South East Water

Drafting Standard

AM2488

AM2488 – Drafting Standard

Document History

Revision No.	Date	Revision Description
0		
1.0	Feb 2014	
2.0	Sept 2018	Integration (& decommissioning) of AM2588 and AM2506. Inclusion of P&ID requirements
3.0	Mar 2020	Updates including SEW Title Block and standard symbols
4.0	Dec 2023	Drawings numbers and DMS

Revision Working Group

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Contents

1. General

1.1 Purpose

Complete, professionally drawn, consistent and unambiguous drawings are essential for health and safety, environment protection, asset performance, efficient operation and maintenance as well as future upgrades.

The purpose of this standard is to define South East Water (SEW) specific engineering drawing requirements. The intended audience is an experienced drafter.

1.2 Qualified Drafter

Drawings must be prepared or modified by an experienced and qualified drafter (draftsperson), unless closely supervised. To be qualified, the drafter must have a Certificate IV in Engineering Drafting or equivalent. A general qualification in engineering, fabrication or construction is not accepted. Qualified drafters with less than five years continuous experience or a non-qualified drafter, must be closely supervised by a qualified drafter with more than ten years experience.

1.3 Dispensation

Any proposed non-compliance with this standard requires the submission of a dispensation and approval by SEW. Refer to Standards Manager.

1.4 Drawing Management System

In 2023, SEW commenced the use of OpenText Extended ECM for Engineering, which is known as the Drawing Management System (DMS). Instructions for using DMS are not included in this standard and can be obtained from the Asset Information Systems Manager.

1.5 References and standards

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

- 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
- AS 3702 Item designation in electrotechnology

- AS 4383 Preparation of documentation used in electrotechnology
- AS 60417 Graphical symbols for use on equipment
- HB7 Engineering drawing handbook by Standards Australia
- 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
- AM2775 Maximo Collection Details

2. Drawing Composition

2.1 Drawing Templates

Water and gravity sewerage pipeline drawings must be completed in accordance with the relevant MRWA drawing templates. CAD templates for these pipeline designs are available at: https://www.mrwa.com.au/standards

Sewage rising mains and pressure sewer mains will use the SEW drawing template.

The same drawing template will be used for the entire project. Unless the drawing set consists of approximately 75% or more of water or gravity sewerage pipeline, then use the SEW drawing template.

2.2 SEW drawing template

The following standard files must be used:

a. South East Water standard DWT template, including standard Title Block in Paperspace and standard Layer arrangements. This standard CAD file is suitable for the following types of drawings:
   (i) Civil
   (ii) Structural
   (iii) Process (P&ID)
   (iv) Mechanical
   (v) Electrical
   (vi) Survey

b. South East Water standard CTB file.

These files can be found on South East Water's water and sewer technical standards web page.

2.3 Drawing format

All CAD files must be produced in AutoCAD dwg format.

All drawings to be delivered no older than one major version old. For example, when AutoCAD 2024 version 24.3 is the latest version, AutoCAD 2019 version 23.0 is the oldest acceptable.

2.4 Equipment Drawings

Equipment drawings are not required in the drawing set for off the shelf proprietary equipment. Such information shall be provided in Operations and Maintenance Manual.

Drawings for custom equipment (Vendor drawings) shall be included in the drawing set and comply with this document.

2.5 File and Drawing Object Structure

DWG files must be separated into logical drawings of a manageable size (max 25MB). Each file must only contain one Paper Space sheet.

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.

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.

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.

2.6 Drawing Sheet Sizes

The standard drawing size must be A1.

The original drawing plot must be in A3 format and shall be legible in A3 format. Full size plots shall only be prepared when specifically requested or required.

2.7 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.

Paper Space viewports must be oriented with the North up the page, the right of the drawing sheet.

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

2.8 Scales

An adequate scale must be chosen to ensure legible, uncluttered drawings, which meet the recommendations of AS1100.101.

Scales must be a multiple of 10 of the following standard scales:

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

The scale used must be represented in the body of the drawing. Where more than one scale is used, the relevant scale must 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”.

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

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

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

2.9 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 must represent the Easting and the “Y” value must represent the Northing.

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

2.10 Colours and Pen Assignments

To accommodate the majority of mono/colour plotting requirements the following standard pen assignments and corresponding plot styles must 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 1 Pen assignment

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	

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 must be such as to be clearly legible.

All new work must 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.

2.11 Layers

Layers must be as per the South East Water standard template (DWT) file. Nothing may be drawn on Layer 0 and no layers may be removed. In the rare event of a layer needing to be added, it shall be named in a consistent format with those in the standard template.

2.12 Standard Blocks and Symbols

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

2.13 Dimension & Annotation Conventions

Dimensioning standards shall be as described in Australian Standard AS 1100, Technical drawing, Parts 101, 201, 301, 401 and 501. In addition:

- All dimensions are to be associative and must NOT be exploded.
- Dimensions must not be repeated.

- 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.
- Coordinates 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.

2.14 SCADA and Asset IDs

Refer to AM2775 Collection Details and SEW project representative for details.

2.15 Clouding Revisions

Revision clouds must be used for all revisions after Issued for Construction. They may be used in earlier versions, if agreed between designer and SEW representative. All changes on a drawing must be indicated by drawing a cloud around the revised part of the drawing. Every revision cloud is given a revision layer which must be turned off when the drawing receives further change. A revision marker (revision number surrounded by a triangle) must accompany the cloud.

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

2.16 Hold Clouds

“HOLD” clouds shall be used to segregate tentative information.

All such holds must 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” and encircled by a reverse cloud.

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.

2.17 Sections and Details

All drawings are to be prepared using third-angle projection.

Where possible:

- sections shall be directed towards the top or left of the drawing sheet and positioned to read in third-angle projection.
- section drawings shall be drawn on the sheet on which they are cut.
- Sections shall 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.

2.18 Process and Instrumentation Diagrams (P&IDs)

Refer to AM2996 P&ID standard.

3. Procedural Requirements

3.1 Drawing Numbering

Drawing numbers for new drawings will be provided through the Drawing Management System.

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.

Drawing number format is:

[identifier/asset number].[area number].[discipline].[sequential number]

Example: WB196.1090.C.001

Identifier/asset number

The identifier consists of a product prefix and the asset class.

Table 2 Identifier

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		
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	Recycling Plant	RP
Standard Drawing	STD	Water Quality Site (e.g. chlorine)	WQ

Table 3 Identifier examples

Examples	
Sewer Rising (Pressure) Main	SM
Recycled Water Flow Meter	RG
Sewage Pump Station	SP
Water Pump Station	WP
Recycled Water Pump Station	RP

The asset number is a sequential number determined by asset management systems.

Treatment plant asset numbers are listed in AM2996 P&ID standard.

Sewer Branch mains (DN300 or larger) and water mains DN300 or higher will have an asset number provided by asset management systems.

Smaller mains (reticulation) will not have an asset number provided. These assets are generally created indirectly through Land Development processes.

Area Numbers

Sewage Treatment plant area numbers are listed in AM2996 P&ID standard.

Water network area numbers are the water distribution zone that is defined within GTViewer.

Sewage network area numbers are the catchment areas defined within GTViewer.

When the area number is less than four digits, add a zero in front, so that it is four digits.

Discipline

Discipline letter must comply with Table 4.

Table 4 Discipline

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

3.2 XREF File Naming

Xref files must be named based on the asset number.

Format is

X_SP123.3344_descriptor1_descriptor2(optional).dwg

Where:

X signifies xref

SP123 is the asset identifier and number

3344 is the area code of the asset. Where the xref spans more than one area, it must be area 0000

Descriptor1 & 2 is up to 20 characters

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 must 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 shall contain 'C3D' within the name. For example:

Table 5 XREF Examples

File Description	File Name	Alternate name with subcategories
Existing feature survey	X_SP123.3344_SURVEY.dwg	X_SP123.3344_SURVEY _SITE A.dwg; X_SP123.3344_SURVEY_SITE B.dwg
Existing services	X_ SP123.3344_EXISTING SERVICES.dwg	X_SP123.3344_SERVICES_DBYD.dwg; X_SP123.3344_SERVICES_PROVEN.dwg
Proposed water main	X_ WT123.3344_WATER ALIGNMENT.dwg	X_ WT123.3344_WATER ALIGNMENT_DN600.dwg X_ SP123.3344_WATER ALIGNMENT_SITE A.dwg
Civil 3D Longitudinal Section	X_ SP123.3344_C3D_SEWER ALIGNMENT.dwg	X_ SP123.3344_SEWER ALIGNMENT_DN900.dwg X_ SP123.3344_C3D_SEWER_SITE A.dwg
Locality Map Image	X_SP123.3344_LOCALITY.png	X_SP123.3344_LOCALITY_SITE A.png

3.3 Drawing Submission

Drawings must be purged, audited and zoomed to extents followed by the use of the Etransmit AutoCAD function to submit.

Each drawing shall be a separate file.

3.4 Existing CAD Files

It is essential for safe and reliable operation and maintenance of SEW assets, that the drawing set for an asset is complete, current and free of inconsistencies and ambiguity.

When modifications, extensions or enhancements are made to existing assets, all affected existing drawings must be revised. This includes general drawings such as drawing list and site layout, overall drawings such as process and instrumentation diagrams as well as plan, section and detailed drawings. Where the new works interface with the existing, there must be reference to the existing drawings on the new drawings, and on the existing drawings to reference the new drawings. Existing drawings must be obtained from Drawing Management System to ensure they are the current revision.

3.5 Existing drawings as images

In some cases, SEW may only be able to provide old drawings as images. When these drawings are impacted by the works:

- The content must be redrawn in AutoCAD.
- The drawing given a new drawing number.
- The old drawing number must be included as a reference within the new drawing.

3.6 Missing or incomplete existing drawings

When proposed works involve existing assets for which the drawings are missing or incomplete, the missing information must be collected and drawn in AutoCAD. Unless specified otherwise in scope of works, accessible dimensions must be collected by survey methods.

Table 6 Accessible dimensions

Description	Example	Requirement
Fully buried	Pipeline	Electronically locate without excavation
Pits	Pipeline pit	Obtain internal pit dimensions without entry into pit, using staff and tape measure. Record equipment within pit. Estimate pipe diameter and material and inlet/outlet angles.
Electrical and communication cabinets	Switchboard	External cabinet dimensions and labelled external doors.
Water retaining structures	Digester	Dimensions that can be obtained when water at normal operating levels from walkways/platforms/ground level.
Above ground pipework	Recycled water cross connection	All dimensions.
Submerged equipment	Wet well pump	No dimensions
Above ground equipment	Pump	Key dimensions, such as joint type (eg flange), flange size, distance between flanges, widest dimension, highest dimension
Buildings	Water pump station	Laser scan showing key features and dimensions.
Above ground structures	Water tank	Dimensions and features obtainable from ground level.

Note: any reference to specific methods is used to indicate level of effort.

3.7 Revision Designation

Table 3 shows the revision number requirements.

Table 7 Revision Block

Drawing Issued for	Revision Format
Preliminary	Alphabetic
Approval	Alphabetic
Tender	Alphabetic
Subsequent Tender	Alphabetic
Construction	0
Subsequent Construction	Numerical
As Constructed	Numerical
All other future changes	Numerical

Revision (alpha or numeric) shall only be changed when the drawing content has changed, with exception of Issue for Construction and As-Constructed revisions.

3.8 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.)

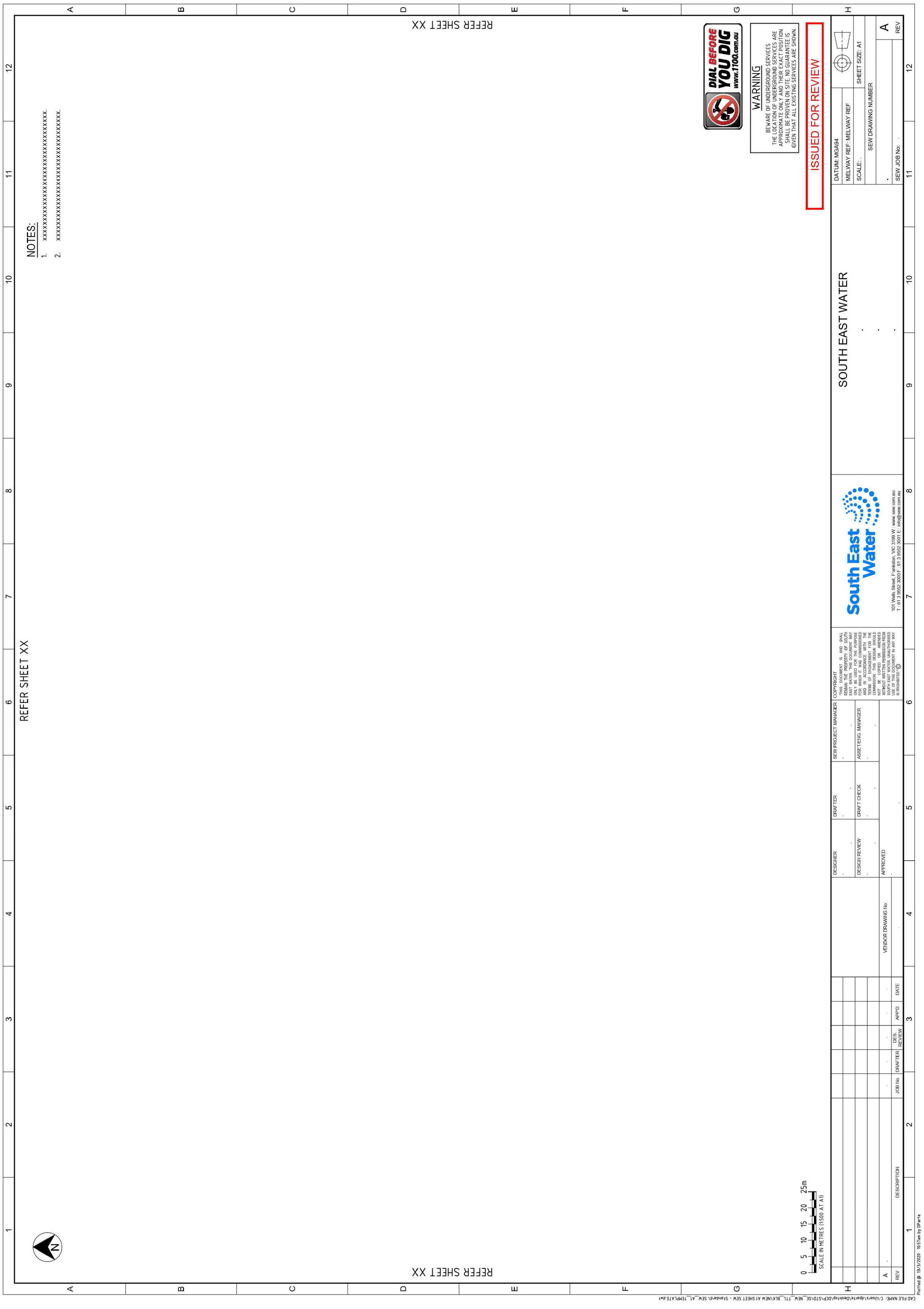
Drawing filenames are to be the drawing number.

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.

3.9 As Constructed Drawings

As Constructed drawings must be prepared in AutoCAD, to the same drafting requirements as the design drawings. The As-Constructed drawings must 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.

Appendix A: SEW Title Block



Appendix B: SEW Standard Blocks

NORTH ARROW

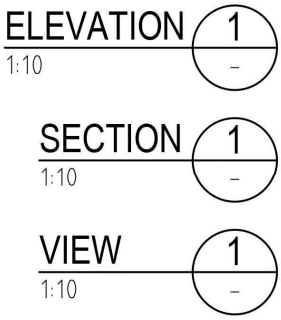
TO BE BE PLACED
IN THE TOP LEFT CORNER

PLAN TITLE

USED FOR DRAWING
TITLES/HEADINGS

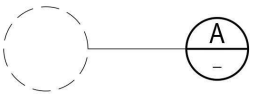
SPECIFIC TITLE

NUMERICAL ONLY



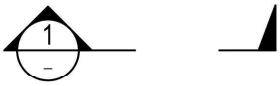
DETAIL CALLOUT

ALPHABET ONLY



SECTION MARK

NUMERICAL ONLY

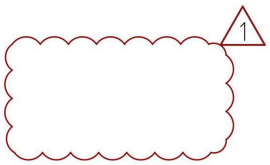


DETAIL TITLE

ALPHABET ONLY

REVISION CLOUDS

USE APPROPRIATE LAYER/COLOUR
FROM TEMPLATE



HOLD POINTS

USE APPROPRIATE LAYER/COLOUR
FROM TEMPLATE