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1 SCOPE

This part of the specification will focus on different types of service connections to customers in urban and rural areas and shall be complimented by the following standards:

GENERAL INFORMATION

The following Standards and Acts shall take precedence:

- National Electricity 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
- SANS 10142 : The Wiring of Premises – Low Voltage Installations

OVERHEAD CONDUCTORS

Regional Standards

- SANS 182-1 : Conductors for overhead electrical Transmission line part 1: Copper wires and stranded copper conductors (metric units)
- SANS 182-2 : Conductors for overhead electrical Transmission line part 2: Stranded aluminium conductors
- SANS 182-3 : Conductors for overhead electrical Transmission line part 3: Aluminium conductors, steel reinforced
- SANS 182-5 : Conductors for overhead electrical Transmission line part 5: Zinc-coated steel wires for conductors and stays.
- SANS 1418-1 : Aerial bundled conductor system Part 1: Cores
- SANS 1418-2 : Aerial bundled conductor system Part 2: Assembled insulated conductor bundles
- SANS 1713 : Electric cables –Medium voltage aerial bundled conductors for voltages from 3.8/6.6kV to 19/33kV
- NRS 020 : Cable ties for use with ABC
- NRS 018 : Fittings and connectors for low voltage overhead power lines using ABC.

International Standards

- BS EN 13601 : Specification for copper for electrical purposes.
- IEC 60889 : Hard Drawn Aluminium Wire for Overhead Conductors
- IEC 61089 : Round Wire Concentric Lay Overhead Electrical Stranded Conductors.
- IEC 62219 : Overhead Electrical Conductors – Formed Wire, Concentric Lay , Stranded Conductors

UNDERGROUND DISTRIBUTION CABLES

Regional Standards

- NRS 013 : Medium voltage cables
- NRS 074 : Low voltage (600/1000 V) cable systems for underground electrical distribution
- SANS 1411-1 : Materials of insulated electric cable and flexible cords Part 1: Conductors
- SANS 1411-2 : Materials of insulated electric cable and flexible cords Part 2: Polyvinyl Chloride (PVC)
- SANS 1411-3 : Materials of insulated electric cable and flexible cords Part 3: Elastomers
- SANS 1411-4 : Materials of insulated electric cable and flexible cords Part 4: Cross-linked Polyethylene (XLPE)
- SANS 1411-5 : Materials of insulated electric cable and flexible cords Part 5: Halogen free, flame retardant materials
- SANS 1411-6 : Materials of insulated electric cable and flexible cords Part 6: Armour
- SANS 1411-7 : Materials of insulated electric cable and flexible cords Part 7: Polyethylene (PE)
- SANS 1507 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V)
- SANS 1507-1 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V) Part 1: General
- SANS 1507-2 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V) Part 2: Wiring cables
- SANS 1507-3 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V) Part 3: PVC Distribution Cables
- SANS 1507-4 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V) Part 4: XLPE Distribution Cables
- SANS 1507-5 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V) Part 5: Halogen-free distribution cables
- SANS 1507-6 : Electric cables with extruded solid dielectric insulation for fixed installations (300/500V to 1900/3300V) Part 6: Service Cables
- SANS 10198-1 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 1: Definitions and statutory requirements
- SANS 10198-2 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 2: Choice of cable type and methods of installation
- SANS 10198-3 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 3: Earthing systems – general provisions
- SANS 10198-4 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 4: Current ratings

PART B-07: SERVICE CONNECTIONS

- SANS 10198-5 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 5: Determination of thermal and electrical resistivity of soil
- SANS 10198-6 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 6: Transportation and storage
- SANS 10198-7 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 7: Safety Precautions
- SANS 10198-8 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 8: Cable laying and installation
- SANS 10198-9 : The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 9: jointing and termination of extruded solid dielectric insulated cables up to 3.3kV
- SANS 10198-10: The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 10: Jointing and termination of paper-insulated
- SANS 10198-11: The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 11: Jointing and termination screened polymeric insulated cables
- SANS 10198-12: The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 12: Installation of earthing system
- SANS 10198-13: The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 13: Testing, commissioning and fault location
- SANS 10198-14: The selection, handling and installation of electric power cables of rating not exceeding 33kV Part 14: Installation of aerial bundled conductor (ABC)
- SANS 97 : Electric Cables- Impregnated paper insulated metal sheathed cables for rated voltages 3.3/3.3kV to 19/33kV (Excluding pressure assisted cables)
- SANS 1339 : Electric cables- Cross linked polyethylene (XLPE) insulated cables for rated voltages 3.8/6.6kV to 19/33kV

International Standards

- BS 6004 : Electric cables. PVC insulated, non-armoured cables for voltages up to and including 450/750 V, for electric power, lighting and internal wiring
- IEC 60189 : Low Frequency Cables and wires with PVC Sheath
- IEC 60055 : Paper Insulated Metal-Sheathed Cables for Rated Voltages up to 36kV
- IEC 60183 : Guide to the selection of high voltage cables
- IEC 60227 : Polyvinyl chloride insulated cables of rated voltages up to and including 1kV
- IEC 60228 : Conductors of insulated cables
- IEC 60502 : Power cables with extruded insulation and their accessories for rated voltages from 1kV up to and including 36kV

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

METERING

- NRS 009 : Electricity Sales Systems
- NRS 057 : Code of practice for electricity metering
- NRS 096-1 : Electricity metering ancillary specifications Part 1: The sealing of electricity meters.
- SANS 1524-1 : Electricity Payment systems Part 1: Prepayment meters
- SANS 1607 : Electromechanical watt-hour meters
- SANS 1799 : Watt-hour meters – AC electronic meters for active energy
- SANS 61036 : Alternating current static watt-hour meters for active energy (classes 1 and 2)
- SANS 60521 : Alternating current electromechanical watt-hour meters (classes 0.5, 1 and 2)

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

INSTRUMENTATION AMPLIFIERS (CURRENT AND VOLTAGE TRANSFORMERS)

Regional Standards

- NRS 029 : Current Transformers for rated A.C. voltages from 3.6kV up to and including 420kV (Maximum voltage for equipment)
- SANS 60044-1 : Instrumentation transformers Part 1: Current transformers
- SANS 60044-2 : Instrumentation transformers Part 2: Inductive voltage transformers
- SANS 60044-7 : Instrumentation transformers Part 3: Electronic voltage transformers
- SANS 1652 : Battery Charges – Industrial type

International Standards

- IEC 60044 : Instrument Transformers
- BS 7626 : Specification for current transformers.

CABLE ACCESSORIES

Regional

SANS 1213 : Cable Glands

NRS 028 : Cable lugs and ferrules – for copper and aluminium conductors

International

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

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

2 SERVICE CONNECTIONS

All service connections shall be provided with a circuit breaker at the tap-off point, i.e. in the distribution kiosk/board or in a weather-proof pole-mounted box on an ABC line pole. Please note that this Standards Document is developed for application to infrastructure up to and including the consumer's metering point.

2.1 General

A service connection means the link between a low voltage bare overhead system, an aerial bundle conductor (ABC network or from an underground system to a potential customer, whether single or three phase connections depending on requirements.

2.2 Underground cable service connections

Three-phase service connections will be provided with underground cable, either from a distribution kiosk/board or from an ABC line, as per site instructions to be given by the Engineer. Single-phase service connections will be provided either underground or overhead as appropriately instructed by the Engineer.

Where the service connection is taken from an overhead line, the phase conductors of the cable are to be terminated on the pole onto a suitable sized circuit breaker in accordance with SANS 152, inside a weather-proof enclosure. Connection to the line is to be made with the correct size insulated conductor and appropriate tap-off connectors.

The cables are to be neatly strapped to the pole at intervals not exceeding 1m. HDPE ridged or galvanized steel kick pipes extending at least 2.7m above and 300mm below ground level must be provided for all cables.

A 2m loop of slack is to be provided at the foot of the pole and buried at the same depth as the run of cable. The size of the loop is to be in accordance with the requirements of standard regulations so as to not exceed the permissible bending radius.

2.3 Overhead service connections

Single-phase service connections to private consumers will generally be provided with overhead split concentric service conductor (Airdac). At the pole the phase conductor shall be fed through a suitably rated circuit breaker in a weather-proof enclosure, as for underground cable services connections fed from an overhead line.

2.3.1 Unarmoured concentric service cable

The concentric single phase service cable shall be similar to Airdac and shall be compliant with SANS 1418

2.3.2 Pigtail screws

Pigtail screws shall be used for the mounting of service cable strain clamps on wooden poles and at the consumer's premises.

2.3.3 Service cable clamps

Strain clamps for 10mm² and 16mm² concentric single-core service cables shall be used for overhead service connections.

2.3.4 Cable glands for unarmoured service cable

Compression glands for unarmoured round cable shall be used for this type of cable.

All Products used shall be approved by the engineer and shall comply with SANS 1213.

3 ELECTRICITY METERING

This specification shall be read in conjunction with SANS 1 524-1, SANS 61036, SANS 1607 and SANS 1799.

The current limit for kWh metering is 60A (single-phase and three-phase). Three-phase consumers requiring in excess of 60A per phase are metered on maximum demand (kVA) in addition to energy (kWh) consumer. Consumption meters shall be supplied by the Local Supply Authority, the cost to purchase these meters from the Supply Authority must be specified.

3.1 Single-phase pre-payment metering

Single-phase consumers requiring a pre-payment kWh meter system shall be supplied with one that is approved by the Supply Authority and in accordance with SANS 1524 and SANS 1799.

3.2 Single-phase conventional credit metering

Single-phase connections shall be provided with conventional single-phase 2-wire kWh credit meters in accordance with SANS 1607 and SANS 61036.

3.3 Three-phase kWh Pre-payment metering

Three-phase consumers requiring less than 60A per phase will be supplied with a three phase kWh pre-payment meter system that is approved by the Supply Authority and in accordance with SANS 1524 and SANS 1799.

3.4 Three-phase conventional kWh metering

Three-phase consumers requiring less than 60A per phase shall be provided with a three phase metering system. Small private three-phase consumers (less than 60A per phase) may also be provided with a three-phase pre-payment meter in accordance with SANS 1799 and SANS 61036.

3.5 Three-phase kWh and VA maximum demand metering

Three-phase consumers requiring in excess of 60A per phase shall be provided with a kWh/maximum demand combination meter.

3.6 Metering equipment and meter boards

3.6.1 Current transformers for tariff metering (SANS 60044)

- (a) The ring resin cast type with the core and winding encapsulated in a high dielectric strength and impact resistant to ensure an insulation level of 660V shall be supplied and installed.

The accuracy class of the CT shall be in accordance with requirements stipulated in SANS 60044.

- (b) Markings

All current transformers shall come complete with a label on which the following information is indelibly stamped:

Manufacturer
Serial No. or Type
Rated primary and secondary current
Rated frequency
Rated output and accuracy class
Highest system voltage
Rated insulation level

- (c) Fault current

Current transformers shall be capable of withstanding the dynamic forces resulting from the maximum through fault current, which may be encountered at the point where they are installed. The short time current rating of current transformers shall be at least equal to that of the associated circuit breaker.

- (d) Impulse level

Current transformers used in system voltage in excess of 660V shall withstand an impulse test level of 95kV. Impulse levels for current transformers used in system voltage up to 660V shall comply with BS 7626.

3.6.2 Meter boards

Meter boards shall be weatherproof surface mounted and shall be of the hot-dipped galvanized in accordance with SANS 121 or of the fibreglass type and shall be approved by the engineer.

The meter boards shall be supplied complete with busbars, busbar insulators and mounting plates and shall comply with SANS 1619, NRS 019 and SANS 1765.

- (a) Single-phase meter boards shall have lockable face plate with single viewing glass.
- (b) Three-phase meter boards shall have lockable face plate with three viewing glasses.
- (c) Maximum demand meter boards shall be of the maximum demand meter board type.