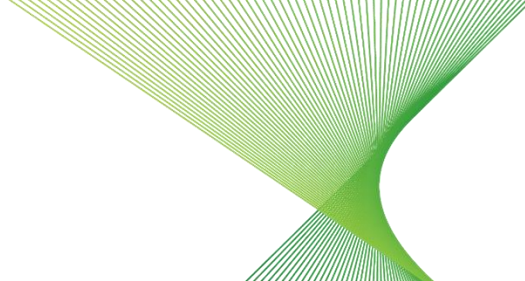


# Plant List – HV Switchgear and Accessory Items



## Summary

This document provides a Schedule of typical product type High Voltage plant items and associated standards and common requirements.

Transgrid publishes this information under clause 5.2A.5 of the National Electricity Rules.

## Document Control

<b>Date of issue</b>	November 2021	<b>Update</b>	Template re-branded and general review and update to include Designated Network Assets.
----------------------	---------------	---------------	---

## Disclaimer and important notice

This document and the information in it is for general guidance only and may be subsequently updated or amended. This document does not constitute technical or other professional advice, and should not be relied on as a substitute for obtaining detailed technical and professional advice about its subject matter.

To the maximum extent permitted by law, TransGrid and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document;
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

# Contents

<b>1. Compliance with Standards .....</b>	<b>3</b>
<b>2. List of Primary Standards .....</b>	<b>3</b>
<b>3. Common Requirements.....</b>	<b>5</b>
<b>4. Schedule of Items – Main Product Type HV Plant.....</b>	<b>5</b>
4.1. Circuit Breakers .....	5
4.2. Post Type Current Transformers.....	7
4.3. Capacitive Voltage Transformers.....	8
4.4. Inductive Voltage Transformers .....	8
4.5. Disconnectors and Earthing Switches .....	8
<b>5. Schedule of Items – Miscellaneous Product Type HV Plant .....</b>	<b>10</b>
5.1. Post Insulators.....	10
5.2. Composite Insulators.....	10
5.3. Surge Arresters .....	11
5.4. Line Traps.....	12

## 1. Compliance with Standards

---

Except as may be herein or otherwise varied, the Contractor<sup>1</sup> shall be responsible for compliance of the Works with the latest edition and amendments of the following documents operative at the base date:

- National Electricity Rules;
- Australian Standards, Codes of Practice, and Australian Regulatory Authorities; (In the event of there not being any appropriate Australian Standard, the latest appropriate International Standard shall be used);
- The Building Code of Australia; and
- Principal's Power System Safety Rules, or equivalent for the relevant authority.

Should a conflict occur between the requirements of these documents and standards then the following order of priority/precedence will be used to resolve such conflict:

1. Regulatory Requirements
2. Australian Codes of Practice
3. Relevant Australian Standards
4. Relevant IEC Standards

## 2. List of Primary Standards

---

Note: This list is not exhaustive.

Number	Part	Title
AS/NZS 3000		Electrical Wiring Rules
AS 1000		The International System of Units (SI) and its Application
AS 1100		Drawing practice
AS/NZS 4680		Hot-dip galvanized (zinc) coatings on fabricated ferrous articles
IEC 60694		Common specifications for high-voltage switchgear and controlgear standards
AS 62271	.1	High-voltage switchgear and Controlgear – Common Specifications
AS 62271	.100	High-voltage alternating-current circuit-breakers
AS 62271	.102	Alternating current disconnectors and earthing switches
AS 62271	.200	A.C metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to 52 kV
AS 62271	.4	Handling procedures for sulphur hexafluoride (SF6) and its mixtures
AS 2700		Colour Standards for General Purposes
AS 61869		Instrument transformers

<sup>1</sup> The 'Contractor' is the person or company responsible for the specific works to be carried out.

AS 2067		Substations and high voltage installations exceeding 1 kV a.c
AS 1767.1		Insulating Liquids Part 1: Specification for unused mineral insulating oils for transformers and switchgear
IEC 60376		Specification of technical grade sulfur hexafluoride (SF <sub>6</sub> ) for use in electrical equipment
IEC 60480		Guidelines for the checking and treatment of sulfur hexafluoride (SF <sub>6</sub> ) taken from electrical equipment and specification for its re-use
AS 60529		Degrees of protection provided by enclosures
IEC 61000	4.30	Testing and measurement techniques – Power quality measurement methods
IEC 60099	.4	Surge-arresters – Part 4: Metal-oxide surge arresters without gaps for a.c. systems
AS 4436		Guide for the selection of insulators in respect to polluted conditions
IEC 60507		Artificial pollution tests on high-voltage insulators to be used on a.c. systems
IEC 60273		Characteristics of indoor and outdoor post insulators for systems with nominal voltages greater than 1 000 V
AS 1154.1		Insulator and Conductor Fittings for Overhead Power Lines
AS 4435.1 / IEC 1109		Insulators-Composite for Overhead Lines – Definitions, test methods and acceptance criteria for string insulator units
AS 4435.2		Insulators Composite for Overhead Power Lines - Standard strength classes and end fittings for string insulator units
AS 4435.4		Insulators-Composite for Overhead Power Lines – Definitions, test methods, acceptance criteria for post insulator units
AS IEC 60437		Radio Interference Tests on high-voltage insulators
AS 2947.1		Test methods – Insulator units
AS 60270		High Voltage Test Techniques
IEC 60353		Line traps for a.c. power systems
AS 4398	.1	Insulators - Ceramic or glass - Station post for indoor and outdoor use - Voltages greater than 1000 V a.c
AS 1307	.2	Surge arresters – metal-oxide surge arresters without gaps for a/c systems

### 3. Common Requirements

---

External painted surfaces shall be N42 - Stormy Grey colour according to AS 2700 'Colour Standards for general purposes' or similar.

The colour of all insulators and bushings shall be N35 - Light Grey colour to AS 2700 or similar.

The required mechanical dynamic (wind + weight + short circuit) equipment terminal loads are as follows:

- 33 kV up to 40 kA = 6.0 kN in any direction
- 66 kV up to 40 kA = 4.5 kN in any direction
- 132 kV up to 50 kA = 4.0 kN in any direction
- 220 kV up to 50 kA = 3.5 kN in any direction
- 330 kV up to 63 kA = 3.5 kN in any direction
- 500 kV up to 63 kA = 3.5 kN in any direction

### 4. Schedule of Items – Main Product Type HV Plant

---

#### 4.1. Circuit Breakers

Circuit Breakers Live Head	
Item No.	Description
1.1	550 kV, 63 kA, 4000 A Circuit Breaker, Single Pole Operated
1.2	550 kV, 63 kA, 4000 A Circuit Breaker with Closing Resistors - Transmission Line Switching (450+/-25 Ohm, 8-12 ms), Single Pole Operated
1.3	550 kV, 63 kA, 4000 A Circuit Breaker with Closing Resistors - Transformer Switching, 3500 +/-500 Ohms, >=12ms, Single Pole Operated
1.4	362 kV, 63 kA, 3150 A Circuit Breaker, Single Pole Operated
1.5	362 kV, 63 kA, 3150 A Circuit Breaker with Closing Resistors - Transformer Switching, >2k Ohms and <5k Ohms and > 14 ms Single Pole Operated
1.6	362 kV, 50 kA, 3150 A Circuit Breaker, Single Pole Operated
1.7	245 kV, 50 kA, 3150 A Circuit Breaker, Single Pole Operated
1.8	145 kV, 50 kA, 3150 A Circuit Breaker, Single Pole Operated
1.9	145 kV, 40 kA, 3150 A Circuit Breaker, 3 Pole Operated
1.10	72.5 kV, 31.5 kA, 2500 A Circuit Breaker, Single Pole Operated
1.11	72.5 kV, 31.5 kA, 2500 A Circuit Breaker, 3 Pole Operated
1.12	Controlled Switching Relay (Point on Wave), Transformer Switching for Live Tank CBs (Using Residual Flux Method)

1.13	Controlled Switching Relay (Point on Wave), Capacitors or Reactors Switching for Live Tank CBs
------	--

### Circuit Breakers Dead Tank\*

Item No.	Description
2.1	550 kV, 63 kA, 4000 A Dead Tank Circuit Breaker, Single Pole Operated
2.2	550 kV, 63 kA, 4000 A Dead Tank Circuit Breaker, 3 Pole Operated
2.3	550 kV, 50 kA, 3150 A Dead Tank Circuit Breaker, Single Pole Operated
2.4	550 kV, 50 kA, 3150 A Dead Tank Circuit Breaker, 3 Pole Operated
2.5	362 kV, 50 kA, 4000 A Dead Tank Circuit Breaker, Single Pole Operated
2.6	362 kV, 50 kA, 4000 A Dead Tank Circuit Breaker, 3 Pole Operated
2.7	362 kV, 50 kA, 3150 A Dead Tank Circuit Breaker, Single Pole Operated
2.8	362 kV, 50 kA, 3150 A Dead Tank Circuit Breaker, 3 Pole Operated
2.9	245 kV, 50 kA, 2500 A Dead Tank Circuit Breaker, Single Pole Operated
2.10	245 kV, 50 kA, 2500 A Dead Tank Circuit Breaker, 3 Pole Operated
2.11	245 kV, 40 kA, 2500 A Dead Tank Circuit Breaker, Single Pole Operated
2.12	245 kV, 40 kA, 2500 A Dead Tank Circuit Breaker, 3 Pole Operated
2.13	245 kV, 40 kA, 1250 A Dead Tank Circuit Breaker, Single Pole Operated
2.14	245 kV, 40 kA, 1250 A Dead Tank Circuit Breaker, 3 Pole Operated
2.15	145 kV, 50 kA, 3150 A Dead Tank Circuit Breaker, Single Pole Operated
2.16	145 kV, 50 kA, 3150 A Dead Tank Circuit Breaker, 3 Pole Operated
2.17	145 kV, 40 kA, 3150 A Dead Tank Circuit Breaker, Single Pole Operated
2.18	145 kV, 40 kA, 3150 A Dead Tank Circuit Breaker, 3 Pole Operated
2.19	72.5 kV, 40 kA, 3150 A Dead Tank Circuit Breaker, Single Pole Operated
2.20	72.5 kV, 40 kA, 3150 A Dead Tank Circuit Breaker, 3 Pole Operated
2.21	72.5 kV, 31.5 kA, 3150 A Dead Tank Circuit Breaker, Single Pole Operated

2.22	72.5 kV, 31.5 kA, 3150 A Dead Tank Circuit Breaker, 3 Pole Operated
2.23	Controlled Switching Relay (Point on Wave), Transformer Switching for Dead Tank CBs (Using Residual Flux Method)
2.24	Controlled Switching Relay (Point on Wave), Capacitors or Reactors Switching for Dead Tank CBs

\*Note: Each item may come with different CT variant depending on the requirement.

## 4.2. Post Type Current Transformers

### Current Transformers (Post Type) above 145kV

Item No.	Description
3.1	550KV 4000A 63KA Current Transformer
3.2	362KV 4000A 50KA Current Transformer
3.3	362KV 4000A 50KA Current Transformer
3.4	362KV 3150A 50KA Current Transformer
3.5	362KV 1250A 50KA Current Transformer
3.6	362KV 1250A 50KA Current Transformer
3.7	245kV 3150A 50kA Current Transformer

### Current Transformers up to 145kV

Item No.	Description
4.1	145KV 3150A 50KA Current Transformer
4.2	145KV 3150A 50KA Current Transformer
4.3	145KV 3150A 50KA Current Transformer
4.4	145KV 3150A 50KA Current Transformer
4.5	72.5KV 2500A 31.5KA Current Transformer
4.6	72.5KV 1250A 25KA Current Transformer

### 4.3. Capacitive Voltage Transformers

Capacitive Voltage Transformers	
Item No.	Description
5.1	500/528 kV 2 X 25 VA 0.2M 3PT1 Capacitive Voltage Transformer
5.2	330 kV 50 VA 0.2M 3PT1 Capacitive Voltage Transformer
5.3	330 kV 2 X 25 VA 0.2M 3PT1 Capacitive Voltage Transformer
5.4	220 kV 50 VA 0.2M 3PT1 Capacitive Voltage Transformer
5.5	220 kV 2 X 25 VA 0.2M 3PT1 Capacitive Voltage Transformer
5.6	132 kV 50 VA 0.2M 3PT1 Capacitive Voltage Transformer
5.7	132 kV 2 X 25 VA 0.2M 3PT1 Capacitive Voltage Transformer

### 4.4. Inductive Voltage Transformers

Inductive Voltage Transformers	
Item No.	Description
6.1	132 kV 50 VA 0.2M 3P Inductive Voltage Transformer
6.2	132 kV 2 X 25 VA 0.2M 3P Inductive Voltage Transformer
6.3	66 kV 50 VA 0.2M 3P Inductive Voltage Transformer
6.4	66 kV 2 X 25 VA 0.2M 3P Inductive Voltage Transformer
6.5	33 kV 50 VA 0.2M 3P Inductive Voltage Transformer
6.6	33 kV 2 X 25 VA 0.2M 3P Inductive Voltage Transformer

### 4.5. Disconnectors and Earthing Switches

Disconnectors and Earth Switches	
Item No.	Description
7.1	550 kV, 63 kA/1s, 4000 A, 3 x 1 Phase Motor Operated Horizontal Double Break Disconnector
7.2	550 kV, 63 kA/1s, 3 x 1 Phase SVB Motorised Associated Earth Switch



7.3	550 kV, 63 kA/1s, 3x1 Phase SVB Motorised Independent Earth Switch
7.4	550 kV, 63 kA/1s, 3x1 Phase SVB Motorised Independent Earth Switch WITH VACUUM/SF6 interrupter (Note: use Western 500kV specs)
7.5	362 kV, 63 kA/1s, 3-Phase SVB Motorised Independent Earth Switch 362 kV, 50 kA/1s, 3150 A, 3-Phase Ganged Motor Operated Horizontal Double Break Disconnecter
7.6	362 kV, 50 kA/1s, 3-Phase Ganged SVB Manual Associated Earth Switch
7.7	362 kV, 50 kA/1s, 3-Phase Ganged SVB Motorised Independent Earth Switch
7.8	362 kV, 50 kA/1s, 3150 A, 3 x 1 Phase Motor Operated Disconnecter (Pantograph) Type
7.9	362 kV, 50 kA/1s, 3 x 1 Phase SVB Manual Associated Earth Switch
7.10	245 kV, 40 kA/1s, 3150 A, 3-Phase Ganged Manual Operated Horizontal Double Break Disconnecter
7.11	245 kV, 40 kA/1s, 3-Phase Ganged SVB Manually Operated Associated Earth Switch
7.12	245 kV, 40kA/1s, 3-Phase Ganged SVB Manually Operated Independent Earth Switch
7.13	145 kV, 50 kA/1s, 3150 A, 3-phase Ganged Manually Operated Horizontal Double Break Disconnecter
7.14	145 kV, 50 kA/1s, 3-Phase Ganged SVB Manually Operated Associated Earth Switch
7.15	145 kV, 50 kA/1s, 3-Phase Ganged SVB Manually Operated Independent Earth Switch
7.16	72.5 kV, 31.5 kA/1s, 2500 A, 3-phase Ganged Manually Operated Horizontal Double Break Disconnecter
7.17	72.5 kV, 31.5 kA/1s, 3-Phase Ganged SVB Manually Operated Associated Earth Switch
7.18	72.5 kV, 31.5 kA/1s, 3-Phase Ganged SVB Manually Operated Independent Earth Switch
7.19	36 kV, 25 kA/1s, 4000 A, 3-phase Ganged Manually Operated Horizontal Double Break Disconnecter
7.20	36 kV, 25 kA/1s, 3-Phase Ganged SVB Manually Operated Associated Earth Switch
7.21	Motor Drive - DS - (All voltages)
7.22	Moto Drive - ES – (All Voltages)

## 5. Schedule of Items – Miscellaneous Product Type HV Plant

### 5.1. Post Insulators

Post Insulators	
Item No.	Description
8.1	362 kV 6 kN Upright Substation Post Insulators
8.2	362 kV 6 kN Underhung Substation Post Insulators
8.3	362 kV 10 kN Upright Substation Post Insulators
8.4	362 kV 16 kN Upright Substation Post Insulators
8.5	245 kV 6 kN Upright Substation Post Insulators
8.6	245 kV 6 kN Underhung Substation Post Insulators
8.7	145 kV 6 kN Upright Substation Post Insulators
8.8	145 kV 6 kN Underhung Substation Post Insulators
8.9	145 kV 12.5 kN Upright Substation Post Insulators
8.10	72.5 kV 6 kN Upright Substation Post Insulators
8.11	72.5 kV 10 kN Upright Substation Post Insulators
8.12	36 kV 6 kN Upright Substation Post Insulators

### 5.2. Composite Insulators

Composite Insulators	
Item No.	Description
9.1	550kV, 210kN SML Composite Longrod Insulator for Light Pollution (Chain eye – 20mm ball)
9.2	362kV, Pivotal Horizontal Vee Composite Longrod Insulator for Light Pollution
9.3	362kV, 2kN MDCL Composite Post Insulator for Light Pollution (Two Hole Blade End – Flange Base)
9.4	362kV, 160kN SML Composite Longrod Insulator for Light Pollution (Chain eye – 20mm ball)
9.5	362kV, 160kN SML Composite Longrod Insulator for Heavy Pollution (Chain eye – 20mm ball)

9.6	300kV, 160kN SML Composite Longrod Insulator for Light Pollution (Chain eye – 20mm ball)
9.7	145kV, 2kN MDCL Composite Post Insulator for Light Pollution (Clamp Top - Rigid Base)
9.8	145kV, 2kN MDCL Composite Post Insulator for Light Pollution (Clamp Top - Flange Base)
9.9	145kV, 6kN MDCL Composite Post Insulator for Light Pollution (Clamp Top - Bendable Base)
9.10	145kV, 6kN MDCL Composite Post Insulator for Light Pollution (Two Hole Blade End – Bendable Base)
9.11	145kV, 6kN MDCL Composite Post Insulator for Light Pollution (Two Hole Blade End – Flange Base)
9.12	145kV, 6kN MDCL Composite Post Insulator for Heavy Pollution (Two Hole Blade End – Bendable Base)
9.13	145kV, 6kN MDCL Composite Post Insulator for Heavy Pollution (Flange End – Bendable Base)
9.14	145kV, 120kN SML Composite Longrod Insulator for Light Pollution (Chain eye – 16mm ball)
9.15	145kV, 120kN SML Composite Longrod Insulator for Heavy Pollution (Chain eye – 16mm ball)
9.16	145kV, 160kN SML Composite Longrod Insulator for Light Pollution (Chain eye – 20mm ball)

### 5.3. Surge Arresters

Surge Arresters	
Item No.	Description
10.1	420kV 20kA Upright Surge Arrester
10.2	288kV 10kA Upright Surge Arrester
10.3	288kV 20kA Upright Surge Arrester
10.4	216kV 10kA Upright Surge Arrester
10.5	198kV 10kA Upright Surge Arrester
10.6	198kV 20kA Upright Surge Arrester
10.7	120kV 10kA Upright Surge Arrester
10.8	60kV 10kA Upright Surge Arrester

## 5.4. Line Traps

Line Traps	
Item No.	Description
11.1	362 kV, 3150 A, 50 kA 150-480 kHz Line Trap
11.2	300 kV 1600 A 20 kA 150-480 kHz Line Trap
11.3	145 kV, 3150 A, 50 kA 150-480 kHz Line Trap
11.4	145 kV, 1600 A, 40 kA 150-500 kHz Line Trap
11.5	145 kV, 1250 A, 31.5 kA 150-480 kHz Line Trap
11.6	145 kV, 1250 A, 25 kA 150-480 kHz Line Trap