Eskom	Standard	Technology

Title: **EQUIPMENT CONTAINER FOR AC- POWERED SITES**

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Content

Figures

1. Introduction

This document outlines the technical requirements that have to be met in the construction, supply and delivery to site of the equipment housing or container.

2. Supporting Clauses

2.1 Scope

This specification covers the design detail for insulated electronic equipment housing as required by Eskom Telecommunications.

2.1.1 Purpose

This document outlines the technical requirements that have to be met in the construction, supply and delivery to site of the equipment housing or container.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings limited.

2.2 Normative/Informative References

The following document(s) contain provisions that, through reference in the text, constitute requirements of this standard. Parties using this document shall apply the most recent edition of the documents listed below:

2.2.1 Normative

[1] ISO 9001 Quality Management Systems

[2] SANS 10142-1 (The wiring of premises Part 1: Low-voltage installations)

[3] SANS 10108 (The classification of hazardous locations and the selection of equipment for use in such locations)

[4] SANS 10086-1 (The installation, inspection and maintenance of equipment used in explosive atmospheres Part 1: Installations including surface installations on mines)

[5] SANS 10089-2 (Electrical and other installations in the distribution and marketing sector)

[6] BS 1088 (British standard specification for plywood)

2.2.2 Informative

None

2.3 Definitions

2.3.1 General

None

2.4 Abbreviations

Abbreviation	Description
CE	Chief Executive
ETDC	Eskom Telecommunication Documentation Centre
MD	Managing Director

2.5 Roles and Responsibilities

Not applicable.

2.6 Process for monitoring

Not applicable.

2.7 Related / Supporting Documents

1) 240-56872119 Telecommunications concrete plinths Rev4
2) 240-56872313 Radio station earthing and bonding Rev 3
3) 240-82172806 Standards for air-conditioning in Transmission substations buildings and Telecommunications sites

3. Equipment housing environmental specifications

The housing shall be designed to protect communications equipment and built to withstand the following environmental conditions:

a) Altitudes ranging from sea level to 3 000 m.
b) Ambient temperatures ranging from -10 degrees C to + 50 degrees C.
c) Maximum relative humidity of 95%.
d) Wind Speeds of up to 180kph (50m/s).

4. Equipment container sizing

The following standard equipment housing sizes shall be used:

Note: All dimensions are specified as external

a) 3 x 3m Equipment Shelter for use with - Sealed lead acid batteries:
- Length (external) 3000 mm
- Width (external) 3000 mm
- Height (internal) 3000 mm

b) 3 x 3m Equipment Shelter for use with – Vented lead acid batteries (battery room):
- Length (external) 3000 mm
- Width (external) 3000 mm
- Height (internal) 3000 mm

c) 4 x 3m Equipment Shelter for use with - Sealed lead acid batteries:
- Length (external) 4000mm
- Width (internal) 3000mm
- Height (internal) 3000mm

d) 4 x 3m Equipment Shelter for use with - Vented lead acid batteries (battery room):
- Length (external) 4000mm
- Width (internal) 3000mm
- Height (internal) 3000mm

e) 6 x 3m Equipment shelter for use with - Sealed lead acid batteries and equipment

- Length (external) 6000mm
- Width (external) 3000mm
- Height (internal) 3000mm

f) 6 x 3m Equipment shelter for use with - Vented lead acid batteries with room devider:

- Length (external) 6000mm
- Width (external) 3000mm
- Height (internal) 3000mm

g) 6 x 3m Equipment shelter for use with - Vented lead acid batteries (battery room only):

- Length (external) 6000mm
- Width (external) 3000mm
- Height (internal) 3000mm

h) Special application (Small confined sites and rural solar)

- 2 x 2 x 2.5 m Equipment shelter for use with - Sealed lead acid batteries and equipment
- Length (external) 2000mm
- Width (external) 2000mm
- Height (internal) 2500mm

i) A generic floor layout drawing is available on request:

- 3 x 3m Container
- 3 x 3m Container as battery room only
- 4 x 3m Container
- 4 x 3m Container with battery room
- 6 x 3m Container
- 6 x 3m Container with battery room
- 6 x 3m Container as battery room only
- 2 x 2 x 2.5 m Limited use special applications

5. General

The Equipment shelter shall conform to the following:

a) The structure shall be designed for an expected service life of 20 years.

b) The construction and design shall be such that equipment shelter can be lifted by means of a mobile crane in the final assembled form as singular unit. Lifting points shall be clearly marked and the complete fully assembled design weight specified on the ID tag.

c) Because of different climatic conditions in the various regions, all housings shall be constructed to cater for the coastal regions.

d) The construction shall be fully sealed and be both water and dust proof.

e) A 1200 mm long x 50 mm wide aluminium drip rail shall be fitted horizontally 75 mm above the door frame and air conditioners, overlapping evenly on either end.

f) One 8mm stainless steel eyebolt shall be fitted at each top corner of the container. These eyebolts shall be used for securing the container with stay wires and must be securely fitted for that purpose.

g) Serial and model numbers for the Equipment Shelters shall be on a metal (aluminium) nameplate and attached to the chassis in the centre of the doorway.

h) Branding on the door shall be restricted to the top left-hand corner.

i) All containers to be fitted with a “tell-tale” drop indicator, if transported in fully assembled state.

j) The tender company shall state whether the Equipment Shelter is also available in semi-knocked down/flat pack form.

k) The housing shall be supplied with overhead racking as per Section 12. The configuration shall be specified in the site specific drawings on order.

l) The security gate shall be supplied as specified per Section 11.The requirement will be specified on order.

m) Due to the height of the roof, each unit shall be fitted and supplied with a fibreglass type portable step ladder of length 1.8 m (6 ft) with a mounted hanging bracket on the wall as indicated on floor layout drawing.

6. Walls

The walls of the container shall have the following characteristics:

a) The walls shall be double with a space in between of range 75 - 85mm with insulation material in between specified.

b) The wall finish by GRS Global Roofing Solutions (Chromadeck) is selected for coastal conditions and shall be strictly as follows and:-

- Thickness - 0.53 mm
- Steelgrade material quality – G550
- Coating type – Zincalume
- Coating weight – AZ150
- Paint system – Colorbond.

c) The insulation range shall be 75 to 85 mm thick, 16kg/m3 polystyrene.

d) The wall allocated for the air conditioners shall be able to sustain its weight of 150 kg.

e) Any equipment, which may be required to be mounted onto the walls, shall be securely fastened to sustain its weight. Mounting methods should not impede the waterproofing or integrity of the structure.

7. Floors

The floor shall be constructed as follows:

a) The floor shall be a suspended floor and be capable of carrying a weight of 2000kg/ square meter. Extra strengthening to be installed. This will be specified in the site specific drawing indicating the estimated total weight and space footprint.

b) The floor shall be constructed from 18mm Maranti marine ply hardwood as per British standard specification 1088.

c) The floor shall be finished with MF2002, 2 mm grey vinyl floor tiles or with solid vinyl sheeting as specified. The tiles must be cleaned with an appropriate stripper and sealed with two coats of sealer. Battery room floors shall have an acid resistant system on the hardwood base, fully bonded and have a slight fall to a low collection point. The acid resistant system must also be applied at 100mm up the walls to contain any acid spillage

d) Battery rooms must be fitted with a 50mm diameter outlet pipe with a containment stopper or valve. The design should allow for the safe removal and draining of any acid spill inside the room in to containers to prevent environmental contamination of the outside soil.

Figure 1: Sample photo of a drain plug installed

e) The underside and the edges of the floor must be waterproofed with bitumen paint or with fibreglass and resin prior to installation.

f) The finish between the floor and the interior walls as well as the roof and the interior walls shall be 38 x 38 x 2 mm aluminium angle edging and fixed with pop rivets and sealed with white polyurethane sealer. (This is mainly for aesthetics).

8. Base Frames

The base frame of the container shall be constructed as follows:

Note: The lifting requirement in section 5 (b) must be incorporated in the design.

a) The frame shall be constructed using a minimum of 2mm thick grade 304 stainless steel.

b) The frame shall not allow any water entrapment and shall have adequate drainage holes. If C channel is used it shall face inwards.

c) The frame shall be supported by means of adjustable legs with one adjustable spinout

- In the case of a 3x3 m container, six (6) legs with one(1) adjustable spin out leg for levelling.
- In the case of a 4x3 m containers, eight (8) legs with two (2) adjustable spin outs legs for levelling.
- In the case of a 6 x 3m containers, ten (10) adjustable with three (3) spin out legs for levelling.

d) The legs shall allow a minimum height of 200mm between the container slab and the bottom of the frame.

e) A 50mm x 13 mm slot in the leg will allow for adjustments on site. M12 x 40mm stainless steel bolts, washers, spring washers and nuts shall be used to secure the legs in position.

f) Each leg shall have a 200mm x 200mm x 6mm thick grade 304 stainless steel footplate welded in the central position of the leg with a continuous weld. One 12mm diameter mounting hole must be drilled in each footplate in such a position to allow easy mounting of the chemical bolts while container is place in final position. The leg upright assemblies shall be constructed using minimum 3mm thick grade 304 stainless steel.

g) In the base frame below the feeder entry point, four 10.5 mm holes shall be drilled in the frame channel for an earth connecting point. These holes shall be co-ordinated with the feeder entry panel and the AC protection box for single point protection.

h) All the fasteners i.e. bolts, nuts, and washers shall be stainless steel. The pop rivets shall be aluminium and must seal off to prevent water ingress.

i) A jig shall be used during the construction of the frame to ensure reliable geometric tolerances (L/500 where L = length in millimetres).

9. Roofs

The roof of the container shall have the following characteristics:

a) The roof shall have a pitch fall of between 25mm and 50mm from back to front and away from the installed air-conditioners

b) Roof construction may incorporate a water catchment design to harvest rainwater, but is not a requirement.

c) All joints in the roof shall be sealed with a waterproofing material and shall not allow for any standing water. A lifetime guarantee of 20 years is required on all waterproofed areas.

d) The roof insulation shall be 75 to 100mm thick, 16kg/m3 polystyrene.

10. Wall finish

The exterior of the enclosure shall be finished as follows:

a) The interior and exterior shall be white, unless Eskom specifies another colour in writing.

b) Include an aluminium connection plate from earth point to the feeder entry as shown in figure 1

Figure 2: Aluminium plate and earth connection points

c) Where environment legislation specifies that painting is required, the painting of the shelters shall be done after the surface has been lightly sanded with water paper or abrasive pads and thoroughly washed with Sugar soap.

d) Containers shall be painted in a factory environment (controlled) with an SABS approved Nitro Cellulose paint system (Duco or an approved equivalent) in accordance with the manufacturer's instructions. A test patch is recommended to check for compatibility and adhesion. Two coats may be needed for proper coverage. Metal surfaces to be painted must be treated with the appropriate prep solution prior to painting.

e) The roof should not be painted and its colour should always be kept white, unless it is specifically required to do so by Eskom.

11. Doors

The door(s) of the shelter shall be supplied and fitted as follows:

Note: For units with a battery room two (2) doors will be required and all doors shall open to the outside. Door requirements and fittings must be discussed with Eskom before manufacturing

a) The door(s) shall be of the hinged type, opening outward in such a manner that it may be retained in the open position. The door opening must be 800mm +/- 20mm wide by 2000mm +/- 20mm high.

b) An internal stainless steel grade 304 door handle shall be fitted.

c) An internal sliding stainless steel grade 304 barrel lock that locks the door from the inside and prevents the door from being locked from the outside shall be fitted.

d) An external stainless steel grade 304 power brace lock shall be fitted, and provision made for a 12 mm padlock protected by a lock box. The internal locking mechanism design needs to be inspected by Eskom Telecomm personnel and accepted in writing.

e) A stainless steel (Grade 304 finish 2B) Tee catch door re-strainer for securing the shelter door in the open position shall be fitted. A stainless steel grade 304 backing plate must protect the specified wall.

f) A full perimeter double exterior UV resistant silicone or polyurethane gasket water seal shall be incorporated in the door design.

g) Tamper proof stainless steel grade 304 hinge with a stainless steel pin and a vesconite bush or a 10 mm brass pin shall be fitted.

h) The door frame shall be aluminium and fit around the whole perimeter and sealed with white exterior polyurethane sealer prior to fixing.

i) If required a rubber doorstop shall be mounted on the lower section of the external wall behind the door of the equipment room to prevent the door locking mechanism causing damage to the wall of the equipment room.

j) A mechanical door alarm switch shall be installed but not wired on all the doors. Specification is a IP67 limit switch, roller lever, N/O & N/C with adjustable roller arm type AZD1008.

k) The tenderer shall provide, where requested, an additional security door(s) to provide additional security on the door(s). The proposed design to be signed off by the relevant project designer implementing the proposed project. Design criteria might vary from region to region.

Figure 3: Sample photo of a security door

Note: Were a battery room is required; the door shall be fitted with the same security door as the equipment room thus some site will require two(2) security doors

- The security door should consist of at least the following:
- Bolt on frame of 75 mm x 50 mm mild steel rectangular tubing with fastening from the inside of the frame
- Solid Door panel of 6mm plate thickness or 35 mm x 35 mm square tube trellis door
- Door panel fully framed with rectangular and square tubing, fully welded at corners.
- The door panel to interlock with the door frame at multiple positions along the circumference of the door panel.
- The door edge frame beam to contain the latch and deadbolt locks option, with additional top and bottom deadbolts for added security.
- Door locks shall be keyed alike and protected.
- Lock side fitted with a slam bar from top to bottom.
- The hinge to be from top to bottom. Welded to one side and bolted to the other with an additional lock bolts to secure the final hinge position after the door has been aligned.
- The security door hinge shall be on the same side of as that that of the container door.
- All components to be electro- coated and powder coated to match the container.
- For coastal conditions hot dip galvanizing shall be used.
- An open position catch mechanism must be included in the design to hold the security door in the open position.
- The direction of opening depends on site conditions.

12. Overhead Racking

The container shall be fitted with overhead cable racking as follows:

Note: No racking is to be installed in battery rooms

a) Type: Wire Mesh

- Width: 300mm

- Height: 50mm
- Base aperture: 50mm x 50mm
- Side Aperture: 25mm x 50mm
- Finish: Hot-dipped galvanized
- Wire diameter: 4mm

b) Racking shall be fitted inside of the building against the wall and at 90degrees to the wall. It will be mounted on 350 mm cantilever brackets. Cantilever brackets to be secured to the wall by means of M10 rivnuts and M10 bolts.

Figure 4:

c) The racking shall run along the entire inside perimeter (except for the door area) as well as across the centre of the container. The centre racking should be suspended with M8 treaded rods secured with M8 spring nuts onto P2000 trunking riveted to the roof.

Figure 5: P2000 trunking and M8 spring nut sample photo

d) The racking shall be fitted 300mm below roof height and shall be able to sustain the weight of at least 1kg/m along its entire length.

Note: Racking layout and routing shall be specified on site specific drawings. Racking height must accommodate the height of the proposed equipment cabinets and other devices. Consultation with the project designer is recommended before final installation.

13. Earthing and bonding

All earthing and bonding shall be in accordance with the Eskom Standard 240-56872313.

a) Provide a 25 x 3mm copper earth strap to the inside of the overhead racking.

b) The routing of the bar to be optimized as to minimize the amount of bolted joints. Joints may be brazed if no damage will be done to internal components. (Preferably mount copper bar on side of wire racking)

c) An additional copper earth strap shall be connected to the feeder entry panel and from this point extended externally to the container main earth outside, thus bonding the internal earthing to the main station earth.(Use the bonding holes as specified in Section 8 (g))

14. Equipment Stand and IDF gland plate

Where requested, it is to be manufactured and supplied as follows:

a) Made of 2 mm mild steel channel and painted black. (design to be provided as needed)

b) To be fastened to the floor with stainless steel bolts.

c) 2mm aluminium plate should be fitted below the IDF to provide a gland plate for cable access.

Note: These items will be specified in detail if required in the site drawings and may vary from site to site

15. Ventilation

The ventilation for the various containers sizes in section 4 shall be catered for as follows:

Note: Reference Specification 240-82172806 Standard for air conditioning in Transmission substation buildings and Telecommunications sites for more detail and compliance to Eskom the standard

a) Two wall mount window mounted air-conditioners are required for each container.

b) The air-conditioners are to be at least 18000 BTU each and utilise R410A gas.

c) Air conditioners shall be installed and tested at the factory and then removed for transportation.

d) The full cut out shall be capped with an aluminium architrave and the opening must be closed securely with a blanking plate that can only be removed from the inside. The architrave shall be sealed with white exterior polyurethane sealer.

e) Vandal proofing cages shall be fitted on the outside.

f) One blanking plate shall be provided in case a unit has to be removed for repairs.

g) The blanking plates shall be waterproof and provide security.

h) The air-conditioners are required for cooling only. They are to be fitted with a de-frost thermostat for de-icing. No heating element is required.

i) The fresh air seal off shall be 100%.

j) Cut outs shall be made in the wall as per the drawings.

k) 1.6mm 3CR12 Stainless Steel White Powder Coated Vandal proofing shall be fitted. An acceptable alternative is metal cages that are hot dipped galvanizing.

l) All air conditioners shall be fitted with temperature control and auto-restart.

m) The units shall be fitted with a Tautech (or equivalent) AC duty controller. Air conditioners shall interface with the duty controller using Gweiss 5 pin plugs (Model No GW60009 with interlocking fitted). The air-conditioner alarm termination points shall to be wired with a 10 pair cable of 10 m length and left unterminated coiled up with the unit. All relevant programming software and documentation must be supplied with the installation.

n) White exterior silicon shall be used to seal the perimeter of the air-conditioner and behind the mounting bracket prior to pop riveting the bracket. The pop rivets shall be sealed with silicon.

~~o)~~ A flameproof/spark proof AC extractor fan shall be fitted to every battery room.

p) The sizing must be such that a minimum of 4 air volume exchanges are done per hour. (Refer to SANS 10108 Annex E for calculation information to determine the exact figure).

q) The extraction fan shall be mounted as high as possible in the wall as per the container room drawing; shall run continuously; shall be resistant against the acid vapour given off by the batteries during boost charging and be equipped with a front gravity louvre.

r) A louvered air inlet panel, through which the necessary replacement air would enter the battery room, shall be fitted as per the container drawing. The air inlet shall be located as close to the floor as possible to ensure that the incoming fresh air passes around and over the battery cells. The air inlets shall provide for unobstructed airflow, but designed in such a way that prevent or limit dust ingress into the battery room. The filter media shall be washable and be able to resist degradation due to cleaning. A suitable anti-theft cover to prevent access to the room shall be fitted.

16. Feeder entry panel

A feeder entry panel (see Figure 6 & 7) shall be provided and fitted. At least a minimum of 6 large feeder port entries are required and 8 smaller 16 mm diameter holes.

The design should incorporate a mounting lip at least 50 mm wide with supporting gussets below the lip. This is to provide a secure mounting for the overhead gantry from the tower. This mounting point must be able to support the full weight of the overhead gantry and cables. No pre drilled holes required.

Note: The contractor must discuss the design and type with Eskom Telecoms before ordering and installation of any feeder entry. The final design shall be documented and agreed upon. The type, make and design model shall be listed for consistency in design for duration of the contract.

The feeder entry panel shall be as follows:-

a) The top first 6 entry holes shall be at least 40 mm internal diameter. They shall be fitted with suitable PVC fittings with a screw on endcap externally. All positions shall be sealed off appropriately.(see Figure 6 for example) Additional to this at the bottom a row of 8 x 16 mm holes shall be drilled at suitable spacing to allow the fitment of RF surge protection modules for RF feeder cable. These 16 mm holes must be sealed with removable plastic or PVC plugs.

b) The feeder entry panel shall be sealed with white exterior Polyurethane sealer and pop riveted into place uniformly.

c) An internal mounting plate of 350 x 350 mm (see Figure 7) for RF lightning surge protectors shall be provided directly in line with the feeder entry panel mounted on the overhead racking and bonded to the station earthing. 9 Pre-drilled holes at 16 mm internal diameter spaced at 100 mm apart (see Figure 3)

d) The surge protector mounting plate shall be bonded by means of 25 mm^2 copper wire or bar to the station earthing.

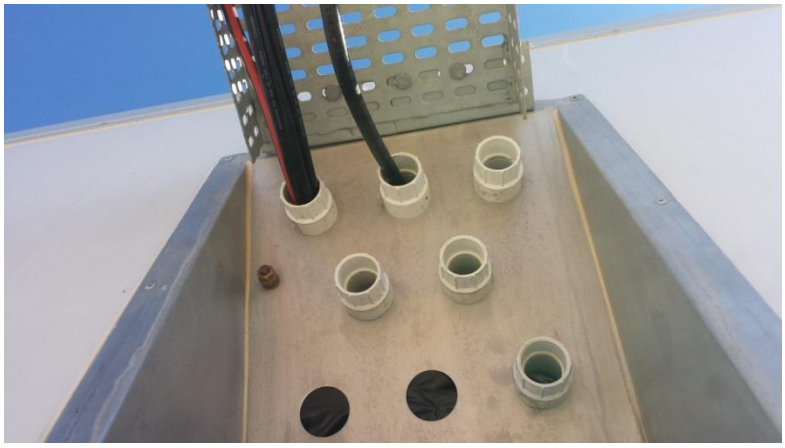


Figure 6: Feeder entry panel

Figure 7: Mounting plate for RF lightning surge protectors

17. Electrical

The electricals for the container shall be supplied as follows:

Refer to the single phase and three phase wiring diagrams in the annexure.

All wiring to comply with SANS 10142-1 (The wiring of premises Part 1: Low-voltage installations)

Note: No LED lighting to be used due to RF interference produced via their switched mode power supplies

a) The Outside Distribution / Protection box shall conform to the following:

1) The box (350mm L X 275mm B x 225mm H) with an IP65 environmental rating ,shall be constructed of fiberglass and be installed next to the earth strip of the port entry panel. (The reason for this placement is to employ the principal of single point earthing).

2) It shall be fitted with 63A single phase double pole Isolator or in the case of three phase it should be 63A per phase and neutral

3) Install Surge protection devices (SPD's) DEHNGaurd 275 FM rated at I_{Normal} = 20kA and I_{Max}=40KA on all phases and neutral. They must be rated class 2. (SANS 61643-1 SABS IEC 0313-1). SPDs shall be equipped with thermal disconnecting mechanism and visual inspection to determine end of life.

4) It shall have a 25 mm^2 earth strap as short as possible to the single point earth on the container. (Connect to pre drilled holes as per section 8 (g))

5) It shall be fitted with a single-phase / three phase double pole single throw bypass switch. (refer to item (g) below)

6) It shall be fitted with the appropriate matching socket for the standby supply. This standby socket should be mounted separately in a suitable sized fibre glass box with a slot cut for the generator cable to allow the operation in adverse weather conditions. (refer to item (f) below foe specification)

7) It shall be fitted with an AC mains fail monitoring device. For single phase supply, install an Over & Under Voltage Single Phase Relay Comparator (ACDC Dynamics WCPT1 or equivalent) and for 3 Phase install a Phase Failure & Sequence Relay (ACDC Dynamics SMP1/N SPDT or equivalent)

b) The inside distribution box shall consist of the following:

1) 18-way Sarel type or equivalent electrical distribution box (250x405x65 mm in dimension).

2) 63 A single (Live & neutral) / 3 Phase main incoming isolator (3 Phases only).

3) 63A single / 3 phase earth leakage switch. (for plugs only)

4) Minimum 1 x 20A circuit breaker for plugs fed via the earth leakage unit

5) 10A single pole plus neutral (SP+N) circuit breakers for lights.

6) 10A single pole plus neutral (SP+N) circuit breakers for extractor fan. (Only fitted to containers that have a Battery room)

7) 1 x 20A 6kA double pole circuit breaker for battery charger. In the case of a three phase supply this should be increased to one each per phase. In the case of a dual charger this requirement should be duplicated. The supply must not be fed via the earth leakage switch.

8) A suitably rated 20 A Curve 2 double pole circuit breaker is required for each air-conditioning unit.

9) Double plug sockets are to be fitted as per drawings. Outlets to comply with SANS164-1 and have a 16A rating.

c) Equipment room lights shall be 1.5 m (5 ft) Dual 58 Watt fluorescent lamp with electronic ballasts covered in vapour proof fittings and ceiling mounted. (Refer to the drawings for placement of light fittings). Note the requirements for light fittings for a battery room in Section 18

d) Provide an outside a waterproof light with a waterproof external switch at an appropriate height on the equipment room and battery room side of the shelter unless otherwise specified. The external waterproof switch shall be a rotary sealed O-ring type. When a battery room is included the internal lights need to be operated via a waterproof switch of the same type mounted externally.

e) AC power cables shall not be routed with any communication cables on the overhead racking. All cables shall be in PVC trunking. 100mm x 40mm. Dual ducting shall be used. These shall be mounted at in the top corners of the wall. Allow for a small spacing gap to facilitate the removal of the covers when fitted close to the ceiling or corners. The plugs and switches shall be connected to the PVC trunking by means of 20 mm PVC conduit with suitable mounting glands saddled to the walls with self-tapper screws or pop rivets.

f) Provision shall be made to connect a mobile 30 kVA 3 phase or 15 kVA single phase generator.

1) For single phase - Provide a suitable 63 Amp (2P + N + E) 3 pin male socket with an IP44 rating on the outside of the container in a suitable weatherproof box.

2) For three phases - Provide a suitable 63 Amp (3P + N + E) 5 pin male socket with an IP44 rating on the outside of the container in a suitable weatherproof box.

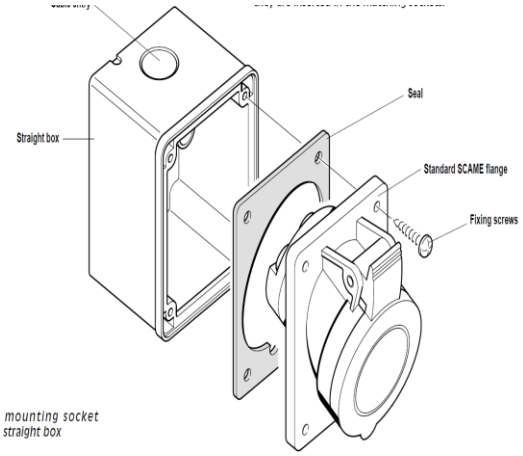


Figure 8: Sample picture of generator plug

g) A manual changeover switch rated at 63 A, shall be fitted between the main incoming AC and the standby generator supply point. This switch must not break the neutral connection in the 3 phase application. This could be mounted in the outside distribution box or internally next to the main AC distribution board.

h) The interconnecting wire between the generator supply point, changeover switch and the container distribution board shall be a minimum of 16 mm2.

i) The supply feed cable must be supplied and shall be a 4 core 16 mm2 armoured cable or 2 core for single phase. This shall be installed from the Municipal/ Eskom supply point to the main 63A isolator on the container. A separate external non insulated earth wire of 25 mm2 size should be run adjacent to the power cable. The length of this cable is site specific. All cables must be buried 500 mm below ground level.

j) The contactor must supply an electrical Certificate of Compliance with every installation.

18. Battery room compliance to SANS Standards

a) The battery room shall be electrically wired in accordance with SANS10142-1 2017 Section 7.14.3- Hazardous locations.

b) The classification of the location and the selection of equipment permitted (such as flameproof, explosion proof and intrinsically safe equipment) shall be in accordance with SANS 10108.

c) The installation of electrical equipment in explosive atmospheres shall be in accordance with SANS 10086-1 and SANS 1008902 respectively. This is where the container is used for a battery room only or part of it is used for a battery room.

The battery room must be equipped with an aluminium gland plate opening of a suitable size to allow the installation of 4 battery cables to be fed to the adjacent equipment room. All glands used must be flameproof (see Figure 9 – Black glands in top right)

The position of this gland plate will be indicated on the site specific drawings but the bottom should always align with overhead racking.

Figure 9: Battery room gland plate

d) The light fittings shall provide sufficient light output to illuminate the tops of the batteries to a level not less than a maintained 100 lux, in accordance with the Occupational Health and Safety Act, 85/1993 for battery and charging equipment rooms.

e) The lighting installation shall consist of fluorescent luminaires only of Type Ex n, Class T1, gas group IIC suitable for installation in zone 2 areas.

f) The luminaires shall be positioned against the walls at a height of 2500mm above floor level, as per the container layout.

g) The light switch (waterproof) shall be mounted outside in close proximity to the battery room door.

h) The contractor shall supply a Master electrician Certificate of Compliance where the need for a battery room was included.

19. Smoke detector

a) Supply a smoke detector mounted but not wired.

b) Ceiling mounted photo – electric sensor Spectrum PA1045H.or similar

20. Container Installation

The container can be transported as a flat pack and erected on site or as a complete unit. Site specific access condition, terrain and distance to site will determine the optimum transport option.

The container shall be delivered to site and installed on the plinth and secured as follows:

a) The container should be correctly placed as per site-layout drawing provided by Eskom Telecommunications and its foot-plates secured with M10 stainless steel chemical bolts. The cable entry panel should align with the underground cable entry pipes of the concrete plinth on site. Station earth mat connection points and overhead gantry routing must be taken into account. Site drawings should be provided to the supplier with every order, indicating the container orientation and all entry points for alignment.

b) In high wind locations, stay wires shall be required: At each corner at a 250 mm offset from side of the of the container on the plinth, set a M10 x 60mm stainless steel chemical eyebolt into the plinth and insert a eyebolt attachment point in the rooftop. Insert the thimble through the 8 mm eye bolt on the top of the container. Loop one end of the 6mm stainless steel stranded cable (250mm) through the thimbles and secure the looped cable using two M6 Stainless steel Crosby Clamps, spaced 100 mm apart. Starting at the thimble tail, so that the “U” end is on the short end of the loop and the clamp is on the long end. Brass/Aluminium ferules may be used in place of the Crosby clamps. Turn-buckles may be inserted and used to tension the cables were required.

21. Special Application Considerations for 2x2x2.5m Container

This is a special order unit mostly for remote solar installations or very small scale sites

Site specific details to be discussed on requisition

Due to site conditions, e.g. the fencing and gates will already be in position, the container may have to be transported manually and erected on site in position.

a) The antenna entry plate shall be standard fitting as supplied on the larger containers. (see section 16 for details)

b) Antenna entry plate shall not be obstructed by the 19 inch cabinet position.

c) Steel battery tray and working table shall be built into container as per specification and drawings.

d) Contractor to supply, fit and wire as per AC/DC diagram the following:

1) Specification as per section 17

2) One 12 way distribution board.

3) Breakers as per requirement.

4) One two-way 16 amp wall socket.

5) One 1.2m double fluorescent light fitting in radio room.

6) One internal light switch by door for overhead light.

7) Provision shall be made for a weatherproof bulkhead light over the doorway. A weatherproof rotary switch on the outside wall must operate the light by the door.

8) The AC board supply shall be fed via conduit from bottom of container. Eg contractor must be able to feed supply through bottom of container via conduit to AC board.

e) All wiring inside module shall be surface mounted in conduit/trunking.

f) All outdoor wiring is shall be weatherproof and UV resistant.

g) All fittings shall have a protection rating of IP65.

h) The AC and DC earth shall be braize-welded to the station earth mat.

i) All AC and DC equipment and fittings shall be supplied by the contractor unless otherwise specified.

j) Unless otherwise specified the container shall be fitted with a thermostatically controlled AC operated extractor fan. Small floor vents to be fitted to ensure airflow. Air vents to have insect gauze. Fan fitting must not expose container wall insulation to water ingress.

22. Authorisation

Name and surname	Designation
Joe Manyisa	Eskom Telecommunications Manager
Ben van Nieuwenhuizen	Manager: Coastal Region

Name and surname	Designation
Jaap Maritz	Manager: Limpopo/ Mpumalanga Region
Keith Cornwall	Manager: Gauteng and North West Region
Joe Manyisa	Manager: Network Management Centre
Craig Pitt	Manager: Business Architecture
Cornelius Naidoo	Manager: CoE Design Engineer
Mlungisi Mkhwanazi	Manager: Programme Management
Mark Ganesan	Manager: SHEQ
Sharon Mokoena	Manager: Key Sales and Marketing (Acting)
Willie van der Vyver	Manager: Network Replacement Portfolio (Acting)
Bheki Nala	Manager: National Planning
Mfundiso Hina	Manager: Network Replacement (Acting)

23. Revisions

Date	Rev	Compiler	Remarks
Aug 2019	2	Jacques van der Heide	Corrected language, typing errors and reference errors in document. 2.7 Added new 2019 air conditioner spec as reference 7 d) Clarified Acid drain hole design 8 g) Changed hole diameter 11 k) Added holding catch to security door and opening details 12 b) Clarified rack mounting design 12 c) Clarified suspended mounting 13 a) Corrected earthing strap size 15 Changed wording removed duplications Added specification reference to 240-82172806 15 m) Added requirement for software and documentation. 15 o) Item removed from specification 16 Added mounting lip for gantry 16 a) Changed and Improved design 16 c) Changed wording and added detail 16 d) Changed wording 17 Added SANS 10141-1 reference & corrected multiple errors 17 a) 1) added IP65 rating 17 a) 2) corrected to Isolator 17 a) 3) Changed to different type and stated rating 17 a) 4) Corrected wording 17 a) 6) added enclosure requirement 17 a) 7) New item – AC fail relay item 17 b) 1) Changed to 18 way larger unit 17 b) 3) Corrected rating to 63 A 17 b) 4) Corrected rating to 20 A 17 b) 5) Corrected rating to 10 A (SP+N) 17 b) 6) Corrected rating and changed wording 17 b) 7) Corrected rating to 20 A Curve 2 17 b) 8) Added SANS 164-1 rating at 16 A 17 e) added detail on installation standard 17 f) Upgraded rating to 63 A and corrected to 3 pin plus changed gender of socket to male type for both units Added IP44 rating 17 g) Specified 63 A rating and neutral caution. 17 h) Downgraded cable size to 16 mm square 17 i) Reworded and clarified specification to 16 mm square and added more detail 18 c) Included omitted battery room cable gland mounting plate and picture
Sept 2018	1	Dawie Naude	First issue

24. Development team

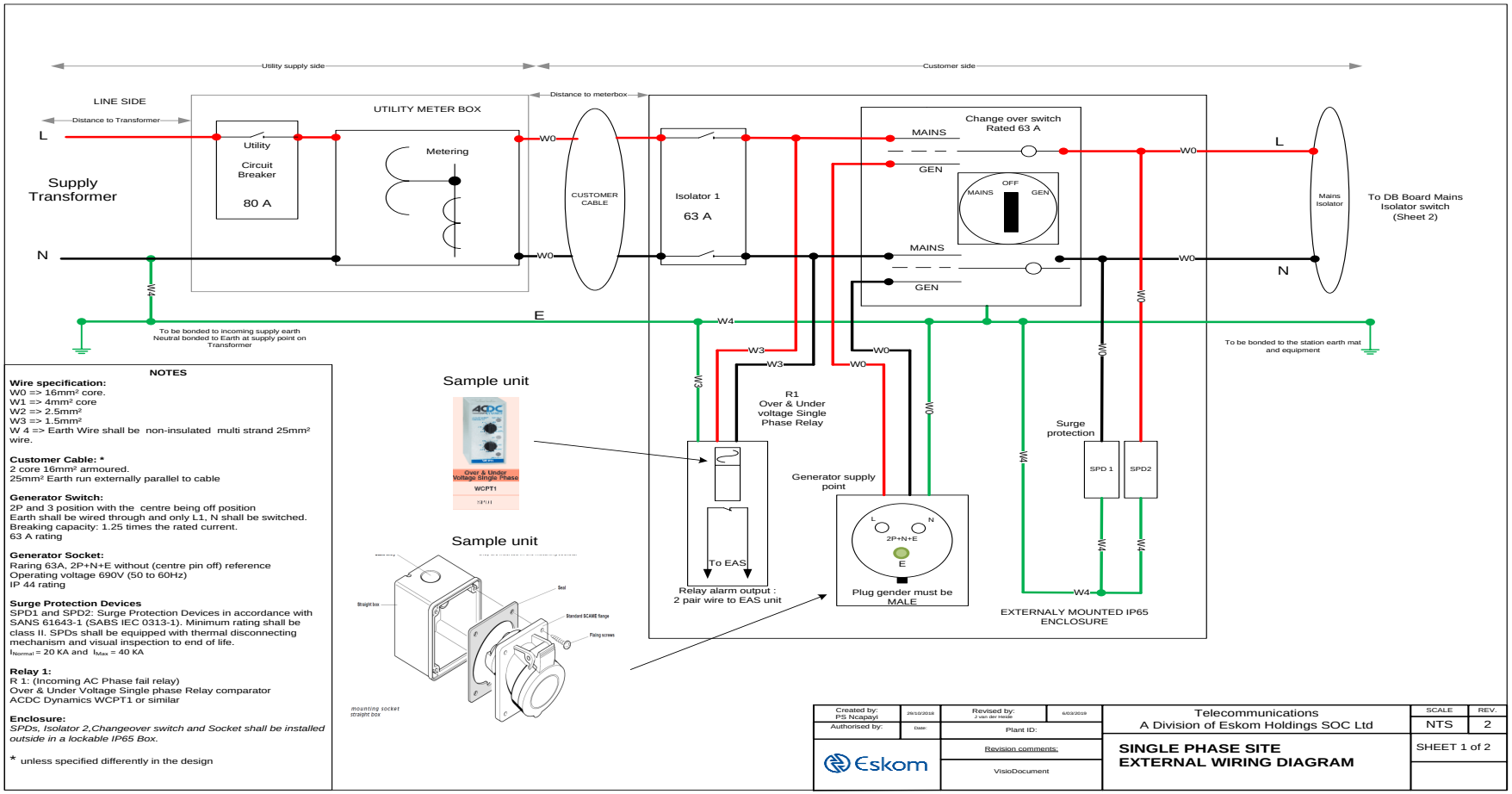
The following persons were involved in the compilation of this document.

- Eric Waddington
- Kamir Lala
- Jacques van der Heide (Pr Tech Eng)

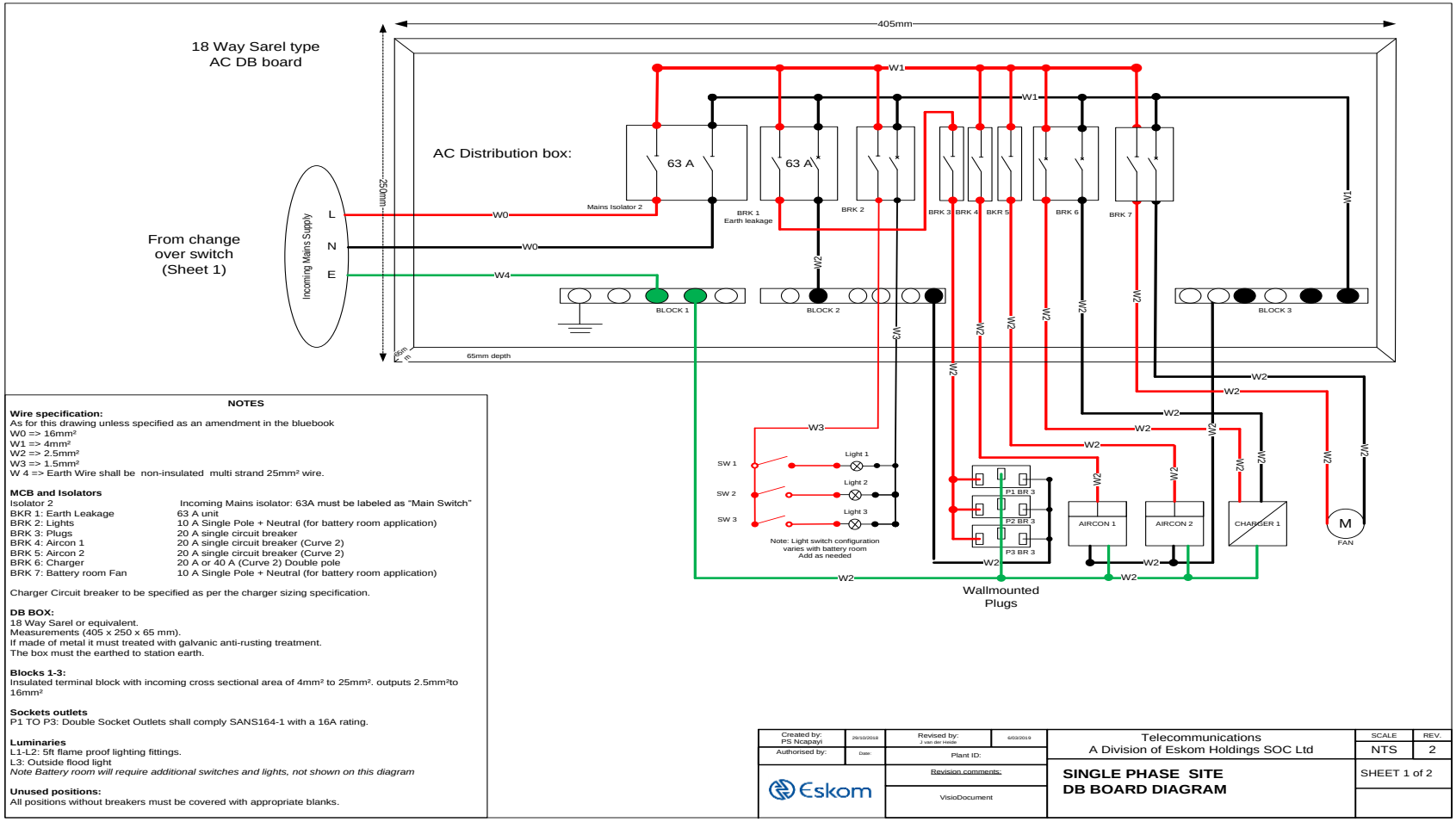
25. Acknowledgements

Not applicable.

Annex A – Single phase site external wiring diagram



Annex B – Single phase distribution board wiring diagram



NOTES

Wire specification:
As for this drawing unless specified as an amendment in the bluebook
W0 => 16mm²
W1 => 4mm²
W2 => 2.5mm²
W3 => 1.5mm²
W 4 => Earth Wire shall be non-insulated multi strand 25mm² wire.

MCB and Isolators

Isolator 2	Incoming Mains isolator: 63A must be labeled as "Main Switch"
BKR 1: Earth Leakage	63 A unit
BRK 2: Lights	10 A Single Pole + Neutral (for battery room application)
BRK 3: Plugs	20 A single circuit breaker
BRK 4: Aircon 1	20 A single circuit breaker (Curve 2)
BRK 5: Aircon 2	20 A single circuit breaker (Curve 2)
BRK 6: Charger	20 A or 40 A (Curve 2) Double pole
BRK 7: Battery room Fan	10 A Single Pole + Neutral (for battery room application)

Charger Circuit breaker to be specified as per the charger sizing specification.

DB BOX:
18 Way Sarel or equivalent.
Measurements (405 x 250 x 65 mm).
If made of metal it must treated with galvanic anti-rusting treatment.
The box must the earthed to station earth.

Blocks 1-3:
Insulated terminal block with incoming cross sectional area of 4mm² to 25mm². outputs 2.5mm²to 16mm²

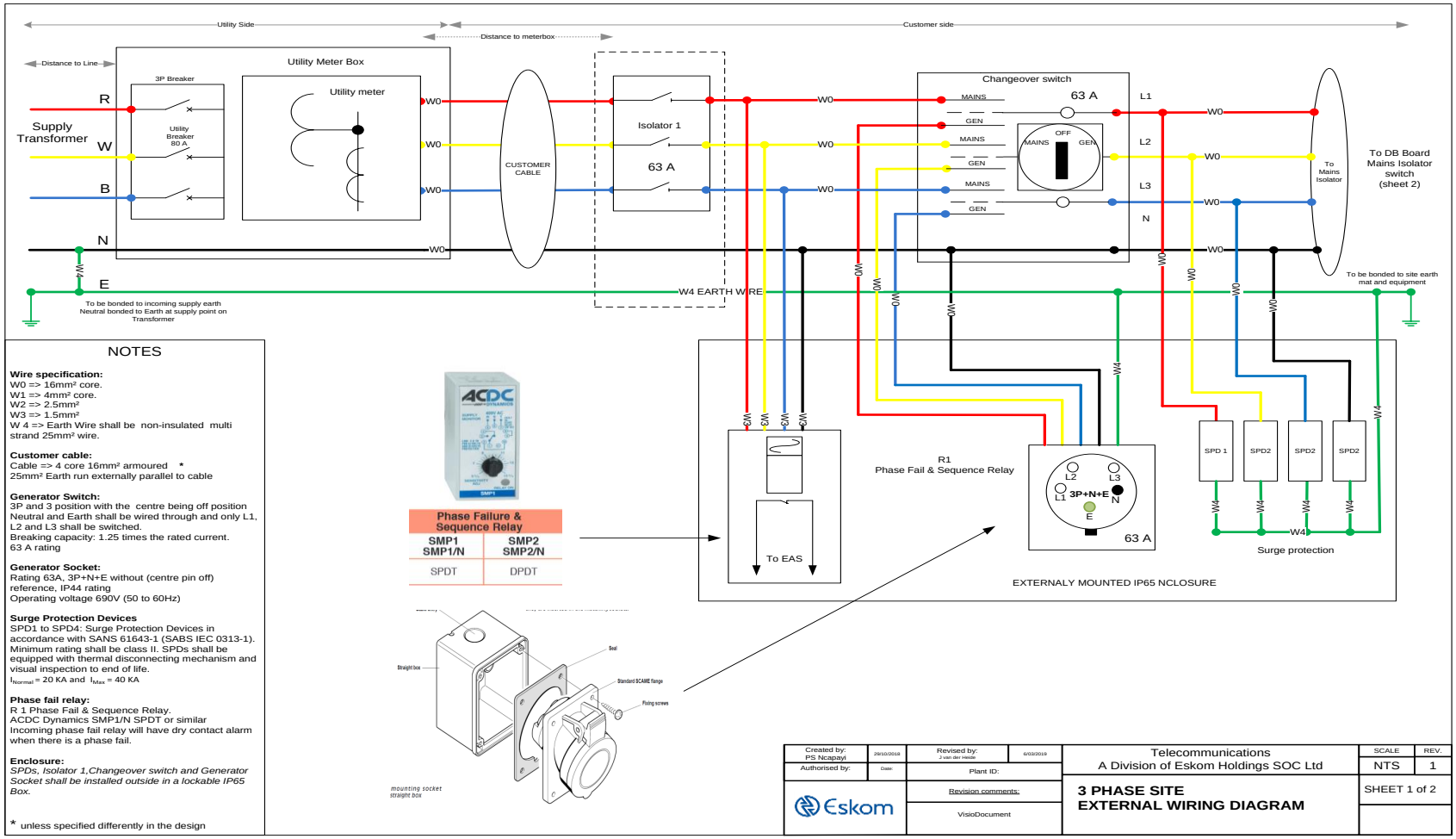
Sockets outlets
P1 TO P3: Double Socket Outlets shall comply SANS164-1 with a 16A rating.

Luminaries
L1-L2: 5ft flame proof lighting fittings.
L3: Outside flood light
Note Battery room will require additional switches and lights, not shown on this diagram

Unused positions:
All positions without breakers must be covered with appropriate blanks.

Created by: PS Ncapayi	29/10/2018	Revised by: J van der Heide	6/03/2019	Telecommunications A Division of Eskom Holdings SOC Ltd	SCALE: NTS / REV.: 2
Authorised by:	Date:	Plant ID:		**SINGLE PHASE SITE** **DB BOARD DIAGRAM**	SHEET 1 of 2
Eskom		Revision comments:			
		VisioDocument			

Annex C – Three phase site external wiring diagram



NOTES

Wire specification:
W0 => 16mm² core.
W1 => 4mm² core.
W2 => 2.5mm²
W3 => 1.5mm²
W 4 => Earth Wire shall be non-insulated multi strand 25mm² wire.

Customer cable:
Cable => 4 core 16mm² armoured *
25mm² Earth run externally parallel to cable

Generator Switch:
3P and 3 position with the centre being off position
Neutral and Earth shall be wired through and only L1, L2 and L3 shall be switched.
Breaking capacity: 1.25 times the rated current.
63 A rating

Generator Socket:
Rating 63A, 3P+N+E without (centre pin off) reference, IP44 rating
Operating voltage 690V (50 to 60Hz)

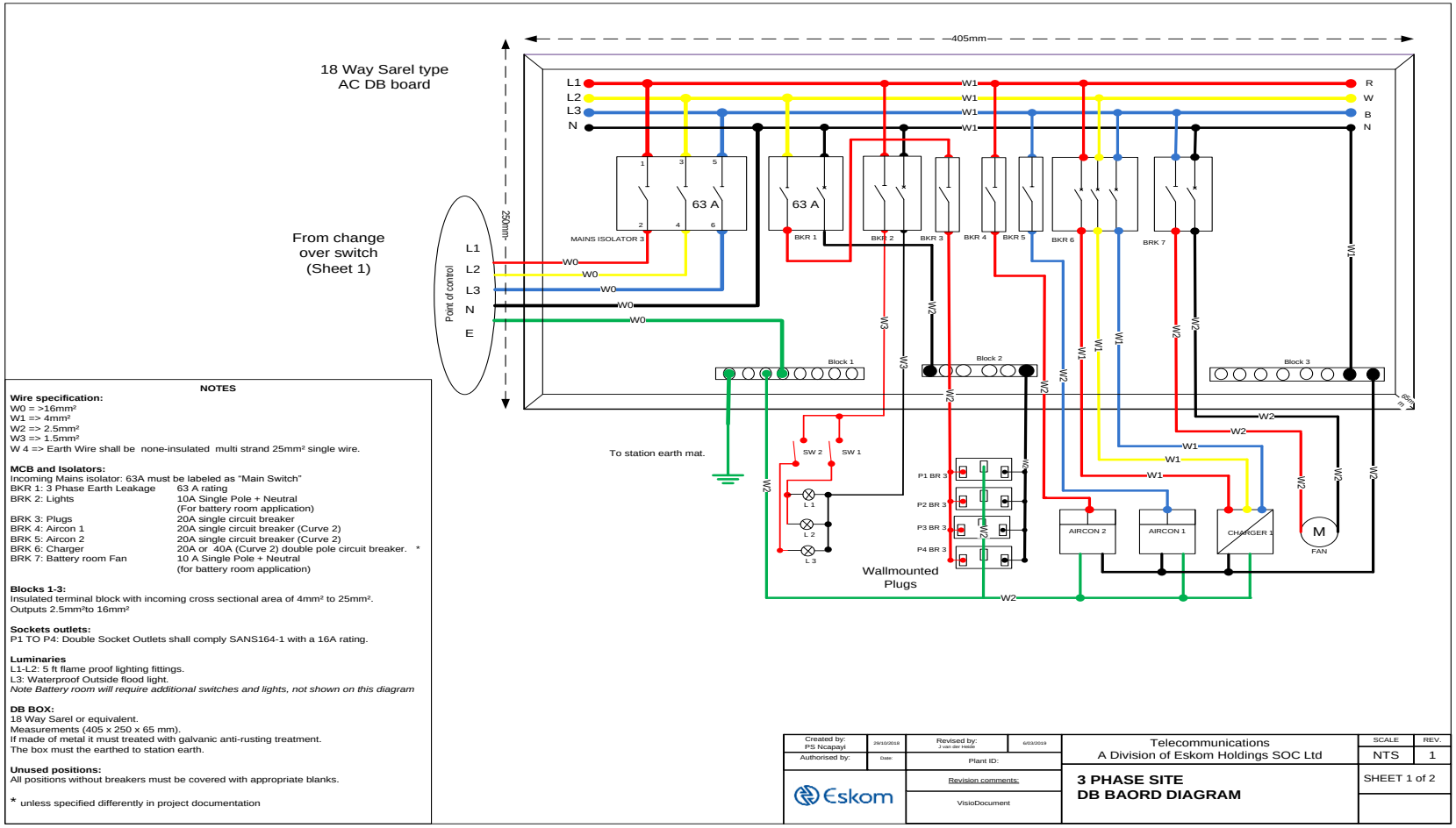
Surge Protection Devices
SPD1 to SPD4: Surge Protection Devices in accordance with SANS 61643-1 (SABS IEC 0313-1). Minimum rating shall be class II. SPDs shall be equipped with thermal disconnecting mechanism and visual inspection to end of life.
I_{Normal} = 20 KA and I_{Max} = 40 KA

Phase fail relay:
R 1 Phase Fail & Sequence Relay.
ACDC Dynamics SMP1/N SPDT or similar
Incoming phase fail relay will have dry contact alarm when there is a phase fail.

Enclosure:
SPDs, Isolator 1,Changeover switch and Generator Socket shall be installed outside in a lockable IP65 Box.

* unless specified differently in the design

Annex D – Three phase distribution board wiring diagram



NOTES

Wire specification:
W0 = >16mm²
W1 => 4mm²
W2 => 2.5mm²
W3 => 1.5mm²
W 4 => Earth Wire shall be none-insulated multi strand 25mm² single wire.

MCB and Isolators:
Incoming Mains isolator: 63A must be labeled as "Main Switch"

BKR 1: 3 Phase Earth Leakage	63 A rating
BRK 2: Lights	10A Single Pole + Neutral (For battery room application)
BRK 3: Plugs	20A single circuit breaker
BRK 4: Aircon 1	20A single circuit breaker (Curve 2)
BRK 5: Aircon 2	20A single circuit breaker (Curve 2)
BRK 6: Charger	20A or 40A (Curve 2) double pole circuit breaker. *
BRK 7: Battery room Fan	10 A Single Pole + Neutral (for battery room application)

Blocks 1-3:
Insulated terminal block with incoming cross sectional area of 4mm² to 25mm².
Outputs 2.5mm²to 16mm²

Sockets outlets:
P1 TO P4: Double Socket Outlets shall comply SANS164-1 with a 16A rating.

Luminaries
L1-L2: 5 ft flame proof lighting fittings.
L3: Waterproof Outside flood light.
Note Battery room will require additional switches and lights, not shown on this diagram

DB BOX:
18 Way Sarel or equivalent.
Measurements (405 x 250 x 65 mm).
If made of metal it must treated with galvanic anti-rusting treatment.
The box must the earthed to station earth.

Unused positions:
All positions without breakers must be covered with appropriate blanks.

* unless specified differently in project documentation

Created by: PS Ncapayi	29/10/2018	Revised by: J van der Heide	6/03/2019	Telecommunications A Division of Eskom Holdings SOC Ltd	SCALE: NTS / REV.: 1
Authorised by:	Date:	Plant ID:		**3 PHASE SITE DB BAORD DIAGRAM**	SHEET 1 of 2
Eskom		Revision comments: VisioDocument			