



Standard

Drawing Drafting Standard

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Authorisations

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Responsibilities

This document is the responsibility of the Network Asset Data Leader, Tasmanian Networks Pty Ltd, ABN 24 167 357 299 (hereafter referred to as 'TasNetworks').

Please contact the Network Asset Data Team (drawings@tasnetworks.com.au) with any queries or suggestions.

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

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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

Version	Description	Date
1	Original Issue (R383981)	23/12/2015
2	Significant update to reflect changes in business requirements.	8/12/2023

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1. General

1.1 Purpose

This standard defines the drafting requirements for both the creation and revision of drawings that will be used by TasNetworks for managing its electrical network and associated infrastructure.

All drawings, both new and revised drawings, shall be fully compliant with the requirements of this standard.

This standard does not cover the management of these drawing records. The management of drawings records is covered by the Drawing Management Standard.

1.2 Scope

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

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

Please refer to the Drawing Management Standard R393979 for drawing numbering.

1.3 Drawing Software Platform

All new drawings are to be created in the AutoCAD '.dwg' drawing format. They shall be saved in 2018 format.

Existing drawings in MicroStation '.dgn' format may remain in this format, although the preference is for such drawings to be updated to AutoCAD '.dwg' format.

1.4 Definitions

AC: Alternating current.

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

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. Embedding '.gp4' file is not TasNetworks preferred method of developing drawings, however may be included with the approval of TasNetworks' Asset Records team.

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

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.

Cloud: A defined area on a drawing in the shape of a cloud. The cloud indicates a change has occurred to the drawing within the extremities of the cloud.

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' electrical reticulation. 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 CAD file after approval from TasNetworks' Network Asset Data team.

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.

Maker's drawings: Drawings provided by equipment manufacturers for equipment being used by TasNetworks.

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 in any project when required for the purposes of identifying TasNetworks' minimum requirements and not subject to alteration without the approval of TasNetworks' relevant document owner.

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' used as a published version of the CAD drawing.

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

R2613716	Drawing Management Standard
R280697	General Substation Requirements Standard
R2466381	Asset Nomenclature Standard
D-806-0001-SD-001	General Electrical Symbols Drawing
AS1100	Technical Drawing (all parts)

1.6 Drawing Templates

AutoCAD Format

D16/3251	AutoCAD A4 Portrait Border Template
D16/3250	AutoCAD A4 Landscape Border Template
D16/3252	AutoCAD A3 Portrait Border Template
D16/3253	AutoCAD A3 Landscape Border Template
D16/3254	AutoCAD A2 Portrait Border Template
D16/3255	AutoCAD A2 Landscape Border Template
D16/3256	AutoCAD A1 Portrait Border Template
D16/3257	AutoCAD A1 Landscape Border Template
D16/3258	AutoCAD A0 Landscape Border Template

MicroStation Format

D16/3902	MicroStation A4 Portrait Border Template
D16/3901	MicroStation A4 Landscape Border Template
D16/3900	MicroStation A3 Portrait Border Template
D16/3899	MicroStation A3 Landscape Border Template
D16/3898	MicroStation A2 Portrait Border Template
D16/3897	MicroStation A2 Landscape Border Template
D16/3896	MicroStation A1 Portrait Border Template
D16/3895	MicroStation A1 Landscape Border Template

2. 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) Units of measure shall use the SI system. Units shall of measure shall be stated for all values.
- (d) Drawings shall be A0, A1, A2, A3 or A4 size. Preference shall be given to A3 and A1 sized drawings.
- (e) All drawing, with the exception of Maker's drawings, shall use one of TasNetworks approved templates. Refer Section 0 for template details.
- (f) All drawings shall be prepared utilising CAD software. They shall be in a format compatible with AutoCAD 2018, i.e. '.dwg', unless the drawing is a revision of an existing drawing done in MicroStation format, i.e. '.dgn', where it may remain in this format.
- (g) Files in '.gp4' format, where used, shall be embedded within the associated '.dwg' or '.dgn' file.
- (h) All drawing objects, with the exception of dimensions, notes and border templates shall reside on the 'Model space' drawing layer.
- (i) All drawing text, dimensions and border templates shall be on the 'Paper space' drawing layer.
- (j) All equipment abbreviations shall comply with the requirements of TasNetworks standards Asset Nomenclature Standard.
- (k) 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 with objects that are not drawn to scale 'NTS' (Not to scale) in the scale box.
- (l) Once the drawing scale has been determined, all viewports shall be 'locked' to prevent the scale of object sin the viewport being accidentally altered.
- (m) All entities that do not form part of the eventual 'As Installed' drawing shall be deleted.
- (n) 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
- (o) 'Raster images' and external references will not be accepted in drawing unless prior approval has been obtained by the leader of the Network Asset Data team.
- (p) By default, the colours, line types and weights used for all objects on the drawing shall be set by the layer properties, with the 'by layer' attribute set for all objects.
- (q) Units of measure used on drawings shall be those defined by the SI system (International System of Units). e.g. mm, m, kg, kV, kPA etc.
- (r) 'Calibri' true type text shall be used as the font for all text and dimensions in drawings. This includes drawing borders.
- (s) All text on drawings shall be capitalised, with the exception of units of measure which shall use their SI format.

- (t) Abbreviations shall be avoided where possible. Where required, only the abbreviations listed in the Asset Nomenclature Standard and the Power System Safety Rules (Attachment F) may be used.
- (u) Where projections are required on a drawing, third angle projection is to be used for the plan, and any external views such as end views. All sections should be orientated in the third angle where possible but may be placed at the most convenient location on the sheet. The plan and direction of these sections will be depicted by section arrows.

3. Requirements for Specific Drawing Types

3.1 Electrical Schematics

3.1.1 Grids and Snaps

- (a) 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.
- (b) For circuitry drawings, a minimum snap setting of 1.25 mm and multiples thereof must be utilised e.g. 2.5, 5.0 etc.

3.1.2 Symbols on Electrical Circuits

- (a) All electrical drawings shall comply with symbols listed on TasNetworks' General Electrical Symbols drawing D-806-0001-SD-001. If any other symbol is required, its approval for use shall be first requested from TasNetworks.

3.1.3 Identification of Equipment

- (a) 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.
- (b) Refer to TasNetworks Asset Nomenclature Standard (R2466381) for the identification of equipment on Transmission Sites.

3.2 Critical Electrical Schematics

The critical drawings for describing electrical systems within TasNetworks sites (collectively the Operational Information) are the:

- (a) Power Circuit One-Line Diagram (PCOLD)
- (b) The Metering and Protection One-Line Diagram (MPOLD)
- (c) Operational Diagram (OD)
- (d) One Line Diagram (OLD) (Reserved for distribution class drawings only).

3.2.1 Power Circuit One-Line Diagram (PCOLD)

A PCOLD shall show the following information:

- (a) Detail all primary plant (e.g. 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.

3.2.2 Metering and Protection One-Line Diagram (MPOLD)

An MPOLD shall show the following information:

- (a) Detail of primary plant (e.g. 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) All 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) For each site, a separate MPOLD for each MV/EHV voltage is to be produced.

3.2.3 Operational Diagram (OD)

All assets at each site shall be represented on a single OD. The OD shall show the following information:

- (a) All primary plant (e.g. busbar, transformers, switchgear) and their device numbers
- (b) Operational notes (as required)
- (c) Regardless of drafted size, ODs shall be suitable for printing on A3 paper.

3.2.4 One Line Diagram (OLD)

One Line Diagrams 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 in 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 detailing all the major equipment.

3.2.5 Critical Drawing Content Definition

The detail required for all critical drawing types is listed Table 1. The content marked with a tick must be included in the indicated drawing.

Table 1: Critical drawing 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)	✓	✓	✓	✓
Capacitive voltage indicator	✓	✓	✓	
Cable Connection	✓	✓	✓	

Element	OD	PCOLD	MPOLD	OLD
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			✓	✓

3.2.6 Provision for Private Installations

Operational drawings shall show the ownership boundary between TasNetworks assets and those privately owned, in one of the following ways:

- (a) The inclusion of privately owned assets on the drawing.
- (b) By reference to continuation.

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. This decision is influenced by operational and practical requirements.

Private Asset Continuation Reference

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

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

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 a connection agreement”. Changes to these diagrams shall be communicated and discussed with the relevant customer.

3.2.7 General Requirements for Electrical Schematics

All electrical schematics shall comply with the following requirements:

- (a) New equipment shall be shown on the schematic diagram (schematic) once only.
- (b) 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.
- (c) All schematics are required to provide the following information:
 - Devices, device numbers and device terminal numbers

- Device functionality
- Wire numbers
- All terminals and links with each item labelled
- All contacts of the devices and relevant cross references
- Panel cabinet location references
- All DC and AC voltage levels
- Protection trip links and references to trip circuits are required to be clearly shown
- Other related electrical components as required
- All notes and legends as required.

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

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

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

3.2.8 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.”

3.2.9 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 e.g. panel number and terminal number.

3.2.10 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’ drawing or sheet number and these drawing references shall also appear in the reference block in the template.

3.3 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.

3.3.1 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.

3.3.2 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.

3.3.3 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.

3.3.4 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.

3.3.5 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.

3.3.6 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.

3.3.7 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) the summary of ratings/specification details
- (c) specific options on synchronising, sensitive earth fault, auto closing etc

To avoid duplication, a site, transmission line or system, shall have only one such schedule.

3.4 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) 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

3.5 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) The layout of the assembled components showing correct dimensions of components, clearances between components and the component identification number
- (b) The material schedule showing the component identification number, quantity, textual description, manufacturer/supplier, type/part number and any remarks
- (c) A label schedule showing the wording, location and label size

Where equipment is being removed or mounted on existing panels the designer must mark up the existing layouts with the above information.

3.6 Maker's drawings

Maker's drawings shall be received from equipment manufacturers, suppliers in their own standard format. The preference is for these drawings to be provided as a CAD file. Drawings provided in pdf format are acceptable.

As a minimum, the drawings shall be given a TasNetworks drawing number in accordance with the requirements of the Drawing Management Standard. The number shall be placed 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 the drawings.

Where equipment is installed at a specific location, a site specific drawing detailing the equipment shall be created. The drawing shall have a unique drawing identification number.

4. Dimensions

Dimension shall be provided on drawings where required to provide complete definition of a particular drawing object.

The dimensions style is defined in the drawing templates. The dimension styles used must not vary from the predefined styles.

Dimensions shall be either in millimetres, or metres for larger distances. The level of precision shall be as required to cover the needs of the end user.

All dimensions shall comply with the following requirements:

- (a) No dimension relating to an object shall need be deduced from other dimensions
- (b) All dimensions necessary to construct a drawing object shall be shown on the drawing so that there is no need to scale off the drawing to determine a dimension.
- (c) Dimensions shown on drawings shall be in millimetres and they shall be placed parallel and above its dimension line. They shall be arranged to be read either from the bottom or the right hand side of the drawing.
- (d) A chain of dimensions shall be covered by an overall dimension except where dimensional tolerances are of critical importance
- (e) Where practical, dimensions shall be placed centrally between the arrows denoting the limit for the dimension.

Dimension, projection and leader lines shall comply with the following requirements:

- (f) Dimension lines shall not be shown as centrelines or as part of an elements outline. Projection lines for dimensions shall extend from a point not less than 2 mm (A1 drawing) from the surface of the object to a point not less than 2 mm (A1 drawing) beyond the dimension line
- (g) Leader lines, projection lines, centre lines and the like, are to be kept clear of dimension text, if possible, otherwise the clashing line is to be broken to provide an uninterrupted view of the dimension text.
- (h) Leader lines shall commence from either the beginning or end of a note with a short horizontal line before and angled line to the point of reference. The termination of the leader line shall be with an arrow touching the reference object, or with a fully shaded dot within the area being noted.

5. 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 the number 1.

5.1 Operational 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.

5.2 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:

- (a) 'Design'
- (b) 'Construction'
- (c) 'As Installed'
- (d) 'Cancelled'
- (e) 'Superseded'
- (f) 'Information or Standard'.

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

6. New drawings

6.1 Border templates

All new drawings shall be produced using one of TasNetworks' standard drawing templates. The drawing shall be prepared so that all technical information is within the drawing border.

TasNetworks' approved templates borders for are listed in Section 0 and shown in Appendices A to D.

Electronic templates of these borders are available on request through TasNetworks' Network Asset Data team. The format and content of the 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 for all templates.

6.2 Drawing Title Block

For new drawings, the title block provided in the electronic template shall be completed as shown in Table 2.

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

- (a) 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.
- (b) Numbered items shall be avoided whenever possible. However, when required the format of "No. 1" series shall be used. e.g. "No. 1 Circuit", "Road No. 2".
- (c) All names must use the following format 'Initial first name'. 'Last name'.

Table 2 - 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 (R393979).	
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 (R393979).	
References	Reference (drawing numbers and titles) of associated drawings.	
Signoff boxes	To be completed by the relevant authorised internal or external resource. The 'Checked By' and 'Approved By' boxes shall be completed by TasNetworks' employees only.	

6.3 Drawing Content Orientation

Where possible, all drawings larger than A4 shall use a landscape orientation. Drawings for use in standards shall be in portrait orientation.

Pictorial, tabular or graphical drawings.

Landscape templates—the longest edge of the content ‘foot print’ of the drawing shall be parallel with the bottom edge of the template.

Portrait templates (generally A4)—the shortest edge of the content ‘foot print’ of the drawing shall be parallel with the bottom edge of the template.

Maps or geographical representation.

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

Any required deviation from these requirements shall be the subject to agreement by TasNetworks.

7. 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.

7.1 Revision of Drawings

Drawing revisions shall be done in accordance with the drawing revision process defined in the Drawing Management Standard.

A new ‘alteration block’ shall be added for each revision made, including superseded or cancelled drawings. The ‘alteration block’ shall be selected based on the drawing size selected, i.e. A0, A1, A3 or A4 respectively. There are also two version of the alteration block, one for drawing alterations undertaken by TasNetworks, and one for updates undertaken by parties external to TasNetworks.

The correct alteration block used must be and its format maintained. The drawing alteration block TasNetworks can supply this block upon request.

The alteration block shall contain the following information:

- (a) Succinct and meaningful descriptions of the alterations.
- (b) Initials (first and surname) of the personnel responsible for the drafting, design, checking and approval.
- (c) For alteration undertaken by an external party, a TasNetworks approval signature.
- (d) Revision date.
- (e) TasNetworks’ project or job number (Where applicable).
- (f) Where the work has been completed by an external party, the company name and their ABN.

The ‘alteration 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.

A new ‘alteration block’ shall be added for each revision of the drawing. The ‘alteration block’ for the latest revision of the drawing shall be to the right of the alteration block for the previous version.

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

Where existing drawings are marked up due to an alteration being required on the drawing, a 'cloud' may be placed on the drawing to highlight the area where the change has occurred. All 'clouds' must be removed from drawings when the drawing's status is changed to 'As installed'.

7.2 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.

On the latest drawing revision, a superimposed note with the word "CANCELLED AS PER P'*project number*' + W/O'*work order number*'" shall be placed across the drawing in suitable large and predominant font size relative to the size of the drawing.

The font shall be red in colour and set to 'bold'. Refer Section 4.

- (b) The description field for the alterations section shall contain the word "CANCELLED", with a brief description as to why the drawings has been cancelled.
- (c) Cancelled drawing number(s) shall not be re-used under any circumstance
- (d) Old drawings which are manually drafted, shall not be altered in any respect prior to cancellation.

7.3 Superseded Drawings

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.

The following will apply to all superseded drawings:

- (a) 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 8.2.

The font shall be red in colour and set to 'bold'.

- (c) The description field for the revision block shall contain the words "SUPERSEDED BY" as well as the identifier of the successor drawing and a brief description for why it was superseded.
- (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.

7.4 As Installed Drawings

The following shall 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 at Drawings@Tasnetworks.com.au.
- (b) The version shall be taken to the next revision letter, e.g. 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.

7.5 Drawing Sign-off Procedure

All the signature fields shall be completed during the life cycle of any drawing. This process is described in the Drawing Management Standard.

Where a drawing will be issued for construction work, a construction sign-off block shall be inserted into the drawing. This sign-off will be used for the signing off the components covered by the drawing.

This sign-off ensures any 'redline mark-up' information on the drawing, is correct, complete and the drawing is ready for drafting to an 'As-built' status.

The sign-off box shall be as per the format shown in Table 3.

Table 3: Drawing sign-off box

Construction Responsibility	Name	Signature	Company	Date
Civil Representative (Internal or External)				
Electrical Representative (Internal or External)				
Commissioning Manager (If applicable)				
TasNetworks Technical Representative				
Work Order/Project No.				
Drawing records attached to WO in SAP				

8. Formatting Information – AutoCAD (‘.dwg’)

New drawings created in AutoCAD shall comply with the formatting requirements defined in this section. Drawings in MicroStation ‘.dgn’ format shall comply with the requirements of Section 0.

Existing drawings in AutoCAD format issued for modification shall retain its formatting for ease of modification.

Where formatting information is absent on any drawing, then the formatting defined in this section shall be applied.

All text shall use the ‘MTEXT’ format. The ‘TEXT’ format shall not be used.

8.1 General Colour Usage

All lines on the drawing shall have a predetermined weighting based upon their colour assignment. The line weighting shall be as per Table 4.

Table 4: Mapping of AutoCAD screen colour to pen thickness

Screen Colour	Screen Colour Number	Pen Thickness (mm)
Blue	5	0.00
Cyan	4	0.00
Green	3	0.00
Light grey	9	0.00
Mid grey	8	0.00
Magenta	6	0.00
Red	1	0.00
White	7	0.00
Yellow	2	0.00

8.2 Layer and Text Type Usage

Texts for drawing objects shall be as per the weightings and colour assignments defined in Table 5.

Table 5: Pen sizes for text (Device ID)

Equipment	Pen Thickness (mm)	Text Colour	Text Size (mm)
Transformers (Excluding Instrument Transformers)	0.00	Red	5.0
Busbar Identification, Transmission Line Header	0.30	Yellow	3.5
Disconnectors, Circuit Breakers, Instrument Transformers	0.00	White	2.5 for A4 and A3 3.5 for A2 3.5 for A1
All Other Equipment	0.00	White	2.5

A list of standard layers is provided in Table 6. If required, additional layers made be used.

Table 6: Standard layers

Layer	Colour	Line Type
0	White	Continuous
BORDER	White	Continuous
BORDER_HEADINGS	Yellow	Continuous
BORDER_NOTES	White	Continuous
BORDERMARK	White	Continuous
BUSBAR	Cyan	Continuous
CENTER LINES & BASE LINES	Cyan	Center
CONDUCTOR	Blue	Continuous
DEFPOINTS	White	Continuous
DETAILS & SECTIONS	Green	Continuous
EARTHING DETAILS	Cyan	Continuous
EARTHWORK DETAILS & SECTIONS	9	Continuous
EQUIPMENT -11kV	Green	Continuous
EQUIPMENT -22kV	Dark blue	Continuous
EQUIPMENT -33kV	Orange	Continuous
EQUIPMENT -110kV	Red	Continuous
EQUIPMENT -220kV	Magenta	Continuous
FITTINGS	White	Continuous
FOUNDATIONS	White	Continuous
HATCH	Magenta	Continuous
HIDDEN LINES	Mid grey (8)	Hidden
NOTES & DIMENSIONS	White	Continuous
PROTECTION	Yellow	Continuous
REV CLOUD	20	Continuous
WATERMARK	249	Continuous

Table 7: Text sizes and orientations for ‘Superseded’ and ‘Cancelled’ drawings

Drawing Size	Orientation Angle (degrees)		Font Size (mm)
	Portrait	Landscape	
A0	30	60	60
A1	30	60	40
A2	30	60	30
A3	30	60	20
A4	30	60	14

8.3 Operational Drawing Requirements

All operational drawings e.g. OLDs, MPOLD etc., shall use the following pen colours and associated line thickness for equipment shown in Table 8.

Table 8: Line colours, weights and types for electrical equipment.

Equipment	Line Colour	Line Thickness (mm)	Line Type
Busbars	Cyan	0.30	Continuous
Transmission Lines, Feeder Lines, Transformers, Capacitor Banks (excluding CT & VT)	Red	0.00	Continuous
Isolators/Disconnectors, Circuit Breakers, Instrument Transformers, (CT & VT) and all other auxiliary equipment	Yellow	0.00	Continuous
Future Bays or Equipment	White (Dashed)	0.00	Dashed
Transformer Winding/Tapping Pole ID	White	0.00	Continuous

9. Formatting Information – MicroStation (‘.dgn’)

Existing drawings in MicroStation ‘.dgn’ format shall comply with the requirements defined in this section.

When exiting drawings are being revised, the new version shall be a ‘.dwg’ export of the original MicroStation ‘.dgn’ drawing, with the original formatting retained. Where formatting information is absent on any drawing, the formatting requirements defined in this section shall prevail.

9.1 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 9.

Table 9: Mapping of Screen Colour to Line Weight

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

9.2 Layer and Line type Usage

The layers to be used for MicroStation format drawings are listed in Table 10. The layers have been categorised based on their purpose.

Table 10: Levels, description and working space

Levels	Description	Working Space
0	Default – create symbols and block	Model Space
Civil	Civil foundation details including footings, plinths, retaining walls and batters	Model Space
Site	Survey contours/gridlines, Finished Surface Levels, easements, subdivision lots, private easements	Model Space
HV cables/conductors	Cable and conductor layout	Model Space
LV cables/conductors	Conductor and cable layout	Model Space
Earthing arrangement	Earthing rods, grid and interconnection	Model Space
Equipment assembly	All equipment Critical Design Information (CDI)	Model Space
Text	Notes, description of components	Sheet Space
Dimensions	Dimensions of components	Sheet Space

Levels	Description	Working Space
Borders	Template border, heading, revisions, sign offs and company logos	Sheet Space
Clouds	'Construction' modifications are to be clouded for identification	Sheet Space
OLD	Single line diagram and general schematics	Model Space
Hatching	Patterns and hatching for all equipment and layout types	Model Space

Table 11: 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 12: Text Heights

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

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