

Hunter Water Corporation A.B.N. 46 228 513 446

Standard Technical Specification for:

PREPARATION OF ELECTRICAL ENGINEERING DRAWINGS

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AMENDMENTS

New Clause	Old Clause	Amendment
4		3 digit sheet number
5.1.1		Revision table comments added
6.1.1		Version of ACAD changed
6.2		Dtext added
6.6		Technical information package information changed
7		Requirement for drawing on grid added
7.1		Complete revision of wire numbering
8.1		Requirement for wet signature removed

1 PURPOSE AND SCOPE

This Standard Technical Specification details the requirements for the production or modification of electrical engineering drawings for the Hunter Water Corporation (HWC).

All electrical engineering drawings supplied to HWC are to conform to the requirements of this document.

This Specification is available online at: <http://www.hunterwater.com.au>

2 INFORMATION SUPPLIED BY HUNTER WATER

Prior to commencing any drawings, obtain the following information from Hunter Water:

Information	Contact at Hunter Water
Drawing Set Number	Electrical Mechanical Services at Hunter Water on 02 49799531 or electrical.drafting@hunterwater.com.au
Equipment Number	Hunter Water Project Manager
Asset Name	Hunter Water Project Manager
Technical Information Package including electronic copy of the standard electrical menu, borders and symbols	Electrical Mechanical Services at Hunter Water on 02 49799531 or electrical.drafting@hunterwater.com.au prior to commencing each project

Ensure that all the electronic information and specifications used to prepare the drawings is of the latest revision.

3 STANDARDS

3.1 Australian Standards

Except where otherwise required in this specification, drawings are to comply with the relevant Australian Standards, including but not limited to:

AS 1000	The international system of units (SI) and its application
AS 1100	Technical drawing Part 101: General principles
AS 1102.101	Graphical Symbols for electrotechnical documentation – General information and general index.
AS/NZS 1102.102	Graphical Symbols for electrotechnical documentation – Symbol elements, qualifying symbols and other symbols having general application.
AS/NZS 1102.103	Graphical Symbols for electrotechnical documentation – Conductors and connecting devices.
AS/NZS 1102.104	Graphical Symbols for electrotechnical documentation – Basic passive components.
AS/NZS 1102.105	Graphical Symbols for electrotechnical documentation – Semiconductors and electron tubes.
AS/NZS 1102.106	Graphical Symbols for electrotechnical documentation – Production and conversion of electrical energy.

AS/NZS 1102.107	Graphical Symbols for electrotechnical documentation – Switchgear, controlgear and protective devices.
AS/NZS 1102.108	Graphical Symbols for electrotechnical documentation – Measuring instruments, lamps and signalling devices.
AS/NZS 1102.109	Graphical Symbols for electrotechnical documentation – Telecommunications – Switching and peripheral equipment.
AS/NZS 1102.110	Graphical Symbols for electrotechnical documentation – Telecommunications - Transmission.
AS/NZS 1102.111	Graphical Symbols for electrotechnical documentation – Architectural and topographical installation plans and diagrams.
AS/NZS 1102.112	Graphical Symbols for electrotechnology – Binary logic elements.
AS/NZS 1102.113	Graphical Symbols for electrotechnology – Analogue elements.
AS3702	Item designation in electrotechnology
AS4383	Preparation of documents used in electrotechnology Part 1: General requirements
AS60417	Graphical symbols for use on equipment Part 1: Overview and application
HB7	Engineering Drawing Handbook

3.2 Copyright

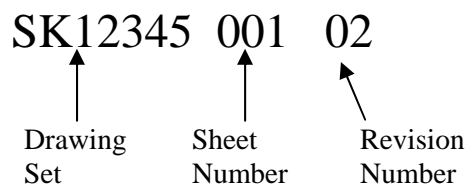
Files provided by HWC for the preparation of drawings remain the copyrighted property of HWC. The drawings are not to be used for any other purpose.

4 DRAWING NUMBERS

The drawing number consists of three segments of information as follows.

- Drawing set
- Sheet number (three digits)
- Revision number (two digits)

An example of a drawing number is shown below.



Only drawing set numbers obtained from Hunter Water will be used on drawings that are to be provided to Hunter Water either as a design or a Work as Constructed package.

The name of the electronic drawing files is to reflect the drawing number. For the above example the digital file name would be SK12345-001_02

The drawing title page will be on sheet -000.

The drawing indexes will begin on sheet -001.

5 BORDERS

Only use the standard borders provided by HWC.

All borders are to be inserted as a block and are not to be exploded.

5.1 Title Block Information

5.1.1 Drawing Title

Drawing titles identify the drawing in the context of HWC's Asset Management System. The drawing title includes the site name, asset number and functional area to which the drawing refers, as well as the specific detail of the drawing's content. Do not use 'No.' or '#' to signify the number of the pump station or pump, refer to examples.

Pump Station

	Format	Example
Title Line 1	Asset name (Equipment Number)	Cardiff South 4 WPS (WSCA015)
Title Line 2	Drawing Description	Pump 1 Control Circuit
Title Line 3	Drawing Description	24VDC PLC Control
Title Line 4	Drawing Type	Schematic Diagram

Treatment Plant

	Format	Example
Title Line 1	Asset name (Equipment Number)	Belmont WWTW (STBEL)
Title Line 2	Drawing Description	Inlet Works
Title Line 3	Drawing Description	Clarifier Pump 1
Title Line 4	Drawing Type	Schematic Diagram

Revision table in left-hand corner of border is to have the latest revision on the top line at all times and the revisions shall read from latest to earliest top to bottom.

5.2 Signatories

5.2.1 Designed

Insert the following information in the designated space:

- The name of the designer certifying that the design requirements for the project (including technical standards) have been met. Abbreviate the name by using the designer's three initials.
- The date on which the designer has certified the above.
- The abbreviated name of the company for which the designer is employed.

5.2.2 Drawn

Insert the following information in the designated space:

- The name of the drafting officer who prepared the drawing. Abbreviate the name by using the drafting officers three initials.
- The date for which the draft person has completed the above.
- The abbreviated name of the company for which the draft person is employed.

5.2.3 Checked

Insert the following information in the designated space:

- The name of the appropriate design team leader verifying that an independent examination of the engineering design and drawing has been carried out to confirm compliance with design standards, accuracy of content and conformance with accepted good practice. Abbreviate the name by using the design team leaders three initials. The design team leader is typically not the same person who has completed the design / drawing.
- The date for which the design team leader has completed the above.
- The abbreviated name of the company for which the design team leader is employed

5.2.4 Approved

Insert the following information in the designated space:

- The name of the delegated officer confirming that the drawing meets the requirements of the project and that the drawing can be issued for use. The person approving the drawing is typically not the same person who has checked / design or has completed the drawing.
- The date for which the delegated officer has verified the above.
- The abbreviated name of the company for which the delegated officer is employed.

6 DRAWING SPECIFICATIONS

6.1 CAD File Format

6.1.1 File Format

Produce all drawings in electronic form and submit to HWC in full compliance with the AutoCAD software (file extension = .DWG).

Do not downgrade standard borders, drawings and symbols to an earlier version. Save all drawings in a version which is 2 versions prior to the current version of AutoCAD.

6.1.2 Sheets

Draw all electrical schematics, switchboard constructions, and layouts on A3 size sheet. A1 drawing sizes may be used for site plans. Exception to this may be granted upon request from Hunter Water.

6.1.3 External References

External references (drawing dependent on another file) on electronic drawings are not permitted.

6.1.4 Paper Space and Model Space

All electrical schematics and single line drawings are to be produced as a 2D drawing file using only MODEL SPACE.

Panel layouts and construction diagrams along with general arrangements are to be produced using a combination of Model and Paper space. The drawing shall be drawn at a scale of 1:1 on Model space and the border inserted in Paper space. Viewports are to be created to show the drawing on Paper space, standard scales of Viewports are to be used. Only one drawing per file, i.e., No multiple Paper space tabs containing more than one drawing

6.1.5 Drawing Insertion Point

Insert all drawing borders at 0,0,0.

6.2 Text Styles

All text is in accordance with the table below:

Text Height Plotted Height	Layer	Colour	Font	Style	Width Factor	Oblique Angle
2.0mm references	- Text20	By layer	ISOCP	T20	1	0
2.0mm – wire number only	Wire	By layer	ISOCP	Wire	1	15
2.5mm	Text25	By layer	ISOCP	T25	1	0
3.5mm	Text35	By layer	ISOCP	T35	1	0
5.0mm	Text50	By layer	ISOCP	T50	1	0
7.0mm	Text70	By layer	ISOCP	T70	1	0

All general text in the drawing shall be Dtext and is to be horizontal and upper case. Only use lower case lettering for abbreviations for engineering units of measure.

6.3 Line Types

Line types and associated colour of all entities are defined “Bylayer”. When drawing a line that is anything other than continuous (i.e. hidden, dashed, etc) the line type is to be changed through the properties command and remain on the allocated layer name.

Do not break lines to simulate a line type.

Standard AutoCAD line types shall be used as per the ACADISO.LIN file and as shown below:

“Continuous”	_____
“Hidden”	-----
“Dashed”	- - - - -
“Centre ”	- . - . - .

The global line type scale of 1 with an object scale of 0.25 shall be used.

Use line types on drawings in accordance with the table below:

LINE TYPE	APPLICATION
Continuous	Solid lines Visible outlines of objects and components General details and symbols Dimension lines, projection lines and leaders Intersection and bend lines General purpose electrical circuits Hatching line work
Hidden	Hidden outlines and edges of objects To group a number of devices in one area Cable runs on electrical arrangements and site plans Objects or material to be removed
Centre	Centre lines and axis of components, solids, holes, hole groups and services Cutting planes
Dashed	Field wiring lines

6.4 Layers

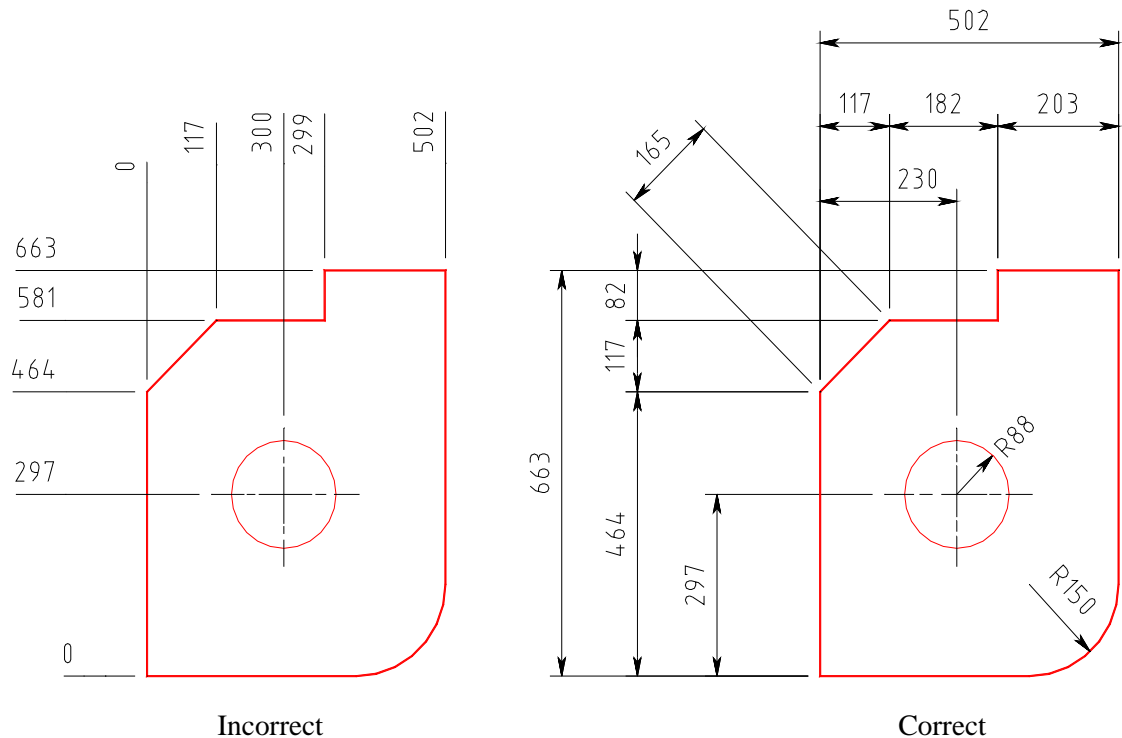
Layers shall be in accordance with the following table:

Layer Name	Colour	Line type	Line weight Thickness	Description / Application
0	7 white	continuous	varies	Standard layer and is not to be used
Defpoints	7 white	continuous	default	Standard layer and is not to be used
Dim	7 white	By layer	0.25	Dimensioning
PEN018	9 grey	By layer	0.18	Hidden lines. Future designs and switch links
PEN025	7 white	By layer	0.25	Control circuit wiring
PEN035	2 yellow	By layer	0.35	Construction outlines. Relay outlines
PEN050	1 red	By layer	0.50	Power circuit wiring
PEN070	5 blue	By layer	0.70	Heavy outlines, bridging bars on terminals and panel designs
Wire	7 white	By layer	0.20	All wire numbers, text only
Text20	7 white	By layer	0.20	Cross references, text only
Text25	7 white	By layer	0.25	Symbol labels and general text
Text35	2 yellow	By layer	0.35	Headings and titles
Text50	1 red	By layer	0.50	Headings and titles for A1 drawings only
Text70	5 blue	By layer	0.70	Headings and titles for A1 drawings only
Vports	7 white	By layer	0.25	Viewports Only (Print turned off)
Symbol	2 yellow 7 white	By layer By layer	0.35 0.25	Symbol Associated text

6.5 Dimensions and Leaders

All dimensions are shown in millimetres. Only solid arrowheads will be used to terminate a dimension line or leaders. Align dimension text parallel to the dimension line as shown below.

Use dimension style AS1100 that is provided with the standard borders and drawings.



6.6 Blocks and Symbols

Use standard HWC symbols on the drawings. These are located in the Technical Information, to receive a copy refer clause 2.

Where a symbol for an item of equipment or detail is not available from the HWC standard list, obtain approval from Hunter Water before use of the symbol. If new blocks are to be drawn, they are to be created on layer "symbol" with their attributed tag name and reference.

Do not create blocks on any other standard layer.

Do not insert blocks with different X & Y scales.

For each particular drawing, blocks shall be inserted at the same scale every time they are used. (i.e. $x = 1$, $y = 1$)

6.7 Hatching

Use standard AutoCAD defined hatch patterns for all shading requirements. Do not explode hatching patterns.

6.8 Grids and Grid Snap

A grid of 5.0mm and a snap of 1.25mm shall be used to ensure that all sectors align correctly. Text where applicable is to be positioned using a 5.0mm grid, 1.25mm snap to ensure a 1.25mm gap between objects and text.

Electrical symbols are in multiples of 2.5mm width and positioned to ensure that line work will snap to the symbols precisely.

6.9 Scaling

All electrical single line, schematic, connection diagrams are to be drawn at a typical scale of 1:1. Construction and layout drawings of electrical panels will also be drawn at a 1:1 scale but may be scaled using the Viewports and Paperspace mode as detailed in section 6.1

7 TECHNICAL PRESENTATION

All electrical drawings shall be drawn on the grid system. Electrical control schematic diagrams are drawn with the circuit ladder rungs vertical.

7.1 Wire Numbering

All wires on the drawings will be numbered. Hunter Water uses two separate wiring numbering systems which is dependant on the size of the electrical installation.

The suffix of the wire numbering system used is a standard incremental two digit number. The suffix of the wire number on each sheet shall start from 00, be incremented by one, and shall not exceed 99. The allocation of suffixes will start in the top left hand corner of the drawing flowing top to bottom and then left to right.

The wire number is to be horizontal and placed adjacent to the wire with spacing as detailed in Clause 6.8. The numbers are to be placed at frequent intervals along the length of the wire.

Wire numbers are to be placed on the associated layer as detailed in Clause 6.4 and using the standard text style 'Wire'.

The last wire number used shall be noted on the bottom right hand corner of the drawing above the title.

7.1.1 Small to Medium Installations (e.g. pumping stations)

This system is applicable when one drawing set is used for the installation with a maximum of 99 sheets.

Control circuit wire numbers consists of a four digit number. The number is determined by using the last two digits of the sheet number, the remaining two-digits are an incremental number as detailed above. E.g. for a typical wire on drawing SK1234-053, the wire number would be '5317'

7.1.2 Large Installations (e.g., treatment facilities)

This system is applicable when the drawing set used for the installation has more than 99 sheets.

Control circuit wire numbers consists of a seven digit number. The first five-digits are made up from the last two digits of the drawing set number followed by the three digit sheet number. The remaining two-digits are an incremental number as detailed above. E.g. for a typical wire on drawing SK1234-053, the wire number would be '3405317'.

7.2 Cross Referencing

All associated contacts and coils are to be cross referenced using the format detailed in this section.

Cross referencing uses a XY reference system. The first two or three characters represent the sheet number and the last two or three characters represent the XY co-ordinates of the contact or coil etc. The cross reference will be distinguished from the wire numbers by placing the number in brackets. For example a contact which is on sheet 3 which has a XY co-ordinate of F12 shall be detailed on the associated coil as (03F12).

If wire numbers are cross referenced to other drawings the cross reference will contain the whole drawing number followed by the XY reference.

7.3 Component Ratings and Settings

7.3.1 Single Line Diagrams

Single line diagrams will contain the prospective fault levels at the incoming supply to the plant and at each node (e.g. CB, Isolators etc) on the diagram. The protection type and setting will be displayed next to the associated protection device. The single line diagram will also display the National Meter Identifier (NMI), the Supply Authorities substation reference and if available the closest Supply Authority pole number.

7.3.2 Schematics

All electrical schematic drawings will clearly identify the type and operating range of the electrical or instrumentation device used in the circuit. All analogue measurement devices are to fully detail the range and unit of measurement including the voltage or current value this range represents.

7.4 Graphical Exactness

All connecting entities (i.e. Lines, circles etc) must meet accurately at their intersecting coordinate. Use object snap all times when editing line work.

8 MODIFICATIONS TO DRAWINGS

8.1 Revisions

Drawings supplied during the review stages of a design are to be given a sequential letter starting with Revision A.

e.g.

Revision A	1st Draft
Revision B	2nd Draft
Revision C	Client Review etc

Once a drawing has been approved for Construction it is to be given a revision status of zero.

e.g.

Revision 0	Construction Issue
Revision 1	Dimension Updated
Revision 2	Work-As-Constructed, etc...

If an amendment is made to the drawing following construction issue, the drawings will display the next sequential number in the title block such as a '1', '2' or '3'. The revision box of the drawing is to be updated with the revision number and description of the amendment before the drawing is re-issued.

The Initials of the draftsman carrying out the modifications along with the initials of person requesting the modification with the dates of both is to be included on all revisions.

All revision information shall be entered onto the border using the Revision Block supplied.

8.2 Highlighting revisions

When changes to the final design drawing have been made, amendment triangle/s, containing the revision number, can be placed adjacent to the modified section. For additional clarity, revision cloud/s may also be used to highlight the modifications. Once the modification has been carried out physically on site all amendment triangles and clouding will be removed before issuing a 'Work as Constructed' version.

8.3 Work as Constructed

8.3.1 General

Revise the electronic versions of all Construction Drawings to accurately depict the Work-As-Constructed. "Construction Drawings" mean all drawings issued or prepared to define the physical characteristics of the works to be constructed.

Comply with all the requirements of this technical specification STS904 when preparing and submitting Work-as Constructed drawings.

Check and revise as necessary all dimensions, coordinates, levels, materials and other drawing notations.

For any features which are noted on the Construction Drawings to be located, sized or otherwise determined during construction amend the notation to indicate the actual location, size or characteristic.

9 COMPLETED DRAWINGS

9.1 Final Drawing Settings

Before completion of a drawing it is to be set as follows:

Save drawing at "ZOOM EXTENTS"

Purge drawing.

All layers to be turned on and thawed.

Run CAD standard checker which is provided in the Technical Information Package

The electronic file name shall be in accordance with section 4.

9.2 Plot Style

The plot style supplied with the Technical information package will be used. The drawing will be saved using this plot style; there will be no variations to this. The plot style is named HWC-ELEC. All drawings will be saved using this plot style.

All drawings will be saved with the plotter / printer name being the 'Default Windows system printer' and the paper size 'A3'.

9.3 Company Logos

No company logos are to be placed on the drawing. The company's abbreviated name is detailed in the allocated area on the standard border.

10 APPENDIX A DEFINITIONS AND ACRONYMS

CAD	Computer Aided Drafting
CAD Drawing File	Electronically Saved Drawing Data
DWG	Default AutoCAD drawing file format.
MODEL SPACE	Defined drawing space in AutoCAD
PAPER SPACE	Defined drawing space in AutoCAD for placing title sheets etc.
LAYER	Logical groupings of data within a drawing file which can be turned on and off as required.
BYLAYER	Settings of line types and colours for specified entities.
PURGED	AutoCAD command to delete any entity information
BLOCK	A subordinate drawing file within the main drawing file.

11 [END TECHNICAL SPECIFICATION]