



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

Standard Technical Specification for:

**STS 911**  
**PREPARATION OF CIVIL, STRUCTURAL  
AND MECHANICAL ENGINEERING  
DRAWINGS**

This Standard Technical Specification was developed by Hunter Water Corporation to be used for the design, construction/installation and/or maintenance of facilities that are, or are to become, the property of Hunter Water Corporation. It is intended that this Standard Technical Specification be used in conjunction with various other standard and project specific drawings and design requirements as defined by Hunter Water Corporation for each particular project.

Hunter Water Corporation does not consider this Standard Technical Specification suitable for use for any other purpose or in any other manner. Use of this Standard Technical Specification for any other purpose or in any other manner is wholly at the user's risk.

Hunter Water Corporation does not assume a duty of care to any person using this document for any purpose other than stated.

In the case of this document having been downloaded from Hunter Water Corporation's website;

- Hunter Water Corporation has no responsibility to inform you of any matter relating to the accuracy of this Standard Technical Specification which is known to Hunter Water Corporation at the time of downloading or subsequently comes to the attention of Hunter Water Corporation.
- This document is current at the date of downloading. Hunter Water Corporation may update this document at any time.

Copyright in this document belongs to Hunter Water Corporation.

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

<b>1 Purpose</b>	<b>5</b>
<b>2 Interpretation</b>	<b>6</b>
2.1 Order of Precedence	6
<b>3 Roles and Responsibilities</b>	<b>7</b>
3.1 Document Owner	7
3.2 Responsibilities	7
<b>4 Definitions</b>	<b>8</b>
<b>5 Compliance Requirements</b>	<b>9</b>
5.1 Standards	9
5.1.1 Hunter Water Standards	9
5.2 Copyright	9
<b>6 Drawing Requirements</b>	<b>11</b>
6.1 Information Provided by Hunter Water	11
6.1.1 Design Documentation	11
6.2 File format	12
6.3 Drawing size	12
6.4 Drawing Numbers	12
6.4.1 Electronic File Name	12
6.5 Drawing Specifications	13
6.5.1 Drawing environment	13
6.5.2 Dimensioning	14
6.5.3 Line types	14
6.5.4 Layers	14
6.5.5 Title block	15
6.5.6 External References	15
6.5.7 Plotting Drawing Information	15
6.5.8 Hatching and Shading	15
6.5.9 Symbols, Blocks and Abbreviations	15
6.5.10 Signatories	16
6.5.11 Other	16
6.6 Drawing Modifications	17
6.6.1 Revisions	17
6.6.2 Highlighting revisions	17
6.6.3 Work as Constructed	17

6.7	Supply of Drawings .....	18
<b>7</b>	<b>Process and Instrumentation Diagrams (P&amp;IDs) .....</b>	<b>19</b>
7.1	Purpose .....	19
7.2	Terms and Abbreviations .....	19
7.3	General.....	19
7.4	Standard Symbols .....	19
7.5	Tag Numbers.....	19
7.6	Tag List.....	21
7.7	Linking P&ID Drawing Sheets .....	21
7.8	Issue for Review and Construction .....	22
7.9	Work as Constructed.....	22
7.10	Logos.....	22
7.11	Valves.....	22
7.11.1	Position.....	22
7.11.2	Fail Safe .....	22
7.12	Pipelines.....	22
7.13	Stop Boards.....	22
7.14	Mechanical Devices with Motors.....	23
7.15	Numeric Sequence.....	23
7.16	Display of Analogue Set-Points and Control Functions (Loops).....	24
7.17	Local Control Panel.....	24
7.18	Interlocks.....	24
<b>8</b>	<b>Related Documents.....</b>	<b>25</b>
<b>9</b>	<b>Document control.....</b>	<b>26</b>
	<b>Appendix A: Australian Standards .....</b>	<b>27</b>
	<b>Appendix B: Instrument Identifiers - Examples .....</b>	<b>28</b>
	<b>Appendix C: Equipment Types (Excluding Instruments) .....</b>	<b>29</b>
	<b>Appendix D: Tag Numbering System for Wastewater Plants .....</b>	<b>31</b>
	<b>Appendix E: Tag Numbering System for Recycled Water Plants .....</b>	<b>33</b>

## TABLES

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

Table 1: Information to be supplied by Hunter Water ..... 11

Table 2: Text Styles - A3 Drawings..... 14

Table 3: Text Styles - A1 Drawings..... 14

Table 4: Colour and Line Weights..... 14

Table 5: Approvals ..... 16

Table 6: Accepted File Types..... 17

Table 7: Drawing Completion Checklist ..... 18



# Standard Technical Specification Preparation of Civil, Structural and Mechanical Drawings – STS 911

## 1 Purpose

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

It does not cover requirements for:

- Work as Constructed (WAC) Drawings specified in *STS 903*
- Electrical Drawings specified in *STS 904*.

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

## 2 Interpretation

For the purposes of the interpretation of *STS 911*, except where the context requires otherwise:

- 'Drawings' means the drawings detailing the work involved in a particular project
- '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
- 'Standards' means applicable industry standards including the Australian Standards (AS), Australian / New Zealand Standards (AS/NZS), and ISO Standards (ISO)
- 'Standard Drawings' means Hunter Water drawings
- 'Standard Technical Specification' (STS) is a reference to 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 STS.

Unless stated otherwise any expression such as "give notice", "submit", "approval", or "directed" means give notice to, submit to, approval by, or directed by the person nominated by the Hunter Water.

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

### 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 *STS 911 – Preparation of Civil, Structural and Mechanical Engineering Drawings* is Hunter Water's Manager Strategic Asset Planning.

#### **3.2 Responsibilities**

The Document Owner shall approve in writing the issue of any updated version of STS 911. Any concession to any requirement in *STS 911 – Preparation of Civil, Structural and Mechanical Engineering Drawings* is valid only when authorised in writing by the Document Owner.

## 4 Definitions

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

<b>Term / Abbreviation / Expression</b>	<b>Definition</b>
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 electrical and mechanical equipment.
Hunter Water	Hunter Water Corporation.



## 5 Compliance Requirements

### 5.1 Standards

Civil, structural and mechanical 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 911* shall be approved in writing on a case by case basis by an authorised Hunter Water representative.

#### 5.1.1 Hunter Water Standards

Check completed drawings using the standard files HWC Civil\_A3.dws or HWC Civil\_A1.dws before submission to Hunter Water. Drawings containing errors will not be accepted.

Where the Standards are referenced throughout this STS, they will refer to the number only.

### 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 civil, structural and mechanical drawings for Hunter Water in accordance with this Standard Technical Specification and to confirm whether the drawings produced comply 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; and;

---

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

- 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.

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

#### 6.1.1 Design Documentation

Prior to commencement of a design, or modification of an existing drawing package, it is the responsibility of the designer to obtain the following information from Hunter Water in Table 1, and ensure the drawing package is the latest revision.

**Table 1: Information to be supplied by Hunter Water**

Information	Description	Source
Drawing Set Number	Project drawing number	Project Manager
Plant Number	Hunter Water Plant number	Project Manager
Asset Name	Hunter Water Asset name	Project Manager
Index Number	Hunter Water Index number	Project Manager
Drawing setup files		
HWC.ctb	Standard plot style pen table	Civil Drafting Package
HWC_scale.ctb	A1 to A3 plot style pen table	Civil Drafting Package
HWC_B&W.ctb	Standard black and white plot style pen table	Civil Drafting Package
HWC_B&W_scale.ctb	A1 to A3 black and white plot style pen table	Civil Drafting Package
A3 drawings:		
HWC Civil_A3.dws	Drawing standards file	Civil Drafting Package
HWC Civil_A3.dwt	Drawing template	Civil Drafting Package
HWC_A3.lin	Line type file	Civil Drafting Package
A1 drawings:		
HWC Civil_A1.dws	Drawing standards file	Civil Drafting Package
HWC Civil_A1.dwt	Drawing template	Civil Drafting Package
HWC_A1.lin	Line type file	Civil Drafting Package

If required the following information shall be provided by the Hunter Water Project Manager:

- Maintenance hole number
- Maintenance shaft number
- Line number
- Vent number
- Flow relief structure number

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

## 6.2 File format

Supply all drawings in the latest version of AutoCAD or previous two versions in .dwg format. Do not save standard borders drawings and symbols to an earlier AutoCAD version.

## 6.3 Drawing size

Prepare drawings as A3 or A1 using supplied drawing templates HWC Civil\_A3.dwt or HWC Civil\_A1.dwt. The template contains layer, line type, text and dimension style definitions, sheet frame and title block.

## 6.4 Drawing Numbers

The drawing number consists of three segments of information. The segments define a valid drawing number:

- Drawing set number
- Sheet number (3 characters)
- Revision number (2 characters)

The Drawing set, Sheet and Revision number is inserted in the title block.

TITLE: CG375202 SHORTLAND 4 SS-SHO-004-PS1 SECONDARY TREATMENT SLUDGE DISPOSAL RISING MAN						
SIZE: A3	SCALE: NTS	INDEX No. 75800	DRAWING No. 15686	SHEET 001	REV No. 01	
S	T	U	V	W	X	Z

### 6.4.1 Electronic File Name

The name of the electronic drawing files are to reflect the drawing number

eg.

15100 - 001 \_ 0A.dwg

Drawing Set Number	Sheet Number	Revision
--------------------	--------------	----------

or

15100 - 001 \_ 01.dwg

Drawing Set Number	Sheet Number	Revision
--------------------	--------------	----------

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

## 6.5 Drawing Specifications

### 6.5.1 Drawing environment

Supply drawings in AutoCAD model and paper space.

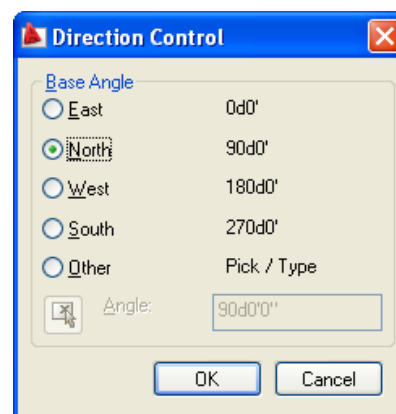
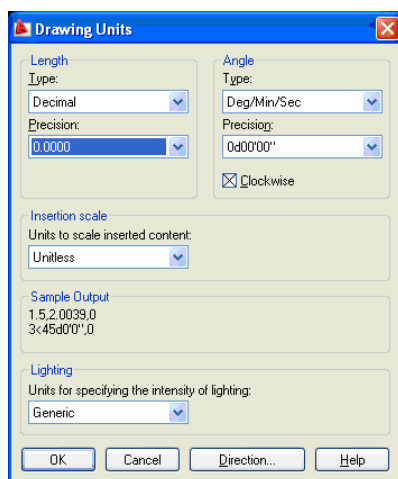
Create all structures in model space with co-ordinates in Map Grid of Australia (GDA94 Zone 56) and levels in Australian Height Datum (AHD) at a 1:1 scale.

Insert dimensions, labels and annotation text in model space.

Insert the drawing frame, general notes, reference drawing list, material list, pipe work schedule and other notation in "paper space".

Set the AutoCAD system variable "Measurement" to "1". (i.e. Metric)

Set Drawing units to:



Call up Sections and Views alphabetically using capital letters. e.g. Section A. Call up Details numerically e.g. Details 1.

Arrange sections, views and details in sequential order left to right, top to bottom on the drawing sheet.

#### 6.5.1.1 Multiple Sheet Layouts

Multiple sheet layouts in a single .DWG file are accepted. Present PDF copies as a single layout for each file.

#### 6.5.1.2 Scales

AS 1100 scales only shall be used. Scales shall be as adopted from AS 1100 Table 5.1 and 5.2 only on original sized documents.

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

### 6.5.1.3 Text styles

All text shall be in accordance with the following:

**Table 2: Text Styles - A3 Drawings**

Text height	Application	Font	Style	Width Factor	Oblique Angle
1.8mm	Notes and Dimensions	ISOCP	T18	1	0
2.5mm	Labels and Sub Headings	ISOCP	T25	1	0
3.5mm	Main Headings	ISOCP	T35	1	0
5.0mm	Main Headings	ISOCP	T50	1	0

**Table 3: Text Styles - A1 Drawings**

Text height	Application	Font	Style	Width Factor	Oblique Angle
2.5mm	Notes and Dimensions	ISOCP	T25	1	0
3.5mm	Labels and Sub Headings	ISOCP	T35	1	0
5.0mm	Main Headings	ISOCP	T50	1	0
7.0mm	Main Headings	ISOCP	T70	1	0

Text shall be upper case.

Use lower case lettering for abbreviations for unit of measure. Do not place text directly on line work or symbols. Text must be readable from the bottom or right hand side of the drawing.

### 6.5.2 Dimensioning

Each dimension shall be a single AutoCAD entity.

### 6.5.3 Line types

Set the AutoCAD entity's "Linetype" property to "Bylayer".

Set the AutoCAD system variables "Ltscale" and "Psltscale" to "1". Individual elements shall have a constant "Ltscale" of "1".

### 6.5.4 Layers

Set the drawing entity's colour, line weight and plot pen thickness to:

**Table 4: Colour and Line Weights**

AutoCAD Entity	Property
Colour	Bylayer

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

Lineweight	Bylayer
Plot Style	Bycolor

#### 6.5.4.1 Layering structure

Use layers supplied in the template files *HWC Civil\_A3.dwt* or *HWC Civil\_A1.dwt*. Freeze layers not required in the drawing.

Drawings with non-standard layers will not be accepted unless previously agreed in writing from: [plan\\_room@hunterwater.com.au](mailto:plan_room@hunterwater.com.au).

#### 6.5.5 Title block

Complete all title block text attribute fields. If there is no information available for a specific field leave the field blank. E.g. Plant number

Do not place company logos on the drawing. The company's abbreviated name shall be detailed in the allocated area on the standard border. Insert consultant's project reference number in appropriate field.

#### 6.5.6 External References

Drawings containing external references shall not be accepted. Convert all external references to AutoCAD inserted "Blocks" prior to submission. Binding the reference file and layers containing external reference file names shall not be accepted.

All external reference files inserted as blocks shall be inserted on layer "0" (zero). External reference files must not contain additional layers to those provided in the Hunter Water template.

#### 6.5.7 Plotting Drawing Information

The file path, name and last plotted information are inserted as an RTEXT element. This shall not be removed.

Plotted drawings shall:

- Be Colour dependant plot style using pen style table *HWC\_B&W.ctb* Have Default plotter set as "default windows system printer"

#### 6.5.8 Hatching and Shading

Use hatching or shading to clarify or enhance the drawing content. It shall be "bylayer" for colour, line type and weight and be consistent throughout the drawing set. Place hatching on appropriate hatching layers.

#### 6.5.9 Symbols, Blocks and Abbreviations

Use symbols where appropriate. List and define symbols on a Symbols and Abbreviations drawing towards the front of drawing set.

Use abbreviations where appropriate. List and define abbreviations on the Abbreviations and Symbols drawing.

## 6.5.10 Signatories

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

**Table 5: Approvals**

<b>Signatory</b>	<b>Information to be included</b>
Designed	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.
Drawn	The name of the draftsman who prepared the drawing. Abbreviate the name by using the draftsman's three initials. The date for which the draftsman has completed the above. The abbreviated name of the company for which the draftsman is employed.
Checked	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 three initials. The design team leader is typically not the same person who has completed the design / drafting. 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.
Approved	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 / designed 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.
Date Drawn	Dates are to be shown with a 'forward slash' separation and with two digits for day, month and year; e.g. 01/01/11 1.1.11, 1/1/11, 01-01-11 and 01/01/2011 format are not acceptable.

## 6.5.11 Other

### 6.5.11.1 Images

Keep the use of images to a minimum. Place images on the defined layer and set "imageframe" system variable to "2". The inserted image shall have a box with diagonal line placed around it on the "defpoints" layer to indicate extents. Text shall be placed along the line to identify the image file name.

Image file names shall comply with the following:

- Drawing set number
- 3 letter image identifier prefix (IMG)
- Image descriptor (eg. locality map)

eg. 14919-IMG-locality\_map.jpg

The following files are accepted:

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**



**Table 6: Accepted File Types**

<b>Extension</b>	<b>Description</b>
*.ecw	ECW Compressed Image Format
*.gif	Graphics Interchange Format
*.jpg	JPEG File Interchange Format
*.jpeg	JPEG File Interchange Format
*.jp2	JPEG 2000
*.j2k	JPEG 2000
*.tif	Tagged Image File Format
*.tiff	Tagged Image File Format
*.bmp	Windows Bitmap

Insert image files using relative paths to avoid loss of data when submitted. Locate all files in the same directory as the drawing they are inserted in. Transmit all image files with the drawings when drawing files are submitted.

## **6.6 Drawing Modifications**

### **6.6.1 Revisions**

Drawings supplied during review stages of a design shall be given a sequential letter. eg. Revision A - 1st Draft, Revision B - 2nd Draft or Revision C - Client Review etc

Once a drawing has been approved for Construction it shall be given a revision status of 0 (zero). eg. Revision 0 - Construction Issue

When an amendment is made to the drawing following construction issue, the drawings shall display the next sequential number in the title block such as a '1', '2' or '3'.

eg. Revision 1 - Dimension Updated or Revision 2 - Work-As-Constructed

The revision box of the drawing shall be updated with the revision number and description of the amendment before the drawing is re-issued.

### **6.6.2 Highlighting revisions**

Amendment triangle/s containing the revision number shall be placed adjacent to the modified section when changes to the final design drawing have been made. Revision cloud/s shall also be used to highlight modifications.

### **6.6.3 Work as Constructed**

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

Comply with all the requirements of this STS when preparing and submitting Work As Constructed drawings.

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

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 when submitting Work as Constructed drawings.

Revision symbols and clouds shall be in “paper space” and removed or placed on a frozen layer when drawings are revised as Work as Constructed.

## 6.7 Supply of Drawings

Supply final design drawings and any subsequent amendments as full size hard copies along with DWG and individual PDF files.

Supply populated spread sheet (Drawing register.xls) provided in the HWC Civil\_3 zip file

The following checklist shall be completed before drawings are submitted:

**Table 7: Drawing Completion Checklist**

1	Entities in “Model” space which are not part of the final design removed
2	All irrelevant blocks, layers, text styles purged
3	Drawings checked using relevant DWS file
4	Drawings checked for errors using the AutoCAD “Audit” command and any encryption or passwords removed
5	UCS set to “world”
6	Model view set to “plan”
7	Ltscale set to 1
8	PSLtscale set to 1
9	Drawings plotted using relevant CTB file
10	Default plotter set as “default windows system printer”
11	Saved in “zoom extents” format in paper space
12	Viewport layer frozen off for display
13	Viewports locked for display

## 7 Process and Instrumentation Diagrams (P&IDs)

### 7.1 Purpose

This section details the preparation and submission of Process and Instrumentation Diagrams (P&IDs).

### 7.2 Terms and Abbreviations

HWC	Hunter Water Corporation
P&ID	Process and Instrumentation Diagram
PLC	Programmable Logic Controller
RAS	Return Activated Sludge
WAC	Work as Constructed Drawing

### 7.3 General

Prepare P&IDs using HWC Civil\_A3.dwt. A1 drawing sizes may be used upon request from the Hunter Water project manager and if approved, the Hunter Water standard A1 border will be provided. All process and instrumentation diagrams are to be produced as a 2D drawing file using only Model Space. External references (drawing dependent on another file) on electronic drawings are not permitted. All external references must be bound prior to submission.

P&IDs are not drawn to scale. To make the drawings easier to interpret, layout the drawing in the way the equipment is orientated in the field and with the overall process flow from left to right where possible.

### 7.4 Standard Symbols

Standard symbols and descriptors are provided in provided in PID Sheet 1 and 2. These are located in the Civil Drawing Package.

### 7.5 Tag Numbers

Tag numbers are the primary means of identification for all physical items in a treatment process e.g. pumps, mechanical equipment, valves, instruments etc. Tag numbers are initially created on the P&ID and are then used as the primary identifier on various other project drawings and documents, including:

- Mechanical drawings
- Electrical (power and control) drawings
- Automatic Control and Monitoring Manual (ACMM)
- Equipment schedules
- Operation and Maintenance Manuals

Additionally:

- Tag numbers are present on field nameplates

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

- Tag numbers should be used within the PLC program.
- Every Tag number must be unique within a single treatment plant.

Tag numbers consist of:

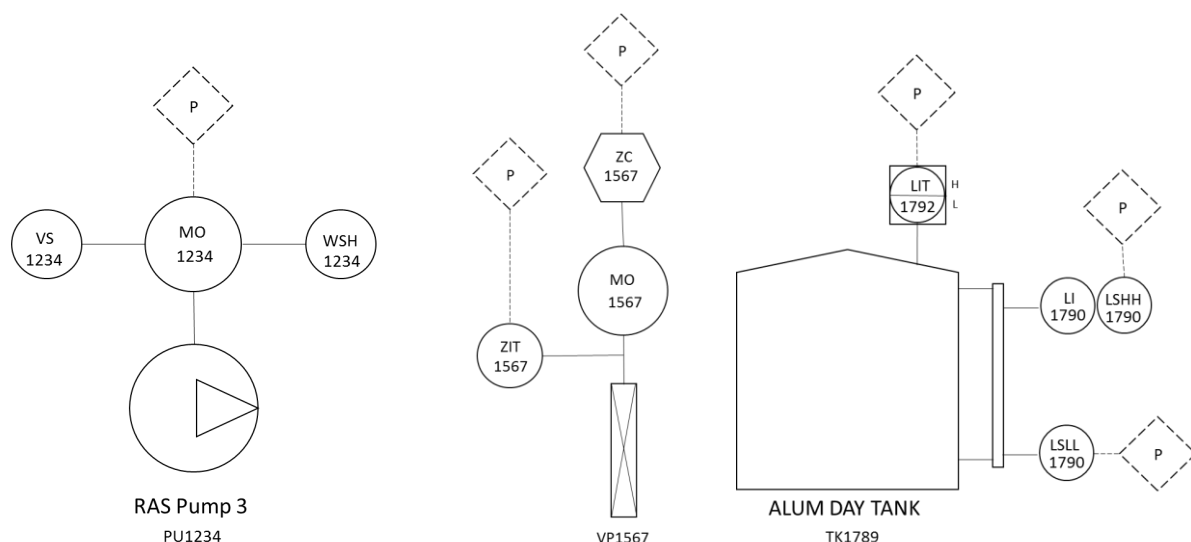
- A mandatory alphabetic prefix of either 2 or 3 letters
- A mandatory four digit suffix
- An optional additional alphabetic suffix.

Hunter Water has identified the alphabetic prefixes for tag numbers that must be used. Alphabetic prefixes for instruments are shown in Appendix B. Alphabetic prefixes for other items of equipment are shown in Appendix C. If an instrument or item of equipment does not occur on either of these lists then a direction from the Asset Management Group at Hunter Water must be consulted as to what alphabetic prefix to use. Do not use prefixes that have not been approved by Hunter Water.

The four digit suffix should, as much as possible be unique at any particular treatment plant. (E.g. do not have VA1234 and MO1234 in the same treatment plant). An exception to this rule is listing items within the same control loop. A control loop is defined as:

*A combination of two or more instruments or control functions arranged so that signals pass from one to another for the purpose of measurement and/or control of a process variable.*

In the example below, the left hand representation contains a pump, motor, variable speed drive and torque limit switch which is hard wired to the pump. All items are operated collectively to control the pump performance. The second example contains a motor actuated penstock arrangement with integrated position controller (ZC) and position indicating transmitter (ZIT). The third example is a tank with attached level indicating transmitter featuring high and low level alarming displayed at a central control panel. The level indicator (sight glass) contains integrated high-high and low-low limit switches.



Appendices D, E and F provide suggested systematic numbering systems for the tag number suffix. The first numeral in the sequence can be used to identify the stage of the upgrade of the treatment plant (e.g. if a “Greenfield” site the numbers could start with the numeral 1 and a later upgrade the tag

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

number sequence could start with the number 2). For upgrade of an existing plant this helps to clearly differentiate between new and existing equipment.

The numbering system in Appendices D, E and F are mandatory but should be followed wherever possible. The overarching requirement is that each tag number must be unique within a wastewater treatment plant.

## 7.6 Tag List

At the commencement of a project a method for reliably capturing all tags as soon as they are allocated shall be adopted. If this method is a spreadsheet then it shall initially consist of 5 columns with the headings.

1. Alphabetic Prefix
2. Digital Suffix
3. Optional alphabetic
4. Tag number
5. Description of the device

Column 4 for each item should be created by the “concatenate” formula of Excel for the cells in the three preceding columns of the same row. For instance if the prefix, suffix and optional letters/numbers are in cells B4,C4 and D4 then the formula in cell E4 would be

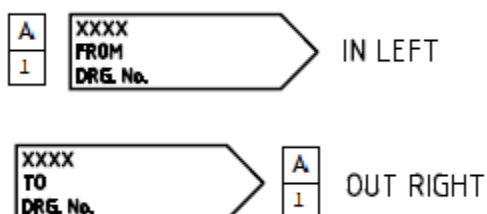
`=CONCATENATE(B4,C4,D4)`

Whichever method is used, the purpose is:

1. To have a quick means to determine which tag numbers are available or not available;
2. To sort the instruments and/or equipment into similar devices for other HWC groups, and;
3. To assist in the preparation of the Asset Information Spreadsheet that is a handover document required to be provided to Hunter Water during and at the end of a project. Note that the Asset Information spreadsheet has many more fields than the five listed above.

## 7.7 Linking P&ID Drawing Sheets

All P&ID Link Symbols (shown below) are to be located on the side of drawings only. It is preferred to show them from the left side (IN) or right side (OUT) of the drawing. These symbols reference the fluid, adjacent equipment, the adjoining drawing number and the grid location of the corresponding line on the adjoining drawing.



## 7.8 Issue for Review and Construction

Issued for Review (IFR) and Issued for Construction (IFC) P&IDs contain (on a separate layer) information such as pipe size and type, new and existing components and items to be deleted (i.e. new work is shown as unbroken bold lines, existing or to be deleted items are shown as dotted lines). At the design manager's discretion fittings such as reducers, flanges etc. may be shown if this is deemed to be of assistance to the construction team.

Minimize notes regarding how to build the works. This type of information belongs in the technical specification, civil or mechanical drawings or other contract documents.

## 7.9 Work as Constructed

The purpose of the Work as Constructed (WAC) P&ID is to present the wastewater treatment process as it is post-commissioning. Items removed or abandoned during the construction are removed from the drawing with no distinction between "new" and "existing" items. For example, dotted lines showing existing devices prior to the upgrade are changed to unbroken lines. The line thickness of all items (whether existing or new) are to be the same.

The layers described in Section 7.7 that provide information to assist the construction team are "turned off" on WAC P&IDs. e.g. pipe size, pipe material, flanges, reducers etc.

Remove "how to build" notes from WAC P&IDs.

## 7.10 Logos

No logos are accepted on drawings. The consultant responsible for the drawing can insert their name (in text) in the title block.

## 7.11 Valves

### 7.11.1 Position

Generally, most valves are "open" for normal process operation. Provide a note on the drawing stating "all valves normally open unless shown otherwise". Valves that are "closed" for normal process operation should have the abbreviation "NC" near the valve.

### 7.11.2 Fail Safe

For valves that have a "fail safe" position if air or power is lost, show the abbreviations F/O (fail open) and F/C (fail close) near the valve on the P&ID to describe this feature.

## 7.12 Pipelines

Provide pipeline tag descriptions for all line types on the P&ID (as per example in Sheet 2). The pipeline tag shall include an alphanumeric sequence which describes the pipeline type in the following order; pipe nominal diameter - fluid in pipe – pipe material e.g. 450-SW-PVC0 would describe a DN450 stormwater pipe made from PVCU, schedule 80 ASTM-D-1785 material.

## 7.13 Stop Boards

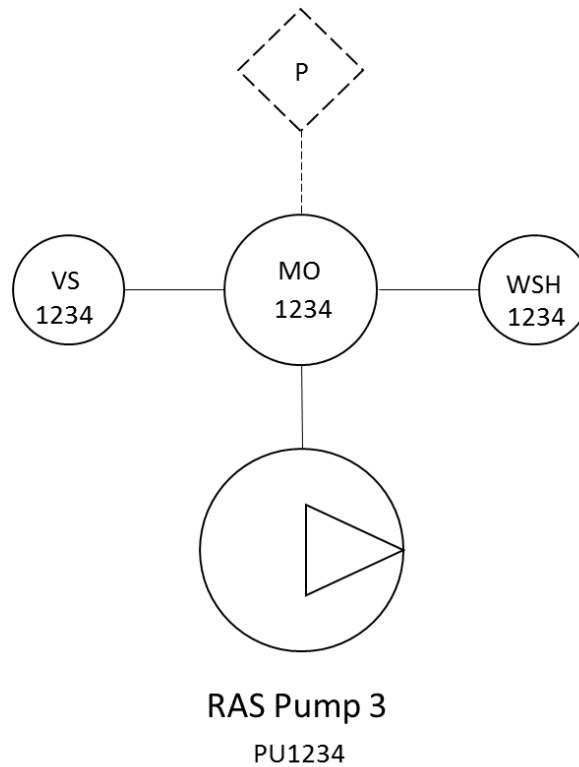
Use the term "stop board". Do not use the terms "stop log" or "stop gate"

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

### 7.14 Mechanical Devices with Motors

Provide tag numbers for the motors as well as the associated mechanical device (i.e. pump, screen, etc.). The full name of the mechanical device should also be shown beneath its symbol (e.g. RAS pump 3).

The following figure illustrates this issue.



The above figure also illustrates the following:

- Unbroken lines depict an electrical connection e.g. VS1234 shows that the pump is driven through a variable speed drive (VS). The pump also has a torque switch high (WSH) that is “hard wired” to the pump. That is, the device will operate both when the pump is under PLC control AND when the pump is in test (i.e. not being controlled by the PLC)
- Broken line represents PLC control
- The description “RAS Pump 3” should be in a font larger than the font used for the tag numbers so that it is clear which item is being represented.

### 7.15 Numeric Sequence

When several pieces of equipment have the same function (e.g. RAS pumps) designate the numeric sequence with a plain digit (i.e. RAS Pump 3). Do not include a symbol or abbreviation in front of the number (i.e. do not use RAS Pump #3 or RAS Pump No. 3).

## 7.16 Display of Analogue Set-Points and Control Functions (Loops)

Set points for analogue devices that are set in the PLC code (and able to be changed on either the SCADA or by modification of the PLC code) do not need to be shown on the P&ID because these set points, and the function that they perform, are described in the Automatic Control section of the ACMM.

The exception to this is if the output from an analogue device is used to stop a motor or drive and there is no separate digital instrument, or hard wired device, provided to protect the device from possible damage or to identify an alarm condition. This is described further in section 7.17.

## 7.17 Local Control Panel

STS 500 requires electrically controlled devices to have an LCP and the requirements are set out in that technical standard. It is assumed that every major electrically operated piece of equipment will have an LCP and therefore the LCP does not need to be identified on the P&ID.

## 7.18 Interlocks

Generally software interlocks shall not be shown on P&ID's.

In cases where the signal from an analogue instrument is the sole means of automatically controlling an equipment item (i.e. there is no additional digital instrument to provide a backup if the analogue device fails), then the software interlock should be shown on the P&ID as a dashed line to the device that it controls. For instance if a level transmitter is used to turn a pump on and off and there is no separate low level switch to also stop the pump, then show a dashed line from the LIT to the pump on the P&ID.



## 8 Related Documents

Other Hunter Water drawing standards include:

- STS 904 – Standard Technical Specification – Preparation of Electrical Drawings
- STS 903 – Standard Technical Specification – Preparation of Work as Constructed Drawings

## 9 Document control

**Document Owner:** Manager Strategic Asset Planning

Version	Date	Author	Details of change	Approval Date	Approved by	Next Scheduled Review
2.0	Dec 2013	J. Yearsley	Full revision Update to new format Add 'Mechanical' to title	Feb 14	G Baker	Jan 16
2.1	Oct 2015	J. Yearsley	Minor revision	July 2015	S Horvath	July 2017
2.2	July 2016	J. Yearsley	Minor revision	July 2016	S Horvath	July 2018
3.0	May 2018	JY, SG	P&ID details added	May 2018	S Horvath	May 2020

**Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.**

## Appendix A: Australian Standards

For clarity, where a standard has several parts and/or amendments and/or supplements, the reference number is for the leading part of the standard. The standards listed below are deemed relevant to lifting equipment. This is not an exhaustive list.

<b>Name</b>	<b>Number</b>
AS ISO 1000-1998	The international system of units (SI) and its application
AS 1100.101-1992	Technical drawing - General principles
AS 1100.201-1992	Part 201: Mechanical engineering drawing
AS 1100.401-1984 / Amdt 1-1984	Technical drawing - Engineering survey and engineering survey design drawing
AS/NZS 1100.501:2002	Technical drawing - Structural engineering drawing
AS 1101.1-2007	Graphic symbols for general engineering - Hydraulic and pneumatic systems
AS 60417.1-2004	Graphical symbols for use on equipment - Overview and application
HB7-1993	Engineering drawing handbook

## Appendix B: Instrument Identifiers - Examples

### Tag ID Syntax (XXXX9999)

**Note: Refer to letter code table provided on sheet 1 for complete list of identifiers.**

AIT	Analytical Indicating Transmitter	PIT	Pressure Indicating Transmitter
FE	Flow Rate Element	PSH	Pressure Switch HIGH
FI	Flow Rate Indicator	PSL	Pressure Switch LOW
FIT	Flow Rate Indicating Transmitter	SSL	Speed Switch LOW
FQT	Flow Totalising Transmitter (meter)	ST	Speed Transmitter
FSH	Flow Rate, Switch HIGH	TI	Temperature Indicator
FSL	Flow Rate, Switch LOW	TIT	Temperature Indicating Transmitter
LE	Level Element	TSH	Temperature Switch HIGH
LI	Level Indicator	VSH	Vibration Switch HIGH
LIT	Level Indicating Transmitter	WSL	Torque Switch LOW
LSH	Level Switch HIGH	WSH	Torque Switch HIGH
LSHH	Level Switch HIGH HIGH	XA	General Alarm Indication
LSL	Level Switch LOW	YA	General Status Indication
LSLL	Level Switch LOW LOW	ZIT	Position Indicating Transmitter
MDP	Moisture Detection Probe	ZSC	Position Switch CLOSED
MSH	Moisture Switch HIGH (Seal Fail)	ZSL	Position Switch LOW
PDI	Pressure Differential Indicator	ZSH	Position Switch HIGH
PDSH	Pressure Differential, Switch HIGH	ZSO	Position Switch OPEN
PE	Pressure Element	WT	Weight Transmitter (Weighing Scale)
PI	Pressure Indicator	WE	Weight Element (Load Cell)
PDSL	Pressure Differential Switch LOW	ASH	Analytical Switch High (Gas Detector)
PDT	Pressure Differential Transmitter		

## Appendix C: Equipment Types (Excluding Instruments)

### Tag ID Syntax (XXX9999)

Grey Items are equipment types that will not generally appear on P&ID's but nonetheless have been allocated within the wider asset numbering system.

AB	Air Blower	DX	Dust Extractor
AC	Air Conditioning	EA	Electrical Appliances
AE	Aeration Diffuser	EU	Uninterruptible Power UPS
AG	Agitator	EW	Eye Wash / Safety Showers
AH	Arch Breaking Sledge	FA	Fire Alarm
AN	Aerial Conductor	FI	Filter
AR	Air Receiver	FV	Control Valve, Flow
AS	Air Break Switch	GC	Grit Classifier
AU	Accumulator	GD	Gravity Drainage Deck
AW	Well Washer	GE	Generator (Electricity)
BA	Battery	HE	Heat Exchange, Heater, Boiler
BC	Belt Conveyor	HP	Hydraulic Power Pack
BF	RPZD Backflow Prevention	HU	Humidifier
BG	Bridge	LV	Control Valve, Level
BP	Bilge Pump / Sump Pump	MB	Membrane Unit
BU	Building	ME	Mechanical Equipment
CB	Circuit Breaker	MI	Mixer
CC	Chlorine Cylinders	MO	Motor
CD	Clarifier Bridge	PA	Pipeline
CE	Chlorine Evaporator	PLC	Programmable Logic Control
CF	Centrifuge	PM	Power Meter
CI	Chlorine Injector	PO	Pond / Lagoon
CM	Compressor	PRV	Pressure Relief Valve
CP	Cathodic Protection	PU	Pump
CR	Crane	PV	Control Valve, Pressure
CS	Changeover Switch	RO	Reverse Osmosis Unit
CV	Control Valve	RP	Pressure Vessel
DM	Motor, Diesel	RS	Rotary Screen
DN	Drain, Gutter, Bund	SA	Surface Aerator
DP	Dewater Wash Press (inc Belt Filter Press)	SB	Switchboard
DR	Dryer, Other	SC	Screw Conveyor
DS	Dosing Siphon	SP	Piping Speciality Item

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

SS	Substation
ST	Strainer
SU	Security Unit
TF	Trickle Filter
TK	Tank, Vessel
TW	Thermowell
TXF	Transformer
UV	UV Disinfector
VA	Valves
VB	Valve, Stop Board
VF	Vent Fan
VI	Vibratory Feeder
VP	Valve, Penstock
VR	Valve, Reflux Non Return or RPZD
VS	Variable Speed Drive
WS	Weather Station
WT	Weighing Scale
ZV	Valve, On / Off

**Appendix D: Tag Numbering System for Wastewater Plants**

Stage No.	Base No.	Sequence No.	Group	Subgroups
1-9	0	00-99	Other	
1-9	1	00-99	Preliminary/Primary Treatment	Flow Reival Screening Grit Removal Residuals Handling Flow Monitoring Wet Weather Bypass Septage Reival Flow Distribution
1-9	2	00-99	Secondary Treatment Process 1 (i.e. Bioreactor & WAS)	Bioreactor Trickling Filters WAS System
1-9	3	00-99	Secondary Treatment Process 2 (i.e. Secondary Clarifiers & RAS)	Secondary Clarifiers Humus Clarifiers RAS System Scum System
1-9	4	00-99	Tertiary Treatment	DAF UV Sand Filters Chlorination
1-9	5	00-99	Effluent Disposal	Effluent Dam Effluent Transfer System Effluent Outfall
1-9	6	00-99	Sludge Treatment	Aerobic Digester Anaerobic Digester Sludge Lagoons
1-9	7	00-99	Sludge Handling	Sludge Thickening Sludge Dewatering Dewatering Building
1-9	8	00-99	Access & Site Services	Site Water Foul Water System RE System Odour Control Amenities Building

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

1-9	9	00-99	Other	
-----	---	-------	-------	--



**Appendix E: Tag Numbering System for Recycled Water Plants**

Tag Number	Group	Subgroups
0000-0999	Spare	
1000-1999	Raw Water & Strainers	
2000-2999	MF/UF	
3000-3999	Reverse Osmosis	
4000-4999	Final Treatment & Product Water	
5000-5199	Aqueous Ammonia	
5200-5399	Sulphuric Acid	
5400-5699	Citric Acid	
5700-5899	Caustic Soda (Sodium Hydroxide)	
5900-6099	Sodium Bisulphite	
6100-6299	Antiscalant chemical	
6300-6499	EDTA	
6500-6699	Sodium Hypochlorite	
8000-8999	Site Services	Process Water
		Compressed Air
		Waste Neutralisation
		Service Water
		Amenities Building

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.

**Appendix F: Tag Numbering System for Water Plants**

Stage No.	Base No.	Sequence No.	Group	Sub Group
1-9	0	00-99	Other	
1-9	1	00-99	Raw Water System	Raw Water Pre-Treatment
				Raw Water Receival
1-9	2	00-99	Filtration System	Filter Beds
				Clean in Place System (CIP)
1-9	3	00-99	Backwash Handling	Backwash Supply
				Backwash Recovery
				Clarifiers
				Dirty Backwash System
				Blown Air System
1-9	4	00-99	Chemical Dosing	Alum
				Chlorine
				Powdered Activated Carbon (PAC)
				Fluoride
				Polymer
				Calcium Hydroxide (LIME)
				Sodium Hydroxide (CAUSTIC)
				Carbon Dioxide (CO2)
				Citric Acid
				Sodium Hypochlorite
1-9	5	00-99	Gravity Settling System	Clarifiers
				Sedimentation Tanks
1-9	6	00-99	Sludge Treatment & Handling	Sludge Lagoons
1-9	7	00-99	Clear Water System	Clear Water Tank
1-9	8	00-99	Access & Site Services	Site Water
				Foul Water System
				Recycled Effluent System
				Odour Control
				Amenities Building
1-9	9	00-99	Other	

Warning – This document is current at time of printing or downloading. It may be reviewed and amended prior to the noted review date at the discretion of Hunter Water Corporation.