

**PART A-01**

**TITLE:** PRE-AMBLE TO THE STANDARD SPECIFICATION FOR MEDIUM AND LOW VOLTAGE ELECTRICITY DISTRIBUTION WORKS

**INCEPTION DATE:** After Gazetting (Working Document for a 3 year period)

**AMENDMENTS/REVISIONS**

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## A-1 DEFINITIONS

All definitions shall not used in this Standard Specification are to be considered together with those stated in the Electricity Act of Namibia. If any discrepancies arise the definitions contain in the Electricity Act shall take preference.

### A-1.1 Supply Authority

Will mean the authority that is responsible for electricity distribution and sale of electrical energy to end customers in its area of responsibility.

### A-1.2 Electricity Distribution Work (or Works)

Will mean the planning, design, procurement, erection, installation, testing, commissioning, and repair of the electricity supply infrastructure under the responsibility of the Supply Authority.

### A-1.3 Engineer

Will mean the competent person responsible for the planning, design and supervision of the Works. The Engineer may either be a staff member of the Supply Authority or a Consulting Engineer appointed by the Supply Authority.

### A-1.4 Contractor

Will mean the electrical contractor appointed by the Supply Authority to perform certain erection, installation, maintenance or repair works on the electricity supply infrastructure as specified by Engineer according to Supply Authority's requirements.

### A-1.5 Developer

Will mean a person developing any structure or building, new suburbs, townships or any other service within an already proclaimed or not proclaimed area to the exact standards of the Supply Authority.

### A-1.6 Detailed Technical Specification

Will mean the detailed specification prepared by the Engineer to describe the specific scope and extent of the Works, including all designs and drawings.

### A-1.7 Contract

Will mean the contract entered into between the Supply Authority and the Contractor for the performance of certain works. The Contract is normally composed of the written undertaking by the Contractor to perform the works in accordance with the Supply Authority's conditions of contract, standard specification, detailed technical specification including all drawings and variation orders issued in terms of the Contract.

### A-1.8 Bulk Supply

Will mean and include all supply mains, switchgear, transformers and any other apparatus required to supply electricity, at the voltage prescribed by the supply authority up to the point or points of supply for the electricity distribution in the township. The point or points will be located in positions approved by the supply authority either at the boundary of the township or where such access supply includes a transforming and/or switching substation installed within the boundary of the township by the supply authority, at the outgoing terminals of the supply authority's switchgear.

- A-1.9 Electricity Distribution**  
Will mean and include all supply mains, switchgear, transformers, street lighting, metering and other apparatus required beyond the Access Supply, which are necessary to provide electricity supplies within the township to individual customers, traffic control and other installations, but will exclude the internal wiring of premises.
- A-1.10 Distributor**  
A MV or LV cable or overhead feeder that is tapped along its route to supply customers.
- A-1.11 Customer's Point of Supply**  
The metering point of a customer. At this point, the customer's electrical installation is connected to the Supply Authority's main.
- A-1.12 Declared or Agreed Voltage**  
The voltage declared to the customers by the supply authority in terms of the Electricity Act.
- A-1.13 Maximum Demand (MD)**  
The highest average electrical demand for a specific period of time between regular meter readings. Maximum Demand requirements are to be implemented according to the rules and codes stipulated by the ECB. Synchronisation with NamPower's power monitors shall be achieved in order to gather information correctly.
- A-1.14 Diversity Factor (DF)**  
The ratio of the sum of the individual customer Maximum Demands to the Maximum of the whole group of customers.
- A-1.15 After Diversity Maximum Demand (ADMD)**  
Maximum Demand over Diversity Factor, i.e. MD/DF. This is dependent upon the class of the residential property, climatic conditions, customer habits and the supply authority's control measures. The figure must be adjusted to cater for the diversity appropriate to the number of customers in the group being considered.
- A-1.16 Unbalance Factor (UF)**  
The ratio of the current in the neutral conductors to the arithmetical average sum of the current in the phase conductors.
- A-1.17 Voltage Drop**  
The difference in electrical potential (RMS) between two points on a feeder due to actual circuit parameters, e.g. circuit impedance, line reactance, length and size of conductors and the type of material of the conductor (electrical resistance).
- A-1.18 Short-Circuit**  
The deliberate or accidental connection of two points of different potential, via a conductor of negligible impedance.

- A-1.19 Earth Fault**  
An insulation failure between a current-carrying conductor and earth.
- A-1.20 Earth Resistance**  
The resistance of earth to stray currents (should be as low as possible to be effective.)
- A-1.21 Fault Current**  
The current flowing through the fault itself as a result of a fault.
- A-1.22 Power Factor**  
The ration of the real power and apparent power, flowing to the load
- A-1.23 High Voltage**  
High voltage means a voltage of more than 44 000 Volts (RMS) (National Electricity Act)
- A-1.24 Medium Voltage**  
Medium voltage means a voltage of more than 1000 Volts (RMS) but more than 44000 Volts (RMS) (National Electricity Act)
- A-1.25 Low Voltage**  
Low voltage means a voltage of 1000 Volts (RMS) or less (National Electricity Act)
- A-1.26 Transmission**  
"Transmission", in relation to electricity, means the conveyance of electricity by means of a transmission system, which consists wholly of high voltage networks and electrical plant, from an energy source or system to a customer.
- A-1.27 Distribution**  
"Distribution", in relation to electricity, means the conveyance of electricity by means of a distribution system, which consist wholly or mainly of medium and low voltage networks, to the consume.

**A-2 ABBREVIATION USED IN THIS STANDARD SPECIFICATION**

ABC	-	Aerial bundle conductor
ACC	-	Aerial concentric conductor
ACSR	-	Aluminium conductor steel reinforced
XLPE	-	Cross linked polyethylene
PVC	-	Polyvinyl chloride
TI	-	Transformer installations
ST	-	Street lighting
SC	-	Service Connection
LV	-	Low voltage – voltage less than 1000V
MV	-	Medium voltage – voltage in excess of 1000V but less than 44kV
PG	-	Parallel groove
SABS	-	South African Bureau of Standards
SANS	-	South African National Standards
BS	-	British Standards
IEC	-	International Electromechanical Commission
ANSI	-	American National Standards Institute
IEEE	-	Institute Electrical and Electronic Engineers
NRS	-	National Rationalized Standards
BECC	-	Bare Earth Continuity Conductor
ECC	-	Earth Continuity Conductor
CNE	-	Combined Neutral Earth
DB	-	Distribution box
$\Omega$	-	Ohm
ADMD	-	After diversity maximum demand
DF	-	Diversity factor
N	-	Number of customers
MD	-	Maximum demand
UF	-	Unbalance factor
IDMT	-	Inverse definite minimum time
PME	-	Protective multiple earthing
CSP	-	Completely self protective
PM	-	Pole mounted
ICP	-	Insulation piercing connector
PEN	-	Protective earth and neutral conductor
CSA	-	Cross sectional area
COC	-	Certificate of Compliance.

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**A-3 GENERAL INFORMATION**

- (a) This Detailed Specification covers the general technical requirements for the planning, design, erection, installation, testing, commissioning, maintenance and repair of the materials and equipment for the electricity supply infrastructure of the Supply Authority.
- (b) The complete Works will comply with the requirements of the Detail Design Specification. Should any discrepancies or contradictions exist between this specification and the Stock List or bill of quantities for the specific Works, then the latter will take precedence.
- (c) The Engineer will inspect the Works from time to time during the progress of the Works. Discrepancies will be pointed out to the Contractor and these will be remedied at the Contractor's expense. Under no circumstances will these inspections relieve the Contractor of his obligations in terms of the Contract.
- (d) The Contractor will notify the Supply Authority timeously when the Works reaches important states of completion (e.g. before closing cable trenches, before casting concrete, etc.) so that the Engineer may schedule his inspections in the best interest of all parties concerned.
- (e) This standard is a developing standard (Working Document) being implemented and updated over a period of three (3) years from inception. This is to allow for the amendment of the document regarding the requirements of the industry in Namibia.
- (f) It is also to be noted that this Standard Document is developed in an effort to harmonise electrical infrastructure and maintenance practises on distribution lines up to and including 33kV. This Standard is applicable to all electricity supply network infrastructure up to and including the Supply Authorities jurisdiction. This standard is therefore not applicable to applications beyond the Supply Authorities jurisdiction.
- (g) During the three year review period, stakeholders are encouraged to document suggestions and amendments with regards to this document. The amendments are to be forwarded to the review committee, who will consider the suggestions and amendments for inclusion in the development of the document as part of the review process.

**A-4 SAFETY CODE**

- (a) The Works will be performed in accordance with applicable safety legislation. Consideration shall be given to The Occupational Health and Safety Act, The Labour Act, Electricity Act and Rules and codes of the ECB (Quality of supply and Quality of service codes). If any discrepancies arise between information provided in this standard, the respective Act or code stated above shall take precedence.
- (b) The Contractor will issue all notices and pay all the required fees in respect of the Works to the authorities, and will supply and install all notices and warning signs that are required by the relevant safety legislation. The Supply Authority will be exempt from any losses, claims, costs or expenditures which may arise as a result of the Contractor's negligence to comply with the applicable safety legislation.
- (c) It will be assumed that the Contractor is conversant with the above-mentioned requirements. Should any requirements, by law or regulation, which contradicts the requirements of this document, apply or become applicable during the erection of the installation, such requirement, by law or regulation will overrule this Document and the



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Contractor will immediately inform the Supply Authority of such a contradiction. Under no circumstances will the Contractor carry out any variations to the installation in terms of such contradictions without obtaining the written permission to do so from the Supply Authority.

**A-5 TECHNICAL STANDARDS**

- (a) The technical standards used in this Detail Standards document have been adapted from existing technical standard specifications and codes of practice, in particular those of the South African Bureau of Standards (SABS/SANS), the South African National Rationalization of Standards (NRS), International Electrotechnical Commission (IEC) and British Standards (BS). Where reference is made to any code of practice or standard specification in this document the latest edition or amendment will be applicable.
- (b) A list of standard specifications and codes of practices to be used as reference this Detail Standards Document is found in section A-12 of this pre-amble.
- (c) All materials and equipment will conform in respect of quality, manufacture, test and performance, with the requirements of the South African National Standards (SANS/SABS) or where no such standard exist, with the relevant current specification of the IEC and NRS or any other standard referenced in this document.
- (d) All material and equipment will be suitable for the conditions on site. These conditions will include weather conditions as well as conditions under which materials are installed, stored and used. Should the materials not be suitable for use under temporary site conditions then the Contractor will at his own cost provide suitable protection until these unfavourable site conditions cease to exist.
- (e) The Contractor will, where requested to do so, submit samples of equipment and material to the Supply Authority or Consulting Engineer for approval prior to installation. Samples may be retained in the Supply Authority's possession until the contract is completed after which they will be returned.

**A-6 SITE CONDITIONS**

- (a) Contractors (tenderers) are advised to visit the site and acquaint themselves with all local conditions pertaining to the execution of the Works before tender closing date. No claims from the Contractor which may arise from insufficient knowledge of site access, type of site, labour conditions, establishment space, transport and loading/unloading facilities, power and water supply etc. will be considered after submission of tenders.
- (b) For services where prior permission is required before contractors can visit the site, a visit will be arranged for all interested parties.

**A-7 ARRANGEMENTS WITH THE SUPPLY AUTHORITY**

- (a) Consultants shall inform the Supply Authority of any Works to be performed in its area of responsibility. All Works must be designed in accordance with this Standard Specification and should any discrepancies arise, arrange prior approval with the Supply Authority before implementation of a design.

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- (b) Any Contractor wanting to perform Works in the Supply Authority's area of responsibility shall conform to the regulations of the relevant Supply Authority, in accordance with the applicable regulations and Acts.

**A-8 SUPPLY AUTHORITY'S RESPONSIBILITY**

- (a) If required, the Supply Authority shall provide its assistance during the planning stages for the Works.
- (b) The Supply Authority shall be responsible for approving way-leaves and right of admission facilities where needed to cross or enter landowners' or tenants' areas.
- (c) The Supply Authority shall be responsible for notifying its customers of planned power disruptions for maintenance or construction purposes well in advance.
- (d) The Supply Authority shall calculate and inform customers/developers of the fees payable for connection to the grid.
- (e) The Supply Authority reserves the right to accept Works as complete only if the relevant certificates and reports from the Engineer and the Contractor are produced and with receipt of proper as-built drawings.
- (f) The Supply Authority shall be responsible for the installation and commissioning of electricity meters at customers' premises.
- (g) The Supply Authority shall be responsible for inspection and testing of customers' installations prior to connection.

**A-9 ENGINEER'S RESPONSIBILITY (ENGINEER TO BE REGISTERED AT ECN)**

- (a) The Engineer Registered at ECN shall be responsible for the design, costing and preparation of drawings and detailed technical specifications to be available for the Contractor to execute the Works.
- (b) The Engineer shall make regular inspections as to the requirements of project specifications, of the Works so as to ensure that the Works are performed in accordance with the specifications.
- (c) The Engineer shall assist with the setting out of the Works.
- (d) The Engineer shall keep the Supply Authority informed of progress on the Works.
- (e) The Engineer shall certify the Works as complete once he has satisfied himself that the Works have been performed in accordance with the specification and have been tested and commissioned.
- (f) It is the Engineer's responsibility to provide network expansion design specifications to the Supply Authority for approval. Designs must take into account future designs and network expansions, considering the upstream network at all times.

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**A-10 CONTRACTOR'S RESPONSIBILITY (CONTRACTOR TO CONFORM TO THE REQUIREMENTS OF THE SUPPLY AUTHORITY)**

- (a) The Contractor shall issue all notices, submit relevant forms and pay the applicable fees for the Works to be performed, in accordance with the relevant regulations.
- (b) The Contractor shall set out the works in liaison with the Engineer and perform the Works in accordance with the specifications and drawings.
- (c) The Contractor shall notify the Supply Authority in accordance with requirements of the Supply Authority well in advance of any power disruptions to the LV or MV supply to be caused during execution of the Works. All required procedures as stipulated in the Quality of Supply Code shall be adhered to. The Quality of Supply Code shall take precedence in all circumstances.
- (d) The Contractor shall be liable for any damages caused by his workmen to existing services during execution of the Works.
- (e) It shall be the responsibility of the Contractor to make the necessary arrangements with the Supply Authority and the Engineer to inspect, test and commission the Works to the requirement of the Supply Authority, it shall however stay the responsibility of the Contractor for the complete and successful testing and commissioning of all Works.
- (f) The Contractor shall ensure that the site is properly cleaned and made good after completion of the Works.

**A-11 DEVELOPER'S RESPONSIBILITY**

- (a) Developers wanting to develop projects that concern the Supply Authority's infrastructure shall notify the Supply Authority well in advance of the scope and programme for the planned development.
- (b) The developer must, on own cost develop the applicable township's electrical infrastructure with the appointment of an electrical consulting engineer registered at ECN and who will provide a detailed design for approval by the supply authority. The developer shall also use of a registered electrical contractor under the supervision of an electrical consulting engineer registered at ECN, to the standards of the Supply Authority.
- (c) The developer must, where applicable reward the Supply Authority in accordance with approved connection charge policies utilised by the relevant Supply Authority.

**A-12 DEFINITION OF METERING POINTS**

Define Metering points classified as:

- Residential property
- Business buildings
- Flat Complex (large density accommodation)
- Complex having Prepayment Meters
- Buildings having Conventional Meters

**A-13 STANDARDS & CODES OF PRACTICE TO BE USED AS REFERENCE TO THIS DOCUMENT**

**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

**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.
- NRS 033 : Conductors for MV overhead lines
- NRS 034-3 : Conductors and ABC for LV overhead lines

**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 underground 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

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- 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
- 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

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- 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

**INSULATORS**

**Regional Standards**

- NRS 066 : Medium voltage insulators
- SANS 60273 : Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1000V.
- SANS 60305 : Insulators for overhead lines with nominal voltage above 1000V – ceramic or glass insulator unit for a.c. systems – characteristics of insulator units of the cap and pin type.

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- SANS 60383-1 : Insulators for overhead lines with nominal voltage above 1000V. Part 1: Ceramic or glass insulator units for a.c. systems – definitions, test methods and acceptance criteria.
- SANS 60383-2: Insulators for overhead lines with nominal voltage above 1000V. Part 2: Insulator strings and insulator sets for a.c. systems – definitions, test methods and acceptance criteria.
- BS EN 60305 : Insulators of ceramic material or glass for overhead lines with a nominal voltage greater than 1000 V. Requirements
- SANS 60720 : Characteristics of line post insulators
- SANS 60815 : Guide to the selection of insulators in respect of polluted conditions
- SANS 61109 : Composite insulators for a.c. overhead lines with a nominal voltage greater than 1000V – Definitions, test methods and acceptance criteria.
- SANS 61462 : Composite insulators – Hollow insulators for use in outdoor and indoor electrical equipment – Definitions, test methods, acceptance criteria and design recommendations.

**International Standards**

- BS 3288 : Insulator and conductor fittings for overhead power lines.
- IEC 1109 : Composite insulators for AC overhead lines with nominal voltage greater than 1000V
- IEC 60168 : Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1kV.
- IEC 60273 : Characteristics of indoor and outdoor post insulators for nominal system voltages greater than 1kV
- IEC 60383 : Insulators for overhead lines with nominal voltage above 1kV
- IEC 60433 : Insulators for overhead lines with a nominal voltage greater than 1kV for ceramic insulators.

**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**

- 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

**SURGE ARRESTERS**

- NRS 039 : Surge arrestors for use in distribution systems
- SANS 60099-1 : Surge arresters Part 1: Non-linear resistor type gapped surge arresters for a.c. systems
- SANS 60099-4 : Surge arresters Part 4: Metal oxide surge arrestors without gaps for a.c. systems
- SANS 60099-5 : Surge arresters Part 5: Selection and application recommendations

**A.C. DISCONNECTORS , EARTHING SWITCHES AND ISOLATORS**

**Regional Standards**

- NRS 031 : Alternating current disconnectors and earthing switches.
- NRS 036 : Auto – Reclosers and Sectionalizers – Pole Mounted Types
- NRS 046 : Electricity Distribution – Load break switch disconnectors – pole mounted type for rated A.C. voltages above 1kV and up to and including 36kV
- SANS 60129 : Alternating current disconnectors and earthing switches

**International Standards**

- BS 3078 : Isolators
- BS EN 60137 : Specification for bushings for alternating voltages above 1000 V
- IEC 60129 : Alternating current disconnectors (isolators) and earthing switches.
- IEC 61129 : Alternating earthing switches induced current switching

**VOLTAGE TRANSFORMERS**

**Regional Standards**

- SANS 60186 : Voltage transformers

**International Standards**

- IEC 61558 : Safety of transformers, reactors, power supply units and similar products
- IEC 60186 : Voltage transformers

**POWER TRANSFORMERS**

**Regional Standards**

- NRS 054 : Power Transformers
- SANS 60076-1 : Power Transformers Part 1: General
- SANS 60076-2 : Power Transformers Part 2: Temperature Rise
- SANS 60076-3 : Power Transformers Part 3: Insulation levels, dielectric tests and external clearances in air.
- SANS 60076-5 : Power Transformers Part 5: Ability to withstand short circuit

**International Standards**

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- IEC 60076 : Power transformers  
IEC 61558 : Safety of power transformers

**DISTRIBUTION TRANSFORMERS**

- NRS 079 : Mineral Insulating Oils  
SANS 780 : Distribution Transformers  
SANS 555 : Unused and reclaimed mineral insulator oils for transformers and switchgear.  
SANS 1037 : Standard Transformer bushings  
SANS 1371 : Ceramic hollow insulators for standard transformer bushings

**BUSHINGS**

**Regional Standards**

- SANS 1037 : Standard Transformer bushings

**International Standards**

- IEC 60137 : Insulated Bushings for Alternating Voltages Above 1kV.

**SWITCHGEAR**

**Regional Standards**

- NRS 003 : A.C. metal enclosed switchgear and control gear for rated voltages above 1kV and up to and including 36kV.  
SANS 555 : Unused and reclaimed mineral insulator oils for transformers and switchgear.  
SANS 1473-1 : Low voltage switchgear and control gear assemblies Part 1: Type tested and partially type tested assemblies  
SANS 1473-2 : Low voltage switchgear and control gear assemblies Part 2: Busbar trunking systems  
SANS 1885 : Metal – Clad switchgear for rated a.c voltages above 1kV and up to and including 36kV- General requirements and methods of test.  
SANS 60282-1 : High Voltage fuses Part 1: Current limiting fuses  
SANS 60282-2 : High Voltage fuses Part 2: Expulsion fuses  
SANS 60298 : A.C. metal enclosed switchgear and control gear for rated voltages 1kV and up to and including 52 kV  
SANS 61264 : Ceramic pressurised hollow insulators for high voltage switchgear and control gear.

**International Standards**

- BS 159 : Specification for high voltage busbars and busbars connections.
- BS 2631 : Switches
- BS 116 : Fuse Switches
- BS 2692 : Fuses
- BS 7354 : Specification for electric power switchgear and associated apparatus
- ANSI/IEEE C37.60 : IEEE standard requirements for overhead, pad mounted, dry vault and submersible automatic circuit reclosers and fault interrupters for ac systems.
- IEC 60694 : Common clauses for high voltage switchgear and control gear standards.
- IEC 60439 : Low Voltage switchgear and control gear
- IEC 60298 : A.C. Metal enclosed switchgear and control gear for rated voltages greater than 1kV up to and including 52kV
- IEC 62271 : High voltage switchgear and control gear
- IEC 60694 : Common Specifications for High Voltage switchgear and control gear standards.

**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

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**International Standard**

- IEC 60056 : High voltage alternating current circuit breakers.
- IEC 60376 : Specification and acceptance of new sulphur hexafluoride (SF<sub>6</sub>).
- IEC 60898 : Electrical accessories – circuit breakers for over current protection for household and similar installations
- VC 8036 : Industry Standards for Circuit Breakers

**MINIATURE SUBSTATIONS**

- SANS 1029 : Miniature substations
- SANS 1030 : Standard longitudinal miniature substations

**RING MAIN UNITS**

**Regional Standards**

- SANS 1874 : Metal enclosed ring main units for rated a.c. voltages above 1kV up to and including 24 kV.

**International Standards**

- IEC 60298 : A.C. Metal enclosed switchgear and control gear for rated voltages greater than 1kV up to and including 52kV

**STREETLIGHTING**

- SANS 10098-1 : Public Lighting Part 1: The lighting of public thoroughfares
- SANS 10098-2 : Public Lighting Part 2: The lighting of certain specific areas of streets and highways
- SANS 1277 : Street lighting Luminaires

**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.

### **BUSBARS**

#### **Regional Standards**

SANS 1195 : Busbars

BS EN 13601 : Specification for Copper for electrical purposes: Rod and Bar

#### **International Standards**

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BS 159 : Specification for High voltage Busbars and busbar connections

**POLES**

NRS 038 : Concrete poles

SANS 470 : Concrete poles for telephone, power and lighting purposes

SANS 753 : Pine poles, cross arms and spacers for power distribution, telephone systems and street lighting

SANS 754 : Eucalyptus poles, cross-arms and spacers for power distribution and telephone systems

**WOOD PRESERVATIVES**

SANS 592 : Wood preservatives containing high temperature creosote and coal tar

SANS 593 : Wood preservatives containing low and medium temperature creosote and coal tar

SANS 10005 : The preservative treatment of timber

**WELDING**

SANS 10044 : Arc Welding

BS 4360 : Welding Structural Sheets

BS 5135 : Metal Arc Welding of Carbon Steels

**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

**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

**ASSEMBLIES AND ASSOCIATED ACCESSORIES**

- NRS 022 : Electricity Distribution – Stays and associated Components
- NRS 051 : Suspension and strain fittings for insulated supporting structures used in medium voltage aerial bundled systems.
- NRS 053 : Accessories for medium voltage power cables (3.8/6.6 kV to 19/33 kV)

**EQUIPMENT STANDARDS**

- SANS 10142 : Electrical Equipment

**CONCRETE WORKS**

- SANS 878 : Ready mixed concrete
- SANS 920 : Steel bars for concrete reinforcement
- SANS 927 : Precast concrete kerbs, edgings and channels
- SANS 1058 : Concrete paving blocks
- SANS 451 : Precast concrete paving slabs



**CORRESPONDING SANS STANDARDS WITH IEC SPECIFICATIONS**

<b>SABS / SANS</b>	<b>DESCRIPTION</b>	<b>IEC</b>
SANS 156	Moulded-case circuit breaker	IEC 60898-1
SANS 182-3	Conductors for overhead electrical transmission lines : Part 3: Aluminium conductors, steel reinforced	IEC 60889
SANS 555	Unused and reclaimed mineral insulating oils for transformers and switchgear	IEC 60296
SANS 1091	National Colour Standards	IEC 60173; IEC 60304
SANS 1195	Busbars	IEC 62271-102
SANS 1213	Mechanical Cable Glands	IEC 60079-11
SANS 1339	Electric Cables – cross-linked polyethylene (XLPE) insulated cables for rated voltages 3,8/6,6 kV to 19/33 kV	IEC 60245-8
SANS 1411-1	Materials of insulated electric cables and flexible cords : Part 1: Conductors	IEC 60228
SANS 1411-2	Materials of insulated electric cables and flexible cords : Part 2: Polyvinyl chloride (PVC)	IEC 60684-3-151
SANS 1411-3	Materials of insulated electric cables and flexible cords: Part 3: Elastomers	IEC 60684-3
SANS 1411-4	Materials of insulated electric cables and flexible cords: Part 4: Cross-linked polyethylene (XLPE)	IEC 60684-3-320; IEC 60684-3-340 TO –3-342
SANS 1411-5	Materials of insulated electric cables and flexible cords: Part 5: Halogen-free, flame-retardant materials	IEC 60684-3-271; IEC 60684-3-244; IEC 60684-3-299; IEC 60684-3-228; IEC 60684-3-217

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SANS 1411-7	Materials of insulated electric cables and flexible cords: Part 7: Polyethylene (PE)	IEC 60684-3-320; IEC 60684-3-340 TO -3-342; IEC 60684-3-420 TO -3-422
SANS 10198-1	The selection, handling and installation of electric power cables of rating not exceeding 33kV: Part 1: Definitions and statutory requirements	IEC 60183
SANS 10198-4	The selection, handling and installation of electric power cables of rating not exceeding 33kV: Part 4: Current Ratings	IEC/TR 62095; IEC 60287-3-2
SANS 10198-7	The selection, handling and installation of electric power cables of rating not exceeding 33kV: Part 7: Safety Precautions	IEC 61936-1
SANS 10198-13	The selection, handling and installation of electric power cables of rating not exceeding 33kV: Part 13: Testing, commissioning and fault location	IEC 60840; IEC 62067
SANS 1524-1	Electricity payment system: Part 1: Prepayment meters	IEC/PAS 62055-41
SANS 1799	Watt-hour meters – AC electronic meters for active energy	IEC 61358
SANS 1473-2	LV Switchgear and control gear assemblies : Part 2: Particular requirements for busbar, trunking systems (busways)	IEC 60439-2