

Standard

Substation General Equipment Detail and Layout Standard R1089602

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Authorisations

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Review cycle	30 months	

Responsibilities

This document is the responsibility of the Asset Strategy Team, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as "TasNetworks").

Please contact the Asset Strategy Leader with any queries or suggestions.

- Implementation All TasNetworks staff and contractors.
- Compliance All group managers.

Minimum Requirements

The requirements set out in TasNetworks' documents are minimum requirements that must be complied with by all TasNetworks team members, contractors, and other consultants.

The end user is expected to implement any practices which may not be stated but which can be reasonably regarded as good practices relevant to the objective of this document.

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Record of revisions

Section number	Details
	New Document

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1 General

1.1 Purpose

To define the general requirements for works conducted on Transmission substations under the responsibility of Tasmanian Networks Pty Ltd (hereafter referred to as "TasNetworks").

1.2 Scope

This standard applies to all works conducted on Transmission substations under the responsibility of TasNetworks.

This standard contains general requirements for the design, station layout and choice of primary equipment at transmission level substations. It applies to substation assets under the responsibility of TasNetworks and is to be applied to new installations as well as redevelopment of part or all of existing installations.

1.3 Objective

TasNetworks requires design, construction, installation and commissioning of equipment, and services as covered in this standard to ensure:

- (a) personnel and public safety;
- (b) environmental hazards are identified, analysed and eliminated or control measures adopted;
- (c) that the requirements of the Tasmanian Electricity Code, National Electricity Rules and relevant Australian legal requirements are met;
- (d) risks to TasNetworks' assets are minimised;
- (e) ease in operation and maintenance;
- (f) minimum disruption to the electricity transmission system following network disturbances;
- (g) that the requirements of TasNetworks' performance objectives are met; and
- (h) that TasNetworks meets its obligations in its connection agreements to its customers.

1.1 Precedence

Any apparent conflict between the requirements of this standard and the law, mandatory requirements, industry standards, project specifications, non-statutory standards or guidelines, and any other associated documents should be brought to the immediate attention of TasNetworks for resolution and no action must be taken that might result in a breach of law or mandatory standard.

Where there may be a conflict between the requirements of this standard and any:

- (a) law, mandatory requirement or industry standard, then that law or statutory requirements will prevail over this standard;
 - (b) non-mandatory standard, or guideline, then this standard will prevail over that standard or guideline; and
 - (c) project specification, then the contract documentation will prevail over this standard.

Approval for a deviation to this standard may only be accorded if it does not reduce the quality of workmanship, pose a safety risk to person or equipment and does not deviate from the intent of this

standard. Deviations if any must be specifically requested, and approved in writing by TasNetworks' Leader Asset Strategy and Performance.

1.1 References

As a component of the complete specification for a system, this standard is to be read in conjunction with other standards and documents as applicable. Unless otherwise specified in the project specification, the equipment shall be in accordance with the latest edition and amendments of the applicable standards, and in particular all primary and secondary equipment standards. The following documents, without reservation, contain provision that, through reference in the text, constitute the requirements of this standard:

1.1.1 TasNetworks Standards

EHV Cable System Standard	R565986	
EHV Combined Voltage and Current Transformer Standard	R586371	
EHV Current Transformer Standard	R522690	
EHV Disconnector and Earth Switch Standard	R586396	
EHV Dead Tank and Live Tank Circuit Breakers Standard	R586376	
EHV Indoor Gas Insulated Switchgear Standard	R565990	
EHV Voltage Transformer Standard	R586391	
Extra High Voltage System Standard	R586386	
General Substation Requirements Standard	R522687	
High Voltage System Standard ()	R565983	
HV and LV Cable Systems Standard	R590630	
HV Shunt Capacitor Bank Standard	R522695	
Network Transformer Standard	R527893	
Security Fences and Gates Standard	R579297	
Substation Civil Design and Construction Standard	R590634	
Substation Intruder Detection and Deterrence Standard	R579295	
Substation Lightning Protection and Earthing Standard	R522692	
Substation Signage Standard	R517372	
Supply Transformer Standard	R527890	
Switchyard Conductor Current Rating Standard	R517375	
Station Standard Drawing Electrical Symbols	TSD-SD-0806-0001-001	
1.1.2 Other Standards		

Power installations exceeding 1 kV a.c	AS 2067
SAA Wiring rules	AS/NZS 3000

2 Primary Asset Details

The following provides an indicative list of currently used primary assets in TasNetworks Terminal Substations.

Project documents will specify if TasNetworks will free-issue items or if they need to be procured direct from supplier or under TasNetworks period contract if in place.

If particular asset is not listed as being on a current period contract then manufacturer and model type shall be used as a guide for previous purchase and would be preferred to continue using unless specifically agreed with TasNetworks and included in project documentation.

2.1.1 EHV Disconnectors and Earth Switch

Voltage Level	Manufacturer	Model Type
220	GE	S3C/S3CT
110	Alstom	S3C/S3CT

TasNetworks standard = R 586396

2.1.2 EHV Combined Voltage and Current Transformer Standard

TasNetworks standard = R 586371

Voltage Level	Manufacturer	Model Type
220	Areva (Ritz)	Kotef
110	Areva (Ritz)	Kotef

2.1.3 EHV Current Transformer Standard

TasNetworks standard = R 522690

Voltage Level	Manufacturer	Model Type
220	GE	OSKF-245
110	GE	OSKF-123

2.1.4 EHV Voltage Transformer Standard

Voltage Level	Manufacturer	Model Type
220	Koncar, Croatia	VCU-245
110	Koncar, Croatia	VCU-123

2.1.5 EHV Post Insulator (PI)

Voltage Level	Manufacturer	Туре	Drawing #
220	NGK, Japan	8A-108101MM	S-135819A
110	NGK, Japan	8A-108051MM	S-135818A

TasNetworks standard = R 574184

2.1.6 EHV Circuit Breakers (AIS)

TasNetworks standard = R586376

Voltage Level	Туре	Operation	Manufacturer	Model Type
220	Dead Tank	Ganged operation	Mitsubishi	200-SFMT-40E
220	Dead Tank	Single pole operation	Mitsubishi	200-SFMT-40G E-IPO
220	Live Tank	Ganged operation	Alstom	FXT14F
220	Live Tank	Single pole operation	Areva	GL314
110	Dead Tank	Ganged operation	Mitsubishi	120-SFMT-40E
110	Dead Tank	Single pole operation	Mitsubishi	120-SFMT-40SE (IPO)
110	Live Tank	Ganged operation	ABB	LTB145D
110	Live Tank	Single pole operation	ABB	LTB145D

2.1.7 EHV Circuit Breakers (GIS)

Voltage Level	Туре	Manufacturer	Model Type
220 ¹	GIS	-	-
110	GIS Tank	Alstom	F35

¹ None currently used

2.1.8 EHV Shunt Capacitor Bank Standard

Voltage Level	Туре	Manufacturer	Model Type
220	Outdoor	ABB and Nokian	ABB-CHD type
			Nokian-TILP type
110	Outdoor	ABB and Nokian	ABB-CHD type
			Nokian-TILP type

2.1.9 HV Shunt Capacitor Bank Standard

TasNetworks standard = R 522695

Voltage Level	Туре	Manufacturer	Model Type
22	2 - indoor	ABB and Nokian	5 MVAR
11	4 - indoor	ABB and Nokian	2.5 MVAR

2.1.10 HV and LV Cable Systems Standard

TasNetworks standard = R 590630

Voltage Level	Туре	Manufacturer
22	1C*630 mm2	Prysmian
11	1C*630 mm2	Prysmian
240/400V		

2.1.11 Network Transformers

Voltage Level	Rating	Туре	Manufacturer
		As detailed in standard.	
220/110	200 MVA	1	ABB or Wilson
220/110	240 MVA	2	ABB or Wilson

2.1.12 Supply Transformers

Voltage Level	Rating	Туре	Manufacturer
		As detailed in standard.	
110/11,6.6	25 MVA	1	ABB or Wilson
110/22	60 MVA	2	ABB or Wilson
110/33	60 MVA	3	ABB or Wilson
110/33,22,11	60 MVA	4	ABB or Wilson

Note: Currently a contract with Wilson exist however not with ABB for transformers

2.1.13 Switchyard Conductor Current Rating Standard

Voltage Level	Туре	Manufacturer/supplier
all	Conductor- AAC Uranus	
all	Solid / Tubular pipe	

3 Typical Substation Electrical Switchyard arrangement

Substation Switchyard arrangements are designed taking into account system supply reliability and securing. TasNetworks utilising typical breaker and a half or double bus for switching stations and 'H' arrangement for through fed substations.

Power Control One Line Diagrams (PCOLD) below detail some typical arrangements that TasNetworks has used with corresponding aerial shots of the substation.

Substation switchyard arrangements will be confirmed during project initiation stage between proponents and TasNetworks.

3.1 Breaker and a half

See appendix A for typical Breaker and a half PCOLD

Figure 1 – Existing Substation with 220 kV breaker and a half and 110 kV double bus.



3.2 Double Bus (EHV)

See appendix B for typical Double Bus (EHV) PCOLD

Figure 2 – Existing Substation with both 220 kV and 110 kV double bus.



3.3 GIS – Double Bus

See appendix C for typical GIS Double Bus (EHV) PCOLD

Figure 3 – Existing Substation with EHV GIS (110 kV).



3.4 'H' arrangement

See appendix D for typical 'H'arrangement (EHV) PCOLD

Figure 4 – Existing Substation with 'H' arrangement (110 kV).



3.5 Radial fed

See appendix E for typical Radial fed (EHV) PCOLD

Figure 5 – Existing Substation with 'Radial EHV supply (110 kV).



3.6 Single Bus (33, 22, 11 kV)

See appendix F for typical Single Bus (HV) PCOLD

Figure 6 – Existing Substation with Single Bus HV (11 kV).



Figure 7 – Existing Substation with Single Bus HV (22 kV).

Appendix A: Typical Breaker and a half (EHV) PCOLD



Appendix B: Typical Double Bus (EHV) PCOLD



Appendix C: Typical GIS – Double Bus (EHV) PCOLD



Appendix D: Typical 'H' arrangement (EHV) PCOLD



Appendix E: Typical Radial fed (EHV) PCOLD



Appendix F: Typical Single Bus (HV) PCOLD

