Identification of operational equipment

TRANSPOWER **APPROVED** STANDARD

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PREFACE

Changes to issue 5, October 2011, and issue 6, November 2011, can be found in Appendix E – Summary of Changes.

Keywords

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CONTENTS

1. PURPOSE

To describe the systems used for the identification and labelling of operational power system equipment for operating, maintenance and general asset management.

2. POLICY

2.1 Transpower requires power system equipment to be uniquely identified and labelled at each location.

2.2 Where non-standard identification exists, this will be aligned with this standard when it is cost effective to do so.

2.3 There must be no conflict in the identification of power system equipment at a site.

2.4 Equipment owned by other asset owners in Transpower switchyards must be identified according to the Transpower standard.

2.5 Transpower owned equipment on other asset owner sites must be identified according to the Transpower standard.

3. DEFINITIONS

The terms in this standard are defined in **TP.OG 45.03** *Defined operating and maintenance terms and abbreviations.* Other terms included in this standard are:

Term	Definition
switchgear number:	A composite number comprising: - a switchgear group number; - a switchgear group extension number, if required; - a switchgear function number.
switchgear group number:	A block of numbers used to identify a group of related equipment in a switchyard bay e.g. in the 630 series, the group contains equipment numbered from 630 to 639.
switchgear group extension number:	A digit used when additional switchgear numbers are required within a switchgear group e.g. at OTA in the 220 kV switchyard CB582 and CB5812 are both connected to the 220 kV bus via a common tee point from DIS583 and DIS585. It is also used for the G.I.S. at BRB, TWI and WIL for the extra earth switches required in the switchgear group.
switchgear function number:	The last digit in the switchgear number that signifies the switchgear's function e.g. CB582, the "2" at the end describes the switch's function as being a CB.

4. REFERENCES

The following Transpower standards and core documents are referred to in this particular standard.

Reference	Title
SM-EI	*Safety Manual - Electricity Industry*
TP.AG 10.11	*Standard Site Abbreviations*
TP.DP 01.31	*Relay and Instrument Diagrams*
TP.OG 45.03	*Defined operating and maintenance terms and abbreviations*
TP.SS 02.14	*Transmission Line Signs and Fittings*

5. RESPONSIBILITIES

5.1.1 The Project Manager is responsible for all aspects and activities related to a project which includes:

(a) Obtaining agreement at the project development stage from Grid Performance - Asset Management Services (HVDC & AC Stations) and Service Operations for the identification of equipment or site naming to be used at the new or upgraded stations.

(b) Ensuring that all new equipment installed under a project is labelled in line with this standard.

5.1.2 Service Operations (Operations Co-ordinator) is responsible for:

(a) Liaising and reaching agreement with Project Management, Grid Performance - Asset Management Services (HVDC & AC Stations) and other operating parties on proposals to change the numbering or site name of operational equipment.

(b) Ensuring operational consistency, safety and other related issues are considered.

6. EQUIPMENT IDENTIFICATION

6.1 General

Historically there have been various systems used to identify equipment. This standard describes known systems used within Transpower.

6.1.1 Transpower identifies equipment by the standard site abbreviation followed by either a numeric or alpha-numeric code. When equipment is labelled on site, only the numeric or alpha-numeric code is displayed on the label.

6.1.2 For switchgear, a series of numbers are allocated for a specific system voltage (refer to **Appendix D** that shows typical equipment identification arrangements). For new installations, identification numbers are established at the development stage of a project in consultation with Service Operations.

6.1.3 Equipment numbering shall allow for future extensions where practical.

6.1.4 Equipment numbering that does not follow the Transpower standard is only permitted on equipment within a fenced enclosure that's only accessible through a gate interlocked with an isolating disconnector and/or earth switch external to the enclosure. The enclosure and external equipment must be numbered to the Transpower standard.

6.2 Outdoor switchgear

6.2.1 Outdoor switchgear is individually numbered in a set pattern according to its voltage and function:

(a) 11 kV and 22 kV switchgear is numbered on a "site by site" basis since Transpower has few 11 kV and 22 kV outdoor installations;

(b) For 33 kV switchgear use numbers within the range 1000 to 2000;

(c) For 50 kV switchgear and above use numbers above 40. Three digit numbers are recommended to minimise the risk of transposition errors during switching. When all

numbers up to the 990 series are used, numbers in the 1000 series may be used which do not conflict with any 33kV switchgear.

6.2.2 The last digit of a number in the series denotes the type and function of the equipment, e.g. "6" for a circuit disconnector. Numbering rules for identifying specific switchgear items are specified in **Appendix A**.

6.2.3 Transmission circuit termination equipment identification must be selected to avoid duplication between ends or any adjoining stations.

6.2.4 When additional equipment numbers are required for a switchgear group a switchgear group extension number is used. The digit "1" is often used for this purpose. The digit "1" can be utilised between the switchgear group number and the digit at the end which describes the switchgear function. An example of this is where two or more circuits are connected to a bus via a common disconnector or other connection point. This numbering method has been used at OTA in the 220 kV switchyard, e.g. CB582 and CB5812 switchgear groups are both connected to the 220 kV bus via a common tee point from DIS583 and DIS585 (refer to **Figure D1**).

6.2.5 The switchgear groups will be numbered sequentially as per the SLD from top to bottom and left to right.

6.2.6 At stations with breaker and a half and double breaker arrangements, there are two sets of 3 and 5 numbered disconnectors associated with each half breaker and their associated circuits (see **Figure D1**). The numbering will follow as per **clause 6.2.5** above.

(a) The half breaker CB disconnector above will be numbered 5 and lower disconnector numbered 3.

(b) The associated circuit disconnector above the half breaker will be numbered 3 and the lower circuit disconnector numbered 5.

(c) A switchgear group extension number will be required where there is more than one earth switch associated with the switchgear group. This earth switch number will use the nearest 3 or 5 switch group number with the number 9 being the extension number (refer to **Figure D1**).

6.3 Indoor switchgear

6.3.1 Existing installations pre 2002:

(a) 11 kV indoor circuit breakers are numbered from 1-39. Numbers 1-29 are allocated to the feeder CB's. Numbers 39-30 are allocated for all other CB's, such as incomers, bus couplers and local service transformers. These numbers start at 39 and descend, in the order in which the CB's are installed on the switchboard, e.g. at stations where 2 transformers are installed, numbers 37 and 39 are used for the circuit breakers feeding into the switchboard. A bus coupler CB, if installed, is numbered 38. If there are more than 2 transformers the numbering is site specific.

(b) 33 kV indoor switchgear is identified with numbers above 2000.

(c) Above 33 kV, the numbering rules for outdoor switchgear apply.

6.3.2 11 kV switchgear post 2002

(a) 11 kV indoor circuit breakers should be numbered in the high 2000 series, e.g. 2700 to 2800. Where possible, a separate number series should be used for each bus section where bus coupler(s) are installed. Generally, the 2900 series is not used so there is a spare number series should the switchboard be extended by a new bus-coupler and bus section. If a site has both 11 and 33 kV switchgear, care must be taken to not overlap the numbers.

(b) Bus coupler numbers end in "8", all other CB numbers end in "2".

(c) Where the bus coupler is used to earth the bus on either side of the coupler. The earth positions take the form:

(i) Switchgear group number (same as the bus coupler);

(ii) Number "0" (to denote bus earth);

(iii) Bus designation letter, e.g. A, B or C, etc.

(d) Where the incomer or other CB is used to earth either side of the CB, the earth positions take the form:
  (i) Switchgear group number (same as the CB);
  (ii) Number "0" for the bus side of the CB;
  (iii) Number "9" for the transformer or equipment side of the CB.

6.3.3 33 kV switchgear post 2002

(a) 33 kV indoor circuit breakers should be numbered in the low 2000 series, e.g. 2100 to 2200. Where possible, a separate number series should be used for each bus section where bus coupler(s) are installed. Generally, the 2000 series is not used so there is a spare number series should the switchboard be extended by a new bus-coupler and bus section

(b) Some switchboards, e.g. Areva SF_6 33 kV switchboards, have a combined three position disconnector/earth switch on the bus side of the CB for feeder isolation and earthing. Feeder and supply transformer earthing is done through a closed CB. The disconnector function of the three position switch has a switchgear function number "4" and the earth switch function has a switchgear function number of "9" (it is not zero because the earth switch cannot be used to earth the bus).

(c) Some switchboards, e.g. Areva SF_6 33 kV switchboards, have a combined two position disconnector /earth switch for the incomer VTs. This switch cannot be designated using the Transpower standard switchgear function numbers as it is simultaneously both a disconnector "4" and an earth switch "9". Therefore it has a composite designation made up as follows:
  (i) The letters "VT"
  (ii) The VT number
  (iii) The letters "DIS/ES"

(d) Above 33 kV, the numbering rules for outdoor switchgear apply.

6.3.4 22 kV switchgear

(a) 22 kV indoor switchgear should be numbered the same as for 11 kV indoor switchgear.

6.4 Busbars

6.4.1 Each busbar is identified by a letter or by a combination of a letter and number.

6.4.2 For new installations, busbar identification for each voltage is to normally start with the letter "A". A gap should be left when letters are allocated to allow for any likely future extensions.

6.4.3 Busbars separated by a bus coupler CB are identified by separate letters, e.g. BUS A, BUS B, etc.

6.4.4 Busbars sectionalised by bus section disconnectors are identified with letters and numbers, e.g. BUS A1, BUS A2 and BUS B1, BUS B2 etc.

6.5 Power transformers

6.5.1 Each three phase power transformer or bank of three single-phase transformers is identified by the letter "T" and a number. A spare transformer is not normally numbered unless dedicated to a particular transformer bank.

6.5.2 Transformer numbers are site specific and should be selected so they are arranged in an expected or logical order when considering the physical layout of the switchyard and accessing the transformers for maintenance. This will reduce the risk of workers accessing the wrong transformer.

6.5.3 Where possible, each voltage transformation system has its own numbering sequence.

Supply transformers, e.g. 110/33 kV, 220/33 kV on the same site would be numbered in the range T1-T9.

6.5.4 A bank of three single phase transformers is labelled with labels attached to the individual transformers. Phase colours are identified on respective labels.

6.6 Earthing transformers

6.6.1 Earthing transformers and associated equipment are numbered with the transformer number, including the following prefixes and suffixes:

(a) **Earthing transformer:** Transformer number prefixed with "ET", e.g. ET 2.

(b) **Neutral earthing resistor:** Transformer number prefixed with "NER", e.g. NER 2. Where both low and high voltage sides have their own NER's, the number is to be suffixed with LV or HV, e.g. T2 NER (LV);

(c) **Tertiary earthing resistor:** Transformer number prefixed with "TER", e.g. TER 2

6.7 Local service transformers

6.7.1 Local service transformers are coded "LS" followed by a number.

6.7.2 For local service transformers directly connected to a power transformer, the numbering is:

(a) The present practice is for the local service transformer to take the number of the power transformer, e.g. LS2 if connected to T2.

(b) A previous practice was for the local service transformer to have a unique number, but with the last digit corresponding to the power transformer, e.g. LS22 if connected to T2.

(c) Another previous practice was for the local service transformers to be coded LS followed by any number starting from 1 upwards.

6.7.3 Local service transformers not directly connected to a power transformer are coded "LS" followed by a number which is as low as sensibly practical. The LS transformer number is not to have the same number as an existing power transformer, or a possible future power transformer.

6.7.4 Where there is only a single LS transformer, previous practice was to code it "LS" without any number. This practice is no longer used at new sites.

6.8 Voltage transformers

6.8.1 Numbers of electromagnetic VTs are to be prefixed "VT", and capacitor VTs are to be prefixed "CVT".

6.8.2 All VTs at a station must have a unique number. This also applies to VTs belonging to another asset owner.

6.8.3 VTs shall have the same number as the associated or adjacent switchgear, with the last digit determined as follows:

(a) Supply transformer VTs, where the VT is physically close to the CB, have the same number as the associated incomer CB;

(b) Supply transformer VTs, which are distant from the CB, take the number of the associated transformer;

(c) Line VTs, typically only on the 220 kV system, end in "2", i.e. have the same number as the associated CB;

(d) Bus VTs, connected directly onto the bus, end in "7". Where installed adjacent to more than one equipment bay, the VT takes on the switchgear group number which is chosen to align with the lowest group number;

(e) In some cases, the bus VT is connected between the bus side disconnector and the CB of the circuit, transformer or capacitor, etc. In these cases the VT number ends in a "4".

6.9 Current transformers

6.9.1 Where CTs are mounted on separate stands adjacent to an associated CB, the CT is identified with the CB number.

Note: *Circuit breaker bushing CT's are considered to be part of the CB.*

6.9.2 Numbers of current transformers are to be prefixed with "CT".

6.9.3 Neutral current transformers associated with transformers are identified with the transformer number and are to be prefixed "NCT". If there are neutral current transformers on both the high and low voltage side of the transformer the number is to be suffixed by

"HV" or "LV".

6.10 Transmission circuits

6.10.1 All transmission circuit names end with a number suffix, e.g. BRK-SFD 1. Transmission line asset names end with a letter suffix, e.g. BPE-SFD A.

Notes:

1. *Asset identification must be kept separate from circuit identification.*

2. *Transmission line names originate from the time the transmission circuit was first built and remain marked on route maps and survey records. These represent the permanent asset names. The subsequent retermination of older circuits does not affect line (asset) names.*

3. *A transmission line will retain its asset name in the event of its operating voltage being changed, e.g. KHD-TKR A. This transmission line retained its name when operating as Ngaranga 33 kV feeders supplied from TKR.*

6.10.2 Each circuit to be individually identified by the names of stations where the circuit can be disconnected by protection operation of fault breaking circuit breakers at each connecting site. The identification system to be used is as follows:

(a) Where a transmission circuit connects only two stations – use the station code placed in alphabetical order followed by a circuit number, e.g. ISL-KIK 1.

(b) Where a transmission circuit connects more than two stations, the circuit name includes the names of all the stations. The names of the stations at the extreme ends of the circuit are the first and last in the circuit description with the name of the intermediate connected station(s) in the middle, e.g. BPE-LTN-HAY 3.

Note: *Where there is more than one intermediate station, the names of these stations to be listed in geographical order, e.g. ISL-WPR-CUL-KIK 2.*

6.10.3 Where a transmission circuit can be divided into sections by using disconnectors, the switching point where the section can be isolated shall have a station name if it is not already at a designated station.

Each section of the circuit shall be identified by the names of the stations or switching points, e.g. the COL-OTI 1 circuit can be isolated into three sections by switching at APS and CLH. Each section shall be identified as the APS-OTI, APS-CLH and CLH-COL sections of the COL-OTI 1 circuit.

Note: *The naming convention for a section to be the same as used for a circuit – i.e. alphabetical order.*

6.11 Line traps

6.11.1 It has been past practice to label station line traps with the letter LT and with a low number starting at 1 and increasing upwards. The new requirement is to align the number with the associated circuit breaker.

6.11.2 Phases are identified by suffix letters "R, Y or B", e.g. LT202R, LT202B. Two line traps in a series are identified with suffixes A and B, with the phase letter added after a hyphen, e.g. LT202A-R or LT202B-R.

6.11.3 Line matching units are identified by the letters "LMU" and the number associated with the line trap, e.g. LMU202R, LMU202Y and LMU202B.

6.12 Coupling Capacitors

Coupling capacitors are identified by the letters "CC" and the number of the associated circuit breaker, e.g. CC182.

6.13 Surge arresters

6.13.1 Surge arrestors are identified by the letters "SA" followed by a number.

6.13.2 Surge arrestors connected to an overhead or cable circuit at a substation take the number of the associated circuit breaker. If the surge arrestors are at more than one location on the circuit, e.g. at both ends of a short cable length exiting the substation, the surge arrestor number is followed by the suffix A, B, C, etc.

6.13.3 Surge arrestors connected to a transformer, take the transformer number. Surge arrestors

connected to capacitors take the capacitor number. If the equipment has more than one set of surge arrestors, a suffix letter is used (A, B, C, etc) to identify the position of the surge arrestor (see **Figure D1)**. "A" is the higher voltage followed by letters "B" and "C" for lower voltages.

6.13.4 Cable sections in the middle of an overhead transmission line, and which have surge arrestors, are identified by the circuit labelling followed by the letters "SA" followed by a number, e.g. MTM-TGA-TMI SA1 and MTM-TGA-TMI SA2. If there are more than one cable sections, use SA3, SA4, etc for subsequent cable sections.

6.14 HV power cables

6.14.1 A power cable is identified by the letter "CBL" followed by a number.

6.14.2 The sealing ends of cables are not normally labelled. However, where there could possibly be confusion at the termination of a circuit, the cable should be labelled with the transmission circuit name and circuit number. The individual phases must be identified (see **subsection 7.3**).

6.15 Synchronous condensers

6.15.1 A synchronous condenser is identified by the letters "SC" followed by a number. When connected to a tertiary of a transformer, the number chosen shall align with the number of the transformer.

6.16 Capacitor banks

6.16.1 Capacitor banks are identified by the letter "C" followed by a number. They may consist of parallel branches of switchable capacitors. Suffix letters are used to identify separate branches or units which make up a bank (see **Figure D6**)

6.16.2 Capacitor banks connected to the tertiary of a transformer take the transformer number.

6.16.3 Manufacturer's naming conventions are retained and apply to items of equipment, associated with the capacitor banks which are housed within interlocked enclosures. Where there is no manufacturer's identification, this standard will apply where appropriate (refer to **clause 6.1.4** as this also applies to capacitor bank installations).

6.17 Static compensators

6.17.1 There are two types of static compensators, a static var compensator and a static synchronous compensator – more commonly known as a STATCOM. This equipment consists of parallel branches containing harmonic filters and a thyristor controlled reactor, and may have series blocking filters. They are identified by the letters "SVC" and "STC" respectively followed by a number.

6.17.2 The number used for the SVC/STC is chosen to match the number of the transformer to which the SVC/STC is connected.

6.17.3 The filters are identified by the letter "F" followed by a number and suffix. The number is chosen to match the number of the transformer to which the SVC is connected. A suffix letter is used where there is more than one filter.

6.17.4 Equipment associated with the SVC, and not housed within interlocked enclosures, shall follow the Standard's naming convention.

6.17.5 Manufacturer's naming conventions are retained and apply for items of equipment, within the branches of the SVC, housed within interlocked enclosures. Where there is no manufacturer's identification this standard will apply where appropriate (refer to **clause 6.1.4** as this also applies to SVC installations).

6.17.6 The branch containing the thyristor controlled reactor is identified by the letters "TCR" followed by the number of the transformer to which the SVC is connected.

6.17.7 The branch containing the thyristor switched capacitor is identified by the letters "TSC" followed by the number of the transformer to which the SVC is connected.

6.17.8 The SVC equipment following manufacturers numbering is likely to be that equipment related to the TSC, TCR and 3rd 5th 7th harmonic filtering and in each case the equipment shall be located in their own separate interlocked compounds and identified on the access

gate accordingly.

6.18 Reactors

6.18.1 Reactors are identified by the letter "R" followed by a number. The number used is chosen to match the equipment to which the reactor is connected. This arrangement is followed irrespective of whether the reactor is series or shunt connected.

6.19 Measuring unit

6.19.1 A measuring unit is identified by the letters "MU" followed by a number.

6.19.2 At some stations measuring units are installed for providing CT and/ or VT supplies for metering and protection circuits. These units are identified by the number of the associated equipment to which the unit is connected, e.g. if connected to "T4", the measuring unit would be labelled as "MU4".

6.20 Outdoor junction boxes

6.20.1 Outdoor junction boxes (ODJB's) are normally identified by individual numbers or letters.

6.20.2 An ODJB serving one bay should be identified by the associated or most adjacent circuit breaker.

6.20.3 ODJB's serving several circuit breakers may be appropriately numbered by sequential numbers or letters.

Note: *Labelling within ODJB's must adequately identify wiring for individual circuits located within the box.*

6.21 Control cabinets

6.21.1 Only the electrical representation of equipment is displayed on control cabinets. It is not possible to achieve consistency between stations by showing a physical representation of equipment on site.

6.21.2 Busbars as represented on station control cabinets are distinguished by designated colours according to the system voltage (see **Appendix B**).

6.22 Relays

6.22.1 Relays are identified by standard codes (see **TP.DP 01.31**).

6.22.2 Relay codes are shown on labels usually mounted adjacent to the protection relays concerned. In some situations codes are abbreviated because the description format is too long.

6.22.3 A relay associated with a CB has its function abbreviation on the relay.

6.22.4 If a trip relay is associated with more than one CB of the same voltage, it takes the number of all the CBs it operates. The order follows the:

(a) Number of the "Main" CB of the group involved;

(b) Lowest number of the CB's involved where no one CB can be designated as a "Main" CB.

6.22.5 In the case of a differential relay protecting a delta-star or star-delta transformer, the relay takes its phase letter from the star winding.

6.22.6 Relays are marked to indicate the phase (R, Y, B or A, B, C) of the equipment the relay operates.

6.22.7 The relay cabinet is labelled with the name of the circuit on which the protection is installed. For circuits with a "system split" point, the circuit label is located at the first station with a circuit disconnector for isolation, e.g. MHO-TKR is normally split at PRM and at TKR the protection cabinet is labelled TKR-PRM (see **Figure 1** below for an example).

Figure 1: Typical Relay Cabinet with Protection Labeling

6.23 Communication equipment identification

6.23.1 Identification of communication equipment on site is by cabinet number (as per the floor plan) and communications bearers used.

6.23.2 All communications bearer equipment is labelled to show the communications bearer number, route, and for power line carriers the transmission circuits and circuit voltage.

6.23.3 All protection signalling equipment is clearly labelled to identify:

(a) The transmission circuit, including number and system voltage;
(b) The protection signalling function;
(c) If applicable, the direction and route of signalling;
(d) If applicable, whether the signalling command is for protection 1 or 2;
(e) Which communications bearers are used for the signalling link.

6.23.4 If more than one protection signalling system is carried on the equipment, details of each of the protected circuits must be shown. Typical labels are shown in **Figure 2** below.

6.23.5

SIGNAL A: OTA WKM 2 220 kV ACCELERATION (PROT1)
SIGNAL B: OTA WKM 3 220 kV ACCELERATION (PROT2)

CARRIED ON BEARER 333/2

SIGNAL A: TMI-TGA BI-DIR INTERTRIP FOR TGA MTM TMI 110 KV
SIGNAL B: TMI-TGA BLOCKING FOR TGA MTM TMI 110 KV
CARRIED ON BEARERS 933, 934, 949

Figure 2: Typical Protection Signalling Circuit Labelling

6.24 Distribution cabinets

Fuse holders in distribution cabinets are black with colour coded labels either in black, white, red, yellow or blue. Typically:

(a) Red is used for protection 1 & 2 and control fuse holders;
(b) Black is used for indication circuits;
(c) Yellow is used for RTU supplies.

6.25 HVDC equipment

HVDC equipment is identified in a similar way to AC station equipment. A full explanation of the HVDC equipment identification system is given in the HVDC standard **T1-DC-999/005.**

7. EQUIPMENT LABELING

7.1 Labels are positioned so that equipment can be readily identified for operation, inspection and maintenance (see **Appendix C**). The number of labels should be kept to a minimum.

7.2 The character size used on the label depends on the size of the equipment and viewing distance**.**

7.3 Phase marking:

(a) Bus phasing is identified using red, yellow and blue phase colours
(b) Where practical individual phases on equipment must be marked
(c) All equipment must be identifiable to a phase marking.

8. LAYOUT OF EQUIPMENT ON DRAWINGS

8.1 Equipment operating at the highest voltage should be located at the top of the page.

8.2 Each bus in a station single line diagram (SLD) should generally follow the physical layout of the bus. Buses which span more than one switchyard, e.g. ALB 110kV, BEN 220kV, may be drawn as a straight bus without the right angle. Buses of different voltages may have any orientation which is convenient for the drawing layout.

8.3 Station equipment is generally numbered with the lowest number for the most northern or north western CB. Numbers are then allocated north to south and progressively increase from west to east for each bay in turn, i.e. on a SLD, top to bottom and left to right for north at the top of the page. Where a bus extension is required, either:

(a) Follow the previous standard to preserve the clockwise numbering sequence using a switchgear group extension number if required, or;
(b) Change the station numbering to this new standard.

8.4 Feeder CBs are labelled with both the CB number and the connected party's feeder name.

A SWITCHGEAR EQUIPMENT NUMBERING RULES

Final Digit	Equipment identification name and position or function
1	This digit has two functions: (a) Disconnector for bypassing a circuit breaker. (b) Busbar disconnector at a 3 busbar station (see Note 1).
2	Circuit breaker used with a transmission circuit, transformer, generator, etc.
3	This digit has three functions: (a) Disconnector for selecting a busbar at a multiple busbar station. (see Note 1) (b) At a breaker-and-a-half station, one of the disconnectors associated with the half breaker is labelled 3 (see also 5(b) below). (c) Busbar disconnector at a 33 kV substation with bypass busbar (see Note 3).
4	Disconnector used for isolating purposes between a circuit breaker and a single busbar.
5	This digit has three functions: (a) Disconnector for selecting a busbar at a multiple busbar station (see Note 1) (b) At a breaker-and-a-half station, one of the disconnectors associated with the half breaker is labelled 5 (see also 3(b) above). (c) CB disconnector at a 33 kV substation with bypass busbar (see Note 3).
6	Disconnector used for isolating purposes between a circuit breaker and a transmission circuit, or transformer, etc., except at breaker-and-a-half and double breaker stations (see 3(b) and 5(b) above).
7	Disconnector used for sectionalising a bus.
8	Circuit breaker used for coupling two busbars.
9	Earth switch for transmission circuit, feeder, transformer, etc. (see Note 4). For GIS switchgear, additional earthing switches labelled 9 are installed for maintenance.
0	Earth switch for a busbar.

Notes:

1. *Haywards and Benmore have 3-220 kV busbars. Some equipment can be selected to all 3 busbars. Busbar disconnector final digits used for numbering 1, 3 and 5 for Bus A, B and C respectively.*
2. *Roxburgh and Clyde have 3-220 kV busbars. At these stations, circuits and generators are selected to 2 busbars only.*
3. *At certain 33 kV substations, a bypass-busbar is installed. In this design the CB bypass disconnector final digit is 5, and the busbar disconnector final digit is 3.*
4. *Some busbars have earth switches, which have 9 as the final digit, e.g. Twizel.*

B STANDARD COLOURS FOR MIMIC DIAGRAMS

The following colours to **NZS 7702:1989** (an adoption of **BS 381C: 1988**) are used.

Voltage	Type	Mimic colour	BS No.
220 kV	a.c.	Light orange	557
110 kV	a.c.	Cherry	538
66 kV	a.c.	Azure blue	104
50 kV	a.c.	Azure blue	104
33 kV	a.c.	Grass green	218
22 kV	a.c.	Grass green	218
16 kV	a.c.	White	-
13 kV	a.c.	White	-
11 kV	a.c.	White	-
6.6 kV	a.c.	Golden yellow	356
3.3 kV	a.c.	Golden yellow	356
400 V	a.c.	Light brown	320
VT Sec	a.c.	Biscuit	369
System Neutral	a.c.	Black	-
350 kV	d.c.	Light Violet	797
270 kV	d.c.	Salmon Pink	447
Earth	d.c.	Light Grey	631

Notes:

1. *The HVDC system operates as two groups, i.e. at ± 270 kV and ± 350 kV respectively.*

2. *Earlier versions of these standards used slightly different colour names or numbers.*

C SWITCHYARD EQUIPMENT LABELLING

Circuit breakers, disconnectors, earth switches and most other equipment are identified by a minimum of 75 mm high black characters on aluminium or white background. This colour combination provides assistance in locating equipment under poor lighting conditions.

Notes:

1. *Labels for outdoor equipment must be made of weather resistant materials with a high contrast of colour between individual characters and the background colour used.*
2. *The character size used on the label depends on the viewing distance, e.g. f or labels on circuit breakers, disconnectors, earth switches and other smaller items of equipment, the black character dimensions shall be no less than 75 mm high with a width of 12 mm.*

C1 Circuit Breaker

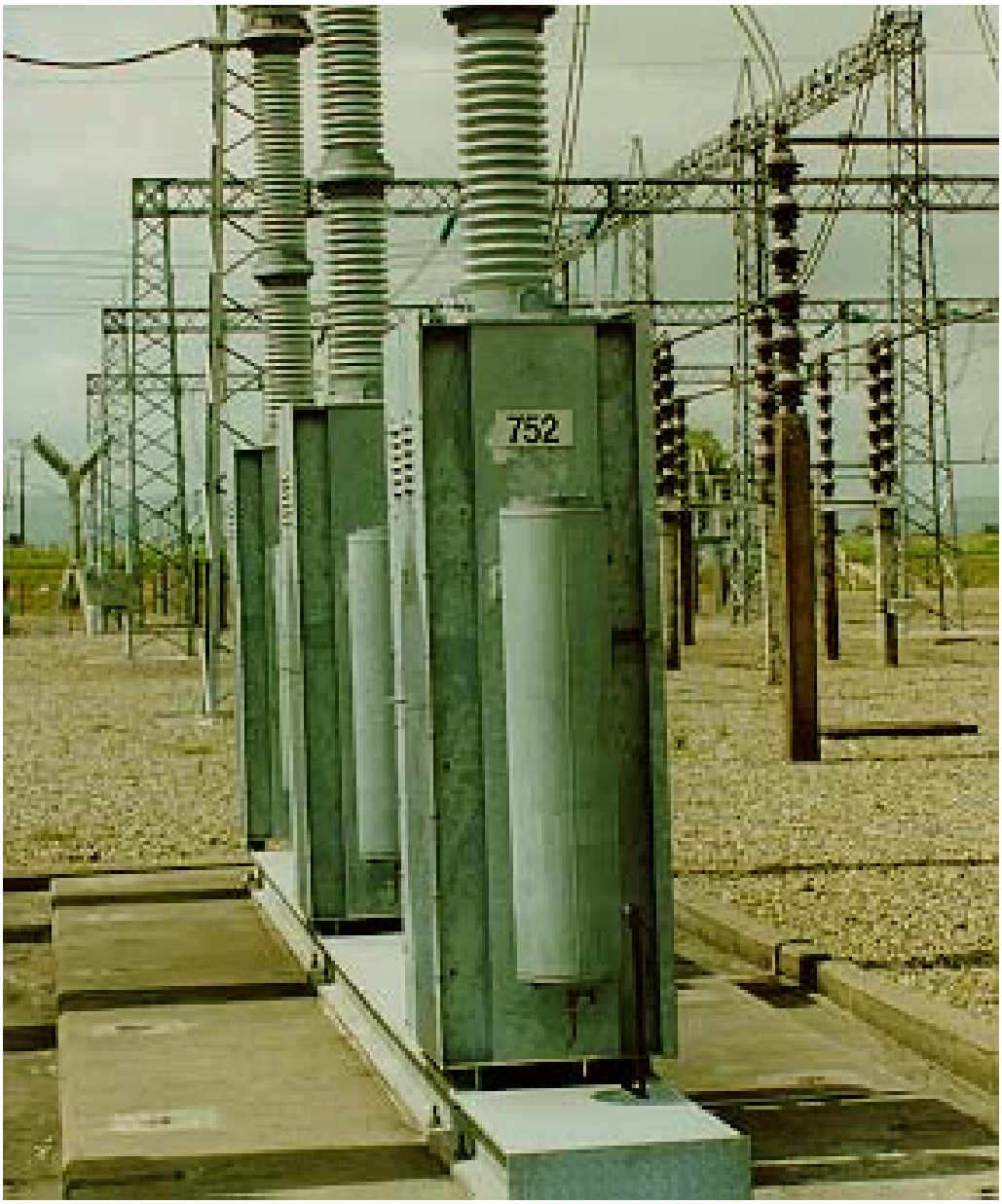


Figure C1: Label on CB mechanism box

Figure C2: Label on CB Tank

C2 Disconnector & Earth Switches

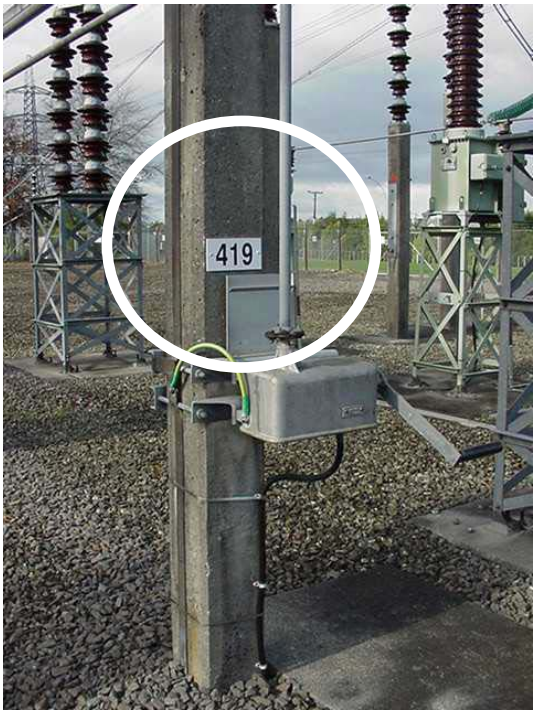


Figure C3: Label on pillar at a line earth switch operating position

C3 Capacitor Bank

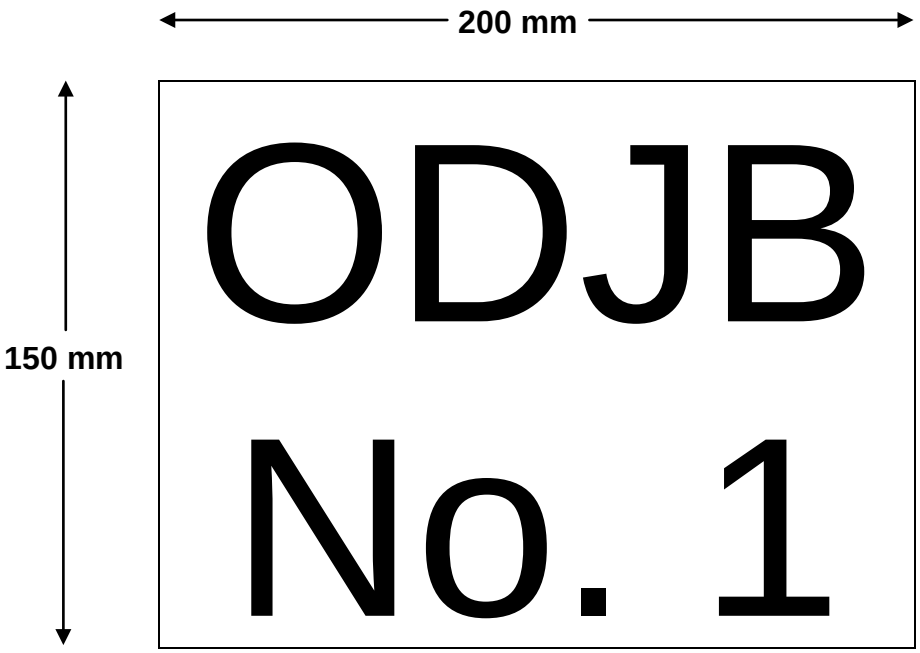
Figure C4: Labelling at the entrance of a capacitor bank enclosure

C4 Transformer

Material:	Labels are to be made of weather resistant plastic material or of aluminium with a white background and black characters.
Size of characters on labels:	Characters are to be 155 mm high with a width of 35 mm.
Location of labels:	For transformers, labels are to be located in a prominent position and/or operating position. For single phase units the phase of each unit is indicated by a coloured plate above the data plate.

Figure C5: Transformer - label position

C5 ODJB Door



Background: White
Lettering: Black, 50 mm high
Material: Traffolyte or similar

These labels shall be secured with screws, one on the outside of each ODJB door (2 per ODJB).

C6 ODJB Warning

Background: Yellow
Lettering: Black, 10 mm high
Material: Traffolyte or similar

One of these labels shall be fitted to each CB closing supply rear shield barrier (1 per ODJB).

D TYPICAL EXAMPLES

Figure D1: Typical example of a 50, 110 kV or 220 kV outdoor station showing equipment descriptions and identification

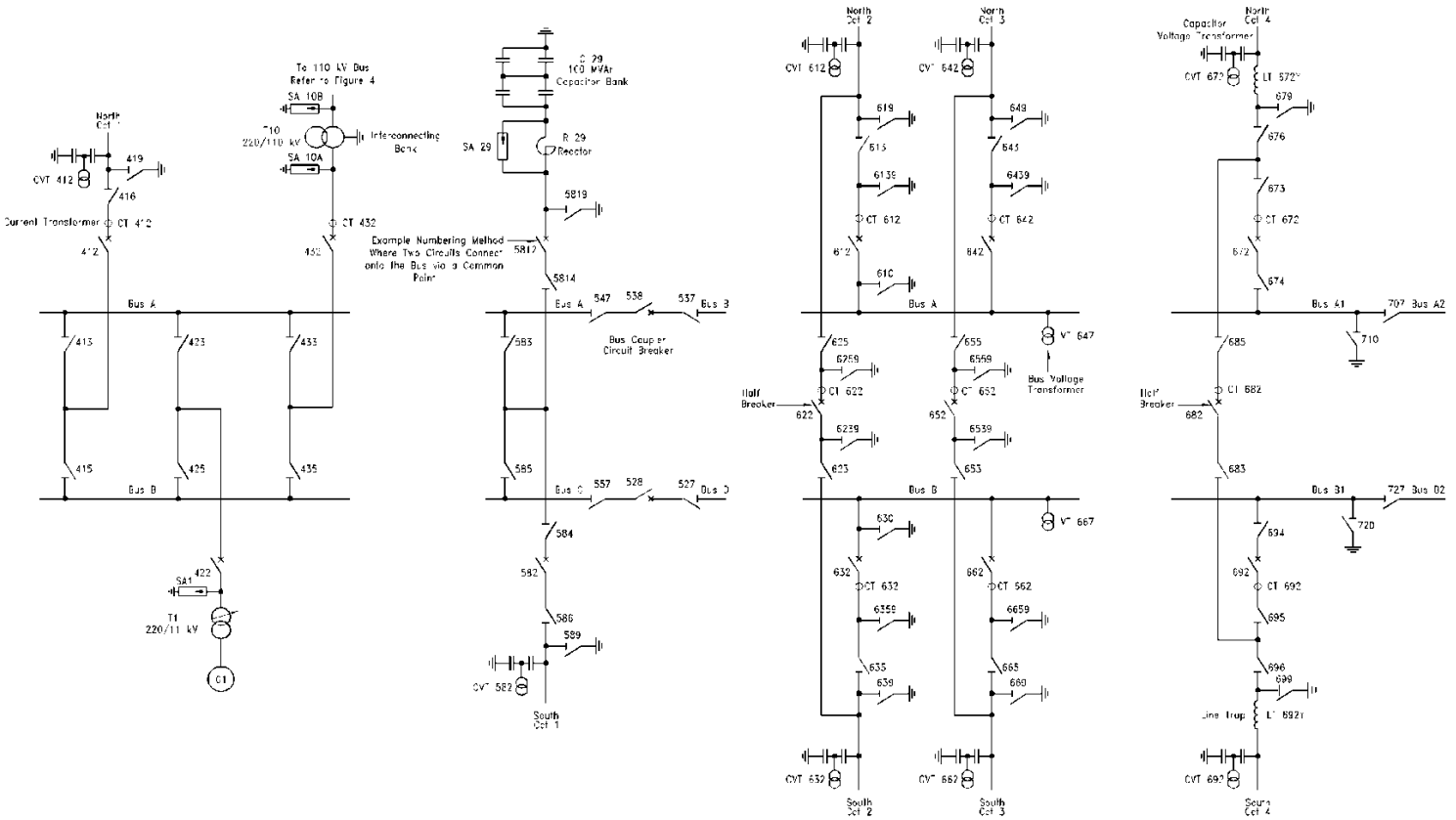


Figure D2: Typical example of a 50, 110 kV or 220 kV outdoor station showing equipment descriptions and identification

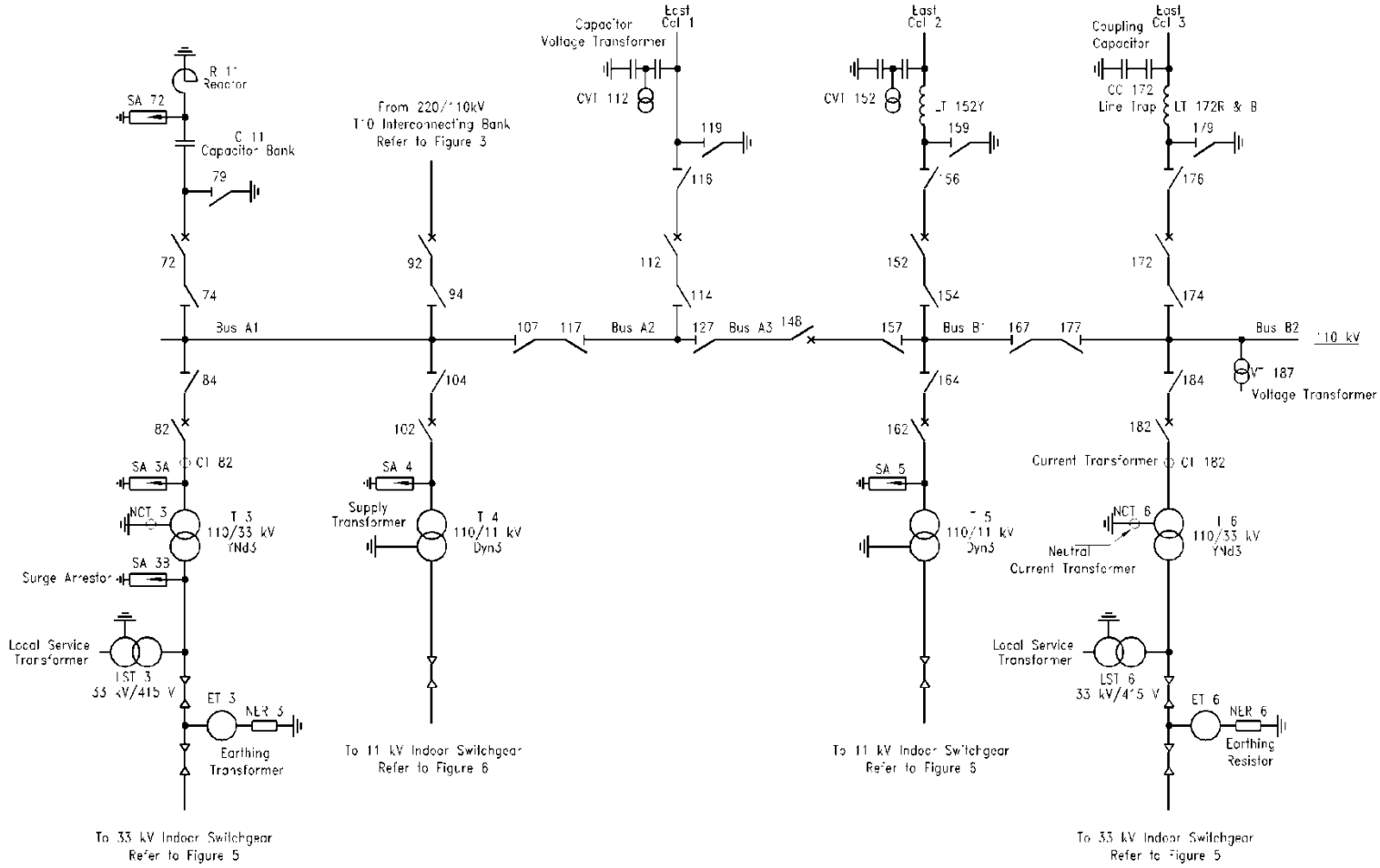


Figure D3: Typical 33 kV indoor switchgear showing typical equipment descriptions and identification

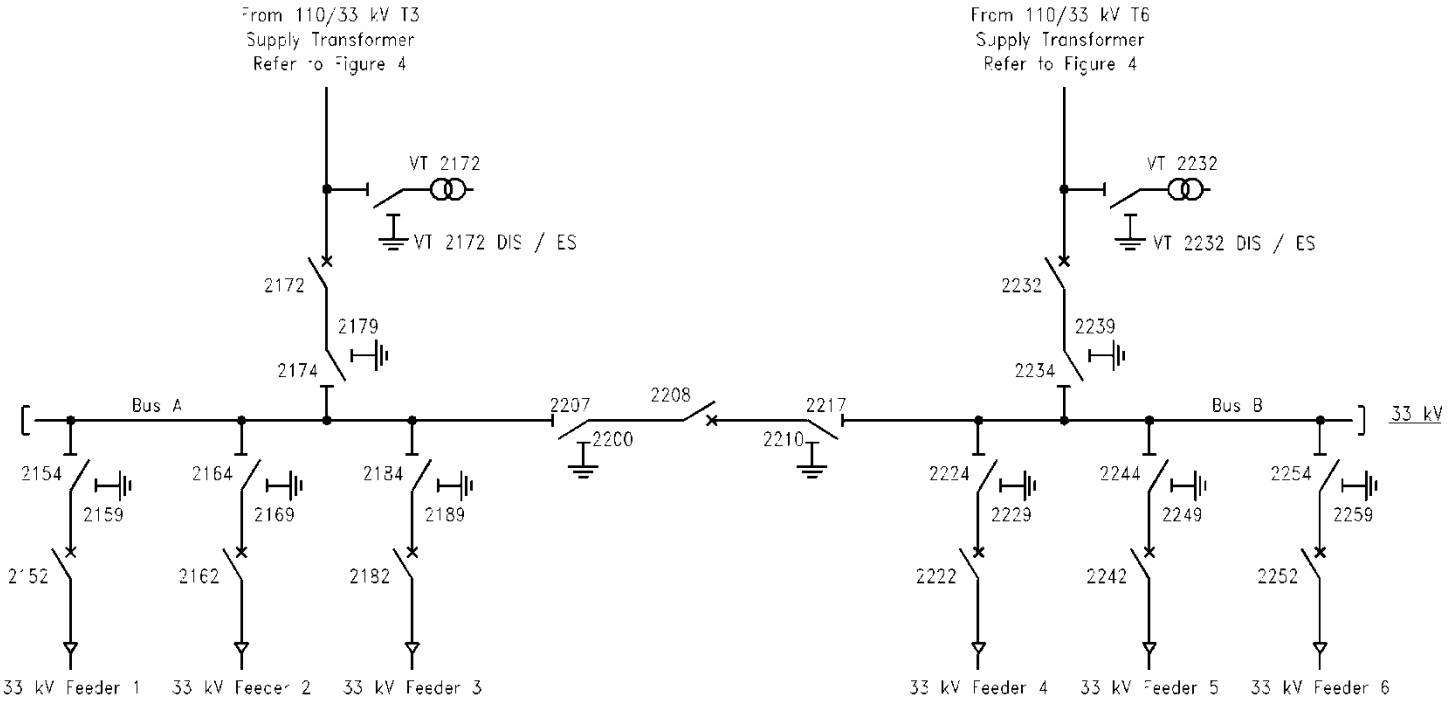


Figure D4: Typical 11 kV Indoor switchgear showing typical equipment descriptions and identification

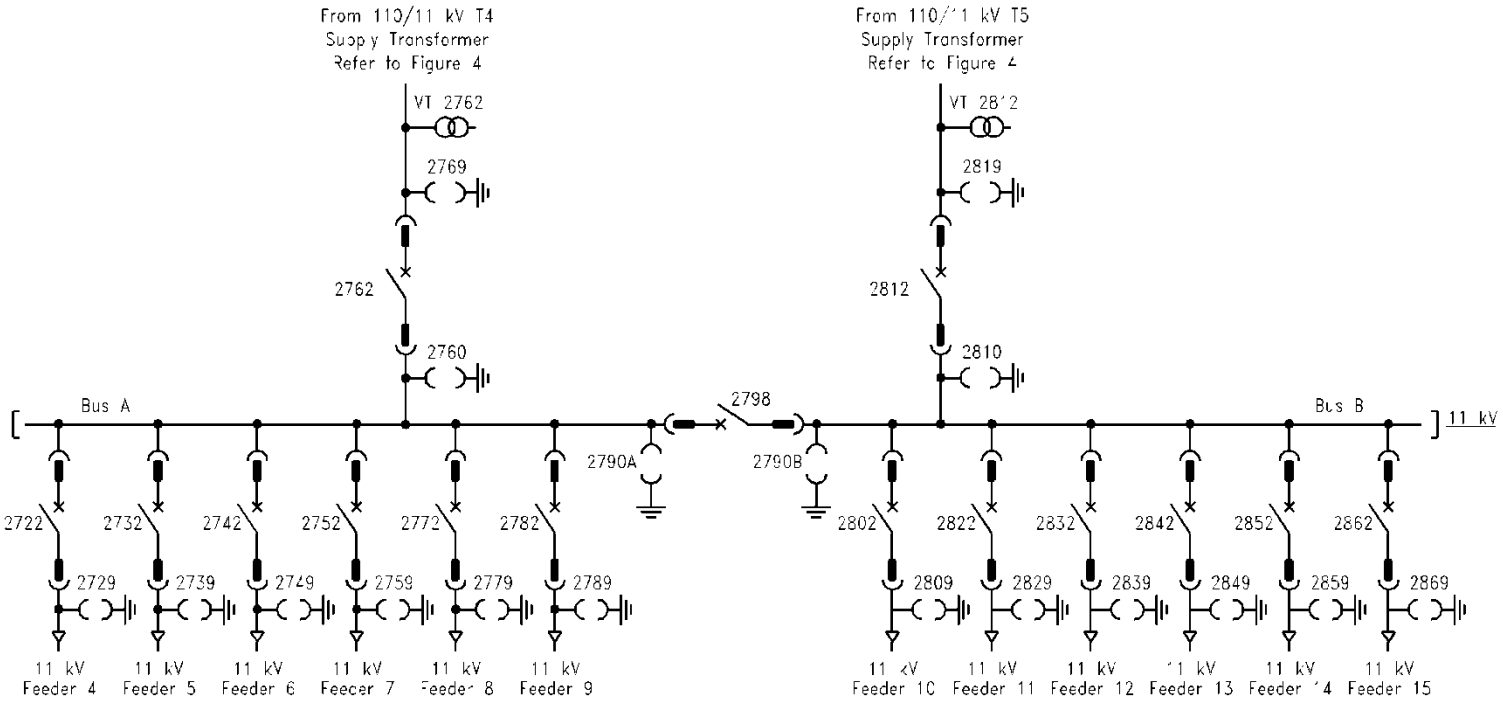


Figure D5: Typical SVC diagram showing typical equipment descriptions and identification.

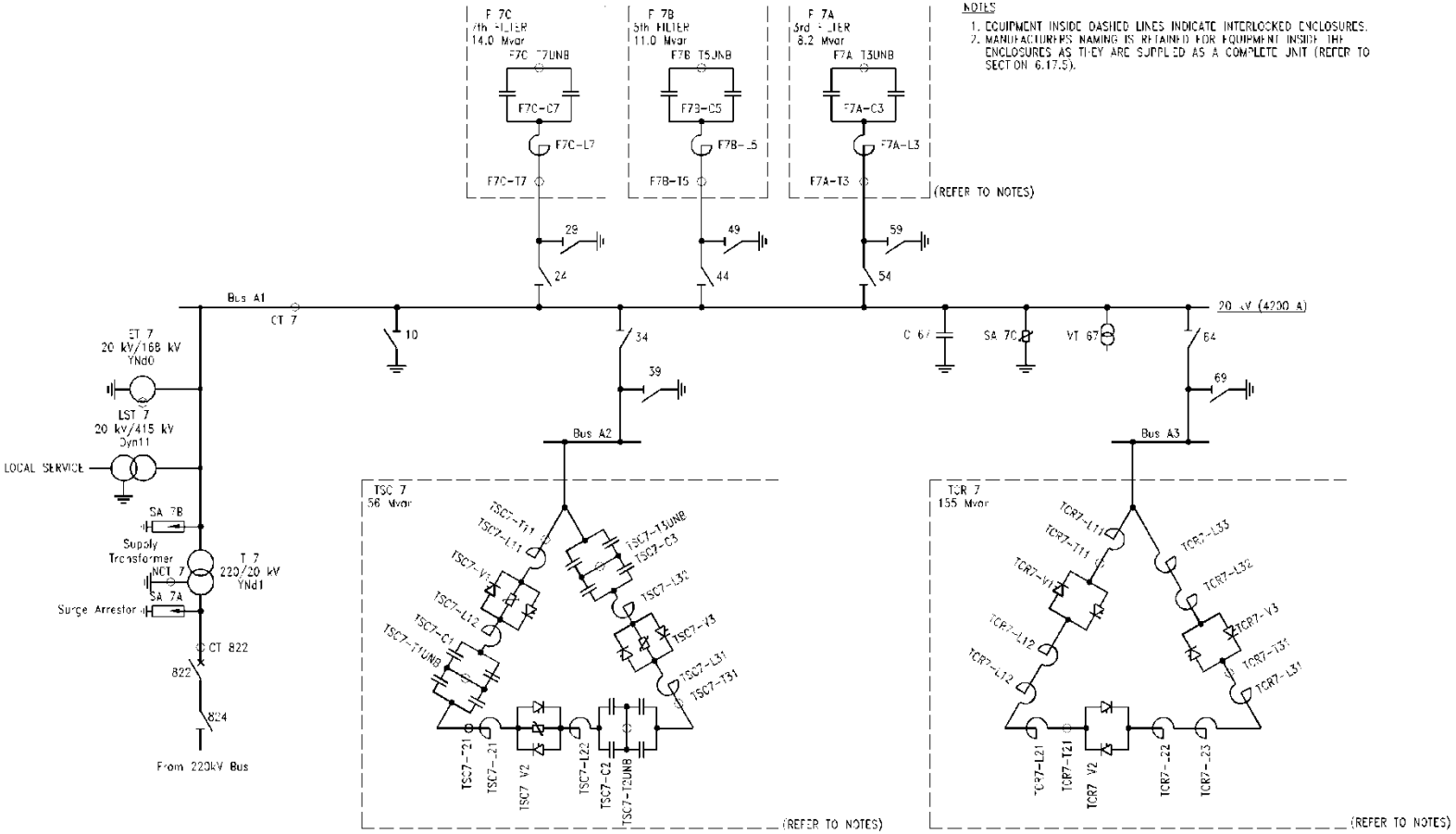
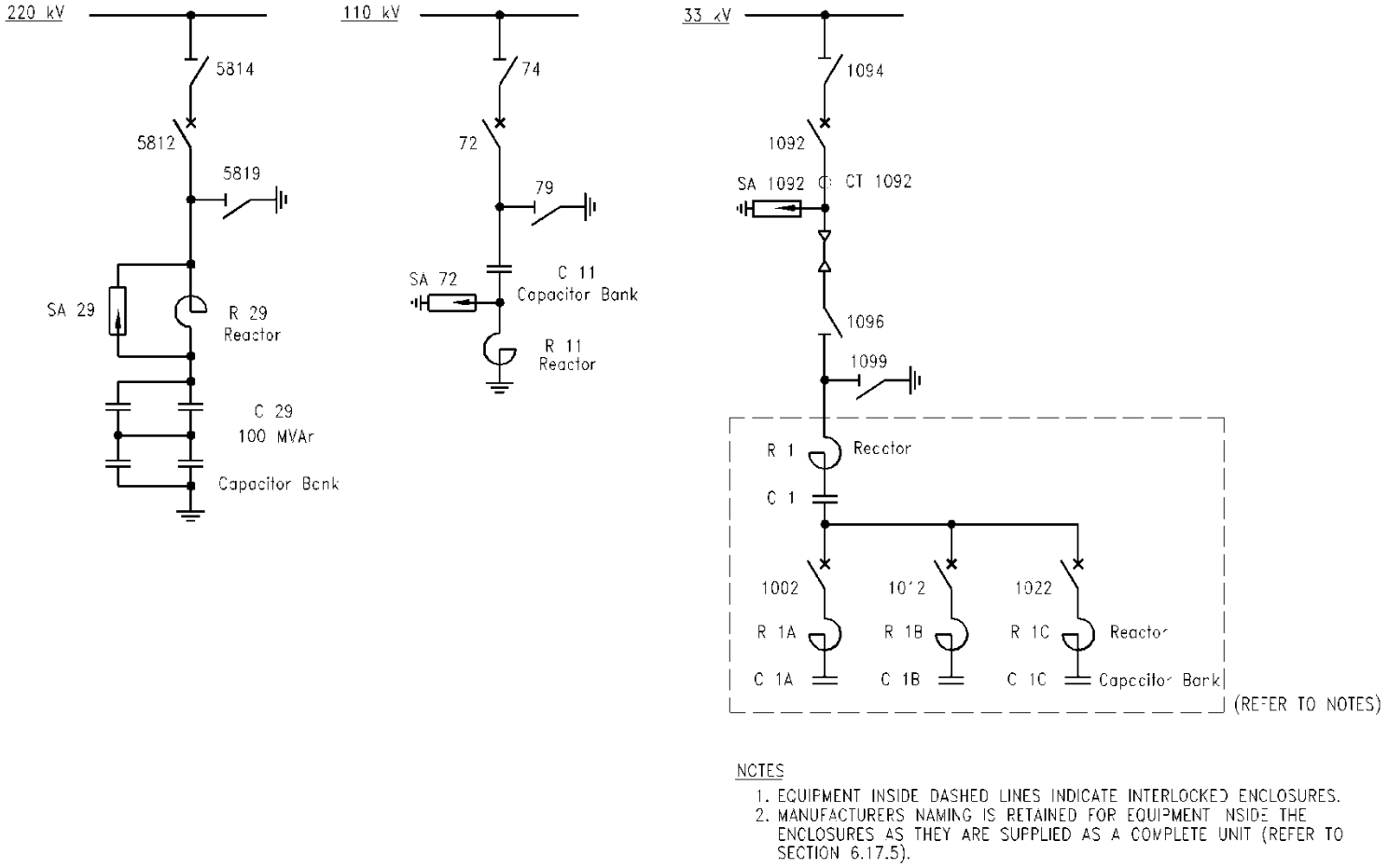


Figure D6: Typical capacitor diagrams showing typical equipment descriptions and identification at different bus voltages.



E SUMMARY OF CHANGES

Issue No.	Affected section or clause number	Comment	Date
6	Section 4	TP.SS 07.30 removed from listed references. TP.DP 01.31 added to listed references.	Nov 2011
	Clause 6.15.1	Change to identification of synchronous condenser. Removal of Note as no longer relevant.	
	Clause 6.22.1	Correction to Controlled Document number referenced.	
5	Preface	Additional Key Words added	Oct 2011
	Subsection 5.1	Changed to Clause 5.1.1 and titles updated	
	Subsection 5.2	Changed to Clause 5.1.2 and titles updated	
	Clause 6.1.3	Changes in wording and Services Operations added	
	Clause 6.1.5	New clause describing the conditions under which non TP numbering requirements are permitted	
	Clause 6.2.3	Inserted words ″adjoining stations″	
	Clauses 6.2.5 and 6.2.6	New clauses added specifying additional outdoor switchgear numbering criteria	
	Subclause 6.3.2 (c) (iii)	Amended to clarify bus earth numbering requirements	
	Clause 6.16.1	Wording amended to clarify capacitor bank numbering requirements	
	Clause 6.16.3	New clause relating to the naming convention of equipment within interlocked enclosures	
	Subsection 6.17	Title, Static var compensator, changed to Static compensator	
	Clause 6.17.1	Modified to differentiate between SVC's and STC's.	
	Clauses 6.17.3 to 6.17.8	New clauses relating to SVC filter naming convention	
	Subsection 6.25	Figures 3 to 8 moved to Appendix D	
	Appendix A	Criteria modified for the use of '6' at breaker and a half stations	
4	Preface	Updated. Previous changes now listed in Appendix D.	Jun 2007
	Section 3	Removed terms: switchgear group number, switchgear number, switchgear group extension number and switchgear function number	
	Section 6	Drawings have been moved to the end of Section 6. Figures 1 – 6 have been renumbered and referencing has been amended. Figures 3 and 5 have been updated.	
	Clause 6.5.1	Minor wording change	

Issue No.	Affected section or clause number	Comment	Date
	Clause 6.7.2 (a)	LS2 changed to T22	
	Clause 6.13.3	Updated	
	Clause 6.14.1	New clause	
	Clause 6.17.1	Updated	
	Clause 6.19.1	New clause	
	Subsection 6.20	Updated and new clauses added	
	Appendix D	New Appendix. Figures 3-8 from subsection 6.25 moved to Appendix and listed as Figures D3 to D8	
	Appendix E	Table of Changes added	
3		This issue supersedes Service Advisory TP.OG 41.10 SA1 VT & CVT numbering.	Jun 2007
		The requirement for 11 kV switchgroup numbers to follow an even or odd sequence has been withdrawn. 11 kV switchgroup numbers are to be consequential.	
		Numbers are to be consequential.	
		A policy has been added on numbering of equipment owned by Transpower on other asset owner's sites.	
		A new section has been included to cover additional equipment numbers required for an outdoor switchgear group.	
		New sections have been included to cover numbering of new indoor switchgear post 2002	
		Additional diagrams have been added to illustrate the numbering of equipment.	
		Additional photos have been added to **Appendix C** to illustrate equipment labelling.	
		There is a clarification of bus VT numbering.	
		There is a clarification of SLD layout requirements.	

F CONTROLLED DOCUMENT FEEDBACK FORM

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