



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

Standard Technical Specification for:

STS 913

**PREPARATION OF PIPING AND
INSTRUMENTATION DIAGRAMS (P&ID)**

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Standard Technical Specification Preparation of Piping and Instrumentation Diagram – STS 913

1 Purpose

This Standard Technical Specification details the preparation and submission of all Piping and Instrumentation Diagrams for 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.
- Civil, Structural and Mechanical 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 the interpretation of *STS 913*, except where the context requires otherwise:

- 'Drawings' or "Diagrams" means the drawings detailing the work involved in a particular project.
- Piping and Instrumentation Diagrams are detailed engineering drawings that represent all the piping, process equipment, instrumentation, control devices and associated components of the plant.
- Process Flow Diagrams are the engineering drawings that represent the key process units or equipment and interconnecting pipework.
- '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:
 - o Australian Standards (AS)
 - o Australian / New Zealand Standards (AS/NZS), and
 - o 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 must not be used in the interpretation of this STS, nor limit compliance to other applicable sections 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.

Failure to comply with the requirements of this STS or any referred documentation may result in rejection. Where equipment or manufacture is 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

Piping and Instrumentation Diagrams must comply with this STS.

The order of document precedence is:

- legislative requirements
- project specifications or drawings
- this STS
- Australian Standards
- WSAA 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 A: Australian Standards](#).

2.2 Deviation from this STS

Any deviation from this STS must be approved in writing on a case by case basis by Hunter Water's Document Owner or authorised representative. (Email: asset.information@hunterwater.com.au).

Approval for deviation are granted on a one off basis and do not set precedence for future deviations. Deviation for other instances or projects must be requested separately.

3 Roles and Responsibilities

3.1 Document Owner

The Document Owner of this STS is Hunter Water's Group Manager Information, Control and Energy.

3.2 Responsibilities

The Document Owner must approve in writing the issue of any updated version of this STS.

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
ACMM	Automatic Control and Maintenance Manual
AS	Australian Standard.
AS/NZS	Australian and New Zealand Standard.
CMMS	Computerised Maintenance Management System
Complex Sites	Sites where the site requires more than two P&ID's to represent the plant (eg Wastewater Treatment Plants, Water Treatment Plants, Reservoirs, Network Chlorination etc)
Designer	Person or organisation creating design and drawings for manufacture of equipment or construction of a system.
Hunter Water	Hunter Water Corporation.
IFC	Issued For Construction
P&ID Drawing Package	The P&ID drawing package available on the HW Website: https://www.hunterwater.com.au/building-and-developing/drawings-plans-and-specifications/standard-technical-specifications Refer to Section 6.1
P&ID	Piping and Instrumentation Diagram
PFD	Process Flow Diagram
PLC	Programmable Logic Controller
Simple Sites	Sites where the site requires one or two P&ID's to represent the plant (eg Wastewater pump stations)

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.

Term / Abbreviation / Expression	Definition
SCADA	Supervisory Control And Data Acquisition. Software and hardware components to allow operators control of the plant.
STS	(Hunter Water) Standard Technical Specification
WAC	Work as Constructed Drawing

5 Compliance Requirements

5.1 Standards

Piping and Instrumentation Diagrams must comply with:

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

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 piping and instrumentation diagrams 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
- 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 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 become the copyright property of Hunter Water.

5.3 Application of this Standard

5.3.1 P&ID Symbols

All changes to piping and instrumentation must be documented in the P&ID's

Use the latest Piping and Instrumentation Diagrams (P&IDs) Symbols (Drawing Set 16066) and conventions for:

- all new P&ID and PFD drawings
- existing projects previously completed to STS913
- all drawings for significant plant upgrades
- changes to an existing drawing sheet (nominally >30%)

STS913 does not apply to Pneumatic/Hydraulic drawings. Use the propriety symbols.

5.3.2 Minor Changes

For minor changes or updates, such as replacing like-for-like components, the requirement to redraw the entire P&ID to the latest standard is waived. This approach ensures the correct balance between consistency, standardisation, maintaining accurate information and operational pragmatism.

5.3.3 Application of Plant 3D

The use of AutoCAD Plant 3D is mandatory for the following:

- Complex Sites
 - o Wastewater Treatment Plants
 - o Water Treatment Plants
 - o Reservoirs
 - o Network Chlorine dosing units; and
- Existing projects completed in AutoCAD Plant 3D

AutoCAD 2D drawings may be used for:

- Simple Sites:
 - o Wastewater pump stations
 - o Water pump stations
 - o Pressure reducing stations
 - o Borefield pump stations
- Minor changes to an existing drawing not in AutoCAD Plant 3D (nominally <30%) (with approval from 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 P&ID Drawing package is the latest revision.

Table 1: Information to be supplied by Hunter Water

Information	Description	Source
Drawing Set Number	P&ID number for the site/location	CMMS via Project Manager
Plant Number	Hunter Water Plant number	CMMS via Project Manager
Asset Name	Hunter Water Asset name	CMMS via Project Manager
TAG Number	Equipment Identification number	CMMS via Project Manager
Existing P&IDs	Current revisions of Piping and Instrumentation Diagram sets for existing sites	Project Manager
A1 Drawing Title block	P&ID drawing block template	Generated from the existing template within the existing project or generated from the template.

The P&ID Drafting package is available on the Hunter Water Website under Information Packages:

<https://www.hunterwater.com.au/building-and-developing/drawings-plans-and-specifications/standard-technical-specifications>

Table 2: P&ID Drawing Package supplied by Hunter Water

File Type	File Name	Description	File Location
Standard Symbols (PDF)	16066-001.pdf to 16066-007.pdf	PDF version of symbol library	Root directory
Plant 3D project template (Folder)	STS913 Plant 3D Standard Rev 2	HW standard AutoCAD Plant 3D project	
Drawing Register	Drawing Register.xls	Drawing Register	
Tool Palettes	AcTpCatalog.atc	Tool Palette Catalog	STS913 Supporting Digital Files\Tool Palettes
	Assemblies.dwg	AutoCAD file with standard groups of blocks that form an assembly. For example, a chlorinator	
	Palettes	Various *.atc files of Plant 3D Tool Palettes	STS913 Supporting Digital Files\Tool Palettes\Palettes
Plot Styles	HWC.ctb	Standard plot style pen table	STS913 Supporting Digital Files\Plot Styles
	HWC_B&W.ctb	Standard black and white plot-style pen table	
	HWC_B&W_scale.ctb	A1 to A3 black and white plot-style pen table	
	HWC_scale.ctb	A1 to A3 plot style pen table	
Profiles	Hunter Water.arg	Drawing Profile	STS913 Supporting Digital Files\Profiles
Template	HWC PID_A1.dwt	P&ID drawing template	STS913 Supporting Digital Files\TitleBlocks
Superseded Symbol Sheets			
Standard Symbols (PDF)	16066 P&ID Symbol Legend Drawings – Ver 0.PDF	P&ID Symbol Legend Ver 0 (14/03/2022)	STS913 Superseded Legend Sheets
	16066 P&ID Symbol Legend Drawings – Rev 1.PDF	P&ID Symbol Legend Ver 1 (28/03/2023)	STS913 Superseded Legend Sheets
AutoCAD Symbols			
STS913 2D symbols	projSymbolStyle.dwg	AutoCAD blocks can be copied from the AutoCAD Symbols style file in the current revision	P&ID Drawing Package Rev 2\STS913 Plant 3D Standard Rev 2

6.2 File format

Supply all drawings in the latest version of AutoCAD Plant 3D or latest version of AutoCAD or previous two versions in .dwg format. (Refer to Section 5.3.3 for application) Do not save standard borders drawings and symbols to an earlier AutoCAD version.

6.3 Drawing size

Prepare piping and instrumentation diagrams as A1 drawings using the supplied drawing templates HWC PID_A1.dwt. The template contains standard symbols, equipment, tagging, layer, line type, text and dimension style definitions, sheet frame and title block.

6.4 Drawing Numbers and Revisions

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

- Drawing number (or Drawing set number) (6 characters)
- Sheet number (3 characters)

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.

Insert the Drawing Number, Sheet and Revision number in the title block.

00.B	ISSUED FOR 90% CONCEPT DESIGN
00.A	ISSUED FOR 60% DESIGN REVIEW
No.	REVISION DETAILS
K	L M

COMPANY: JACOBS	TITLE: BELMONT WWTW					
COMPANY: JACOBS	ST-BEL					
COMPANY: JACOBS	INLET WORKS - H2S MANAGEMENT					
COMPANY: JACOBS	PIPING AND INSTRUMENTATION DIAGRAM (P&ID)					
COMPANY: JACOBS	ODOUR CONTROL SYSTEM - SERVICE WATER TANK AND PUMPS					
COMPANY: JACOBS	SIZE: A1	SCALE: NTS	INDEX No. 87873	PROJECT REFERENCE	DRAWING No. 300089	SHEET No. 006
X		Y		Z		

For each site/location (eg Wastewater Treatment Works, Sewage Pump Station), P&ID's must be drawn under the one Drawing number. A unique P&ID number will be issued for the initial site project. Future changes, additions, modifications, concept designs and detail designs must continue using this drawing number. Manage drawings via revision control (Refer Section 6.4.1).

DO NOT generate a new drawing number when modifying or adding to a site.

6.4.1 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. Project Number

Do not place company logos on the drawing. Detail the company's abbreviated name in the allocated area on the standard border. Insert consultant's project reference number in appropriate field. An example of fields in the Title Block is shown in Table 3: Drawing Title Examples

Table 3: Drawing Title Examples

Line No.	Field Attribute	Example Treatment Plant Contents
1	Asset Name	BELMONT WWTW
2	Plant Number	ST-BEL
3	Plant Area	INLET WORKS – H2S MANAGEMENT
4	Drawing Type	PIPING AND INSTRUMENTATION DIAGRAM (P&ID)
5	Sub Plant Area/Process	ODOUR CONTROL SYSTEM – SERVICE WATER TANK AND PUMPS

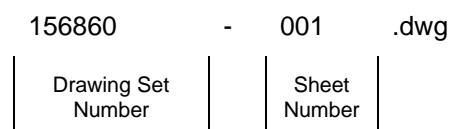
Asset Name and Plant number can be found in [Appendix B: Plant Drawing Numbers](#)

6.4.2 Logos

The consultant responsible for the drawing can insert their name and/or Logo in the title block under Consultant Details. As per Section 6.5.8.1.

6.4.3 Electronic File Name

Use the drawing set number and sheet number as the file name as shown in the example below. Insert a dash (not an underscore) between the drawing set number and sheet number. For the example below the digital file name would be 156860-001



Do not include revision numbers in the file name. The revision number is added to the Meta data when loading into Hunter Water's document management system (e.g. Lunr, Meridian or Aconex)

New drawing numbers are six digits with three digits sheet numbers.

6.4.1 Revision Control

For work in progress drawing versions, up rev the drawing (eg increase the revision number by 1) and add a suffix to the drawing revision number. Increment the suffix for each subsequent WIP drawing revision.

For Concept Design add an Alpha suffix after the existing revision number

For Detail Design add a Numeric suffix after the existing revision number

For new P&ID's (ie new installations within an existing site):

- use a new sheet within the existing plant drawing set number
- Start the drawing sheet revision with 00 and following the numbering above for project revisions

For succeeding revisions "Issued For Construction" or issued "Works As Constructed", increment the drawing revision number.

Example 1: Modification to existing drawing in concept design

- Existing WAC revision is Rev 03
- The first project revision issued for review is Rev 04.A
- Increment succeeding project revisions eg Rev 04.B, Rev 04.C, Rev 04.C etc

Example 2: Modification to existing drawing in detail design

- Existing WAC revision is Rev 03
- The first project revision issued for review is Rev 04.01
- Increment succeeding project revisions eg Rev 04.02, Rev 04.03, Rev 04.04 etc
- IFC version will be Rev 04
- Succeeding IFC revisions will increment the number eg Rev 05
- WAC version will be the next incremental number. eg Rev 06

Example 3: New drawing in concept design

- Revision will be Rev 00
- The first project revision issued for review is Rev 00.A
- Increment succeeding project revisions eg Rev 00.B, Rev 00.C, Rev 00.C etc

6.4.2 Highlighting revisions

Use amendment triangle/s containing the revision number adjacent to the modified section when changes to the final design drawing or previous drawing revisions have been made. All amendment triangles and revision clouds shall be created on the Revisions layer in "paper space" with that layer to be frozen and not displayed when drawings are issued as Work as Constructed.

6.4.3 Drawing Sheet Standard Numbering

Use the drawing sheet number sequence in

Table 4: Drawing Sheet Standard Numbering for complex sites.

Table 4: Drawing Sheet Standard Numbering





Sheet Number	Description
000	Drawing Title Page
001	Site location map
002 to 009	Drawing Index
010 to 019	Process Flow Diagrams
020 to 999	Piping and Instrumentation Diagrams

Note: Reference the Standard Drawing Symbol drawing set 16066. Do not reproduce the Standard Drawing Symbol Set within the site drawing set.

Note 1 on each of the P&ID's is to read "Refer to Hunter Water Standard drawings set 16066 for P&ID symbol legend"

6.4.4 Equipment Construction Status

All equipment and line status must be assigned (Plant 3D) or colour coded (AutoCAD) with one of the four Equipment Construction States:

Black		NEW EQUIPMENT TO BE INSTALLED
Grey		EXISTING EQUIPMENT
Red		EQUIPMENT TO BE REMOVED
Blue		FUTURE EQUIPMENT

Refer to Appendix G: Using P&ID Painter to indicate Status in P&ID Drawing for details on use.

Fittings such as reducers, flanges etc. may be shown if this is deemed to be of assistance to the process or construction team.

Minimise notes regarding how to build the works. Provide construction information in the technical specification, civil or mechanical drawings or other contract documents.

6.4.5 Work as Constructed

Issued for Construction Drawings (IFC) refers to drawings issued or prepared to define the physical characteristics of the works to be constructed.

Work As Constructed (WAC) refers to drawings issued to accurately represent the works as they were constructed and commissioned

Update WAC drawings with:

- Any features which are noted on the Construction Drawings to be located, sized or otherwise determined during construction. Amend the notation with actual location, size or characteristic.

Remove from WAC drawings:

- All construction notes or "how to build" notes.
- Items removed or abandoned during the construction
- Temporary construction items

- Any distinction between “new” and “existing” items. For example, blue lines showing future devices prior to the upgrade are changed to black lines. The line thickness of all items (whether existing or new) are the same.

Do not remove or turn off layers from WAC drawings that:

- provide information to assist the construction team e.g., pipe size, pipe material, flanges, reducers etc.

6.5 Drawing Specifications

6.5.1 Drawing Environment

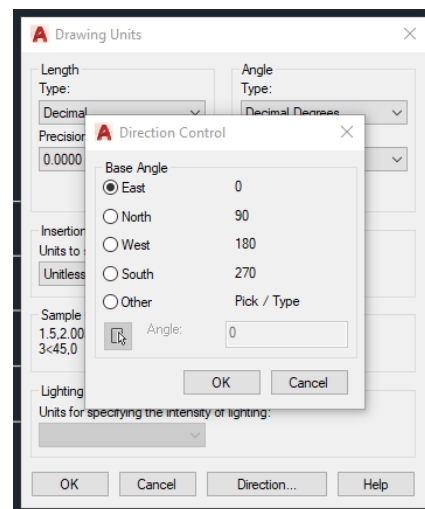
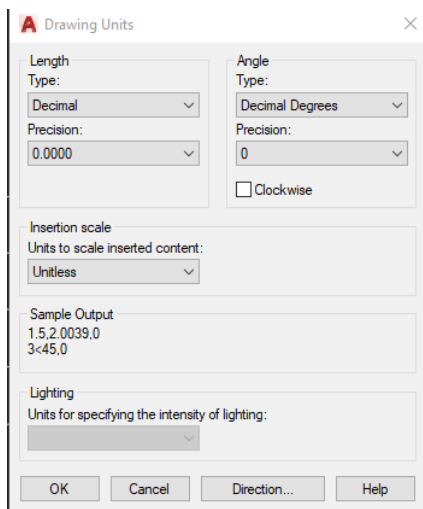
Supply drawings with P&ID drawing in Model Space and Drawing Border in layout view (paper space)

Create all drawings in model space at a 1:1 scale.

Insert equipment labels, symbol blocks, pipeline work, general notes, reference drawing list, material list, pipe work schedule and other notation in "model space".

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

Set Drawing units to:



Preferred major process flow direction and tag numbering is sequential order from left to right and top to bottom on the drawing sheet, with process entry points aligned with the left border and process exit points aligned with the right border. To make the drawings easier to interpret, lay out the drawing in the way the equipment is orientated in the field if possible.

6.5.1.1 Multiple Sheet Layouts

AutoCAD Plant 3D

Multiple sheets are impossible when using AutoCAD Plant3D, therefore will no longer be accepted. Separate cad files are required for each drawing sheet.

AutoCAD

Submission of multiple sheet layouts in a single .DWG file are not accepted. PDF renditions of each sheet are to be submitted as individual files.

6.5.1.2 Scaling

All Piping and Instrumentation Diagrams are required to be drawn in Model Space at a 1:1 scale. Scaling using paper space viewports is not permitted as piping and instrumentation diagrams are schematic diagrams that do not require scaling of process lines, symbols or text. Existing blocks are available in the template at 1:1 scale.

6.5.1.3 Text styles

All text must be in accordance with Table 5 below:

Table 5: 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 Subheadings	ISOCP	T35	1	0
5.0mm	Main Headings	ISOCP	T50	1	0
7.0mm	Main Headings	ISOCP	T70	1	0

Text must be:

- Use upper case for all text except lower case lettering may be used for abbreviations for unit of measure.
- Not placed directly on line, work or symbols.
- Readable from the bottom or right hand side of the drawing.

6.5.2 Dimensioning

Dimensions are not required to be shown on Piping and Instrumentation Diagrams. Draw reference dimensions and leaders as annotation text in paper space.

6.5.3 Linetypes

Linetypes and associated colour of all entities are defined "Bylayer. Set the AutoCAD entity "Linetype" property to "Bylayer". Change lines that are not 'Continuous' (i.e. hidden, dashed) with the properties command and retain on the allocated layer.

Set the AutoCAD system variables "Ltyscale" and "Psltscale" to "1". Use a constant "Ltyscale" of "1" for individual elements.

All allowable linetypes are contained within the drawing template.

6.5.3.1 Plant 3D

When using the standard Plant 3D tool palettes, Plant 3D will automatically set the linetype to the correct layer.

6.5.4 Layers

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

Table 6: Layer Weights

AutoCAD Entity	Property
Colour	Bylayer
Lineweight	Bylayer
Plot Style	Bycolor

6.5.4.1 Layering structure

Use layers supplied in the template files as per the drawing supplied. Freeze layers not required in the drawing.

Drawings with non-standard layers will not be accepted unless previously agreed in writing from: asset.information@hunterwater.com.au.

Table 7: Colour and Line Weights

Layer Name	Colour	Description
_CONSTRUCTION_ISSUE	10	Stamp
_PRELIMINARY_ISSUE	10	Stamp
_TENDER_ISSUE	10	Stamp
_WORK_AS_CONSTRUCTED_STAMP	10	Stamp
Annotation	White	Annotations
BORDER	White	Drawing Border
BOUNDARY_FRAME	White	Boundary Frame to designate Areas of Plant
LIMIT_OF_VENDOR_SUPPLY	Yellow	Limit of Vendor Supply
P&ID_OPEN_CHANNEL_DUCT_OR_HYDRAULIC_LINK	Red	Open Channel or Hydraulic Link
P&ID_SYMBOL	White	P&ID Mics Symbols
PEN018	Magenta	Secondary Process Line
PEN025	White	
PEN035	Yellow	Main Process Line
PEN050	Red	
PEN070	Cyan	
SYMBOL	Yellow	P&ID symbol (Plant3D)
TEXT_25	White	Notes and Dimensions
TEXT_35	Yellow	Labels and Subheadings
TEXT_50	Red	Main Headings
TEXT_70	Cyan	Main Headings
VIEWPORT	40	Viewport

6.5.4.2 Plant 3D

When using the standard Plant 3D tool palettes, Plant 3D will automatically set all Plant 3D items on the correct layer.

6.5.5 External References

Drawings containing external references are not accepted.

6.5.6 Plotting Drawing Information

Use the plot style supplied with the Technical Information Package. Save the drawing using this plot style; there will be no variations. The file path, name and last plotted information are inserted as an RTEXT element. Do not remove this.

Plotted drawings must:

- Be Colour dependent plot style using pen style table HWC_B&W.ctb. Set the default plotter as “default Windows system printer”

Create new layouts as follows:

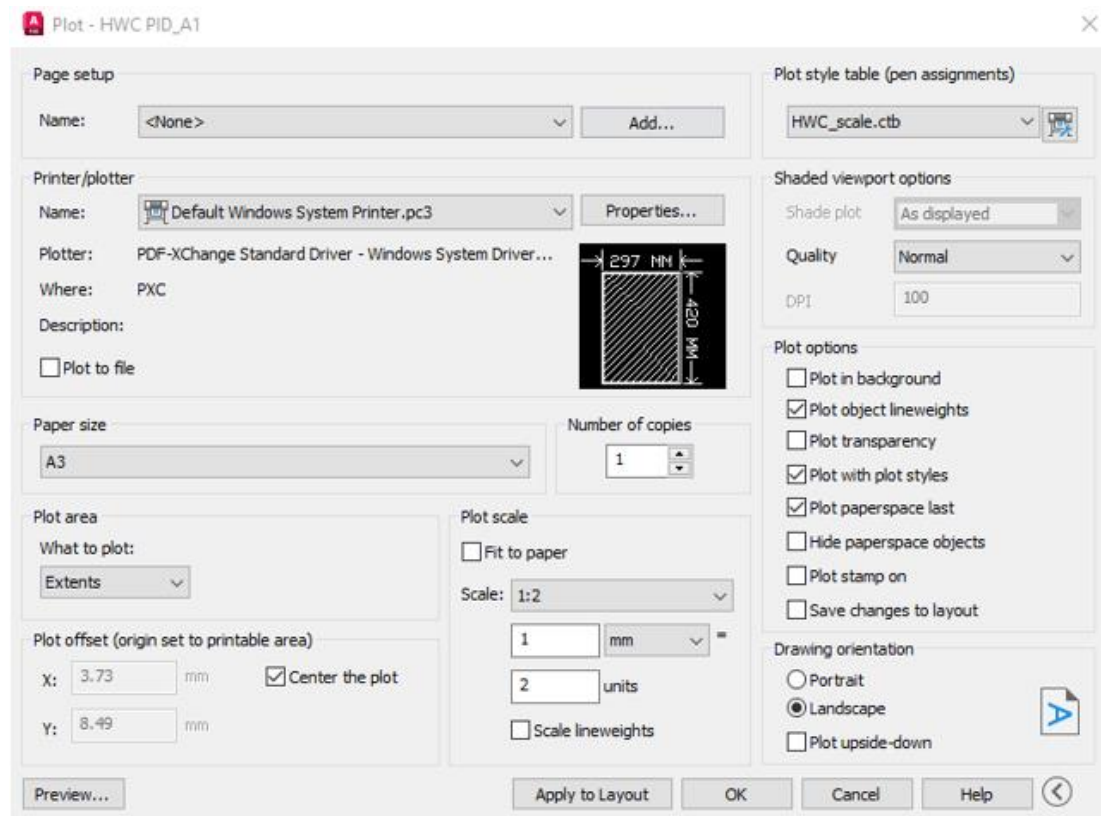


Table 8: Print Layout Setup

Layout	A1 Layout
Plot Style Table	HWC_scake.ctb
Paper size	A3 (297 x 420mm)
Plot Scale	1:2
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

6.5.7 Symbols, Blocks and Abbreviations

Use the Hunter Water blocks and symbols available from the AutoCAD Plant3D (P&ID) Tool Palette which is supplied in the P&ID Drawing Package. Standard Drawing Set 16066 provides details of the Hunter Water blocks and symbols.

For AutoCAD these symbols are provided in the Project Symbol Library.

Where a symbol/block for an item of equipment or detail is not available from the Hunter Water Standard Library, provide Hunter Water an example of the new block for approval. On approval incorporate the block in the project library. Hunter Water will update the standard library with the new symbol and re-issue the standard on a periodic basis. Update existing libraries from the current library as individual P&ID sets are modified.

Do not create blocks on any other standard layer.

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

All abbreviations for equipment as designated using the 'Assign Tag' function in AutoCAD Plant3D.

For AutoCAD use equipment abbreviations found in the model space of Standard Drawing Set 16066.

6.5.8 Signatories

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

Table 9: Approvals

Signatory	Information to be included
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.

Signatory	Information to be included
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.

6.5.8.1 Images

Images are not permitted in the Piping and Instrumentation Diagram set except:

- site location plan
- company logos in the "Consultant Details" section of the title block

6.6 Supply of Drawings

Supply final design drawings and any subsequent amendments as:

- A3 size hard copies
- DWG file; and
- Individual A3 PDF files.

Supply a populated spreadsheet (Drawing register.xls) provided in the P&ID Drawing Package.

Complete the following checklist before submitting drawings:

Table 10: Drawing Completion Checklist

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

6.6.1 Plant 3D

For all Plant 3D projects. The entire Plant 3D project including all project files shall be supplied back to Hunter Water

7 P&ID Conventions

Refer to Drawing Set 16066 for Hunter Water Approved:

- Equipment Symbols, associated Process Codes and name
- Analogue and Digital Symbols and Codes
- Line Types
- Pipeline Tag and codes
- Off page connectors
- Typical Examples

The following section outlines the conventions used in developing P&ID's

7.1 Equipment Tags

Equipment Tags are a combination of the 'equipment abbreviation' and a 'tag-number' and are the primary means of identification for all physical items in a process e.g. pumps, mechanical equipment, valves, instruments etc. Equipment 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

The TAG Numbers forms a critical part of the Plant Numbers that form the exclusive equipment identification within HW Operating System and Drawing Filing System.

Additionally:

- Equipment Tags are present on field nameplates
- Equipment Tags are used within SCADA and the PLC program.

Equipment and Instrument Tags consist of:

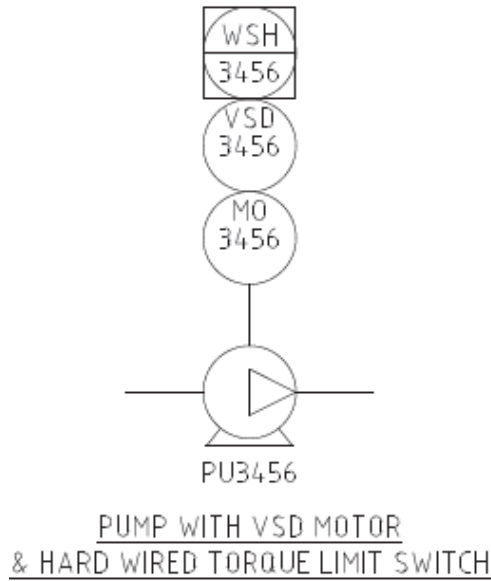
- A mandatory alphabetic prefix (equipment abbreviation) of either 2, 3 or 4 letters. Prefixes are defined in Standard P&ID Drawing set 16066
- A mandatory four digit suffix (tag-number)
- An optional additional alphabetic suffix.

If an equipment or instrument is not defined in 16066 then request alphabetic prefixes from the Hunter Water Asset Management Group.

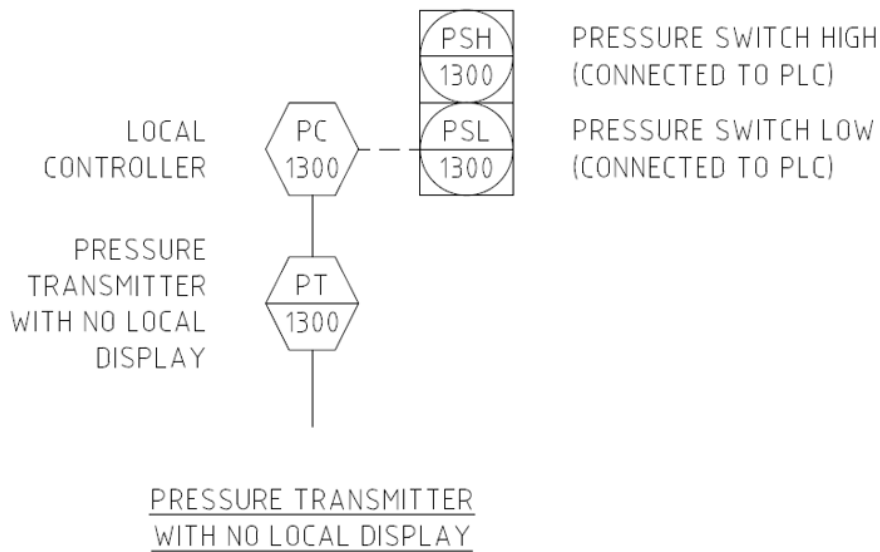
The four digit suffix should, as much as possible be unique at any particular treatment plant. An exception to this rule is listing items within the same control loop. A control loop is defined as:

“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.”

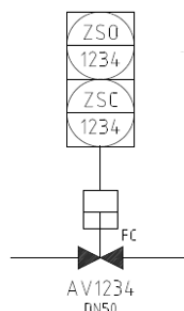
The example below represent a pump and motor with variable speed drive and torque limit switch which is hard wired to the pump. All items are operated collectively to control the pump performance.



The example below depicts a pressure transmitter with a proprietary local control system. The pressure transmitter does not have a local display. The proprietary controller has 2 digital output (High Pressure and Low Pressure) wired into the standard PLC and is displayed in SCADA.



The example below depicts a pneumatically actuated valve with fail closed functionality. The actuator has both open and closed limit switches connected to local PLC displayed in SCADA. For simplicity the driving solenoid is not shown as it is essential for operation. The limits switches are not always essential and are to be shown when needed.



Note: Examples of ways to combine equipment utilising the same TAG Numbers are supplied in Standard Drawing Set 16066.

Appendices C, D, E and F provide suggested systematic numbering systems for the tag number suffix. The tag number range helps to identify which sub-process the piece of equipment is associated with.

The numbering system in Appendices C, D, E and F are not mandatory but should be followed wherever possible.

7.1.1 Tag List

7.1.2 AutoCAD Plant 3D Project

AutoCAD Plant 3D manages all tag data for the project and ensures no double-ups. At various stage of the project a Tag Reports will be required to assist in the preparation of the Asset Information Spreadsheet.

7.1.3 AutoCAD Projects

For all non AutoCad Plant 3D projects, a method for reliably capturing all tags as soon as they are allocated shall be adopted at the commencement of a project. If this method is a spreadsheet, it shall initially consist of 5 columns with 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.

7.2 Equipment Naming - 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).

7.3 Linking P&ID Drawing Sheets

Off Page Connectors (shown below) are to be used to connect P&ID process lines from one drawing to the next.

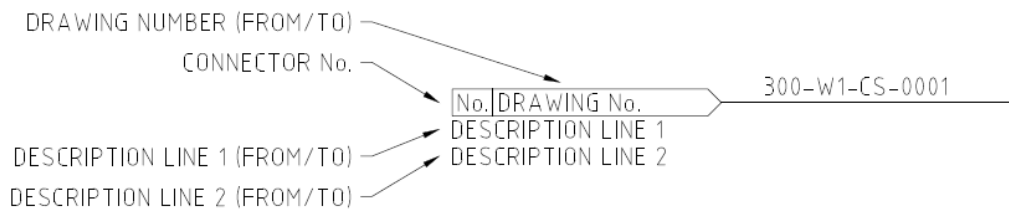
The connect includes:

- A unique number shared with the associated connector on the other drawing
- Connecting Drawing number
- Description of what process unit it is connecting to

Off Page Connectors are to be:

- Located at the side of drawings
- (Ideally) shown in from the left side and out to the right side of the drawing

OFF-PAGE CONNECTOR



Double headed connectors indicate bidirectional or two-way flow.



TWO-WAY OFF-PAGE CONNECTOR

7.4 Valves

7.4.1 Normal Position

Generally, most valves are “open” for normal process operation. The valve normal position is shown graphically with different symbols for Open vs Closed. The full list is shown below.

Valves can also be locked open (LO) or locked closed (LC). This is denoted by text LO or LC besides the valve.

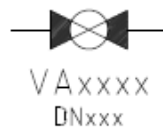
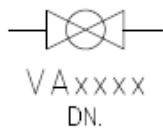
A manual valve can have one of the four states:

- Normally open
- Normally closed
- Locked open
- Locked closed

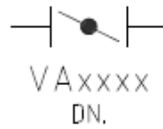
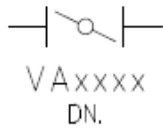
The valve status is changed via the metadata.

NORMALLY OPEN

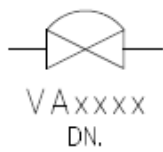
NORMALLY CLOSED



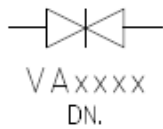
VALVE, BALL



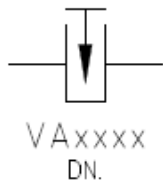
VALVE, BUTTERFLY



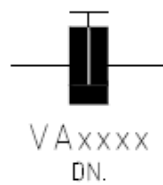
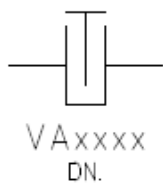
VALVE, DIAPHRAGM



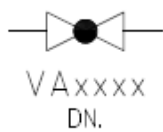
VALVE, GATE




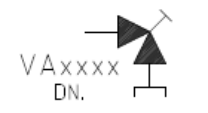
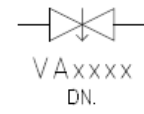
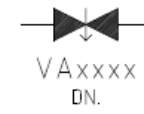
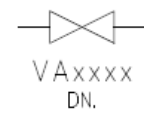

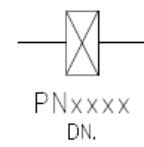
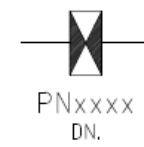
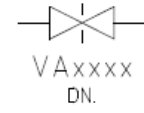
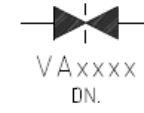
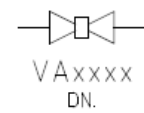
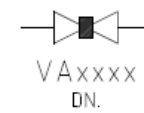
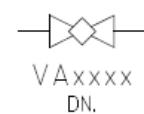



VALVE, GATE KNIFE



VALVE, GATE SLIDE

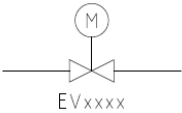
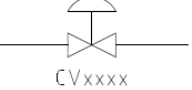
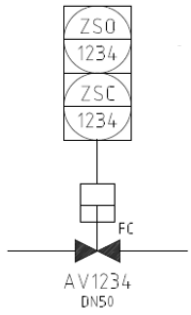

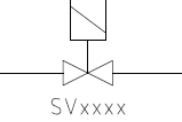


VALVE, GLOBE

		VALVE, HOSE BIB
		VALVE, NEEDLE
		VALVE, OTHER (TO BE ONLY USED FOR PRELIMINARY DRAWINGS - REPLACE WHEN VALVE TYPE IS KNOWN)
		VALVE, PENSTOCK
		VALVE, PINCH
		VALVE, PLUG
		VALVE, PLUG ECCENTRIC
		VALVE, STOPBOARD

7.4.2 Valve Actuation

Use the following symbols for valve actuation:

Actuator	Process Code	Use	Symbol
Electric	EV	Electric driven actuator both modulating and on/off	
Control	CV	Pneumatically or electrically driven actuator used for modulating control ie position controlled by 4 - 20 mA signal	
Pneumatic	AV	Pneumatically driven actuator used for on/off applications. Example with open and closed limits switches Show Open and closed limit switches only if applicable	
Rotary	RV	Typically electric but may be pneumatic driven. Show electrically driven valves with a motor symbol.	
Solenoid Valve	SV	Electromechanical valves driven with electromagnet. Typically used for low reliability applications and do not have open or closed limit switches	

7.4.3 Control Valve Failure Status

Automatic valves can have the following “fail safe” positions if air or power is lost:

Fail Position	Acronym	Action on Loss of Signal
• Fail Open	FO	Valve opens
• Fail Closed	FC	Valve closes
• Fail Locked	FL	Fails in last position and is secured in position.
• Fail indeterminate		Vale failure state is unspecified (or does not matter).
• Fail last/drift open	FL/DO	Fails in last position. Fluid force drives valved open.
• Fail last/drift closed	FL/DC	Fails in last position. Fluid force drives valved closed

The failure status is denoted with the above abbreviations near the valve stem on the P&ID. The failure status is changed via the metadata associated with the valve actuator.

Failure states are not applicable to:

- Manual Gearboxes
- Rotary Valves

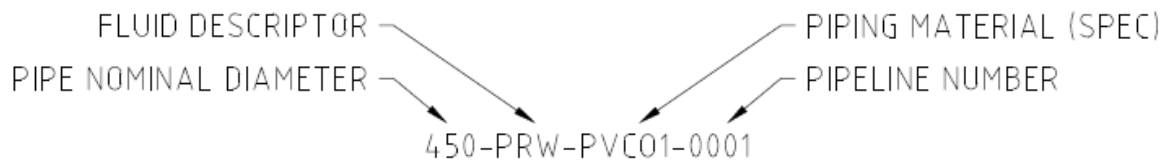
7.5 Stop Boards

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

7.6 Pipelines

Provide pipeline tag descriptions for all line types on the P&ID. The pipeline tag includes:

- pipe nominal diameter
- fluid in pipe
- pipe material
- Unique pipeline number

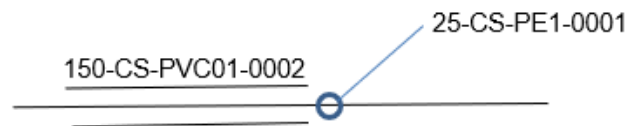


Refer to Drawing 16066 Sheet 4 for identifier details.

7.6.1 Double containment

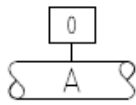
For double contained pipe use the double contained pipe line in addition to the process line. This will provide allowance to specify both the process pipe and outer containment pipe code.

e.g.

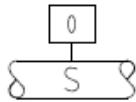


7.6.2 Insulation

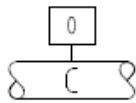
Use the following symbols to indicate the type of insulation with the insulation thickness nominate in the box above:



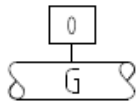
ACOUSTIC INSULATION



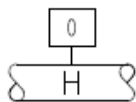
ANTI-SWEAT INSULATION



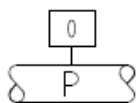
COLD INSULATION



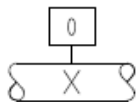
GLASS FIBRE INSULATION



HOT INSULATION



PERSONAL PROTECTION INSULATION



SPECIAL INSULATION

Motors

7.7 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).

Note: An example of this is illustrated in Standard Drawing Set 16066.

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

Set points for analogue devices that are set within 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 Control Philosophy section of the ACMM.

7.9 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.

7.10 Control Logic/Lines

Generally, do not show software control logic with control lines on the P&ID's. Articulate control logic in the ACMM.

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 show the control signal to demonstrate software interlocks on the P&ID. 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 control lines from the LIT to the pump on the P&ID.

7.10.1 Interlocks

For complex interlock use the following symbol:



Differentiate different interlocks with a numeric suffix e.g. I1, I2, I3

Do not show interlock logic with control lines on the P&ID's. Articulate interlock logic in the ACMM

8 Vendor Drawings

Show all vendor equipment on P&ID's including tagging and the individual components. Do not display the vendor equipment as a "black box".

9 Process Flow Diagrams

Use the P&ID symbols to develop Process Flow Diagrams (PFD). Rectangles may be used to depict process units

PFDs must include a Process Flow Table.

Process Flow Tables typically include:

- Stream Number
- Fluid description
- Normal Flow
- Max Flow
- Minimum Flow

Each stream must be labelled numerically and correspond to the Process Flow Table

A typical PFD for a single unit process will include these elements:

- Major equipment: Including names and ID numbers. Examples include compressors, mixers, vessels, pumps, boilers and coolers.
- Process piping: Moves the product, usually fluids, between equipment pieces.
- Process flow direction
- Control valves and process-critical valves
- Major bypass and recirculation systems
- Operational data: Such as pressure, temperature, density, mass flow rate and mass-energy balance. Values often will include minimum, normal and maximum.
- Composition of fluids
- Process stream names
- Connections with other systems

What to exclude in a PFD

Typically, these more detailed items are omitted:

- Pipe classes and pipeline numbers
- Process control instruments
- Minor bypass valves
- Isolation and shutoff valves
- Maintenance vents and drains
- Relief valves and safety valves
- Code class information

10 Related Documents

Other Hunter Water drawing standards include:

- STS 903 – Standard Technical Specification – Preparation of Work as Constructed Drawings
- STS 904 – Standard Technical Specification – Preparation of Electrical Drawings
- STS 911 – Standard Technical Specification – Preparation of Civil and Engineering Drawings

11 Document control

Document Owner: Group Manager Information, Control and Energy

Document Reviewer: Manager Operational Information

Document Approver: New or major update – Executive Manager Customer Delivery

Minor update - Group Manager Information, Control and Energy

Document review is as per the Integrated Management System Document Management Standard [HW2013-421/22.002](#).

Version	Author	Details of change	Approval Date	Approved by
1	T. Thompson	New Issue Separated from STS 911	22/12/2021	J. Watts
2	P. Stone	Updated to incorporate changes to Autocad Plant 3D P&ID	8/01/2024	R. Chhillar

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 Piping and Instrument Diagrams. This is not an exhaustive list.

Name	Number
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: Plant Drawing Numbers

Use the following P&ID numbers for all future works:

Name	Equipment Description	P&ID Number
RT-FAR	RWTP, FARLEY (GILLIESTON HEIGHTS)	300144
RT-CHM-002-CDS	RWTP, MORPETH (CHISHOLM)	300145
RT-MAW	AWTP, Mayfield West (KIWIS)	300170
ST-BEL	WWTW, BELMONT	300089
ST-BOU	WWTW, BOULDER BAY	300146
ST-BRA	WWTW, BRANXTON	300008
ST-BUR	WWTW, BURWOOD	300134
ST-CES	WWTW, CESSNOCK	300147
ST-CLA	WWTW, CLARENCETOWN	300148
ST-DOR	WWTW, DORA CREEK	300149
ST-DUN	WWTW, DUNOGG	300150
ST-EDG	WWTW, EDGEWORTH	300151
ST-FAR	WWTW, FARLEY	300152
ST-KAR	WWTW, KARUAH	300010
ST-KEA	WWTW, KEARSLEY	300153
ST-KUR	WWTW, KURRI KURRI (LOXFORD)	300154
ST-MOR	WWTW, MORPETH	300155
ST-PAX	WWTW, PAXTON	300009
ST-RAY	WWTW, RAYMOND TERRACE	300156
ST-SHO	WWTW, SHORTLAND	300118
ST-TAN	WWTW, TANILBA BAY	300157
ST-TOR	WWTW, TORONTO	300158
WT-ANN	WTP, ANNA BAY	300159
WT-BED	WTP, BENDOLBA (DUNOGG PAC PLANT)	300160
WT-BES	WTP, BELMONT SOUTH (DESALINATION)	16411
WT-DUN	WTP, DUNOGG	300162
WT-FEO	WTP, FERODALE (SCHRODER PAC PLANT)	300163
WT-GRA	WTP, GRAHAMSTOWN	15080
WT-GRS	WTP, GRESFORD	300165
WT-LEM	WTP, LEMON TREE PASSAGE	300166
WT-NEL	WTP, NELSON BAY	300011
WT-TOM	WTP, TOMAGO 1	300167

Appendix C: Tag Numbering System for Wastewater Plants

Note: The following Sub-Process TAG Ranges are supplied as a structural **guideline**. Verification of TAG numbers to be used in any process is required from Hunter Water due to existing equipment within this Sub-Process and Existing Plant.

PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
0001-0999	FACILITY SUPPORT SERVICES	0001-0099	LAND, BUILDINGS & SERVICES
		0100-0199	ELECTRICAL SERVICES
		0200-0299	COMPRESSED AIR SYSTEM
		0300-0399	POTABLE WATER SYSTEM
		0400-0499	PROCESS/INDUSTRIAL WATER SYSTEM
		0500-0599	TELEMETRY & CONTROL
		0600-0699	SITE STORMWATER SYSTEM
	ODOUR CONTROL SYSTEM	0700-0799	FOUL AIR SYSTEM (1-9)
		0800-0899	SOIL BED FILTER SYSTEM (1-9)
		0900-0999	OTHER
1000-1999	CHEMICAL DOSING SYSTEM	1000-1099	ALUM
		1100-1199	CITRIC ACID
		1200-1299	SODIUM HYDROXIDE (CAUSTIC)
		1300-1399	CHLORINE
		1400-1499	FERROUS CHLORIDE
		1500-1599	SODIUM HYPOCHLORITE
		1600-1699	CALCIUM HYDROXIDE (LIME)
		1700-1799	POLYMER DOSING SYSTEM 1
		1800-1899	POLYMER DOSING SYSTEM 2
1900-1999	OTHER (FERRIC SULPHATE, MAGNESIUM HYDROXIDE, SODIUM BISULPHITE, SODIUM LAURYL SULPHATE)		
2000-2999	INLET WORKS	2000-2099	GRIT REMOVAL SYSTEM 1
		2100-2199	GRIT REMOVAL SYSTEM 2
		2200-2299	SCREENING SYSTEM 1 - 9
		2300-2399	INLET LIFT / PRIMARY PUMP STATION
		2400-2499	SECONDARY PUMP STATION
		2500-2599	OTHER (PS3-9, BYPASS, DISTRIBUTION)
	WET WEATHER SYSTEM	2600-2699	WET WEATHER STORAGE
		2700-2799	WET WEATHER SCREENING
	BIO-FILTER SYSTEM	2800-2899	ACTIVATED BIO FILTER TOWER
	TRICKLING FILTER SYSTEM	2900-2999	TRICKLING FILTER 1 - 9
3000-3999	BIOREACTOR / AERATION	3000-3099	BLOWN AIR SYSTEMS
		3100-3199	BIOREACTOR 1 / AERATION TANK 1
		3200-3299	BIOREACTOR 2 / AERATION TANK 2
		3300-3399	BIOREACTOR 3 / AERATION TANK 3
		3400-3499	BIOREACTOR 4 / AERATION TANK 4
		3500-3599	BIOREACTOR 5 / AERATION TANK 5
		3600-3699	WAS 1 PUMP STATION

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PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
		3700-3799	WAS 2 PUMP STATION
		3800-3899	MIXED LIQUOR RETURN 1 PUMP STATIONS
		3900-3999	OTHER (OXIDATION PONDS, MATURATION)
4000-4999	PRIMARY SEDIMENTATION SYSTEM	4000-4099	PRIMARY CLARIFIERS 1 - 9
		4100-4199	SEDIMENTATION TANK 1 - 9
	SECONDARY CLARIFIER SYSTEM	4200-4299	COMPRESSED AIR SYSTEM
		4300-4399	CLARIFIER 1 - 3
		4400-4499	CLARIFIER 4 - 6
		4500-4599	CLARIFIER 7 - 9
		4600-4699	HUMUS CLARIFIER
		4700-4799	RAS PUMP STATION 1
		4800-4899	RAS PUMP STATION 2
		4900-4999	OTHER
5000-5999	FLOTATION SYSTEM	5000-5099	COMPRESSED AIR SYSTEM
		5100-5199	DISSOLVED AIR FLOTATION SYSTEM
		5200-5299	PUMP STATION, TERTIARY FEED
	FILTRATION SYSTEM	5300-5399	CLEAN IN PLACE
		5400-5499	FILTER BED 1 - 9
		5500-5599	PUMP STATION, FILTER LIFT
	MEMBRANE FILTRATION	5600-5699	MEMBRANE BLOWN AIR SYSTEM
		5700-5799	MEMBRANE TRAIN 1 - 9
		5800-5899	PERMEATE TRAIN 1
		5900-5999	OTHER
6000-6999	BACKWASH HANDLING SYSTEM	6000-6099	BACKWASH SUPPLY SYSTEM
		6100-6199	DIRTY BACKWASH SYSTEM
		6200-6299	PUMP STATION, DIRTY BACKWASH
		6300-6399	PUMP STATION, BACKWASH
		6400-6999	OTHER
7000-7999	SLUDGE TREATMENT & HANDLING	7000-7099	AEROBIC DIGESTER 1-9
		7100-7199	BLOWN AIR SYSTEM / COMPRESSED AIR SYSTEM
		7200-7299	BELT FILTER PRESS SYSTEM
		7300-7399	CENTRIFUGE
		7400-7499	COLD DIGESTER 1
		7500-7599	GRAVITY DRAINAGE DECK
		7600-7699	HEATED DIGESTER
		7700-7799	PUMP STATIONS
		7800-7899	SLUDGE LAGOON SYSTEM
7900-7999	OTHER (HEATED DIGESTER, COGENERATION SYSTEM, BIOGAS HANDLING)		

PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
8000-8999	EFFLUENT MANAGEMENT SYSTEM	8000-8099	EFFLUENT STORAGE SYSTEM
		8100-8199	OUTFALL SYSTEM / IRRIGATION SYSTEM
		8200-8299	PERMEATE SYSTEM
		8300-8399	RECLAIMED EFFLUENT SYSTEM
		8400-8499	EFFLUENT PUMP STATIONS
		8500-8599	RECLAIMED EFFLUENT PUMP STATIONS
		8600-8699	PUMPS STATIONS
	RECYCLED WATER SYSTEM	8700-8799	RECYCLED WATER STORAGE
		8800-8899	RECYCLED WATER DISTRIBUTION
		8900-8999	OTHER
9000-9499	UV DISINFECTION	9000-9099	COMPRESSED AIR SYSTEM
		9100-9199	UV SYSTEM 1
		9200-9299	UV SYSTEM 2
		9300-9399	PUMP STATIONS
		9400-9499	OTHER
9500-9999	SPARE	9500-9999	OTHER

Appendix D: Tag Numbering System for Recycled Water Plants

Note: The following Sub-Process TAG Ranges are supplied as a structural **guideline**. Verification of TAG numbers to be used in any process is required from Hunter Water due to existing equipment within this Sub-Process and Existing Plant.

PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
0001-0999	FACILITY SUPPORT SERVICES	0001-0099	LAND, BUILDINGS & SERVICES
		0100-0199	ELECTRICAL SERVICES
		0200-0299	COMPRESSED AIR SYSTEM
		0300-0399	POTABLE WATER SYSTEM
		0400-0499	PROCESS/INDUSTRIAL WATER SYSTEM
		0500-0599	TELEMETRY & CONTROL
		0600-0699	SITE STORMWATER SYSTEM
		0700-0999	OTHER
1000-1999	CHEMICAL DOSING SYSTEM	1000-1099	ALUMINIUM CHLOROHYDRATE
		1100-1199	CITRIC ACID
		1200-1299	SODIUM HYDROXIDE (CAUSTIC)
		1300-1399	CHLORINE
		1400-1499	AQUEOUS AMMONIA
		1500-1599	SODIUM HYPOCHLORITE
		1600-1699	SULPHURIC ACID
		1700-1799	SODIUM BISULPHATE
		1800-1899	ANTISCALENT CHEMICAL
1900-1999	OTHER (EDTA)		
2000-2999	RAW WATER SYSTEM	2000-2299	RAW WATER RECEIVAL
		2300-2599	RAW WATER PRE-TREATMENT
		2600-2799	OVERFLOW SYSTEM
		2899-2899	PUMP STATION (1-9)
		2900-2999	OTHER
3000-3999	SPARE	3000-3999	OTHER
4000-4999	FILTRATION (MF / UF)	4000-4899	FILTER BEDS 1-10 / MEMBRANE TRAINS 1 - 10
		4900-4999	CLEAN IN PLACE SYSTEM
5000-5999	REVERSE OSMOSIS SYSTEM	5000-5499	MEMBRANE TRAIN 1 - 9
		5500-5599	DE-GASSING SYSTEM
		5600-5699	FEED SYSTEM
		5700-5799	CLEAN IN PLACE SYSTEM
		5800-5899	PERMEATE TRAIN 1
		5900-5999	OTHER
6000-6999	BACKWASH HANDLING SYSTEM	6000-6099	BACKWASH SUPPLY SYSTEM
		6100-6199	DIRTY BACKWASH SYSTEM
		6200-6299	PUMP STATION
		6300-6399	PUMP STATION
		6400-6499	DIRTY BACKWASH SYSTEM
		6500-6599	CHEMICAL NEUTRALISATION SYSTEM

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PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
		6600-6999	OTHER
7000-7999	SPARE	7000-7999	OTHER
8000-8999	PRODUCT WATER SYSTEM	8000-8099	PRODUCT WATER STORAGE
		8100-8199	PRODUCT WATER DISCHARGE
		8200-8299	PUMP STATION 1
		8300-8399	PUMP STATION 2
		8400-8999	OTHER
9000-9999	SPARE	9000-9999	OTHER

Appendix E: Tag Numbering System for Water Treatment Plants

PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
0001-0999	FACILITY SUPPORT SERVICES	0001-0099	LAND, BUILDINGS & SERVICES
		0100-0199	ELECTRICAL SERVICES
		0200-0299	COMPRESSED AIR SYSTEM
		0300-0399	POTABLE WATER SYSTEM
		0400-0499	PROCESS/INDUSTRIAL WATER SYSTEM
		0500-0599	TELEMETRY & CONTROL
		0600-0699	SITE STORMWATER SYSTEM
		0700-0999	OTHER
1000-1999	CHEMICAL DOSING SYSTEM	1000-1099	ALUM
		1100-1199	CARBON DIOXIDE (CO ₂)
		1200-1299	SODIUM HYDROXIDE (CAUSTIC)
		1300-1399	CHLORINE DOSING SYSTEM 1
		1400-1499	FLUORIDE
		1500-1599	SODIUM HYPOCHLORITE
		1600-1699	CALCIUM HYDROXIDE (LIME)
		1700-1799	POLYMER DOSING SYSTEM 1
		1800-1899	POLYMER DOSING SYSTEM 2
		1900-1999	OTHER (CHLORINE 2, POWDERED ACTIVATED CARBON)
2000-2999	RAW WATER SYSTEM	2000-2299	RAW WATER RECEIVAL
		2300-2599	RAW WATER PRE-TREATMENT
		2600-2999	OTHER
3000-3999	GRAVITY SETTLING SYSTEM	3000-3099	CLARIFIER 1
		3100-3199	CLARIFIER 2
		3200-3299	SEDIMENTATION TANK 1
		3300-3399	SEDIMENTATION TANK 2
		3400-3499	SEDIMENTATION TANK 3
		3500-3599	SEDIMENTATION TANK 4
		3600-3999	OTHER
4000-4999	FILTRATION SYSTEM 1-2	4000-4499	FILTER BED 1-10
		4500-4899	FILTER BED 11-16
		4900-4999	CLEAN IN PLACE
5000-5999	REVERSE OSMOSIS SYSTEM	5000-5499	MEMBRANE TRAIN 1 - 9
		5500-5599	DE-GASSING SYSTEM
		5600-5699	FEED SYSTEM

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PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
		5700-5799	CLEAN IN PLACE SYSTEM
		5800-5899	PERMEATE TRAIN 1
		5900-5999	OTHER
6000-6999	BACKWASH HANDLING SYSTEM	6000-6099	BACKWASH SUPPLY SYSTEM
		6100-6199	DIRTY BACKWASH SYSTEM
		6200-6299	PUMP STATION
		6300-6399	PUMP STATION
		6400-6499	CLARIFIER
		6500-6599	BACKWASH RECOVERY
		6600-6699	BLOWN AIR SYSTEM
7000-7999	SLUDGE TREATMENT & HANDLING	7000-7699	OTHER
		7700-7799	PUMP STATION
		7800-7999	SLUDGE LAGOON SYSTEM
		7900-7999	OTHER
8000-8999	CLEAR WATER SYSTEM	8000-8099	CLEAR WATER TANK 1
		8100-8199	CLEAR WATER TANK 2
		8200-8299	CHLORINE CONTACT TANK
		8300-8399	PUMP STATION, CLEAR WATER
		8400-8999	OTHER
9000-9999	SPARE	9000-9999	OTHER

Appendix F: Tag Numbering System for Desalination Plants

PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
0001-0999	FACILITY SUPPORT SERVICES	0300-0399	POTABLE WATER PUMPS
		0400-0499	CHLORINATED SERVICE WATER PUMPS
		0700 – 0799	WET RACKS
		0800 – 0899	FIRE WATER SYSTEM
		0900 - 0950	ADMIN WASTEWATER BUILDING (WASTEWATER AND LAB WATER)
		0950-0999	SWITCHROOMS
1000-1999	CHEMICAL DOSING SYSTEM	1000-1099	ANTISCALANT DOSING SYSTEM
		1100-1199	CARBON DIOXIDE DOSING SYSTEM
		1200-1299	SODIUM HYDROXIDE DOSING SYSTEM
		1300-1399	CHLORINE DOSING SYSTEM
		1400-1499	FLUORIDE DOSING SYSTEM
		1500-1599	SODIUM HYPOCHLORITE DOSING SYSTEM
		1600-1699	LIME DOSING SYSTEM
		1700-1799	POYLMER - LIME CLARIFIER
		1800-1899	POLYMER - LIME DEWATERING
1900-1999	SMBS		
2000-2299	RAW WATER SYSTEM	2000-2299	SEAWATER INTAKE
2300-2999	RAW WATER PRE-TREATMENT/ OTHER		OSMOFLO
3000-3999	GRAVITY SETTLING SYSTEM (repurposed)		OSMOFLO
4000-4999	FILTRATION SYSTEM		OSMOFLO
5000-5999	REVERSE OSMOSIS SYSTEM		OSMOFLO
6000-6999	BACKWASH HANDLING SYSTEM		OSMOFLO
7000-7999	SLUDGE TREATMENT & HANDLING	7000-7699	7000-7200 LIME DEWATERING SYSTEM 7600-7699 NORTHERN GPPS
		7700-7799	NEUTRALISATION SUMP/SOUTHERN GPPS /OCEAN OUTFALL DISCHARGE TANK

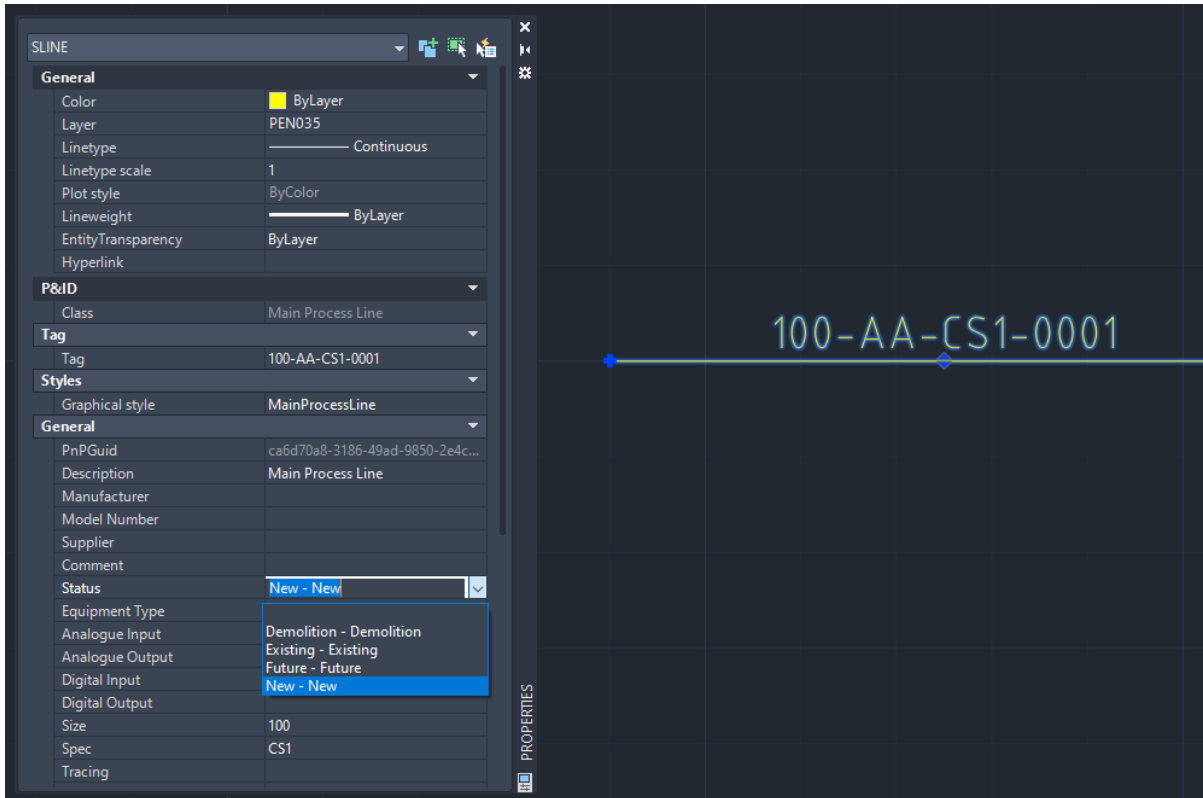
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PROCESS TAG RANGE	PROCESS	SUB-PROCESS TAG RANGE	SUB-PROCESS
8000-8999	CLEAR WATER SYSTEM	8000-8099	TREATED WATER STORAGE TANK
		8100-8199	TREATED WATER STORAGE TANK
		8300-8399	TREATED WATER PUMPS
		8400-8499	TREATED WATER PUMPS
		8500-8599	LIME DOSING SYSTEM
		8700-8799	CHLORINATED SERVICE WATER CONNECTIONS
		8800-8999	COOLING TOWER SYSTEM
9000-9999	SPARE	9000-9099	ANTISCALANT DOSING SYSTEM
		9100-9199	ANTISCALANT DOSING SYSTEM
		9200-9299	SODIUM HYDROXIDE DOSING SYSTEM
		9300-9399	9300-9349 CHLORINE DOSING SYSTEM 9350-9399 FLUORIDE DOSING SYSTEM
		9400-9499	SMBS DOSING SYSTEM
		9500-9599	SMBS DOSING SYSTEM
		9600-9699	LIME DOSING SYSTEM
		9700-9799	LIME DOSING SYSTEM
		9800-9899	LIME DOSING SYSTEM
		9900-9999	HYDROCHLORIC ACID DOSING SYSTEM

Appendix G: Using P&ID Painter to indicate Status in P&ID Drawing





Use the AutoCAD Plant3D P&ID Painter functionality to visually display the Status property of the items in the P&ID (pipeline, valves, equipment).

For example, when selecting the Main Process Line shown below, in the Properties box on the left under General, there is a property 'Status' that has a drop down list with the options Demolition, Existing, Future and New.



(Note: Set the status for pipeline and equipment. Items like valves, pipe fittings and inline instruments acquire their status from the pipeline. If required, the acquisition rule can be overridden to change the status.)

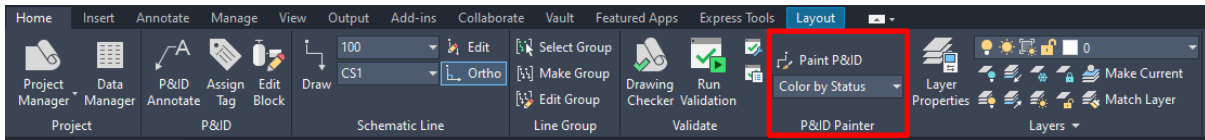
Use the P&ID Painter function in AutoCAD Plant3D to change the way the drawing is displayed so that it shows the Color by Status instead of the default display style. This will show the printout with the following status colours:

	NEW EQUIPMENT TO BE INSTALLED
	EXISTING EQUIPMENT
	EQUIPMENT TO BE REMOVED
	FUTURE EQUIPMENT

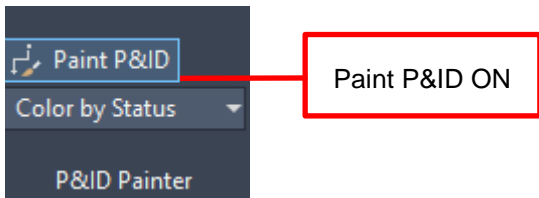
Use the Status Property of items and equipment in a P&ID. At the end of the project (eg WAC) change the status of everything to Existing using Data manager.

How to use P&ID Painter

With the P&ID drawing open in AutoCAD Plant3D, under the ‘Home’ tab look for ‘P&ID Painter’



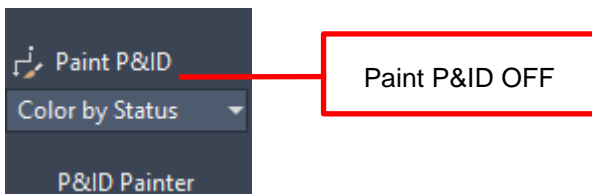
Make sure the drop-down box has selected ‘Color by Status’ and then click on the button ‘Paint P&ID’



The drawing will display the colour of the P&ID in accordance with their status.

How to turn off P&ID Printer

Click the button ‘Paint P&ID’ again to turn off this functionality.



Note:

Equipment text will remain black. Changing the text colour is not required

Due to a limitation with Plant 3D the colour of the custom channels line type will need to be changed manually to match the status.