Eskom	Standard	Transmission

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Executive Summary

This document is a standard defining the process to be followed by the Contractor appointed by Eskom Transmission on the Self-build and EPC's (including turnkey project(s)) when they are choosing and selecting the material to be used to build the substation(s) or infrastructure. It addresses a standard approach applicable to the whole Self-build and turnkey project(s) of the Eskom Transmission asset(s). This document is in alignment with the Transmission Self-build Procedure (240-61713594 Rev 3, refer to 8.9 Annexure I: Typical Eskom Standard Equipment Ratings).

In this document, the word "Self-build" is used to cover all situations by which Eskom Transmission appoints the Contractor(s) to design, source, build and deliver the complete asset (substation or infrastructure) that gets handed over to Eskom Transmission as its own asset for power delivery, this includes the awarded EPC's and turnkey projects. Secondly, in this document the use of the word "Contractor" refers to this Eskom Transmission appointed entity that will carry out the projects or scope of work that this document addresses.

1. Introduction

This standard is meant to be followed by the Eskom Transmission appointed Contractor when choosing and selecting HV equipment to use when building the Eskom Transmission substation or infrastructure. It is in alignment with the Transmission Self-build Procedure (240-61713594 Rev 3, refer to 8.9 Annexure I: Typical Eskom Standard Equipment Ratings)

In this document, the word “Self-build” is used to cover all situations by which Eskom Transmission appoints the Contractor(s) to design, source, build and deliver the complete asset (substation or infrastructure) that gets handed over to Eskom Transmission as its own asset for power delivery. This can be the awarded EPC(’s) or turnkey project(s) of any engineering magnitude where Eskom Transmission takes a decision of sourcing the infrastructure not using the inhouse constructing or building capability. It is including the Eskom Transmission awarded EPC’s.

It is important to note that Substation Equipment and Diagnostics (SED) shall develop and maintain an updated the list of Eskom Transmission pre-approved HV equipment to be used in the design and construction of substation infrastructure. In this, SED shall ensure that this list accommodates the new entry Suppliers (OEM’s) that have been evaluated and found to meet Eskom Transmission requirements of the specific HV equipment Technical Standard specification. The list of Eskom Tx pre-approved HV equipment will be updated continuously to give more options on the acceptable equipment. The Contractor shall have a choice of options of the equipment to be used.

2. Supporting clauses

2.1 Scope

This document covers all HV equipment that are the responsibility of Substation Equipment and Diagnostics department, namely HV switchgear (circuit-breakers, disconnectors (isolators), earthing switches, by-pass switches and disconnecting circuit-breakers), mixed technologies switchgear (MTS), gas insulated substation (GIS), transformers, reactors, surge arrestors, surge capacitors, post insulators, cables, instrument transformers (CT’s, VT’s, coupling capacitors), shunt capacitor banks (capbanks), series capacitor banks (capbanks), FACTS (SVC’s and STATCOM) and equipment for HVDC (the power electronic devices). This applies to indoor and outdoor equipment that may be required for the Self-build and turnkey projects.

2.1.1 Purpose

This document aims to mitigate unnecessary confusion that can lead to unintended delays when it comes to selecting and acquiring HV equipment used on the Self-build and/or EPC (turnkey) project of Eskom Transmission. It assists the Eskom Transmission appointed Contractors of the Self-build and/or turnkey projects on the process to follow.

2.1.2 Applicability

This document shall apply throughout Eskom Holdings Limited Divisions.

2.2 Normative/informative references

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

2.2.1 Normative

[1] ISO 9001, Quality Management Systems.

[2] Occupational Health and Safety Act (OHS Act) No. 85 of 1993 – Construction and Electrical Machinery Regulations

[3] ESP 32-846: Operating Regulations for High Voltage Systems (ORHVS)

[4] 240-61713594 Rev 3 (onwards), Procedure for Self-Build Customer Projects in Transmission

[5] SANS/ IEC 60050(441):1984: International Electrotechnical Vocabulary – Chapter 441: Switchgear, controlgear and fuses

[6] SANS/ IEC 62271-1, High-voltage switchgear and controlgear – Part 1: Common specifications.

[7] SANS/ IEC 62271-100, High-voltage switchgear and controlgear – Part 100: High-voltage alternating-current circuit-breakers.

[8] SANS/ IEC 62271-203, High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV.

[9] SANS/ IEC 62271-102, High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches

[10] SANS/ IEC 61869-2, Instrument transformers Part 2: Additional requirements for current transformers

[11] SANS/ IEC 61869-3, Instrument transformers Part 3: Additional requirements for inductive voltage transformers

[12] SANS/ IEC 61869-5, Instrument transformers Part 5: Additional requirements for capacitor voltage transformers

[13] SANS/ IEC 60099-4: 2014, Surge arresters Part 4: Metal-oxide surge arresters without gaps for a.c. systems

[14] IEC 63360, Fluids for electrotechnical application: Mixtures of gases alternative to SF6 (CD, Final Draft or Latest published)

[15] IEEE 1052. IEEE Guide for Specification of Transmission Static Synchronous Compensator (STATCOM) Systems

[16] IEC 60871, (all parts) Shunt capacitors for A.C. power systems having a rated voltage above 1 000 V

[17] IEEE 1031, Guide for the Functional Specification of Transmission Static Var Compensators.

[18] IEEE 1303, Guide for Static Var Compensator Filed Tests.

[19] IEC 60700, VSC Valves for High Voltage Direct Current (HVDC) Power Transmission – Part 1 : Electrical Testing

2.2.2 Informative

[20] Annex B – (for Technical Standard specifications of the High Voltage equipment and their associated Technical A & B Schedules)

[21] Annex B – (for applicable Technical Bulletins (TB), Engineering Instructions (EI's), and Technical Instructions (TI's) of the High Voltage equipment)

[22] Annex C – (for Phasing diagram – requirement to ensure the Substation matches the phasing on the Lines

[23] Self-build Agreement - Contract Conditions for the Self-build of Eskom Transmission connection Assets by Customers

[24] Memorandum: Simplified Technical Evaluation Process of Equipment Commodity Suppliers, dated 19 March 2023 (signed 22 March 2023)

2.3 Definitions

2.3.1 General

Definition	Description
Circuit-breaker	[IEC 62271-100 clause 3.4.103] The mechanical switching device that is capable of making, carrying and breaking the normal currents, and also making and carrying for a specified time, and breaking currents under specified abnormal circuit condition such as those of short circuit. [IEV 441-14-20 definition] [2] **Note:** without malfunctioning when called to operate, even when it has been standing in one position for long duration.)
Capacitive Range	Amount of capacitive reactive power that can be supplied by an SVC.
Capacitive Voltage Transformer	[IEC 61869-5 clause 3.1.501] voltage transformer comprising a capacitor divider unit and an electromagnetic unit so designed and interconnected that the secondary voltage of the electromagnetic unit is substantially proportional to the primary voltage, and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections.
Capacitor bank	An assembly of parallel and series connected capacitor units.
Capacitor unit	Collection of capacitor elements connected in parallel and series arrangements fitted inside a metal enclosure and vacuum sealed with an insulation fluid. Internal connections made to a bushing situated on the outside of the unit enclosure.
Current Transformer	[IEC 61869-2 clause 3.1.201] instrument transformer in which the secondary current, under normal conditions of use, is substantially proportional to the primary current and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections
Disconnector (Isolator)	[IEV 441-14-05 definition] [2] The mechanical switching device which provides, in the open position, the isolating distance in accordance with the specified requirements. **Note**: A disconnector is capable of opening and closing the circuit when neither negligible current is broken or made, or when no significant change of voltage across the terminals of each of the poles of the disconnector occurs. It is also capable of carrying current under normal circuit conditions or carrying for a specified time current under abnormal conditions such as those of short-circuit.
Earthing Switch	[IEV 441-14-11 definition] [2] The mechanical switching device for earthing parts of the circuit, capable of withstanding for a specified time currents under abnormal conditions such as those of short-circuit, but not required to carry current under normal conditions of the circuit. **Note**: An earthing switch may have the short-circuit making capacity.
Gas	[IEC 63360 clause 3.1.2] a pure gas or gas mixture used for insulation and/or switching within electric power equipment
Inductive Range	Amount of reactive power that can be absorbed by an SVC

Definition	Description
Power Transformer	An electrical apparatus that is designed to transform power from one voltage level to another for the purposes of transmission and distribution at a prescribed frequency.
Post Insulator	[IEC 60168 and IEC 60273 definitions] Unless otherwise specified, this refers to an assembled post insulator of ceramic material or glass intended for outdoor or indoor use, complete with metal fittings. The insulators covered by these standards are intended for use in isolators (disconnectors) or as busbar or fuse supports.
Refurbishment	Re-instatement of existing assets to their original condition and intended performance with consideration for cost and current technology for the purpose of extending the plants useful life expectancy (includes Retrofit (life extension); Modification/s to assets of capital nature (life extension); Major overhaul and Replacement of assets before failure (end of life).
Series Capacitor Bank	A three-phase assembly of capacitor units with the associated protective devices, discharge current limiting reactors, protection and control system, bypass switch, and insulated support structure that has the primary purpose of introducing capacitive reactance in series with an electric circuit.
Series Reactor	reactor connected in series in a power system to limit the current under system fault conditions.
Shunt Capacitor Bank	A device with a combination of capacitor units connected in parallel and series connections that are connected between live potential and ground to provide reactive support.
Shunt Reactor	reactor connected phase-to-earth, phase-to-neutral or between phases in a power system to compensate for capacitive current.
Surge Arrestor	[IEC 60099 definition] a device designed to protect electrical apparatus from high transient voltage and to limit the duration and frequently the amplitude of follow-current. The term "surge arrester" includes any external series gap which is essential for the proper functioning of the device as installed for service, regardless of whether or not it is supplied as an integral part of the device. **Note**: Surge arresters are usually connected between the electrical conductors of a network and earth although they may sometimes be connected across the windings of apparatus or between electrical conductors.
SVC	Are shunt-connected static generators and/or absorbers whose outputs are varied to control specific parameters (e.g., voltage, reactive power flow) of the power system.
Voltage Transformer	[IEC 61869-3 clause 3.1.301] instrument transformer in which the secondary voltage, in normal conditions of use, is substantially proportional to the primary voltage and differs in phase from it by an angle which is approximately zero for an appropriate direction of the connections

2.3.2 Disclosure classification

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

2.4 Abbreviations

Abbreviation	Description
AM	Asset Management
CG	Care Group
CL	Close Loop
CT	Current Transformer
CVT	Capacitive Voltage Transformer
DRPC	Dynamic Reactive Power Compensation
EPC	Engineer, Procure, and Construct
Eskom	Eskom Holdings SOC (Ltd)
FACTS	Flexible AC Transmission Systems
GIS	Gas Insulated Switchgear
HV	High Voltage
HVDC	High Voltage Direct Current
LVRT	Low Voltage Ride Through
MACH	Control and Protection Computer (hardware and software) used on AEG/ ABB SVCs
OEM	Original Equipment Manufacturing
OVRT	Overvoltage Ride Through
PTM&C	Protection Telecommunication Metering &
QITP	Quality Inspection Test Plan
RFP	Request for Proposal
RFQ	Request for Quotation
SCOT	Study Committee of Technology
SE&D (SED)	Substation Equipment & Diagnostics

Abbreviation	Description
STATCOM	Static Synchronous Compensator
SVC	Static Var Compensator
TCR	Thyristor Controlled Reactor
TSC	Thyristor Switched Capacitor
Tx	Transmission
VSC	Voltage Source Convertor
VT	Voltage Transformer

2.5 Roles and responsibilities

Substation Equipment and Diagnostics – compiles this document and keep it up to date for Eskom Transmission use and its appointed Contractors. Also develop and maintain an up-to-date list of Eskom Transmission pre-approved HV equipment that will be given to all internal stakeholders (Substation Engineering, Subs Integration, TPD and others) to make available to the appointed Contractors.

Substation Engineering and Engineering Integration – participate in the development of this document. Also use this document during interaction with the Eskom Transmission appointed Contractor of the Self-build and/or turnkey project(s) for implementation of the design.

Project Management (TPD) – ensures the implementation of this document during the project phases of a substation on the Eskom Transmission Self-build and/or turnkey projects(s).

2.6 Process for monitoring

Not Applicable.

2.7 Related/supporting documents

Not applicable.

3. Document content

Below is the contents of this document which is applicable to all HV equipment defined under clause item 2.3 of this document.

3.1 Intention

- To optimise on using the HV equipment that has undergone Eskom Transmission process of technical evaluation (and quality), approval of equipment drawings and signing-off. Thus to minimise the repeat work requiring technical team to perform evaluations and drawings approval process.
- To avoid introducing inferior technology to Eskom Transmission network.
- To avoid flooding Eskom Transmission network with the same product – to be able to manage where inherent defects with the type eventually develops affecting most parts of the network, where possible and ensuring compliance with the rules governing Eskom sourcing of new equipment.
- To avoid introducing technology that Eskom Transmission cannot support in the long term, e.g. spares, special tools, difficult to locate high expertise technical skills
- To highlight the Eskom Transmission published documents that are required when the substation is built and/or the Bay equipped.

3.1.1 Other deliverable

- To perform power line propagation studies (Line Trap phase allocations) for Teleprotection designs, the Contractor shall provide an Phasing Diagram (electrical line diagram) that details and confirms the phasing at both the substations and on the corresponding line. This diagram will also include the line transpositions if required. (Refer to Annex C).

3.2 Background

Eskom Transmission approach in introducing technology in the network is as follows:

- Cross functional team made up of Engineering, Quality, Commercial, Finance and SHE representation is formed;
- Prepare a sourcing strategy;
- Conclude on items and their quantities of what to form part of the procurement package;
- Provide Technical Standard specification and Technical Evaluation Criteria;
- Procurement then issues a tender (RFQ/ RFP);
- Eskom Transmission perform Technical Evaluation – of what is submitted by Tenderers;
- Design Reviews assessment prior to the first of manufactured in accordance with Eskom Transmission Standard specification
- Supplier submitting final equipment drawings for Eskom Transmission commenting, allocating drawing numbers and approval sign-offs. Also approval of QITP (manufacturing) and QITP (site works);
- Participate on the FAT when the first-of built to Eskom Transmission Standard specification has been manufactured prior to delivery;
- then inspection of the first of deliveries, witness installation and site pre-commissioning tests (site inspections).

3.3 The stipulated approach

To ensure alignment with the Eskom Transmission Self-build Procedure (240-61713594 Rev 3, refer to 8.9 ANNEXURE I: TYPICAL ESKOM STANDARD EQUIPMENT RATINGS), below is the stipulated approach for the Contractor of the Self-build and EPC (turnkey) projects shall follow on choosing and selecting material (HV equipment) to use to build the Eskom Transmission substation or infrastructure:-

3.3.1 Use of the list of Eskom Transmission pre-approved HV equipment

The Contractor shall:-

a) select the HV equipment from the list of Eskom Tx pre-approved HV equipment in their design and construction of the substation infrastructure. This approach will accelerate the process from award to construction of the substation infrastructure. The list of Eskom Tx pre-approved HV equipment shall be updated regularly in order to widen the options.

This should benefit with the equipment drawings that would have already been approved between Eskom Transmission and the Supplier and its OEM factory. It will thus mitigate the additional resources of the Eskom Transmission technical team on technical evaluation and drawings approval process.

NOTE 1: SED shall ensure that all the drawings supporting the Eskom Tx pre-approved products are available. In the case where the drawing is not available, SED will facilitate the issuing of the drawing with the Supplier or OEM.

NOTE 2: In all instances, where Eskom Transmission has indicated use of standardised equipment steel support structures and/ or foundations, the Contractor shall assess and confirm the compatibility between HV equipment selections and the steel supports and foundations.

3.3.2 Use of equipment that is not on the Eskom Tx pre-approved HV equipment list

In the case where the Contractor chooses to use the products that are not pre-approved by Eskom Transmission, Eskom Tx shall follow the process of approving that product and that can have time duration implication. It can also pose a potential risk to the product ending up not being approved by Eskom Transmission, thus delays.

In this case the process following process shall apply:-

a) The Contractor shall approach the Suppliers and OEM's for that HV equipment using the current revision of the Eskom Transmission Standard specification and the Technical A & B schedules, with referenced documents and drawings.

b) The Contractor shall submit the technical documentation to SED for evaluation by the Equipment Specialist.

c) SED shall conduct the technical evaluation of the equipment using the communicated Technical Evaluation Criteria. This process involves desktop paper technical evaluation, design reviews, drawings approval and FAT. The equipment will only be accepted if it meets Eskom Tx specified requirements.

It is very important to note that the process of approving the product can be time consuming depending on that particular HV equipment. This might affect the delivery timelines of the project.

d) After the SED technical evaluation concluding that the offered product does not meet the Eskom Transmission requirements, it must be noted that the Contractor has an option to revert to the list of Eskom Tx pre-approved HV equipment as per 3.3.1.

NOTE: Typically this process of evaluating and approving a product that is not on Eskom Tx list of pre-approved HV equipment may take up to 6 months subject to, amongst others, the specific HV equipment evaluated, availability of specified technical documentation, changes required to be made to the equipment comply to Eskom requirements, the country location of the OEM manufacturing facility, drawing approval, etc.

4. Authorization

This document has been seen by:

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5. Revisions

Date	Rev.	Compiler	Remarks
Aug 2023	1	S Nkosi	Authorised official version
Jul - Aug 2023	0.5	S Nkosi	Final comments from signing process and after the meeting (Procurement Strategies – Technical requirements).
Apr - Jun 2023	0.4	S Nkosi	Final draft version. Updated received comments, also title and scope to cater for Self-build and Turnkey projects in line with 31 March 2023 discussion (EPC strategies on Commodity contracts workgroup). Memorandum, dated 19 March 2023 (signed 22 March 2023) Circulated for comments to the EPC Strategies on Commodity Contracts Workgroup (convened by Siziwe Phewa)
Mar 2023	0.3	S Nkosi	Incorporating discussions between SE&D and Substation Engineering (Primary Equipment Detail Availability, 06 March 2023). Circulated for seen by and final commenting.
Jan-Feb 2023	0.2	S Nkosi	First draft version for comments and confirmation of the details on the existing Transmission Self-build Procedure (240-61713594 Rev 3, refer to 8.9 Annexure I).
Dec 2022	0.1	S Nkosi	New 240-number and first draft version – document required to consolidate the process to give guidelines to be followed by Contractors on Eskom Transmission Self-build program.

6. Development team

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

- Sphiwe Nkosi
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7. Acknowledgements

The Compiler acknowledges the inputs, contributions and comments made by the Colleagues at Substation Equipment & Diagnostics and all input comments from Engineering (Substations and PTM&C) and the Grid HV Plant Management.

Annex A – Typical list of equipment prepared by Eskom Transmission (Generic example)

Below is the typical list of HV equipment (Annex H of the Self-build Agreement - Contract Conditions for the Self-build of Eskom Transmission connection Assets by Customers).

Table A.1: List of Equipment (*typical*)

Name of Equipment/ Material (765 kV)	Description of the Equipment/ Material	Supplier/ Original Equipment Manufacturer (OEM)	ESKOM SAP Number	ESKOM Outline Drawing Number	SUPPLIER DRAWING NUMBER/DOCUMENT ID	CONTRACT NUMBER
Isolator (Conventional)	765 kV Isolators (exact type short description)	Supplier / OEM factory (country)				
Earthing switches	765 kV Earthing switches (exact type short description)	Supplier / OEM factory (country)				
Circuit Breaker	765 kV CB's (exact type short description)	Supplier / OEM factory (country)				
Current Transformers	765 kV CT's (exact type short description)	Supplier / OEM factory (country)				
Coupling Voltage Transformers	765 kV CVT's (exact type short description)	Supplier / OEM factory (country)				
Post Insulator	765 kV PI (exact type short description)	Supplier / OEM factory (country)				
Surge Arrestor	765 kV SA (exact type short description)	Supplier / OEM factory (country)				
Transformer	765 kV/400 kV Transformer (exact type short description)	Supplier / OEM factory (country)				

Name of Equipment/ Material (400 kV/ 550 kV)	Description of the Equipment/ Material	Supplier/ Original Equipment Manufacturer (OEM)	ESKOM SAP Number	ESKOM Outline Drawing Number	SUPPLIER DRAWING NUMBER/DOCUMENT ID	CONTRACT NUMBER
Isolator (Conventional)	400 kV Isolators (exact type short description)	Supplier / OEM factory (country)				
Isolator (Pantograph)	400 kV Pantographs (exact type short description)	Supplier / OEM factory (country)				
Isolator (Conventional)	400 kV Earthing Switches (exact type short description)	Supplier / OEM factory (country)				
Circuit Breaker	400 kV CB's (exact type short description)	Supplier / OEM factory (country)				
Circuit Breaker	550 kV CB's (exact type short description)	Supplier / OEM factory (country)				
Current Transformers	400 kV CT's (exact type short description)	Supplier / OEM factory (country)				
Coupling Voltage Transformers	400 kV CVT's (exact type short description)	Supplier / OEM factory (country)				
Post Insulator	400 kV PI (exact type short description)	Supplier / OEM factory (country)				
Surge Arrestor	400 kV SA (exact type short description)	Supplier / OEM factory (country)				
Transformer	765/ 400 kV Trfr (exact type short description)	Supplier / OEM factory (country)				
STATCOM	275kV STACOM 1 GARONA	RXPE (China)				

Annex B – High level documentation of equipment covered (at the time of publication)

Table B.1: Equipment covered by this document and the applicable technical documents

Equipment	**Eskom Tx Standard Specification**	**SANS/ IEC standards** **(basis of the standard specification)**	**Eskom Technical Bulletin/ Engineering Instruction (EI)/ Technical Instruction (EI)** *NB: these are internal Eskom Tx documents, to be handled in this context*
Surge Arresters	240-75540566, Rev 5 (or latest)	SANS 60815: 2009/IEC 60815: 2008 SANS/IEC 60099-4: 2014	240-142598739
Post Insulators	240-56030435, Rev 5 (or latest)	SANS 60815: 2009/IEC 60815: 2008 IEC/SANS 60273 IEC/SANS 60168	240-142598739 Rev 3, …Guidance on technical Standards applicable for pollution related qualification of High Voltage equipment (internal Eskom Transmission Engineering Instruction)
RTV silicon rubber coatings	240-56062705, Rev 3 (coating) (or latest) 240-56063877, Rev 3 (application) (or latest)	IEC 62217 as a minimum, together with either: • Cigre TB 555, or • Cigre TB 691, or • IEC TR 62730, or Pollution flashover performance test curves. Additional: • SANS 60815: 2009/IEC 60815: 2008 IEC 62073	240-142598739

Equipment	Eskom Tx Standard Specification	SANS/ IEC standards (basis of the standard specification)	Eskom Technical Bulletin/ Engineering Instruction (EI)/ Technical Instruction (EI) *NB: these are internal Eskom Tx documents, to be handled in this context*
Circuit-breakers	240-180000572 Specification for high voltage air insulated switchgear rated for voltages 1 kV and above – outdoor circuit-breakers	SANS 62271-100, High-voltage switchgear and controlgear – Part 100: High-voltage alternating-current circuit-breakers	240-180000036, Install Surge Capacitors on 88 kV and 132 kV Feeder bays to mitigate overstress of CB's by switching transients upon permanent faults (sustained faults); (NB: internal Eskom Tx document) 240-148617190, Replace with new 132 kV circuit-breakers rated for 50 kA and above at the substations with fault-levels 30 kA and above (NB: internal Eskom Tx document) 240-142598739
Disconnectors (Isolators) and earthing switches	240-180000569, Specification for high voltage air insulated switchgear rated for voltages 1 kV and above – outdoor disconnectors and earthing switches	SANS 62271-102, High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches	240-180000653, engineering instruction to install pantographs on 132 kV and 88 kV busbar selection upon design layout requiring inline arrangement; (NB: internal Eskom Tx document) 240-142598739
GIS	240-50807380 Rev 6, (or latest), Specification for Gas Insulated Switchgear (GIS) and associated Auxiliary Equipment	SANS 62271-203, High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	240-142598739 (appliable to outdoor air insulated Bushings)
Mixed Technology Switchgear (MT-GIS)	240-56030436, Rev 3, (or latest), Distribution groups Specific requirements for 132kV Mixed Technology Gas Insulated Switchgear Standard	SANS 62271-203, High-voltage switchgear and controlgear – Part 203: Gas-insulated metal-enclosed switchgear for rated voltages above 52 kV	240-142598739 (appliable to air insulated Bushings)

Equipment	**Eskom Tx Standard Specification**	**SANS/ IEC standards** **(basis of the standard specification)**	**Eskom Technical Bulletin/ Engineering Instruction (EI)/ Technical Instruction (EI)** *NB: these are internal Eskom Tx documents, to be handled in this context*
Insulation gases (for switchgear)	240-151122225, Rev 2 (or latest), Specification for new SF6 gas supplied in standard gas cylinders with the Technical Evaluation Criteria	IEC 60376, Specification of technical grade sulphur hexafluoride (SF6) for use in electrical equipment SANS 10019, Transportable pressure receptacles for compressed, dissolved and liquefied gases - Basic design, manufacture, use and maintenance NRS 087, Guidelines for the management of SF6 (sulphur hexafluoride) for use in electrical equipment IEC 63360, Fluids for electrotechnical application: Mixtures of gases alternative to SF6 (CD, Final Draft or Latest published)	
Current Transformers	240-56062864, Current transformers Eskom specific requirements up to 132kV in accordance with NRS 029 standard		240-142598739

Equipment	**Eskom Tx Standard Specification**	**SANS/ IEC standards** **(basis of the standard specification)**	**Eskom Technical Bulletin/ Engineering Instruction (EI)/ Technical Instruction (EI)** *NB: these are internal Eskom Tx documents, to be handled in this context*
Power Capacitors	240-64688878, Generic Specification for Shunt/Filter Capacitor Bank Installations 240-53798941 Generic Specification for Shunt and Filter Capacitors	IEC 60871 (all parts) Shunt capacitors for A.C. power systems having a rated voltage above 1 000 V	240-180000040: Transmission Maintenance Standard for Series and Shunt Capacitor Banks 240-77586127 240-85660782 TMN41-415 Instruction and Maintenance manual for externally fused capacitor bank installations TESRP0353, Performance Improvement of Externally Fused Shunt Capacitor Banks
FACTS (STATCOM and SVC's)	240-103797616 Specification for the 400 kV, 500 MVAR, DRPC for Aries substation. TESSP0038 Technical Specification for the Design, Supply, Deliver, Installation and Commissioning of the Garona ±45MVAr, 275kV STATCOM.	IEEE 1031 Guide for the Functional Specification of Transmission Static Var Compensators. IEEE 1303 Guide for Static Var Compensator Filed Tests. IEEE 1502 IEEE Guide for Specification of Transmission Static Synchronous Compensator (STATCOM) Systems. IEC 60700 VSC Valves for High Voltage Direct Current (HVDC) Power Transmission – Part 1 : Electrical Testing.	12TB-014 Changes of Technology from SVC to STATCOM for Garona Project. 240-78325782, Health Appraisal Report for FACTS devices installed in the Transmission Network

Annex C – Phasing diagram to ensure the Substation matches the phasing on the Lines (typical example)