

B-PRO-STD-003 Piping and Instrumentation Diagram Drafting

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1. Purpose

This document is part of a suite of Seqwater Engineering Standards which are in alignment with the Seqwater Quality Management System. Their purpose is to provide a consistent approach to the development, modification, and management of Seqwater infrastructure that is fit for purpose, economic over the life of the asset, and meets Seqwater's Work Health and Safety obligations.

The purpose of this Procedure is to describes the Procedure for the drafting of Piping and Instrumentation Diagrams (P&IDs) that Seqwater require for all assets and how Seqwater P&ID's are required to be set out for consistency and ease of interpretation.

2. Scope

This Procedure applies to all Seqwater employees, contractors, suppliers and consultants working for, or on behalf of, Seqwater unless otherwise stated. Deviation from the requirements in this Procedure requires written agreement from Seqwater as per the deviation process detailed in *X-PRO-STD-008 Asset Standards Management and Application Procedure*.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this Procedure, the complete list of Seqwater Engineering Standards should be reviewed to ensure currency and applicability of standards to be applied to the works.

Advice must be sought from the Seqwater Document Owner, via the Engineering Mailbox, to clarify any ambiguities in relation to this Procedure.

P&IDs would typically be drawn by Process Engineers in compliance with B-SPE-STD-007 Process Flow Diagram and Piping and Instrumentation Diagram Requirements and provided for drafting in AutoCAD. This Procedure outlines Seqwater's P&ID drafting requirements.

3. P&ID Drawing Software Package

The standard drawing software package utilised at Seqwater is AutoCAD 2020 therefore all layers, line types and line weights (thickness) are setup for this application. The current .dwg file format is AutoCAD 2018 compatible (AC1032). If P&IDs are to be drafted using other drawing software packages, the deliverables of a native AutoCAD .dwg file in .zip format and a signed PDF complying with the requirements in this Procedure, X-PRO-STD-007 Drawing & Spatial Data Standards Procedure and X-PRO-STD-002 Drawing Number Procedure shall be provided.

4. P&ID Drawing Sheet

All Piping and Instrumentation Diagrams (P&IDs) must be drafted on Seqwater's standard A1 P&ID template X-DWG-STD-005 Title Block P&ID Drawings, which is to be requested by the Seqwater Drawings Requestor for the project through the Coordinator, Plans and Drawings. The Engineering Inbox (engineering@seqwater.com.au) is used to contact the Coordinator, Plans and Drawings.

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This template file will be provided by Seqwater in .zip file format with all fonts and plot configuration files (i.e. .ctb file & .pc3 file) attached complying with Seqwater's X-PRO-STD-007 Drawing & Spatial Data Standards Procedure.

For plotting/printing of Seqwater P&IDs using X-DWG-STD-005 Title Block P&ID Drawings, refer to Section 11 of this Procedure.

5. P&ID Drawing Numbers

All new P&IDs require a Seqwater drawing number (or a block of numbers) that has been allocated by Seqwater's *Coordinator, Plans and Drawings* in accordance with *X-PRO-STD-014 Drawings Management Procedure*.

All existing P&IDs that require modifying must be requested from the *Coordinator, Plans and Drawings*. The Engineering Inbox (engineering@seqwater.com.au) is used to contact the *Coordinator, Plans and Drawings*. Details on drawings management procedures are contained in *X-PRO-STD-014 Drawings Management Procedure*.

P&IDs that do not have a Seqwater allocated drawing number shall not be accepted for close-out of the project until the P&IDs comply with Seqwater's *X-PRO-STD-007 Drawing & Spatial Data Standards Procedure*.

6. Developing Seqwater P&IDs

6.1. Title Block P&ID Drawings Template Setup

The Title Block P&ID Drawings template X-DWG-STD-005 Title Block P&ID Drawings is setup for AutoCAD with the drawing sheet, associated attributed title block and a 1:1 viewport in PaperSpace only. All P&ID drawing, text and revision clouds must be drawn in the drawing frame provided in ModelSpace. The viewport must not to be scaled to any other scale than to 1:1. The drawing frame must not to be moved as it is positioned correctly for the title block in PaperSpace. The P&ID-HPLASER.ctb must be used for Seqwater's P&IDs to plot/print correctly. All P&IDs must be at a scale of 1:1.

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6.2. Seqwater P&ID Drawing Layer Structure

As shown in Figure 1, are Seqwater's standard layers utilised in creating and developing P&IDs setup for consistency and ease of interpretation.

Name	O.	F...	L...	P...	Color	Linetype
0					white	Continuous
18 Future					magenta	CENTER2
25					white	Continuous
25 Instrument					white	Continuous
25 Instrument - Capillary Tubing					white	Capillary Tubing
25 Instrument - Electrical					white	H2
25 Instrument - Hydraulic					white	H2
25 Instrument - Pneumatic					white	Pneumatic
25 Instrument - Software					white	Software
25 Piperun - Enveloped					white	H2
25 Piperun - Heat Tracing					white	H2
25T					white	Continuous
25T Legacy Number					white	Continuous
35					yellow	Continuous
35 Equipment - Minor					yellow	Continuous
35 Fittings					yellow	Continuous
35 Piperun - Insulated					yellow	DOT2
35 Piperun - Line Number					yellow	Continuous
35 Piperun - Minor					yellow	Continuous
35 Valves					yellow	Continuous
35T					yellow	Continuous
50					red	Continuous
50 Equipment - Major					red	Continuous
50T					red	Continuous
70					cyan	Continuous
70 Piperun - Major					cyan	Continuous
70T					cyan	Continuous
Area Boundary					white	PHANTOM2
Cloud					20	Continuous
Cloud - Demolition					magenta	Continuous
Cloud - Hold					magenta	Continuous
Defpoints					white	Continuous
DIMS					magenta	Continuous
DrgSht					white	Continuous
DrgShtTxt					white	Continuous
Rev Triangle					magenta	Continuous
Vendor Package					white	PHANTOM2
viewport					magenta	Continuous

Figure 1 - Layer and line types utilised in Seqwater P&IDs

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Table 1 shows the above layers and a description of how they are utilised within the P&ID.

Table 1 AutoCAD layer Structure

Layer	Where & what the layer is used for
0	Default AutoCAD layer
18 Future	Used for any future piperuns proposed for future installation
25	Used for miscellaneous items
25 Instrument	Used for instrumentation bubbles and hardwired instrumentation
25 Instrument – Capillary Tubing	Used for instrumentation capillary connections
25 Instrument – Electrical	Used for instrumentation where there is electrical connection
25 Instrument – Hydraulic	Used for hydraulic piperuns
25 Instrument – Pneumatic	Used for compressed air
25 Instrument – Software	Used for instrumentation software connections
25 Piperun – Enveloped	Used for piperuns that are enveloped/encased in another pipe for containment
25 Piperun – Heat Tracing	Used for heat traced piperuns
25T	Used for 2.5mm text height
25T Legacy Number	Used for legacy numbers only (equipment, pipe & instrument numbers)
35	Used for on/off page connector symbols and miscellaneous auxiliary shapes/items
35 Equipment - Minor	Used for minor equipment
35 Fittings	Used for pipe fittings
35 Piperun – Insulated	Used for thermal protection/insulation on piperuns
35 Piperun – Line Number	Used for pipeline numbers
35 Piperun – Minor	Used for minor process piperuns
35 Valves	Used for all valves and fittings, unless otherwise stated
35T	Used for notes, equipment descriptions, valve tagging & on/off page connector information. Text height used is 3.5mm
50	Used for miscellaneous shapes/items with no equipment number
50 Equipment - Major	Used for all major equipment
50T	Used for major equipment numbers and area heading text. Text height used is 5.0mm
70	Used for miscellaneous items
70 Piperun – Major	Use for MAIN process piperuns for that area
70T	Used for major headings. Text height used is 7.0mm

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Layer	Where & what the layer is used for
Area Boundary	Used for the boundary area
Cloud	Used for revision clouds. Cloud color to be 20.
Cloud - Demolition	Used for equipment, pipe, valves, etc. to be removed/demolished
Cloud - Hold	Used for equipment, pipe, valves, etc. on hold
Defpoints	Standard AutoCAD system layer used for miscellaneous items (this layer is set not to print)
DIMS	Used for leaders, holds inverted clouds and revision clouds
DrgSht	Used for drawing sheet only
DrgShtTxt	Used for drawing sheet title block text only
Rev Triangle	Used for revision triangle symbol
Vendor Package	Used for vendor packages
Viewport	Used for PaperSpace viewport (this layer is set not to print) only

6.3. Seqwater P&ID Process Lines & Symbols

Seqwater has developed a set of legend sheets with all approved P&ID linetypes and symbols that shall be utilised when undertaking work on P&IDs for Seqwater. The linetypes and symbols have been developed to provide consistency across the board with all Seqwater P&IDs and ease of interpretation for future users. Seqwater's P&ID Legend Sheets B-DWG-STD-001 to B-DWG-STD-007 contain all P&ID linetypes and symbols approved by Seqwater. The linetypes and symbols are already drafted as per the layer structure shown in Figure 1 of Section 10.2 of this Procedure and must retain this layer name, linetype and lineweight when returned to Seqwater's Coordinator, Plans and Drawings for project close-out.

For any changes to symbols or additional symbols, Principal approval is required.

6.3.1. Line Symbols

6.3.1.1. Major and Minor Process Lines

Major & minor process lines are used to depict the process. When drafting a Seqwater P&ID, major process lines are used to show the main process / important part in an area of the process and the minor process lines are used to show the various additions made to that main process. These process lines at most times will have a unique pipe number tag for future users of the P&ID to easily identify specific piperuns. The only time when a major or minor process line doesn't require a unique pipe number tag is when it is depicting a direct connection to another piece of equipment.

As shown in Figure 2, the major process lines shall be drafted in the layer '70 Piperun – Major' as this layer has thicker lineweight for easy identification of the main process. The minor process lines shall be drafted in the layer '35 Piperun – Minor' as this layer has a thinner lineweight to easily denote from the main process and show the additions to the main process. Major and minor process lines must be drafted as per B-DWG-STD-001 - P&ID Legend Sheet.

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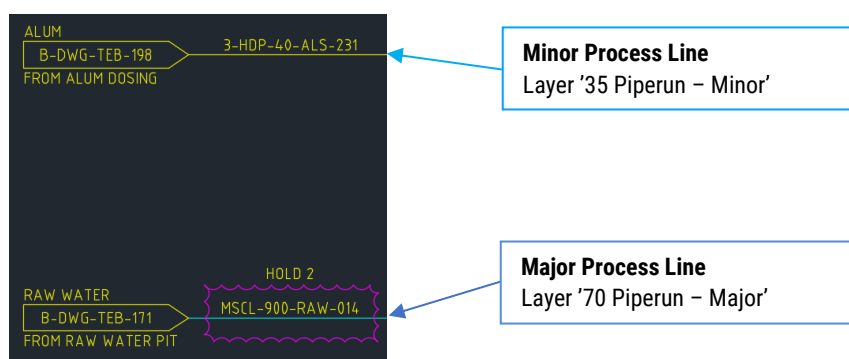


Figure 2 - Definition of Major and Minor Process Lines

6.3.1.2. Process Line Tagging

All new pipe numbers shall be drafted in the layer '35 Piperun – Line Number' and have a text style ISOCF. Text height must be 3.5mm with a width factor of 1.0. Figure 3 shows the standard format to be used for new pipe numbers. If a legacy pipe number exists, the number shall be placed on layer '25 Legacy Number' and have a text style ISOCF. Text height must be 2.5mm with a width factor of 1.0. Legacy pipe numbers must be placed in brackets. Figure 3 also shows the standard format to be used for legacy pipe numbers.

When numbering piperuns, it is preferred that the unique pipe number is placed with the corresponding piperun as shown in Figure 3. Pipe numbers shall be placed 3.0mm above the relevant piperun and any legacy numbers (if applicable) shall be placed in brackets 3.0mm below the relevant piperun and centrally located to the new pipe number where space is available on the piperun, also shown in Figure 3. When placing pipe numbers and legacy numbers on a process line as shown in Figure 3, text justification for the pipe number must be middle centre. If placing pipe number and legacy number vertically on a piperun the text to is read bottom to top as shown in Figure 4.

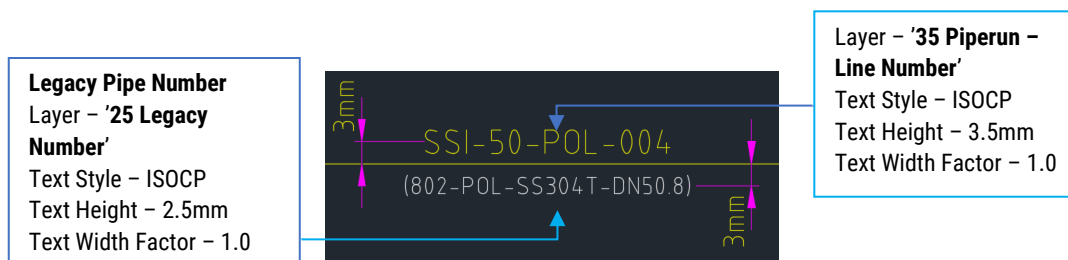


Figure 3 - Format & Preferred placement of new pipe number and legacy pipe numbers on a process line

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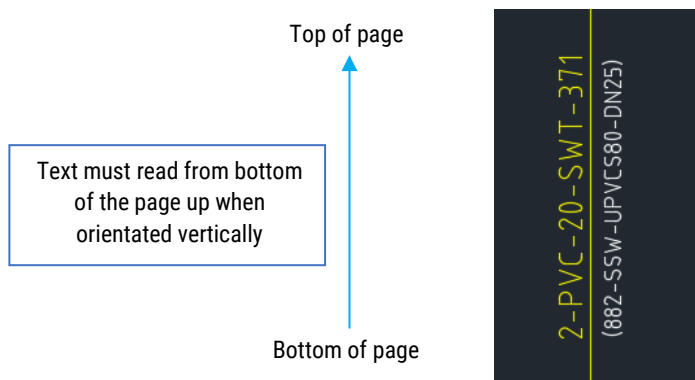


Figure 4 - Orientation of pipe numbers and legacy pipe numbers on a process line when placed vertically

When minimal space is available for a pipe number and legacy pipe number, the pipe numbers must be leadered and pointing to the corresponding process line to indicate which piperun the pipe number belongs to, as shown in Figure 5. When placing pipe and legacy numbers with a leader, text justification shall be middle left or middle right depending on the orientation of leader also shown in Figure 5 and for ease of any future editing of the P&IDs all leaders must not be associated to the leader text.

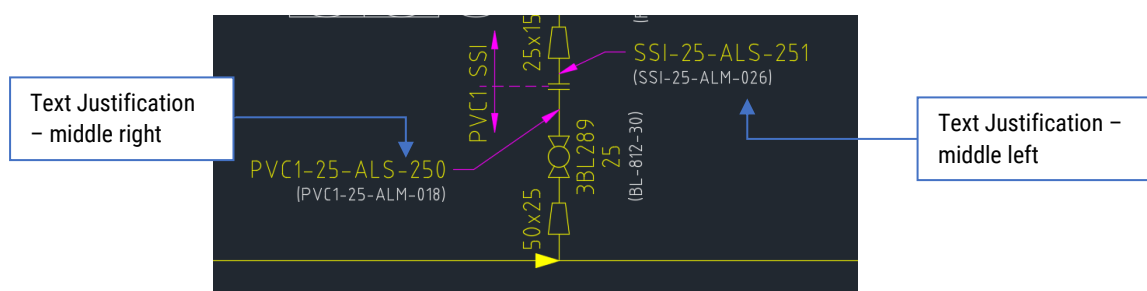


Figure 5 - Format & placement pipe number and legacy pipe number with leader to corresponding pipe

'Direction connection' process line tags are used when depicting two or more pieces of equipment directly connected with no pipes. 'Direction connection' process line tags shall be placed on layer '35T' and have a text style ISOCF. Direct connection tags shall be placed in brackets 3.0mm above or below the relevant process line as shown in Figure 6. Text height must be 3.5mm with a width factor of 1.0. Also shown in Figure 6 is the standard format that is be used by Seqwater when tagging direct connection process lines.

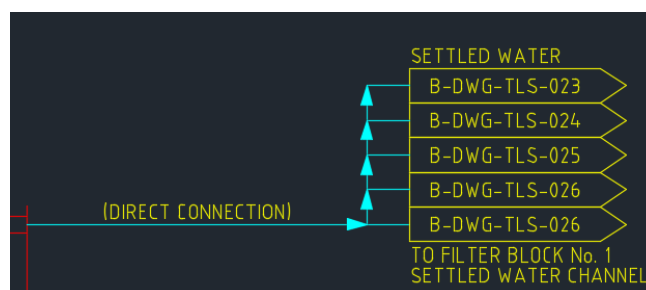


Figure 6 - Format & placement of 'Direct Connection' tag

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6.3.1.3. Enveloped Process Lines

The enveloped process line is utilised when depicting a process line / piperun that is encased in another pipe.

Enveloped / encased process lines must be drafted in the layer '25 Piperun – Enveloped' as per the B-DWG-STD-001 P&ID Legend Sheet. The enveloping / encasement pipe shall be labelled with the details of the enveloping pipe. Figure 7 shows the preferred standard format and layout for depicting an enveloped / encased piperun. The enveloping pipe text details shall be drafted in the layer '35T' and have a text style ISOCP. Text height must be 3.5mm with a width factor of 1.0. Text justification shall be middle centre justified.

If there is minimal space for the enveloping pipe details, the details must be leadered and pointing to the corresponding enveloping pipe, shown in Figure 8. When placing pipe numbers and legacy numbers with a leader, text justification shall be middle left or middle right depending on the location of leader as shown in Figure 8 and for ease of any future editing of the P&IDs all leaders must not be associated to the leader text.

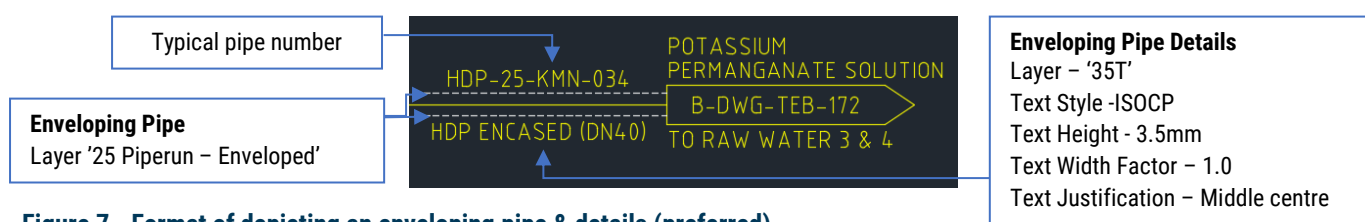


Figure 7 - Format of depicting an enveloping pipe & details (preferred)

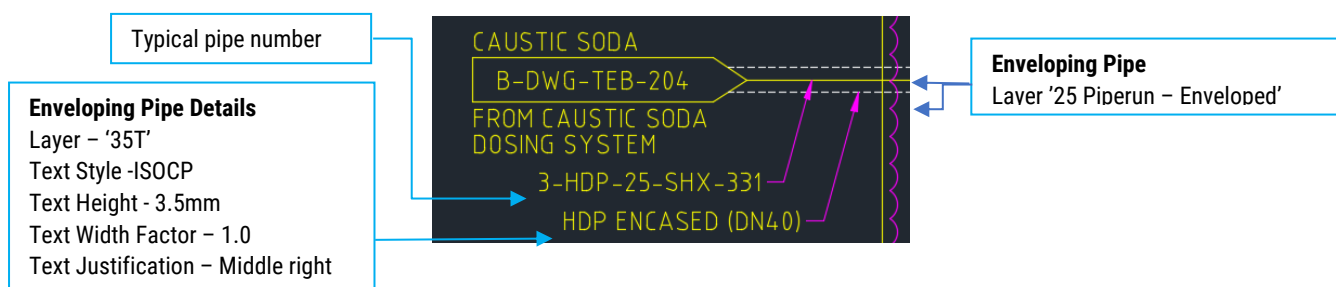


Figure 8 - Format of depicting an enveloping pipe & details when leadered (alternative)

6.3.1.4. Insulated Process Lines

The insulated process line is utilised when depicting a process line / piperun that has thermal protection / insulation.

Insulated process lines shall be drafted in the layer '35 Piperun - Insulated' as per the B-DWG-STD-001 P&ID Legend Sheet. The insulated pipe shall be labelled 'Thermal Protection' or 'Thermal Insulation' unless other details have been provided by the Process Engineer. The label's text shall be drafted in the layer '35T' and have a text style ISOCP. Text height must be 3.5mm with a width factor of 1.0. If there is minimal space for the insulated pipe details, the details must be leadered and pointing to the corresponding insulation as shown in Figure 9. When placing the label's text with a leader, text justification shall be middle left or middle right depending on the orientation of leader also shown in Figure 9 and for ease of any future editing of the P&IDs all leaders must not be associated to the leader text.

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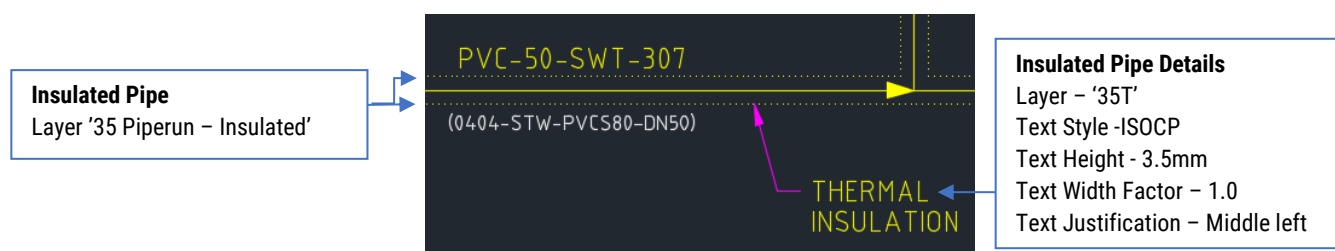


Figure 9 - Format of depicting an enveloping pipe & details when leadered (alternative)

6.3.1.5. Capillary Tubing Line

The capillary tubing line is utilised when depicting a small pipe less than DN5 but is required to be shown as part of the process of the P&ID.

The capillary tubing line must be drafted as per the layer that it is drafted in on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. As capillary tubing does not have a unique pipe number, the line depicting the capillary tubing shall be labelled 'Capillary tubing' unless other details have been provided by the Process Engineer. The capillary tubing linetype scale must NOT be changed as it is already drafted on the correct layer and linetype to suit Seqwater's requirements.

6.3.1.6. Hydraulic Signal Line

The hydraulic signal line is utilised when depicting equipment utilising hydraulic oil and is an integral part of the process shown on the P&ID. In most cases, the hydraulic oil line will be allocated a unique pipe number, with this being allocated by the Process Engineer as per the requirements in *X-PRO-STD-006 Equipment Numbering and Naming Convention*.

The hydraulic signal line must be drafted as per the layer that it is drafted in on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. If the hydraulic signal line has a unique pipe number, the number shall be drafted in the layer '35T' and have a text style ISOCP. Text height must be 3.5mm with a width factor of 1.0. If a legacy pipe number exists, the number shall be placed on layer '25 Legacy Number' and have a text style ISOCP. Text height must be 2.5mm with a width factor of 1.0. Legacy pipe number must also be placed in brackets.

Hydraulic pipe numbers shall be placed 3.0mm above the relevant piperun and any legacy numbers (if applicable) shall be placed in brackets 3.0mm below the relevant piperun and centrally located to the new pipe number where space is available on the piperun. When placing pipe numbers and legacy numbers on a process, text justification for the pipe number shall be middle centre. If placing pipe number and legacy number vertically on a piperun the text is to read bottom to top. If there is minimal space for the hydraulic pipe details, the details must be leadered and pointing to the corresponding hydraulic pipe. When placing the label's text with a leader, text justification shall be middle left or middle right depending on the orientation of leader and for ease of any future editing of the P&IDs all leaders must not be associated to the leader text.

The hydraulic signal linetype scale must NOT be changed as it is already drafted on the correct layer and linetype to suit Seqwater's requirements.

6.3.1.7. Pneumatic Line

The pneumatic line is utilised when depicting use of compressed air or instrument air in the process shown on the P&ID. In most cases, the compressed air and instrument air lines will be allocated a unique pipe number, with this being allocated by the Process Engineer.

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The pneumatic line must be drafted as per the layer that it is drafted in on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. If the pneumatic line has a unique pipe number, the number shall be drafted in the layer '35T' and have a text style ISOCP. Text height must be 3.5mm with a width factor of 1.0. If a legacy pipe number exists, the number shall be placed on layer '25 Legacy Number' and have a text style ISOCP. Text height must be 2.5mm with a width factor of 1.0. Legacy pipe numbers must be placed in brackets.

Pneumatic pipe numbers shall be placed 3.0mm above the relevant piperun and any legacy numbers (if applicable) shall be placed in brackets 3.0mm below the relevant piperun and centrally located to the new pipe number where space is available on the piperun. When placing pipe numbers and legacy numbers on a process, text justification for the pipe number shall be middle centre. If placing pipe number and legacy number vertically on a piperun the text is to read bottom to top. If there is minimal space for the pneumatic pipe details, the details must be leadered and pointing to the corresponding pneumatic pipe. When placing the label's text with a leader, text justification shall be middle left or middle right depending on the orientation of leader and for ease of any future editing of the P&IDs all leaders must not be associated to the leader text.

The hydraulic signal linetype scale must NOT be changed as it is already drafted on the correct layer and linetype to suit Seqwater's requirements.

6.3.1.8. Electrical Signal Line

The electrical signal line is utilised when depicting an electrical signal / connection between different instrumentation and equipment.

The electrical signal line must be drafted as per the layer that it is drafted in on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. Electrical signal lines are not tagged with a unique number. The electrical signal linetype scale must NOT be changed as it is already drafted on the correct layer and linetype to suit Seqwater's requirements.

6.3.1.9. Software Link or Logic Line

The software link or logic line is utilised when depicting the interaction of instrumentation with the control system such as PLC and SCADA.

The software link or logic line must be drafted as per the layer that it is drafted in on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. Software link or logic lines are not tagged with a unique number. The software link or logic linetype scale must NOT be changed as it is already drafted on the correct layer and linetype to suit Seqwater's requirements.

6.3.1.10. Flow Arrows (One-way and Bidirectional)

Flow arrows (one way and bi-directional) are utilised to show the direction of flow of a process.

Flow arrows shall be placed at all changes in direction of the process flow. This is done for ease of interpretation by future user of the P&IDs. The flow arrow block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The flow arrow symbol must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.1.11. Slope Symbol

The slope symbol is used to indicate when the flow of the process involves gravity feed or piping requiring to be on an angle for the process to operate correctly. The slope symbol requires to be noted with angle of the piping.

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Slope symbol block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The slope symbol text shall be drafted on layer '35T' and have a text style of ISOCP. Text height must be 3.5mm with a width factor of 1.0. The slope symbol must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.2. On / Off Page Connections

The on/off page connectors (one-way and bi-directional) are used to connect and continue a process from one drawing to another. These connectors are used for all process and instrumentation connections. On / off page connectors have been provided in attributed block form on Seqwater's B-DWG-STD-001 P&ID Legend Sheet for use when developing Seqwater P&IDs.

On / off page connector details consist of a service description, a source or destination (to / from) and a P&ID number. Page connector text shall be drafted on layer '35T' and have a text style of ISOCP. Text height must be 3.5mm with a width factor of 1.0. Service description and source / destination description text must be top left justified, and the P&ID number is to be middle centre justified. Shown in Figure 10 & Figure 11 is Seqwater's standard format of the on / off page connectors.

The On / off page connector block must be inserted on layer '35' as per Seqwater's B-DWG-STD-001 P&ID Legend Sheet, where the page connectors have been provided by in attributed block form. On/off page connectors and associated text must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

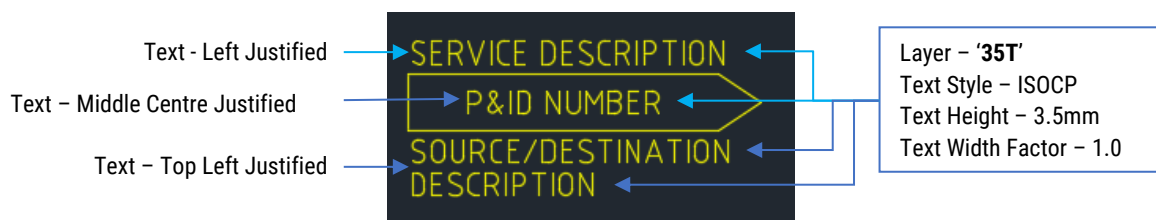


Figure 10 - One-way flow on/off page connector

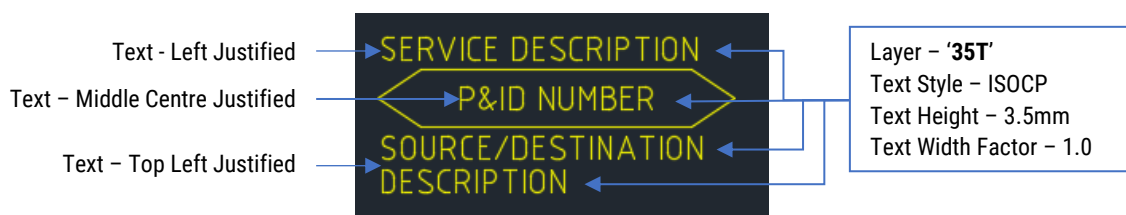


Figure 11 - Bi-directional flow on/off page connector

On / off page connectors shall enter the P&ID from the left side and exit the P&ID from the right side of drawing sheet. There must be a minimum of 5mm allowed from the side edge of the drawing frame as shown in Figure 12 & Figure 13. Bi-directional on/off page connectors may enter and leave the P&ID on either the left or right side of the P&ID due to its bi-directional flow. Bi-directional page connectors must also be placed a minimum of 5mm from the side edge of the drawing frame as shown in Figure 14. One-way and bi-directional on/off pages connectors must NOT be enter or exit in the middle of the drawing and must not enter or exit a P&ID from the top or the bottom of the drawing sheet. In the rare case where it is not practical for the P&ID process to enter from the

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left side of drawings sheet, the on/off page connector (one-way) may enter a P&ID from the right side of the drawing. This will be dictated by the Process Engineer.

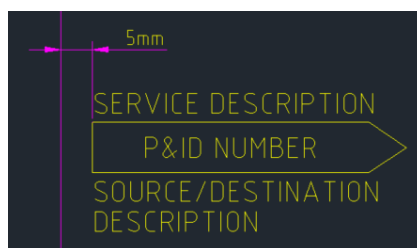


Figure 12 - On/off page connector entering from left side of P&ID and spacing from drawing sheet border

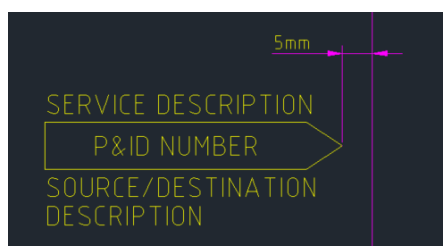


Figure 13 - On/off page connector exiting from right side of P&ID and spacing from drawing sheet border

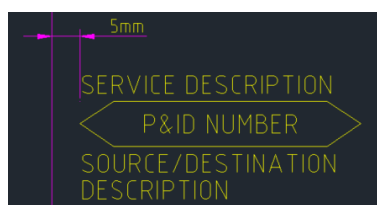


Figure 14 - Bi-directional on/off page connector entering from left side of P&ID and spacing from drawing border (also for entering from right side of P&ID)

6.3.3. Miscellaneous Line Symbols

6.3.3.1. Tie-in Points

Tie-in point symbol is utilised when new pipework is being added to an existing process.

The Tie-in points block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The tie-in point block must NOT to be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.3.2. Battery Limits

Battery limit symbols are utilised to delineate process boundaries.

The Battery limit block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The battery limit block must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

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6.3.3.3. Stream Number

Stream number symbols are utilised when referencing a mass balance table. This symbol is predominantly used on Process Flow Diagrams. In the rare case where the process engineer requires to show this information on a P&ID then the stream number symbol will be utilised.

The Stream number block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The stream number block must NOT be scaled or altered as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.3.4. Spec Break / Instrumentation Piping Break

Spec / Instrumentation piping break are utilised to delineate where a piping specification changes from one type to another.

The Spec / Instrumentation piping breaks must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The spec / instrumentation break block must NOT be scaled or altered as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.3.5. Above ground / Underground Delineation

Above ground / underground delineation symbols are utilised to show where a process changes from above ground to underground.

The Above ground / Underground delineation block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The above ground / underground delineation block must NOT be scaled or altered as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.3.6. Sub-area Break

Sub-area break symbols are utilised to show where a process goes from one area to another.

The Sub-area block must be inserted on layer '35' as per the layer that it is drafted on Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The sub-area break block must NOT be scaled as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

6.3.4. Piping Valve Symbols

A selection of piping valve symbols relating to Seqwater Assets has been provided in attributed block form on Seqwater's B-DWG-STD-001 P&ID Legend Sheet for use when developing and amending Seqwater P&IDs.

Piping valve symbols and valve tags must be drafted as per Seqwater's B-DWG-STD-001 P&ID Legend Sheet. Valve symbols and text must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

Valve tag details consist of a unique valve number, valve size, a function code (if applicable) and a legacy valve number (if applicable). The valve symbol shall be drafted on layer '35 Valves'. If a legacy valve number exists, the number shall be drafted on layer '25T Legacy Number' and have a text style of ISOCP. Text height must be 2.5mm with a width factor of 1.0. The legacy number must also be placed in brackets. Figure 15 shows Seqwater's standard format for valves and tagging.

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Figure 15 - Format & placement of valve tag text

Valve tag placement shall be centrally located directly below the valve. Where there is minimal space available due to multiple process lines, valve tags may be placed above the valve as shown in Figure 16.

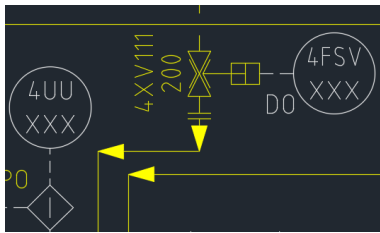


Figure 16 - Placement of valve tag when space is limited

Where there are numerous valves and fittings being placed closely together and minimal space available for valve tags, the tags may be staggered vertically with a leader indicating the valve which the tag belongs to as shown in Figure 17.

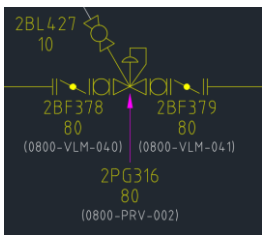


Figure 17 - Placement of valve tags when valves and fittings are placed closely together

All valve tag text shall be middle centred justified and be in the same orientation (horizontal / vertical) as the valve. When valve and valve tag are vertically oriented, valve tag text is to read from bottom to top of drawing as shown in Figure 18.

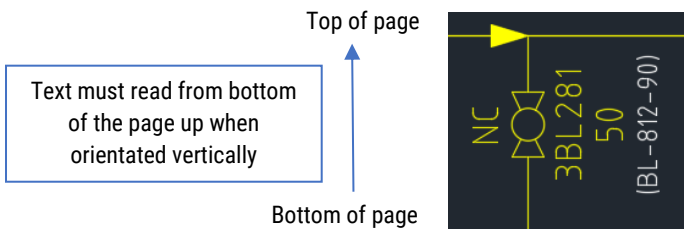


Figure 18 - Placement of valve tag text when valve orientation is vertical

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6.3.5. Instrumentation

Various instrumentation symbols have been provided in attributed block form on the Seqwater's B-DWG-STD-002 P&ID Legend Sheet for use when developing Seqwater P&IDs.

Instrument symbols consist of an identification code identifying what the instrument use is, an instrument number, instrument critical and plant alarms (if applicable) and a legacy instrument number (if applicable). The instrumentation block must be inserted on layer '25 Instrument'. If a legacy instrumentation number exists, the number shall be drafted on layer '25T Legacy Number' and have a text style of ISOCP. Text height must be 2.5mm with a width factor of 1.0. The legacy number must also be placed in brackets.

Instrument critical and plant alarm indicators can be positioned either side or above/underneath the instrumentation symbol depending on the positioning of the instrument symbol. The legacy instrument number (if applicable) can also be positioned as per the alarm indicators. Figure 19 and Figure 20 shows Seqwater's preferred format and placement for instrumentation.

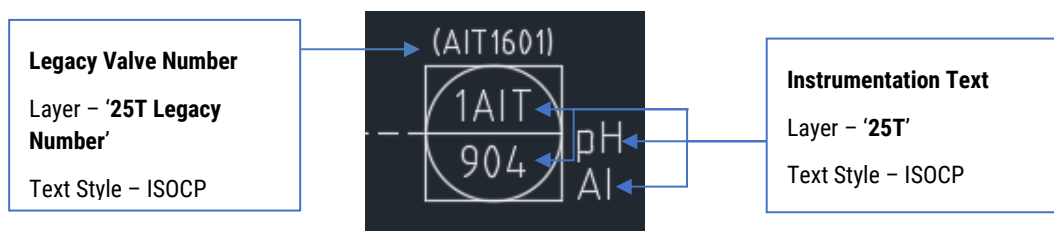


Figure 19 - Format and placement of instrumentation text

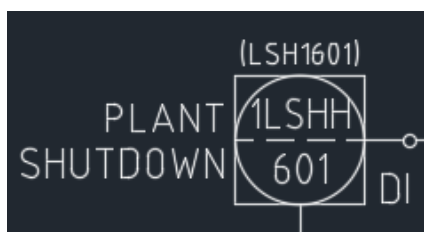


Figure 20 - Placement of instrumentation text (Alternative)

Instrumentation symbols must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template. If all instrumentation function text (e.g., 1LSHH – refer Figure 20) cannot fit within the parameters given, the text width factor can be reduced from 1.0 but not going below 0.80 maximum width factor to fit all function code letters within its parameters.

6.3.6. Fittings

A selection of pipe fittings that relate to Seqwater Assets has been provided by Seqwater on the Seqwater's B-DWG-STD-001 P&ID Legend Sheet for use when developing P&IDs for Seqwater.

All fittings must be drafted on layer '35 Fittings' apart from the flexible hose and insulated flexible hose symbols as per Seqwater's B-DWG-STD-001 P&ID Legend Sheet. The flexible hose symbol shall be drafted on either the '70 Piperun – Major' or '35 Piperun – Minor' layer depending on whether it is part of the Major or the Minor process. The insulated flexible hose symbol shall also be drafted as per the flexible hose dependent on the process whether it is major or minor and the insulation must be drafted on layer '35 Piperun – Insulated'.

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All fitting text (if applicable) shall be drafted on layer '35T' with a text style of ISOCP. Text height must be 3.5mm with a width factor of 1.0. Placement of text for fittings shall be as per Seqwater's B-DWG-STD-001 P&ID Legend Sheet.

Concentric & Eccentric reducer sizing tag shall be positioned above the reducer as shown in Figure 21 and Figure 22. Also shown in Figure 21 and Figure 22 is the correct orientation of the reducer sizing tag is as per the pipe sizes either side of reducer / expander. Shown in Figure 23 is the incorrect orientation of expander / reducer sizing tag. If there is minimal space to place reducer / expander sizing tag above the reducer / expander the reducer size tag can be positioned underneath the reducer. For vertical reducers, the reducer sizing tag should be positioned as shown in Figure 24.

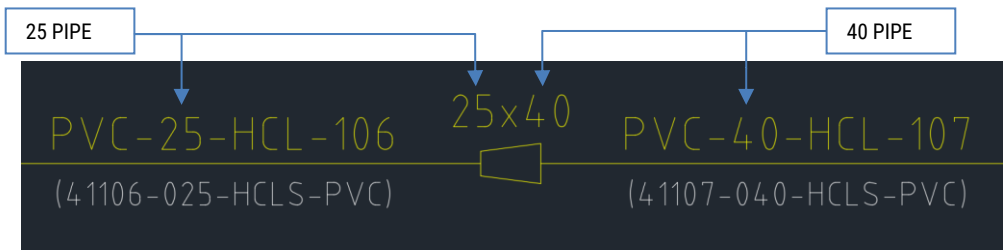


Figure 21 - Correct orientation of expander/reducer sizing (small to large) tag

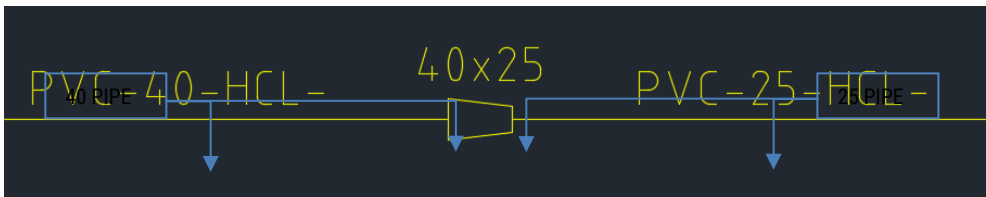


Figure 22 - Correct orientation of reducer/expander sizing (large to small) tag

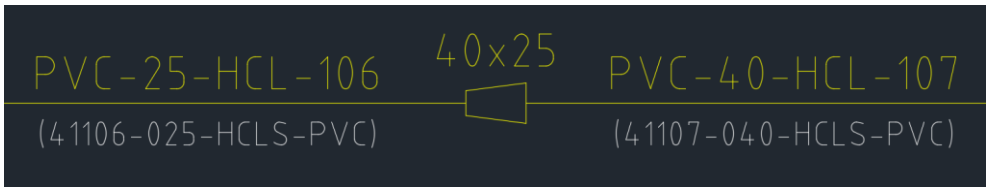


Figure 23 - Incorrect orientation of reducer/expander sizing tag (sizing wrong way around)



Figure 24 - Placement of reducer/expander sizing tag when valve orientation is vertical

All text and fittings with the exception of the personnel access hole, tundish / drain, removable spool, flexible and insulated hose must NOT be scaled or changed as they are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template. The personnel access and maintenance hole symbol may be

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scaled up to suit where it is being used (e.g., where there are multiple process lines entering / exiting through the personnel access hole or when being used on a tank). The tundish / drain symbol may also be scaled up when multiple processes are exiting through the tundish / drain. The removable spool symbols and flexible hose (insulated and non-insulated) symbols can be lengthened to suit the process needs but must NOT be scaled.

6.3.7. Major Equipment

A selection of major equipment symbols that relate to Seqwater assets has been provided by Seqwater on B-DWG-STD-006 P&ID Legend Sheet for use when developing P&IDs for Seqwater.

Major equipment symbols must be inserted on layer '50 Equipment – Major' as per the layer that it is drafted on Seqwater's B-DWG-STD-006 P&ID Legend Sheet with most of the major equipment symbols able to be scaled and / or lengthened to suit the amount of processes coming into the equipment and the amount of instrumentation required on that piece of equipment. Table 2 shows which major equipment must NOT to be altered as these equipment symbols are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

Table 2 - Major equipment NOT to be altered

Equipment description	Are NOT to be altered
All Compressors and Blowers	Yes
All Pumps	Yes
Rotary Valve	Yes
Air Dryer	Yes
Heater	Yes
Heat Exchanger	Yes
Pulsation Dampener	Yes
All Safety Showers & Eyewash Stations	Yes
Agitator	(mixer arm can be lengthened)
Mixer	(mixer arm can be lengthened)

6.3.7.1. Major Equipment Number & Description Tags

Major equipment tags must consist of an equipment number, a legacy number in brackets (if applicable) and the major equipment description which may include name of equipment, flowrate, capacity / volume, power rating, construction material, etc. The major equipment symbol must be drafted on layer '50 Equipment - Major'. The equipment number tag text shall be drafted on layer '50T' with a text style of ISOCP. Text height must be 5.0mm with a width factor of 1.0. The equipment description shall be drafted on layer '35T' with a text style of ISOCP. Text height must be 3.5mm with a width factor of 1.0. If a legacy equipment number exists as shown in Figure 25, the equipment number shall be drafted on layer '25T Legacy Number' and have a text style of ISOCP. Text height must be 2.5mm with a width factor of 1.0. The legacy number must also be placed in brackets. Figure 25 shows the typical major equipment tag layout and standard format required by Seqwater.

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Figure 25 - Typical major equipment tag layout and format

When placing major equipment number tags, one equipment number (e.g., 4TNK102) tag shall be placed centrally below the piece of equipment and one equipment number tag and the equipment's description must be placed at the top of the Seqwater drawing sheet as shown in Figure 26. The major equipment number tag and description that is placed at the top of the drawing sheet must be placed directly above the respective piece of equipment but if this is not possible, the major equipment tag and description will be placed in order of appearance with the other equipment on the P&ID.

6.3.8. Minor Equipment

A selection of minor equipment symbols that relate to Seqwater Assets has been provided by Seqwater on B-DWG-STD-007 P&ID Legend Sheet for use when developing P&IDs for Seqwater.

Minor equipment symbols must be inserted on layer '35 Equipment – Minor' as per the layer that it is drafted in on Seqwater's B-DWG-STD-007 P&ID Legend Sheet. Not all minor equipment will have a minor equipment number tag but if so, minor equipment number tag text shall be drafted on layer '35T' with a text style of ISOCP. Text height must be 3.5mm with a width factor of 1.0. If a legacy minor equipment number exists, the number shall be drafted on layer '25T Legacy Number' and have a text style of ISOCP. Text height must be 2.5mm with a width factor of 1.0. The legacy number must also be placed in brackets. Minor equipment tag placement shall be centrally located directly below the minor equipment symbol.

Some of the minor equipment symbols may be altered in size to meet the requirements of the P&ID. Below in Table 3 lists the equipment that can be altered in size. All other minor equipment not listed in Table 3 must NOT be scaled or lengthened as these equipment symbols are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

Table 3 - Minor equipment that can be altered

Equipment description	Can be altered in size
Filter	Yes
Tundish/Drain	Yes

6.3.9. Miscellaneous Equipment

On Seqwater's B-DWG-STD-007 P&ID Legend Sheet is a selection of miscellaneous equipment for use when developing P&IDs for Seqwater. The miscellaneous equipment includes symbols such as heavy vehicles, containment/storage, motors, engines, drives etc.

The miscellaneous equipment symbols must be inserted on layer '35 Equipment – Minor' as per the layer that it is drafted in on Seqwater's B-DWG-STD-007 P&ID Legend Sheet. Table 4 lists the equipment that may be altered in size to the requirements of the P&ID. All other miscellaneous equipment not listed in Table 4 must NOT be scaled or lengthened as these equipment symbols are already drafted at a scale of 1:1 and on the correct layer to suit Seqwater's A1 Title Block template.

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Table 4 - Miscellaneous equipment that can be altered

Equipment description	Can be altered in size
Load Scales	Yes
Weigh Scale	Yes
Bund/Trench	Yes
Pit – Uncovered	Yes
Pit – Covered	Yes
Pond/Lagoon	Yes
Stockpile	Yes
Intake Tower/Dam	Yes
Heat Tracing	Can be lengthened
Water Level	Can be lengthened

6.3.10. Notes and Hold Notes

Ideally, notes and hold notes shall be placed at the bottom of the P&ID drawing sheet and positioned to the left or right side of the drawing sheet, shown in Figure 26. Also shown in Figure 26, utilising both sides of the drawing sheet for notes and hold notes is acceptable. If space isn't available in this position, notes and hold notes may be placed anywhere to the left or right side of the P&ID but must stay below major equipment numbering and description as shown in Figure 27 & Figure 28. Notes and hold notes must not overlay on the P&ID information and must not be placed in the middle of the drawing.

When a note is no longer required, 'NOTE DELETED' shall be used.

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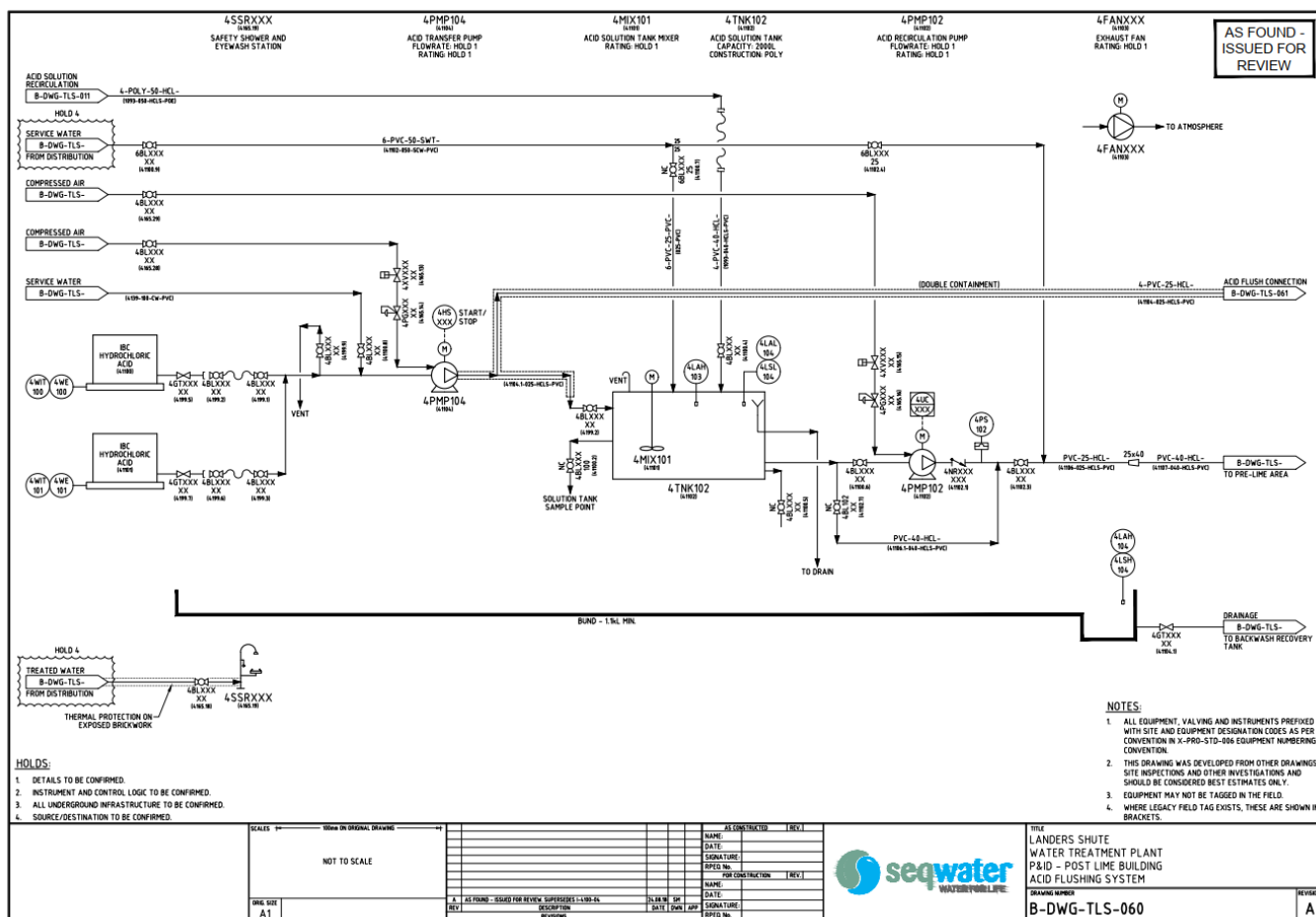


Figure 26 - Placement of notes, hold notes (preferred) and major equipment tags

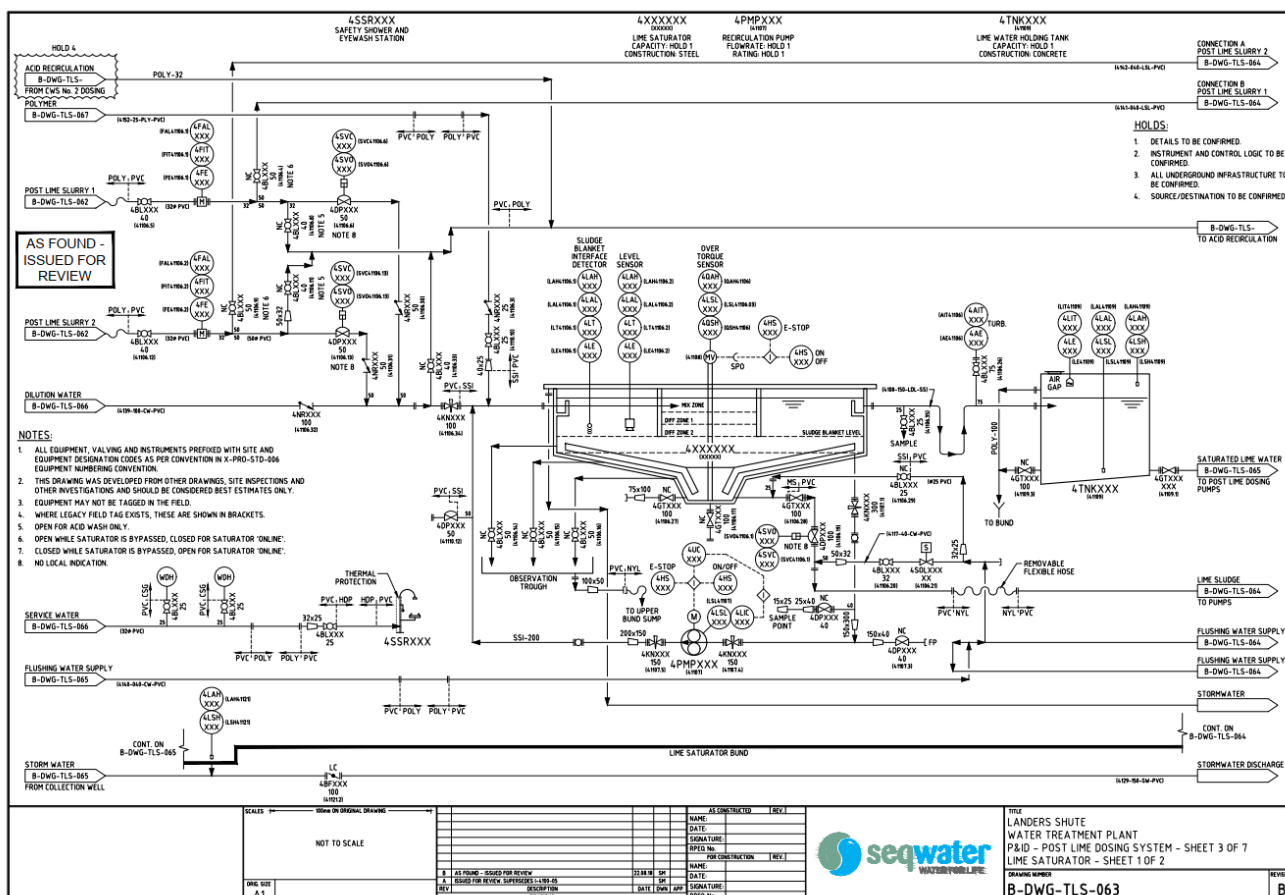


Figure 27 - Placement of notes & hold notes (alternative)

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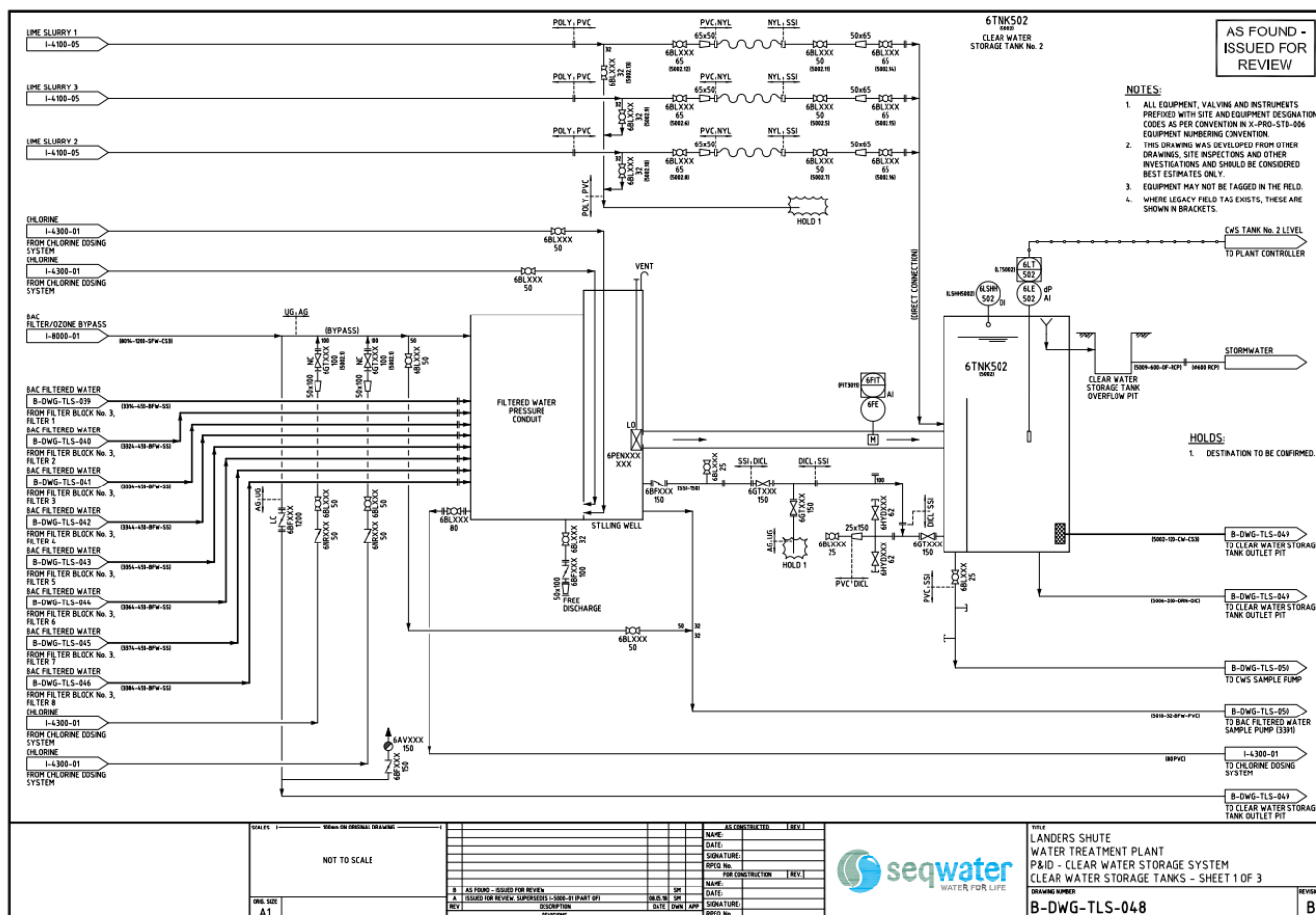


Figure 28 - Placement of notes & hold notes (alternative)

6.3.11. Future Process Lines, Equipment, Valves & Instrumentation

Future process lines, equipment, valves & instrumentation are utilised when a future process and associated equipment have been planned for but are not yet approved or developed further. These future process lines will not have a unique pipe number.

All future processes and associated equipment must be drawn in the layer '18 Future'. This layer has thin lineweight for easy identification on the P&ID. Figure 29 is an example of how a future process line is to be drafted.



Figure 29 - Format of future process line

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7. Plotting / Printing of Seqwater P&IDs

Whether plotting / printing Seqwater P&IDs for engineering review or project close-out, all Seqwater P&IDs must be plotted / printed in PDF format compatible with Adobe Pro and Fox It PDF applications. When viewing the PDF with Adobe Pro or Fox IT, the P&ID must be printed / plotted to A3 landscape and with NO Layer tab visible. Refer to Section 3.5.1 of Seqwater procedure X-PRO-STD-007 Drawing & Spatial Data Standards Procedure for information. Supplied by Seqwater with the title block template .zip file is Seqwater's .ctb file P&ID-HPLASER.ctb that must be used when creating a PDF or hard print. This file contains all approved lineweights that Seqwater utilise to show contrast to differentiate between the equipment, instrumentation, major and minor processes for ease of interpretation by future users. Figure 30 shows the AutoCAD plot / print setup utilised by Seqwater to create the contrast required.

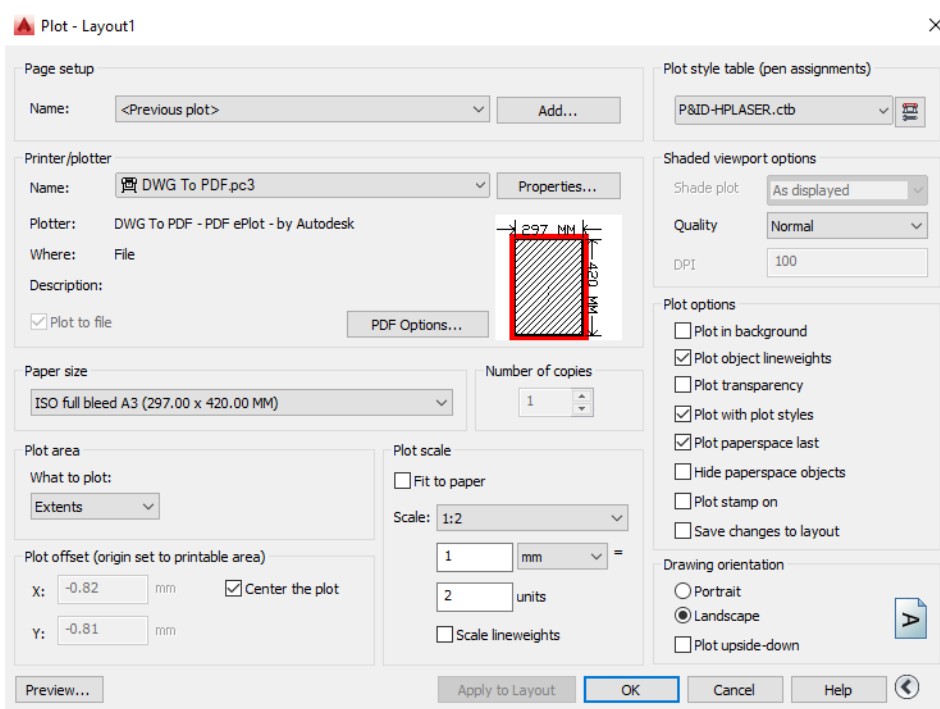


Figure 30 - AutoCAD plot/print configuration

8. Issuing of Signed-off P&IDs

As per Seqwater's X-PRO-STD-007 Drawing and Spatial Data Standards Procedure, all signed-off "As Found", "Issued For Construction" and "As Constructed" P&IDs delivered to Coordinator, Plans and Drawings must be supplied in .zip file format containing .dwg file, associated blocks, x-references, associated fonts and plot configuration files attached and a signed-off PDF of the P&ID, with both the PDF and .zip file numbered and named as per the format set out in Seqwater's X-PRO-STD-007 Drawing & Spatial Data Standards Procedure ready for uploading into Seqwater's document storage system REX. The P&ID must also be able to be viewed and printed with the correct contrast as detailed in Section 11 of this Procedure.

Signed PDF files must comply with the requirements of Section 3.5.2 of Seqwater procedure X-PRO-STD-007 Drawing & Spatial Data Standards Procedure.

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P&IDs that do not comply with this Procedure, X-PRO-STD-002 Drawing Number Procedure and X-PRO-STD-007 Drawing & Spatial Data Standards will NOT be accepted by the Coordinator, Plans and Drawings.

9. Definitions & Abbreviations

Table 5 Definitions and Abbreviations

Term	Definitions
AC1032	Drawing file format version code up to and including AutoCAD 2018 / 2019 / 2020 / 2021 / 2022 / 2023 / 2024
A1	Paper size A1
Contractor	An entity engaged by Seqwater to undertake work in accordance with an agreed contract with a defined scope of work.
Employees	Means persons employed directly by Seqwater in a permanent, temporary or casual capacity.
ISOC	AutoCAD text style
Leader	Means any Level 1, 2, 3 and 4 Leader with responsibility for managing a functional area of the business, including people management responsibilities within their functional area.
Manufacturer / Supplier / Vendor / Original Equipment Manufacturer (OEM)	The entity that manufactures or supplies equipment to meet the specifications of the Contractor.
OT	Operational Technology
Owner / Principal / Seqwater	The entity that engages the Contractor to undertake the work and takes custody of the outcome. The Owner may delegate responsibilities to other entities to act on its behalf (e.g. a consultant).
PDF	Portable Document Format
PFD	Process Flow Diagram
PLC	Programmable Logic Controller
P&ID	Piping and Instrumentation Diagram
REX	Seqwater Electronic Document and Records Management System.
SCADA	Supervisory Control and Data Acquisition
Seqwater Approval / Agreement / Acceptance	Written sign-off gained via the deviation process, as detailed in X-PRO-STD-008 Asset Standards Management and Application Procedure.
Seqwater Engineering Standard	Includes Standard Procedures and Standard Specifications and associated supporting documents such as Standard Drawings, Guidelines, Lists, Datasheets, Manuals, Registers, and Templates.
shall / must	Indicates a mandatory requirement.
should	Indicates a recommendation.

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Term	Definitions
TSI	Technical Support and Improvement
Worker(s)	Includes all permanent, temporary, and casual employees of Seqwater, and: • vocational and work experience placements • volunteers suppliers, contractors, and consultants temporarily engaged to do work for or on behalf of Seqwater.
.dwg, .ctb, .pc3 file extensions	Drawing file types, Plot Style file type & Print Configuration file type in AutoCAD
.zip	Data compression file format (created using AutoCAD eTransmit function to gather all required information for drawing)

10. Roles and Responsibilities

Table 6 Roles and Responsibilities

Role	Responsibility
Coordinator, Plans and Drawings	Manages Seqwater's drawings database as per Seqwater standards <i>X-PRO-STD-014 Drawings Management</i>, <i>X-PRO-STD-002 Drawing Number Procedure</i> and <i>X-PRO-STD-007 Drawing & Spatial Data Standards</i>. Main contact for all drawings queries. Checks in / out drawings, issues new drawing numbers, supersedes / obsolete drawings, co-ordinates internal redline mark-up drawing updates, and any other drawings management activities.
Draftsperson	Person(s) who draft the mark ups of P&IDs in AutoCAD.
Leaders	In addition to the responsibilities of a worker, ensure compliance with this Procedure by those they lead.
Manager Service Delivery	Accountable for implementation and management of this Procedure.
Team Leader Process & Analysis	Responsible for implementation and management of this Procedure.
Process Engineer	Person(s) who provide mark ups of P&IDs for drafting.
Seqwater Drawings Requestor	Requests existing drawings or new drawing numbers from the Coordinator, Plans and Drawings via the Engineering Mailbox.
Workers / Employees	Be aware of and comply with this Procedure

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11. References and Related Materials

The documents listed in Table 7 below, and the requirements therein, are relevant to this Procedure in their latest editions, these documents form a part of this document. Note that this is not an exhaustive list of documents relevant to the works.

Seqwater undertakes regular updates of its Engineering Standards. Before utilising this document, the complete list of Seqwater Engineering Standards should be reviewed to ensure currency and applicability for the proposed works.

Table 7 References and Related Material

Description	Location
691454 B-DWG-STD-001 P&ID Legend – Sheet 1 of 5, Piping, Valve & Fitting Symbols	REX
691455 B-DWG-STD-002 P&ID Legend – Sheet 2 of 5, Instrument & Control Valve Symbols	REX
843198 B-DWG-STD-004 P&ID Typical Details – Sheet 2 of 2, Motor Control Typical Details	REX
843200 B-DWG-STD-003 P&ID Typical Details – Sheet 1 of 2, Instrumentation Valve Typical Details	REX
D18/156707 X-DWG-STD-005 Title Block P&ID Drawings	REX
D18/165556 B-DWG-STD-005 P&ID Legend – Sheet 3 of 5, Material Codes	REX
D18/165558 B-DWG-STD-006 P&ID Legend – Sheet 4 of 5, Major Equipment Symbols	REX
D18/165560 B-DWG-STD-007 P&ID Legend – Sheet 5 of 5, Minor Equipment & Miscellaneous Symbols	REX
PRO-01617 X-PRO-STD-009 Engineering Design, Construction, Operation and Maintenance Procedure	REX
PRO-01872 X-PRO-STD-002 Engineering Drawing Numbers Procedure	REX
PRO-01873 X-PRO-STD-001 Asset Standards Document Classification and Naming Structure Procedure	REX
PRO-01874 X-PRO-STD-004 Development and Review of Asset Standards Procedure	REX
PRO-02187 X-PRO-STD-007 Drawing and Spatial Data Standards Procedure	REX
PRO-02190 X-PRO-STD-006 Equipment Numbering and Naming Convention Procedure	REX
PRO-02191 X-PRO-STD-012 Accessing Drawings Stored in REX Procedure	REX
PRO-02205 X-PRO-STD-008 Asset Standards Management and Application Procedure	REX
PRO-02253 X-PRO-STD-014 Drawings Management Procedure	REX
SPE-00351 B-SPE-STD-007 Process Flow Diagram and Piping and Instrumentation Diagram Requirements	REX
TEM-00224 X-TMP-STD-022 Asset Standards Deviation Request Template	REX
AS 1100 Technical Drawing	Intertek Inform

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12. Verification

Compliance with this document may be verified by internal audit.

13. Further Information

For further information please contact the owner of this document.

14. Changes from previous version

This Procedure will be regularly reviewed in accordance with the requirements of the Seqwater Controlled Document Management Procedure. Reviews will include consideration of suggestions for alteration or improvement made in accordance with Seqwater Procedure X-PRO-STD-004 Development and Review of Asset Standards. Changes made from the previous version are summarised in Table 8 below.

Table 8 Changes from previous version

Section Number	Change
All	Minor updates

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