



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

Standard Technical Specification for:

PREPARATION OF ELECTRICAL ENGINEERING DRAWINGS

STS 904

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Standard Technical Specification – Preparation Electrical Engineering Drawings – STS 904

1 Purpose

This Standard Technical Specification details the preparation and submission of all electrical engineering design drawings to Hunter Water Corporation (Hunter Water).

It does not cover requirements for

- Work As Constructed (WAC) Drawings specified in *STS 903*
- Civil, Structural, Mechanical and P&ID Drawings specified in *STS 911*

This Specification is available on the Hunter Water website <http://www.hunterwater.com.au>.

2 Interpretation

For the purposes of interpreting *STS 904*, except where the context requires otherwise:

- 'drawings' means the drawings detailing the work involved in a particular project in hand
- 'include' means including, but not limited to, and is used to provide clarification or examples of the type and nature of items intended
- 'specification' means a specification detailing the work involved in a particular project
- 'standard drawings' means Hunter Water drawings
- 'standards' means applicable industry standards and includes:
 - Australian Standards (AS)
 - Australian/New Zealand Standards (AS/NZS)
 - American National Standards Institute (ANSI) Standards and
 - International Organization for Standardization (ISO).
- 'standard technical specification' (STS) references any of Hunter Water's standard technical specifications, as implied by the text.

Headings are for the convenience of the reader and shall not be used in the interpretation of this standard technical specification.

Unless otherwise stated, expressions such as 'give notice', 'submit', 'approval', or 'directed' mean 'give notice to', 'submit to', 'approval by', or 'directed by' the person nominated by Hunter Water.

Approval does not imply acceptance of responsibility by Hunter Water for compliance with this STS. Unless issued in writing, approval has not been granted.

Failure to comply with the requirements of this STS or any referred documentation may result in rejection. Where equipment or manufacture are rejected, notice will be given by Hunter Water in writing. All associated rectification work shall be completed by the contractor at their cost.

2.1 Order of Precedence

All work shall meet all stated requirements in this STS in addition to project specifications or standards specified.

Any deviation from this STS shall be approved in writing on a case by case basis by Hunter Water's Document Owner.

3 Roles and Responsibilities

3.1 Document Owner

The Document Owner of this *STS* is the Manager Capability Engineering.

3.2 Responsibilities

Any request for a variation to this *STS* shall be made in accordance with the change management process in *Hunter Water Asset Standards Management Plan*.

The Document Owner shall approve in writing the issue of any updates.

4 Definitions

Where the following term, abbreviation or expression occurs in this STS, it is defined as follows, unless the context implies otherwise:-

| Term / Abbreviation / Expression | Definition |
|---|--|
| AS | Australian Standard |
| AS/NZS | Australian and New Zealand Standard |
| Designer | Person or organisation creating design and drawings for manufacture of equipment or construction of a system of mechanical equipment |
| Hunter Water | Hunter Water Corporation |
| STS | Standard Technical Specification |

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5 Compliance Requirements

5.1 Standards

Electrical drawings shall comply with:

- This STS
- Other relevant Hunter Water Standards
- Relevant Australian Standards

Except where otherwise required in this specification, drawings are to comply with the current relevant Standards including, but not limited to those found in Appendix 1.

Any deviation from *STS 904* shall be approved in writing on a case by case basis by an authorised Hunter Water representative.

5.2 Copyright

All electronic files supplied by Hunter Water are the property of Hunter Water. This includes, but is not limited to, the contents of the Technical Information Package, including the Microsoft Office format files, AutoCAD format files and associated files, menus, plug-ins, code and scripts (Files). Hunter Water retains all intellectual property and related rights in or relating to the Files including without limitation copyright (including future copyright); confidential information, and all other rights conferred by statute, common law or equity in relation to the Files.

The purpose of the Files is to assist the user in the production of electrical drawings for Hunter Water in accordance with this Standard Technical Specification and to confirm whether electrical drawings produced for Hunter Water are compliant with this STS (Intended Use).

The Files are not to be used, copied, modified, manipulated, supplied, reproduced, provided or disclosed by or to any other person or for any purpose other than the Intended Use without the prior written consent of Hunter Water.

To the extent permitted by law, all conditions and warranties concerning the Files expressed or implied by statute, common law, equity, trade, custom or usage or otherwise are expressly excluded. Hunter Water makes no representation as to the stability of the Files and accepts no liability for any loss or damage arising from the instability of the Files.

Hunter Water is not required to provide maintenance support for the Files or detailed instructions on operational use.

The user must ensure that the Files are:

- Used in accordance with any instructions provided by Hunter Water
- Used appropriately and only for such of the Intended Use
- Only used, accessed, operated, and copied by, or provided to persons who are officers, employees or agents of the user and are aware of and have agreed to be bound by these terms and conditions

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The user acknowledges that a zero error report by the compliance checking files does not guarantee that the drawings checked are compliant with this STS.

The user indemnifies and will keep indemnified Hunter Water against all actions, suits, claims, demands, costs, charges, damages, liabilities, loss and expenses to which Hunter Water may incur arising out of the provision to the user of, and any use, reproduction or disclosure of or change to, the Files by the user or any other person claiming through the user, which is in any way connected with or arises from the use of the Files.

Drawing files submitted to Hunter Water shall become the copyright property of Hunter Water

6 Drawing Requirements

6.1 Information Provided by Hunter Water

Hunter Water Electrical Drafting has available a Technical Information Package as detailed in Table 1.

Prior to commencement of a design, it is the responsibility of the designer to request from Hunter Water the information as detailed in Table 1.

A meeting with Hunter Water Electrical Drafting prior to commencement is strongly advised if this is the first time the Contractor has carried out drafting for Hunter Water.

Table 1: Documentation Provided by Hunter Water

| Information | Contact at Hunter Water |
|--|---|
| Equipment Number | Hunter Water Project Manager |
| Asset Name | Hunter Water Project Manager |
| Drawing Set Number | electrical.drafting@hunterwater.com.au |
| Technical Information Package including electronic copy of the standard electrical menu, borders, symbols and template drawing set | electrical.drafting@hunterwater.com.au prior to commencement of each project |

For modification to an existing drawing set, it is the responsibility of the designer to request from Hunter Water the latest revision of the existing drawing set.

6.2 File Format

Drawings shall be supplied in an AutoCAD version which is two versions prior to the current AutoCAD release.

6.3 Drawing Size

Draw all electrical schematics, switchboard constructions, and layouts on an A3 size sheet.

A1 drawing sizes may be used upon request to, and approval from, Hunter Water Electrical Drafting. If approved, the Hunter Water standard A1 border will be provided.

6.4 Drawing Numbers

The drawing number consists of three segments of information inserted in the title block as follows:

- Drawing set
- Sheet number (two digits & three digits if over 100 sheets)
- Revision number (one digit for 0-9, two digits for 10 onwards)

An example of a drawing number is shown below:

| | | |
|-------------|-----------------|--------------------|
| SK12345 | 01 | 2 |
| Drawing Set | Sheet Number | Revision Number |

or

| | | |
|-------------|-----------------|--------------------|
| SK12345 | 101 | 2 |
| Drawing Set | Sheet Number | Revision Number |

All drawings submitted to Hunter Water shall only have drawing set numbers provided by Hunter Water.

6.4.1 Electronic File Name

The name of the electronic drawing files are to reflect the drawing number, but an extra zero is to be inserted in front of the sheet number if two digits and in front of the revision number. A dash is inserted between the drawing set number and sheet number, an underscore is inserted between the sheet number and the revision number. For the above example the digital file name would be *SK12345-001_02* or *SK12345-101_02*.

The drawing title page will be on Sheet 00 and the drawing index is on Sheet 01. If additional drawing index sheets are required then they shall follow sequentially directly following Sheet 01.

6.5 Drawing Specifications

6.5.1 Drawing Environment

All electrical single line, schematic and connection diagrams 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 1:1 scale in Model Space and the border inserted in Paper Space. Viewports are to be created to show the drawing in 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.

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6.5.1.1 Scaling

All electrical single line, schematic and connection diagrams are to be drawn at a 1:1 scale. Construction and layout drawings of electrical panels will also be drawn at a 1:1 scale, but may be scaled using the Viewports and Paper Space mode as detailed in Section 6.5.1.

6.5.1.2 Borders

Only use the standard border provided by Hunter Water.

All borders are to be inserted as a block at 0,0,0 and are not to be exploded or modified.

6.5.2 Text Styles

All text is in accordance with the table below:

Table 2: Text Styles

| Text Height Plotted Height | Layer | Colour | Font | Style | Width Factor | Oblique Angle |
|----------------------------|--------|---------|-------|-------|--------------|---------------|
| 2.0mm - references | TEXT20 | ByLayer | ISOCP | T20 | 1 | 0 |
| 2.0mm – wire number only | Wire | ByLayer | ISOCP | Wire | 1 | 15 |
| 2.5mm | TEXT25 | ByLayer | ISOCP | T25 | 1 | 0 |
| 3.5mm | TEXT35 | ByLayer | ISOCP | T35 | 1 | 0 |
| 5.0mm | TEXT50 | ByLayer | ISOCP | T50 | 1 | 0 |
| 7.0mm | TEXT70 | ByLayer | 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. Mtext only permitted for multileader objects.

Annotative text is a property that belongs to objects that are commonly used to annotate drawings. This property allows you to automate the process of scaling annotations. Annotative objects are set to Paper Space defined height, and displayed in layout viewports and model space at the size determined by the annotation scale set for those spaces. Annotative text is to be used when drawing panel layouts, etc.

6.5.3 Dimensioning

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

Use dimension style as found in *AS 1100* and multileader style 'Standard' as provided with the standard borders and template drawings.

Note: Annotative scaling can be used to control the overall scale of dimensions displayed in layout viewports. When you create annotative dimensions, they are scaled based on the current annotation scale setting and automatically displayed at the correct size.

Dimensions and leaders to be drawn in Paper Space (as per template drawing set).

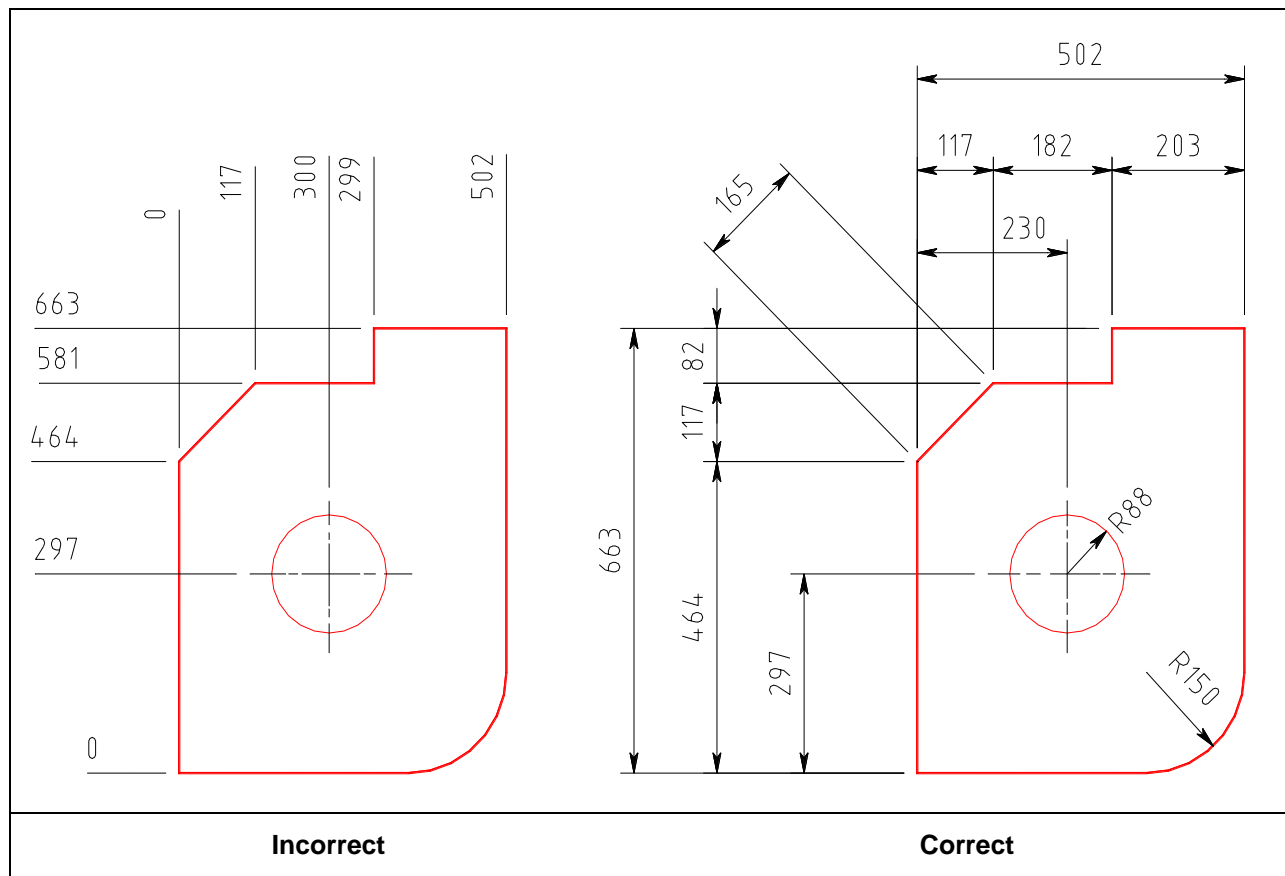


Figure 1: Dimensions

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6.5.3.1 Leaders

All leaders to be placed onto layer TEXT20 and formatted as follows:

Table 3: Multileader Style Manager

| Leader Format | | |
|-------------------------|---|--|
| General | Type Colour Linetype Lineweight | Straight ByLayer ByLayer ByLayer |
| Arrowhead | Symbol Size | Closed filled 2.5 |
| Leader Break | Break size | 2.5 |
| Leader Structure | | |
| Constraints | Maximum leader points | 2 |
| Landing settings | Automatically include landing Set landing distance | Selected 2.5 |
| Scale | Annotative Specify scale | Selected 1 |
| Content | | |
| Multileader type: | Mtext | (only time Mtext is permitted) |
| Text options: | Default text Text Style Text Angle Text Colour Text Height | Default text T20 Keep horizontal ByLayer Defaults to 2.0 |
| Leader connection: | Horizontal attachment Left attachment Right attachment Landing gap | Selected Middle of top line Middle of top line 2.5 |

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| Linetype | Application | Schematic | Layout |
|----------|-------------------------|-----------|--------|
| Dashed | Field wiring lines only | ✓ | ✓ |

6.5.5 Layers

Layers shall be in accordance with the table in Appendix 2.

6.5.6 Title Block Information

6.5.6.1 Drawing Title

Drawing titles identify the drawing in the context of Hunter Water'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.

Table 6: Drawing Title Examples

| Title Line | Format | Pump Station | Treatment Plant |
|------------|-------------------------------|--------------------------------------|---------------------------|
| 1 | Asset Name (Equipment Number) | CARDIFF SOUTH 1 WPS (WS-CAS-001-PS1) | BELMONT WWTW (ST-BEL) |
| 2 | Sub Plant Area | PUMP 1 SOFT STARTER CONTROL CIRCUIT | INLET WORKS / MCC6000 |
| 3 | Equipment Description | 24VDC PLC CONTROL | CLARIFIER PUMP 1 – MV1234 |
| 4 | Drawing Type | SCHEMATIC DIAGRAM | SCHEMATIC DIAGRAM |
| 5 | Sheet Data | SHEET 1 OF 2 | SHEET 1 OF 2 |

6.5.6.2 Revision Table

The 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. If the revision table is full the earliest revision is removed from the list and the latest is put on the top line. The revision description is to reflect what has been changed on the drawing, e.g. WAC - PLC UPGRADE as detailed in Section 6.6.4.2.

6.5.7 External References

External references (drawing dependent on another file) on electronic drawings are not permitted. All external references must be bound prior to submission.

6.5.8 Plotted Drawing Identification

The plot style supplied with the Technical Information Package must be used. The drawing must 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.

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All drawings must be saved with the plotter / printer name being the 'Default Windows system printer' and the paper size 'A3' as follows:

6.5.8.1 Page Setup Manager / Printer Setup

Create new layouts as follows:

Table 7: Print Layout Setup

| Layout | A3 Model | A3 Layout | A4 Model | A4 Layout |
|-------------------------|---|-----------|------------------|-----------|
| Plot Style Table | HWC-ELEC.ctb | | HWC-ELEC-A4.ctb | |
| Paper size | A3 (297 x 420mm) | | A4 (210 x 297mm) | |
| Plot Scale | 1:1 | | Fit to paper | |
| Printer/plotter | Default Windows System Printer.pc3 | | | |
| Shaded viewport options | Quality – Normal Shade plot – As displayed | | | |
| Plot Area | Extents | | | |
| Plot offset | Centre the plot | | | |
| Drawing Orientation | Landscape | | | |
| Plot options | Plot object lineweights Plot with plot styles Plot paper space last | | | |

6.5.9 Hatching

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

6.5.10 Symbols and Blocks

Use standard Hunter Water symbols on the drawings. These are located in the Technical Information Package. To receive a copy, refer to Section 6.1.

Where a symbol/block for an item of equipment or detail is not available from the Hunter Water standard list, obtain approval in writing from Hunter Water Electrical Drafting 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 and change the text to layer symbol, bylayer, colour and the colour of the text.

Do not create blocks on any other standard layer.

Do not insert blocks with different X, Y and Z scales.

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For each particular drawing, blocks shall be inserted at the same scale every time they are used, i.e. X = 1, Y =1, Z=1.

Do not explode blocks provided by Hunter Water.

The Hunter Water blocks and symbols are available from the AutoCAD menu which will be supplied in the Technical Information Package. Drawing set *SK10055* shows details of the Hunter Water blocks and symbols and is supplied as a PDF in the Technical Information Package for reference only.

6.5.11 Signatories

The following drawing review and approval information is required on the title block.

Table 8: Signatories

| Signatory | Information to be Included |
|------------|--|
| Designed | <p>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 initials.</p> <p>The date on which the designer has certified the above.</p> <p>The abbreviated name of the company for which the designer is employed.</p> |
| Drawn | <p>The name of the draftsman who prepared the drawing. Abbreviate the name by using the draftsman's initials.</p> <p>The date for which the draftsman has completed the above.</p> <p>The abbreviated name of the company for which the draftsman is employed.</p> |
| Checked | <p>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 leader's initials. The design team leader is typically not the same person who has completed the design / drafting.</p> <p>The date for which the design team leader has completed the above.</p> <p>The abbreviated name of the company for which the design team leader is employed.</p> |
| Approved | <p>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. Abbreviate the name by using the approver's initials. The person approving the drawing is typically not the same person who has checked / designed or has completed the drawing.</p> <p>The date for which the delegated officer has verified the above.</p> <p>The abbreviated name of the company for which the delegated officer is employed.</p> |
| Date Drawn | <p>Dates are to be shown with a 'Dot' separation and with two digits for day, month and year; e.g. 01.01.11</p> <p>Formats which are not acceptable include 1.1.11, 1/1/11, 01-01-11 and 01/01/11</p> |

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6.5.12 Other

6.5.12.1 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.

6.6 Supply of Drawings

6.6.1 Design Phase Review

Design Phase drawings to be submitted to Hunter Water (electrical.drafting@hunterwater.com.au) for STS 904 compliance check prior to issuing for construction.

6.6.2 Revisions

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

The latest revision is always on the top line of the revision box in the drawing border.

e.g.:

| | |
|------------|-------------------------|
| Revision D | Issued for Construction |
| Revision C | Client Review, etc. |
| Revision B | Second Draft |
| Revision A | First Draft |

If an amendment is made to the drawing following construction issue, the drawings will display the next sequential alpha revision in the title block, such as a 'D', 'E' or 'F'. 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.

Once a drawing has been constructed and is submitted to Hunter Water as a Work as Constructed 'WAC' Drawing (refer to STS 903), it shall be given a revision status of '1'. The latest revision is always on the top line of the revision box in the drawing border.

e.g.:

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| | | | | | | | | | | | | |
|-----|---------------------|---|---|---|---|---|-----|-----|-----|-----|----------|---|
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 1 | WORK AS CONSTRUCTED | | | | | | WW | XX | YY | ZZ | DD.MM.YY | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| No. | REVISION DETAILS | | | | | | DES | DWN | CHK | APP | DATE | |
| | A | B | C | D | E | F | G | H | J | K | L | M |

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

6.6.3 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 WAC version. All notes are to be amended to the as-installed condition as appropriate.

6.6.4 Work As Constructed

6.6.4.1 General

Revise the electronic versions of all Construction Drawings to accurately depict WAC. "Construction Drawings" refers to all drawings issued or prepared to define the physical characteristics of the works to be constructed. WAC drawings are to be delivered as follows:

- Show only the WAC revision when submitted to Hunter Water; remove all pre-WAC revisions
- Comply with all the requirements of this STS when preparing and submitting WAC drawings
- Check and revise as necessary all dimensions, co-ordinates, 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
- Remove all pre-construction notes

6.6.4.2 Ongoing Revisions

When the drawings are revised after "WAC" the revision must show the following information:

- The Lead Engineer's initials and company
- The Lead Drafter's initials and company

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- A relevant description of the work done along with the initials of person requesting the modification and the date of completion of the revision

e.g.:

| | | | | | |
|-----------------|---------------------------|-------------|----------|-------------|----------------|
| 2 | PLC UPGRADE (XX 01.01.11) | YY | ZZ | WW | 02.02.11 |
| Revision Number | Description of Work | Designed By | Drawn By | Approved By | Date Completed |

6.7 Completed Drawings

6.7.1 Final Drawing Settings

Completed drawings to be supplied to Hunter Water as follows:

- Grid of 5mm
- Snap of 1.25mm
- All layers to be turned on and thawed
- Purge drawing
- Save drawing at “ZOOM EXTENTS”
- Run CAD standard checker which is provided in the Technical Information Package
- The electronic file name shall be in accordance with Section 6.4.1
- All drawing sets are to be submitted as a whole set regardless of how many sheets were revised

6.7.2 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.

6.8 Technical Presentation

All electrical drawings shall be drawn on the 5mm grid system. Electrical control schematic diagrams are drawn with the circuit ladder rungs vertical on the alpha/numerical grid.

Each Pump Station set should typically contain the drawing sheets as listed in Table 9 and defined in Sections 6.8.4 to 6.8.11:

Table 9: Drawing Suffix List

| Sheet | Sheet Suffix Example |
|-------------|----------------------|
| Title Sheet | SK12345-00 |
| Index Sheet | SK12345-01 |

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| | |
|-------------------------|------------|
| Single Line Diagram | SK12345-03 |
| Schematic Diagram | SK12345-10 |
| Termination Diagram | SK12345-76 |
| Instrumentation Diagram | SK12345-45 |
| Block Cabling Diagram | SK12345-70 |
| Cable Schedule | SK12345-69 |
| Conduit Schedule | SK12345-__ |
| General Arrangement | SK12345-79 |
| Drafting Legend | SK12345-91 |
| Equipment List | SK12345-92 |
| Locality/Site Plan | SK12345-99 |

For a Treatment Plant, spaces are to be left to allow future modifications, e.g. Pump 1 sheets 5-20, Pump 2 sheets 25-40.

Refer to *SK10062-01* for a typical sheet listing.

6.8.1 Wire Numbering

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

The system is based on sheet of origin of the wire. The prefix is based on the sheet number, 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 Section 6.5.12.1.

Wire numbers are to be placed on the associated layer as detailed in Appendix 2 and using the standard text style 'Wire'.

The last wire number used shall be noted on the bottom corner of the drawing above the border as shown on the template drawings and using the standard text style "T20".

6.8.1.1 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 consist 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;

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e.g. for a typical wire on drawing *SK12345-53*, the wire number would be '5317', where 5317 is the 17th wire that requires numbering on Sheet 53.

6.8.1.2 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 consist 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 *SK12345-153*, the wire number would be '4515317', where 4515317 is the 17th wire that requires numbering on Sheet 153.

6.8.2 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 coil which is on Sheet 3 which has a XY co-ordinate of F20 shall be detailed on the associated contact as (03F20). If the number of sheets goes over 99, e.g. for a Treatment Plant, the reference would be (003F20).

The references are to be on layer "TEXT20" with the standard text style of "T20" as detailed in Section 6.5.2.

If wire numbers are cross referenced to other drawings in the same drawing set the cross reference will contain the sheet number followed by the XY reference for specific locations (preferred) or just the sheet number where more general, e.g. either (10A15) or (SHT 10) as appropriate.

If wire numbers, contacts or coils are cross referenced to other drawings not in the same drawing set the cross reference will contain the whole drawing number, e.g. (SK11223-45).

6.8.3 Component Ratings and Settings

Component ratings and settings shall be included on drawings in the symbol attributes or tables where applicable, refer to template drawings for further guidance.

6.8.4 Single Line Diagrams

Single line diagrams will contain the prospective fault levels at the incoming supply to the plant. 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.

6.8.5 Schematic Diagrams

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

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and unit of measurement including the voltage or current value this range represents. Any adjustable circuit breakers are to show the relevant setting(s).

6.8.6 Termination Diagrams

All termination diagrams will clearly identify the terminals of equipment or items of the station and indicate the interconnection between the terminals. They will flow from the source protective device through to the field device.

6.8.7 Cable Schedules

All cable schedules will clearly identify the following:

- Origin
- Destination
- Class (data, power or control)
- Cable size
- Number of cores
- Ratings of cable
- Type of cable
- Estimated length

6.8.8 Block Cabling Diagrams

All block cabling diagrams will show a simple representation of the principle operation or function, with blocks representing the components or groups of components. No details of connections are to be given.

6.8.9 Switchboard Layouts

All switchboard layouts will clearly identify the switchboard dimensions and general arrangement.

6.8.10 Equipment Lists

All equipment lists will clearly identify the tag name, a description of the device, the make and model of the equipment.

6.8.11 Site / Locality Layout

All site / locality layouts will clearly identify major electrical elements, conduits, pits, power poles, transformer, cable routes etc. The locality plan is to show the station location, the closest main road and surrounding streets.

6.8.12 Graphical Exactness

All connecting entities; (i.e. lines, circles, etc.) must meet accurately at their intersecting co-ordinate. Use object snap at all times when editing line work.

6.9 Drawings Prepared Prior to the First Issue of STS 904

6.9.1 Revisions

Drawings produced prior to the initial release of *STS 904* may require modification to meet current drawing standards. The following are the requirements for the modification of older drawings.

Contact Hunter Water Electrical Drafting at electrical.drafting@hunterwater.com.au for guidance.

6.9.1.1 Major Revisions

Hunter Water Electrical Drafting will determine if the complete drawing set will need to be redrawn to *STS 904*; i.e. if a number of new drawings are integrated into an existing set or if there are revisions to existing '.tif' files.

6.9.1.2 Minor Revisions

Where not deemed a major revision by Hunter Water Electrical Drafting, only the drawings relevant to the works undertaken, including relevant index sheet(s), shall be revised.

6.9.2 Electronic File Name

All pre-*STS 904* CAD file names are to be renamed to *STS 904* naming convention as detailed in Section 6.4.1.

6.9.3 Drawing Border and Title

For all pre-*STS 904* drawings, the first line of the title is to be as detailed in Section 6.5.6.1. The index sheet only shall include on the second line of the title the station address.

Contact Hunter Water electrical.drafting@hunterwater.com.au for this information.

A pre-*STS 904* attributed border (HWCA3 OLD BORDER) shall be provided in the Technical Information Package to replace the existing pre-*STS 904* border.

Leave previous revision details intact.

6.9.4 Revision Description

As detailed in Section 6.6.4.2.

6.9.5 Redrawing TIF Files

If old Hunter Water drawings in '.tif' format require revisions to be made and it is still in use, then a new SK number must be obtained from Hunter Water and it must be redrawn to *STS 904* format and referenced to any other drawings as required.

6.9.6 Plot Style

The plot style supplied with the Technical Information Package must be used. The drawing must be saved using this plot style; there will be no variations to this. The plot style is named HWC-ALLBLACK. All pre-*STS 904* drawings must be saved using this plot style.

All drawings must be saved with the plotter / printer name being the 'Default Windows system printer' and the paper size 'A3'. See Section 6.5.8.

7 Related Documents

Other Hunter Water drawing standards include:

- *STS 911 – Preparation of Civil, Structural and Mechanical Engineering Drawings*
- *STS 903 – Work As Constructed Information*

8 Document Control

Document Owner: Manager Capability Engineering

Document Author: Team Leader Electrical Engineering

Document Controller: Senior Engineer Standards & Strategy

| Version | Date | Author | Details of Change | Approval Date | Approved By | Next Scheduled Review |
|---------|------------|----------|-------------------|---------------|--------------|-----------------------|
| 1.0 | Dec 2013 | M Bucci | Full revision | Dec 2013 | S Horvath | Dec 15 |
| 2.0 | April 2019 | R Watson | Full revision | 30/05/2019 | L Backhausen | 30/05/2021 |

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Appendix 1. Australian Standards

| Number | Name |
|---------------------------|---|
| AS ISO 1000-1998 | The international system of units (SI) and its application |
| AS 1100.101-1992 (R2014) | Technical drawing - General principles |
| AS 1102.101-1989 ** | Graphical symbols for electrotechnical documentation – General information and general index |
| AS/NZS 1102.102:1997 ** | Graphical symbols for electrotechnical documentation – Symbol elements, qualifying symbols and other symbols having general application |
| AS/NZS 1102.103:1997 ** | Graphical symbols for electrotechnical documentation – Conductors and connecting devices |
| AS/NZS 1102.104:1997 ** | Graphical symbols for electrotechnical documentation – Basic passive components |
| AS/NZS 1102.105:1997 ** | Graphical symbols for electrotechnical documentation – Semiconductors and electron tubes |
| AS/NZS 1102.106:1997 ** | Graphical symbols for electrotechnical documentation – Production and conversion of electrical energy |
| AS/NZS 1102.107:1997 ** | Graphical symbols for electrotechnical documentation – Switchgear, controlgear and protective devices |
| AS/NZS 1102.108:1997 ** | Graphical symbols for electrotechnical documentation – Measuring instruments, lamps and signalling devices |
| AS/NZS 1102.109:1997 ** | Graphical symbols for electrotechnical documentation – Telecommunications – Switching and peripheral equipment |
| AS/NZS 1102.110:1997 ** | Graphical symbols for electrotechnical documentation – Telecommunications - Transmission |
| AS/NZS 1102.111:1997 ** | Graphical symbols for electrotechnical documentation – Architectural and topographical installation plans and diagrams |
| AS/NZS 1102.112:1995 ** | Graphical symbols for electrotechnology – Binary logic elements |
| AS/NZS 1102.113:1995 ** | Graphical symbols for electrotechnology – Analogue elements |
| AS 3702-1989 ** | Item designation in electrotechnology |
| AS/NZS 4383.1:1996 ** | Preparation of documents used in electrotechnology: General requirements |
| AS 60417.1-2004 ** | Graphical symbols for use on equipment: Overview and application |
| HB7-1993 (R2014) | Engineering drawing handbook |
| Other reference standards | |
| AS 1101.6-1989 (obsolete) | Process measurement control functions and instrumentation |

** denotes that the standard has been withdrawn but is used as a symbol reference.

Appendix 2. Drawing Layers

| Layer Name | Colour | Line Type | Line Weight Thickness | Description/ Application | Schematics | Layouts |
|------------|----------|------------|-----------------------|---|------------|---------|
| 0 | 7 white | continuous | varies | Standard layer and is not to be used | ✓ | ✓ |
| BORDER | 7 white | ByLayer | 0.25 | Border and revision blocks only | ✓ | ✓ |
| DEFPOINTS | 7 white | continuous | default | Standard layer and is not to be used | ✓ | ✓ |
| DIM | 7 white | ByLayer | 0.25 | Dimensioning | | ✓ |
| PEN018 | 9 grey | ByLayer | 0.18 | Hidden lines and/or Hatching Future designs and switch links | ✓ | ✓ |
| PEN025 | 7 white | ByLayer | 0.25 | Control circuit wiring | ✓ | |
| PEN035 | 2 yellow | ByLayer | 0.35 | Construction outlines Relay outlines | ✓ | ✓ |
| PEN050 | 1 red | ByLayer | 0.50 | Power circuit wiring Panel designs | ✓ | ✓ |
| PEN070 | 5 blue | ByLayer | 0.70 | Heavy outlines Bridging bars on terminals | ✓ | ✓ |
| WIRE | 7 white | ByLayer | 0.20 | All wire numbers, text only | ✓ | |
| TEXT20 | 7 white | ByLayer | 0.20 | Cross reference text only | ✓ | |
| TEXT25 | 7 white | ByLayer | 0.25 | Symbol labels General text | ✓ | ✓ |
| TEXT35 | 2 yellow | ByLayer | 0.35 | Headings and titles | ✓ | ✓ |
| TEXT50 | 1 red | ByLayer | 0.50 | Headings and titles for A1 drawings only | | ✓ |
| TEXT70 | 5 blue | ByLayer | 0.70 | Headings and titles for A1 drawings only | | ✓ |
| Vports | 7 white | ByLayer | 0.25 | Viewports Only (print turned off) | | ✓ |
| SYMBOL | 2 yellow | ByLayer | 0.35 | Symbol | ✓ | |
| | 7 white | ByLayer | 0.25 | Associated text | ✓ | |

NB: Future text/lines to be in PEN018 and removed from the template drawings if not applicable.

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