SEW Drafting Standard

AM2488

Document History

Version No.	Date	Author	Version Description
0			
1	21/2/2014		
2	30/09/2018	G. Haskins & R. Jagger	Integration (& decommissioning) of AM2588 and AM2506. Inclusion of P&ID requirements
3	13/03/2020	J. Moody & R. Jagger	Updates including SEW Title Block and standard symbols

Contents

Table List

1. Purpose

This manual is to detail the methods required by South East Water to ensure a consistent standard of drafting of design and as-constructed drawings and 3D models such that they can be easily interpreted by users and can be entered into the Electronic Plan Room in an organised way. The procedure is to be used by all personnel preparing or checking drafting for South East Water.

2. References and standards

Unless otherwise stated in this standard, drawings shall comply with the most recent revision of the following standards, shown in order of precedence:

- This standard
- AS 1000 The International System of Units (SI)
    - AS 1100 Technical Drawing:
    - Part 101 General Principles
    - Part 201 Mechanical Engineering Drawing
    - Part 301 Architectural Drawing
    - Part 501 Structural Engineering Drawing
- AS 1101 Graphical symbols for general engineering:
    - Part 1 Hydraulic and pneumatic systems
    - Part 2 Welding and non-destructive examination
    - Part 3 Machine elements
    - Part 4 Piping, ducting and mechanical services for buildings
    - Part 5 Process measurement control functions and instrumentation
- ISO 3511 Industrial process measurement control functions and instrumentation -- Symbolic representation
- AS 1102 Graphical symbols for electro technology - Parts 101-113 and 12
- AS 1654 Limits and fits for engineering
- WSA 03-2011-3.1. Water Supply Code of Australia. Melbourne Retail Water Agencies Edition. Version 2.0
- WSA 02-2014-3.1. Gravity Sewerage Supply Code of Australia. Melbourne Retail Water Agencies Edition. Version 2.0
- WSA 07-2007. Pressure Sewer Code of Australia. MRWA Supplement, Melbourne Retail Water Agencies
- WSA 04-2001, Sewage Pumping Station Code – South East Water Supplementary Manual

2.1 Standard Files

For drawings created outside of the Land Development process (i.e.: delivery managed by South East Water or delegate), there are two standard files that drawing providers will need to obtain and used in the creation and management of their drawings. These include:

a) South East Water standard DWT template, including standard Title Block in Paperspace and standard Layer arrangements. Layers are grouped by discipline and type on the left hand side for easy selection. This standard CAD file is suitable for the following types of drawings:
    - Civil

- Structural
- Process (P&ID)
- Mechanical
- Electrical
- Survey

b) South East Water standard CTB file.

These files can be found on South East Water's Technical Standard web page or they can be provided on request by South East Water's project manager or project officer.

3. General Requirements

3.1 2D Drawing Platform

All CAD files must be produced in AutoCAD.dwg format.

Drawings are to be delivered in AutoCAD 2013 version.

Drawings can be created in later versions of AutoCAD (i.e. 2018) or other CAD software, however these should be saved as AutoCAD 2013 version prior to delivery to South East Water. Later versions will be supported in the future.

The exception to this is Civil 3D drawings which are to be delivered in the format they were created in (i.e. 2018).

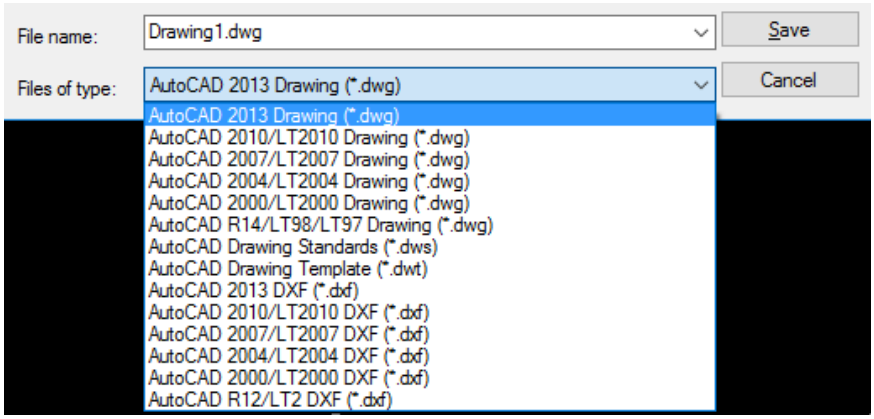


Figure 1: CAD Drawing Save As Type

All CAD files shall be purged of unnecessary data before transferring.

3.2 3D Drawing Platform

Typically for any significant installation at a Water Recycling Plants (WRP's) or any other facility that has a significant amount of mechanical and electrical equipment, a 3D model will be required in design and as-constructed form. 3D models may be exempted for simple facilities on approval from SEW.

3D CAD models shall be prepared and submitted in a format approved by the South East Water Design Manager prior to commencement of drafting work. The project shall be supplied as a "Pack and Go" composite, containing all parts, assemblies, drawings and library items. South East Water may also accept 3D data contained within DWG formatted files.

For complex and / or very significant projects (e.g. major treatment plant upgrades), 3D modelling requirements and the software and standards to apply to the project shall be negotiated and agreed to during the procurement phase of the project.

3.3 Third Party Equipment Drawings

Drawings of off the shelf proprietary equipment (e.g. pumps, motors, drop boards, valves etc…) that are not modified during installation are not considered design drawings and are therefore only required in the final As Constructed CAD file submission to South East Water.

3.4 Pipeline Drawing Templates

Water supply and gravity sewerage pipeline drawings shall be completed in accordance with the relevant MRWA edition of the WSAA codes, MRWA standards and MRWA drawing templates. Any departure from these standards and templates shall be negotiated with the South East Water project manager or relevant officer. CAD templates for these pipeline designs are available at: http://www.mrwa.com.au/Pages/Standards.aspx.

3.5 File and Drawing Object Structure

DWG files should be separated into logical drawings of a manageable size (max 25MB). Each file shall only contain one Paper Space sheet, unless otherwise agreed by South East Water. The following hierarchy can be used a guide.

XREF File

XREF files should contain all drawing content which may be used by multiple drawings, such that an update to the XREF file would enable a number of associated drawings to be simply updated.

1. Model Space

Model space should normally contain an attached XREF file, with unrequired XREF layers frozen. Geometric drawing content shall be drawn in the appropriate layer over relevant XREF layer content.

Layers with Standard Attributes

Layer attributes in Model Space shall not be altered and shall remain standard.

Blocks

All blocks will be to SEW drafting standards and follow the correct line colours and linetypes. Most objects within a block are to be on layer ‘0’, so that no unnecessary layers are added to parent drawings. Most objects within blocks will also be ‘ByBlock’. This means that the objects will adopt the colour of the layer they are insertion. Exceptions to the these will occur if multiple colours are required within a block, but in these cases clear layer naming is to be utilised. Blocks must be scaled to the appropriate sizes.

2. Paper Space (with Title Block and Viewports)

Drawings are to be plotted from Paper Space within the South East Water title block. Viewports shall be used to display relevant Model Space content at the appropriate scale. Standard scales shall be used where practical. Where practical; text, dimensions and labelling should be drawn in Paper Space over Viewports. Layer attributes for Paper Space content other than Viewports should not be altered.

Viewport (Layer Attributes user configurable)

Users may alter Viewport Layer attributes to freeze layers, improve clarity and highlight features most relevant to the drawing. Where practical, Viewport Layer standard attributes should be consistent across drawings for ease of interpretation (i.e. which potentially reduces the need for legends and labelling).

3.6 XREF File Naming

External reference files are to be named descriptively and logically to ensure that anybody can recognise its contents, in relation to the project. All XREF files should be prefixed with a capital X and be separated with underscores. Additional sub-categories can be introduced in file naming to help delineate between similar files. Any Civil 3D drawings should contain 'C3D' within the name. For example:

Table 1 XREF Examples

File Description	File Name	Alternate name with subcategories
Existing feature survey	X_SURVEY.dwg	X_SURVEY _SITE A.dwg; X_SURVEY_SITE B.dwg
Existing services	X_EXISTING SERVICES.dwg	X_SERVICES_DBYD.dwg; X_SERVICES_PROVEN.dwg
Proposed water main	X_WATER ALIGNMENT.dwg	X_WATER ALIGNMENT_DN600.dwg X_WATER ALIGNMENT_SITE A.dwg
Civil 3D Longitudinal Section	X_C3D_WATER ALIGNMENT.dwg	X_C3D_WATER ALIGNMENT_DN900.dwg X_C3D_WATER ALIGNMENT_SITE A.dwg
Locality Map Image	X_LOCALITY.png	X_LOCALITY_SITE A.png

3.7 Inserting External References

Once the XREF is created and setup, it can be referenced into the relevant working drawings.

When attaching an XREF, the reference is inserted onto the current layer, so a separate XREF layer should be created (e.g. XREF-SURVEY, XREF-EXISTING SERVICES). This ensures that XREF's aren't accidentally frozen, deleted or un-plotted. When referencing a .dwg XREF, the following settings should be followed where possible:

- Reference type: Overlay
- Path type: Relative Path
- Un-tick ‘Specify on-screen’ for Scale, Insertion point and Rotation (drawings should not require any alteration to these before being inserted)
- Check that block units match current drawing units

When using multiple XREF’s, check the drawing order of linework and objects, and ensure that the design linework is in front of any background references. Any picture files (jpg, png, etc.) that may be required in a drawing shall always be saved in the project folder and referenced into the drawing (command ‘IMAGEATTACH’).

When inserting an object (such as geometry, block, xref, or raster image) into an AutoCAD drawing, the object is required to be inserted at the correct scale.

To ensure the insertion is correct use the DWGUNITS command in the receiving file and follow the prompts. Check the dimensions on the original file using the DIST command for consistency with the dimensions.

There are three system variables (INSUNITS, INSUNITSDEFSOURCE, and INSUNITSDEFTARGET) that control the insertion scale for blocks, xrefs, and raster images. Inserted objects should be automatically scaled to the units of the host file.

Note: The INSUNITSDEFSOURCE and INSUNITSDEFTARGET set the source file units value only when INSUNITS is set to zero.

3.8 Drawing Sheet Sizes

The standard size of the drawing sheet shall be A1. The original drawing plot shall be A3. Full size plots shall only be prepared when specifically requested or required.

A0, A2 and B1 are non-preferred sizes. Plans of this size should only be prepared following written direction or approval from the South East Water Design Team Leader.

3.9 Drawing Orientation

The model space of all drawings shall be set to World UCS with North orientated up the page and the angle rotation to be clockwise.

Unless specifically outlined, or by the nature of the project, Paper Space viewports should be oriented with the North orientated up the page or if required, the right of the drawing sheet.

The north arrow should be placed in the upper left-hand corner of single plan drawings. If project north varies from true north, this variation should be shown on the plot plan and key plan only. Other plans shall use project north.

3.10 Scales

An adequate scale shall be chosen to ensure legible, uncluttered drawings, which meet the recommendations of AS1100.101 or relevant industry standards.

The South East Water Design team member shall approve any scale that is not a multiple of 10 of the following standard scales:

- 1:1
- 1:2
- 1:2.5
- 1:5

Similar scales are not to be used on the same drawing where possible (i.e. 1:20 and 1:25) to ensure clarity.

The prominent scale of the paper space is to be nominated in the designated title block location. E.g. “1:100 AT A1”.

The scale used must be represented in the body of the drawing. Where more than one scale is used, the relevant scale should be shown under each section, detail, etc. Where there is a single scale on a sheet it is to be nominated on the title block, where there is more than one scale on a sheet the title block scale is to appear as “AS SHOWN AT A1”.

Where different scales are used for horizontal and vertical dimensions, each scale shall be clearly indicated.

If a drawing is not to scale or a non-standard scale, the letters ‘NTS’ or ‘Not to Scale’ should be inserted where the scale would normally feature.

Standard scale blocks are available in the DWT template as indicated in Appendix B.

3.11 Drawing Units

Drawing units are generally dictated by each discipline, as a guide:

Survey models 1 unit = 1 metre (1m)

Civil models 1 unit = 1 metre (1m)

Structural models 1 unit = 1 millimetre (1mm)

Mechanical models 1 unit = 1 millimetre (1mm)

Architectural models 1 unit = 1 millimetre (1mm)

X” and “Y” Values

For CAD purposes the “X” value shall represent the Easting and the “Y” value shall represent the Northing.

By default, all drawings shall have their insertion scale set to 'unitless', INSUNITS = 0.

3.12 Colours and Pen Assignments

To accommodate the majority of mono/colour plotting requirements the following standard pen assignments and **corresponding plot styles shall be followed**. The following standard pen assignments support both colour and monochrome plots with one pen table.

All pen weights are to be assigned by layer, i.e.: **CECOLOR = 'BYLAYER'**.

Standard Plot File to be used on all SEW drawings:

A3 Half size SEW_standard_COLOUR.ctb

Should an A1 sheet be required, the following CTB is to be used:

A1 Full size SEW_standard_COLOUR.ctb

Table 2 Standard pen assignments

AutoCAD Colour Number	AutoCAD Colour	Printed Colour	Full size plotted line thickness (mm) A1	Half size plotted line thickness (mm) A3
1	Red	Black	0.18	0.09
2	Yellow	Black	0.35	0.18
3	Green	Black	2.00	1.00
4	Cyan	Black	0.70	0.35
5	Blue	Black	0.35	0.18
6	Magenta	Black	0.50	0.25
7	White (Black)	Black	0.25	0.13
8	Dark grey	Black	0.50	0.25
9	Pale grey	Black	0.35	0.18
10-249	Colours	Colours	Use Object Lineweight	
250-255	Greys	Greys	Use Object Lineweight	

Note, line work must be consistent and solid throughout the drawing set to ensure maximum clarity, legibility and understanding of the drawing content. The thickness of any line after reduction or reproduction shall be such as to be clearly legible.

All new work shall be displayed with greater emphasis than any existing works. Typically, existing works are shown in a grey colour between colour 251 and colour 253, however dashed/ phantom linetypes, alternate colours and hatching techniques can also be employed, depending on the situation.

3.13 Layers

Layers shall be as per the South East Water standard template (DWT) file. Nothing may be produced on Layer 0 and no layers may be added or removed without approval of South East Water's Design Manager.

All items shall be drawn on the most appropriate layer.

3.14 Layer Naming Convention (LNC)

Layer naming shall conform to the SEW Layer Naming Convention (LNC), unless otherwise agreed with the client. Where a client specific LNC is to be used on a project, the Project

Lead Drafter shall fully document the LNC in the project folder and make aware to all staff working on the project.

Colour and linetypes shall always be set to 'BYLAYER'.

3.15 Line and Text Attributes

Model Space and Paper Space layer attributes shall not be altered. Viewport layer attributes may be altered when necessary to maximise drawing clarity.

All line weights and colour designations shall be as per the South East Water supplied CTB plot file (Refer Table 2).

Standard text is available in the DWT template as indicated in Appendix B.

3.16 Match Lines

Where match lines are indicated on drawings, they shall be bold, 0.35mm thick lines, broken at intervals by two dashes and located by a coordinate (or chainage, if appropriate).

Reference to all adjoining drawings shall be given on the match line in 5mm high lettering.

3.17 Annotations

All annotation such as text, dimensions, symbols, revision clouds & hold clouds must be placed on separate allocated layers in Paper Space (layout tab).

3.18 Standard Blocks and Symbols

Any non-standard blocks created shall be stored in the Library directories. All block file names should be sensible and meaningful to enable other users to identify and therefore utilise them. Note that to remain relevant, the block library requires constant revision. Refer to the South East Water Design Team Leader if you have developed a detail suitable for inclusion.

NOTE: New blocks shall be created on layer"0" and inserted on the required layer. Should sub layers be required the naming blocks shall be in accordance with the layering convention outlined in this manual.

South East Water standard title block and annotation blocks are depicted in Appendix A and Appendix B respectively.

3.19 Dimension & Annotation Conventions

Dimensioning standards shall be as described in Australian Standard AS 1100, Technical drawing, Parts 101, 201, 301, 401 and 501. Condensed guidelines are below:

- All dimensions are to be associative and must NOT be exploded. Dimensions shall be created on layer "DIM" with arrows and 2.5 text.
- The dimensions on all drawings shall be presented so that they can be read from the bottom and/or right-hand margin. Dimensions should not be repeated.
- Dimension lines shall be continuous, with the dimensions placed above the line in the case of horizontal dimensions, and to the left of the line in the case of vertical dimensions.

- Arrowheads shall be filled in and terminated at the dimension lines.
- All dimensions should be in millimetres as default when no unit is shown, e.g. 2400 would be assumed to be 2400mm. Where it is deemed preferable to use metres (such as for very long measurements), the unit must be shown, e.g. 450m.
- Coordinate shall be shown in the format of Easting (x-axis) before Northing (y-axis), and shall always be shown to three decimal places, e.g.: E 359762.423, N 5881512.179.
- Areas of 10,000 m2 and over shall be shown in hectares, e.g. 1 ha.
- Volumes for earthworks, etc. shall be shown in cubic metres, e.g. 1 m3.
- Volumes for fluids, etc. shall be shown in litres or kilolitres, e.g. 1 L, 1 kL.
- Any civil drawing showing set out coordinates shall include, at a minimum, a note referencing the relevant survey drawing with the coordinate and height datums, and survey control points (TBMs, PMs, etc.).Unless required otherwise by the formal contract, chainages shall increase from left to right across the drawing sheet and shall be read from the left side of the sheet. Geocentric Datum of Australia (GDA) to be confirmed with SEW project manager i.e. GDA94, GDA20.
- As a general rule, the direction of water flow shall be from left to right across the drawing sheet.
- Should it be necessary to indicate dimensions differently, the appropriate symbol should be used (for example, for tolerances in fine engineering) as depicted in the relevant Australian Standard.
- Dimensions that are not to scale shall have “Not to scale” or ‘NTS’ inserted (in brackets) under the dimension line.
- Generally, levels shall be expressed in metres to 3 decimal places. However, the order of accuracy of original levels must be maintained and additional zeros shall not be added to provide 3 decimal places when the original level was given in whole metres or to the nearest 10mm. Where the level is less than 1 metre it shall be prefixed by a zero, e.g. RL 0.940.

3.20 SCADA and Asset IDs

SCADA and Asset IDs shall be designated on drawings as per the following process:

a) The designer uses their own asset numbering up to the drawings being issued to South East Water for review (IFR).
   Each entity that features within the SCADA system will have a unique SCADA identifier embedded in the model (drawing) data.

Each significant item including all items listed in AM2775 WaterShed Collection Details will require a unique Asset ID with that name embedded in the model (drawing) data.
Design consultant issues equipment lists to South East Water with the IFR drawings.

b) South East Water designates SCADA and Asset ID's to the equipment on the equipment list.
c) South East Water issues the revised equipment list to the consultant.
d) All drawings are updated with the SEW SCADA and Asset IDs during the As Constructed phase.

3.21 DBYD

DBYD is available to help with locations of other utilities assets and services.

Application will need to be lodged on: www.1100.com.au.

In addition to water, recycled water and sewer, DBYD is used for:

- Telstra Plans – Local main cable and optical fibre
- NBN Co – Cables and installations used for the NBN
- Other communications. – Optus, etc...
- Electricity – underground and overhead
- Gas – residential underground gas
- Drainage – Local Council and Melbourne Water
- Specific asset easements, such as the Victorian Desalination Plant

On many drawings, particularly site layouts, pipeline plan and long sections and other drawings calling for significant ground penetration, the DBYD logo and warning would be expected to feature on drawings.

4. Procedural Requirements

4.1 Drawing Life Cycle Process

Drawings shall be created, revised, approved and implemented as follows:

a) Create drawing.
b) Internal review and approval.
c) Dispatch Issue for Review (IFR) drawings with document transmittal to South East Water project manager or relevant officer.
d) Update drawings to the satisfaction of South East Water, providing revision numbers and descriptions as revised drawings are issued. Once complete:
e) Dispatch Issue for Tender (IFT) drawings with document transmittal to South East Water project manager or relevant officer. This step is not relevant to design and construction (D&C) projects. Once the tender process is complete, update the drawings with any design changes negotiated during the tender process. Once complete:
f) Dispatch Issue for Construction (IFC) drawings with document transmittal to South East Water project manager or relevant officer.
g) Once construction and commissioning is complete, dispatch As Constructed drawings with document transmittal to South East Water project manager or relevant officer.

All drawings shall be purged, audited and zoomed to extents before being dispatched electronically with the eTRANSMIT function with any associated referenced files (e.g.: XREF). Files and transmittal forms shall be dispatched electronically, typically via email or by placement of drawings on an agreed location within the cloud or agreed project portal.

This process is sequential. Each step shall be completed and approved by South East Water before the next step can be completed. Note that South East Water approval or acceptance for a drawing generally requires the approval or acceptance from a number of internal South East Water stakeholders.

4.2 Existing CAD Files

In instances where CAD files are required for modification or reference, they shall be requested of South East Water for release. Contact the South East Water project manager or relevant officer to obtain a copy of existing drawings. Note that any changes made to an existing drawing must have a separate Revision number which is unique. South East Water shall designate any revision numbers to be adopted and shall manage the Checking In and Checking Out of all CAD files from its Electronic Plan Room.

Three dimensional models of physical assets exist at a number of South East Water sites.

Should a 3D model be required as part of a project, the following process will need to occur:

- South East Water will supply its existing 3D models of the site.
- Designers shall provide a compatible 3D model for the new works only.
- South East Water will integrate updated designer supplied models into its system.

4.3 Revision Designation

Revisions are to follow sequentially through all phases with the exception of the Issued for Construction phase where numerical revisions are to start from 0 (refer Table 3). When new phase is reached, previous phase revisions are to be removed, e.g. when the ‘As Constructed’ issues are created, any Issued for Construction issues do not need to be noted.

Alphabetic: A, B, C etc…

Numerical: 0, 1, 2, etc…

Project Initial Signatures

Initials on the left of the title block (standard title block edge reference 2 and 3) are to be filled out in the following format:

“JC” for John Citizen

Table 3 is to be adhered to for drawing issues. “CAD” denotes typed initials and “Signed” denotes signed initials. Signed initials are to be converted to CAD upon next revision.

Table 3 Revision Block

Phase	Revision Format	Drafter Initials	Design Review Initials	App'd Initials
Preliminary	Alphabetic	CAD	-	-
Issued for Approval	Alphabetic	CAD	Signed	Signed
Issued for Tender	Alphabetic	CAD	Signed	Signed
Subsequent Tender Issue	Alphabetic	CAD	Signed	Signed
Issued for Construction	0	CAD	Signed	Signed
Subsequent Construction Issue	Numerical	CAD	Signed	Signed
As Constructed	Numerical	CAD	CAD	CAD

Project Roles Title Block Designation

Names in the middle of the title block (edge reference 5 and 6) are to be filled out in the following format:

“J. Citizen” for John Citizen

All names are required for all revisions, typed in CAD. Preliminary issues are the only exception where just the designer and drafter are required.

4.4 Clouding Revisions

Once a drawing has been issued for construction, all subsequent revisions shall indicate changes by drawing a cloud around the revised part of the drawing. It is recommended that every revision cloud is given a revision layer which should be turned off when the drawing receives further change.

Clouds are to be removed for the first As Constructed issue, with clouds used for subsequent revisions.

A standard revision cloud style is available in the DWT template as indicated in Appendix B.

4.5 Recording Revisions

As South East Water drawings will often be revised across a number of projects, the Project No. is to be recorded against each drawing revision, as well as the Revision Designation, Revision description, Date and initials.

4.6 As Constructed Markups

The following steps are to be undertaken for As Constructed drawing mark-ups.

- Obtain the latest CAD & PDF (Issued for Construction)
- On site ‘Walk the Line’ with drawings and add/delete

- Ensure final mark-up is actual “AS CONSTRUCTED” including all instruments, additional or deleted equipment, & tag numbers (note missing tags)
- Update drawing (CAD)
- All drawings to be to AS 1100 Standard Drawing numbers
- All Metadata relating to the drawings shall be completed & supplied on the standard SEW template provided.
- Transmittal of all documents & drawings requires a standard transmittal form detailing the issue & receipt acknowledgement
- A drawing register is required to keep track of all drawings issued for rework showing all identification details (e.g. drawing number, title type of drawing version number issue date and current status).

4.7 As Constructed Drawings

As Constructed drawings shall generally be prepared for all projects and all drawings unless otherwise specified by South East Water and provided to South East Water after the End of Defects period has elapsed. The As Constructed drawings shall be prepared and neatly printed in accordance with the standards set out in this document. The As-Constructed drawings shall bear the name, company and logo of the original designer as this provides useful information for future reference. The Constructor may add its details to an appropriately blank area of the drawing.

Where the asset is operated for a period of time as part of the construction contract, after the operational period is finished, any modifications to the assets made during this time shall be updated in revised in the As-constructed drawings. These final drawings must be provided to South East Water in PDF and Native format, as part of the handover of the asset.

AutoCAD drawings must be sent as individual drawings per file using the eTRANSMIT fuction for XREFS as required or as arranged with South East Water.

Where existing drawings that are to be modified do not have a native file, i.e. are only JPEG or PDF, the contractor shall draft up the existing drawing in AutoCAD incorporating any previous markups and return to South East Water.

Any part of the works that is new and do not impact existing drawings shall have a new drawing number provided by South East Water. Note that where the new works interface with the existing, there must be reference to the existing drawings, and the existing drawings modified and revised up to ensure that there is no conflicting information between the proposed drawings and the existing drawings.

4.8 Holds

“HOLD” clouds shall be used to segregate tentative information in order that any drawing can be issued for tender or construction prior to the drawing being completed.

A standard hold cloud style is available in the DWT template as indicated in Appendix B.

All such holds shall be numbered sequentially (1, 2, 3, etc.) for each drawing. The word “Hold”, together with the relevant hold number, is to be inserted in the hold cloud.

All data holds on a drawing are to be listed (in sequential order) in the area allocated for notes. The hold number, date of hold and a brief description of each hold are to be included. The list is to be titled “Hold”.

Once information enabling a hold item to be finalised becomes available, the relevant cloud shall be removed from the drawing and the item deleted from the hold list.

Data that is not covered by a certified drawing shall continue to be shown as hold items on the project drawing until the data has been certified by the vendor as being correct.

4.9 Drawing Transmittal

All external reference files must be bound to the relevant documents, prior to transmittal.

A Document Transmittal must accompany all issues and at a minimum shall include the following details:

- Project name and number
- Transmittal date
- Drawing numbers
- Drawing names
- Revision ID (letter, number or combination)
- Purpose of issue (i.e. Issued for Review, Issued for Construction etc.)

Drawing filenames are to be as per section 5.2.

If compressed files are grouped together then a list of the compressed file and all the files it contains along with the associated drawing numbers shall accompany this data. All external reference files must be listed on the Transmittal when issued in ‘unbound’ form.

It is the responsibility of South East Water project managers to ensure that transmitted documents are placed in the project file.

5. Drawing Components

5.1 Title Block

For drawings created outside of the Land Development process the South East Water drawing title block shall be used for all drawings prepared for or by South East Water. The border and title panel dimensions shall not be altered.

An area in the middle of the lower section of the panel is reserved for the Consultant, Contractor or Vendor to insert their own details (i.e. logo, address, etc.), including their drawing number, drawn by, design by and approved by information.

Where applicable the relevant South East Water project number is to be recorded both below the South East Water drawing number and within the designated column in the revision box. Listing the project number in the revision box will allow future tracking of projects that have required revisions to the particular drawing.

The Principal’s Representative shall sign each drawing in the allocated section of the panel, in the lower centre of the sheet. The names of the consultant’s representatives i.e. Designed, Checked and Authorized shall be shown.

5.2 Drawing Numbering

The South East Water drawing number shall be placed in the section of the panel in the lower right-hand corner of the sheet. The number shall be generated in the Engineering Plan

Numbering Application which can be obtained from the SEW project manager (refer Applications page of Aquanet).

Drawing Numbering Conventions

Should new drawings be required, drawing numbers are to be derived from South East Water's Electronic Plan Room by South East Water nominated administrators. South East Water will confirm drawing numbers in writing to the Consultant or Contractor. South East Water nominated administrators shall update existing drawings and drawing numbers where practical to bring them up to the current standard.

The Consultant or Contractor may include their own drawing number, provided this is located according in the Contractor's / Consultant/s designated area in region H4 of the title block.

Following the project / file number an alphabetised indicator or a discipline is required to identify the plan type classification:

Table 4 Drawing Discipline Options

Discipline	Description
A - Architectural	Building and interior design plans. Landscape plans
C - Civil	System hydraulics, extended pipelines (not between M&E items in a plant area), surface, road, drainage, earthworks. Hydraulic grade and level drawings. Lagoons and waterways
E - Electrical	Switchboards. Power systems. Wiring arrangements for instruments and relays. Control and network communications including fibre optic, Ethernet, PLC and RTU data connections
G - General	Site wide non discipline specific drawings
M - Mechanical	Mechanical items, e.g. blowers, pumps, fans, fire services, lifting equipment. Piping between mechanical items within a plant area
P - Process	Process & Instrumentation Diagrams
S - Structural	Concrete and structural steel installation drawings including foundations, concrete slabs, frames, supports
U - Survey	Feature survey drawings

Non- Treatment Plant Drawings

Drawings / plans for South East Water assets follow a specific numbering convention to allow for effective communication of both the nature and location of the asset. A list of the standard prefixes is below:

Table 5 Product and Asset Classes

Product Prefix			
Water (potable water)	W		
Sewage / Sewer	S		
Recycled Water. Non Drinking Water	R		
Asset Class	**Suffix**	**Asset Class**	**Suffix**
Branch Main (sewer)	BR	Main (pressure)	M
Pressure Reducing Station	BS	Pump Station	P
Chlorination Plant	CP	Retic Main (water / sewer)	R

Disinfection Plant	DP	Recycled Water Pump Station	RP
Flow Meter / Monitor	G	Reservoir (service)	R
Emergency Relief Station	ERS	Transfer Main (water)	T
Electrolysis Point	ES	Elevated Tank (service)	TS
Filling Station	FS	Treatment Plant	TP
Standard Drawing	STD	Water Quality Site (e.g. chlorine)	WQ
Examples		Examples	
Sewer Rising (Pressure) Main	SM	Water Transfer Main	WTM
Recycled Water Flow Meter	RG	Water Flow Meter	WG
Sewage Pump Station	SP	Branch Sewer	SBR
Water Pump Station	WP	Retic Sewer	SR
Recycled Water Pump Station	RP	Recycled Reservoir	RR

After incorporating the asset number, the file number / project number is incorporated to facilitate association with relevant project files.

A drawing number is then required to generate a unique drawing / plan identifier.

Asset drawing numbers shall follow the convention:

[Product Prefix][Asset Class Suffix].[Site ID].[Project ID].[Discipline].[Drawing Number]

a) Product Prefix. 1 alpha character
b) Asset Class Suffix. 1 or 2 alpha characters
c) Site ID number. Typically 3 digits (sewers typically alpha characters).
(note: a) and b) and c) are concatenated together)

d) Project ID. Typically 4 digits
e) Discipline. 1 alpha character (refer table YYY)
f) Drawing Number. Typically 3 digits (small –med project) and 4 digits (large project)

An example of a drawing number is:

RP123.7586.C.001 where:

- RP indicates that the drawing is for a Recycled Water Pump Station
- Where the RP site has a unique identification number 123
- Which was constructed in project 7586
- Where the drawing relates to the Civil discipline
- And the drawing is the first civil drawing in the project

Treatment Plant Drawings

For South East Water Treatment Plant drawings, a), b) and c) from the above convention is replaced with 8 product / asset class / site ID characters as follows:

- STP8 + Site ID, where site ID is as follows:

Blind Bight	-	538	Longwarry	-	542
Boneo	-	535	Mt Martha	-	534
Koo Wee Rup	-	539	Pakenham	-	533

Lang Lang	-	540	Somers	-	536

An example of a Sewerage Treatment Plant drawing number is:

STP8535.7586.C.0001 where:

- STP8 indicates that the drawing is for a Water Treatment Plant
- For the Boneo plant
- Which was constructed in project 7586
- Where the drawing relates to the Civil discipline
- And the drawing is the first civil drawing in the project

5.3 Locality / Key Plan

A location key plan helps to identify the location of a drawing within a project. Large projects will require a location key to be affixed to each plan prepared. Plans prepared for small projects (requiring only a few drawings) will not require a key plan.

The location key is to be placed in the area allocated for notes with sufficient space allowed to place drawing status stamps.

5.4 Drawing Notes

The first sheet of a set of drawings or of a group of drawing within a set should contain notes that provide general information common to the drawing set (or group). All other drawings in the set (or group) should refer to the drawing containing the notes.

Such notes should be kept to a minimum, must not conflict with the contract specification and shall not replicate commonly accepted standards relevant to the discipline (eg: MRWA standards for buried pressure or gravity pipelines, AS 3600 for Concrete Structures). General notes should be placed at the right-hand side of the drawing sheet.

Individual notes should not be underlined and left justified.

Drawing notes should include:

- References to project unique standards
- Quality requirements for materials and workmanship
- Design criteria
- Non-standard abbreviations

The person preparing the drawing notes must refer to the designer for appropriate information relevant to the particular project.

5.5 Sections and Details

All drawings are to be prepared using third-angle projection, unless otherwise approved by South East Water's Design Team Leader.

Where possible, sections should be directed towards the top or left of the drawing sheet and positioned to read in third-angle projection. As far as possible, section drawings shall be drawn on the sheet on which they are cut. Repetition of details, notes and dimensions should be avoided.

Sections should preferably be cut from the plan views; avoid cutting any major section from another.

A standard section block is available in the DWT template as indicated in Appendix B.

Sections are to be named alphabetically and Details are to be named numerically.

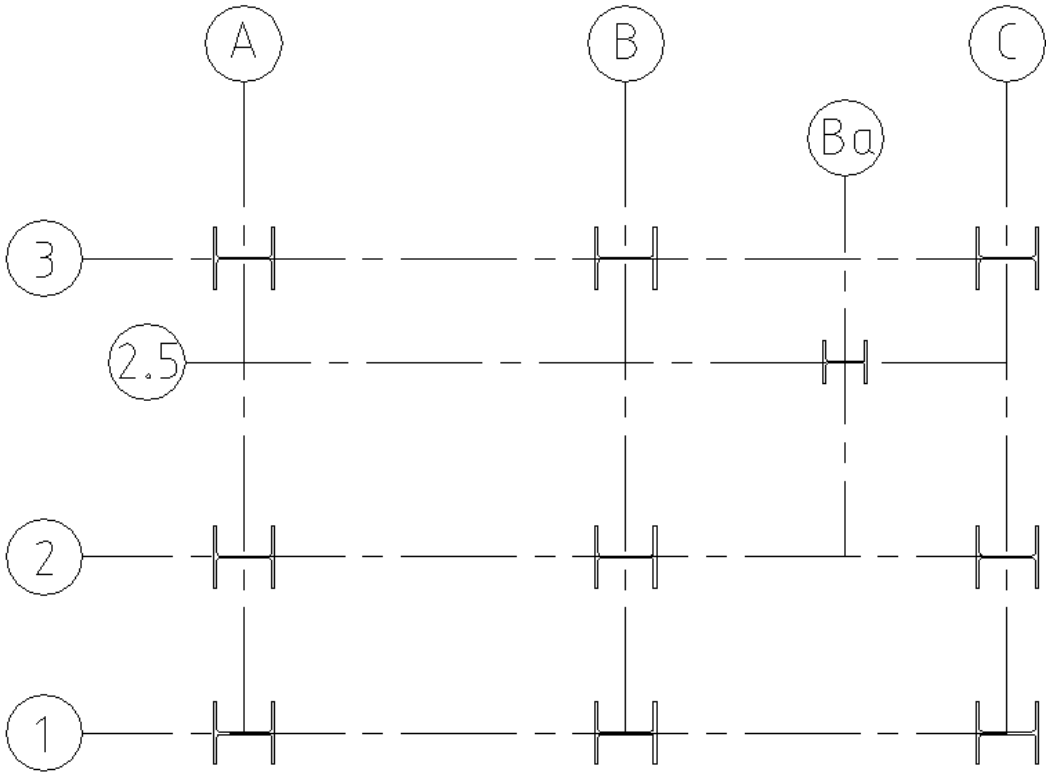
Each Section “bubble” shall contain the drawing number from which the Section is cut or on which the Section view is drawn.

The text height within this bubble is to be 5.0 mm

When the Section view is drawn on the same sheet on which the section cut plane is depicted, a dash shall be used in lieu of the drawing number in the section bubble.

5.6 Building Column Grids

Major building column grid lines that are project north-south shall be designated with numbers and those that are east-west with upper case letters. Intermediate column lines shall be identified by a major column line letter or number, followed by a lower case letter. Individual columns can be identified as the intersection points of perpendicular grid lines as shown below:



5.7 Process and Instrumentation Diagrams (P&IDs)

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Piping Designation

Piping designation shall be in the format: **DIA- MATL-FLUD- XXX**, where:

- **DIA** is the pipe nominal diameter
- **MATL** is the material code as per the below table

- **FLUD** is the Fluid Code
- **XXX** is the line number (optional)

Example: An dechlorinated effluent pipe which DN280 PE line 10 should be designated as:

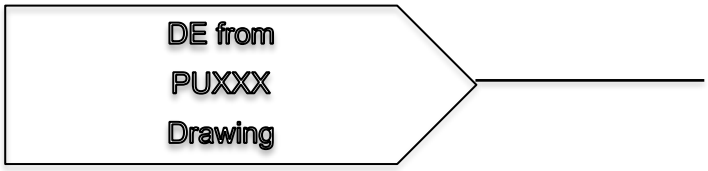
- 280-PE-DE-010

Process Flow Tag Format

Process flow tags shall contain the following information as appropriate:

- **FLUID** code of description with source or destination
  (note: for fluid abbreviations, ref Table 8)
- **EQUIPMENT** name and number (note: for equipment abbreviations, ref Table 6)
- **DRAWING NUMBER** of source or destination drawing (complete drawing number)

Example: Dechlorinated effluent water from a booster pump on a previous sheet might be designated as:



Equipment Designation

Equipment designation shall be in the format: **EQPT- LOCN-XXX**, where:

- **EQPT** is the equipment or valve type abbreviation from Table 6
- **LOCN** is the plant area name abbreviated
  e.g. Chemical dosing area might be: CHEMDOSE
- **XXX** is the equipment number (optional)

Note: Generally fluid is designated with piping rather than equipment. Where fluid is unclear in piping designations, it may be appropriate to include a fluid designation with the item of equipment.

Example: Pump number 2 in the chemical dosing area might be designated as:

- PU-CHEMDOSE-002

Instrument Designation

Instrument designation shall be in the format: **INST- LOCN-XXX**, where:

- **INST** is the instrument abbreviation from Table 9
- **LOCN** is the plant area name abbreviated
  e.g. Blower room: BLOWRM
- **XXX** is the equipment number (where multiple)

Note: Generally fluid is designated with piping rather than equipment. Where fluid is unclear in piping designations, it may be appropriate to include a fluid designation with the instrument.

Example: Current transmitter number 2 in the blower room might be designated as:

- IT-BLOWRM-002

Cross Referencing

Mechanical components described in P&IDs shall have be separately listed in an equipment list. This list shall enable items to be linked with the relevant P&ID drawing as well as Watershed, SCADA and installation details. Full drawing numbers are to be used throughout.

6. Codes and Abbreviations

(i) Abbreviations are to be in accordance the tables in this section where practical
(ii) Where absent or not appropriate, adopt AS 1100 and ISO 3511 standards wherever practical.
(iii) Other abbreviations not shown in the following list may be used provided that their meaning is clearly defined on the drawing or in the general notes.
(iv) Punctuation marks are not to be used with abbreviations.
(v) Feature Survey conventions and standard layers can be found in South East Water' DWT template.

Table 6 General Abbreviations (materials and equipment)

Abbreviation	Description
ABS	Acrylonitrile-Butadiene-Styrene
AC	Asphaltic Concrete
AGGR	Aggregate
AHD	Australian Height Datum
AMG	Australian Map Grid
ASSY	Assembly
BKWK	Brickwork
BLKWK	Block work
BL	Blower / Fan
BM	Bench Mark
BOT	Bottom
BPL	Base plate
BRG	Bearing
BRS	Brass
BRZ	Bronze
CHEM	Chemical
CHS	Circular Hollow Section
CI	Cast Iron
CICL	Cast Iron Cement Lined
CCH	Concrete Channel
CJ	Construction Joint
CL	Centerline
CL	Cement Lined
COL	Column
CONC	Concrete
COMP	Compressor
COORD	Coordinate
COOR	Corrugated
CRS	Centre(s)
CS	Cast Steel
CU	Copper

Abbreviation	Description
MS	Mild Steel
MSCL	Mild Steel Cement Lined
N	Nylon
NO	Number
NOM	Nominal
NS	Natural Surface
NTS	Not to Scale
OA	Overall
PC	Precast Concrete
PCD	Pitch Circle Diameter
PE	Polyethylene
PFC	Parallel Flange Channel
PH BRZ	Phosphor Bronze
PL	Plate
PNEU	Pneumatic
PS	Pumping Station
PSS	Pressure Sewer System
PTFE	Polytetrafluoroethylene
PU	Pump
PV	Pressure Vessel
PVC	Polyvinylchloride
PVCU	Unplasticized PVC
PVCM	Modified PVC
PVCM	Oriented PVC
QTY	Quantity
RAD	Radius
RC	Reinforced Concrete
REF	Reference
REINF	Reinforcement
REQD	Required
RHS	Rectangular Hollow Section

MI	Malleable Iron
DI	Ductile Iron
DIA	Diameter
DIAG	Diagram
DICL	Ductile Iron Cement Lined
DIEL	Ductile Iron Epoxy Lined
DIST	Distance
DRG/DWG	Drawing
EA	Equal Angle
EFM	Electromagnetic Flow Meter
EJ	Expansion Joint
EQUIV	Equivalent
EXT	External
FC	Fail Closed
FFL	Finished Floor Level
FGL	Finished Ground Level
FIG	Figure
FL	Flat
FLG	Flange
FO	Fail Open
FRP	Fibre Reinforced Plastic
GALV	Galvanized
GL	Ground Level
GWL	Ground Water Level
HD BOLT	Holding Down Bolt
HDPE	Polyethylene (high density)
HORIZ	Horizontal
HYD	Hydraulic
ID	Inside Diameter
IL	Invert Level
INCL	Inclusive
INSUL	Insulated / Insulation
MDPE	Medium Density Polyethylene

RL	Reduced Level
RSJ	Rolled Steel Joist
CSK	Countersink
SFL	Structural Floor Level
SHS	Square Hollow Section
SIM	Similar
SJ	Shrinkage Joint
SOP	Set Out Point
SPEC	Specification
SQ	Square
SS	Stainless Steel
SST	SS schedule pipe
STD	Standard
SWL	Safe Working Load
SWSS	Spiral Wound Stainless Steel
SYM	Symmetrical
TK	Tank
TFC	Taper Flange Channel
THK	Thick
TOC	Top Of Concrete
TOS	Top Of Steel
TP	Tangent Point
TUBE	Flexible Nylon Tube- Black
TWL	Top Water Level
TYP	Typical
U/S	Underside
UA	Unequal Angle
UB	Universal Beam
UC	Universal Column
UF	Ultra-Filtration Unit
UNO	Unless Noted Otherwise
UV	Ultra-Violet Unit
VC	Vitrified Clay

MIN	Minimum
MISC	Miscellaneous
MJ	Movement Joint

VERT	Vertical
WB	Welded Beam
WC	Welded Column
WP	Work Point

Table 7 Valve, Reinforcement and Lining Abbreviations

Reinforcement Abbreviation	Description
ABR	Alternate Bars Reversed
B	Bottom Face
EF	Each Face
EW	Each Way
EXTF	External Face
FF	Far Face
INTF	Internal face
NF	Near Face
T	Top Face
VAR	Length Varies
Lining Abbreviation	**Description**
EL	Epoxy Lined
CL	Cement Mortar Lined
BL	Bitumen Lined
PL	Plastic Lined
RL	Resin Lined

Valve Abbreviation	Description
BV	Ball Valve
BFV	Butterfly Valve
DAV	Double Orifice Air Valve
GV	Gate valve
KNG	Knife Gate Valve
NRV	Check Valve / Non Return Valve
PRV	Pressure Reducing Valve
PSV	Pressure Sustaining Valve
PV	Plug Valve
RV	Pressure Relief Valve
Note: PRV is not to be used to denote a pressure relief valve	

Table 8 Fluid Abbreviations

Abbreviation	Description
AH	Alcohol
AL	Alum
ACH	Aluminium Chlorohydrate
AM	Ammonia

Abbreviation	Description
HCL	Hydrochloric Acid
HYPO	Sodium Hypochlorite
IA	Instrument Air
L	Lime

ANT	Antiscalant
ASW	Air Saturated Water
AU	Air Utility
BG	Biogas
BR	Brine
BW	Backwash
CHW	Chemical Waste
CL	Chlorine Gas
CLA	Chloramine
CIT	Citric Acid
CS	Cleaning Solution
CA	Compressed Air
CAU	Sodium Hydroxide
CW	Cooling Water
DE	Dechlorinated Effluent
DF	Diesel Fuel
DP	Degassed Permeate
DS	Digested Sludge
DW	Drain
EX	Equipment Exhaust
F	Filtrate
FA	Foul Air
FC	Ferric Chloride
FW	Fire Water
GR	Grit
HA	Halon
HY	Hydraulic Fluid

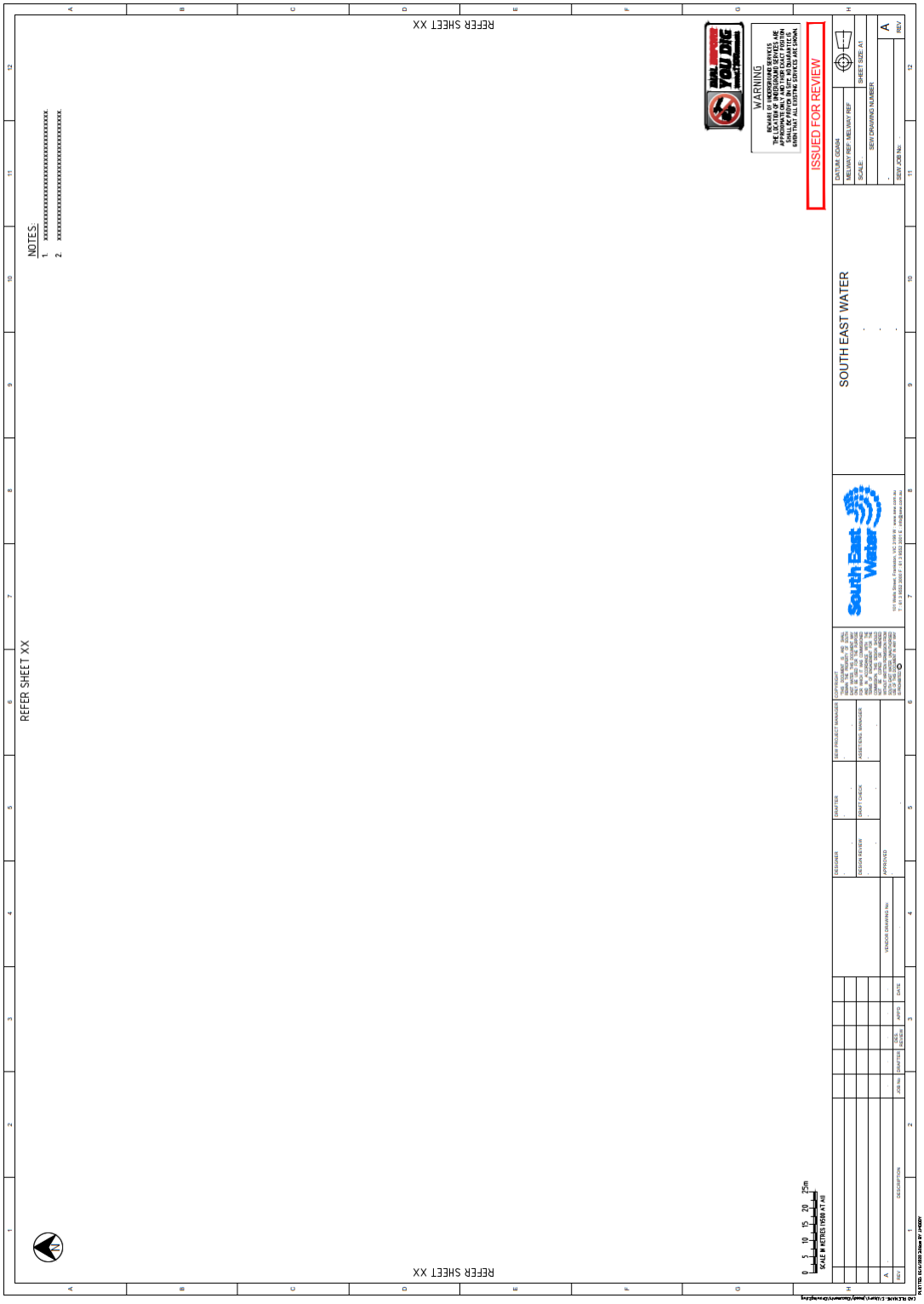
LO	Lube Oil
ML	Mixed Liquor
MS	Mixed Sludge
N	Nitrogen
OA	Odorous Air
PS	Primary Sludge
PW	Potable Water (drinking water)
PY	Polymer
R	Refrigerant
RAS	Return Activated Sludge
RE	Recycled Effluent
RO	RO Permeate
RS	Raw Sewage
RW	Recycled Water
SC	Scum
SL	Sludge
SBS	Sodium Biosulphate
SE	STP Effluent (class C)
SS	Screened Sewage
SW	Safety Valve Discharge
SW	Saturated Water
TA	Treated Air
TWAS	Thickened Waste Activated Sludge
UF	UF Permeate
VG	Vent Gas
WAS	Waste Activated Sludge
WW	Waste Water

Table 9 Instrument Identification and Function Abbreviations

Abbreviation	If used as First Letter	If used as Second Letter	If used as Third Letter
A	Analysis	Alarm	Alarm
B	Burner / Flame		State or Status Display

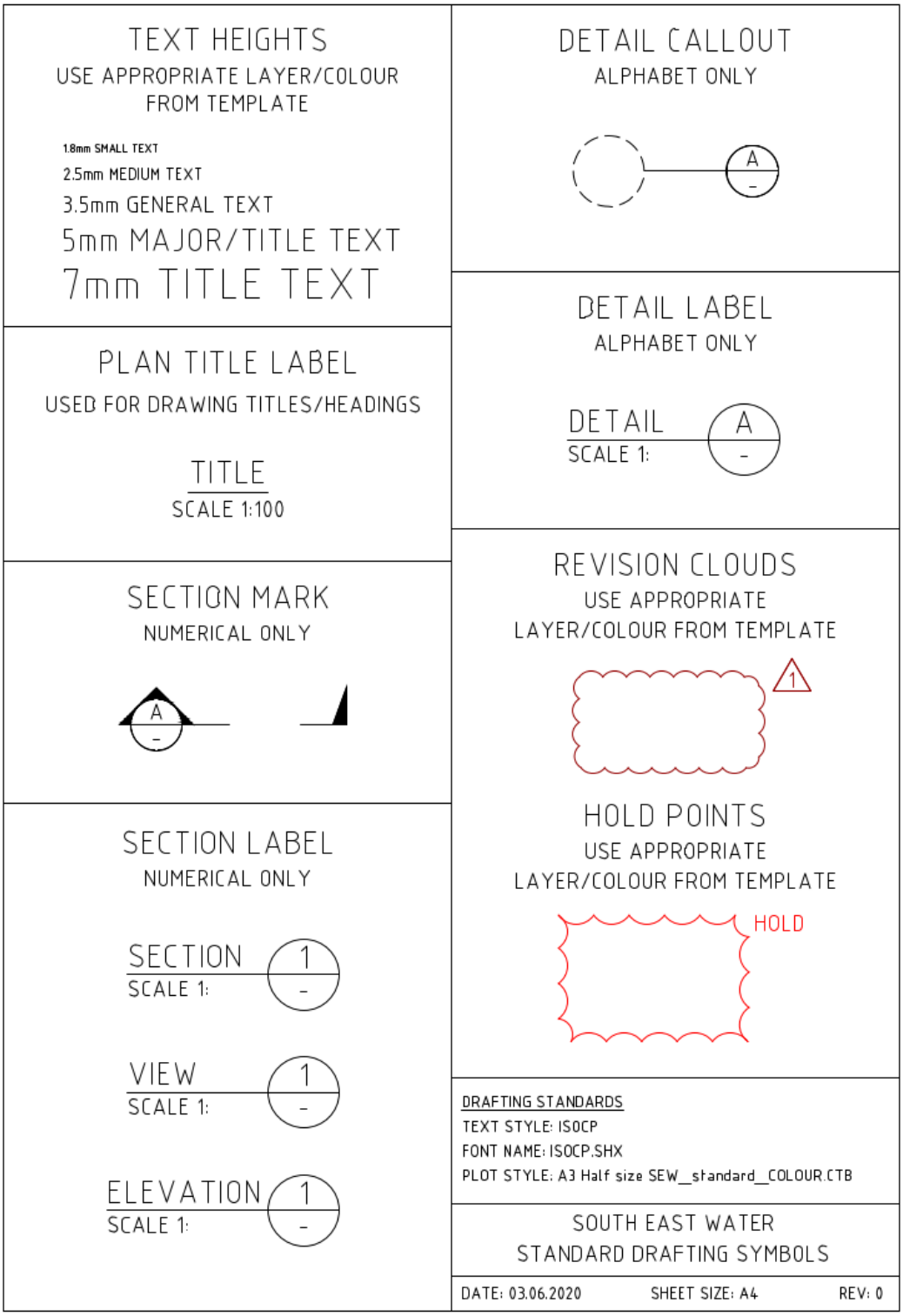
C	Conductivity	Control	Control
D	Density	Difference	
E	Voltage	Sensing Equipment	
F	Flow	Ratio	
G	Gauge Position or Length	Gauge	Glass
H	Hand Operated	High	High
I	Current	Indicator	Indicator
J		Scan	
K	Time		Barrier
L	Level	Low	Low
M	Moisture or Humidity	Intermediate	
N			
O			
P	Pressure or Vacuum	Pressure or Vacuum	Test Point Connection
Q	Quantity	Integrate or Totalise	Integrating or Summating
R	Radioactivity		Recording
S	Speed or Frequency	Switch	Switch
T	Temperature	Transmitter	Transmitter
U	Multivariable		Multifunction Unit
V	Vibration	Valve	Valve, Damper, Louvre
W	Weight or Force		Wells
X			Cathode Ray Tube
Y		Converter	Computing Relay, Relay
Z	Position		Emergency or Safety Acting

Appendix A: SEW Title Block



Please note this is an A4 representation of the SEW titleblock, refer Section 3.8 of this document for standard plot sizes.

Appendix B: SEW Standard Blocks



Please note this is an A4 representation of the SEW symbols.