Copyright

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The information contained in this Standard is strictly for the private use of the intended recipient in relation to works or projects of SA Water.

This Standard has been prepared for SA Water’s own internal use and SA Water makes no representation as to the quality, accuracy or suitability of the information for any other purpose.

Application & Interpretation of this Document

It is the responsibility of the users of this Standard to ensure that the application of information is appropriate and that any designs based on this Standard are fit for SA Water’s purposes and comply with all relevant Australian Standards, Acts and regulations.

Users of this Standard accept sole responsibility for interpretation and use of the information contained in this Standard. Users should independently verify the accuracy, fitness for purpose and application of information contained in this Standard.

Only the current revision of this Standard should be used which is available for download from the SA Water website.

Significant/Major Changes Incorporated in This Edition

- Completely re-written to replace issue 2.0, dated 10 June 2014.
- New forms for drawing and CAD file requests and submission.
- New Title Block.
- Removal of TG 150.
Document Controls

Revision History

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<th>Author</th>
<th>Comments</th>
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<td>C. McDonald</td>
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Template: Technical Standard Version 4.00 02/11/2015

Approvers

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<td>Responsible Discipline Lead</td>
<td>5/02/2016</td>
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<td>Robert Alaia</td>
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<tr>
<td>Manager Engineering Technical Services</td>
<td>8/02/2016</td>
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<td>Murat Aksoy</td>
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<tr>
<td>Senior Manager Engineering Services</td>
<td>8/02/2016</td>
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<td>Richard Gray</td>
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Reviewers

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1 Introduction

SA Water is responsible for operation and maintenance of an extensive amount of engineering infrastructure.

This standard has been developed to assist in the design, maintenance, construction, and management of this infrastructure.

1.1 Purpose

The purpose of this standard is to detail minimum requirements to ensure that assets are constructed and maintained to consistent standards and attain their economic asset life.

1.2 Glossary

The following glossary items are used in this document:

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA Water</td>
<td>South Australian Water Corporation</td>
</tr>
<tr>
<td>TG</td>
<td>SA Water Technical Guideline</td>
</tr>
<tr>
<td>TS</td>
<td>SA Water Technical Standard</td>
</tr>
</tbody>
</table>

1.3 References

1.3.1 Australian

The following table identifies the standards, documents and/or articles that are referenced in this document:

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1000</td>
<td>The International System of Units (SI) and its application</td>
</tr>
<tr>
<td>AS 1100</td>
<td>Technical Drawing</td>
</tr>
<tr>
<td>AS 1101</td>
<td>Graphical Symbols for General Engineering</td>
</tr>
<tr>
<td>AS 1102</td>
<td>Graphical Symbols for Electrotechnology Documentation</td>
</tr>
<tr>
<td>AS 3702</td>
<td>Item Designation in Electrotechnology</td>
</tr>
<tr>
<td>AS 4383</td>
<td>Preparation of Documentation used in Electrotechnology</td>
</tr>
<tr>
<td>AS 60417</td>
<td>Graphical Symbols for use on Equipment</td>
</tr>
</tbody>
</table>
1.3.2 **SA Water**

The following table identifies the standards, documents and/or articles that are referenced in this document:

<table>
<thead>
<tr>
<th>Number</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS 112</td>
<td>Process and Instrumentation Diagrams (P&amp;ID)</td>
</tr>
<tr>
<td>TS 153</td>
<td>Electronic Lodgement of Asset Information (Currently under development)</td>
</tr>
</tbody>
</table>

1.4 **Definitions**

The following definitions are applicable to this document:

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SA Water’s Representative</td>
<td>The SA Water representative with delegated authority under a Contract or engagement, including (as applicable):</td>
</tr>
<tr>
<td></td>
<td>- Superintendent’s Representative (e.g. AS 4300 &amp; AS 2124 etc.)</td>
</tr>
<tr>
<td></td>
<td>- SA Water Project Manager</td>
</tr>
<tr>
<td></td>
<td>- SA Water nominated contact person</td>
</tr>
<tr>
<td>Responsible Discipline Lead</td>
<td>The engineering discipline expert responsible for TS 95 defined on page 3 (via SA Water’s Representative)</td>
</tr>
<tr>
<td>Authorised Drawing</td>
<td>Any drawing that has the design or the current revision authorised with a signature, accompanied with the date and name of the signatory.</td>
</tr>
<tr>
<td>DataView®</td>
<td>Document archival and retrieval software used by SA Water to manage Authorised, As Constructed drawings.</td>
</tr>
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</table>
2 Scope

This Technical Standard details the requirements for production and submission of Engineering drawings, created or modified for SA Water. This document applies to the Computer Aided Design (CAD) drawings and the drawings outputted from them.

This Technical Standard applies to but is not limited to the following drawing discipline types:

- Mechanical,
- Electrical,
- Civil,
- Structural,
- P&ID,
- Site Plans,
- Site Services,
- Survey.

The following documents referenced in this Technical Standard can be downloaded from this page:


- A1 SA Water Title Block.dwt
- A3 SA Water Title Block.dwt
- A1 SA Water Mono.ctb
- A3 SA Water Mono.ctb
- A1 Revision Authorise Block.dwg
- A3 Revision Authorise Block.dwg
- Drawing Transmittal.xls
- CAD Request – Submission.xls
- Drawing Number Request Form.doc

This Technical Standard is not applicable to drawings representing the design and installation of water, wastewater and recycled water network infrastructure as a result of:

- Land development,
- Mains replacements and relays.

Drawing requirements for network infrastructure are defined on the SA Water website:


In addition, this Technical Standard is not applicable to design and installation drawings for:

- Extension to existing network,
- Connections,
- Cathodic Protection.

Please contact SA Water’s Representative for specific requirements for these types of drawings.
3 Compliance with Standards

All drawings shall comply where applicable with SA Water discipline specific standards, this standard and relevant Australian Standards.

Where conflict between the standards exists, the following order of priority shall apply:

1. Project specific drafting requirements (shall be documented).
2. SA Water discipline specific Technical Standard.
3. TS 95 – Requirements for Technical Drawings.
4. Drafting practices set out in the relevant Australian Standard.

3.1 SA Water Technical Standards (Discipline Specific)

SA Water is continually developing various discipline based Technical Standards, which may include specific drafting requirements. These may supplement and in some cases override this Technical Standard. It is the responsibility of the drafter to ensure that they are working with any relevant Technical Standards.

3.2 Australian Standards

Drawings shall comply, where applicable, with the current relevant Australian Standard including but not limited to:

- AS 1000 - The International System of Units (SI) and its application
- AS 1100 - Technical Drawing
- AS 1101 - Graphical Symbols for General Engineering
- AS 1102 - Graphical Symbols for Electrotechnology Documentation
- AS 3702 - Item Designation in Electrotechnology
- AS 4383 - Preparation of Documentation used in Electrotechnology
- AS 60417 - Graphical Symbols for use on Equipment

3.3 Typical and Standard Drawings

SA Water has created Standard and Typical drawings, that encompass some commonly installed infrastructure. Some of these drawings pre-date this technical standard. If these drawings are to be used as a base for project specific drawings, then the new drawings shall comply with this standard.

It is the responsibility of whoever is creating / modifying a drawing to ensure that the latest versions of these documents are used. PDF’s are all available for download from the SA Water website and CAD versions can be requested from the CADD Coordinator at Engineering.Projects@sawater.com.au
3.4 Existing Non-Compliant Drawings

In some instances there may be a requirement to work on or modify existing drawings that do not conform to the current standard. Drafting protocol is to maintain the standards that were applied at the time of drawing creation, unless major modifications to the content are required or a conflict with symbology (e.g. P&ID, Electrical, and Process Flow) is introduced. It is the responsibility of the drafting provider to seek clarification from the CADD Coordinator when required.

SA Water does not require that an existing drawing is migrated onto the current title block when being modified unless more than 50% of the drawing content is being modified. As this figure is subjective, advice shall be obtained from the CADD Coordinator for major drawing modifications.

If an existing non-conforming drawing is being used as a base for a drawing with a new drawing number, then the new drawing shall conform to the current version of TS 95.

4 General CAD Requirements

General CAD requirements are as follows:

- All new drawings produced for SA Water shall be presented on the current SA Water title block. All drawings shall be either A1 landscape or A3 landscape unless prior arrangements are made. The title block shall not be modified or exploded,
- With the exception of some Equipment Manufacturers drawing, or by prior arrangement, drawings not on an SA Water title block will not be accepted,
- Drawings shall be presented in monochrome, unless there is a specific requirement to show coloured line work. If a drawing shall be presented in colour, lighter colours such as yellow and cyan should be avoided,
- All site layouts shall contain a north arrow,
- All Site Layouts shall be located in a coordinate system. The horizontal datum shall be planar based on MGA (e.g. MGA54 - GDA 94) coordinates derived from network Permanent Survey Marks. The origin shall be as near as practical to the centre of the survey area. In the event that this is not practical, coordinates shall be based on Global Navigation Satellite System (GNSS) observations,
- All elevations shall be referenced to the Australian Height Datum (AHD),
- All drawings shall be legible when plotted / printed at A3 size,
- All drawings provided by SA Water remain the copyrighted property of SA Water and may only be used to assist in the preparation or modification of drawings to be provided under contract,
- All drawings prepared for SA Water under contract (excluding equipment manufacturer’s drawings) become the copyrighted property of SA Water upon submission,
- All drawings shall be supplied in the appropriate native CAD format (see clauses 4.1 and 4.2) along with PDF plots that capture the various stages of the drawing lifecycle.
4.1 Acceptable 2D CAD Formats

All new 2D drawings shall be prepared and submitted in AutoCAD® (release 2014) .dwg format or earlier unless approval of the SA Water CADD Coordinator is given prior to commencement of any drafting work. If another package is to be used for the preparation of 2D drawings, the native CAD file along with an AutoCAD® conversion (where available) shall be provided.

The use of XREF’s is permitted by SA Water when required. Any drawing containing XREFS, imported images etc. shall be provided using the “E-Transmit “command. XREFS shall not be bound and shall use a single folder hierarchy. All file paths shall be relative. Multiple sheets shall not be contained in a single E-Transmit or archive. Each sheet shall be stand alone.

4.2 Acceptable 3D CAD Formats

All new 3D CAD models shall be prepared and submitted in AutoCAD Inventor® (release 2014) format or earlier unless approval of the SA Water CADD Coordinator is given prior to commencement of any drafting work. The Inventor project shall be supplied as a “Pack and Go” composite, containing all parts, assemblies, drawings and library items. If another package is to be used for the preparation of 3D CAD models, then the native CAD file along with a model export in .STEP, .IGES or .SAT (where available) shall be provided.

SA Water can also accept 3D data contained within a dwg file, such as surface information created in Civil3D®.

4.3 Equipment Manufacturers Drawings

Drawings of proprietary equipment (e.g. pumps, motors, valves etc.) that are not modified prior to installation are not considered Engineering Drawings and shall be included in the Operations and Maintenance manuals.

5 Information supplied by SA Water

At the commencement of any drafting engagements, it is the responsibility of the drafting provider to ensure that current and relevant information is sourced from SA Water. This includes the following CAD information in addition to the aforementioned Technical Standards (see clause 3.1).

5.1 Drawing Templates

It is the responsibility of the drafting provider to ensure that the current version of the SA Water title block is being used.

The title block is supplied as a .DWT file for insertion as a new sheet. It contains attributes fields to capture drawing information, some of which are mandatory. Refer to clause 7 for more information.

5.2 Drawing Numbers

Every new drawing shall have an SA Water issued drawing number. Each drawing number can contain up to 99 sheets. Multiple sheets can be used in instances where the drawing set covers a single discipline over the same asset. Sheet 0 shall not be used.

The drawing number is formatted as YYYY-NNNNN-SS, where Y=Year, N=Drawing Number and S=Sheet Number. All fields shall be used, with zeros substituting missing digits e.g. 2015-00123-01 is a valid drawing number, 15-123-1 is not.

Drawing numbers shall be requested through SA Water Engineering by completing the Drawing Number Request form (refer Appendix B) and emailing to Engineering.Projects@sawater.com.au. All fields shall be completed. Any spare numbers at the end of the project shall be declared on the drawing transmittal form. A minimum of 3 days shall be allowed for this processing. Any requests sent through to specific SA Water personnel, other than via the above email, may take longer to be processed.

Regional, Outer Metro, Allwater and Water/Wastewater Infrastructure will continue to issue, use and manage the allocated drawing number ranges issued to them as per Appendix E. At the end of each calendar year, this information is to be supplied to the CAD Coordinator.

5.3 Existing CAD files

In instances where existing CAD files are required for modification or reference, they may be released from SA Water.

Existing CAD files can be requested through SA Water Engineering by filling in the CAD Request/Submission form (refer Appendix C) and emailing to Engineering.Projects@sawater.com.au. All fields shall be completed. A minimum of 3 days shall be allowed for processing of small quantities and up to 10 working days for large quantities. Any requests sent through to specific SA Water personnel, other than via the above email, may take longer to be processed.

All drawings issued by SA Water will be checked out to the requestor by SA Water and shall be returned to SA Water when they are no longer required. Note that any drawings checked out cannot be checked out again for modifications until they are checked in.

Any drawings that are checked out for modification shall be returned when completed or no longer required, using the CAD Request/Submission (refer Appendix C) and emailing to Engineering.Projects@sawater.com.au.

If checked out drawings are being submitted as part of an overall project with new drawings, the modified drawings to be Checked In, shall be separated and submitted with the overall drawing package along with the CAD Return form, refer to clause 0 for more information.

CAD files will generally be supplied in one of three formats as detailed in clauses 5.3.1, 5.3.2 and 5.3.3.

5.3.1 1 Sheet per CAD File

In this scenario, each sheet is supplied as an individual CAD file and only the modified sheets need to be returned as a CAD file. Any sheets that were Checked Out but not modified, still need to be Checked In, however the CAD files do not need to be returned.
5.3.2 Multiple Sheets Contained In a Single CAD File

In this instance a single CAD file contains multiple sheets. All sheets contained within that CAD file will be checked out to the requestor regardless of if they are requested or not. The CAD file shall be returned as a single file, with all sheets intact. Sheets that need to be modified shall not be separately saved as an individual CAD file unless requested by SA Water. In this instance, only the checked out sheets need to be itemised and Checked In on the CAD Return form.

5.3.3 Multiple Sheets Contained In a Single E-Transmit ZIP File

Occasionally a CAD sheet will be contained in an E-Transmitted ZIP file that also contains other sheets that may or may not share the same XREF’s. All sheets contained within that ZIP file will be checked out to the requestor regardless of if they are requested or not. The file shall be returned as a single ZIP file, with all sheets intact and with the original folder structure in place. Sheets that need to be modified shall not be separately saved or supplied as an individual or standalone CAD file unless requested by SA Water. In this instance, only the checked out sheets need to be itemised and Checked In on the CAD Return form.

6 Drawing Requirements

6.1 Drafting Space

It is expected that drawings produced for SA Water use a combination of Model and Paper Space. The drawing itself or model shall be drawing in Model Space at a scale of 1:1, in millimetres. The title block or drawing frame shall always remain in paper space using viewports to show the model. Unscaled drawings (e.g. P&ID, Electrical Schematics, and Process Flow etc.) are exempt from this requirement and can be drawn completely in either space. The title block however shall remain in paper space.

Drawing annotations may be in either Model Space or Paper Space; however a consistent approach shall be maintained over the drawing. If Annotations are to be located in Model Space, then they shall be scaled to suit the viewport. All dimensions should be associative.

Should multiple sheets be used, each sheet tab shall be named appropriately with the drawing number and sheet number.

6.2 Dimensions

Dimensions shall be in accordance with Australian Standard AS 1100. The SA Water supplied template contains the dimension style “SA Water”, which shall be used.

Linear dimensions should be in millimetres and angular dimensions in decimal degrees unless industry standards for that particular drawing type differ, in which case the industry standard shall take preference.

Dimensions shall not be exploded.

6.3 Text Styles

SA Water requires that the ISOCP font is used. If a different font must be used, it shall be an AutoCAD® standard font. Generally text should be vertical (Oblique=0), however italic text is acceptable to give emphasis. All text should have a width factor of 1, however it is permissible to reduce this to fit into the drawing.
The table below defines typical sizes for font usage throughout the drawing:

<table>
<thead>
<tr>
<th>Text Height</th>
<th>Line Weight</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 mm</td>
<td>0.35 mm</td>
<td>General notes, labels, tables, dimensions etc.</td>
</tr>
<tr>
<td>5 mm</td>
<td>0.5 mm</td>
<td>Minor headings</td>
</tr>
<tr>
<td>7 mm</td>
<td>0.7 mm</td>
<td>Major headings</td>
</tr>
</tbody>
</table>

In some circumstances, it is permissible to use smaller fonts to enable good drawing presentation. In these cases the minimum size for A1 drawings is 2.5 mm and A3 drawings 2mm, providing that the drawing is legible when plotted / printed at A3 size.

### 6.4 Line Types

Line styles applied to drawings shall conform to Australian Standard AS 1100 and industry standards. Where possible all line work should use standard AutoCAD® line styles. If a custom line style is to be used, then a copy of the line type file (*.lin) shall be provided. Globally LTSCALE should be set to 1. All line properties – Colour, Line weight and Line Type shall be set to ByLayer.

### 6.5 Line Weights

The following AutoCAD® colours shall be used to represent the various line weights or “pen thicknesses” when plotted at full size.

<table>
<thead>
<tr>
<th>AutoCAD® Colour No</th>
<th>Colour</th>
<th>Line weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
<td>0.5 mm</td>
</tr>
<tr>
<td>2</td>
<td>Yellow</td>
<td>0.35 mm</td>
</tr>
<tr>
<td>3</td>
<td>Cyan</td>
<td>1.4 mm</td>
</tr>
<tr>
<td>4</td>
<td>Green</td>
<td>2.0 mm</td>
</tr>
<tr>
<td>5</td>
<td>Blue</td>
<td>0.7 mm</td>
</tr>
<tr>
<td>6</td>
<td>Magenta</td>
<td>1.0 mm</td>
</tr>
<tr>
<td>7</td>
<td>White</td>
<td>0.25 mm</td>
</tr>
<tr>
<td>8</td>
<td>Light Grey</td>
<td>0.18 mm</td>
</tr>
</tbody>
</table>

- The SA Water supplied plot style - SA Water Mono.ctb shall be used to ensure compliance with the above requirements. There is a different ctb file for A1 and A3 sheets.

### 6.6 Layers

Layer naming should follow a logical approach and be descriptive but brief. Ideally the layer name should be no more than 20 characters. The same applies to any layer groups created.

Any layer beginning with SAW_ should not be deleted.

Layer 0 should not be used except for the creation of blocks.
6.7 Drawing Scales

Drawings should be scaled as per Australian Standard AS 1100. Otherwise industry accepted scales may be used. Every effort should be made to reduce the number of different scales displayed on a single drawing.

If a single scale is applied for the entire drawing, this shall be clearly indicated at the bottom of the drawing. Individual views with differing scales shall have the scale clearly indicated below the view heading.

6.8 Revisions

All revisions including As Constructed and Issued for Construction shall be recorded in the revision table. Revision clouds and adjacent revision triangles are to be used for the current revision where appropriate. Revision clouds and triangle for previous revisions shall be removed, however the details shall remain in the revision table.

6.9 Preparing CAD files for submission

CAD files shall be prepared as follows prior to submission to SA Water:

- Any drawing model space items not used in the final view shall be deleted,
- All files shall be purged to remove unused items,
- All files shall be audited with “fix errors” enabled,
- All sheets shall be zoomed to extents,
- Any drawings containing XREFS or external drawing references shall be saved through the “E-Transmit “function. Items shall not be bound and a single folder hierarchy shall be used. All file paths shall be relative.

7 Drawing Sheet Information

The SA Water Drawing Sheet or Title Block is designed to capture required information throughout the life of the drawing. As the CAD file itself is a constantly evolving document, SA Water relies on plots, taken at various milestones to record the various revisions to the drawing. As this also provides an audit trail, it is a requirement that all mandatory fields are filled out prior to creating any plots that are to be submitted as a project deliverable.

In order to automate data extraction, all fields shall be entered into the existing set of attributes. To access the attribute table, simply double click on any existing fields, or on the purple text along the bottom of the sheet that reads “DOUBLE CLICK HERE TO EDIT TITLE BLOCK”. This text is on a non-plot layer.

The Title Block can be divided into 3 areas, each capturing different stages of the drawing lifecycle.
7.1 Drawing Information Panel

This area contains all of the information that identifies the drawing, such as Title, number, sheet count etc. The various fields are described as follows:

- **DRAWING NUMBER**: This is the unique identifier for the drawing. It consists of the year, the drawing number and sheet number. All three fields are mandatory and preceding zeros shall be used to ensure that the drawing number has 5 digits and the sheet number has 2.

- **DRAWING TITLE**: This contains information about the drawing and its location. Abbreviations are acceptable providing that they are industry recognised e.g. WWTP for Waste Water Treatment Plant or PRV for Pressure Reducing Valve. The title shall be descriptive and give a clear indication of the location, plant and type of drawing as follows:
  - The first line contains the location of the drawing. The location can also contain asset information such as Pump Station or PRV if required,
  - The second line is the description of the drawing, or element covered by the drawing,
  - The third line is the type of drawing,
  - The fourth line is used for miscellaneous or extra information. Leave blank if not required,
  - The fifth line contains the name of the project under which the drawing is created.

- **DISCIPLINE**: This numerical code refers to the discipline that is covered by the drawing content. The available fields are currently:
  - 01 Other,
  - 02 Mechanical
  - 03 Electrical (Including switchboard layouts),
  - 04 Civil,
  - 05 Structural,
  - 06 P&ID,
  - 07 Site Plan (when multiple disciplines are represented on a site layout),
  - 08 Site Services (Not to be used unless requested),
  - 09 Survey.

- **SHEET COUNT**: This shows the total number of sheets contained within the drawing number. This field shall only be filled out on sheet number 1 of any sheet set. For all subsequent sheets contained within a drawing number, this field shall be left blank. For single sheet drawings, “1” needs to be entered into this field.

**NOTE**: If an existing drawing set is to have a sheet added, then only the Sheet Count on sheet 1 should be modified to reflect the new amount.
- **PROJECT NUMBER**: this is the SA Water project number for which the drawing is created.
- **REVISION**: This displays the current revision of the drawing and shall always reflect the latest revision in the revision table.
- **MAXIMO ID**: This is the Maximo ID of the infrastructure associated with the drawing. This is currently under development, so leave blank if no information is provided by SA Water.
- **SUPERSEDES**: If the drawing is replacing or superseding an existing drawing, then this drawing number is entered here.

### 7.2 Design Panel

This Panel contains all of the information relating to the design of the drawing. This is generally filled in at the completion of the design. The authorised section is generally completed at the “Issued for Construction/Tender” revision. The fields are described below.

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGNED</td>
<td>Use this box to enter the name of the designer and the date of the design.</td>
</tr>
<tr>
<td>DRAWN</td>
<td>Use this box to enter the name of the drafter and the completion date of the drawing.</td>
</tr>
<tr>
<td>REVIEWED</td>
<td>Use this box to enter the name of the reviewer and the date of the review.</td>
</tr>
<tr>
<td>AUTHORISED</td>
<td>The drawing is generally authorised at the “Issued for Construction/Tender” revision. The name of the person authorising and ultimately assuming responsibility for the design is entered along with the date on which the drawing is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer clause 9 for valid signatures), the text “ORIGINAL SIGNED” is to be entered into the signature field and then saved.</td>
</tr>
<tr>
<td>CONTRACTOR</td>
<td>This box contains the company name of the contractor responsible for authorising the design. “SA Water” is to be entered into this field for internal drawings.</td>
</tr>
</tbody>
</table>
7.3 Revision Panel

This panel contains all of the relevant revisions applied to the drawing. Every revision that forms part of a project deliverable shall be authorised.

If the revision table becomes full, then additional revisions can be entered over the top of existing revisions, starting with the earliest.

The various fields are described below.

<table>
<thead>
<tr>
<th>REV</th>
<th>DATE</th>
<th>DRN</th>
<th>DETAILS</th>
<th>APR'D</th>
<th>CURRENT REV AUTHORISED</th>
<th>DESIGN</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>10/09/15</td>
<td>P.H</td>
<td>AS CONSTRUCTED</td>
<td>M.I.</td>
<td>10/09/15</td>
<td>J.JOHNSON</td>
</tr>
<tr>
<td>1</td>
<td>28/05/15</td>
<td>T.B.</td>
<td>ISSUED FOR CONSTRUCTION</td>
<td>P.G.</td>
<td>CURRENT REVISION CONTRACTOR ABC CONTRACTING</td>
<td></td>
</tr>
</tbody>
</table>

- **REV**: This field contains the revision letter or number of the revision being described.
- **DATE**: The date that the revision was drafted.
- **DRN**: The initial of the drafter responsible for the revision.
- **DETAILS**: A description of or brief summary of the revision. With exception of “Issued for Construction/Tender” and “As Constructed”, revisions should also be referred to on the drawing with clouds and triangles. Refer to clause 6.8 for more detail.
- **APR’D**: The initial of the person who has approved the revision. This field is not mandatory.
- **CURRENT REV AUTHORISED**: The name of the person authorising and ultimately assuming responsibility for the revision is entered along with the date on which the revision is authorised. The drawing is to be plotted with the signature field left blank. Once a signature has been applied to the PDF (refer clause 9 for valid signatures), the text “ORIGINAL SIGNED” is entered into the signature field and then saved. Note: The revision authorisation information is only valid for the current revision. Once a new revision is undertaken, the authorisation fields are entered anew.
- **CURRENT REVISION CONTRACTOR**: This box contains the company name of the contractor responsible for authorising the current revision. Note: The contractor information is only valid for the current revision. Once a new revision is undertaken, the contractor fields are entered anew. “SA Water” is entered into this field for internally completed revisions.
8 Drawing Development

The majority of Engineering Drawings produced for SA Water follow the same steps. These steps generally follow a similar sequence and ultimately produce a deliverable (Authorised PDF). There will always be exceptions to this, so it is important that issues are raised early to avoid re-work.

8.1 Step 1: Drawing / Design Development

The first phase is the development of the drawing. This is generally where the design is developed, refined and finalised. Revisions in this phase are alpha only, usually for internal use and unless requested, do not form a project deliverable. “Issued for Concept Design” drawings shall maintain an alpha revision system, even on the final drawings that form the project deliverable. For details on interim revisions, see SA Water’s Representative.

The final outcome (with the exception of concept designs) of this phase is the “Issued for Construction” revision. At this stage all alpha revisions are removed and the “Issued for Construction” Revision becomes revision “1”. All subsequent revisions from this point are numeric. The “Issued for Construction” Revision constitutes a project deliverable and the drawing shall be plotted, authorised and delivered to SA Water’s Representative. Design liability rests with the person who authorises this revision. While “Issued for Construction” appears as a revision, the authorisation is entered in the Design panel, not the revision panel. CAD files are generally not provided to the CADD Coordinator at this stage as they shall be passed on to whoever is going to be responsible for the next stage.

Note: As this revision does not get uploaded to SA Water’s Drawing Management System, the Drawing Transmittal is not required unless requested.
8.2 Step 2: As Constructed

At the end of the construction stage, the drawing is revised up to “As Constructed”. If no changes are made to the “Issued for Construction” drawing during construction, then this is normally revision “2”. If design changes are made during construction, these shall be recorded as revision/s (numerical) and authorised. Any deviations between design and as constructed, that do not require a design change, can be aggregated within the As Constructed revision.

The “As Constructed” Revision constitutes a project deliverable and the drawing shall be plotted, authorised and delivered to SA Water’s Representative in PDF format. In addition to the Authorised drawings, SA Water also requires that the CAD files are delivered.

8.3 Step 3: Ongoing Revisions

Any modifications made to the drawing throughout its life shall be recorded as a revision. Refer to clause 6.8 for information on revision clouds. Each revision shall be authorised when completed and delivered to SA Water’s Representative or the CADD Coordinator: Engineering.Projects@sawater.com.au if modified outside of a project. Refer to clause 7.2 for information on filling out the revision table.

8.4 Obsolete Drawings

Occasionally a drawing is no longer required, due to infrastructure being removed, or superseded by another drawing. When this occurs, the drawing is given one last revision “X”. The description shall state the reason why the drawing is no longer required. In addition to this, 50 mm high text shall be placed on each drawing sheet in a prominent location (usually the centre of the drawing sheet), that states either “DRAWING OBSOLETE” OR “SUPERSEDED BY: enter new drawing number”. All obsolete drawings shall be submitted with the CAD Return form.

If the drawing being made obsolete or superseded, is part of a sheet set, then the sheet allocation for the remaining drawings stay in place.
9 Plotting and Authorising Drawings

As the CAD file is an evolving document, all authorisations and signatures are applied to a plot at key milestones. All signed drawings shall be provided to SA Water in PDF format. Hard copy drawings will not be accepted unless through prior arrangement with the CADD Coordinator. All signatures shall be entered in the Signature portion of the relevant area of the title block. The authorised details such as name and date shall also be completed.

A drawing is not authorised until it contains a valid signature and the identification of whoever is signing the drawing. There are two acceptable methods of signing that SA Water recognises.

9.1 Digital Signatures

Digital Signatures are the preferred method and by far the easiest and most secure way to sign a drawing. They can be applied by most PDF authoring software.

An important distinction between digital signatures and electronic signatures is that the latter are not validated for authenticity. An electronic signature is simply an electronic representation of somebody's autograph; a digital signature contains a unique digital ID to verify its authenticity. As the PDF should be locked to prevent any changes, it is important that the drawing is presented in the correct orientation.

Most PDF authoring software can create and validate signatures from self-signed certificates, which is acceptable for certification that occurs within organisations or among trusted parties. SA Water also allows the use of commercially available certificates that can be purchased from third party providers; however this is not a requirement.

The digital signature shall contain an image of the authoriser’s signature. The name, date and other details are optional, as these details are captured elsewhere within the title block.

9.2 Wet Pen Signing

SA Water currently accepts wet pen signatures which are then scanned to PDF. This method requires that the drawing is plotted to full sheet size, signed and then scanned. The scan quality shall be of sufficient quality so that the drawing can be reproduced at A3 size and all line work and text is clear and legible.

9.3 Plotting

Drawings to be plotted should use “SA Water Mono.ctb” file to ensure that all line weights are set. If plotting to PDF format, then the DWG To PDF.pc3 should be used. This ensures that the drawing is in the correct orientation and that layer information is exported to the PDF.

9.4 Authorising Revisions to Existing Drawings

In many instances an existing drawing on an old title block shall be modified. Some old title blocks do not have sufficient fields to properly capture a revision authorisation. In this instance and providing there is no requirement to migrate the drawing into the current Title Block, a block shall be inserted into the CAD file: “A1 (or A3)Revision Authorise Block.dwg”. It is preferable that it is located near the pre-existing revision section of the title block if the drawing allows. The block is to be entered as per clause 7.3.
10 Submission of Files to SA Water

All Engineering drawing information provided to SA Water shall comply with certain file formats, naming conventions and be contained in a pre-defined folder structure. Any information that does not meet these criteria will be rejected.

Drawing packages can be emailed or provided on CD, DVD or USB. In the first instance they should be provided to SA Water’s Representative, who is responsible for checking and passing on to the CADD Coordinator.

All email correspondence, including drawing submissions, shall have the project number (if applicable) included in the subject line. All DVD’s / CD’s shall be clearly labelled with the project number and project name.

10.1 File Formats

- All CAD files shall be saved as an AutoCAD® 2014 Drawing (.dwg) format. Earlier release versions are acceptable if working on an earlier version. Any drawings containing X-REFS shall be supplied as a ZIP file. Refer to clauses 4.1 and 4.2 for additional information on E Transmit and other CAD packages.
- All authorised drawings shall be submitted in PDF format.
- All Drawing Transmittals and request forms shall be submitted to SA Water in the same format as they were provided by SA Water.

10.2 File Names

10.2.1 Single Sheet CAD Files

The following format is to be used for single sheet CAD files: YYYY-NNNNN-SS.dwg where Y=Year, N=Drawing Number and S=Sheet Number. All fields shall be used, with zeros substituting missing digits (e.g. 2015-00123-01.dwg is a valid drawing filename; 15-123-1.dwg is not).

10.2.2 Multiple Sheet CAD Files

The following format is to be used for multiple sheet CAD files: YYYY-NNNNN.dwg where Y=Year and N=Drawing Number. All fields shall be used, with zeros substituting missing digits (e.g. 2015-00123.dwg is a valid drawing filename; 15-123.dwg is not).

10.2.3 Authorised PDF’s

The following format is to be used for all PDF files: YYYY-NNNNN-SS_R.pdf where Y=Year, N=Drawing Number, S=Sheet Number and R=Revision. All fields shall be used, with zeros substituting missing digits, except for revision (e.g. 2015-00123-01_2.pdf is a valid drawing filename; 15-123-1_02.pdf is not).
10.3 Folder Structure

All files shall be contained within a folder named “CXXXX Drawing Submission”, where CXXXX is the project number (if applicable). Located within this folder can be the Drawing Transmittal and up to 3 subfolders depending on what is being submitted to SA Water (no empty folders permitted). The subfolders can be any combination of the following:

- **“CAD” Subfolder**: All CAD files covered by this standard shall be located within the root of “CAD” (no subfolders).
- **“PDF” Subfolder**: All PDF files covered by this standard shall be located within the root of “PDF” (no subfolders).
- **“CHECKED IN” Subfolder**: Any drawing/s previously checked out by SA Water, that have been modified and are ready to be checked in shall be placed in this folder along with the CAD File Request / Submission form covering the checked in drawings only. Obsolete and superseded drawings are to be included in this clause. Authorised PDF’s that are created from any modified CAD files are to be located in this folder along with any modified CAD files.

The drawing submission folder can be compressed as ZIP format at the top level only, to allow it to be attached to an email.

11 Drawing Transmittal

The final submission of Engineering Drawings (CAD and PDF) to SA Water shall have an accompanying Drawing Transmittal. This acts as a record of what has been delivered and as an aid to upload the information into DataViewer® (document storage utility). As DataViewer has certain requirements, it is critical that information is entered into the spreadsheet as indicated and that the format is not altered.

NOTE: The Drawing Transmittal is for Engineering Drawings only. Drawings not covered by this Technical Standard may have different submission / approval requirements.

Refer to Appendix –A Drawing Transmittal for details on populating this document.
## Appendix A Drawing Transmittal


The file shall be supplied as an Excel spreadsheet.

The sample below shows the typical layout that is expected. The first entry shows the format required, while the second line shows a simulated entry. The third line shows how to display unused drawing numbers.

**NOTE:**

- All drawing sheets shall be a separate entry/line in the transmittal, regardless of if they share the same drawing number.
- There shall be a space either side of the dash separating each title element.
- The document is formatted to capture the information in such a way as to make it compatible with other systems. Altering the formatting will render the document unusable.
- The document shall be returned as an unlocked Excel document.
- The filename is the filename of the authorised PDF and associated CAD file and shall include the .pdf or .dwg extension.
- If a new drawing created is superseding an existing drawing, the old drawing number shall be entered in the “SUPERSEDES” field, otherwise leave blank.

### Drawing Transmittal

<table>
<thead>
<tr>
<th>TITLE / DESCRIPTION</th>
<th>YEAR</th>
<th>DRAWING NO</th>
<th>SHEET</th>
<th>REVISION</th>
<th>DISCIPLINE</th>
<th>PDF FILENAME</th>
<th>CAD FILENAME</th>
<th>SUPERSEDES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROJECT LOCATION - PROJECT ELEMENT DESCRIPTION - DRAWING TYPE - MISC INFORMATION - PROJECT NAME - PROJECT NUMBER</td>
<td>YYYY</td>
<td>NNNNN</td>
<td>SS</td>
<td>R</td>
<td>D</td>
<td>YYYY-NNNNN-SS_R.PDF</td>
<td>YYYY-NNNNN-SS.DWG</td>
<td></td>
</tr>
<tr>
<td>MOLLIE AVE, ENCOUNTER BAY - VENTILATION &amp; BUILDING MODIFICATIONS LAYOUT - PLAN &amp; DETAILS - ENCOUNTER BAY PUMP STATION UPGRADE - C1234</td>
<td>2015</td>
<td>00123</td>
<td>01</td>
<td>2</td>
<td>2</td>
<td>2015-00123-01_2.PDF</td>
<td>2015-00123-01.DWG</td>
<td></td>
</tr>
<tr>
<td>UNUSED</td>
<td>2015</td>
<td>00124</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix B  Drawing Number Request Form

To request drawing numbers, the Drawing Number Request form shall be completed and emailed to Engineering.Projects@sawater.com.au.


<table>
<thead>
<tr>
<th>Request For Drawing Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of drawings required</td>
</tr>
<tr>
<td>Name of requestor</td>
</tr>
<tr>
<td>Name of recipient</td>
</tr>
<tr>
<td>Company name recipient works for</td>
</tr>
<tr>
<td>Project title</td>
</tr>
<tr>
<td>Capital number of project [XXXX]</td>
</tr>
<tr>
<td>Anticipated project completion date</td>
</tr>
</tbody>
</table>

When determining how many drawing numbers are required please consider:

- **Can sheet numbers be used** – A project may be broken down into its individual engineering component. For example a new pumping station may involve civil works/site preparation, the building, security, pumps, pipe-work, switch-boards, P&ID etc. Each of these components would have one drawing number and if necessary a series of sheets sufficient to cover the amount of drawings required for that component up to a maximum of 99 sheets.

- **Manufacturer’s drawings** – The project may include a proprietary manufactured item such as a pump set. These drawings contain information that would not be generally captured in For Construction/As Constructed drawings such as component list which is necessary for operation and maintenance of the unit. Therefore the number of proprietary drawings that are to be provided need to be included in the overall total of drawing numbers required for the project. Proprietary drawings are to be presented with all As Constructed drawings and must contain the appropriate drawing number. By making an allocation in the group of drawing numbers for proprietary drawings means all drawings associated with the project will be grouped together when loaded into Dataviewer.
Appendix C  CAD Request / Submission Form

To request existing CAD files or submit previously checked out CAD files, the CAD File Request / Submission form shall be completed and emailed to Engineering.Projects@sawater.com.au.


The form has two states that are controlled by radio buttons. These select the relevant fields that are required depending on if CAD files are being requested or returned

**C1  CAD File Request (Check Out)**

- CAD files that need to be modified will be “Checked Out” to the requestor. These shall be “Checked In” when they are finished.
- In instances of multiple file matches, if no revision is specified, then the file with the latest modified date shall be supplied.
- All drawings and sheets requested shall be entered as individual line items. If no sheet number is specified and the search returns multiple sheets, then sheet 1 will be provided.
- If a CAD file or ZIP archive contains multiple sheets, the entire CAD file and all sheets will be “Checked Out” even if all of the sheets are not required.

**CAD FILE REQUEST / SUBMISSION FORM**

<table>
<thead>
<tr>
<th>Project Number: C1234</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name: Pump Station Upgrade</td>
</tr>
<tr>
<td>Date: 10/11/15</td>
</tr>
<tr>
<td>Name: Paul Hawthorne</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Revision</th>
<th>Drawing to be Modified (Y/N)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-00123-02</td>
<td>2</td>
<td>Y</td>
</tr>
<tr>
<td>99-12345</td>
<td></td>
<td>N</td>
</tr>
</tbody>
</table>
C2 CAD File Submission (Check In)

- Every Checked Out drawing shall be checked back in as an individual line item.
- If a single CAD file containing multiple sheets is being returned, all sheets shall be checked in, even if they were not modified.
- If no changes have been undertaken, then “NO CHANGE” shall be entered in the Revision column. In this instance, the CAD file and PDF do not need to be supplied back to SA Water.
- If the drawings has become obsolete, or has been superseded by another drawing(s), the new drawing number(s) (if superseded) shall be entered in the “SUPERSEDED BY” field. If the drawing is now obsolete, “OBSOLETE” shall be entered. If the drawing is still for use, leave this field blank. Details of the superseding drawing should be included in the Drawing Transmittal form for all new drawings.

<table>
<thead>
<tr>
<th>Drawing Number</th>
<th>Revision</th>
<th>PDF FILENAME</th>
<th>CAD FILENAME</th>
<th>SUPERSEDED BY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012-00123-02</td>
<td>3</td>
<td>2012-00123-02_3.pdf</td>
<td>2012-00123-02.dwg</td>
<td></td>
</tr>
<tr>
<td>99-12345</td>
<td>NO CHANGE</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D  Requirements for SA Water’s Representatives

This section is intended for SA Water’s Representatives who are responsible for delivering project related drawings to the CADD Coordinator.

D1  Network/GIS and Engineering Drawings

Engineering drawings (PDF) are currently stored in DataViewer, while most other types excluded in the Scope section are stored in the SA Water Geographic Information System (GIS). Engineering acts as the custodian for all CAD files regardless of whether they are covered by this standard or not. If a project contains some drawings that are covered by this standard and some that are not, it is the responsibility of the SA Water Representative to separate these drawings and forward them on to the relevant parties as per the below points.

As this standard is only directly applicable to Engineering drawings, the SA Water Representative shall:

- Ensure that the relevant parties within SA Water receive any drawings not covered by this standard (refer clause 0 – Scope).
- Ensure that any drawing package submitted to the CADD Coordinator only contains drawings covered by this standard (refer clause 0 – Scope).
- Forward on to the CADD Coordinator Engineering.Projects@sawater.com.au any Non Engineering CAD files that have been received. A drawing transmittal is not required for these CAD files however they shall still conform to the naming convention set out in this Technical Standard. The delivery of these files shall be separate from the drawing submission discussed in clause 10 of this document.

D2  Design and As Constructed Drawings (PDF)

Currently DataViewer is set up only to store and distribute As Constructed information. To this end, the CADD Coordinator should only receive the final set of As Constructed PDF’s and the associated CAD files. All intermediate revisions such as “Issued For Construction” and any design changes before the drawing is issued and authorised “As Constructed” are to be stored within the project space and not submitted to the CADD Coordinator.

D3  Design and As Constructed Drawings (CAD)

Unless prior arrangements are made, no CAD files for uncompleted projects are to be delivered. The SA Water Representative is responsible for ensuring that the CAD files are transferred from the Design Drafter to the Construction Drafter. Project Server/SharePoint should not be used to store CAD files due to possible corruption of data.

D4  Operational Handover Check Sheet Sign Off

Project signoff will only occur when the requirements of this standard have been met.

The project signoff form should be supplied with the drawing package.

All drawings shall be submitted to Engineering.Projects@sawater.com.au

If a non-conformance warranting rejection is found, whoever submitted the drawings will be notified by email with a list of issues to be rectified.

Please allow up to 7 working days for compliance checking after which the project can be signed off, or the drawings returned for re-work.
## Appendix E City and Regional Drawing Number Allocation

### City and Regional Drawing Number Allocation Table

<table>
<thead>
<tr>
<th>Category</th>
<th>Number Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial &amp; Business Development</td>
<td>00001 to 02999</td>
</tr>
<tr>
<td>(Including PMP) Metro region</td>
<td>05000 to 09999</td>
</tr>
<tr>
<td></td>
<td>30000 to 31999</td>
</tr>
<tr>
<td>Water, Wastewater Infrastructure</td>
<td>03000 to 04999</td>
</tr>
<tr>
<td>Accommodation</td>
<td>15001 to 20000</td>
</tr>
<tr>
<td>Outer Metro Region</td>
<td>22001 to 29999</td>
</tr>
<tr>
<td>Riverland region (RMO)</td>
<td>32001 to 35000</td>
</tr>
<tr>
<td>Riverland Region (Berri)</td>
<td>36001 to 39000</td>
</tr>
<tr>
<td>Northern Region (Crystal Brook)</td>
<td>40001 to 43000</td>
</tr>
<tr>
<td>Eyre Region (pt Lincoln)</td>
<td>45001 to 48000</td>
</tr>
<tr>
<td>South East Region (Mt Gambier)</td>
<td>50001 to 53000</td>
</tr>
<tr>
<td>Engineering Survey Group</td>
<td>55001 to 58000</td>
</tr>
<tr>
<td>AllWater</td>
<td>66001 to 70000</td>
</tr>
</tbody>
</table>