

Drawing Drafting Standard

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Authorisations

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Responsibilities

This document is the responsibility of the Network Information Systems Leader, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as “TasNetworks”).

Please contact the Network Information Systems 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.

Record of revisions

Section number	Detail
All sections	This document was revised from the old Transend standard and has been updated to include the old Aurora distribution drawing standards and Comms practices.

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1 General

1.1 Purpose

To provide specific requirements to drafters for the format, numbering, presentation and identification with respect to TasNetworks drawings.

1.2 Scope

This standard is applicable to all TasNetworks drawings including but not limited to:

- Assemblies
- Block Diagrams
- Details
- General Arrangements and Layouts
- One Line Diagrams
- Templates
- Schedules
- Schematics.

1.3 Drawing Software Platform

TasNetworks currently has two CAD software platforms being MicroStation V8 XM and AutoCAD 2013. The following notes are mandatory in using these platforms:

- Distribution Systems shall be drawn in MicroStation
- Transmission Systems including Zone Stations shall be drawn in AutoCAD
- Drawings issued from the TasNetworks archive for modification will continue in their existing format.

1.4 Definitions

AC: Alternating current.

AEMO: Australian Energy Market Operator.

Approved: Authorisation of a drawing for release to the next project stage.

AED: Accredited Electrical Designer.

AEC: Accredited Electrical Constructor.

As Installed: The status of a drawing that depicts the arrangement or configuration of equipment as currently installed. 'As Built' and 'As Installed' have the same meaning.

CAD: Computer Aided Design. Within this standard, CAD refers to an electronic drawing provided in .dwg or .dgn format which may include an embedded .gp4 file.

Cancelled: The status of a drawing that is no longer required as a result of equipment being removed from service.

Checked: The verification of technical adequacy and completeness of a drawing or the part of a drawing which has been altered.

Checked-in: The status of a current drawing when it is stored in the EDMS.

Checked-out: The status of a drawing when it checked out of the EDMS for the purpose of alteration.

Communication System: Defined as assets for network telecommunication purposes.

Concept Drawing: A drawing which is part of a concept definition.

Construction: The status of a drawing that depicts the arrangement or configuration of equipment as designed for construction.

Critical Drawings: A risk-based list of drawing types which are required to safely operate the TasNetworks network. The list comprises of the Power Circuit One-Line Diagram (PCOLD), the Metering and Protection One-Line Diagram (MPOLD), Operational Diagram (OD), One Line Diagram (OLD), General Arrangement (GA), Wire Position Diagram (WPD), Standard Drawing (SD) and System Diagrams.

CT: Current transformer.

Design: The status of a drawing that depicts a potential arrangement or configuration of equipment during the conceptual design phase of a project.

Distribution System: Defined as assets inclusive from all network substation distribution connections to the final consumer connection point.

Drawing: Pictorial, tabular or graphical representation of technical design. Drawings may also contain a map or a representation of geographical features.

Drawing Type: Indicates the differing drawing characteristics including General Arrangement, Layout, Details, Assembly, Diagram, Schematic and Schedules.

Drawing Team: TasNetworks representatives with the responsibility for managing the TasNetworks EDMS.

DWG: Electronic CAD format files with a .dwg or .dgn file extension to create or modify drawings.

EDMS: Electronic drawing management system.

GA: General Arrangement drawing showing physical relationship between multiple equipment within a site boundary, transmission line or system.

GP4: A scanned amendable drawing image with a file extension of .gp4, which may be used in conjunction with, or embedded into, a .dwg file.

Issue: The transmission of drawings to personnel or organisations which includes electronic and hard copy formats.

Layout: Layout drawing of a single piece of equipment which may be within a General Arrangement.

Metadata: Data registered against a drawing in the EDMS.

NTS: Not to scale.

Original: The status of a drawing representing the first registration of a drawing in the EDMS by TasNetworks.

P & C: Protection and control.

Project Manager: Any representative who has been assigned the responsibility to manage a project and perform the role of Principal's Representative and/or Purchaser's Representative.

Redline Mark-ups: A hard copy drawing which is marked in red ink to indicate changes to 'Construction' drawings, which does not constitute a formal revision to the approved 'Construction' drawing. These changes are subject to the check and approval process.

RTU: Remote Terminal Unit.

SCADA: Supervisory, control and data acquisition.

Standard Drawing: A TasNetworks approved drawing used for use in any project when required and not subject to alteration.

Superseded: The status of a drawing that has been replaced by a new drawing.

TIF: (Tagged Image Format) An electronic image file with a file extension .tif.

Transmission System: Defined as assets inclusive of all network substations and transmission above 33kV to the power generator connection point.

VT: Voltage transformer.

1.5 Applicable Standards

R357929	Drawing Management Standard
R280697	General Substation Requirements Standard
R358449	Site Names and Abbreviations Standard
R280718	Transmission Line and Cable Numbers Standard
R280717	Transmission Circuit Name Abbreviations Standard
R280703	Asset Identification Standard
R280754	Site Drawing Prefix Master List
R358302	Drawing Checking and Approval Authorisation Guidelines
TSD-SD-806-0001-001	Drawing Symbols Drawing
AS1100	Technical Drawing (all parts)
AS1102.101	Electrical Symbols

2 Template Border Completion

This chapter details all the sections associated with the template border and how these should be completed.

All drawings shall be produced in a format consistent with the TasNetworks standard template. The drawing shall be prepared so that all technical information is within the drawing border.

Example border templates are shown in Appendices A and B respectively. Electronic templates in MicroStation and AutoCAD format are available on request for A0, A1, A2, A3 and A4 size drawings. The format and content of templates shall not be modified.

Each template contains a standard title block. Title blocks must not be scaled and CAD ref point 0,0 used.

2.1 Drawing Content Orientation

Where possible drawing contents shall be oriented (landscape is preferred unless required) as follows.

Pictorial, tabular or graphical drawings.

- a. landscape templates—the shortest edge of the content “foot print” of the drawing shall be parallel with the right edge of the template.
- b. portrait templates (generally A4)—the longest edge of the content “foot print” of the drawing shall be parallel with the right edge of the template.

Maps or geographical representation.

- a. the north point shall be parallel with the right edge of the template, pointing to the top.

Where compliance with the above is not possible, a proposed orientation shall be the subject of TasNetworks agreement.

2.2 Original Issue Drawing Title Block

For new TasNetworks designed drawings, the title block provided in the electronic template shall be completed as shown in Table 1.

Within TasNetworks title and alteration blocks, the following text restriction shall apply.

- The use of “the”, “of”, “and” and “for” in drawing titles shall be kept to an absolute minimum. Non-alpha-numeric characters shall not be used in any circumstances. The use of plurals, unless specifically required in a title, should be avoided.
- Numbered items shall be avoided whenever possible. However, when required the format of “No. 1” series shall be used. example No. 1 circuit, road No. 2.

Table 1 - Guidelines for use of Original Issue Drawing Title Block

Drawing Title Block		
Title	Line 1	Subject site name, system or standard drawing.
	Line 2	Bay, Circuit, Asset or location.
	Line 3	Description (optional line).
	Line 4	Drawing type as derived from the drawing number.
Identification Below Title (Drawing Number)	From the drawing identification tables in the Drawing Management Standard.	

Drawing Title Block	
Scale	The scale to which the drawing is drawn or NTS (Not To Scale) as applicable.
Box Below Scale	Reserved for the size of the original printable file, i.e. A0, A1, A2, A3 or A4.
Revision	From the drawing revision notation in the Drawing Management Standard.
References	Reference (drawing numbers and titles) of associated drawings.
TasNetworks signoff boxes	To be completed by authorised TasNetworks employees only.

2.3 Drawing Revision

Drawing revisions shall be made in accordance with the revision process in the Drawing Management Standard.

2.4 Drawing Alteration Title Block

A new alteration block shall be added for each revision made, including superseded or cancelled drawings.

It shall contain the following information:

- a. succinct and meaningful descriptions of the alterations
- b. full names of the personnel responsible for the drafting, design, checking and approval
- c. TasNetworks approval signature
- d. the date the revision was made
- e. the TasNetworks project or job number
- f. name of the organisation completing the work
- g. ABN and optional logo for AED's.

A new drawing shall have an alteration block provided complying with the above requirements, which shall be replaced when the drawing is finally 'As Installed'. Refer to 6.4.4 for 'As Installed' requirements.

The alteration title block shall be positioned 90° anticlockwise to the orientation of the original title block and as near to the lower left hand corner of the drawing as space will allow. The dimension of the alteration block, including any logo, shall not exceed the height of the original title block and the width shall not exceed the height.

The revision in the original issue TasNetworks title block (located in the bottom right hand corner of the drawing) shall be updated to correspond to the revision shown on the latest alteration block.

Refer to Appendices A and B for examples of both drawing templates.

2.5 Drawing Sign of Procedure

All the signature fields will be completed during the life cycle of any drawing. This process is described in two standards:

- Drawing Checking and Approval Authorisation Guidelines
- Drawing Management Standard.

When a drawing is issued for construction, a construction sign off block will be inserted into the drawing, which will become a project related sign off. This ensures the redline information collated on the drawing during its implementation life cycle is correct and is complete and ready for drafting.

Construction Responsibility	Signature	Company	Date
Civil AEC Representative			
Electrical Plant Installer			
Commissioning Manager			
Tasnetworks Representative			

3 AutoCAD Formatting Information

New drawings in AutoCAD shall use the guidelines in this section. Archive drawings in AutoCAD issued for modification shall retain its formatting for ease of modification. Where formatting information is absent on any drawing then this section shall prevail.

3.1 General Colour Usage

All lines on the drawing shall have a predetermined thickness based upon a colour assigned in accordance with the requirements as listed in Table 2 for AutoCAD.

Table 2 - Mapping of AutoCAD Screen Colour to Pen Thickness

Screen Colour Number	Screen Colour	Pen Thickness (mm)
9	Light Grey	0.10
6	Magenta	0.18
7	White	0.25
2	Yellow/Green	0.35
1	Red	0.50
4	Cyan	0.70
5	Dark Blue	1.00
9 to 255	Not Used	Not Used

Note 1: Orange and green may be used in addition to white and yellow respectively in cases of heavy usage of 0.25 and 0.35 lines as a means of visually distinguishing on screen elements which belong to different design components.

3.2 Operational Information AutoCAD Requirements

All Operational Information shall use the following pen colours and associated line thickness for equipment shown in

Table 3 and 4.

Table 3 - Pen Sizes

Equipment	Pen Thickness (mm)	Line Colour
Busbars	0.7	Cyan
Transmission Lines, Feeder Lines, Transformers, Capacitor Banks (excluding CT & VT)	0.5	Red
Isolators/Disconnectors, Circuit Breakers, Instrument Transformers, (CT & VT) and all other auxiliary equipment	0.35	Yellow
Future Bays or Equipment	0.25	White (Dashed)
Transformer Winding/Tapping Pole ID	0.25	White

Table 4 - Pen Sizes for Text (Device ID)

Equipment	Pen Thickness	Text Colour	Text Size
Transformers (Excluding Instrument Transformers)	0.5mm	Red	5.0mm
Busbar Identification, Transmission Line Header	0.35mm	Yellow	3.5mm
Disconnectors, Circuit Breakers, Instrument Transformers	0.25mm	White	2.5mm for A4 and A3 3.5mm for A2 3.5mm for A1
All Other Equipment	0.25mm	White	2.5mm

3.3 Layer and Text Type Usage

Table 5: Layers and Text Heights

Layer	Description	Colour	Text Height
0	default - create symbols -blocks	White	N/A
Border	paper space - scales, north points, notes	Yellow	3.5 mm
Border_Headings	notes and device description headings	Yellow	3.5 mm
Border_Notes	descriptive notes for devices or general notes	White	2.5 mm
Bordermarks	bordermark layer contains document phase, current revision and date of latest revision	White	See table 8
Clouds	'Construction' modifications are to be clouded for identification	Magenta	N/A
defpoints	objects on this layer will not print	White	N/A

Layer	Description	Colour	Text Height
DEVICE_ID_CB_ISOL_INST	device ID – disconnectors, circuit breakers, instrument transformers	Yellow	3.5 mm
DEVICE_ID_MISC	device ID – all other equipment	White	2.5 mm
DEVICE_ID_TF	device ID transformers (excluding instrument transformers)	Red	5.0 mm
DEVICE_ID_TL_FDR	device ID busbar identification and transmission line header	Yellow	3.5 mm
DEVICE_No_FUNC_DESCR	device number function description	White	2.5 mm
DEVICE_TERM_No	device terminal numbers	Magenta	1.8 mm
Dimensions	dimensions layer contains all dimensions for the drawing in model space	White	Various
DRG_No_Ref	drawing number references	White	2.5 mm
EQUIP_BAY_FUTURE	equipment - future bay	White (dashed)	N/A
EQUIP_BUSBARS	equipment - busbars	Cyan	N/A
EQUIP_CB_ISOL_TF	equipment – isolators/disconnectors, circuit breakers, instrument transformers (CT & VT) and all other ancillary equipment	Yellow	N/A
EQUIP_TL_FDR	equipment – transmission lines, feeder lines, transformers, capacitor banks (excluding CT & VT)	Red	N/A
EQUIP_WIND_TAPP	equipment – transformer winding/tapping pole ID	White	Various
MVIEW	mview is a window on paper space that displays part of a model space	Blue	N/A
TEXT	all descriptive text “middle left” in model space	Magenta/ White/Yellow/ Red and Cyan	1.8/2.5/3.5 /5.0/7.0mm Respectively
VIEW_LABELS_A0	plan, layout, section etc	Red	5.0 mm
WIRE_No	wire numbers	White	3.5 mm

4 MicroStation Formatting Information

New drawings in MicroStation shall use the guidelines in this section. Archive drawings in MicroStation issued for modification shall retain their formatting for ease of modification. Where formatting information is absent on any drawing then this section shall prevail.

4.1 General Colour Usage

All lines on the drawing shall have a predetermined thickness based upon a colour assigned in accordance with the requirements as listed in Table 6

Table 6 - Mapping of Screen Colour to Line Weight

Screen Colour Number	Screen Colour	Line Weight	Pen Thickness (mm)
14	Light Grey	0	0.10
5	Magenta	1	0.18
0	White	2	0.25
4	Yellow/Green	3	0.35
3	Red	4	0.50
7	Cyan	6	0.70
1	Dark Blue	8	1.00
15 to 255	Not Used	10-15 Not Used	Not Used

Note 1: Orange and green may be used in addition to white and yellow respectively

4.2 Layer and Line type Usage

Table 7: Levels

Levels	Description	Levels	Description
62	Border	13 - 16	Steelwork
1	Text (OLD approval Stamp)	17 - 20	Concrete outlines
3	Text OLD circuit and component descriptions	21 - 24	Reinforcing
4	Dimensions	25 - 28	Mechanical
5	Hatching / patterning, OLD equipment outlines	29 - 30	Surveys - grid lines,
6 - 8	Circuits & proposals	31 - 32	Surveys - contours
9 - 12	Civil outlines		

Table 8: MicroStation Line Types for One Line Diagrams

Design Drawing Line types				
Description	Level	Colour	Style	Weight
HV Cable >1kV	6	1	0	4
LV Cables 400V	6	1	0	4
HV Underground Cable >1kV	6	1	3	4
LV Underground Cables 400V	6	1	3	4
HV/LV protection equipment	8	5	4	0
LV Cable 230V	6	1	0	2
HV earthing equipment	8	4	0	0
HV/LV equipment enclosures	7	0	2	0

Table 9: Text Heights

As a guide the following text heights and justifications are used:

Sheet size	Justification	A3	A1
Labels & View Names	Middle centre	3.5mm	5.0mm
Notes & Legend Titles	Middle left	3.5mm	5.0mm
Notes & Legend Text	Middle left	2.5mm	3.5mm
Wire & Terminal numbers	Middle centre	2.5mm	3.5mm
Device terminal numbers	Middle centre	1.8mm	2.5mm

5 Cancelled and Superseded Drawings

CANCELLED and SUPERSEDED BY notes superimposed on drawings (refer to section 4.3) shall comply with the text size in Table 8.

A brief description of the reason that a drawing is cancelled or superseded shall be included in the revision box

Table 10 - Superimposed Note Text Font Size

Drawing Size	Font Size
A0	30mm
A1	20mm
A2	15mm
A3	15mm
A4	15mm

6 Drawing Requirements

6.1 General requirements for all Drawings

The following shall apply to all types of TasNetworks drawings:

- a. all drawings shall be clear, legible and free from errors or omissions
- b. all drawings shall be in the English language only
- c. only SI system of units may be used. Units shall be stated for all values. CAD units are to be millimetres
- d. scales wherever used on physical layout and general arrangement drawings shall conform to Australian Standards AS 1100 - Technical Drawing Part 101 - Section 5 Scales
- e. all drawings that are prepared to scale shall have a relevant scale block(s) included. The preferred scale for General Arrangement Drawings is 1:200 and section sheets 1:100. Drawings not to scale shall be noted as NTS
- f. drawings shall be A0, A1, A2, A3 or A4 size. Preference shall be given to A3 and A1 sized drawings
- g. all drawings shall be prepared utilising CAD software and shall comply with the requirements of Australian Standard AS 1100, unless otherwise stated herein. Electronic copies of the drawings shall be provided as follows:
 - i a format compatible with MicroStation, ie .dgn
 - ii a format compatible with the latest version of AutoCAD, ie .dwg
 - iii any .gp4 files shall be embedded within an associated .dwg file.
- h. acceptable equipment abbreviations are explained in the following TasNetworks standards
 - i R280718 Transmission Line and Cable Numbers Standard
 - ii R280717 Transmission Circuit Name Abbreviations Standard
 - iii R290703 Asset Identification Standard
 - iv R280722 Site Names and Abbreviations Standard.
- i. entities that do not form part of the eventual "As Installed" drawing shall be deleted
- j. all drawings shall be purged, have all appropriate layers turned on and the drawing sheet shall be maximised in the viewing window before the file is saved for publishing
- k. drawings with multiple sheets to be published from one model shall be set to individual paper space layouts with the full drawing number as the layout name. Drawings subsequent to the first sheet shall be published in PDF with full name and metadata
- l. where possible, the use of raster images and external references shall be avoided
- m. all text fonts contained within drawing borders in all types of drawings as defined in the above tables shall be in accordance with ISO3098B.SHX for AutoCAD drawings and Engineering Font 3 (height to width ratio = 0.7) for MicroStation drawings.

6.2 Requirements for specific drawing types

6.2.1 Electrical Schematic Requirements

6.2.1.1 Grids and Snaps

The use of grids and snaps are critical in the production of electrical drawings. In particular it creates a method of simple and efficient drafting and provides accuracy, ease of maintenance and a quality presentation. Under no circumstances shall electrical drawings be produced without the continuous use of grids and snaps.

For circuitry drawings, a minimum snap setting of 1.25mm and multiples thereof must be utilised, ie 2.5, 5.0 etc.

6.2.1.2 Symbols on electrical circuits

All electrical drawings shall use standard symbols that comply with applicable Australian Standards. If any other symbol is required, the same shall be requested in writing to TasNetworks. Refer to the Standard Drawing Electrical Symbols Drawing Number TSD-SD-806-0001-001 for commonly used symbols on TasNetworks drawings.

6.2.1.3 Identification of equipment

A unique identification number termed as “device number” shall identify each device and shall follow TasNetworks standard which is based on their point of installation and specific function.

Refer to TasNetworks General Substation Requirements Standard (R280697) for the identification of equipment on Transmission Sites.

6.2.1.4 Critical Drawing Requirements

The critical drawings for describing electrical systems within TasNetworks sites (collectively the Operational Information) are the Power Circuit One-Line Diagram (PCOLD), the Metering and Protection One-Line Diagram (MPOLD) and the Operational Diagram (OD). The One Line Diagram (OLD) is reserved for distribution class drawings.

A PCOLD shall show the following information:

- a. primary plant (eg. busbar, transformers, CTs, VTs) and their device numbers
- b. if more than one PCOLD is required for a site, equipment shown on each drawing shall be grouped by operating voltage. Transformers shall be grouped according to the higher of their operating voltages
- c. one PCOLD per voltage per site is to be produced.

An MPOLD shall show the following information:

- a. primary plant (eg. busbar, transformers, CTs, VTs) and their device numbers
- b. all Metering and Protection equipment and their device numbers
- c. notes on the protection relay operation describing breakers tripped, any time delayed operations, initiation of other devices, sending of inter-trips, and initiation requirements from other devices. Reference numbers (in brackets) against each associated device should correspond with the notes listed
- d. a legend of the device numbers shown on the drawing including the type of associated relay
- e. a table of the VTs shown on the drawing detailing the voltage and class of each winding to TasNetworks standards

- f. a table of the CTs shown on the drawing detailing the voltage, ratios, class, and function of each CT. Reference letters (in brackets) against each associated device should correspond to TasNetworks standards
- g. a list of relevant notes to provide any additional information on the drawing
- h. busbar protection equipment that is not directly connected to current transformer circuits should be drawn in a central location to the busbars with an appropriate device number. Peripheral equipment for busbar protection that is connected to the current transformer circuits should be shown with a corresponding protection operation reference number and appropriate device number
- i. all secondary wiring between instrument transformers and devices should be drawn where appropriate. If secondary wiring creates congestion on the drawing, reference can be made between the instrument transformer and the device. Similarly, reference of secondary wiring between devices can be made to decrease drawing congestion
- j. all mechanically connected transformer protection and monitoring devices should be drawn next to the transformer with appropriate device number and corresponding protection operation reference number
- k. all device boxes should be drawn the same size
- l. one MPOLD per voltage per site is to be produced.

An OD shall show the following information:

- a. primary plant (eg. busbar, transformers, switchgear) and their device numbers
- b. operational notes
- c. all assets at each site shall be represented on a single OD
- d. regardless of drafted size, ODs shall be suitable for printing on A3 paper.

An OLD shall show the following information.

- a. primary plant (transformers, circuit breakers, earth switches CTs, VTs etc)
- b. all Metering and Protection equipment and their device numbers
- c. notes on the protection relay operation describing breakers tripped, any time delayed operations, initiation of other devices, sending of inter-trips, and initiation requirements from other devices. Reference numbers (in brackets) against each associated device should correspond with the notes listed
- d. a legend of the device numbers shown on the drawing including the type of associated relay
- e. a table of the VTs shown on the drawing detailing the voltage and class of each winding to TasNetworks standards where appropriate
- f. a table of the CTs shown on the drawing detailing the voltage, ratios, class, and function of each CT. Reference letters (in brackets) against each associated device should correspond to TasNetworks standards
- g. a list of relevant notes to provide any additional information on the drawing
- h. all secondary wiring between instrument transformers and devices should be drawn where appropriate. If secondary wiring creates congestion on the drawing, reference can be made between the instrument transformer and the device. Similarly, reference of secondary wiring between devices can be made to decrease drawing congestion

- i. all mechanically connected transformer protection and monitoring devices should be drawn next to the transformer with appropriate device number and corresponding protection operation reference number
- j. a table of major equipment.

6.2.1.5 Content Definition

The following table details the necessary elements of each critical drawing type. Content marked with a tick is to be included in the indicated drawing.

Table 11 - Content Definition

Element	OD	PCOLD	MPOLD	OLD
Circuit Breaker	✓	✓	✓	✓
- functionality	✓		✓	✓
Disconnecter	✓	✓	✓	✓
Fault-throwing switch	✓	✓	✓	
Earth-switch	✓	✓	✓	✓
Current Transformer	✓	✓	✓	✓
- polarity	✓	✓	✓	✓
- number of taps		✓	✓	✓
- individual cores		✓	✓	✓
- phase designation		✓	✓	✓
- ratio specification			✓	✓
- class			✓	✓
Voltage Transformer (including winding detail)	✓	✓	✓	✓
Power or Distribution Transformer	✓	✓	✓	✓
- winding detail	✓	✓	✓	✓
- number of taps	✓	✓	✓	✓
- tap changer	✓	✓	✓	
- tap changer duty (on/off-load)	✓	✓	✓	
- VT ratio table			✓	✓
Reactor	✓	✓	✓	
Regulating Transformer	✓	✓	✓	
Relay (including specification)			✓	✓
AC Motor	✓	✓	✓	
AC Generator	✓	✓	✓	
Link	✓	✓	✓	✓
Resistor	✓	✓	✓	
Fuse	✓	✓	✓	✓
Surge Diverter	✓	✓	✓	✓
Line Trap	✓	✓	✓	
Capacitor	✓	✓	✓	
Earth	✓	✓	✓	✓
Isolating Facility – (Rack-out)	✓	✓	✓	✓

Element	OD	PCOLD	MPOLD	OLD
Capacitive voltage indicator	✓	✓	✓	
Cable Connection	✓	✓	✓	
Rack-out specification (including integrated earth)	✓	✓	✓	
Asset Ownership Boundary	✓	✓	✓	✓
Phase specification (other than 3-phase)	✓	✓	✓	
Transmission Circuit Names	✓	✓	✓	
Circuit Designations				✓
Drawing Continuation Reference	✓	✓	✓	✓
Bus designation (including voltage)	✓	✓	✓	✓
Operational Notes	✓			✓
Protection Operation Notes			✓	✓

6.2.1.6 Provision for Private Installations

Operational information shall represent the interface between TasNetworks assets and those privately owned, in one of the following ways:

- a. by inclusion of privately owned assets
- b. by reference to continuation.

6.2.1.7 Inclusion of Privately Owned Assets

Operational information, which is required to contain data pertaining to assets that are privately owned is determined on a case-by-case basis as agreed with TasNetworks and is influenced by operational, AEMO and practical requirements.

6.2.1.8 Private Asset Continuation Reference

Where it is not necessary to show private assets on operational information, reference to continuation shall be made using at least one of the following text notes:

- a. reference to private asset operational information (for example, “for continuation see Hydro drawing A-12345”)
- b. reference to the nearest asset in the circuit on the private side of the boundary (eg. “to A29A”).

6.2.1.9 Reference to Customer Connection Agreement(s)

Diagrams that are defined within a connection agreement shall include a note stating, “Note: This is a controlled document under connection agreement” and changes to these diagrams shall be communicated and discussed with the relevant customer.

6.2.1.10 General Requirements

New equipment shall be shown on the schematic diagram (schematic) once only.

All existing schematics shall be marked up and new schematics created to show the new equipment and the interface between the new equipment and the existing site.

All schematics are required to provide the following information:

- a. devices, device numbers and device terminal numbers

- b. device functionality
- c. wire numbers
- d. all terminals and links with each item labelled
- e. all contacts of the devices and relevant cross references
- f. panel cabinet location references
- g. all DC and AC voltage levels
- h. protection trip links and references to trip circuits are required to be clearly shown
- i. other related electrical components as required
- j. all notes and legends as required.

AC schematics shall preferably be laid out so that red, white and blue phases are shown with either:

- a. red phase on the left hand side for vertical lines followed by white then blue
- b. red phase on the top of drawing for horizontal lines followed by white then blue.

Equipment that is physically removed from service shall be erased from existing schematics.

6.2.1.11 Equipment State Shown

All equipment and devices are to be shown in the open, de-energised, reset or shutdown condition, with pneumatic and hydraulic pressure systems at atmospheric pressure and drained.

All limit switches are to be shown in their de-activated position.

All schematics are to include a general note stating that “All equipment and devices are shown in the open, de-energised, reset or shutdown conditions with pneumatic and hydraulic systems at atmospheric pressure and drained.”

6.2.1.12 Routing Information

All modifications to existing and all new schematics shall show routing information. This will at a minimum include every terminal and test link that the wires pass through. Each terminal shall be labelled with its location eg panel number and terminal number.

6.2.1.13 References between Drawings

All the electrical schematic diagrams for the site shall be arranged in a logical sequence and cross referenced so that all circuits can be easily followed across the drawings or sheets within the suite of related drawings. There shall be a master index sheet of all equipment arranged in device number order so that the primary location in the drawing system of any device can be readily located. From this drawing or sheet, all components and connections to that device shall be referenced to where they appear on other drawings or sheets, and conversely, the components and connections shall be referenced back. Curly brackets are preferred for reference indication.

The reference will be TasNetworks’s drawing or sheet number and these drawing references shall also appear in the reference block in the template.

6.2.2 Schedules

Schedules, when existing for a particular site, shall be updated as defined below.

When a schedule does not exist, a new schedule shall be developed at the direction of TasNetworks.

6.2.2.1 Device Schedule (P&C Assets)

Site device schedules are being phased out in favour of device entries into the drawings relating to that device. The existing site device schedule entries will be deleted (with a strike through line) as part of the project and any new or reused devices added into the new drawings. As the schedule is still a functioning document the standard check and approval process applies.

The new device entry will typically require the relay device number, make and type.

Refer to TasNetworks General Substation Requirements Standard (R280697) for specific information about device numbering for Transmission Sites.

6.2.2.2 Label Schedule

Site label schedules are being phased out in favour of label entries into the related suite of drawings. The existing site label schedule entries will be deleted as part of the project. As the schedule is still a functioning document the standard check and approval process applies.

6.2.2.3 Instrument Schedule

Site instrument schedules are being phased out in favour of instrument entries into the drawings relating to that instrument. The existing site instrument schedule entries will be deleted (with a strike through line) as part of the project and any new or reused instruments added into the new drawings. As the schedule is still a functioning document the standard check and approval process applies.

6.2.2.4 Drawing Schedule

If a drawing schedule (typically Transmission or Zone Substations) exists for a site, all new drawings shall be added to it. Any equipment removed from service shall be deleted from the schedule either by modifying quantities or placing a line through the entry if all items of that type are removed.

6.2.2.5 RTU Schedule

If an RTU schedule exists for the site then it shall be modified as the project requires.

Any equipment removed from service shall be deleted from the schedule either by modifying quantities or placing a line through the entry if all items of that type are removed.

6.2.2.6 SCADA Schedule

If a SCADA schedule exists for the site then it shall be modified as the project requires.

Any equipment removed from service shall be deleted from the schedule either by modifying quantities or placing a line through the entry if all items of that type are removed.

6.2.2.7 Major/Material Equipment (Primary Electrical Assets) Schedule

Major equipment schedule and rating sheets must include:

- a. the ratings/specification details and the connected ratio for CTs and VTs
- b. summary of ratings/specification details
- c. specific options on synchronising, sensitive earth fault, auto closing etc
- d. to avoid duplication, a site, transmission line or system, shall have only one such schedule.

6.2.3 Layout Drawings

Layout drawings include general arrangements and sections, and shall contain all information, including without limitation, the following:

- a. clearly defined datum points of reference, to which all dimensions, levels or calculations are based, as provided by or agreed with TasNetworks
- b. all equipment and structures
- c. correct dimensions of equipment and structures
- d. clearances between equipment live parts and from live parts to earth
- e. spacing between equipment and between equipment and wall or structure
- f. equipment, structure, roads and building centre line positions reference to switchyard datum
- g. device numbers for all equipment, labelling and correct position of equipment as mounted throughout the site
- h. sectional lines relating the layout drawing with detailed sectional drawings
- i. Buried cable or services routes with GPS coordinates or survey points where required

6.2.4 Assembly drawings

The designer must prepare assembly drawings for all new components to be mounted in enclosures.

Assembly drawings must show for each assembly in the enclosure:

- a. layout of the assembled components showing correct dimensions of components, clearances between components and the component identification number
- b. material schedule showing the component identification number, quantity, textual description, manufacturer/supplier, type/part number and any remarks
- c. label schedule showing the wording, location and label size
- d. where equipment is being removed or mounted on existing panels the designer must mark up the existing layouts with the above information.

6.2.5 Maker's drawings

Typically electronic drawings, which are received from manufacturers, suppliers or makers in their own standard format, which do not depict any integration of their equipment into TasNetworks networks or systems shall have as a minimum a TasNetworks drawing number in accordance with the requirements of the drawing management standard. This number shall be as near to the lower right hand corner of the drawing as possible.

In addition, for schematics and structural drawings, reference to the site where the equipment is to be located shall be made on checked in drawings. Where necessary, a copy of the drawing for each site at which the subject equipment is to be installed shall be made with a unique drawing number.

6.3 Drawing Notes

Where possible and practicable, notes, legends and drawing scales shall be located in the lower right hand corner of the drawing above the original issue title block. Notes shall be sequentially numbered commencing at 1.

6.3.1 Protection Operation Notes on MPOLDS

Notes which relate specifically to protection operation shall be sequentially numbered within brackets, thus (1), (2) etc and be located, where possible and practicable, in the top right hand corner of the drawing, but in any case a different location to the notes referred to in this section.

The bracketed number reference shall be placed within the model space of the drawing against the specific device to which the note relates.

6.3.2 Border Marks

All drawing templates provided, contain pre-set border mark place holders. These are accessible for amendment via the border mark layer and include information outside the drawing border as follows, "CAUTION: printed document is uncontrolled" and the purpose or status of the revision:

- 'Design'
- 'Construction'
- 'As Installed'
- cancelled
- superseded
- information or standard.

Border marks shall be edited by the organisation responsible for the creation or alteration of a drawing.

6.4 Changes to Drawings

All changes to existing drawings shall be generally in accordance with all the requirements previously defined within this standard, in terms of format, content and authorisation.

6.4.1 Altered Drawings

Where existing drawings are altered, the alteration shall be indicated with a "cloud" and the revision and alterations section in the alteration block updated with a brief description and project number.

6.4.2 Cancelled Drawings

The following will apply for cancelled drawings:

- a. all drawings that are redundant as a result of changes shall be identified and the cancellation agreed by TasNetworks
- b. the description field for the alterations section shall contain the word "CANCELLED"
- c. the new revision shall have the word "CANCELLED" placed across the drawing in suitably large and predominant font size relative to the size of the drawing. Refer to section 3.3.1
- d. all metadata to the cancelled drawing from any drawing identified in the EDMS shall be updated
- e. cancelled drawing numbers shall not be re-used under any circumstance
- f. old drawings which are manually drafted, shall not be altered in any respect prior to cancellation.

6.4.3 Superseded Drawings

The following will apply to all superseded drawings:

- a. changes to a drawing, which in its current format is non-compliant with any or all of the requirements of this standard, may result in the drawing being superseded and re-drawn. All drawings that are to be superseded shall be identified and agreed by TasNetworks
- b. the new revision shall have the words "SUPERSEDED BY" followed by the identifier of the successor drawing, placed across the drawing in suitably large and predominant font size relative to the size of the drawing. Refer to section 3.3.1
- c. the description field for the alteration block shall contain the words "SUPERSEDED BY" as well as the identifier of the successor drawing
- d. reference shall be made to the superseded drawing in reference section of the title block of the successor drawing
- e. old drawings which are manually drafted, shall not be altered in any respect prior to superseding.


6.4.4 As Installed Drawings

The following will apply for 'As Installed' drawings:

- a. on completion of the drawing as built additions, a final version showing 'As Installed' information shall be sent to the TasNetworks drawing team
- b. the version shall be taken to the next revision letter, eg issue Rev B shall be updated to Rev C, irrespective of other revisions the drawing may have been given
- c. the final version shall be marked 'As Installed' in the alteration block. TasNetworks will control the document at this version. References to all revisions used in the construction process shall be removed from the drawing
- d. all construction process clouding shall be removed from the final version and the construction sign off block shall be removed.


Appendix A – Drawing Template Layout Example for TasNetworks Designed Drawings

CAUTION : Printed document is uncontrolled.

	1	2	3	4	5	6	7	8	9	10
A										
B										
C										
D										
E										
F										
G										
ALTERATIONS		REFERENCE			TasNetworks PTY. LTD. <small>ABN: 34 961 357 299</small>			<small>© COPYRIGHT – TASNETWORKS PTY. LTD. NO PART OF THIS DRAWING MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM IN ANY FORM, OR TRANSMITTED BY ANY MEANS WITHOUT PRIOR PERMISSION OF TASNETWORKS.</small>		
ORIGINAL ISSUE			DRAWN C JAMES DRAFTING CHECK D WILLIAMS DESIGNED BY A WALTON CHECKED BY P COLEMAN APPROVED BY J GROSS DATE APPROVED 15/12/2015		SUBJECT, SITE_NAME, SYSTEM_OR_STD_LOCATION BAY, CIRCUIT, ASSET_OR_LOCATION DESCRIPTION (OPTIONAL LINE) DWG_TYPE_AS_DERIVED_FROM_DWG_NO. A - BBB - CCCC - DD - EEE			SCALE SCALE A3 REVISION A		
BORDER_MARK_DATE	DOCUMENT_PHASE				Rev. BM_REV	BM_DWG_NO				

Appendix B - Drawing Template Layout Example for Contractor Designed Drawings

CAUTION : Printed document is uncontrolled.

1	2	3	4	5	6	7	8	9	10
A									
B									
C									
D									
E									
F									
G									
ALTERATIONS ORIGINAL ISSUE A. SUCCINCT AND MEANINGFUL DESCRIPTION OF ALTERATIONS PROJECT No. 1723456 DRAWING No. 78910 DESIGNED BY A SD CHECKED BY DF DATE 15/12/2015 TASNWORKS APPD. J. GROSS DATE 15/12/2015		REFERENCE	 TasNetworks	TasNetworks PTY. LTD. ABN: 24 167 357 299 © COPYRIGHT – TASNWORKS PTY. LTD. NO PART OF THIS DRAWING MAY BE REPRODUCED, STORED IN A RETRIEVAL SYSTEM IN ANY FORM OR TRANSMITTED BY ANY MEANS WITHOUT PRIOR PERMISSION OF TASNWORKS.	SCALE SCALE A3 REVISION A				
			SUBJECT, SITE, NAME, SYSTEM OR STD. LOCATION BAY, CIRCUIT, ASSET OR LOCATION DESCRIPTION (OPTIONAL LINE) DWG_TYPE_AS_DERIVED_FROM_DWG_NO. A - BBB - CCCC - DD - EEE						

BORDER_MARK_DATE

DOCUMENT_PHASE

BM_DWG_NO

Rev. BM_REV