

TECHNICAL STANDARD**REQUIREMENTS FOR TECHNICAL DRAWINGS**

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The currency of these Standards should be checked prior to use.


APPROVAL TO DEVIATE FROM THIS STANDARD

Approval may be granted by the Asset Owner to deviate from the requirements as stipulated in this Standard if the functional requirements (e.g. Asset Life) for the asset differs from those stated in the Standard, but is assessed as still being acceptable by the Asset Owner's nominated representative.

Any approval to deviate from the stated requirements of this Standard will not be seen as creating a precedent for future like project. Any request to deviate from this Standard must be carried out on a project by project basis where each alternate proposal will be individually assessed on its own merit.

MAJOR CHANGES INCORPORATED IN THE JULY 2011 EDITION

The February 2010 edition of TS95 has been modified to reflect the changes to the drafting procedures and drawing sheets issued August 2011.

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Section 1: Scope

This Technical Standard (TS) details the Computer Aided Design & Drafting (CADD) standards that apply to all civil, structural, mechanical, electrical, engineering survey and Water / Wastewater Network type drawings produced for SA Water. Whether in-house, by consultants or contractors for any of the following purposes:-

- Intended to be a drawing kept in SA Water's plan system.
- Drawings forming part of a specification for tender or quotation.
- Drawings forming part of an SA Water standard.
- For Construction.
- As Constructed.

This document **DOES NOT** cover the preparation of design plans for the Water, Wastewater and Recycle drawings or for the provision of Water Construction Manual (**Blue Book**) and the SA Water Sewer Construction Manual (**Red Book**) standards drawings.

Adherence to this standard ensures that drawings of SA Water facilities are consistent and accessible.

This document is available on the SA Water website under www.sawater.com.au/SAWater/DevelopersBuilders/EngStandardsGuidelines/Standards.htm

For Water, Wastewater and Recycle drawing standards refer to TS-???

For Water Construction Manual drawings standards refer to TS-???

For Wastewater (Sewer) Construction Manual drawing standards refer to TS-???

Section 2: General

2.1 DRAWINGS

All drawings shall be produced by means of a CADD system capable of producing Cadd files in .dwg format unless otherwise approved.

All drawings to be submitted to SA Water shall be in AutoCAD version 2004 - 2008 file format.

Methodology and practice in relation to AutoCAD usage shall conform to this document.

2.2 QUALITY / STANDARDS

All Drawings produced shall be in accordance with AS 1100, AS 1101, AS 1102, AS 60417, AS 3702, AS 4383 and HB7 as applicable. The requirements of this document will take precedence over other standards unless otherwise specified in this document or there is safety or legal issues in which case the matter shall be brought to the attention of SA Water.

All abbreviations and units shall be in accordance with AS 1000. Dimensions shall be in metric units.

2.3 COPYRIGHT AND INTELLECTUAL PROPERTY

SA Water shall own the copyright and intellectual property of all drawings required to be produced for SA Water in accordance with TS 95.

Section 2: General

2.4 INFORMATION SUPPLIED BY SA WATER

Those producing drawings for SA Water shall request the following:-

- CADD drawing sheet templates in .dwg format. (Version 2000 Format)

Contact the Cadd Department in the Infrastructure Delivery section of Planning & Infrastructure: (E-mail Engineering.Department@sawater.com.au)

- Block of drawing numbers sufficient to accommodate the needs of the project or contract (Drawing sheet numbers may be used and is limited to 99 **sheets** per drawing number).

Explanation.

Sheet numbers would generally be used when a number of engineering disciplines are associated with the same project. E.g. a new pump station may have one drawing number for (civil) earth works, one number for building (structural), one number for pipe work (Mechanical), one number for switchboards (electrical) etc. All of these numbers would have associated sheet numbers with them.

NOTE!

It is therefore expected that a numbering discipline be employed to reflect the nature of the work being drafted.

e.g. 1. Mechanical, electrical, structural, civil disciplines of the same project are allocated separate numbers.

(i.e. Project 'X' Mechanical 2011-00001-01 to 2011-00001-99

Civil 2011-00002-01 to 2011-00002-99)

e.g. 2. Different physical areas of plant for the same discipline and same project are allocated separate numbers.

(i.e. Project 'X' Mechanical, Pump Station 2011-00005-01 to 2011-00005-99

Mechanical, Blower Room 2011-00006-01 to 2011-00006-99)

and, if equipment manufacturer's drawings and other similar type third party drawings, (e.g. :- pump/valves/motors, etc.) details are required to form part of the set of drawings for the project, then these will also need to be considered when calculating the size of the block of drawing numbers required for the project.

- These drawings shall be allocated an appropriate number and added to the drawing list and submitted to SA Water as part of the set for the contracted work. The drawing numbers will be placed on the drawings by SA Water prior to scanning if not already printed correctly.

Section 2: General

2.4 INFORMATION SUPPLIED BY SA WATER (CONT.)


- All drawing number blocks where possible shall be in sequence for a contract.

In the case of Regional Contracts, where the Capital or Operational project is managed by the region and the drawings are produced in that region, the drawing numbers are to be sourced from an allocated block of numbers issued to the particular region or branch for which the drawings are being produced. (i.e.:- Crystal Brook for Northern Region).

For Adelaide Metro Projects and Regional Projects handled by the Adelaide office, the Project Manager assigned to the project will be responsible for obtaining the required block of drawing numbers from SA Water's Adelaide Plan Room.

(E-mail Engineering.Department@sawater.com.au)

The Project Manager will then provide the numbers to whom they have engaged to produce the required drawings for the project.

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Section 3: Deliverables

3.1 GENERAL

All drawings shall be produced and submitted using the electronic drawing template provided by SA Water.

Drawings submitted, printed on Contractors sheet templates will not be accepted.

Both an electronic CADD file and a **signed** original (not reproduced) hard copy of each drawing shall be provided for inclusion in SA Water's plan index system at the following times:-

- 'As Constructed' release.
- All Amendments.

At completion of the project, the signed original hard copies of the 'AS Constructed' drawings ONLY along with an electronic copy (in .dwg format) of ALL revisions to date of each drawing shall be provided to the **Engineering Support Manager**.

Drawings shall be individually identified on a Transmittal document. (Drawing numbers not used shall be clearly identified as such). A copy of the Project Brief clearly defining the Scope of works shall be provided to enable the full set of drawings to be audited for completeness against all engineering disciplines.


Prior to sign off on the Project Operational Handover Checklist (Form CPMM302) by the Engineering Support Manager, all 'As Constructed' drawings will be checked for compliance to this standard (TS-95)

3.2 CADD FILES

3.2.1 Completed Drawing Clean-up

Prior to submission of Final or As Constructed drawings to SA Water;

- All files shall be edited to remove all entities in "Model space" which do NOT form part of the final design.
- All files shall be purged to remove all irrelevant blocks, layers, text styles, etc. through use of the AutoCAD "**Purge**" command.
- All files shall be checked for errors using the AutoCAD "**Audit**" command (with the file opened) and any encryption or passwords removed.

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Section 3: Deliverables Cont.

3.2.2 “As Constructed Drawings”

CADD files shall be provided on a CD containing the following:-

- One single file per drawing number.
 - When using paper space tabs, each tab is to be labelled with the sheet number.
 - If the drawing requires more than one file then a folder containing all drawing files is to be provided.
- The name of the folder shall be made up of the Project Title and Project Number and the File is to be named using the drawing number, in the following format :-
YYYY-NNNNN
Where YYYY is the year, NNNNN is the drawing number.

Every DRAWING NUMBER shall be saved as a unique file.

Drawings containing sheets, (e.g. 2010-10000-01 to 2010-10000-45) would be saved as a file named 2010-10000.dwg

- When creating the file, “AutoCAD” **E_Transmit** (Refer **FIG. 1**) shall be used to compile the drawing folder. (ZIP file)
This will capture ALL files used in the production of the submitted drawing.
This is the preferred method for SA Water deliverables.

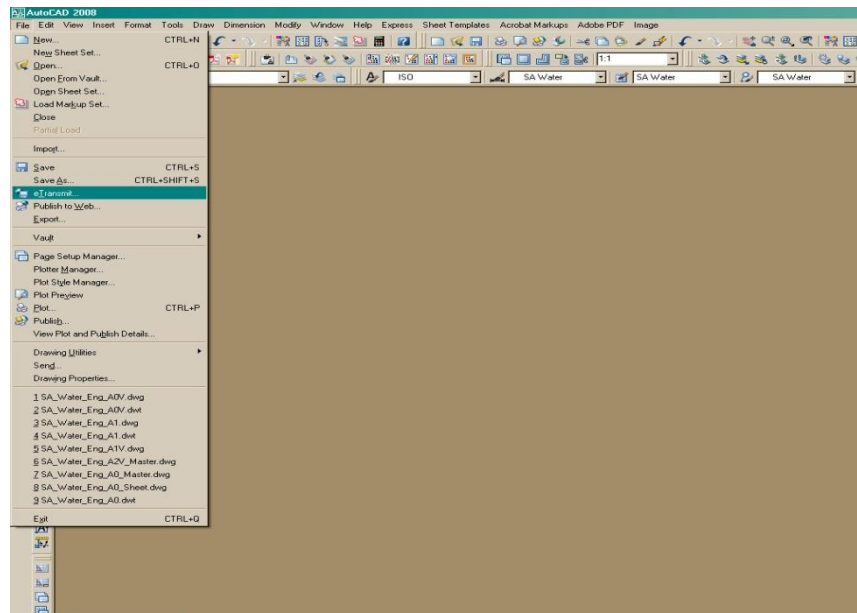


FIG. 1

Section 3: Deliverables Cont.

However only if the “E_Transmit” command is not available, then the drawing file will be placed in a folder, (Named the drawing number) and all files used in the production of the drawing file, (e.g. symbols, line styles, shape files, text fonts, blocks, X-references, plotting styles etc.) shall be placed in a dedicated folder appropriately named and placed under the drawing folder.

3.3 HARD COPY

Hard copy drawings shall be provided in accordance with the following:-

- Signed, (Wet pen signature)
- Printed in black and white with the SA Water Logo Panel in colour.

If the project requires that the drawing be printed in colour, then only the body of the drawing is to be in colour. (The drawing sheet shall be black and white with the SA Water Logo Panel in colour.

- High quality and fully legible.

Hard copies shall be supplied as follows:-

- One set of full size prints (printed to actual size drawn)
e.g. A3 printed as A3, A1 printed as A1 (not bound).
- Additional sets of prints may be requested depending upon project requirements.
- Printing :-
All drawings are to be printed on the SA Water sheet, using the correct line weights for the sheet. (Plot file supplied)

The SA Water sheet template shall be printed in black and white except for the SA Water Logo which is in colour. (AutoCad colours 104 and 160)
(See Appendix 2, Page 29)

Section 4: Drawing Standards

4.1 GENERAL

The Standard Drawing Sheet Template (.dwt) files contain layer definitions, text & dimension style definitions and the standard drawing sheet frame and title block. The layer definitions are set in Layer groups. (Refer FIG. 2)

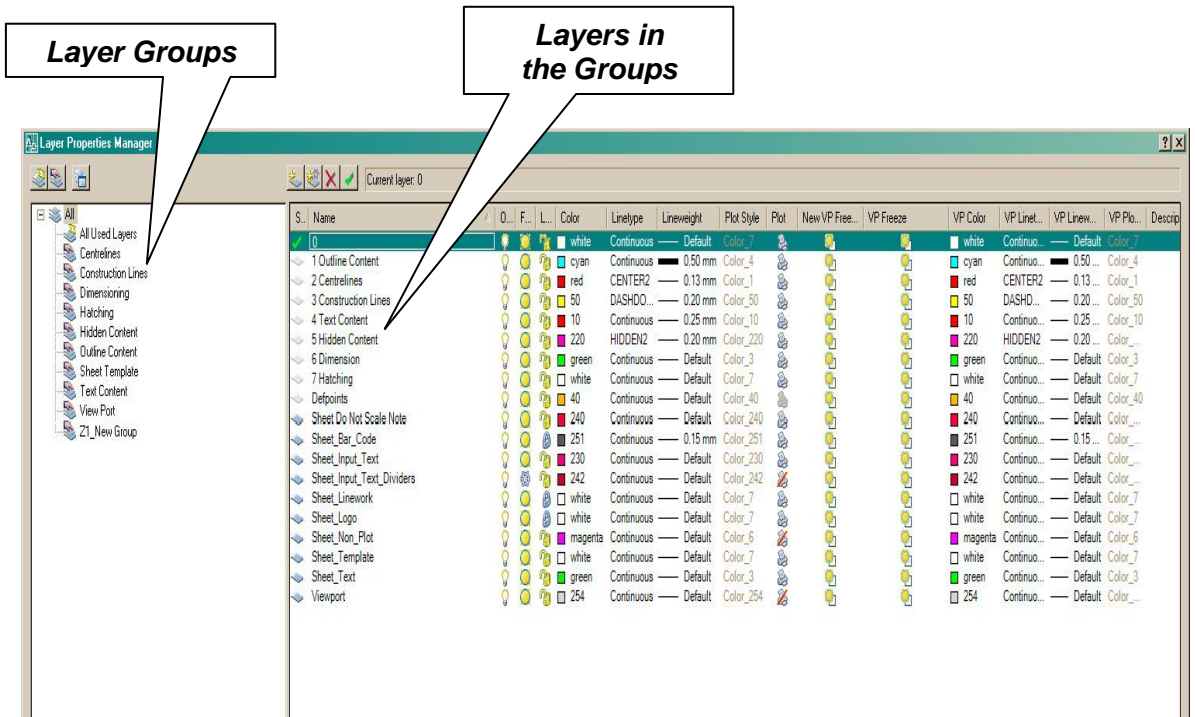


FIG. 2

The text & dimension styles are set in the loading of the template and will appear in the pull downs. (Refer FIG. 3)

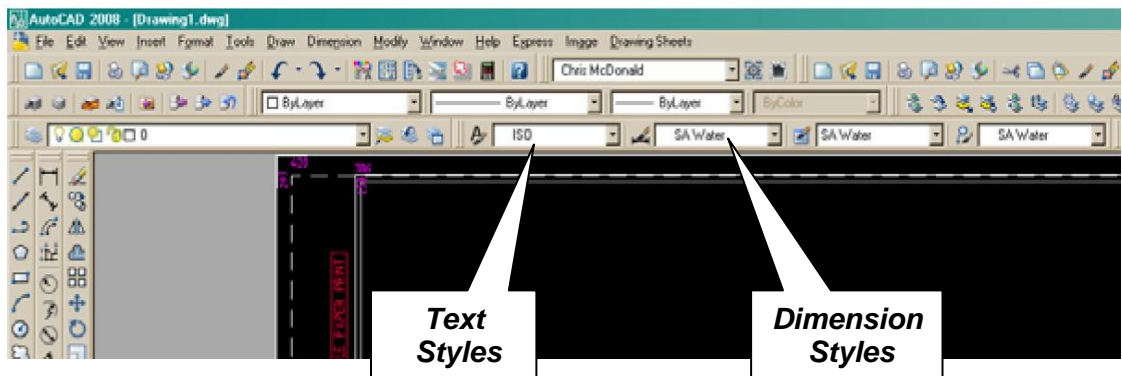


FIG. 3

Section 4: Drawing Standards Cont.

4.1 GENERAL CONT.

The standard drawing sheet frame & title block contains variable fields defined using AutoCAD “Attributes” for the information input, and should **NOT** be renamed or exploded.

The fields are shown in Appendix 1, Page 28 and shall be completed as per clause 4.4 TITLE BLOCK of this document.

4.2 SHEET SIZES

The drawings shall be A1 or A3 size unless otherwise approved.

When drawings sheets larger than A3 are used, the drawings shall be clearly legible when reduced to A3. (reduction to A3 size should only be done for presentation purposes)

4.3 DRAWING SHEETS

4.3.1 Supply and Use.

SA Water will supply the standard drawing sheet (both A1 and A3 complete with associated files) as a template file on request.

The drawing sheets (templates) provided shall be used as they have been presented and shall **NOT** be exploded or changed in any way.

SA Water may supply alternate drawing sheet templates for use on specific projects on request.

Associated files such as .ctb and .shx files shall be used and need to be placed in the appropriate folder in AutoCAD to be read.

Section 4: Drawing Standards Cont.

4.4 TITLE BLOCK CONT.

4.4.1 Drawing Information Panel

The drawing number panel consists of 6 sections. (Refer **FIG. 5**)

1. Drawing Number Panel.
2. Sheet Number Totalisation Panel.
3. Sheet Size Panel.
4. Revision Number Panel.
5. Project Number Panel.
6. Docket Number Panel.

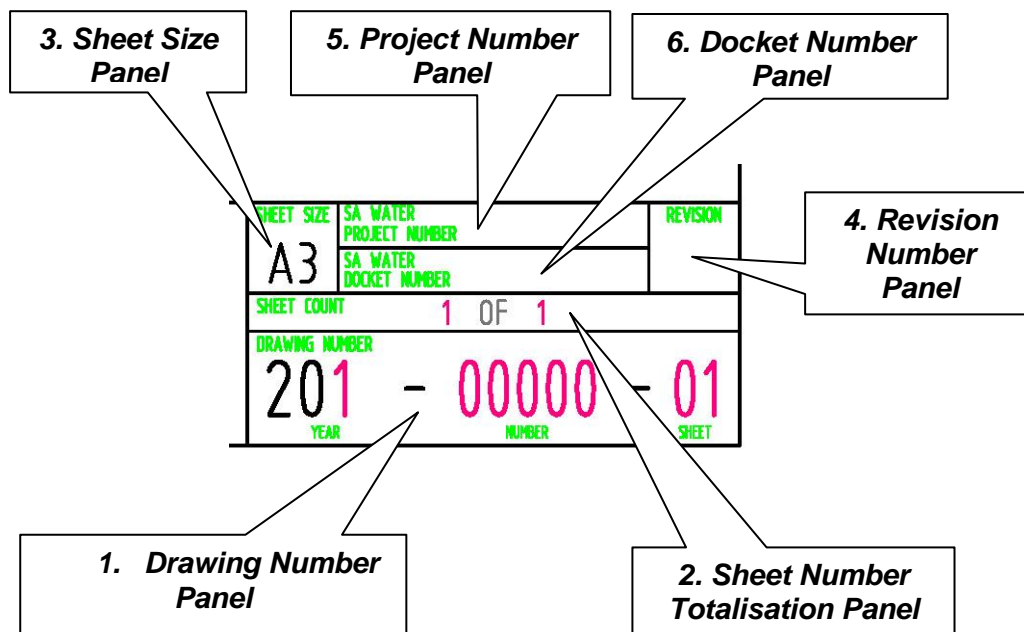


FIG. 5

4.4.1.1 Drawing Number Panel

The numbering system for drawings used by SA Water is as follows:-

Example 2010-00000-01 (The numbers in **MAGENTA** are editable)

- Where
- (1) 2010 indicates year.
 - (2) 00000 indicates drawing number.
 - (3) 01 indicates a sheet number in the drawing number set.

- Drawings that are too large to fit on to a single sheet or form part of a series of drawings shall be spread over a number of drawings each with a unique **SHEET** number, refer also 4.4.1, Page 16.

Section 4: Drawing Standards Cont.

4.4 TITLE BLOCK CONT.

4.4.1.2 Sheet Number Totalisation Panel

Drawings can have multiple sheets to form a drawing number set.

e.g.: 2010-00000-01 to 2010-00000-10.

01 to 10 is the sheet set of drawing number 2010-00000.

These drawings will then have a series number shown in the Sheet Number Totalisation Panel of the title block.

(e.g. Sheet Number “x” of “y”)

(see FIG. 6)

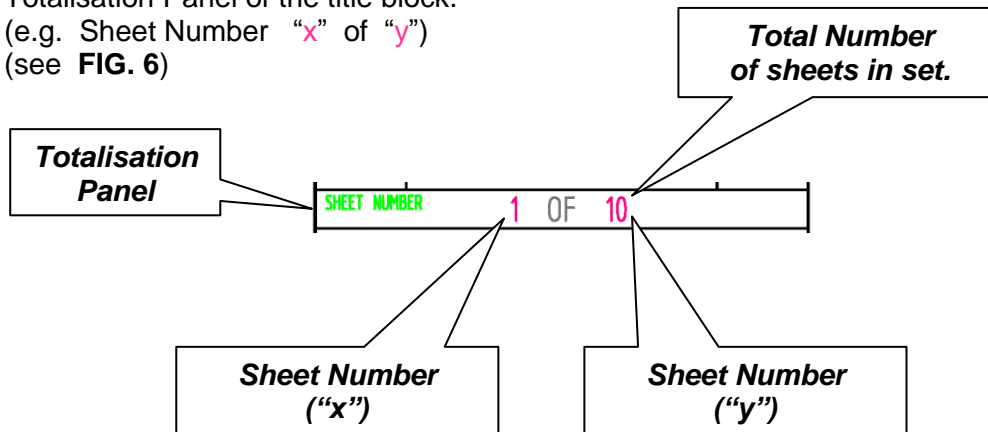


FIG. 6

4.4.1.3 Sheet Size Panel

The sheet size panel denotes the size of sheet being used.

(e.g. A3)

This panel is **NOT** editable.

4.4.1.4 Revision Number Panel

This panel is for the Revision version of the drawing and is editable via the attribute table. (Refer Appendix 1, Page 28)

This, either letter or number, is to be the same as the last shown revision (letter or number) in the Revision Panel. (Refer FIG. 11, Page. 20)

4.4.1.5 Project Number Panel (SA WATER PROJECT NUMBER)

The SA WATER Project Number (when known) shall be placed in the Project Number Panel on the drawing sheet. (Refer FIG. 5, Page. 15)

This field is editable via the attribute table. (Refer Appendix 1, Page 28)

Section 4: Drawing Standards Cont.

4.4 TITLE BLOCK CONT.

4.4.1.6 Docket Number Panel (SA WATER DOCKET NUMBER)

The SA WATER Docket Number (when known) shall be placed in the Docket Number Panel on the drawing sheet. (Refer **FIG. 5**, Page 17)

This field is editable via the attribute table. (Refer Appendix 1, Page 28)

4.4.2 Drawing Title Panel

The drawing title panel consists of 5 lines. (Refer **FIG. 7**)

These lines are all editable via the attribute table. (Refer Appendix 1, Page 28)

1. Project Name. (Top line)
2. Project Location. (Line 2)
3. Project element description. (Line 3)
4. Drawing Type. (Line 4)
5. Miscellaneous Information. (Line 5)

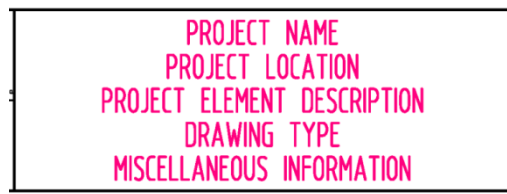


FIG. 7

The appropriate information shall be entered into the appropriate lines in the attribute table. (Refer **FIG. 8** for an example)

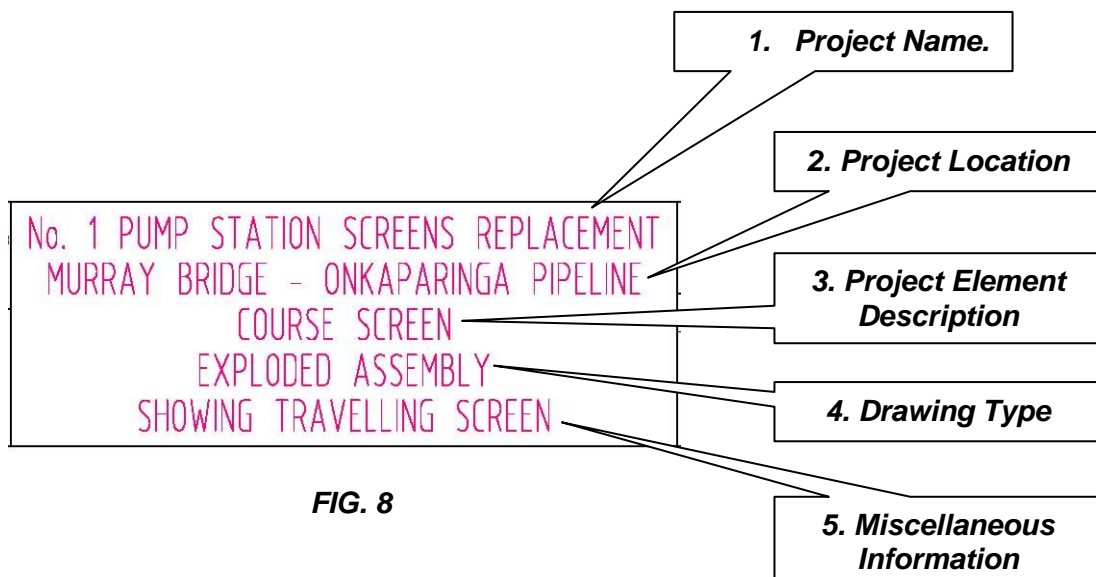


FIG. 8

Section 4: Drawing Standards Cont.

4.4 TITLE BLOCK CONT.

4.4.3 SA Water Logo Panel (FIG. 9)

This logo panel is on a locked layer and shall not be removed or altered in any way.

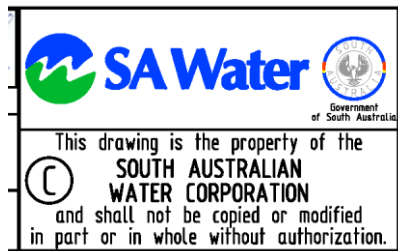


FIG. 9

4.4.4 Drawing Authorization Panel

The drawing authorization panel consists of 3 sections. (Refer FIG. 10)

1. Drawing Authorization Panel.
2. Drawing Participants Panel
3. Contractor Company Name panel.

The drawing authorization panel is a table with three main sections indicated by callouts: 1. Drawing Authorisation Panel, 2. Drawing Participants Panel, and 3. Contractors Company Name Panel. A separate callout for 'Wet Pen Signature & Date' points to the signature and date fields in the authorization section.

DESIGNED	J.S.	01-12-09	AUTHORIZE	
DRAWN	F.T.	10-12-09	SIGNATURE	/ /
REVIEWED	M.S.	15-12-09		DATE
	INITIALS	DATE	PRINT NAME	
CONTRACTOR/COMPANY NAME:				
CONTACT DETAILS:				

FIG. 10

Initials of designer, drafter and reviewer and dates shall be inserted in the Drawing Participants Panel via the attribute table, (See Appendix 1, Page 28)

Section 4: Drawing Standards Cont.

4.4 TITLE BLOCK CONT.

4.4.4 Drawing Authorization Panel Cont.

Company Name and contact phone number shall be inserted in the Contractor's Company Name Panel via the attribute table, (See Appendix 1, Page 28)

- Authorisation

All drawings shall be authorised, (signed), at the "For Tender" release of the project. If the project does not require "For Tender" drawings, then the requirement will apply to the "For Construction" release of the drawings.

The authorisation process consists of a wet pen signature, with the name of the signatory clearly printed and dated in the Authorisation Panel of the title block.

It shall be noted as a numeric revision at this level release starting at rev.1 which appears in the revision number panel and the revision panel of the title block. (See **FIG. 10** Page 18)

Unauthorised drawings shall **NOT** be released "For Tender" or "For Construction".

After the authorised release and at the next revision stage the name of the original signatory shall be entered (electronically) into the PRINT NAME Panel via the attribute table, (See Appendix 1, Page 28)

Responsibility for the accuracy of the content of the drawing is that of the company that has produce the drawing(s) and therefore the authorising signature (wet pen signature) on the drawing shall be that of the nominated representative of that company.

When a drawing is revised the company that revises the drawing (this may or may not be the company that produced the original drawing) is required to place the name of the company in the REVISIONS area (far left hand side) of the title block. They are also required to sign the revision note and clearly print their name in the appropriate panels of the revisions area.

Section 4: Drawing Standards Cont.

4.4 TITLE BLOCK CONT.

4.4.5 Drawing Revision Panel

The drawing revision panel consists of 7 sections. (Refer **FIG. 11**)

1. Revision Number
2. Revision Date.
3. Drawn By Initials.
4. Revision Description.
5. Revision Approval Box. (Wet pen signature on print)
6. Approval Signatory (Printed Name) Box
7. Revision Company Name & Details Box

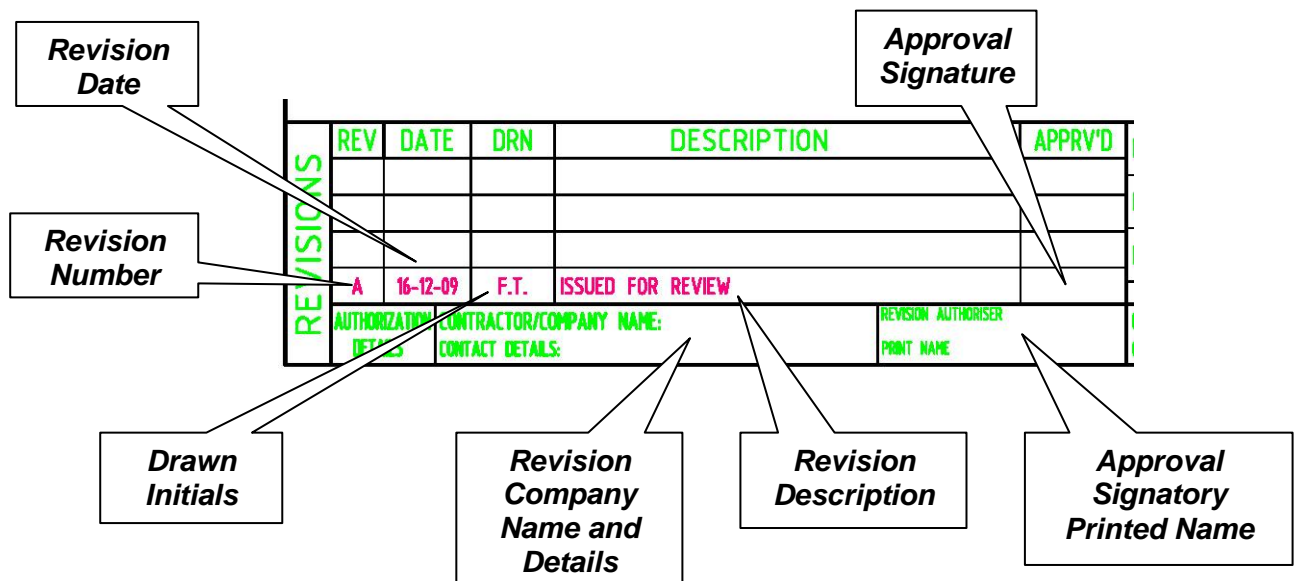


FIG. 11

Section 4: Drawing Standards Cont.

- Approval

All revisions after the review release shall be recorded in the revision panel and approved in the approval column (Wet pen signature), (see FIG. 12 & FIG. 13 below)

REVISIONS	REV	DATE	DRN	DESCRIPTION	APPRV'D
	1	18-12-09	F.T.	ISSUED FOR TENDER	
AUTHORIZATION DETAILS		CONTRACTOR/COMPANY NAME: CONTACT DETAILS:		REVISION AUTHORISER PRINT NAME	

Approval Column

Print Name

Wet Pen Signature

FIG. 12

4.4 TITLE BLOCK CONT.

4.4.5 Drawing Revision Panel Cont.

REVISIONS	REV	DATE	DRN	DESCRIPTION	APPRV'D
	1	20-12-09	F.T.	ISSUED FOR CONSTRUCTION	
AUTHORIZATION DETAILS		CONTRACTOR/COMPANY NAME: CONTACT DETAILS:		REVISION AUTHORISER PRINT NAME	

Approval Column

Wet Pen Signature

FIG. 13

Subsequent revisions of a signed drawing shall be raised to the next revision number (e.g.: '2', '3' etc.) and dated with the drafter's initials and a brief description of what the revision entails. The revision will then be approved, (wet pen signature), (See FIG. 11)

The revisions panel shall show only the last 4 revisions (from bottom up) with the drawing status, (a brief description of what the revision entails).

The drawing content shall show the last revision by means of a triangle symbol containing the change letter/number positioned at each change.

The unique drawing number provided for each drawing shall remain unchanged throughout each release of the drawing, (i.e. concept, for tender, for construction, as constructed etc.).

It is only the revision "Letter" or "Number", (depending upon which release the drawing is in), and that will change.

Section 4: Drawing Standards Cont.

4.5 DRAWING FILE SPECIFICATIONS

4.5.1 Drawing Environment

All drawings, other than process & instrumentation drawings and other similar unscaled drawings, shall be supplied in AutoCAD files utilising the “paper space/ model space” feature of AutoCAD.

Under this environment, all structures and details must be created in “model space” at a scale of 1:1 and displayed in “paper space” using a suitable scaled AutoCAD viewport.

Schematics, process, instrumentation drawings and other similar unscaled drawings may be supplied entirely in “model space”, (i.e. “Tile mode” 1) with the drawing form, notes, dimensions, etc. scaled appropriately.

Where the “Paper Space” feature of AutoCAD is utilised, and the dimensions, labels and annotation text is inserted in “Model Space”, they shall be scaled to suit “Paper Space”.

However the drawing frame, general notes, reference drawing list, material lists, pipe work schedules etc. shall be inserted as “paper space” entities at a scale of 1:1 on the drawing layout.

In order to ensure AutoCAD references METRIC line types, pattern hatches, etc. the AutoCAD system variable “Measurement” shall be set to “1”.

4.5.1.1 Text Styles

Excluding measurement unit designations, all text shall be in UPPER CASE.

For general usage, the text style shall be AutoCAD ISO.

The text style will be defined as follows:-

Style name	ISO
Font name	ISO.shx
Height	0
Width factor	1.0
Obliquing angle	0
Backwards	N
Upside-down	N
Vertical	N

It is recognised that occasions arise where it is necessary to use other fonts.

This practice will only be accepted when the desired result cannot be achieved using the ISO.shx font.

Where a substitute text font is used, the text style and font shall be forwarded to SA Water with the drawing file and should be a recognised AutoCAD font.

The style name shall match the font name.

Section 4: Drawing Standards Cont.

4.5 DRAWING FILE SPECIFICATIONS CONT.

4.5.1.1 Text Styles Cont.

Text height, line weight and typical usage for drawing annotation shall be as follows:-

<u>Text Height</u>	<u>Line Weight</u>	<u>Typical Use</u>
3mm	0.35mm	General notes, Labels, Dimensions, etc.
5mm	0.5mm	Minor view & section titles, Headings, etc.
7mm	0.7mm	Major view & section titles, Major Headings

4.5.1.2 Dimension Styles

The dimension style shall be in accordance with the National Standard AS 1100 and HB7: Engineering Drawing Handbook issued by Standards Australia.

Each dimension shall be a single AutoCAD entity. "Exploded" dimensions are **NOT** acceptable.

The dimension style to be used shall be the SA Water set in the drawing sheet template. (Refer to **FIG. 3**, Page 12)

4.5.1.3 Line Types

The line type of a layer on which each AutoCAD drawing entity resides shall determine the entity's line type.

This shall be achieved by setting the AutoCAD entity's "Linetype" property to "Bylayer".

Drawings supplied utilising the AutoCAD "paper space/model space" feature shall have the AutoCAD system variables "Ltscale" and "Psltscale" set to "1" (Default).

Schematics, process & instrumentation drawings and other similar unscaled drawings which are supplied not using this feature shall have the AutoCAD system variable "Ltscale" and "Psltscale" set to match the scaling of the drawing.

Any line types developed and used in the drawing must be defined for use in a metric environment and shall be supplied to SA Water with the drawing file.

Section 4: Drawing Standards Cont,

4.5 DRAWING FILE SPECIFICATIONS CONT,

4.5.1.4 Layering

The layering structure is outlined in the supplied sheet template and shall be complied with.

A layering structure shall be built within the Layering Groups with layer names to reflect what the layer is used for.

The entities' colour and style is to reflect that of the layer group to which the entity belongs.

(See FIG. 14)

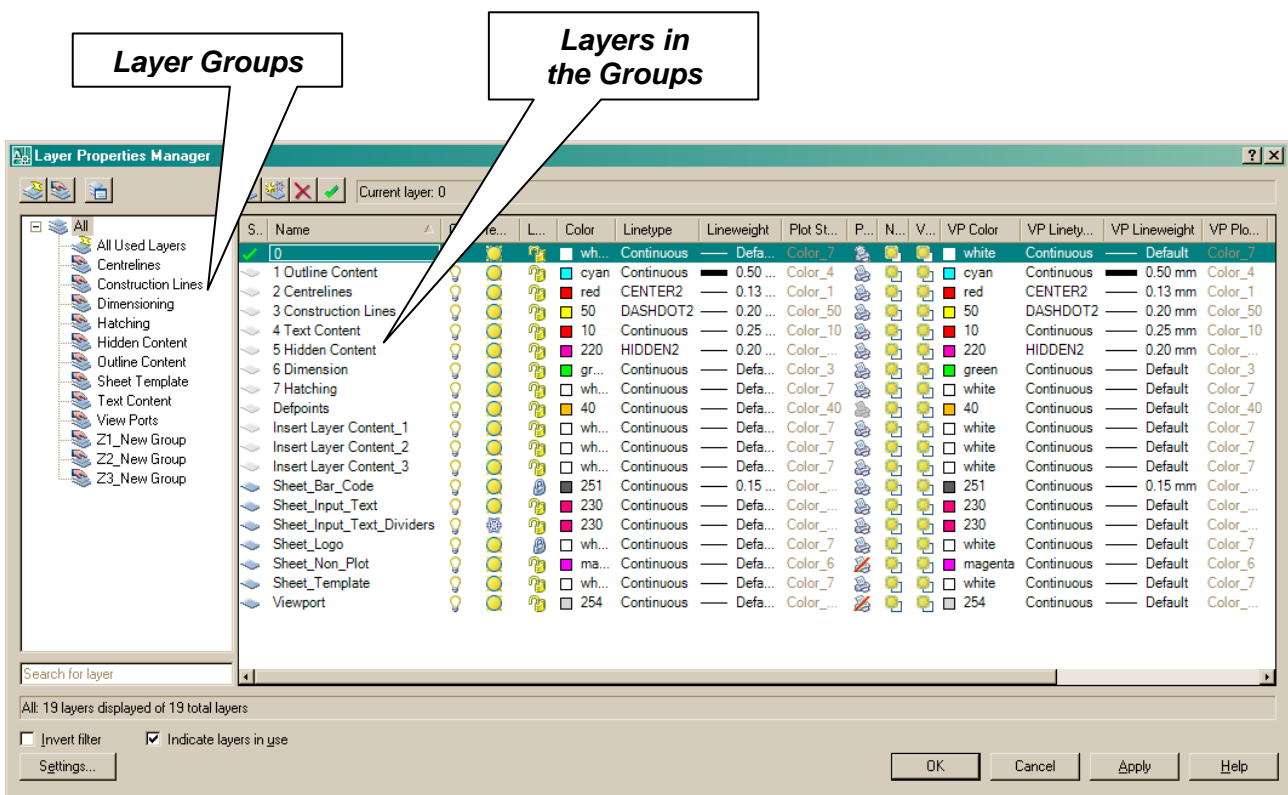


FIG. 14

Section 4: Drawing Standards Cont,

4.5 DRAWING FILE SPECIFICATIONS CONT,

4.5.1.5 Entity Colour and Line Weights

The method of setting a drawing entity's colour and line weight, and hence the entity's plotting pen thickness, shall be set to the AutoCAD entity "Colour & Lineweight" properties to "ByLayer" and AutoCAD entity "plot Style" property to "Bycolor".
(See FIG. 15)

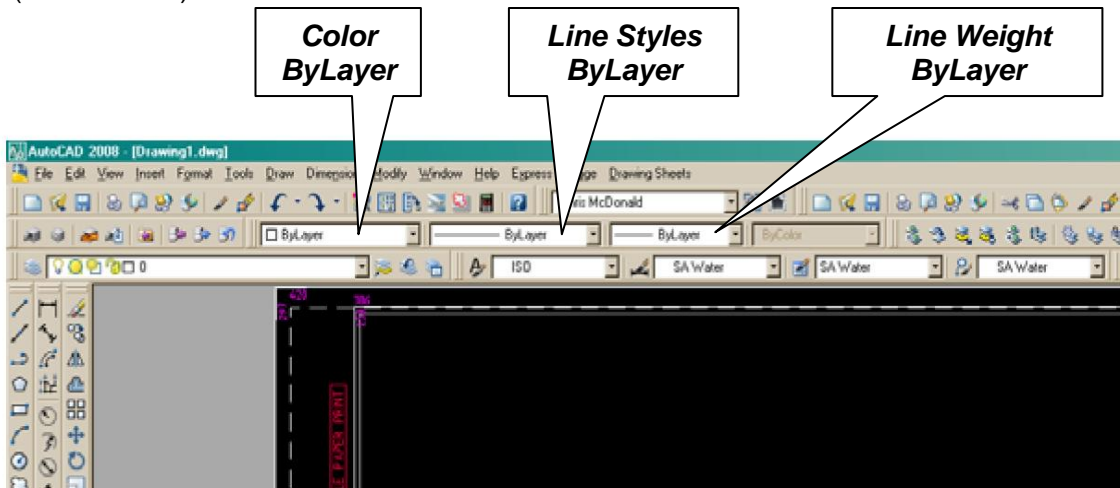


FIG. 15

4.6 EXTERNAL REFERENCE FILES

External reference files promote co-ordination among different disciplines by making drawing information simultaneously available to different users.

To assist in drawing preparation, where a major element within a project appears on more than one drawing, it may be drawn in a file that is attached using the AutoCAD "xref" command.

On submission of final or AS CONSTRUCTED drawings to SA Water, ALL EXTERNAL REFERENCES must be supplied using the AutoCAD "E-Transmit" command.

(Refer FIG. 1 Page 10)

Section 4: Drawing Standards Cont,

4.7 DRAWING INFORMATION

4.7.1 General

Information to be shown on the drawing shall include where applicable:

- Scales
- Legends
- Notes
- Compass points
- SA Water contract number

Consultant / Contractor company logos are not permitted on drawings.

Section 5: Drawing References.

5.0 REFERENCE DOCUMENTS

AS 1100:	Technical drawing
AS 1101:	Graphic symbols for general engineering
AS 1102:	Graphical symbols for electro-technical documentation
AS 60417:	Graphical symbols for use on equipment
AS 3702:	Item designation in electro-technology
AS 4383:	Preparation of documents using electro-technology
HB7:	Engineering handbook issued by Standards Australia

Title Block Attribute Dialogue Box.



All SA Water required information is nominated as “Mandatory” in the Attribute Editor line.

City and Regional Drawing Number Allocation Table

- Planning & Infrastructure (City) 00001 to 02999
if all used then go to 30000 to 32000
- Accommodation 15001 to 20000
- Outer Metro Region 22001 to 30000
- Riverland region (RMO) 32001 to 35000
- Riverland Region (Berri) 36001 to 39000
- Northern Region (Crystal Brook) 40001 to 43000
- Eyre Region (pt Lincoln) 45001 to 45000
- South East Region (Mt Gambier) 50001 to 53000
- Engineering Survey Group 55001 to 58000
- All Water 66001 to 70000

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