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1 SCOPE

This specification covers the supply, delivery, installation, testing and commissioning of distribution boards, kiosks and pole mounted distribution boards.

The specific standards shall be read in conjunction with this section:

GENERAL INFORMATION

The following Standards and Acts shall take precedence:

- National Electricity Act of Namibia
- Occupational Health and Safety Act of Namibia
- Labour Act of Namibia
- Quality of Service Standard
- Quality of Supply Standard
- NamPower Specifications for the Erection of Overhead Power Lines
- NamPower Specifications and General Conditions for Survey and Route Clearing for New Power Lines

The following Standard shall be used as reference:

- NRS 033 : Electricity Distribution – Guidelines for the application design, planning and construction of medium voltage overhead power lines up to and including 33kV, using wooden pole structures and bare conductors.
- NRS 034 : Guidelines for the provision of electrical distribution networks in residential areas.
- NRS 043 : Code of practice for the joint use of structures for power and telecommunication lines
- NRS 059 : Recommendations to minimize problems associated with the theft of transformer neutral and neutral earthing copper conductors
- NRS 060 : Code of practice for clearances for electrical systems with rated voltages up to and including 145kV, for the safety of persons
- NRS 082 : Recommended maintenance policy for electricity networks
- SANS 10280 : Overhead power lines for conditions prevailing in South Africa

DISTRIBUTION BOARDS

Regional Standards

- NRS 032 : Service Distribution boxes - Pole mounted types for overhead single phase A.C. service connections at 230V.
- NRS 056 : Service distribution boxes – Meter kiosks and distribution kiosks
- SANS 1619 : Small power distribution units (ready boards) for single phase 230V service connections
- SANS 1765 : Safety of Distribution Boards
- SANS 141 : Glass reinforced polyester (GRP) Laminates

International Standards

- IEC 60439 : Low voltage switchgear and control gear assemblies

BOLTS, FASTNERS AND GLANDS

Regional Standards

- SANS 134 : Metallic materials - Hardness test - Calibration of standardized blocks to be used for Rockwell superficial hardness testing machines (scales 15N, 30N, 45N, 15T, 30T and 45T)
- NRS 028 : Cable lugs and ferrules – for copper and aluminium conductors
- SANS 1213 : Mechanical Cable Glands
- SANS 1282 : High Strength bolts, nuts and washers for friction grip joints.

International Standards

- IEC 61238 : Compression and mechanical connectors for power cables with copper and aluminium conductors

BUSBARS

Regional Standards

- SANS 1195 : Busbars
- BS EN 13601 : Specification for Copper for electrical purposes: Rod and Bar

International Standards

- BS 159 : Specification for High voltage Busbars and busbar connections

PAINT AND FINISHING

- NRS 002 : Graphical Symbols and Labelling for electrical diagrams
- SANS 1091 : National colour standards for paints
- SANS 935 : Hot dip galvanised zinc coatings on steel wire
- SANS 121 : Hot dip galvanised coatings on fabricated iron and steel articles.
- SANS 10064 : The preparation of steel surfaces for coating
- SANS 679 : Zinc chromate primers for steel.
- BS 183 : Specification for galvanized steel wire.
- BS 381 : Paint
- BS 2569 : Zinc Metal Spraying

EARTHING

- NamPower : Code of Practice for the Earthing of Low Voltage Distribution Systems
- SANS 10199 : The design and installation of an earth electrode
- SANS 1063 : Earth rods and couplers
- SANS 10200 : Neutral Earthing in medium voltage industrial power systems
- SANS 10292 : Earthing of low-voltage (LV) distribution systems
- ESKCAAB4 : Zinc coated earth conductor, guy and stay wire for transmission lines.
- SANS 10313 : The protection of structures against lightning

FUSES AND DROP OUT FUSES

- NRS 035 : Outdoor Distribution Cut-Outs (Drop –out fuse assemblies or solid - link assemblies): Pole – Mounted Type
- SANS 172 : Low – Voltage Fuses
- SANS 60269 : Low Voltage Fuses
- SANS 1779 : High-voltage Fuses
- SANS 60282 -1 : High voltage Fuses Part 1: Current Limited Fuses
- SANS 60282 -2 : High voltage Fuses Part 2: Expulsion Fuses

CIRCUIT BREAKERS

Regional Standard

- SANS 767-1 : Earth leakage protection units Part 1: Fixed earth leakage protection circuit breakers
- SANS 767-2 : Earth leakage protection units Part 2: Single phase portable units
- SANS 60934 : Circuit breakers for equipment (CBE)
- SANS 10142-1 : The Wiring of premises Part 1: Low-voltage installations
- SANS 152 : Low voltage air break switches, air break disconnections, air break switch disconnections and fuse combination units.
- SANS 156 : Moulded case circuit breakers
- SANS 60056 : High-voltage alternating current circuit breakers
- SANS 60265-1 : High voltage switches Part 1: Switches rated for voltages 1kV and less than 52kV
- SANS 6227 -100 : High voltage switchgear and control gear Part 100: High Voltage alternating current circuit breakers

International Standard

- IEC 60056 : High voltage alternating current circuit breakers.
- IEC 60376 : Specification and acceptance of new sulphur hexafluoride (SF₆).
- IEC 60898 : Electrical accessories – circuit breakers for over current protection for household and similar installations
- VC 8036 : Industry Standards for Circuit Breakers

2 DISTRIBUTION KIOSKS AND BOARDS

2.1 General

2.1.1 Notices

At least one electricity danger sign (e.g. Lightning flash) with the words "DANGER" shall be mounted outside on the front of the distribution kiosk and board. The notice shall be embossed into the fibreglass door of the distribution kiosk and board.

2.1.2 Drawings and specifications

A set of prints of the shop drawings of the kiosks shall be submitted to the Engineer for approval before the kiosks are manufactured or installed.

2.2 Floor-standing fibreglass kiosks

2.2.1 General

(a) Type

Double door fibreglass kiosks complete with frame, root base, canopy, equipment board, gland plate and busbars shall be supplied and installed.

(b) Sizes

The following sizes are specified are generally used in accordance with design specifications and NRS 056:

12 way	-	box size	:	1200mm x 700mm x 430mm
	-	board size	:	900mm x 680mm
	-	root base	:	900mm high (note: this is non-standard)
6 way	-	box size	:	870mm x 530mm x 420mm
	-	board size	:	600mm x 650mm
	-	root base	:	900mm high (note: this is non-standard)

Any size that is not generally used shall be supplied in accordance with NRS 056.

(c) This specification covers the manufacture of fibreglass and stainless steel distribution kiosks and boards for general reticulation and distribution systems in environmental conditions specified for three-phase, four-wire, 400/230 V, 50Hz systems.

(d) Moisture and vermin proof

Kiosks and boards shall be weatherproof. To prevent the ingress of water onto live equipment, the door entry surrounds shall have a channel shape, at least 12mm deep, to accommodate the door edge.

The roof shall be constructed with an overhang above non-continuous panelling and shall be provided with a drip-edge according to standard manufacturing practises.

(e) Legend card holder

On the side of the kiosk front door shall be mounted a standard legend card holder of size 160mm x 180mm.

The card holder shall be riveted in place.

2.2.2 Construction of fibreglass distribution kiosks

- (a) The laminate shall be constructed to SANS 141.
- (b) An outer isophthalic resin gelcoat with a minimum thickness of 0.4mm and ultraviolet absorption properties to prevent degradation of the surface from exposure to the sun shall be provided.
- (c) The gelcoat shall be backed by multiple layers of chopped strand mat glass rendering not less than 1.2kg/m². The strength shall be increased to 1.35kg/m² on kiosks with panelling larger than 500mm x 500mm.
- (d) The fibreglass shall be thoroughly impregnated with polyester resin. The resin should preferably be clear.
- (e) The resin to fibreglass ratio shall not be less than 2.5:1 and not more than 3.0:1.
- (f) Air trapped between the glass layers shall be thoroughly worked out. The laminate must be free of air bubbles and voids.
- (g) All edges shall be reinforced with an additional 700g/m² of fibreglass.
- (h) All large surfaces, wider than 300mm shall be reinforced or panelled to improve stiffness and rigidity.
- (i) A resin coat shall be applied to the inside of the kiosk to cover the fibre pattern.
- (j) Brass or steel backing plates shall be laminated into the fibreglass at hinge points, locking mechanism catch support areas, door restraint fixing points and all other points which will be subjected to mechanical stress.
- (k) Doors shall be adequately braced, reinforced, ribbed or double laminated with an air gap between the two layers of laminate to ensure rigidity.
- (l) The fibreglass canopy shall be fixed to the internal equipment support frame with bolts accessible through the door only.
- (m) The fibreglass canopy shall be removable.
- (n) The doors shall be provided with heavy-duty brass hasp and staple and epoxy coated die cast zinc hinges with stainless steel pins.

2.2.3 Finish and colour of fibreglass kiosks

- (a) The outside surface of the kiosk shall have a glossy, smooth finish to ensure good weathering. To obtain this the manufacturer shall ensure that the mould is smooth, free of voids, hairline cracks, pores or other defects.

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- (b) Compound rubbing or sanding of the outside surface will not be permitted.
- (c) Pigments shall be added to the outer gelcoat to obtain a matching colour to SANS 1091 "LIGHT STONE", colour C37.
- (d) Fibreglass kiosks and boards shall not be painted.

2.2.4 Equipment support frame

- (a) A free standing, angle iron or similar type rigid support framework shall be provided.
- (b) The frame shall be bolted down on the root base by four M16 high tensile steel bolts. The holding down bolts shall be accessible from the inside of the cubicle only. The frame of fibreglass canopies shall be bolted to the root base.
- (c) A galvanized steel cable gland plate according SANS 121 shall be bolted to the bottom of the frame across the full width of the cubicle to cover the cable entry opening in the base.
- (d) The gland plate shall be suitably punched to accept the number and gland size specified below for incoming and outgoing cables.

Gland size	Number
1	4
2	4
3	4
4	4
5	2
6	2

- (e) All steelwork shall be hot-dipped galvanized in accordance with SANS 121.

(f) Equipment mounting board

The equipment mounting board shall be manufactured from glass fibre reinforced polyester laminate according to SANS 141. The board shall have the following characteristics:

Tensile strength	:	83MN/m ²
Flexural strength	:	140MN/m ²
Sheer strength	:	76MN/m ²
Compression strength	:	117MN/m ²
Glass content	:	25min
Hardness (barcol)	:	35min
Dielectric strength	:	250V/mm

Impregnated hardboard, other treated or untreated wood products are not acceptable.

2.2.5 Root base (height 900mm minimum)

- (a) To ensure stability of the kiosk after installation, it shall be mounted on a fibreglass root base.
- (b) The vertical height of the root base shall be at least 900mm and the construction shall be such as to provide a rigid support for the kiosk.
- (c) The root base shall protrude to a minimum height of 300mm above ground level. Provision shall be made for the protection and concealing of the cables entering the kiosk and to prevent access of animals and vermin.
- (d) The kiosk shall be secured to the root base by at least four M16 bolts. The bolts, nuts and washers shall be galvanized and supplied with the kiosk.
- (e) All galvanizing shall be to SANS 121.
- (f) The kiosk manufacturer shall supply a detailed drawing of the root base and shall be subject to the engineer's approval.

2.2.6 Construction of 3 CR 12 kiosks

(a) General

The kiosks shall be an adequate size to accommodate the number of outgoing consumer circuits specified.

The kiosks shall have two sections, namely:

- (i) one section containing all incoming and outgoing switchgear and cables, and
- (ii) one section containing the consumer meters and circuit breakers.

(b) Fabrication

The kiosks shall be fabricated from 3CR12 stainless steel of minimum thickness 2,5mm and shall be mounted on a channel iron steel base.

A metal frame work, manufactured from solid angle iron, channel iron, or 2,5mm 3CR12 folded sheet steel shall be mounted on the base of the kiosk. The kiosk shell shall be completely independent from the frame and equipment so that the kiosk shell can be removed and replaced without disconnecting any equipment. The kiosk shall be bolted down onto the base by means of four M16 high tensile bolts which shall be accessible from the inside of the kiosk only.

The kiosks shall be weatherproof, vermin and insect-proof and proved against tampering. To prevent the ingress of water onto live equipment, the door entry surrounds shall have a channel shape, at least 12mm deep, to accommodate the door edge. A rubber or neoprene closer strip shall be so fitted to the edges of each door as to provide a seal to keep rain water and dust out of the kiosk.

The kiosk shall have a pitched roof that slopes downwards at the front and at the back with an overhand of at least 75mm all round.

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The kiosks shall be fitted with a door in the front and at the back of the kiosk. The maximum width per door shall be 600mm. The doors shall provide free access to the equipment and shall provide a full view of all meters. The doors shall have well returning edges to fit into the channel of the door entry surrounds. Each door shall have three robust solid brass hinges each of length at least 100mm. The hinges shall be completely concealed. Doors shall be fitted with lever locks. The locking mechanism shall facilitate three points latching at the top, side and bottom of the doors. In the case of double doors the first door shall be locked with two slides on the inside onto the kiosk shell. The second door shall close over a lip on the first one. Nylon door restraints shall be provided. The fixing points of the restraints at the door and the canopy shall be reinforced. The doors shall be earthed bonded to the frame by means of a copper braided strap, tooth washer, bolts and nuts.

Ventilation louvres with approximate size 225 x 150mm shall be provided on both sides of the kiosk. Each ventilation louver shall be covered on the inside with perforated plates with 2,5mm² holes so that

- it is not possible to push a steel wire through it into the interior of the kiosk, and
- it prevents vermin from entering into the kiosk.

A mounting panel shall be positioned in the centre of each kiosk, fixed to the framework, for the mounting of the specified equipment.

(c) Mounting panel

The mounting panel shall consist of a minimum 3mm thick mild steel plate.

The one section of the panel shall be equipped with copper busbars mounted on porcelain or similar insulators and of sufficient length to accommodate three 12mm brass bolts for the connection of distribution cables and six consumer meter connections per phase. The busbars shall be tinned after the drilling of holes. The busbars shall be able to carry 250 Ampere at a current density of not more than 1.5 A/mm². Each busbar shall be marked red, yellow and blue with black for the neutral bar. The busbars shall be able to withstand the thermal and dynamic forces resulting from short circuits without deformation taking place or parts breaking.

The specified consumer equipment shall be installed in the second section. The mounting panel and equipment shall be enclosed by a machine punched removable front panel through which the operating handles of the equipment and the face plates of the meters protrude.

(d) Equipment installed in kiosks

The equipment to be installed in the kiosks shall be as specified in the detail specification for project works.

(e) Wiring of kiosks

The internal wiring in the kiosks shall be done with PVC insulated copper conductors in accordance with SANS 1507-3. The wiring shall be done in neat horizontal and vertical columns. Each consumer circuit shall be wired from the phase busbars to the circuit breaker and from the circuit breaker to the meter.

Connections to busbars and terminals shall be done by means of cable lugs crimped in an approved manner to the conductor ends and in accordance with NRS 028 and

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IEC 61238. Connections of the busbars shall be made by means of cadmium plated high tensile steel bolts and nuts with locking washers.

(f) Earthing

A copper earth bar shall be installed in the bottom of the kiosk according to SANS 10198-3.

10mm diameter holes shall be drilled through the earth bar to provide for the distribution cable and service cable earth conductors. All bolts used for the fixing the earth conductors shall be cadmium plated and only one earth conductor shall be connected per bolt.

The metal work of the kiosk shall be earthed to the earth bar by means of a 70mm² (Minimum) stranded copper conductor. An earth stud shall be provided on the kiosk housing for this purpose and shall comply with SANS 1063 and SANS 10199.

(g) Cable gland plate

The cable shall be terminated on a removable galvanized gland plate of suitable dimension and strength according to SANS 121. The gland plate shall cover the full length of the kiosk.

The gland plate shall be at least 300mm below the nearest terminal of switchgear allowing sufficient space for bending the cable ends. Sufficient space shall be provided underneath the gland plate to allow for the installation of the cables without removing the gland plate. The gland plate shall be earthed by means of a 70mm² stranded copper earth conductor in accordance with SANS 182.

(h) Terminal blocks

A terminal block suitable for the termination of 16mm² stranded copper conductors shall be provided. Terminals shall be of the screw type and a terminal shall be provided for each service connection cable.

(i) Labels

The kiosks shall be supplied with the following labels:

- (i) An aluminium label with 40mm high letters and numeral indicating the kiosk number fitted to the side facing the oncoming traffic.
- (ii) Engraved trafolite labels with 6mm high numerals under each circuit breaker, meter, and terminal on the terminal block indicating the consumer stand number.

The labels shall have a white background and black letters. The 40mm labels shall be fixed by means of rivets and the 6mm high labels shall be inserted in 25mm wide aluminium label holder mounted on the bottom of the relevant equipment.

(j) Danger signs

The requirements of Regulation C-52 of the Machinery and Occupational Safety Act No. 6 of 1983 shall be complied with. All doors shall be fitted with a 150 x 100mm Danger sign.

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(k) Painting and finishing

(i) Post-weld cleaning and passivation of 3CR12

Post-weld cleaning shall be undertaken on all welded areas. One of the following cleaning methods may be used to remove all surface discolouration and scale from welded areas.

- (1) Wire brushing: Where it is possible to remove the discolouration and detritus from weld areas by brushing, stainless steel wire brushed, that have not been used on other material other than 3CR12, may be used.
- (2) Grinding: Dedicated grinding wheels and discs based on alumina shall be used for the dressing of welds. The use of silicon carbide wheels and discs shall not be used.
- (3) Abrasive blast cleaning: The abrasive used shall be washed silica sand or alumina totally free of metallic iron, iron oxides or chlorides.

(ii) Chemical cleaning (picking)

The picking of 3CR12 shall be carried out using formulations based on nitric (HNO₃) and hydrofluoric (HF) acid. Formulations based on hydrochloric acids shall not be used. Acids used shall conform to commercial purity standards. Where proprietary pickling formulations are used, the manufacturer's directions concerning the application procedures shall be strictly adhered to.

(iii) Passivation

The passivation of the 3CR12 shall be carried out as soon as possible after the post-weld cleaning has taken place. A solution made up of nitric acid shall be used for the passivation of the 3CR12. The solution shall be generously applied to the steel by brush, cloth, spray or dipping. Care shall be taken that the solution does not dry on the steel surface. The steel shall be thoroughly washed with clean cold water to remove all traces of the acid used.

(iv) General

The entire process of cleaning, pickling, passivation and neutralization shall be completed in one working day.

Details of the post weld process intend to be used shall be approved by the Engineer and in accordance with SANS 10044.

(v) Painting

All interior metal work shall be thoroughly degreased as well as all rust removed and shall be prepared for painting in accordance with SANS 10064.

Immediately after cleaning a zinc chromate red oxide primer with a dry film thickness of 25 micrometre shall be applied in accordance with SANS 679. An intermediate enamel coat shall be applied to the primed surface and thereafter the finishing coat of white enamel paint shall be applied to the interior and "light stone", colour C32 SANS 1091 to the exterior.

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The bases and under sides must be treated in an approved manner and finished with two coats epoxy-tar paint.

(l) Drawings and information

Full details of the cubicles offered will be approved by the Engineer:

- a drawing indicating all dimensions of the kiosks
- a drawing indicating the dimensions of the plinth with fixing arrangements
- a drawing indicating the general internal equipment layout of the kiosks

A schematic wiring diagram of the kiosk, as wired and colour coded shall be submitted to the client at the completion of the contract.

(m) Inspection

The Engineer shall have full access to the manufacturer's works at all reasonable times to inspect the progress of the work and to witness all tests.

2.2.7 Consumer distribution pillars

(a) General

The pillars shall be of adequate size to accommodate the distribution cables and outgoing circuits specified.

(b) Fabrication

The pillars shall be 300mm wide, 300mm deep and 1300mm high and shall be suitable for planting directly in the ground. The top lid of the pillar shall slide upwards for easy access to the equipment. Guides shall be welded to the shell of the pillar and the lid to prevent any contact with live terminals when the top lid is moved. Hinged panels shall be provided below the lid at the front and the rear of the pillar for easy access to connect the incoming and outgoing cables. The lid shall overlap the hinged panels when in position.

Ventilation of the pillar shall be provided by means of holes in the roof return of the pillar lids.

A mounting panel shall be positioned in the centre of the pillar for the mounting of the specified equipment.

(c) Equipment installed in pillars

The following equipment shall be installed in the pillars:

- (i) 80 ampere 10kA curve 1 type single pole circuit breakers.
- (ii) P1000 unistrut rail with K clamps to connect the incoming and outgoing cables.
- (iii) Three tinned copper busbars for the phase connections. The busbars shall be of sufficient length to accommodate three 12mm brass bolts for the

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connection of distribution cables and four 8mm bolts for consumer connections per phase.

(iv) A 25mm x 6mm tinned copper neutral bar.

(v) A 25mm x 6mm tinned copper earth bar.

Provision shall be made for suitable shrouds to cover all live terminals in the pillar so that no live parts are exposed when the lid of the pillar is moved into the open position.

(d) Wiring of the pillars

The internal wiring in the pillar shall be done with 16mm² PVC insulated copper conductors in accordance with SANS 1507-3. Each circuit breaker shall be individually wired.

Connections to busbars and terminals shall be done by means of cable lugs crimped in an approved manner to the conductor ends and in accordance with NRS 028 and IEC 61238. Connections to the busbars shall be made by means of cadmium plated high tensile steel bolts and nuts with locking washers. The busbars shall be predrilled with holes for the connection of the distribution cables and service connection cable conductors. Only one conductor shall be corrected to a bolt. The steel wire armouring of each of the cables shall be bonded to the earth bar.

(e) Labels

The pillars shall be supplied with the following labels:

- (i) A traffolyte label with 40mm high letters and numeral indicating the pillar number fitted to the side facing the oncoming traffic.
- (ii) Engraved traffolyte labels with 6mm high numerals under each circuit breaker, meter, and terminal on the terminal block indicating the consumer stand number.

The labels shall have a white background and black letters. The 40mm labels shall be fixed by means of rivets and the 6mm high labels shall be inserted in 25mm wide aluminium label holders mounted at the bottom of the relevant equipment.

(f) Danger signs

The requirements of Regulation C-52 of the Machinery and Occupational Safety Act No. 6 of 1983 shall be complied with. All doors shall be fitted with a 150 x 100mm Danger sign.

(g) Finishing

(i) Post-weld cleaning and passivation of 3CR12
Post-weld cleaning shall be undertaken on all welded areas. One of the following cleaning methods may be used to remove all surface discolouration and scale from welded areas.

- (1) Wire brushing: Where it is possible to remove the discolouration and detritus from weld areas by brushing, stainless steel wire brushes

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that have not been used on other material other than 3CR12, may be used.

- (2) Grinding: Dedicated grinding wheels and discs based on alumina shall be used for the dressing of welds. The use of silicon carbide wheels and discs shall not be used.
- (3) Abrasive blast cleaning: The abrasive used shall be washed silica sand or alumina totally free of metallic iron, iron oxides or chlorides.

(h) Chemical cleaning (pickling)

The pickling of 3CR12 shall be carried out using formulations based on nitric (HNO₃) and hydrofluoric (HF) acid. Formulations based on hydrochloric acids shall not be used. Acids used shall conform to commercial purity standards. Where proprietary pickling formulations are used, the manufacturer's discretion concerning the application procedures shall be strictly adhered to.

(i) Passivation

The passivation of the 3CR12 shall be carried out as soon as possible after the post-weld cleaning has taken place. A solution made up of nitric acid shall be used for the passivation of the 3CR12. The solution shall be generously applied to the steel by brush, cloth, spray or dipping. Care shall be taken that the solution does not dry on the steel surface. The steel shall be thoroughly washed with clean cold water to remove all traces of the acid used.

(j) General

The entire process of cleaning, pickling, passivation and neutralization shall be completed in one working day.

Details of the post weld process intend to be used shall be approved by the Engineer and in accordance with SANS 10044.

2.2.8 Drawings and information

Full details of the kiosk and pillars offered will be approved by the Engineer:

- a drawing indicating all dimensions of the kiosk/pillar
- a drawing indicating the general internal equipment layout of the kiosk/pillar

A schematic wiring diagram of the kiosk/pillar, as wired and colour coded shall be submitted to the client at the completion of the contract.

3 POLE-MOUNTED GALVANIZED STEEL DISTRIBUTION BOARDS AND STREET LIGHTING BOARDS

- (a) Manufactured pole-mounted weatherproof distribution board complete with mounting brackets frame, equipment board, gland plate and busbars shall be supplied and installed in accordance with NRS 032. Safety of distribution boards shall be in accordance with SANS 1765.

The pole-mounted distribution board shall be made of hot dipped galvanized steel, 1.2mm thick in accordance with SANS 121, with double door, padlockable with suitable cut outs as per detailed drawing. Knockouts for connections shall be supplied in the bottom of the board. Pole-mounting brackets and support u-bolts shall be attached at the rear side of the board.

- (b) Sizes:

The following sizes will be utilised:

Type A as required by design specifications
- box size (approx.) : 900mm x 740mm x 250mm

Type B as required by design specifications
- box size (approx.) : 900mm x 690mm x 250mm

- (c) This specification covers the manufacture of distribution kiosks and boards for general reticulation and distribution systems in environmental conditions specified for three-phase, four-wire, 400/231 V, 50 Hz systems.

- (d) Moisture and vermin proof

Kiosks and boards shall be weatherproof. To prevent the ingress of water onto live equipment, the door entry surrounds shall have a channel shape, at least 12mm deep, to accommodate the door edge.

The roof shall be constructed with an overhang above non-continuous panelling and shall be provided with a drip-edge.

- (e) Legend card holder

On the side of the kiosk front door shall be mounted a standard legend card holder of size 160mm x 180mm.

The card holder shall be riveted in place.

- (f) All steelwork shall be hot-dipped galvanized in accordance with SANS 121

3.1 Pole mounted box: Bundle Box

Pole-mounted box as required by design specifications, with sliding lid, pole brackets, knockouts and clip tray for MCCB" included, and shrouds on DB's, with phase busbars, neutral bar, and earth bar.

3.2 Pole-mounted box: 3CR12 stainless steel enclosure

Pole-mounted box as required by design specifications, with lid, pole brackets, knockouts and clip tray for MCCB's included, with phase busbars, neutral bar, and earth bar.

3.3 Pole-mounted box: SPB1

Complete unit with SPB1 pole mounting box or similar, for mounting vertically onto a pole shall be supplied as required by design specifications, complete with 1 x slide and a mounting bracket equal to type SPB1 Kit H strapping bracket (non-ferrous) to enable strapping of the box onto the pole.

3.4 Earthing

- (a) All non-current carrying metal parts of the enclosure e.g. framework, gland plates, etc., shall be bonded to the earth in accordance with NRS 106 and SANS 10292.
- (b) The consumer's earth continuity conductor (ECC) from the distribution kiosk/board shall be bonded to the LV earth (earthing bar in distribution kiosk/board) in accordance with NRS 106 and SANS 10292.
- (c) The transformer MV earth electrode arrangement and bare parts of consumer's ECC shall be separated by at least 5000mm, so that the ECC is outside the resistance area of the MV earth.
- (d) The consumer's ECC shall not be smaller than half the cross-sectional area of the largest current carrying conductor o the consumer's service cable.

4 BUSBARS

4.1 Material

Busbars shall be manufactured of solid high conductivity tinned copper with rectangular cross-section in accordance with SABS 1195, BS 159 and BS EN 13601, where applicable.

4.2 Voltage rating

The busbars shall be designed to withstand a test voltage of 2.5kV for one minute.

4.3 Current rating

(a) The maximum allowable temperature of busbars (including joints) carrying full load current in an ambient temperature as specified shall not exceed 80°C. An ambient temperature is 40°C shall be assumed with a maximum temperature increase of 45°C.

(b) The size of the busbars shall be 25mm width x 6.3mm thickness (rating approx. 470 amps) where the distance between the phase busbars shall be at least the distance of the longer side of the cross section with a minimum spacing of 50mm. It is however essential that that the manufacturer shall make due allowance for the "proximity and skin" effects, the effect of ventilation, etc. for the arrangement used.

Manufacturers shall, where requested, prove that the busbar rating and enclosure design comply with the temperature rise specified above. The busbars can also be rated to DIN 43671 for unpainted busbars.

(c) Busbars may not be tapered. The rating of the bars shall be equal to the incoming current rating of 750 amps.

4.4 Mounting

Busbars shall be supported on resin insulators. Porcelain insulators are not acceptable. The rating and fixing of busbars shall be designed to withstand mechanical and temperature stresses during fault conditions. Minimum clearance as specified in SANS 1195 for system voltages up to 600V, is 10mm and shall be strictly maintained.

Busbar insulators of various colours complete with M8 bolt, M8 stud, washers, spring washers and nuts shall be supplied.

4.5 Neutral busbar

(a) The neutral busbar shall have a cross-sectional area equal to that of a phase busbar. The neutral bar shall be insulated from earth.

(b) Each neutral bar shall be supplied with 5 x 25mm² and 2 x 10mm² terminal blocks complete with thermoplastic mounting bracket.

4.6 Street lighting busbars

The street lighting busbar shall have a cross-sectional area equal to that of a phase busbar. The busbar shall be of standard mounting and insulated.

4.7 Busbar connections

Conductor ends will be terminated with crimped lugs which will be bolted to the busbar in accordance with NRS 028 and SANS 1213. Each busbar shall be installed pre-drilled with the following holes: 4 off 7mm diameter holes and 6 off 11mm diameter holes. An additional 4 off 11mm holes must be allowed for.

4.8 Screws, bolts and nuts

- (a) All bolts and screws supplied shall be cadmium plated yellow passivated stainless steel grade 304 to BSS standards.
- (b) All nuts and washers shall be electro-plated.
- (c) Coach screws shall be electro-plated galvanized.
- (d) All bolts etc. shall have ISO threads
- (e) The largest possible size bolt that will fit into holes in lugs and fixing holes of equipment shall be used.
- (f) Bolts shall be of sufficient length so that at least two but not more than five threads protrude beyond the nut.

5 DISTRIBUTION CIRCUIT BREAKERS

5.1 Connection

The supply end connections to equipment will be at the top end and load end connections at the bottom.

5.2 Moulded case circuit breakers

5.2.1 General

- (a) This section covers single- or multi-pole moulded case circuit breakers for use in power distribution systems, suitable for panel mounting, for rating up to 1000A, 600V, 50Hz.
- (b) The circuit-breakers shall comply with SANS 156.
- (c) The continuous current rating, trip rating and rupturing capacity shall be as specified.
- (d) The contacts shall be silver alloy and shall close with a high pressure wiping action.
- (e) Where specified, the circuit breaker shall be capable of accommodating factory fitted shunt trip or auxiliary contact units or similar equipment.
- (f) The operating handle shall provide clear indication of "ON", "OFF" and "TRIP" positions.
- (g) The mechanism shall be of the TRIP-FREE type preventing the unit from being held in the ON position under overload conditions.
- (h) All mould-case circuit breakers in particular installation as far as practical are to be supplied by a single manufacturer.
- (i) The incoming terminals of single-pole miniature circuit breakers shall be suitable for connection to a common busbar.
- (j) The circuit breaker shall have a rating plate indicating the current rating, voltage rating and breaking capacity.

5.2.2 Large frame circuit breakers (300A – 600A)

- (a) Triple pole current limiting circuit breakers shall be supplied where the rating specified is above 250A.
- (b) Each circuit breaker shall be supplied with a complete set of cable clamp terminals and 2 x terminal covers for both the load and line side.

5.2.3 Large frame circuit breakers (60A – 250A)

- (a) Triple pole circuit breakers shall be supplied and installed complete with phase barriers and terminal covers for both the line and load sides.

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- (b) Each breaker shall also be supplied and installed complete with 4 x brass screws M6 x 70mm. Each brass screw shall be complete with 1 x flat washer, 1 x spring washer, 2 x nuts. The nuts and washers shall also be brass.

5.2.4 Industrial panel board clip-in circuit breakers (10A – 100A)

SF range, tripping curve 2, or similar circuit breakers shall be supplied and installed.

5.3 Circuit breaker accessories

5.3.1 Circuit breaker shrouds

5kA SF range circuit breakers shall be supplied and installed. Two types of shrouds are required:

- (a) for 5kA SF single-pole circuit breaker: 1 / 2 shroud
- (b) for 5kA SF triple-pole circuit breaker: 5/6 shroud

5.3.2 Circuit breaker mounting rails

When a brand of circuit breaker is installed, the appropriate “mini-rails” shall be supplied and installed with the approval of the engineer.