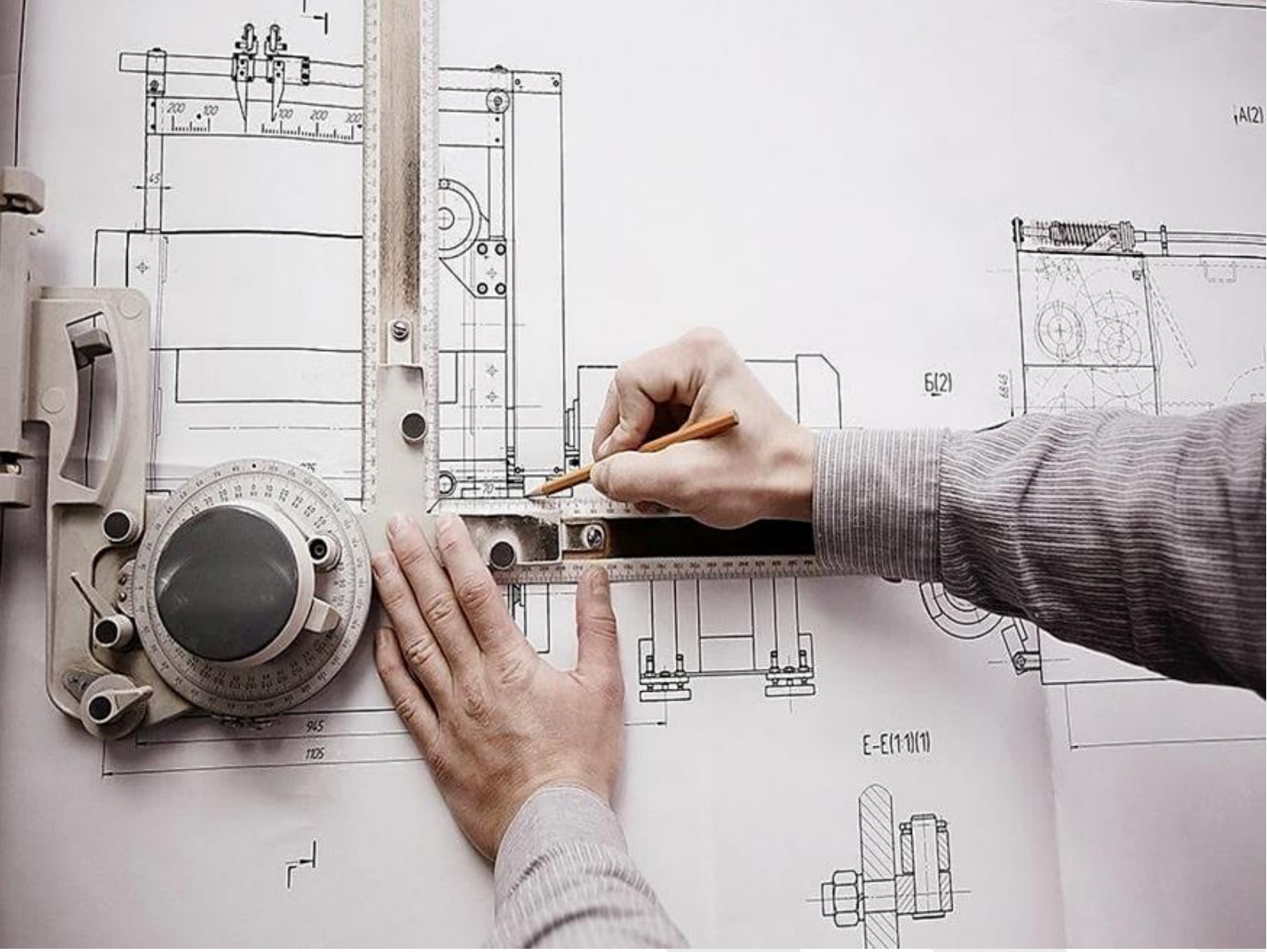

Technical Standard - TS099

Distribution and Sub-Transmission CAD Drafting Standard

Published: 21 July 2022

SA Power Networks

Empowering South Australia

Revision Notice:

Date	Details	Author	Authorised
21 July 2022	**Removed:** • Section 3: Grace Period **Minor Updates:** • Section 5: Access to AutoCAD Templates and Files • Section 6, dot point 40. • Section 7.22: Pole Schedules • Section 11.1: AutoCAD Map 3D Drawing Software **Added**: • Section 11.3: Smart Asset Schedule App (SAS App)	A. Pradhan A. Butler	M. Napolitano

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1. The purpose of this document is to set out standards with which equipment connected to the SA Power Networks electricity distribution network must comply to facilitate the safe and effective operation of the distribution network. However, SA Power Networks makes no representation of any nature that the fact customer or generator equipment complies with these standards means that the equipment will be suitable for a particular customer's or generator's needs and electricity requirements. Each customer/generator must seek its own advice as to these matters from licensed electricians or other suitably qualified professionals and is solely responsible for ensuring the equipment installed at its premises is suitable for the use the customer or generator wishes to make of that equipment.
2. This document is subject to change from time to time.
3. Nothing in this document constitutes endorsement of any third-party product or service. As noted in paragraph 1 each customer and generator must make their own assessment of the suitability for their needs of third-party products and services and seek appropriate professional advice.

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Contents

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1. Purpose

This technical standard describes and provides guidelines to ensure a consistent approach to the preparation of standard design drawings and the use of standard symbols for the SA Power Networks electrical distribution and sub-transmission up to and including the 66kV network.

It also includes details of the processes and methods to ensure effective version control and access and security of design documents using Autodesk Vault.

The application of this standard will result in all network drawings being of a uniform appearance, professional standard, and securely stored.

2. Scope

The specifications in this technical standard are applicable to all electrical and civil design drawing works, for any installation, that will become a component of SA Power Networks infrastructure.

This includes internally and externally produced design drawings detailing the construction or maintenance of overhead and underground distribution, sub-transmission, and public lighting infrastructure.

This technical standard is limited to installations external to any substation boundary.

3. Deviation from this Standard

Deviation from any specific requirement(s) of this Standard will only be permitted with the written approval of SA Power Networks Network Standards Manager (NSM).

Contact 'Standards and Equipment Team' via Hotline (08) 8404 4200, and or send an email to: networkstandards@sapowernetworks.com.au

4. Intellectual Property

If anyone wishes to utilise SA Power Networks specification for a design that is not being vested to SA Power Networks, then they shall request written approval from SA Power Networks Network Standards Manager (NSP).

A charge may apply for the use of SA Power Networks drawings or templates for the design or construction of assets not intended to be vested to or constructed for SA Power Networks.

Contact 'Standards and Equipment Team' via Hotline (08) 8404 4200, and or send an email to: networkstandards@sapowernetworks.com.au

5. Access to AutoCAD Templates/Files

SA Power Networks provides access to standard line design drawing templates, AutoCAD drawing palettes, and associated blocks etc., as well as instructional materials, training files, and user manuals, via its secured internet **Contractors External SharePoint site**. This will assist designers to produce a drawing file that complies with the requirements of this standard and is compatible with SA Power Networks systems.

Contractors are advised to obtain and maintain a correct version of AutoCAD Map 3D software, and ensure they have the latest version of SA Power Networks templates and files.

Note: If you are not an approved external designer, and need access to the **Contractors External SharePoint site,** please forward your request email to networkstandards@sapowernetworks.com.au.

Refer to Appendix A of NICC401, for further details.

SA Power Networks internal designers shall have access via Customer Solutions intranet website. Browse 'Resource Centre', then under heading 'Training Material/User Manuals', click Line Design CAD and access all 'AutoCAD and PLS-CADD, How to Guides, Symbols/Palettes'.

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6. Standard Drawings - Minimum Requirements

Drawing content requirements are to be established during the project planning phase to ensure that the drawing will appropriately meet project delivery and record-keeping requirements.

SA Power Networks may specify the requirement for a high precision 'As Constructed' drawing to be prepared for specific projects if recording of higher precision/more detailed asset location information is deemed pertinent. This is more likely to be required for works involving the installation or alteration of high priority/high value assets (eg 66kV), assets in heavily utilised areas, and/or cables and conduits installed with significant lengths of directional boring. Refer to **Section 7.20** and **Appendix B** for further information on high precision 'As Constructed' drawings.

Drawings shall, as a minimum, contain the following:

1. Drawing number (SA Power Networks Notification number).
2. Sheet Numbers (All sheets bearing the same drawing number must be uniquely numbered and have main index/overview sheet indicating sections covered by relevant sheets. Refer to **Section 7.10** and **Appendix C**, for more details).
3. Customer/Project name and project address.
4. Designer name and logo, if not SA Power Networks. External designers shall add their company logo to the standard template to identify the origin of the design. External designer's logos should not be embedded within SA Power Networks title block but be included as a part of the drawing. Refer to **Section 7.25**, for more details.
5. North Point. Drawings are to be oriented such that 'North' is towards the top of the sheet where practicable, or within 90 degrees left.
6. Bar scale and written drawing scale for the main drawing frame on each sheet.
7. Roads with road names labelled, or distance and direction to nearest roads noted.
8. Property boundaries with street numbers or lot numbers where available.
9. Plan parcel identification numbers (country areas).
10. Suburb/Town name/Hundred (country areas).
11. Specify reference to 'Distribution Design Templates (DST)' as well as the 'E-drawing' numbers for public lighting, overhead construction assemblies, specific service pits/pillars etc on the design drawing.
12. Standard notes to conform with the purpose of the drawing.
13. Feeder plan and substation references (eg Happy Valley Substation, SSD-210, Aberfoyle West Feeder PN-210C).
14. Map Grid of Australia Zone number.
15. Grid reference co-ordinates for lower left/upper right corner of project location.
16. South Australian Topographic Map reference.
17. Adjoining sheets and reference drawings noted.
18. Cross sections where necessary to give trenching and conduit use details.
19. Easement dimension detail plans.
20. Customers confirmed maximum demand current, where applicable.
21. Asset Owner.
22. Bush Fire Risk Area.
23. Earthing type - Localised CMEN, CMEN, MEN or SWER.
24. Transformer details showing high and low voltage Single Line Diagram (SLD) arrangements (Padmount Transformers only).
25. Drawing status eg 'For Construction' etc.
26. Constructor details and construction completion date.
27. Dimensioned positions and alignments of installed or altered SA Power Networks assets and identification of abandoned and removed assets (on 'As Constructed' drawings).
28. Revision's block containing Revision Identifier, Description, Reviser and Revision Date.

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29. Detailed asset information. The following is a general list of information that shall be provided using notes, labels, and legend items, where applicable:
    (a) Existing and proposed device stock item numbers and network identification numbers (for transformers, switching devices, voltage regulators, capacitors etc).
    (b) Phase sequence details for overhead and underground power lines.
    (c) Pole top line attachment geometry and attachment height; pole height; and pole stock item numbers.
    (d) Presence and position of earth/neutral wires or cables with installed/altered HV overhead lines.
    (e) Distance from pole top (or identified as underground).
    (f) Earth/Neutral conductor types, sizes, and counts.
    (g) Design temperature and line rating, for overhead lines.
    (h) Source phase identification for single/three phase devices/equipment.
    (i) Underground cable types including:
        - Cross-sectional area per core, number of cables, number of cores per cable (eg 300mm^2 3x1c)
        - Conductor material (eg Aluminium)
        - Insulation type/construction (eg XLPE / HDPE, PLYHDPE)
        - Stock Item Numbers
    (j) Overhead conductor types including:
        - Stranding and wire size (eg 7/3.75, 30/7/2.75)
        - Conductor type (eg ACSR/GZ 1350, AAAC 1120, SC/AC)
        - Insulation/covering details if applicable (eg ABC, CC, CCT)
        - Stock Item Numbers
    (k) Pit and pipe types.
30. Clear depiction of the intended final LV and HV electrical configuration including:
    (a) Cable and feeder/conductor connections to switches, transformers, cubicles, voltage regulators, capacitors, and other operational devices.
    (b) Service connections and LV mains arrangements at affected/pertinent switches, transformers, cubicles, and specifically connections at either side of proposed LV open points.
    (c) Switching device/connection states (open/normally open/closed/fused (specify size)/ solid links inserted/closed to earth etc).
31. Switching Cubicle details showing High Voltage or Low Voltage SLD arrangements.
32. Sheet size.
33. Units (Metres or Millimetres).
34. Access permits points and extents of contractor and SA Power Networks works.
35. Development Number and Development Name, where applicable.
36. Name of the relevant SA Power Networks Project Manager.
37. Cable pulling and/or conductor stringing tension tables, where applicable.
38. All other applicable drawing sheet fields completed.
39. Record clearances, depths, and alignments for third party assets crossing or adjacent to installed/altered SA Power Networks assets. Refer to **Section 7.24**, for more details.
40. The latest SA Power Networks Title Block available via the **Contractors External SharePoint site**. Refer to **Section 5**, for more details.
41. Standard SA Power Networks Line and Device Symbols. Refer to **Sections 5**, and **10**, for more details.
42. Details to ensure correct construction around third-party assets, including service locations and required clearances. Refer to **Section 7.24**, for more details.
43. Standard correct version of AutoCAD templates, Map 3D software/tools etc, Refer to **Section 5**, for more details.

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7. Standard Drawings - Specific Requirements

7.1 Drawings Template

All drawings covered by the scope of this standard shall be created using the current SA Power Networks drawing template 'LD-Template.dwt' and use the appropriate associated drawing sheets.

For access to AutoCAD templates/files, refer to **Section 5**, for more details.

7.2 Fonts

SA Power Networks uses multiline text and standard ISO fonts for all text on construction drawings. Fonts and text should comply with the requirements of AS 1100. Many standard fonts are accessible via the Symbols palette (Refer to **Section 5**, for more details). These fonts are assigned their own specific layer.

7.3 Notes

General notes shall be included on the drawing detailing the scope of works to be undertaken by responsible parties for the project. Network Access points should be numbered and detailed. 'Notes' regarding the layout of the project and any applicable standards should also be included.

7.4 Main Layer Colours

SA Power Networks utilise many standard colours to represent specific voltages and asset types. All colours are defined in the standard layers' tables. Refer to **Section 5**, for more details.

All electronic and hard copy drawings shall be issued in colour.

Note that due to the large number of different lines colours and styles, users are encouraged to add a label to lines if considered necessary.

7.5 Scaling

SA Power Networks utilise annotative scaling to allow the display of symbols, text, and other annotative objects at various scales in each viewport. The standard scales listed in **Table 1** are preferred for the display of plan drawings.

Table 1 - Preferred Standard Scales

Nos.	Scale	Application
1	1:50	for detailed enlargements of underground installations
2	1:100	for detailed enlargements of underground installations
3	1:500	for underground installations
4	1:1,000	for overhead and underground
5	1:2,000	for Urban
6	1:2,500	for Urban
7	1:5,000	for Rural
8	1:10,000	for Rural
9	1:20,000	
10	1:25,000	

Use of other scales may be considered by SA Power Networks if required to support specific project requirements. Inset views and 'Not to Scale' (NTS) views may be used as appropriate and clearly indicated as required.

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7.6 Drawing Units

Drawing units shall be used as per the **Table 2**.

Table 2 - Drawings Units

	Type	**Decimal**
Length	Precision	0.000
	Units	Metres
Angle	Type	Decimal Degrees
	Precision	0
	Insertion scale	Millimetres
	Intensity of Photometric Lighting	Generic
Base Angle	East	0.00

7.7 Coordinates and Measurements

Coordinates and measurements are to be provided in metre using two decimal places as per the following examples. The applicable unit of measurement (Metres) must be specified on each drawing sheet.

1. Coordinate Labels: E281062.77, N6132600.60, EL60.25
2. Coordinates (Tabulated): 281062.77, 6132600.60, 60.25
3. Dimensions and Chainages: 12.75

7.8 External References (Xrefs)

External references (Xrefs) are permitted to be used on SA Power Networks drawings in a limited number of circumstances. Generally, this should be limited to the following types of drawings:

1. Projects with very large land base/reference file sizes which may cause issues during the Vault check in process.
2. Complex, long term infrastructure type projects that may have numerous land base/reference data changes over the life of the project.
3. Projects that may require multiple designers to create drawings using a single source of land base/reference data.

External references may be used, where the geographical project area requires multiple sheets to cover the extent of the project.

For drawings that have been created outside of SA Power Networks Vault environment; for example, drawings created by external designers without access to the Vault, the following is required:

1. Any externally referenced drawing that captures the drawing data of another drawing using the AutoCAD Xrefs method, must use the 'relative path' method, explained below.
   (a) Set an Xref Path to be Relative (not Absolute)
   (b) Display the External References palette.
   (c) Display the path options using one of the following methods:
   - In the File References pane, right-click the reference name.
   - In the Details panel, click the Browse button.
   - In the External References toolbar, click the Change Path button.

   Select one of the options, ie Path Make Relative.

   (a) Sets a path that assumes the current drive letter or the folder of the host drawing. Note that, Relative Path method is only effective, if the drawing and the referenced file are stored on the same drive.
2. When supplying drawings to SA Power Networks, all drawings referring each other must be supplied as a set.

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3. Drawings with external references, that will not resolve, when opened by AutoCAD will be deemed non-compliant and will not be accepted.

7.9 Embedded Objects

Object Linking and Embedding (OLE) may be utilised, if necessary, to display design details. However, preference should be given to use of standard SA Power Networks objects if they are available. OLE objects should only be the embedded not linked.

7.10 AutoCAD File Naming

The file naming format for AutoCAD (*.dwg) files for line and feeder design drawings must comply with the strict naming conventions detailed in this standard. Any other file that is associated with the drawing file and is intended to be checked into the SA Power Networks Vault, must also comply with these naming conventions.

This includes:

1. Files created from the AutoCAD drawing, such as Adobe PDF files
2. Photographs attached to the drawing
3. Spreadsheets attached and referenced by the drawing

Refer to **Appendix C** for details of the file naming conventions.

7.11 Multiple Work Sites

Drawings that detail construction work at more than one work site should be split over separate sheets. This requirement ensures that drawings can be easily located and retrieved from SA Power Networks GIS systems.

As a guide, multiple work sites that are more than 200m to 300m apart should be placed on separate sheets.

However, designers are encouraged to create multiple drawings sheets when it will assist with the construction (if construction is likely to be completed at or over staged / longer time periods or greater detail) and management of the project and archiving of the 'As Constructed' drawings. References to other sheets in a series should be included on each sheet. Consideration of a summary page to show multiple sites should also be considered.

7.12 Standard Projections

Drawing land base data shall be geographically oriented to the 'Geocentric Datum of Australia (GDA)' with the correct 'Map Grid of Australia (MGA)' Zone projection, for the area of South Australia. SA Power Networks current land base data is to be GDA2020. Designers must ensure that the correct datum is utilised and noted on the drawing. This is importance if coordinates are displayed on the drawing.

Refer to the following websites for more information:

1. https://maps.sa.gov.au/SAPPA/
2. https://www.icsm.gov.au/

For most SA Power Networks drawings, the Zone will be 54 for projects east of Longitude 138°, or a line through Port Pirie. Project's west of this line will be Zone 53.

The **'LD-Template.dwt'** is configured to default to Zone 54. The drafter shall ascertain the correct zone before commencing the drawing and assign this zone in AutoCAD Map using the 'Map Setup' function. All coordinates displayed on the drawing shall be expressed as Eastings and Northings.

Use of the SA Power Networks *Custom Tool > SAPN Locate* will automatically assign the correct Map Zone. The project Map Zone and extent coordinates shall be entered in the standard drawing sheet title block. Note that the default Zone 54 projection can be changed within AutoCAD.

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7.13 Standard Layers Tables

SA Power Networks uses dedicated layers for each specific line styles, fonts, and symbols. Access to symbols and lines etc from SA Power Networks standard palettes ensures that components are automatically inserted on the correct layer.

The use of layer display should be used to control the appearance of the final drawing. Several predefined layer filters are also included to allow simple control of these layers. Refer to **Section 6**, for more details.

7.14 Standard Line Styles

SA Power Networks uses the standard line styles in drawings. These line style descriptions are also the standard legend descriptions which are to be modified to meet specific asset description requirements.

Where there may be confusion between line styles, a label shall be placed on the affected line style to clarify it, eg add label 'Proposed ABC low voltage'. For the following types of line styles, refer to **Section 5**, for more details:

1. Overhead Lines Styles
2. Underground Lines
    (a) Proposed cables Lines Styles - 11kV, 7.6kV and LV
    (b) Proposed or Existing Cu Cables Line Styles
    (c) Proposed or Existing 19kV, 33kV and 66kV cables
    (d) Existing 11kV, 7.6kV, LV, Pilot and Fibre cables
    (e) 11kV, 7.6kV and LV cables to be Abandoned
    (f) Abandoned cables
    (g) Miscellaneous Line Styles

7.15 Standard Drawing Symbols

SA Power Networks uses standard drawing symbols/blocks in drawings. These symbol descriptions are also the standard legend descriptions which are to be modified to meet specific asset description requirements. For the following types of symbols, refer to **Section 5**, for more details:

1. Overhead Network Symbols
2. Underground Network Symbols
3. Public Lighting Network Symbols

7.16 Blocks

SA Power Networks have developed numerous standard AutoCAD blocks for underground and overhead drawings. For access to Blocks, refer to **Section 5**, for more details.

The majority of the standard symbol blocks are dynamic and include some of the following functions:

1. Visibility states
2. Auto-align functionality
3. Dynamic grip rotation
4. Graphical wipe-outs
5. Polar stretch (selected symbols)
6. Polar stretch construction grid
7. Editable attributes
8. Annotative scaling

These functions improve the functionality of the blocks and reduce the overall number of individual blocks that are required.

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Poles, and symbols that are allocated a device number (Load Switch, Padmount Transformer etc) have editable attributes which can be accessed by double clicking on the block. These functions should be used to ensure a standard format.

7.17 Stamps and Tables

Several standard stamps and tables have been developed and are available (Refer to **Section 5**, for more details) to display standard information in a uniform format, they are listed as below:

1. Standard Position of Service Pillar/Pit Stamp
2. Bushfire Risk Stamp
3. Earthing Stamp
4. General Notes Stamp
5. Cable Reference Stamp
6. LD Maximum Demand Stamp
7. LD Maximum Demand Multi Stamp
8. Railway Crossing Stamp
9. Transformer and Switching Cubicle Layout - Stamp
10. Stringing Tension and Cable Pulling Tables
11. Pole Schedules Table

Designers should include standard SA Power Networks stamps and tables whenever applicable and appropriate to the status of the drawing to provide a consistent appearance.

For most projects, the drawing should contain the following stamps as a minimum, with applicable details completed.

1. LD ENERGISE DATE
2. LD MAX DEMAND
3. LD EARTHING
4. LD GENERAL NOTES

7.18 Land Base

Land base reference data shall not be moved from its original geographical position within the model. This requirement will maintain the integrity of the geo-referenced data within the drawing.

Different views of the same location shall be created using a combination of viewports and layers, wherever possible. This applies particularly for projects with before and after components, such as 'Power Line Environment Committee (PLEC)' projects.

If it is not practicable to achieve alternative portrayals of an area through use of layers and viewport settings (eg Inset enlargements), then use of separate DWG files is recommended. For example, it may be necessary to create a separate sheet and DWG file to depict detailed 'As Constructed' enlargements at a larger scale, in their correct geographic locations, without compromising the main design. All drawings sheets shall be numbered as stated in **Section 7.3** and **Appendix C**.

The use of 'External References (Xrefs)' data for subsequent sheets is encouraged. Refer to **Section 7.8** and **Appendix C.5**, for more details.

7.19 Trench Cross Section Details

For projects that involve trenching, the required arrangements should be detailed using the standard SA Power Networks trench cross section block. The actual completed trench details shall be included on the 'As Constructed' drawing.

The occupancy of each conduit must be specifically detailed and confirmed/updated upon production of the 'As Constructed' drawing. Refer to TS085, for more details.

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7.20 Directional Boring Requirements

'Preliminary' or 'For Construction' drawings depicting underground directional bores are to include references to the applicable Technical Standards and project-specific bore requirements including proposed section diagrams, longitudinal sections, and other details as necessary to describe the work required.

A standard SA Power Networks section diagram block is available and may be applicable to some proposed works (refer to an example in **Figure 1**).

'As Constructed' drawings for installations incorporating directional boring are to include section diagrams, longitudinal sections, bore logs and other detailed information to comprehensively describe the assets and record their precise locations and depths.

A high-precision drawing (as described in **Appendix B**) may be required to sufficiently record assets installed in directional bores.

The level of detail required is to be determined by SA Power Networks Project Manager and established with all relevant parties prior to commencement of works. Refer to **Appendix B** for further information on recording directional bored installations.

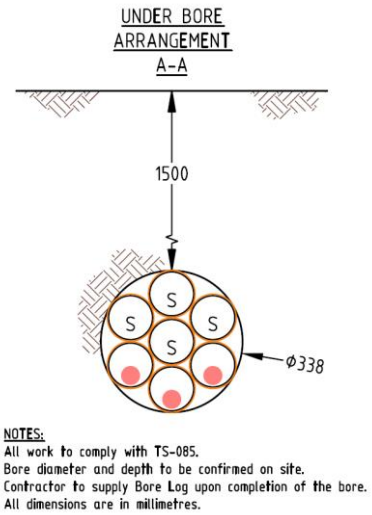

Figure 1 - Example of 'Under Bore Block'

7.21 Easements

Any drawing that details installation of proposed infrastructure on private property shall include details of the required easements, using the standard SA Power Networks easement blocks, layers, and line styles.

Refer to Easement Standard TS102 for specific details.

7.22 Pole Schedules

For Line Designs the required arrangements are detailed in the SA Power Networks **Smart Asset Schedule (SAS App).** For instructions on how to use the **SAS App** refer to the training material provided in the **Contractors External SharePoint site.** Refer to **Section 5.0** and NICC401 for the details.

Pole schedules must be attached to drawings as embedded spreadsheets, as noted in **Section 7.9**. Embedded spreadsheets must be in MS Excel format and of a version that is compatible with SA Power Networks current version of AutoCAD Map 3D. As a minimum embedded pole schedules shall contain same information as an example in **Appendix E.3**.

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For 66kV project works, depending on the extent or works done, a 'Master Pole Schedule' and 'Master Layout Design' may be requested by Network Planning to be completed once 'As Constructed' drawings are supplied. The pole schedules will also be separately provided in MS Excel format.

For PLEC project works, a 'Modified Pole Schedule' may be provided by the SA Power Networks Project Manager.

7.23 Overhead Line Profiles

For some projects it may be beneficial to include a vertical profile and/or plan view of the line route on the drawing, showing conductor attachment heights, ground clearance and side swing at the applicable operating temperature.

The requirement for a profile should be determined by the relevant SA Power Networks Project Manager at the commencement of the project. Projects requiring clearance to critical areas, such as vegetation in bush fire areas, high load corridors, transmission lines, airports or complex projects are examples that may require a profile. Refer to **Section 11.2**, for more details.

7.24 Additional Construction Information

Where appropriate third-party service locations shall be added to the drawing. The designer should add additional section views, plan views, and notes as required to clearly explain critical construction dimensions to third-party assets and detail non-routine construction requirements.

Examples of this, but not limited to are critical dimensions between third-party assets and pole footings, cables, installation of footings at greater depth than standard, notes to positively locate services on site, other additional information etc.

7.25 External Designer Logos

External designers shall add their company logo to the standard template like the example shown in **Figure 2**. The details should include the entity name, address, and any applicable contact details. **Note**: Do not modify the Title Block layout or logos. External designer logos must be inserted in the drawing as separate elements to the title block.

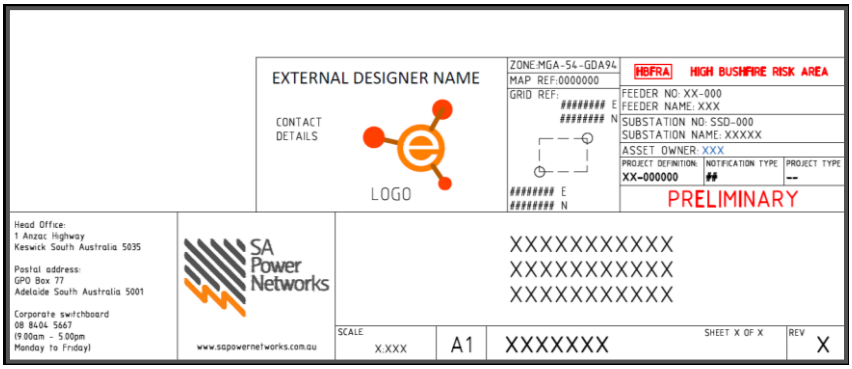

Figure 2 - Example External Designer Logo Placement

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8. Standard Format

8.1 Electronic File Format

The CAD design drawing files which will be supplied to us shall be in SA Power Networks current version AutoCAD Map 3D format.

Externally created drawing files shall be transferred to SA Power Networks as specified in **Section 15** using the AutoCAD standard function, eTransmit, to ensure that all associated files are included.

8.2 AutoCAD Layering and Styles

The AutoCAD file shall be compatible with SA Power Networks systems and processes including checking, verification, archiving, analysis, and planning requirements.

The drawing format, layers, styles, symbology etc shall comply with all requirements specified in this standard.

We reserve the right to reject any outdated, non-compliant or non-compatible design data and to require revision and re-submission of the data in a form acceptable to us in compliance with this technical standard. Refer to **Section 5**, for more details.

9. Distribution Standard Templates (DST) and E Drawings

The design shall be in accordance with specific Distribution Standard Templates (DST) and/or E-drawings to ensure that the correct assembly is ordered and installed. Therefore, relevant DST and/or E-drawings shall be referenced on the design drawing. Refer to **Section 5**, for more details.

The design shall specify E-drawing numbers for public lighting, overhead construction assemblies, specific service pits / pillars etc on the design drawing.

Non-Standard Special Purpose E-drawings (E-SP) require approval from the Network Standards Manager (NSM) or delegate before they can be included in any design. The approval date and by whom, shall be included in the notes or Pole Schedule.

10. Standard Drawing Sheets

10.1 Layout Tabs

All drawings covered by the scope of this standard shall be created using the current SA Power Networks template 'LD-Template.dwt' and use the appropriate associated drawing sheets.

Designers shall ensure that they have a current version of the drawing template before commencing drafting. Refer to **Section 5**, for more details.

The 'LD-Template.dwt' template contains preconfigured layout tabs with SA Power Networks drawing sheets. It also contains legend title blocks for each type of symbol block and line style. The 'LD-Template.dwt' contains layout tabs for 9 sheet sizes as listed in **Table 3**.

Table 3 - Standard 'LD-Template.dwt' - Sheet Sizes Layout Tabs

Nos.	Sheet Sizes Layout Tabs for Standard Projects
1	A4
2	A4V
3	A3
4	A3V
5	A2
6	A2V
7	A1
8	A1V
9	A0

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Each layout contains a configured drawing sheet title block, a design viewport, a legend viewport, scale bar, north sign and 37 editable attributes and a variable number of revision attributes.

The designer shall ensure that all attribute fields are completed with accurate information, as applicable. The drawing sheet title blocks contain several automated functions which only work correctly when using SA Power Networks standard LD AutoCAD build. If necessary, these fields can be completed manually.

All unused layout tabs (drawing sheets) within the drawing shall be deleted as soon as the initial drawing has been created. Refer to **Appendix E** for 'General Design Drawing Presentation Examples'.

10.2 Standard Editable Attributes - Drawing Sheet

Each sheet contains numerous editable attributes to allow entries of standard information into the sheet. Various attributes are searchable within SA Power Networks Vault file server. All attributes allow the simple entry of data in a standard format and location. Refer to **Appendix D**, for more details.

11. Standard Drawing Software

11.1 AutoCAD Map 3D Drawing Software

AutoCAD Map 3D is SA Power Networks standard CAD package for all drawings covered by the scope of this standard. The Line Design (LD) AutoCAD package includes a suite of custom palettes to provide access to standard SA Power Networks line styles and symbols. It also includes Autodesk Vault, which provides a secure drawing management system for all Customer Solutions drawings. Refer to **Section 5**, for more details.

All drawings covered by the scope of this standard shall be created using the current templates available at SA Power Networks secured internet website at **Contractors External SharePoint site.** Approved external designers will need login and password, for organising access, please contact 'Standards and Equipment Team' via email to: networkstandards@sapowernetworks.com.au. Refer to Appendix A of NICC401, for further details.

11.2 PLS-CADD Overhead Design Software

PLS-CADD is SA Power Networks standard overhead line design package. All internally designed SA Power Networks overhead line designs shall be completed using the Network Management build of PLS-CADD.

SA Power Networks preference is that all externally designed overhead line projects are completed using SA Power Networks current version of PLS-CADD. For PLS-CADD designed projects, a copy of the 'filename.bak' file shall be provided to the relevant SA Power Networks Project Manager for archiving on completion of the project.

For non-PLS-CADD designed projects, a *.pdf and or *.dwg copy of the line profile will be provided. In any case, full conductor design and tension details shall be provided.

11.3 Smart Asset Schedule App (SAS App)

The **Smart Asset Schedule App (SAS App)** is SA Power Networks web-based method of recording the design pole schedule details. The access to the web application will be provided to all designers registered as per **Section 5** and NICC401.

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12. Drawings Issuing Process

It is the designer's responsibility to ensure that all relevant parties are in receipt of the latest design information and drawings throughout the life of the project.

12.1 The Designer's Role

Upon revision of the design drawing, it is the designer's responsibility to ensure that the design drawing is issued to all relevant parties.

SA Power Networks internal designers are to issue drawings as per SA Power Networks existing internal procedures and forward 'Safety in design/Life cycle safety' documentation to the relevant Project Manager/Construction teams.

External designers are to issue drawings as specified below:

1. Forward a hard copy or PDF file at the 'Preliminary' Stage to the relevant SA Power Networks Officer responsible for management of drawings.
2. At the 'For Construction' and 'As Constructed' stages, forward electronic copies to the relevant SA Power Networks Officer responsible for management of drawings (DWG + PDF copies).
3. Forward copies appropriately to all other relevant recipients in their required quantities and formats.
4. Electronic drawing files shall be lodged with the relevant SA Power Networks Officer responsible for management of drawings via email, USB and/or other data storage devices, unless otherwise specified.
5. SA Power Networks Network Project Officer or Project Manager, who is interacting with or engaging an external designer shall fulfill the role of distributing drawings.
6. For more details, refer to **Appendix A**.

12.2 The Project Manager's Role

It is the relevant SA Power Networks Project Manager's responsibility to ensure that the internal design drawings are to be managed and issued according to SA Power Networks internal procedures and that the external design drawings are to be issued as specified below:

1. Preliminary drawings - DWG format drawings are to be lodged with SA Power Networks Facilities Records Team via SA Power Networks 'Autodesk Vault' lifecycle process.
2. During the 'For Construction' and 'As Constructed' phases - DWG format drawings are to be lodged via SA Power Networks 'Autodesk Vault' lifecycle process, upon each drawing revision.
3. Hard copies are to be issued to the Compliance Coordinator at the 'As Constructed' stage.
4. For more details, refer to **Appendix A**.

13. Drawings Requirements to Project Phases

The designer shall ensure that all relevant parties shall be in receipt of the latest design information and drawing throughout all phases of the project (ie Preliminary, For Construction and As Constructed phases), including all revisions made during these phases.

Design changes shall be clearly and promptly communicated as described in **Section 15** to ensure that all relevant parties are informed. Use of an outdated, incorrect, or unapproved design may result in equipment ordering and installation errors, increased risks, introduction of life-threatening hazards or significant additional cost variations.

The designer shall prepare the electrical design layout in a form acceptable to SA Power Networks and in accordance with SA Power Networks standards, E-drawings, and other relevant specifications.

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13.1 Preliminary Phase

The initial drawing that needs to be submitted to the relevant SA Power Networks Project Manager shall be marked as a 'Preliminary'. By default, this status is included in every drawing sheet of the 'LD-Template.dwt'.

Preliminary drawings must be thoroughly checked by a suitably qualified designer before they are issued. The checkers name shall be included on the title block.

13.2 For Construction Phase

Internal design drawings are to be managed and issued according to SA Power Networks internal procedures. The external designer can issue a 'For Construction' design, only upon receipt of the 'Specification Compliance' from SA Power Networks. It is the responsibility of the design contractor to ensure that all the SA Power Networks specification requirements have been met. The 'Specification Compliance' confirms the requirements, the design specification, TS100, TS110, TS085, and any other individual project requirements have been satisfied, such as:

1. Any non-standard design arrangement is approved.
2. Council / DPTI has accepted / approved the works in any road reserve and any public lighting installation and tariff and SA Power Networks is in receipt of that agreement.
3. The offer has been signed and accepted by the customer.
4. Any easement requirement is either lodged with the LTO or SA Power Networks is in receipt of an Agreement to Grant an Easement. (Refer to Easement Standard TS102); and
5. For sub-transmission projects, DAC SCAP Approval and design certification has been achieved.

On completion of the 'For Construction' version of the drawing, the 'Preliminary' status shall be changed to 'For Construction' within the title block. The drawing shall be checked by a suitably qualified designer and initials entered into the revision block.

If the construction is to be contestable, the requirements stated in NICC400 are to be applied. The design drawing shall also clearly identify the scope and extents of work which is contestable and will be undertaken by the contractor, and the non-contestable work which will be undertaken by SA Power Networks.

The design drawing shall also specify that the contractor undertakes the maximum proportion of the work, unless otherwise specified by SA Power Networks. Work on existing assets managed by SA Power Networks is to be undertaken by SA Power Networks unless otherwise specified by the relevant SA Power Networks Project Manager.

The 'Authority to Proceed - Construction' confirmation letter will not be issued until all requirements of this 'TS099' have been met.

13.3 As Constructed Phase

The design drawing must be comprehensively reviewed and updated to ensure that the 'As Constructed' drawing is an accurate and detailed representation of the work performed. The construction crew must provide 'As Constructed' drawings as part of the 'Job Folder Close Out' to the relevant Project Manager, within 30 days of practical completion.

Some of the key information required on 'As Constructed' drawings can only be obtained during construction; therefore, it is essential that all relevant parties from design through construction are aware of the specific requirements for collection and provision of information to the designer/drafter prior to commencement or completion of the works, and that prompt transfer of the required information is ensured during and after construction.

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'As Constructed' drawing content requirements include, but are not limited to, the following (where applicable):

1. Removed assets must be specifically identified as 'Removed'.
2. Abandoned assets which remain in-situ must be specifically identified as 'Abandoned'.
3. Installed or altered assets must be clearly differentiated from pre-existing assets.
4. Any optional/non-specific/undefined items on the 'For Construction' drawing must be reviewed, and the final action/state recorded (eg aspects that could not be determined until construction).
5. Dimensioned cable joint locations and depths provided with jointed phases specified.
6. Above, below and ground level cable marker locations and their types must be depicted.
7. Clearances to adjacent/crossing third-party services and SA Power Networks assets recorded for underground assets.
8. Electrical connection/termination details and open point locations.
9. Final conduit occupancy must be detailed and individual duct continuity through bends/junctions and changes in configuration must be clearly depicted.
10. Detailed 'As Constructed' enlargements may be included as additional views if it is not practicable to incorporate the information into the main design. If so, the main design view must be updated to correctly reflect the works performed and cross-referenced to the detailed views.
11. Pole schedules, Single Line Diagrams (SLDs) and other drawing notes/tables/diagrams must be reviewed and updated as necessary to reflect the works completed and the constructed state of the assets.
12. Construction completion dates must be specified as prominent notes on the main drawing sheet.
13. All 'Contestable Works', at the 'As Constructed' phase, shall be marked clearly on 'As Constructed' drawings, stating which work areas are 'Contestable'.
14. All 'Projects with Multiple Stages', at the 'As Constructed' phase, it must be clearly marked indicating which stage/s are completed and which stages are not.
15. Locations of installed/affected assets are to be detailed using cover measurements (for underground assets) and dimensions/chainages relative to surrounding landscape features.
16. Horizontal measurements are required to define locations in at least two directions (eg offset from property boundary and distance from nearest defined property boundary corner) or nominated surveyor general's survey mark.
17. Surveyed three dimensional coordinates (Easting, Northing, AHD Elevation) may be specified as an additional project requirement for specific installations where recording of high-precision asset location information is deemed pertinent. This is most likely to be required for works involving the installation or alteration of high priority/high-cost underground assets and/or cables and conduits or assets requiring significant lengths of directional boring. Coordinates may be presented in tabular form on the drawing (indexed to labelled point locations) or as individual labels at specific point locations. For further relevant information, refer to **Appendix B**.
18. Defined building/boundary lines and kerb lines are to be the primary origins for dimensions and chainages. Adjacent assets, significant trees or other prominent features may be used as additional references or as secondary alternatives if buildings/boundary lines and kerb lines are not present.
19. For overhead line design drawings that include a line profile, the drawing profile must be updated to include the 'As Constructed' details. In all cases, the PLS-CADD model must be updated to reflect the 'As Constructed' details of the project and an 'As Constructed .bak' file provided to the relevant SA Power Networks Project Manager for archiving.

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20. For high priority/high value assets such as 66kV and 33kV lines, a follow-up survey may be required at the completion of construction to ensure an accurate 'As Constructed' model is completed. The relevant SA Power Networks Project Manager will determine if this is required and include details in the specification. For project, where there is significant change to a line construction, SA Power Networks Project Manager may request for a full line survey, master pole schedule and layout.

SA Power Networks may specify the requirement for a high precision 'As Constructed' drawing to be prepared for specific projects if recording of higher precision/more detailed asset location information is deemed pertinent.

This is more likely to be required for works involving the installation or alteration of high priority/high value assets (such as 66kV cables), assets in heavily utilised areas, and/or cables and conduits installed requiring significant lengths of directional boring. For further information on high precision 'As Constructed' drawing requirements, refer to **Appendix B**.

14. Revision Requirements and Deviations from Design Drawings

Once a Preliminary version of a drawing has been issued, any changes to a design shall be submitted to the relevant SA Power Networks Project Manager for approval. Minor changes or corrections which do not alter the scope of works, specific construction arrangements, line routes, easements or the cost of the project may be excluded from this requirement.

The designer shall be aware that any changes/revisions made to the 'For Construction' and 'As Constructed' design shall be in accordance with the following requirements:

1. For each revision, the Revision Identifier Character shall be advanced one letter and the Revision Identifier, Description, Reviser and Revision Date shall be logged in the revisions block.
2. Only compliant 'Revision Identifier Characters' are permitted, which are stated below:
   (a) -
   (b) A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, T, U, V, W, Y
   (c) AA, AB, AC, and so on
3. All revision details shall be clearly and unambiguously marked/specified (eg public light changes, additional cable installations, additional road crossings, HV cable loops into easements etc). The use of revision clouds and/or a revision identifier on the body of the drawing is encouraged.
4. For complex revisions and/or projects, consideration should be given to including a drawing revision memo, detailing all changes, when issuing the revised drawing.
5. Where it may not be possible to singularly itemise all changes as a design moves from a 'Preliminary' design to a 'For Construction' design, the critical changes and particularly the ones that may impact any quotation (remembering that the 'Preliminary' design may have been released for quoting purposes) shall be noted.

Any variation in the proposed electrical configuration of the network during construction must be updated and re-issued on the 'For Construction' design drawing no later than 30 business days prior to energisation. This is required to prepare the 'Advanced Distribution Management System (ADMS)' network model ahead of switching.

The relevant SA Power Networks Project Manager is to be consulted to resolve any uncertainties regarding incorporation of variations into the design drawing. Refer to TS100, TS110, TS085 and **Appendix A** for more specific requirements.

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15. Equipment Position Changes Affecting Easements

If the position of any transformer/switching cubicle or underground cable is to be altered at any time during the design process or the execution of the works, the survey plan shall be amended to reflect the change and satisfy the requirements stated in the Easement Standard TS102.

Prior to altering any planned or existing asset positions that impact on easements, the details of the alterations must be submitted to the SA Power Networks Project Manager and approved by the appropriate authority.

16. Provision for Future Stages

It is imperative that a master drawing layout for any distribution and sub-transmission system is undertaken at the commencement of any multi-staged development to ensure that there is an orderly and cost-effective installation.

Where a cable is installed to ultimately feed a future stage, the cable is to be shown on the 'For Construction' design as being connected and capped. Refer to TS100 for full details regarding provision for future stages.

17. Who You Should Talk To?

For Documentation Access or For Approval of Non-Standard Special Purpose E-drawings:

For E-Drawings, Non-Standard Special Purpose E-drawings (E SP), AutoCAD standard templates, Technical Standards, and Instructional manuals, please contact 'Standards and Equipment Team' via Hotline on (08) 8404 4200 or send an email to: networkstandards@sapowernetworks.com.au.

For 'Service & Installation Rules':

For support regarding Service & Installation Rules or your connection, contact our Customer Service number, and a team member will assist or direct you to the appropriate SA Power Networks Customer Solutions Manager. https://www.sapowernetworks.com.au/contact-us/

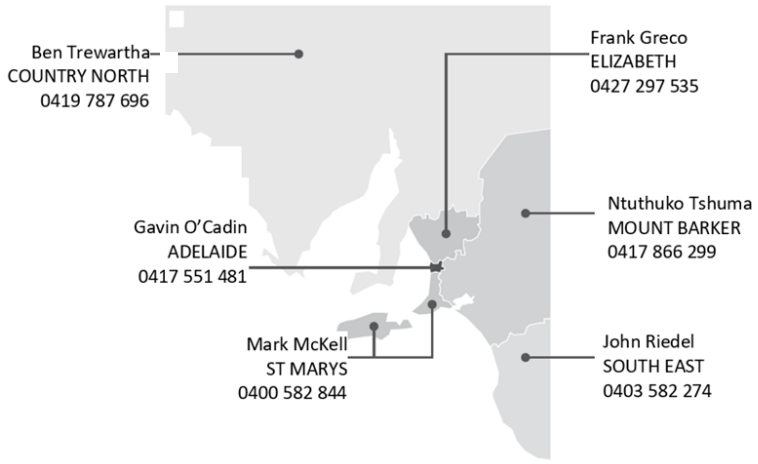
13 12 61

For faults and emergencies, please call our 24/7 phone line:

13 13 66

Before You Dig Australia (BYDA) Enquiries: Visit their internet website at www.1100.com.au

Contact our Customer Solutions Managers



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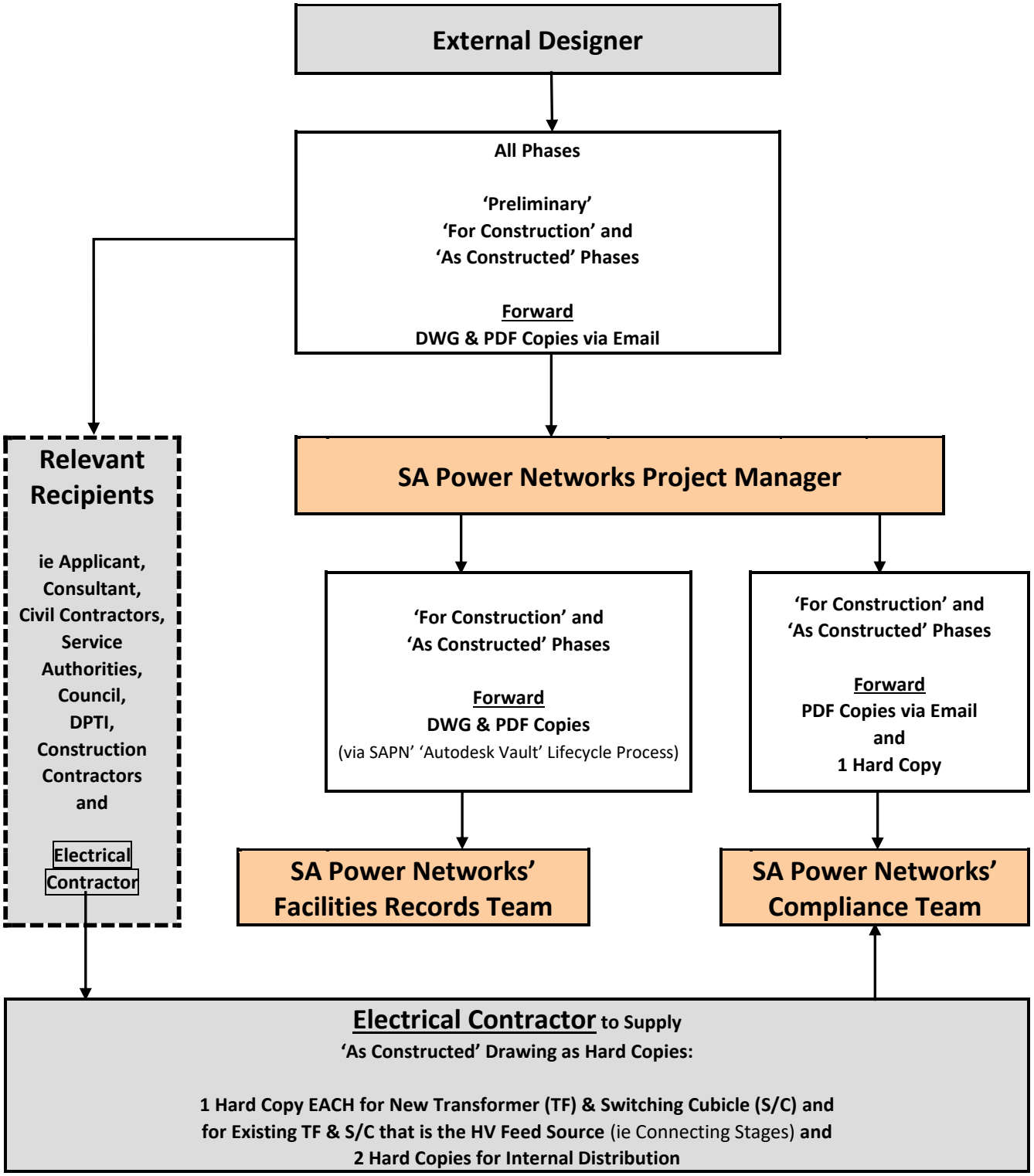
Appendices

A. Design Drawings Issuing Process



Note: Internal designs produced using SA Power Networks standard AutoCAD design package are to be managed according to SA Power Networks internal procedures including lodgement with Facilities Records Team via SA Power Networks 'Autodesk Vault' lifecycle process.

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B. Supplement for High-Precision 'As Constructed' Drawings

SA Power Networks may specify the requirement for a high precision 'As Constructed' drawing to be prepared for specific projects if recording of higher precision/more detailed asset location information is deemed pertinent. This is more likely to be required for works involving the installation or alteration of high priority/high value assets eg sub-transmission, assets in heavily utilised areas, and/or cables and conduits installed with significant lengths of directional boring.

The requirement for a drawing of this kind to be produced should be determined at the preliminary stage to ensure that the initial design drawing is compiled in a manner that will support the future level of detail required, and to ensure that suitable construction information is collected during and after the works.

High precision 'As Constructed' drawings may require CAD objects that are not available in the standard Line Design template 'LD-Template.dwt' (eg for scaled enlargements of conduit connection arrangements).

The relevant SA Power Networks Project Manager may seek advice from SA Power Networks Facilities Records Coordinator to identify other standard SA Power Networks CAD object styles or conventions that may be applicable.

This Appendix only specifies enhanced or additional requirements applicable to high precision 'As Constructed' drawings. These drawings must also comply with the other drawing requirements detailed under this Standard.

Cross Sections

- To be drawn for the start and end of each bored/trenched section and elsewhere as necessary to describe asset positions at breaks, pits and where configuration changes. Cross-sections diagrams must be precisely referenced to their applicable locations on the drawing
- To depict the positions of installed assets relative to the finished ground surface and relative to each other. Details including final bore diameter, trench contents, cover measurements and asset descriptors are to be marked on sections as applicable. Dimensions of the overall configuration and of asset positions within the configuration are to be included where technically feasible
- If the nature of the installation renders it unfeasible to precisely ascertain the conduit configuration (eg where conduits have been pulled through a long bore hole) then an approximated configuration may be drawn and labelled with an accompanying note 'No Controlled Configuration' or similar
- Sections portraying multiple conduits are to bear corresponding numbers for identification of individual conduits at the start and end of each conduit, at breaks, pits and where changes in configuration occur

Longitudinal Sections

- May be required by SA Power Networks for specific sections of the works, for example:
  - Directional bores
  - Cables laid through areas containing multiple crossing services (eg road intersections)
  - High value assets (eg 66kV cables)
  - Longitudinal sections are to be embedded in the drawing
  - Longitudinal section starts and end points must be specified on the section diagram and clearly related to their corresponding locations on the main plan view
  - Horizontal and vertical scales must be labelled on the longitudinal section. Must show depth of assets relative to existing and finished surface levels
  - The radii of curvatures for conduits/cables are to be labelled

Permanent Survey Marks

- To be drawn and labelled with their identification numbers and coordinates
- To be related to their adjacent building lines, kerb lines and project related assets through application of dimensions and/or chainages
- The Permanent Survey Marks used as origins for surveys are to be specifically noted on the drawing

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Coordinates, Dimensions and Depths

- Shall comprehensively describe the locations of installed and/or affected assets
- Asset positions, bends, ends, configuration changes, gaps, joins and other significant construction elements are to be drawn with corresponding three-dimensional coordinates, cover measurements and chainages/dimensions relative to kerb lines and building/boundary lines. Bend radii are to be labelled. 'Long-term' static landscape features (eg significant trees, structures) may be used as origins for measurements in the absence of kerb/building/boundary lines or as additional information
- Three dimensional coordinates provided for directional bores are to reference the pilot hole drill position as surveyed during the Works. These three-dimensional coordinates must be specifically identified as pilot hole drill positions. Cover measurements are required to reflect the distance from the finished ground level to the top of the installed assets, not to the pilot hole position
- Where two or more conduits are installed in a trench in close configuration (eg touching or laid in trefoil) the horizontal coordinates/measurements may be generalised to the centre line of the configuration rather than providing multiple positions for individual conduits. In these circumstances vertical coordinates and cover measurements are to relate to the top of the shallowest asset in the configuration at that location
- The requirement for chainages/dimensions may be adapted or omitted at the relevant SA Power Networks Project Manager's discretion if no building / boundary lines, kerb lines or other appropriate long-term static landscape features exist near the works to use as origins for measurements. Three dimensional coordinates and cover measurements are required
- Where directional bores include bends, the drilled radius calculations shall be displayed on the drawing with reference to their locations
- Coordinates are to be provided as Eastings and Northings in MGA94 or MGA2020 datum projection with accompanying elevations in Australian Height Datum (AHD). Datum and projection are to be specified on the drawing
- Chainages are to be clearly differentiated from other dimensions to eliminate potential for misinterpretation. Larger font sizes are typically used for chainages
- Estimated spatial accuracy is to be noted on the drawing. It is recognised that the accuracy of coordinates and measurements may be subject to technical and/or environmental limitations. Measurement/surveying techniques are to be selected and employed with the aim of meeting the following accuracy targets:
  - Cover measurements - visible/accessible assets
    - +/- 50mm
  - Cover measurements - buried/inaccessible assets
    - +/- 5% for less than 3 metre cover
    - +/- 10% for greater than 3 metre cover
  - Three dimensional coordinates
    - +/- 50mm within the suburbs of Adelaide and North Adelaide
    - +/- 200mm within metropolitan, residential & commercial/industrial areas
    - +/- 500mm in rural areas
  - Chainages & other dimensions measured relative to landscape features
    - +/- 50mm or 1% (whichever is greater)
- Survey/Measurement Date
- Surveyor/Measurer Name and Company Name

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Bore Logs

- Bore logs are to be embedded into the drawing as tables. They are to be complete and comprehensively detailed with information including:
  - Bore Log Number
  - Bore location description
  - Name of drilling company/contractor details
  - Date of Drilling
  - Bore Numbers.
  - Start and end locations (noted in log and marked precisely on drawing)
  - Size and Number of conduits installed
  - Final bore diameter
  - Rod lengths
  - Depth measurement type noted (eg 'Depths from surface to centre of pilot hole')
  - Type of backfill material used
  - Depth below finished surface level to the top of the bore at minimum 3,000mm (3m) spacing and at lesser intervals as required to comprehensively describe bends and irregularities
  - Rod numbers (incremental) with accompanying depths and alignments relative to property boundaries
  - Relevant notes (eg obstructions encountered)
  - Other information considered necessary by either the Contractor or Liaison Person

For 66kV

- Earthing arrangement schematic indicating position of earth continuity conductor relative to phase conductors
- Joint bay detail drawings

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C. File Naming Format

The following are the File Naming format for AutoCAD Drawings and associated files for the Vault.

C.1 File Naming Format of AutoCAD (*.dwg) files in Vault

The file naming format for AutoCAD (*.dwg files) for Line Design drawings must be based on the applicable SAP Notification number, and Notification Type code. For example, for a typical small project the drawing may be named: '**LD-5000XXXXX-CN.dwg'**.

1) The Components of the Name are:

Nos.	Abbreviation	Description
1	LD	Designates that the drawing is a Line Design drawing and built from the Line design CAD file template, named 'LD-Template.dwt'
2	5000XXXXX	Is the Notification number from SAP
3	02	Only required for multiple sheet projects, when saved as separate files
4	CN	Is the Notification Type code, which may be AW, QS, CS, DD, CN or FM

2) The Standard Notification Type Codes are:

Nos.	Notification Type	Description
1	CN	Connection
2	AW	Asset Work
3	QS	Quality of Supply
4	DD	Distribution Defect
5	CS	Customer Supply
6	FM	Field Maintenance

C.2 Drawing File Names - Single Sheet/ *.dwg File Projects

For **single sheet** drawings, the drawing file name in Vault will be shown as **'LD-5000XXXXX-CN.dwg'**.

Note that when the *.dwg file is saved in this format, an automated routine will update the title block with the Notification Type, in the 'SAPN_NOTIFICATION_TYPE' field. Refer to **Figure C2.1**.

Figure C2.1: SAPN Notification Type Field

C.3 Drawing File Names - Multiple Sheet single*.dwg File Projects

Projects requiring **multiple drawing sheets** should utilise multiple drawing layouts within a single *.dwg file as a preference. The sheets need to be in sequential order from Left to Right, and relevant sheet size selected to cover geographical area. The naming will be based on the applicable SAP Notification number, and Notification Type code and will be as follows:
All sheets 'LD-5000XXXXX-CN.dwg'

Refer to Figure C3.1.

LD-5000XXXXX-CN.dwg

Figure C3.1: Examples of Layout Sheets - 'LD-5000XXXXX-CN.dwg'

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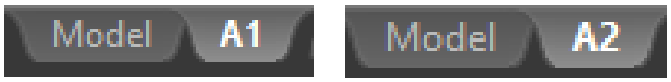
C.4 Drawing File Names - Multiple Sheet/multiple *.dwg File Projects

Alternatively, the file naming format for multiple *.dwg files containing one drawing sheet only will be based on the applicable SAP Notification number, sheet reference number and Notification Type code and will be as follows:

- Sheet 1 - LD-5000XXXXX-01-CN.dwg
- Sheet 2 - LD-5000XXXXX-02-CN.dwg
- Sheet 3 - LD-5000XXXXX-03-CN.dwg

Refer to **Figure C3.1.**



LD-500######-01-CN.dwg **LD-500######-02-CN.dwg**

Figure C3.1: Example of Layout Sheets

C.5 Multiple *.dwg File Management

- Multiple *.dwg files will normally be used for major projects and projects which involve multiple distinct locations and parcels of work. This may require the release of drawing sheets in stages, which the drawing sheet grouping should align with.
- Best practice is to capture common land base data and other common geometry within the first *.dwg file, and then subsequent sheets will Xref (External Reference) this data from drawing sheet 1. For very large geographic projects sheet 1 should contain all land base data and display this as an overview, noting individual sheet references. Refer to **Section 7.8** for specific requirements for the use of Xrefs.
- For projects requiring many individual drawing sheets, a better result may be achieved by creating additional dedicated SAP notification numbers, for different sheets/sheet sets.
- The relevant SA Power Networks Project Manager associated with the project can arrange this if required.
- The designer should seek guidance and discuss the best option regarding multiple *.dwg file drawings with the relevant SA Power Networks Project Manager
- This may occur at any time during the life of the project, as requirements become apparent.

The sheet numbers will be reflected when editing the drawing sheets, regardless of the size used. Refer to **Figure C4.1**.

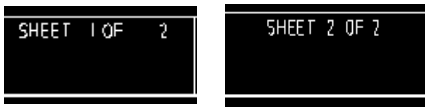


Figure C4.1: Sheet Numbers

Note: Do not add a revision number to the drawing file name, as this is captured and searchable as a separate field in the Vault Database.

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C.6 Additional Drawing Sheet Information

For minor projects, such as minor customer connections, only SAP notification number is raised. For larger projects a 'Project definition' number is also raised. This is referenced back to the SAP notification and is used to monitor projects including milestones and financial reporting. Project numbers have in the past been prefixed CP, NW, EX etc.

As part of the NECF Process we have a common NC Project (combining CP, EX and URD) which required us to separately identify the different types of projects for reporting.

The list below allows you to choose the 'Project Type' for inclusion on the drawing sheet. A 'Project Type' is only relevant to a CS Notification Type.

Refer to **Appendix D**: 'Standard Editable Attributes - Drawing Sheet', for more details.

1) New 'Project Type' Descriptors:

Nos.	Project Type	Description
1	RC	Retail Customer (Customer Connect Projects)
2	RD	Real Estate Development (Underground Residential Development - URD), or (Underground Industrial Development - UID)
3	EG	Embedded Generation
4	AR	Asset Relocation (old EX jobs)
5	PLEC	Powerline Environment Committee
6	QS	Quality of Supply
7	TC	Telecommunications
8	NW	Network Upgrade Projects
9	NBN	NBN Projects

For the majority of Line Design type projects, the drawing sheet will include a Project definition; NC-002196; a Notification type, CN, FM, AW, QS, DD, or CS; and a Project type, (only applicable to CN Notification type). Refer to **Figure C5.1**.

This will allow us to search for drawings within the Vault, based on project definition, notification type and project type. This information is only valid on the drawing sheet and is not applicable to the file name in Vault.

Figure C5.1: Example of 'Project Description'

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C.7 Non- AutoCAD file naming

The following file naming formats apply only to non-AutoCAD files. They must be applied as detailed, regardless of the number individual *.dwg files used on the project. Hence the multiple sheet examples below apply to both single and multiple *.dwg projects. All reference files must be stored in the same Vault folder as the drawing file. If you are unsure how to apply these formats, please seek assistance.

1) PDF/A File Naming Format

The file naming format for PDF/A files created from AutoCAD *.dwg drawings, and added to Vault via the LD Lifecycle, will be based on the template name, applicable SAP NOTI number, and Notification Type code.

Note: The LD Lifecycle upon release to FR Outbox creates the required separate PDF/A sheets automatically. No user interaction is required.

Single and Multi are the same until they reach FR Outbox.
Single Sheet Example: LD-5000XXXXX-CS.pdf

Multiple Sheet Example: LD-5000XXXXX-02-CS.pdf
Note: Only created in FR Outbox state. There is an automatic process in place which will create separate sheets for FRT use. They are removed once FRT have completed processing. This note is to avoid confusion if users see them in the FR Outbox.

2) Site Photograph Image File Naming Format

The file naming format for site photographs, Google maps etc. that are used in the AutoCAD drawing are added to Vault, and will be based on the template name, applicable SAP NOTI number and type, with the last two numbers being a simple numerical list of image files used for this project, for example:

Single Sheet Example:

Nos.	Example	Naming Format
1	First photo image used	LD-5000XXXXX-IMG-01.jpg
2	Second photo image used	LD-5000XXXXX-IMG-02.jpg

Multiple Sheet Example:

Nos.	Example	Naming Format
1	First photo image used on Sheet 1	LD-5000XXXXX-01-IMG-01.jpg
2	Second photo image used Sheet 1	LD-5000XXXXX-01-IMG-02.jpg
3	First photo image used on Sheet 2	LD-5000XXXXX-02-IMG-01.jpg
4	Second photo image used Sheet 2	LD-5000XXXXX-02-IMG-02.jpg

3) Excel Spreadsheet File Naming Format

The file naming format for Excel Spreadsheets that are used in AutoCAD drawings are added to Vault via the LD Lifecycle, and will be based on the template name, applicable SAP NOTI number and type, for example:

Single/Multi Sheet Example:

Nos.	Example	Naming Format
1	Pole schedule example	LD-5000XXXXX-PS.xlsx
2	Stringing chart example	LD-5000XXXXX-SC.xlsx
3	Bore Log example	LD-5000XXXXX-BL.xlsx

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C.8 Summary

C.8.1 Single Sheets

File Type	File Name	Comment
*.pdf Adobe Reader	LD-5000XXXXX-CS-XX.pdf	*.pdf files have a revision letter at the end of the file name.
*.jpeg Photos, Bitmaps, PNG etc	LD-5000XXXXX-IMG-01	*.jpeg files are imported to the drawing via Vault. The suffix IMG is to be added with a numerical sequence for each image used.
Pole Schedule *.xlsx Excel	LD-5000XXXXX-PS	*.xlsx files are imported to the drawing via Vault. The suffix PS represents Pole Schedules and will have a numerical sequence for each schedule used.
Stringing Chart *.xlsx Excel	LD-5000XXXXX-SC	*.xlsx files are imported to the drawing via Vault. The suffix SC represents Stringing Charts and will have a numerical sequence for each chart used.
Bore Log *.xlsx Excel	LD-5000XXXXX-BL	*.xlsx files are imported to the drawing via Vault. The suffix BL represents Bore Logs and will have a numerical sequence for each log used.

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C.8.2 Multiple Drawing Sheets

File Type	File Name	Comment
*.pdf Adobe Reader	LD-5000XXXXX-01-CS-A.pdf	*.pdf files have a revision letter at the end of the file name. The sheet number is represented after the Noti number and before the Noti type. Created automatically in FR Outbox only. Removed once drawing is return to Released or Archived.
*.jpeg Photos, Bitmaps, PNG etc	LD-5000XXXXX-01-IMG-01 eg more than one image LD-5000XXXXX-01-IMG-02 LD-5000XXXXX-01-IMG-03 eg additional sheets and more than one image LD-5000XXXXX-02-IMG-01 LD-5000XXXXX-02-IMG-02	*.jpeg files are imported to the drawing via Vault. The sheet number is represented after the Noti number and before the prefix IMG. A numerical sequence is used for each image. Each image is to be labelled on the drawing.
Pole Schedule *.xlsx Excel	LD-5000XXXXX-01-PS-01	*.xlsx files are imported to the drawing via Vault. The sheet number is represented after the Noti number and before the suffix PS.
Stringing Chart *.xlsx Excel	LD-5000XXXXX-01-SC-01	*.xlsx files are imported to the drawing via Vault. The sheet number is represented after the Noti number and before the suffix SC.
Bore Log *.xlsx Excel	LD-5000XXXXX-01-BL-01	*.xlsx files are imported to the drawing via Vault. The sheet number is represented after the Noti number and before the suffix BL.

The file naming convention has been designed to capture all information used for the design of the project and store in the Vault for future reference. If you are unsure of any of the file formats detailed in this guide, please seek assistance.

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D. Standard Editable Attributes - Drawing Sheet

Each sheet contains numerous editable attributes to allow entries of standard information into the sheet. Various attributes are searchable within SA Power Networks Vault file server, as listed in **Table 4**. All attributes allow the simple entry of data in a standard format and location.

Table 4 - Standard Editable Attributes

Attribute name	Prompt	Default Value	Expected Value	Value unique per sheet	Type	Vault map-ped	Comments
SAPN_APPROVED_BY	SAPN_APPROVED_BY	XXX	FirstInitial.Lastname	NO	User entry	YES	
SAPN_APPROVED_DATE	SAPN_APPROVED_BY		DD-MM-YYYY	NO	User entry	YES	
SAPN_APPROVER_LOCATION	SAPN_APPROVER_LOCATION	XXX	NPO/NPM Depot	NO	User entry	YES	
SAPN_APPROVERS_PHONE	SAPN_APPROVERS_PHONE	X	Phone number	NO	User entry	YES	
SAPN_ASSET_OWNER	SAPN_ASSET_OWNER	XXXXX	SAPN or DLC	NO	User entry	YES	
SAPN_CHECKED_BY	SAPN_CHECKED_BY	XXX	FirstInitial.Lastname	NO	User entry	YES	
SAPN_CHECKED_BY_DATE	SAPN_CHECKED_BY_DATE		DD-MM-YYYY	NO	User entry	YES	
SAPN_COUNCIL	SAPN_COUNCIL	City Of_	Council name	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_DRAWING_NUMBER	SAPN_DRAWING_NUMBER	XXXXXXX	Notification number	NO	User entry	YES	
SAPN_DRAWN_BY	SAPN_DRAWN_BY	XXX	FirstInitial.Lastname	NO	User entry	YES	
SAPN_DRAWN_BY_DATE	SAPN_DRAWN_BY_DATE		DD-MM-YYYY	NO	User entry	YES	
SAPN_FEEDER_NAME	SAPN_FEEDER_NAME	XXXXX	FEEDER NAME XXkV	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_FEEDER_NO	SAPN_FEEDER_NO	XX-000	Feeder No.	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_GROUND_SCALE	SAPN_GROUND_SCALE	X.XXXXXX	6 Decimal Places As per Section 7.14	NO	User entry	YES	
SAPN_HORIZ	SAPN_HORIZ	PSM XXXXXXXXX PLANE	PSM XXXX/XXXXX PLANE	NO	User entry	YES	
SAPN_HUNDRED_OF	SAPN_HUNDRED_OF	Hundred Of_	HUNDRED of XXX	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_INSPECTED_BY	SAPN_INSPECTED_BY		FirstInitial.Lastname	NO	User entry	YES	For major projects workflow only, ie. 66kV
SAPN_INSPECTED_BY_DATE	SAPN_INSPECTED_BY_DATE		FirstInitial.Lastname	NO	User entry	YES	For entire project area
SAPN_LLE_COORDS	SAPN_LLE_COORDS	######## E	Lower Left Easting	NO	Palette tool	YES	For entire project area
SAPN_LLN_COORDS	SAPN_LLN_COORDS	######## N	Lower Left Northing	NO	Palette tool	YES	
SAPN_MAP_REF	SAPN_MAP_REF	XXXXXX-X	MAP_REF	NO	Palette tool	YES	
SAPN_MGA_ZONE	SAPN_MGA_ZONE	MGA-54-GDA94	MGA54, 53, 52, GDA2020	NO	Automatic routine	YES	
SAPN_NOTIFICATION_TYPE	SAPN_NOTIFICATION_TYPE	##	CN, AW, QS, DD, CS, FM	NO	Automatic routine	YES	
SAPN_PROJECT_DEFINITION	SAPN_PROJECT_DEFINITION	XX-0000000	NW, NC, etc	NO	User entry	YES	
SAPN_PROJECT_TYPE	SAPN_PROJECT_TYPE	--	AR, etc, As per Appendix C-3	NO	User entry	YES	

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Table 4 - Standard Editable Attributes (continued)

Attribute name	Prompt	Default Value	Expected Value	Value unique per sheet	Type	Vault map-ped	Comments
SAPN_REVISION	SAPN_REVISION	-	As per Section 18	NO	User entry	YES	
SAPN_REVISION_*01 to 15*	SAPN_REVISION_*01 to 15*		As per Section 18	NO	User entry	YES	
SAPN_REVISION_APPROVED_*01 to 15*	SAPN_REVISION_APPROVED_*01 to 15*		FirstInitial.Lastname	NO	User entry	YES	
SAPN_REVISION_BY_*01 to 15*	SAPN_REVISION_BY_*01 to 15*		FirstInitial.Lastname	NO	User entry	YES	
SAPN_REVISION_CHECKED_*01 to 15*	SAPN_REVISION_CHECKED_*01 to 15*		FirstInitial.Lastname	NO	User entry	YES	
SAPN_REVISION_DATE_*01 to 15*	SAPN_REVISION_DATE_*01 to 15*		DD-MM-YYYY	NO	User entry	YES	
SAPN_REVISION_DETAILS_*01 to 15*	SAPN_REVISION_DETAILS_*01 to 15*		Description of changes made to drawing set	NO	User entry	YES	
SAPN_REVISION_INSPECTED_*01 to 15*	SAPN_REVISION_INSPECTED_*01 to 15*		FirstInitial.Lastname	NO	User entry	YES	For major projects workflow only, ie. 66kV
SAPN_SCALE	SAPN_SCALE		As per Section 7.14	YES	User entry	YES	
SAPN_SHEET_NUMBER	SAPN_SHEET_NUMBER		X of XX	YES	User entry	NO	
SAPN_STATUS	SAPN_STATUS	PRELIMINARY	Lifecycle state (PRELIMINARY)	NO	User entry	YES	
SAPN_SUB_NAME	SAPN_SUB_NAME	SUB NAME	Substation Name	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_SUB_NO	SAPN_SUB_NO	SSD-000	Substation Number	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_SURVEY_DATE	SAPN_SURVEY_DATE	XXX	DD-MM-YYYY	NO	User entry	YES	
SAPN_SURVEYORS_NAME	SAPN_SURVEYORS_NAME	XXX	FirstInitial.Lastname	NO	User entry	YES	
SAPN_TITLE_LINE_1	SAPN_TITLE_LINE_1	TITLE_LINE_1	Project Name	NO	User entry	YES	
SAPN_TITLE_LINE_2	SAPN_TITLE_LINE_2	TITLE_LINE_2	Summary of works	NO	User entry	YES	
SAPN_TITLE_LINE_3	SAPN_TITLE_LINE_3	TITLE_LINE_3	Address	NO	User entry	YES	Multiple values concatenated if more than 1 (Value 1, Value 2, Value 3 etc)
SAPN_TOWNSHIP_SUBURB	SAPN_TOWNSHIP_SUBURB	Suburb	SUBURB	NO	User entry	YES	
SAPN_URE_COORDS	SAPN_URE_COORDS	######## E	Upper Right Easting	NO	Palette tool	YES	For entire project area
SAPN_URN_COORDS	SAPN_URN_COORDS	######## N	Upper Right Northing	NO	Palette tool	YES	For entire project area
SAPN_VERT	SAPN_VERT	PSM XXXXXXXXX AHD	PSM XXXX/XXXXX AHD	NO	User entry	YES	

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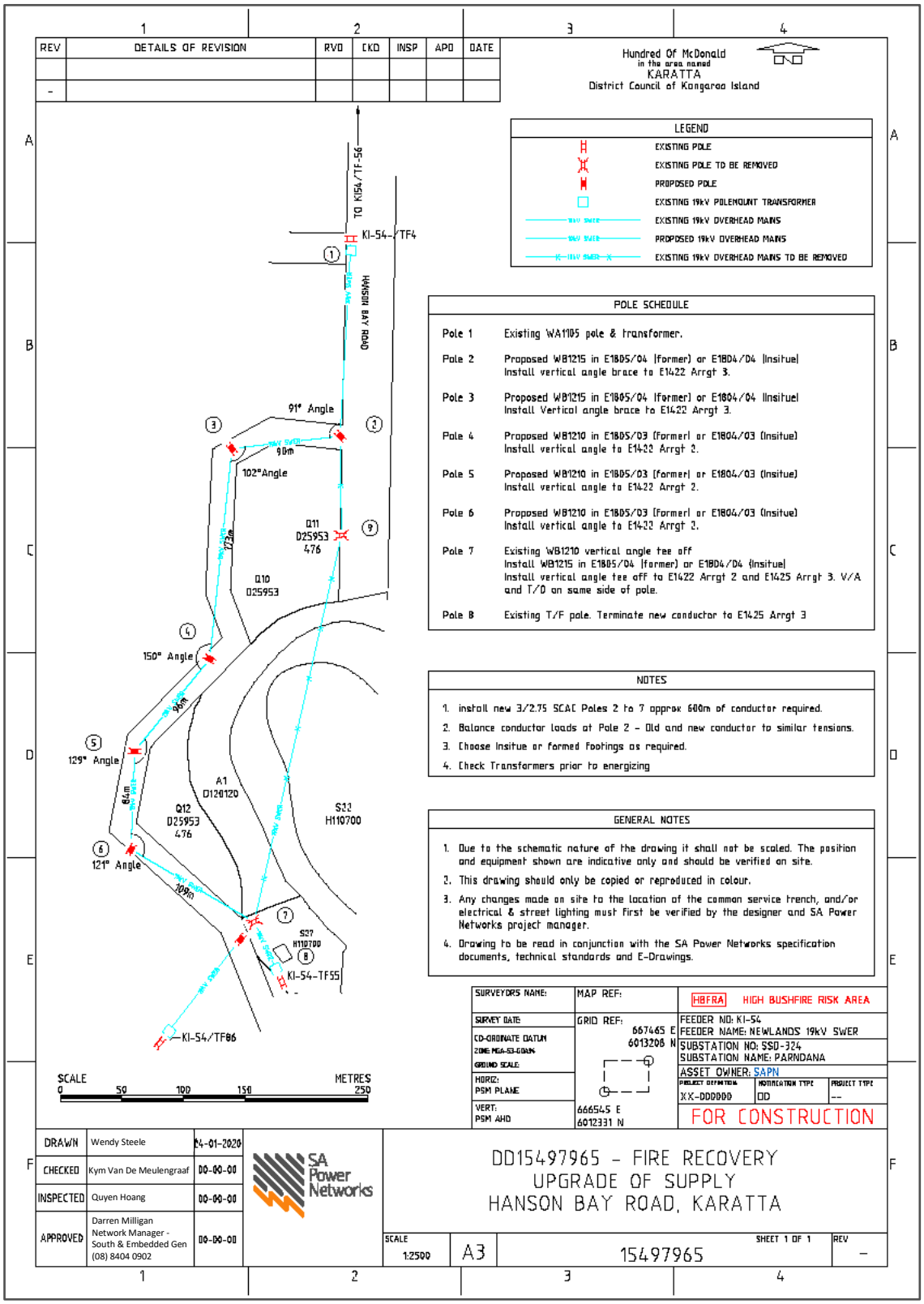
E. General Design Drawing Presentation Examples:

E.1 A3 Vertical Portrait Drawing Sheet



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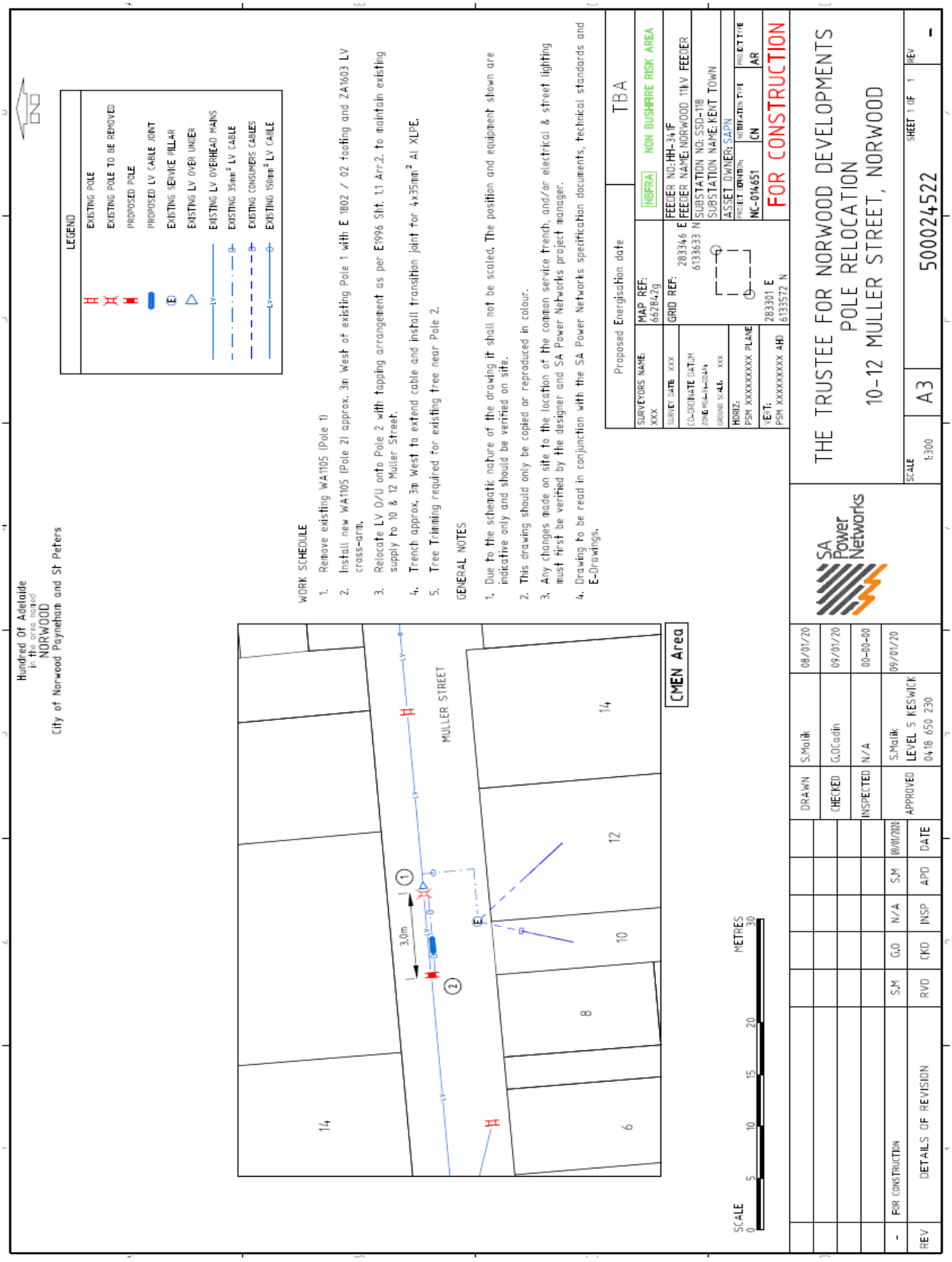
E.2 A3 Horizontal Landscape Drawing Sheet



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E.3 Pole Schedule Layout Sheet

POLE SCHEDULE

POLES					LOW VOLTAGE ARRANGEMENT					EARTH	HIGH VOLTAGE ARRANGMENT				
POLE	SPAN	EXISTING	PROP.	PROP. FOOTING	EXISTING ARRGT.	PROP. ARRGT.	X-ARM SI NO.	COND.	REMARKS	PROP.	EXISTING ARRGT.	PROP. ARRGT.	X-ARM SI NO.	COND.	REMARKS
1	120	WA1115	WB1227	E1805/11	E1121	E1128	ZA1604	7/4.75 AAC	NEW BRACE POSITION	CMEN	E1222	E1226	ZA1736	7/4.75 AAAC	New 11kV Brace position
2	123	WA1105			E1121						E1222				
3	145	WA1105			E1121						E1222				
4	129	WA1105			E1121						E1222				
5	132	WA1105			E1121						E1222				
6	116	WA1105			E1121						E1222				
7	120	WA1105			E1121						E1222				
8	121	WA1105	WB1210	E1805/03	E1121						E1222	E1222	ZA1207		Line angle, remove existing pole
9	120	WA1105			E1121						E1222				
10		WA1110	WB1227	E1805/11	E1121	E1128	ZA1604		NEW BRACE POSITION		E1222	E1226	ZA1736		New 11kV Brace position

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F. Definitions

Accredited Designer	A designer who has satisfied SA Power Networks Terms and Conditions to undertake an electrical design.
Applicant	Person applying for access to the SA Power Networks network.
Bush Fire Risk Area	The part of the State shown in the maps in Electricity (Principles of Vegetation Clearance) Regulations 2010, Schedule 4 as the bushfire risk area excluding the areas shown in those maps as non-bushfire risk areas.
Cable	An insulated conductor, or two or more such conductors, laid together, whether with or without fillings, reinforcements, or protective coverings. (Note: Cable for the purpose of this manual also means aerial bundled cables).
CMEN	Common Multiple Earthed Neutral.
Conductor (Overhead)	A wire, cable or form of metal designed for carrying electric current.
Contractor	Includes but is not limited to licensed subcontractors, consultants and sub consultants and engaged by the Applicant.
Council	The local government authority for the site of the Development.
CSO	SA Power Networks Customer Service Officer.
Design Drawings	Drawings produced for the design, construction/maintenance of overhead and underground distribution, sub-transmission and public lighting infrastructure including recording the final state of the constructed assets.
Development	The development proposed by the Applicant on the Land and any land external to that land but included in the Applicant's proposal.
DST	Distribution Standard Template.
Earthed	Connected to the general mass of earth by a conductor to ensure and maintain the effective dissipation of electrical energy.
High Voltage or 'HV'	For the purpose of this document means a nominal voltage exceeding 1,000 volts alternating current or exceeding 1,500 volts direct current.
Low Voltage or 'LV'	A nominal voltage exceeding 50 volts alternating current or 120 volts direct current, but not exceeding 1000 volts alternating current or 1500 volts direct current.
Local CMEN	A CMEN system in an isolated (=remote) location, as defined below. It differs from CMEN only in that the neutral is not connected back to the substation earth.
MEN	Multiple Earthed Neutral.

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F.1: Definitions (Continued)

Minor Scoping Works	Include: CC notifications - connection applications that be accommodated without significant extension work (<$30K, L05 maintenance activity type); • Application for new service provision • Application for alteration of service provision • Request for Temporary Disconnection/Reconnection of supply CS notifications • Request quotation for security lighting • Application for public/CLER lighting (Connect only) • Request for low voltage line covers (Tiger tails) CN notifications – Initial Enquiries. • Request quotation for network extension/modification
MNP	SA Power Networks Manager Network Planning
NSO	SA Power Networks Network Service Officer
NPO	SA Power Networks Network Project Officer
PLEC	Stands for Power Line Environment Committee. They are responsible for the selection of sites where SA Power Networks assets are to be undergrounded for the community benefit.
Project Manager	SA Power Networks Network Project Manager, Delivery Project Manager, Network Project Officer, Network Service Officer, Customer Service Officer, Strategic Project Manager, or any Officer / Supervisor who is ultimately responsible for the management of a project.
Shall or Must	Is to be understood as mandatory.
SLD	Single Line Diagram.
Sub-Transmission Networks	66kV and 33kV lines in the case of SA Power Networks. Any plant, equipment, structure, pole, building, conductor, cable, fixture, attachment, or other thing that comprises part of the infrastructure that SA Power Networks utilises to provide 66kV connection services.
Substation	Part of a power system, concentrated in each place, including mainly the terminations of transmission or distribution lines, switchgear, and housing and which may also include transformers. It generally includes facilities necessary for system security and control (eg the protective devices).

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G. References

This list of references has been made as comprehensive as possible at the time of publication. However, other references may have been applicable at the time. The references listed may have been amended or made obsolete and new references may be applicable. The user is responsible to correct references applied.

G.1 Acts and Regulations

- Competition and Consumer Act 2010
- Electricity Act 1996 and Electricity (General) Regulations 2012
- Plumbers, Gas Fitters & Electricians Act 1995
- Work Health & Safety Act 2012 and Work Health & Safety Regulations 2012

G.2 Codes and Guidelines

- National Electricity Rules
- National Energy Retail Rules
- Electricity Distribution Code
- Electricity Retail Code
- Electricity Metering Code
- References, Administrators, and their contact details include:
  - ❖ Standards Australia www.standards.com.au
  - ❖ Electricity Network Distributor www.sapowernetworks.com.au
  - ❖ The Australian Energy Regulator www.aer.gov.au
  - ❖ Australian Energy Market Operator www.aemo.com.au
  - ❖ Australian Energy Market Commission www.aemc.gov.au
  - ❖ SafeWork SA www.safework.sa.gov.au
  - ❖ The Office of Technical Regulator www.sa.gov.au
  - ❖ The Department for Infrastructure and Transport www.dit.sa.gov.au

G.3 SA Power Networks Publications

Manuals	
Manual 32	Service and Installation Rules
NICC Brochures	
NICC400	Information for an applicant undertaking a contestable extension
NICC401	Information on Network Design and Installation by an External Contractor
NICC404	Working in the Vicinity of SA Power Networks Infrastructure - Network Access Permit Process
Technical Standards	
TS085	Trenching and Installation of Underground Conduits and Cables (up to and including 33kV)
TS100	Electrical Design Standards for Underground Distribution Cable Networks (up to and including 33kV)
TS105A (Forms)	Standard Forms for SA Power Networks Underground & Overhead Electricity Distribution and Sub-Transmission Cable Networks
TS107	Overhead Line Design Standard for Electrical Sub-Transmission and Distribution Systems
TS109	Technical Standard for Earthing of the Distribution Network
TS110	Electrical Design, Civil/Electrical Works & Testing for 66kV UG Sub-Transmission Networks
Relevant E Drawing Series	

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G.4 Standards Australia

AS 1100 Series	Technical drawings: Part 101: General principles Part 201: Mechanical drawing Part 401: Engineering survey and engineering survey design drawing Part 501: Structural engineering drawing
AS 60038	Standard voltages
AS/NZS 1158.0	Lighting for Roads and Public Spaces
AS/NZS 3000	Electrical Installations (known as the wiring rules)
AS/NZS 4026	Electric cables - for underground residential distribution systems

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