Drafting Requirements for Rail AutoCAD Drawings

Engineering Standard

Rail Commissioner

AM4-DOC-000364
DOCUMENT CONTROL

Document Status

<table>
<thead>
<tr>
<th>Action</th>
<th>Name and Position</th>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared By:</td>
<td>Name: Kuldeep Zala</td>
<td></td>
<td>10/05/17</td>
</tr>
<tr>
<td></td>
<td>Title: Technical Assurance Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reviewed By:</td>
<td>Name: Keith Charlton</td>
<td></td>
<td>10/15/17</td>
</tr>
<tr>
<td></td>
<td>Title: Manager, Rail Technical and Operational Assurance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Approved By:</td>
<td>Name: Peter Lawson</td>
<td></td>
<td>17/05/17</td>
</tr>
<tr>
<td></td>
<td>Title: Manager, Rail Asset Management</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Document Review Schedule: This document is due for review as required

Document Amendment Record

<table>
<thead>
<tr>
<th>REVISION</th>
<th>CHANGE DESCRIPTION</th>
<th>DATE</th>
<th>PREPARED</th>
<th>REVIEWED</th>
<th>APPROVED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Initial Issue</td>
<td>June 2013</td>
<td>Kuldeep Zala</td>
<td>Keith Charlton</td>
<td>Brian Green</td>
</tr>
<tr>
<td>1</td>
<td>New Acceptance Process</td>
<td>May 2017</td>
<td>Kuldeep Zala</td>
<td>Keith Charlton</td>
<td>Peter Lawson</td>
</tr>
</tbody>
</table>
# TABLE OF CONTENTS

1. Introduction ..................................................................................................................... 5
2. Purpose............................................................................................................................ 5
3. Scope ............................................................................................................................... 5
4. Related Documents ........................................................................................................ 5
5. References ....................................................................................................................... 5
6. Acronyms ....................................................................................................................... 5
7. Definitions ....................................................................................................................... 5
8. Roles and Responsibilities ............................................................................................ 6
   8.1. Designer ................................................................................................................ 6
   8.2. Drafter ................................................................................................................... 6
   8.3. Checker/Independent Verifier .............................................................................. 6
   8.4. Approver ................................................................................................................ 6
9. AutoCAD Drafting Requirements .................................................................................. 7
   9.1. Drawing Size ........................................................................................................... 7
   9.2. Drawing Files .......................................................................................................... 7
   9.3. Drawings Layout .................................................................................................... 7
   9.4. Model Space .......................................................................................................... 7
   9.5. Paper Space .......................................................................................................... 7
   9.6. Drawing Scales ...................................................................................................... 7
   9.7. Line Types .............................................................................................................. 8
   9.8. Shape Files ............................................................................................................ 8
   9.9. Line Colour and Line Weight ................................................................................... 8
   9.10. Text ....................................................................................................................... 8
         9.10.1. Size .......................................................................................................... 8
         9.10.2. Colour ....................................................................................................... 8
         9.10.3. Case ......................................................................................................... 9
         9.10.4. Fonts ........................................................................................................ 9
         9.10.5. Width Factor / Angle .............................................................................. 9
         9.10.6. Elevation .................................................................................................. 9
   9.11. Layer ..................................................................................................................... 9
         9.11.1. Layer Naming........................................................................................... 9
         9.11.2. Subdividing Layers ................................................................................ 10
   9.12. AutoCAD File Name ............................................................................................ 10
   9.13. Title Block .......................................................................................................... 10
         9.13.1. TITLE 1, TITLE 2, TITLE 3, DRAW TYPE ........................................... 11
         9.13.2. Scale ....................................................................................................... 11
9.13.3.  Drawing Number ........................................................................................................ 11
9.13.4.  Revision .................................................................................................................. 11
9.13.5.  Sheet ....................................................................................................................... 11
9.13.6.  Revision Box .......................................................................................................... 11
9.13.7.  Rail Drawings Acceptance Details ....................................................................... 12

9.15.  Superseding Drawings .......................................................................................... 12
9.16.  PDF Files .................................................................................................................. 13
9.17.  Drawing Housekeeping upon Completion ............................................................ 13

APPENDIX A: Layers for General Drawing Enhancement – Example ...................... 14
APPENDIX B: Layers for Signalling Drawings - Example ........................................... 15
1. Introduction

The Department of Planning, Transport and Infrastructure (DPTI) owns, operates and maintains the Adelaide Metropolitan Passenger Rail Network (AMPRN) under the Rail Accreditation assigned to the Rail Commissioner. This standard is intended to ensure that the drafting and approval/acceptance of rail drawings does not create any risks not deemed to meet the So Far As Is Reasonably Practicable (SFAIRP) principles under Rail Safety National Law (RSNL).

Drafting standards are important in maintaining consistency during the development and approval/acceptance of technical drawings related to rail infrastructure.

2. Purpose

The purpose of this standard is to detail AutoCAD drafting requirements for rail technical drawings.

3. Scope

This standard applies to all DPTI developed rail drawings.

Where there is significant road or third party infrastructure involved in a rail project DP001 Design Presentation – Construction Drawings – General Requirements should be applied to the drawings applicable to the road/third party component of the project.

4. Related Documents

<table>
<thead>
<tr>
<th>DOCUMENT NAME</th>
<th>KNET NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Title Block</td>
<td>7636680</td>
</tr>
<tr>
<td>A2 Title Block</td>
<td>7636685</td>
</tr>
<tr>
<td>A3 Title Block</td>
<td>7636665</td>
</tr>
</tbody>
</table>

5. References

- Rail Safety National Law (SA) Act 2012
- Rail Safety National Law National Regulations 2012
- FR-AM-GE-803 Lifecycle Management of Technical Documents and Drawings
- FR-AM-GE-806 Identification and Numbering of Technical Documents and Drawings
- FR-AM-GE-1013 Rail Drawings Acceptance Procedure
- DP001 Design Presentation – Construction Drawings – General Requirements

6. Acronyms

<table>
<thead>
<tr>
<th>ACRONYM</th>
<th>FULL NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPTI</td>
<td>Department of Planning, Transport and Infrastructure</td>
</tr>
<tr>
<td>AMPRN</td>
<td>Adelaide Metropolitan Passenger Rail Network</td>
</tr>
</tbody>
</table>

7. Definitions

<table>
<thead>
<tr>
<th>TERM</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acceptance</td>
<td>The Functional Group Manager is satisfied that the level of technical endorsement is appropriate and the drawing meets the specific requirements described in this document. This acceptance provides authorisation that the drawing (s) can be used for its intended purpose.</td>
</tr>
<tr>
<td>Acceptance Form</td>
<td>The DPTI form FO-AM-GE-1014 Rail Drawings Acceptance Form (Knet # 11259605)</td>
</tr>
<tr>
<td>Approved</td>
<td>The Functional Group Manager is satisfied that the designer, drafter and checker have the competency to carry out their design and drawing development responsibilities and has authorised a drawing by signing the</td>
</tr>
</tbody>
</table>
### Rail Drawings Acceptance Form

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset Drawings</td>
<td>Approved or formally accepted DPTI Rail Drawings that are applicable to a particular asset or location. Asset drawings are allocated a formal drawing number in accordance with FR-AM-GE-806 Identification and Numbering of Technical Documents and Drawings.</td>
</tr>
<tr>
<td>Standard Drawings</td>
<td>Approved or formally accepted DPTI Rail Drawings that are applicable to a multiple assets. Standard drawings are generally associated with infrastructure that is not specific to any one location. Standard drawings are allocated a formal drawing number in accordance with FR-AM-GE-806 Identification and Numbering of Technical Documents and Drawings.</td>
</tr>
</tbody>
</table>

### 8. Roles and Responsibilities

#### 8.1. Designer
The Designer is responsible for:
- verifying the design requirements/changes
- ensuring that the design meets the design requirements/changes
- ensuring that the design meets all relevant DPTI standards
- ensuring, where required, that the design is independently verified, and;
- signing the Rail Drawings Acceptance Form

#### 8.2. Drafter
The Drafter is responsible for:
- following the designer’s directions in composing the drawing
- ensuring that the drawing complies with this document and other relevant drafting standards, and;
- signing the Rail Drawings Acceptance Form

The drafter and designer may be one person.

#### 8.3. Checker/Independent Verifier
The Checker/Independent Verifier is responsible for:
- ensuring the drawing complies with this drafting standard
- carrying out a review of the drawing content against the design requirements/changes, and;
- signing the Rail Drawings Acceptance Form

For complex designs the Checker/Independent Verifier may be required by the Approver to review and verify the design.

#### 8.4. Approver
The Approver is responsible for:
- ensuring the Designer, Drafter and Checker/Independent Verifier have the competency to carry out their design and drawing development responsibilities
- authorising the drawing for use, and;
- signing the Rail Drawings Acceptance Form
9. AutoCAD Drafting Requirements

9.1. Drawing Size
The following sheet sizes will be used:

- A1 (594 mm x 841 mm) - KNet # 7636680
- A2 (420 mm x 594 mm) - KNet # 7636685
- A3 (297 mm x 420 mm) - KNet # 7636665

9.2. Drawing Files
- All drawings shall be created in AutoCAD 2010 (preferred) or AutoCAD 2007 format.
- Each DWG file shall only contain one drawing – multiple layout tabs for different drawings in one DWG file are not acceptable.

9.3. Drawings Layout
- Views, symbols, dimensions, etc. should be spaced to provide clarity. If necessary areas of fine detail should be shown suitably enlarged on additional drawing sheets.
- Dimensions should be placed clearly above the dimension line.
- Crossing of dimension lines should be avoided. (suitable AutoCAD command may be used)
- Extension lines should extend at least 2 mm beyond the dimension line.
- Notes should be located clear of the drawing entities and leaders used where necessary to ensure it is clear what the note relates to. Notes should be referenced in the drawing as – ‘See Note X’.
- Details of reference drawings or documents should be placed below Notes.

9.4. Model Space
- Model Space shall contain all the information for the body of the drawing including the dimensions.
- All content in ‘the model’ and any other content that needs to be positioned with respect to the model should exist in Model Space.

9.5. Paper Space
- Content that needs to be located in relation to the sheet of paper should exist in Paper Space.
- The title block should be inserted in Paper Space.
- Paper Space may only contain the title block, legend, north point, scale bar, notes and tables. The title block shall be referenced in at the origin location of (0, 0) at a scale of 1:1 in Paper Space, and shall incorporate accurately scaled viewport/s as required to display the information contained in ‘the model’.
- The drawing limits shall be set to the correct sheet size (A3, A2 or A1) with the bottom left hand corner set to (0, 0).
- Viewports shall be set to ‘not print’ and be ‘locked’ unless visible objects for details are required.
- Any scaling and rotation of information shall be performed within viewports.

9.6. Drawing Scales
- All Model Space contents shall be created at 1:1 and displayed in Paper Space at one of the preferred scales listed below.
- Where it is not practical to create the drawing at 1:1 or to use any specific scale (e.g. for schematic drawings) then the whole drawing or the specific detail shall be clearly marked as “NTS (Not To Scale)”
Preferred Scales
- Details 1:2, 1:2.5, 1:5, 1:10,1:20, 1:25, 1:50, 1:100

9.7. Line Types
Only standard AutoCAD line types or those supplied by DPTI shall be used.

9.8. Shape Files
Only standard AutoCAD shape files or those supplied by DPTI shall be used.

9.9. Line Colour and Line Weight
The colours of the lines in the drawing can be set by the Drafter. Examples of line colours for drawing layers are shown in Appendix A and B.

When drawings are plotted the weight of each line shall be determined by its colour. (See the table below). Default width of the line is 0.25 mm.

When plotting at a reduced size the line weights shall be scaled accordingly by selecting the 'Scale Line Weights' option from the AutoCAD plot dialog.

<table>
<thead>
<tr>
<th>AUTOCAD COLOUR</th>
<th>LINE WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Red</td>
</tr>
<tr>
<td>2</td>
<td>Yellow</td>
</tr>
<tr>
<td>3</td>
<td>Green</td>
</tr>
<tr>
<td>4</td>
<td>Cyan</td>
</tr>
<tr>
<td>5</td>
<td>Blue</td>
</tr>
<tr>
<td>6</td>
<td>Magenta</td>
</tr>
<tr>
<td>7</td>
<td>White / Black</td>
</tr>
<tr>
<td>8</td>
<td>Grey</td>
</tr>
<tr>
<td>9</td>
<td>Pale Grey</td>
</tr>
<tr>
<td>10-255</td>
<td>(All Other Colours)</td>
</tr>
</tbody>
</table>

9.10. Text

9.10.1. Size
The finished paper text height for all text shall be either 2.5mm, 3.5mm, 5mm, 7mm or 10 mm.

9.10.2. Colour
For SHX fonts, the text colour shall be dependent upon the text height as indicated in the table below.

Other text may either be black or follow the convention in the table below:
9.10.3. Case
All text shall be in upper case except for notes & references and where a recognized convention dictates otherwise. This includes SI units (e.g. mm, kg, kV, kPa)

9.10.4. Fonts
All text shall use one of the following fonts:

- ARIAL NARROW
- ISOCP
- ARIAL

The text for the electronic signature in the title block shall be in accordance with PR-AM-GE-1013 Rail Drawings Acceptance Procedure.

9.10.5. Width Factor / Angle
All text shall be vertical and have a width factor of 1.

9.10.6. Elevation
All text shall have an elevation (Z level) of 0.

9.11. Layer

9.11.1. Layer Naming
The format for all layer names shall be:
X-CODE-DESCRIPTION

Where,
X – ‘D’ for design features, ‘S’ for surveyed features, 'R' for rest of features
CODE – one of 4 character feature type codes from the table below:

<table>
<thead>
<tr>
<th>CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAIL</td>
<td>Features related to train or tram track works</td>
</tr>
<tr>
<td>RAEL</td>
<td>Features related to rail electrification and other electrical systems</td>
</tr>
<tr>
<td>RAST</td>
<td>Features related to civil structures for rail (bridges, safety screens etc)</td>
</tr>
<tr>
<td>RASA</td>
<td>Features related to rail station works (platforms, shelters etc)</td>
</tr>
<tr>
<td>SIGS</td>
<td>Features related to signals</td>
</tr>
<tr>
<td>COMM</td>
<td>Feature related to communications</td>
</tr>
<tr>
<td>SECU</td>
<td>Feature related to security and passenger interface</td>
</tr>
</tbody>
</table>
9.11.2. **Subdividing Layers**

Base layers may be subdivided by adding a further description to the right hand end of the layer name. For example “D-RASA-Platform” may be subdivided into “D-RASA-Platform-Edge” and “D-RASA-Platform-Paving”.

9.12. **AutoCAD File Name**

The drawings shall have file names consisting of the drawing number and revision.

9.13. **Title Block**

The following title block shall be used for rail drawings.
Designed, Drafted, Checked and Approved attributes shall be ‘filled out’ appropriately in accordance with PR-AM-GE-1013 Rail Drawings Acceptance Procedure

Other attributes should be ‘filled out’ as indicated below:

9.13.1. **TITLE 1, TITLE 2, TITLE 3, DRAW TYPE**
Four separate lines giving a descriptive title of the drawing contents in accordance with FR-AM-GE-806 Identification and Numbering of Technical Documents and Drawings.

9.13.2. **Scale**
Scale or scales of the drawing or “NOT TO SCALE” if the drawing is not drawn to any specific scale.

9.13.3. **Drawing Number**
The drawing number shall be issued in accordance with FR-AM-GE-806 Identification and Numbering of Technical Documents and Drawings.

9.13.4. **Revision**
The revision number corresponding to the most recent revision shall be inserted in the revision box.

9.13.5. **Sheet**
In the case of individual or stand-alone drawings, it shall always be 1 of 1.

In the case of group of drawings, it shall be appropriately numbered, for example 1 of 10, 2 of 10, 3 of 10 etc. However, each individual sheet in a group of drawings shall have a unique drawing number.

9.13.6. **Revision Box**

<table>
<thead>
<tr>
<th>REVISION</th>
<th>DESCRIPTION</th>
<th>DSGN</th>
<th>DRN</th>
<th>CHK</th>
<th>APRV</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FIRST DRAFT</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

For each drawing revision the following details shall be filled out in the revision box.

- Revision number or letter
- Brief description
- Initials of the Designer, blank if there is no designer.
- Initials of the Drafter.
- Initials of the Checker/Independent Verifier.
- Initials of the Approver
- The date the drawing was approved for use.
9.13.7. Rail Drawings Acceptance Details

The Rail Drawings Acceptance Form Number and KNet Number shall be inserted in accordance with PR-AM-GE-1013 Rail Drawings Acceptance Procedure.


Revisions record the changes made to a drawing throughout its life. The details of each revision shall be recorded in the revision area at the bottom left side of the title block.

The changes made shall be highlighted with the use of a circle containing the revision number or letter. ‘Clouding’ may also be used in combination with the revision circle to further highlight the changes at the Drafter’s discretion.

At the time that a new revision is made all circles and clouds highlighting the previous revision shall be removed from the drawing.

Prior to Approval

Revisions that occur prior to a drawing being ‘approved’ by the approver are identified with a revision letter (A, B, C etc.). The alphabetical characters “O” and “I” shall not be used.

Following Approval

Once a drawing is “approved” the drawing shall be deemed to be “Revision 0” at which time:

- All clouding and revision circles are to be removed from the drawing.
- All details are to be removed from the revision area at the left side of the title block.
- “0” shall be added to ‘Revision Box’ at the right side of the title block.
- ‘First Release’ shall be added to the description column.

Revisions that are made from this point on are identified by a number (1, 2, 3 etc)

Legacy Drawings

If legacy drawings have been allocated an alphabetical character (A, B, C etc) in their revisions then that same pattern should be continued for all future revisions.

9.15. Superseding Drawings

At times a new drawing may ‘supersede’ or ‘partly supersede’ an older drawing.

When this occurs both the new and old drawing shall have a note added stating the following:

On the SUPERSEDED drawing:

- THIS DRAWING IS SUPERSEDED BY FIM-XXX-NNNNNN or
- THIS DRAWING IS PART SUPERSEDED BY FIM-XXX-NNNNNN

On the SUPERSEDING drawing:
• THIS DRAWING SUPERSEDES FIM-XXX-NNNNNN or
• THIS DRAWING PART SUPERSEDES FIM-XXX-NNNNNN

Note: The cross-reference note may list multiple drawing numbers if required.

When only part of a drawing is superseded it shall be made clear on the drawings which area/detail is no longer current.

Where cross reference notes represent a revision to the drawing the relevant processes for revising drawings as detailed in 9.14 shall be used.

9.16. PDF Files

All PDF files shall be created by converting the DWG into a PDF. This is to achieve the highest quality of drawing content. Scanning of hard copies to create PDF files shall be avoided.

There shall be only one PDF file for each drawing sheet. PDF files shall include layer information but not be restricted or password protected in any way.

9.17. Drawing Housekeeping upon Completion

The following drawing housekeeping rules shall be applied prior to final approval/acceptance.

DWG files:
• Shall be purged to remove unused content
• Shall not contain any custom objects or proxy graphics
• Shall have the current layer set to ‘0’
• Shall have ‘Base’ set to 0,0,0
• Shall have all layers displayed or not displayed as required so that the drawing displays as intended without further manipulation
• Shall not contain any Paper Space objects outside the area of the title block
• Shall be saved with the drawing being zoomed to extents in paper space
• Shall have external files (Xrefs) bound to the host drawing.
• Shall accompany raster image files, if used.

No other files should be transmitted unless their use has been expressly authorised in writing by the relevant DPTI Rail Functional Group Manager or Design Manager. This includes such things as Plot style tables, font files, line styles files and shape files.
### APPENDIX A: Layers for General Drawing Enhancement – Example

<table>
<thead>
<tr>
<th>LAYER NAME</th>
<th>COLOUR ID#</th>
<th>LAYER DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-ENHA-TABLE</td>
<td>9 (Grey)</td>
<td>Contains a table within the drawing</td>
</tr>
<tr>
<td>D-ENHA-TEXT</td>
<td>0 (White)</td>
<td>Contains all drawing text excluding sheet related text</td>
</tr>
<tr>
<td>D-ENHA-NOTES</td>
<td>177 (Blue)</td>
<td>Contains additional notes that may be required for construction purposes.</td>
</tr>
<tr>
<td>D-ENHA-DIMENSIONS</td>
<td>0 (White)</td>
<td>Contains all drawing dimensions</td>
</tr>
</tbody>
</table>
APPENDIX B: Layers for Signalling Drawings - Example

<table>
<thead>
<tr>
<th>LAYER NAME</th>
<th>COLOUR ID#</th>
<th>LAYER DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-SIGS-TERMINALS</td>
<td>0 (White)</td>
<td>Contains terminal drawings, and other apparatus</td>
</tr>
<tr>
<td>D-SIGS-ADDITIONS</td>
<td>1 (Red)</td>
<td>Contains all additions to be made (prior to commissioning)</td>
</tr>
<tr>
<td>D-SIGS-REMOVALS</td>
<td>3 (Green)</td>
<td>Contains all removals to be made (prior to commissioning)</td>
</tr>
<tr>
<td>D-SIGS-TRACK CCTS</td>
<td>0 (White)</td>
<td>Contains track circuit information</td>
</tr>
<tr>
<td>D-SIGS-LOC BOXES</td>
<td>9 (Grey)</td>
<td>Contains location box boundaries and LOC box identification numbers</td>
</tr>
<tr>
<td>D-SIGS-LEVEL XINGS</td>
<td>53 (Green Shade)</td>
<td>Contains all level crossings information related to signalling</td>
</tr>
<tr>
<td>D-SIGS-PED XINGS</td>
<td>81 (Green Shade)</td>
<td>Contains all pedestrian crossings information related to signalling</td>
</tr>
<tr>
<td>D-SIGS-CABLES</td>
<td>150 (Blue Shade)</td>
<td>Contains all signal cable information</td>
</tr>
<tr>
<td>D-SIGS-GRADIENT</td>
<td>150 (Blue Shade)</td>
<td>Contains all gradient information</td>
</tr>
<tr>
<td>D-SIGS-LINE SPEED</td>
<td>60 (Light Green)</td>
<td>Contains all line speed information</td>
</tr>
<tr>
<td>D-SIGS-CURVES</td>
<td>41 (Light Brown)</td>
<td>Contains all curve information</td>
</tr>
<tr>
<td>D-SIGS-SIGNALS</td>
<td>123 (Aqua)</td>
<td>Contains all signal information</td>
</tr>
</tbody>
</table>