineering and Operator Training at Sere Wind Farm
    b) The amount of training personnel is captured in the Schedule A.

7.2.9.2 Training Requirements

10. Engineering Training

a) Overview of the EV Charger System;

b) Overview of communication troubleshooting for all interfaces;

c) The training includes the following aspects:

I. Familiarisation with documentation (maintenance plan, procedures etc.);

II. Operator interface familiarisation e.g. operational functions, alarms etc;

d) Hardware familiarisation;

e) Hardware maintenance;

f) Maintenance of components
g) fault finding
h) Full commissioning understanding

11. Operator training

a) Familiarise with documentation including drawing configuration logic;
b) Operating the equipment, e.g. isolations and switching etc;
c) Operator interfacing and intervention, e.g. operating functions, indications and alarm etc;
d) Safety switching and isolating mechanisms of the equipment, e.g. Incomers, feeder breakers

12. Maintenance training

a) Familiarise with documentation, e.g. drawings, maintenance plan, procedures etc.
b) Operator interface familiarisation, e.g. operational functions, alarms etc.
c) Hardware familiarisation
d) Hardware Maintenance

7.2.9.3 Training Documentation

13. All necessary technical data, design data literature and drawings to be incorporated into a training manual.
14. Course material to be in English.
15. All third-party devices and components must be covered as well.
16. The training manual to be submitted by *Contractor* to the Project Manager for acceptance 4 weeks prior to the execution of the training.

7.2.10 Operational maintenance after Completion

The *Contractor* is required to provide Operation and Maintenance Manuals for all of the works, for acceptance by the Project Manager 4 weeks prior to the completion of the *Works.*

8. PLANT AND MATERIALS STANDARDS AND WORKMANSHIP

8.1 INVESTIGATION, SURVEY AND SITE CLEARANCE

The *Contractor* conducts a thorough site investigation of existing facilities and the area around which he is to do his work before he commences with any part of the *Work* as detailed in this report.

If the *Contractor* requires access to specific areas, this is arranged with the Project Manager and notifying in advance.

The *Contractor* to dispose all waste generated from the *Works*.

Existing shade net removed from carport structure to be stockpiled on site for *Employer* to recommend further action.

8.2 BUILDING WORKS

N/A

8.3 CIVIL ENGINEERING AND STRUCTURAL WORKS

8.3.1 List of Standardised Specifications

During the construction of the *Works* there are numerous standards and specifications to which the *Contractor* must adhere to. The documents listed below, and indicated on the drawings, including normative references within, are not bound in this document but are obtained by the *Contractor* at his own expense and must be adhered to during the implementation of the works.

Where a SANS standard referenced has been replaced by a newer standard, the *Contractor* is required to adhere to the latest revision of the newer standard. Where a SANS standard referenced is composed of several parts, all applicable parts are to be adhered to.

The following specifications are required to be complied to:

- SANS 1200 – Standardised specification for civil engineering construction
- SANS 2001 – Construction works
- SANS 3001 – Civil engineering test methods
- SANS 10400 – The Application of the National Building Regulations

8.3.2 Structural Steelwork

The following codes are required to be complied to:

- SANS 2001 CS1: Structural Steelwork
- SANS 1200 H: Structural Steelwork (Only Clause 8 – Measurement and Payment)
- AWS D1.1: Structural welding code – steel
- SANS 1921-3: Construction and management requirements for works contracts, Part 3: Structural steelwork
- SANS 50025-2: Hot rolled products of structural steel – Part 2 – Technical delivery conditions for non-alloy structural steels
- SANS 1700: Fasteners
- SANS 10162: The structural use of steel

The table below indicates particular specifications pertaining to SANS 2001-CS1 and must be read in conjunction with the code.

Clause	Particular Specification
4.1	**Materials**
4.1.1	Add the following: • All structural steelwork is required to be grade S355JR.
4.1.4.1	• Electrodes for electric welding are required to be E7018.
4.1.5.1	• Ordinary bolts to be grade 8.8 with class 8 nuts, as a minimum.
4.2	**Drawings**

4.2.4	Fabrication drawings (shop detailing)
4.2.4	The following clause is added: "Fabrication drawings are to be prepared by the *Contractor.* These are issued to the Project Manager for acceptance in the form of two paper prints and in "PDF" electronic format. The *Contractor* may not commence with fabrication until written acceptance from the Project Manager is received.
4.2.4.2	Attachments to facilitate erectins may not remain as part of the permanent structure.
4.2.4.7	Connections to allow movements are as shown on the Drawings.
4.3	**Workmanship (General)**
4.3.6	Holing
4.3.6	The following clause is added: "Flame cutting of holes is not permitted."
4.6	**Workmanship – Erection**
4..6.5	On site welding is not permitted.
5.3	**Non-destructive testing of welds**
5.3.3	• Fillet welds are required to undergo magnetic particle inspection (20% of welds).
5.3.4	All butt welds and full penetration welds are required to undergo ultrasonic non-destructive testing (100% of welds).
Variations	
Cl 5.2	Add the following: Properly documented evidence of previous qualification of welders is acceptable.
Additional Clauses	
1	All materials are to be new and as specified in this document and on the relevant Drawings.
2	Materials not listed in this specification or on the relevant Drawings are not permitted.
3	In the event of any specified steel not being available, the *Contractor* advises the Project Manager in writing. The Project Manager is to reply in writing on alternative materials and / or sections.

8.3.2.1 Additional Requirements and Specifications

- *Contractor* is responsible for the stability of the entire structure and all structural elements during all the erection stages.
- All dimensions are required to be verified on site by the *Contractor* before any fabrication of steelwork commences.
- All welding is required to be conducted by coded welders. Supporting documentation is also required to be submitted to the Project Manager for acceptance. All welding is required to comply with AWS D1.1.
- All welds are required to be inspected using visual aids and relevant tests as listed above.
- The *Contractor* is required to supply all bolts, washers, nuts, etc. for the structural steelwork.

- Welded connections are required to be welded all around with a minimum of 6mm fillet welds unless otherwise stated on the *Contractor's* Drawings. Butt welds are required to be full penetration welds.
- Minimum thickness of gusset plates is to be 10mm.

8.3.3 Concrete Works (Structural)

- SANS 2001 CC1: Concrete Works (Structural)
- SANS 1200 G: Concrete (Structural) (Only Clause 8 – Measurement and Payment)

8.3.4 Corrosion protection of Structural Steelwork

The following codes are required to be complied to:

- SANS 1200 HC: Corrosion Protection of Structural Steel
- SANS 10064: The preparation of steel surfaces for coating
- SANS 121: Hot dip galvanized coatings on fabricated iron and steel articles

The table below indicates particular specifications pertaining to SANS 1200 HC and must be read in conjunction with the code.

Clause	Particular Specification
Variations	
Cl 5.3	Add the following: All burrs and sharp areas are to be removed by: • Chamfering or • Ground to a smooth radius of at least 1mm.
Cl 5.4.1	Add the following: The method of cleaning and preparing the substrate of steelwork prior to the application of the coating system is to be in accordance with the applicable provisions of SANS 10064.
Cl 5.4.3.1. b)	Add the following: Dry abrasive blast cleaning: • Blast cleaning media is not recycled. Wet abrasive blast cleaning: • Wet abrasive blast cleaning is to be carried out as indicated on the Drawing.
Cl 5.7	Add the following: The coating system is to be hot-dip galvanising which is carried out in accordance with SANS 121: 2011, if used.

8.4 ELECTRICAL & MECHANICAL ENGINEERING WORKS

The *Contractor* adheres to the standards and specification listed in 2.2.1, as a minimum, in providing the *Works*.

The *Works* are provided as per drawings listed in 9.1 and Schedules listed in Appendix A.

8.5 PROCESS CONTROL AND IT WORKS

N/A

8.6 OTHER

N/A

9. LIST OF DRAWINGS

9.1 DRAWINGS ISSUED BY THE *EMPLOYER*

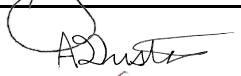
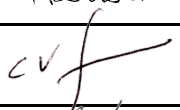
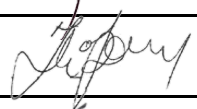
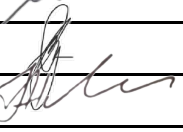
This is the list of drawings issued by the *Employer* at or before the Contract Date and which apply to this Technical Specification.

Note: Some drawings may contain both Works Information and Site Information.

Drawing number	Revision	Title
0.95/6	**00**	**Sere Wind Energy Facility Permanent Eskom – Buildings Locality Plan**
0.95/19	**10**	**Sere Wind Energy Facility O&M Offices and Visitors Centre Site Plan**
D-DT-0854	**8**	**LV Power Cable Trench Details**
D-DT-8012	**4**	**Cable Marker**
D-DT-3034	**13**	**Specification's for MCCB's**
D-DT-3128	**19**	**Power Cables - LV**
D-DT-3147	**7**	**Cable Accessories, Joints and Termination Kits - LV**
D-DT-8018	**4**	**Pipe PVC**

10. ACCEPTANCE

This document has been seen and accepted by:

Name & Surname	Designation	Signature	Date
Francois Dragner	Senior Technologist Aux & Anc Engineering - LDE		2024-11-13
Abraar Dusty	Senior Technician Civil Engineering - LDE		2024-11-13
Verwey Fourie	Chief Engineer Electrical – Asset Management		2024-11-13
Zahier Kapery	Chief Technologist Civils – Asset Management		2024-11-13
Nivashini Naidoo	System Engineering Manager (acting) - Civils		2024/11/14
Deon Van Der Merwe	O&M Sere Wind Farm		2024-11-13
Shawn Hurling	Plant Manager Sere Wind Farm		2024-11-14

11. REVISIONS

Date	Rev.	Compiler	Remarks
Nov 2024	1	F. Dragner	First Issue

12. DEVELOPMENT TEAM

The following people were involved in the development of this document:

Francois Dragner - Senior Technologist Aux & Anc

Abraar Dusty – Senior Technician Civils

Deon Van Der Merwe - O&M Manager Sere Wind Farm

13. ACKNOWLEDGEMENTS

Peaking EV Project Team.

APPENDIX A: SCHEDULE A/B TECHNICAL REQUIREMENTS

1.1 GENERAL

The technical requirements of this section specified under 'Schedules A and B' shall form part of the *Employer's* enquiry documentation. Schedule B shall be completed by the *Contractor* and submitted with their tender.

1.2 SCHEDULES A AND B

Schedule A: Particular of *Employer's* Requirements

Schedule B: Guaranteed technical particulars of equipment offered in response to Schedule A requirements by the *Contractor*.

1.3 FILLING IN INSTRUCTIONS

1.3.1 Where the *Contractor* does not fully comply with the *Employer's* requirement, any deviations must be clearly indicated in Schedule B and listed in the Deviation Schedule (Annexure B).

1.3.2 Where there is a need to substantiate or further describe an item in Schedule B, especially in instances of non-compliance with Schedule A, particulars are furnished on a separate sheet clearly marked with the notation of the Schedule A item referred to.

1.3.3 If a blank space is left in Schedule B next to certain requirement specified in Schedule A, this constitutes a confirmation that the tender does not comply with that specific requirement.

1.3.4 Where *** is indicated for an item in Schedule A, the *Contractor* is required to fill in the appropriate information in Schedule B, for the equipment offered.

Schedule A: Particulars of Eskom's requirements
Schedule B: Guarantees and technical particulars of equipment offered

Item	Description	Units	Schedule A	Schedule B
	GENERAL			
1.1	**Power supply site conditions of LV Supply Point of Connection (for information purpose)**			
1.1.1	Voltage	V	400	
1.1.2	Voltage range	Per unit	0.80 - 1.1	
1.1.3	Frequency Range	Hz	47.5 – 52	
1.1.4	Voltage imbalance; negative sequence voltage as a percentage of the normal sequence voltage.	%	3	
1.1.5	Waveform; maximum amplitude deviation from sine wave phase voltage	%	5	
1.1.5.1	Depression to 0,85 of nominal for up to one hour with further drops to 0,7 of nominal for up to 10 seconds		Yes	
1.1.5.2	Complete loss of supply for one second		Yes	
1.2	**Electrical characteristics of LV reticulation (for information purpose)**			
1.2.1	Rated operating Voltage (Ue)	V	400	
1.2.2	Rated Insulation Voltage (Ui)	V	1000	
1.2.3	Rated Frequency	Hz	50	
1.2.4	Short-circuit withstand for 1 second	kA	***	
1.2.5	Number of Phases and Neutral		3 + N	
1.2.6	Neutral Earthing		Solid	
1.2.7	Conditional short-circuit current (Peak)	kA @ U_e + 10%	***	
1.3	**EV Charger**			
1.3.1	EV charging station load rated at 250 A, 400V (2 x 60 kW, 22 kW).		***	
1.3.2	EV Charger Corrosion protection	Yes	***	
1.4	**Operation and cable access – mini-substation**			
1.4.1	Front operation		Yes	
1.4.2	Cable access		Front	
1.4.3	Cable entry from above or below		Below	
1.5	**Cable securing arrangement**			
1.5.1	gland plates provided		***	

Item	Description	Units	Schedule A	Schedule B
	MOULDED-CASE CIRCUIT BREAKERS (MCCB'S)			
1.6	**General**			
1.6.1	Manufacturer		***	
1.6.2	Type		***	
1.6.3	number of poles		3	
1.6.4	utilization category (IEC 60947-2)		A or B	
1.7	**Ratings**			
1.7.1	**Rated voltages and frequency**			
1.7.1.1	rated operating voltage (U_e)	V	400	
1.7.1.2	rated insulation voltage (U_i)	V	1 000	
1.7.1.3	rated frequency	Hz	50	
1.7.2	**Rated currents**	Provide brochure	***	
1.7.3	**Rated duty**	operations	Uninterrupted	
1.7.4	**Short circuit characteristics**	Provide brochure	***	
1.7.5	**Operating Times**	Provide brochure	***	
1.8	**Mechanism of operation and feedback**			
1.8.1	Manner of closing	Manual/ electrical	***	
1.8.2	Manner of releasing energy	Yes	electrical	
1.8.3	Manual – mechanical latch	Yes	***	
1.8.4	Auxiliary contacts (utilization category AC 14 or DC 13 to IEC 60947-5-1)	Yes	***	
	LV CABLES			
1.9	**General**			
1.9.1	Manufacturer		***	
1.9.2	Type		***	
1.9.3	number of cores		***	
1.9.4	Conductor size	mm^2	***	
1.9.5	Conductor material		***	
1.9.6	Serving or protection: a) For buried cable cables – Flame retardant PVC sheathed (FYRGARD)		***	
1.9.7	Water blocking		***	

Item	Description	Units	Schedule A	Schedule B
1.9.8	Low voltage power cables (SANS 1507-3)		Yes	
1.9.9	Cable code (BVX**QCM)		***	
1.9.10	Insulation type		PVC	
1.9.11	Cable finish construction: a) For cables that require protection against mechanical damage		Screen and Armoured	
1.9.12	Insulation resistance		MΩ.km	
1.9.13	Marking of cables sheaths		Red/Orange/ Blue/White	
1.9.14	Cable glands - Armour gripping type		***	
1.9.15	Tinned copper cable lugs		***	
1.9.16	Type Test Reports and certificates as required in SANS 1507-3	Yes	***	
1.9.17	Routine Test reports and certificates generic copies as required in SANS 1507-3	Yes	***	
1.10	**LV Cable Ratings**			
1.10.1	**AC rated voltages and frequency**			
1.10.1.1	rated operating voltage (U_e)	V	400	
1.10.1.2	rated insulation voltage (U_i)	V	1 000	
1.10.1.3	rated frequency	Hz	50	
1.10.2	**Rated currents**	Provide data sheet	***	
1.10.3	**Short circuit characteristics**	Provide data sheet	***	
1.11	**MCCB Protection function**			
1.11.1	Overcurrent protection		***	
1.11.2	Earth fault protection		***	
	Special tools and Spares if required			
1.12	**Tools**			
1.12.1	number of tool sets required	1 set per ASSEMBLY	***	

Item	Description	Units	Schedule A	Schedule B
	EV Charger documentation			
1.13	**General**			
1.13.1	Language to be used in all documentation		English	
1.13.2	Documentation to be compatible with Windows Office pack		Yes	
1.14	**Manuals**			
1.14.1	Number of hardcopies of instruction, Operation and maintenance manuals to be supplied	sets per ASSEMBLY	2	
1.14.2	Electronic copy	set	2	
1.14.3	Manual format		A4	
1.15	**Drawings**			
1.15.1	Number of drawings provide (hard copy)	sets per ASSEMBLY	2	
1.15.2	Number of drawings provide (software copy where one copy is in PDF format)	sets per ASSEMBLY	2	
1.15.3	Drawing software format		Bently Microstation (DGN)	
1.15.4	Drawing format		A3	
	Training			
1.16	**Operational training for EV Charger System**			
1.16.1	operations and shift supervisors		2	
1.16.2	mechanical maintenance		2	
1.16.3	electrical maintenance		2	
1.16.4	engineer/technician		2	
1.16.5	Training type		Classroom and on plant	
1.16.6	venue		Site	
1.16.7	training duration		***	
1.16.8	Timing		Before SAT	
1.16.9	Training material supplied (hardcopy and softcopy)		Yes	
1.17	**Specialised training for EV Charger System, if required**			
1.17.1	electrical maintenance		1	
1.17.2	engineer/technician		1	
1.17.3	training duration		***	
1.17.4	Timing		Before Construction Completion	
1.17.5	Training material supplied (hardcopy and softcopy)		Yes	

Item	Description	Units	Schedule A	Schedule B
	Compliance with OHS requirements			
1.18	RCC Certificates available for all components and cables		Yes	

APPENDIX B: SPARES

Item	Description of spares, special tools and consumables	Quantity
1	Miscellaneous	
1.1 1.1.1 1.1.2 1.1.3 1.1.4	Mandatory spares	
1.2 1.2.1 1.2.2 1.2.3	Special tools	

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