



The Preparation of a Computer Aided Drafting (CAD) Drawing for Control and Communications Systems

Document ID: W110-600-011

Revision Number: 2.00

This document is controlled within the Livelink Document Management System.

Please refer to the electronic version on Livelink to confirm you have the latest version.

Document Category:	Standard Procedure
Division:	Railway Safety Management
Applicable to:	Brookfield Rail Pty Ltd

	Date	Name	Title	Signature
Owner:	25/09/2014	Veronica Masters	Drafting Coordinator	<i>V. Masters</i>
Reviewer:	26/09/2014	John Ursic	Manager Control and Communications Systems	<i>[Signature]</i>
Approver:	30/09/2014	Paul Larsen	Chief Executive Officer	<i>[Signature]</i>

Document History

Revision	Date	Amended By	Details of Amendment
1.00	15/08/2005	Document Controller	New Document Created
1.01	01/03/2000	Document Controller	AutoCad Reference updated
1.02	18/01/2001	Document Controller	Amend for Westnet Rail
1.03	12/06/2004	Documentation Controller	Corrected to current requirements
1.04	15/08/2005	Documentation Controller	Corrected to current requirements
1.05	10/03/2006	Documentation Controller	Clause 6.1 added
1.06	14/09/2007	Signal manager Projects and Standards	Updated to align with Westnet Rail C&CS group requirements and signalling standards
1.07	24/03/2011	Drafting Coordinator	To incorporate revised reference drawings
1.08	08/10/2013	Drafting Coordinator	Amend for Brookfield Rail
2.00	25/09/2014	Drafting Coordinator	Add point 6 from Procedure W110-600-017

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	2 of 13

Table of Contents

1. PURPOSE	4
2. SCOPE	4
3. REFERENCES	4
4. DEFINITIONS	5
4.1. Brookfield Rail	5
4.2. CAD	5
4.3. Drawing	5
4.4. AutoCad	5
4.5. Drafting Coordinator	5
4.6. External Party	5
5. RESPONSIBILTIES	5
6. Actions	6
6.1. Request for Drafting Work	6
6.2. Drafting Work	6
6.3. Drawings to be Issued to External Parties by Brookfield Rail	7
6.4. New or Altered Drawing Files to be Issued to Brookfield Rail by External Parties	7
6.5. Processing of As-Built Drawing Files by Brookfield Rail	9
6.6. AutoCad Drawing Requirements – General	9
6.7. AutoCad Drawing Colour Assignments	10
6.8. AutoCad Drawing Line Types and Hatch Patterns	11
6.9. AutoCad Drawing Spacing	11
6.10. AutoCad Drawing Units and Line Type Scale	12
6.11. AutoCad Drawing Shading	12
6.12. AutoCad Drawing Text	12
6.13. AutoCad Drawing Dimensioning	12
6.14. AutoCad Drawing External Referencing	12
6.15. AutoCad Drawing Model Space / Paper Space	13
6.16. AutoCad Drawing Unused Items and Styles	13
6.17. AutoCad Drawing Layer Names for Illuminated Diagrams ONLY	13
7. Documentation	13

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	3 of 13

1. PURPOSE

- 1.1 The purpose of this procedure is to control the standards and requirements for the preparation of Drawings for the Brookfield Rail Control & Communications Systems utilising Computer Aided Drafting (CAD) systems.
- 1.2 The objective of this procedure is to ensure uniformity in the preparation and presentation of CAD prepared Drawings to enable the Brookfield Rail Control & Communications Systems to easily view, store, retrieve, update and plot these Drawings. Drawings prepared utilising CAD systems for the Brookfield Rail Control & Communications Systems shall comply with the requirements of this procedure.

2. SCOPE

- 2.1 This procedure applies to Computer Aided Drafting (CAD) Drawings of both internal and external origin, relevant to Control & Communications Systems.
- 2.2 Included in the scope of this procedure:
 - 2.2.1 General Signalling Drawings.
 - 2.2.2 Scale Signalling Plans.
 - 2.2.3 Signalling Circuit Drawings.
 - 2.2.4 Illuminated Diagram Drawings.
 - 2.2.5 General Communications Drawings.
 - 2.2.6 Communications Circuit Drawings.
 - 2.2.7 General Electrical Services Drawings - Yard Lighting, etc.

3. REFERENCES

- 3.1 Australian Standards - AS.1100. Series
- 3.2 Brookfield Rail C&CS Technical Symbols Library.
- 3.3 Procedure W110-600-012 - Numbering of a Drawing.
- 3.4 Procedure W110-600-013 - Authorisation of a Drawing.
- 3.5 Procedure W110-600-014 – Registering, Issuing and Storage of a Drawing.
- 3.6 Procedure W110-600-016 - Cancellation of a Drawing.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	4 of 13

4. DEFINITIONS

4.1. Brookfield Rail

Brookfield Rail shall mean Brookfield Rail's Control & Communications Systems section.

4.2. CAD

Computer Aided Drafting.

4.3. Drawing

A Drawing shall read as "All Drawings, plans, layouts, diagrams and the like, prepared utilising CAD systems".

4.4. AutoCad

The computer software "AutoCAD" by Autodesk. This definition includes AutoCAD LT and AutoCAD Electrical.

4.5. Drafting Coordinator

The nominated person in Brookfield Rail responsible for the preparation of drawings.

4.6. External Party

Any consultant or contractor responsible for altering existing or producing new drawings for Brookfield Rail's Control & Communications Systems section.

5. RESPONSIBILTIES

- 5.1 The Signal Manager Projects & Standards is responsible for the overall management of and setting of standards for signalling drawings produced by Brookfield Rail's drawing office and external parties. Any aspect of drafting and the preparation of signalling drawings and drawing files not covered by this procedure must be referred to the Signal Manager Projects & Standards.
- 5.2 The Communications Systems Manager is responsible for the overall management of and setting of standards for communications drawings produced by Brookfield Rail's drawing office and external parties. Any aspect of drafting and the preparation of communications drawings and drawing files not covered by this procedure must be referred to the Communications Systems Manager.
- 5.3 All Managers, Supervisors, Technical Specialists and External Parties are responsible, within their area of control, for ensuring the provision of accurate and comprehensive information and documentation, relevant to the production of a Drawing to the Drafting Coordinator or external party responsible for its production.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	5 of 13

- 5.4 The Drafting Coordinator, on behalf of the Signal Manager Projects & Standards or Communications Systems Manager as appropriate, is responsible for ensuring that all Drawings prepared or altered by Brookfield Rail or submitted by external parties have been prepared in accordance with this procedure and the current Drawing Standards.

6. Actions

6.1. Request for Drafting Work

- 6.1.1 All requests for the design and preparation of new or altered drawings shall be made to the Drafting Coordinator. The Drafting Coordinator shall record all such requests using a unique job number.
- 6.1.2 Requests for drawing work to be carried out by external parties shall initially be made to the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative for particular projects. If agreed the request shall be forwarded to the Drafting Coordinator

6.2. Drafting Work

- 6.2.1 All drawing work, either by Brookfield Rail or external parties, shall be carried out in accordance with this section.
- 6.2.2 Appropriately licensed and legally acquired computer software must be utilised for the production of CAD Drawing files.
- 6.2.3 All new or altered drawings shall be produced in AutoCAD .dwg format.
- 6.2.4 All new or altered drawings shall include the project job number, in the job number area of the main title block for new drawings or in the amendment block for altered drawings.
- 6.2.5 All Amendments shall use Brookfield Rail's standard amendment blocks as follows: -
 - A101 - Drawing Size A1 or A2.
 - A102 – Drawing Size A3 or A4.
- 6.2.6 The CAD Operator shall not overcrowd drawings, keeping all views, symbols, dimensions, lines and notes spaced to provide drawing clarity in accordance with the current revision of Drawings W-CM-37, 38 and 39. Notes shall be located clear of drawing details in the bottom right hand corner above the Title Block. If necessary, areas of fine detail are to be shown suitably enlarged on additional drawing sheets.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	6 of 13

6.2.7 The CAD Operator shall use technical symbols, standard Drawing sheet sizes, title blocks and layouts in accordance with Brookfield Rail's Technical Symbols Library, Blocks, Masters and the current revision of Drawings W-CM-37, 38 and 39. A Copy of these will be provided to any external party upon request.

Where the work is carried out by external parties the version of the Technical Symbols Library, Blocks, Masters and Drawings W-CM-37, 38 and 39 to be used shall be set out in the contract documentation for the works.

6.3. Drawings to be Issued to External Parties by Brookfield Rail

6.3.1 Requests for the release of drawing files by external parties shall be made to the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative for particular projects as appropriate. Where the request is agreed the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative shall forward the request to the Drafting Coordinator for release of the drawing files.

6.3.2 Brookfield Rail shall normally process such requests within 10 working days.

6.3.3 The Drafting Coordinator shall formally release a copy of the requested drawing files on a CD-ROM or Email Transmittal to the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative.

6.3.4 The Drafting Coordinator shall reserve the drawing files on LiveLink and add the relevant details to the drawing's properties, to denote that the records are subject to alteration and cannot be used for any other alterations until returned by the external party. (Refer W110-600-014)

6.3.5 The Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative shall formally issue the drawing files to the external party.

6.4. New or Altered Drawing Files to be Issued to Brookfield Rail by External Parties

6.4.1 New drawings issued to Brookfield Rail shall be numbered in accordance with procedure W110-600-012 – Numbering of a Drawing. The Drafting Coordinator shall issue new unique drawing numbers as required upon request by the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative for a particular project.

6.4.2 The new numbers shall be advised to the external party by the Signal Manager Projects & Standards, Communications Systems Manager or nominated representative for inclusion in the As-Built records.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	7 of 13

Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control and Communications Systems

- 6.4.3 Where existing Brookfield Rail drawings have been amended/updated the drawing file shall be renamed to reflect the amendment, e.g. drawing file HC13284B.dwg is renamed HC13284C.dwg. The following naming conventions apply:
- 6.4.3.1 Only upper case letters are to be used in drawing file names.
 - 6.4.3.2 Drawing amendments are to be labelled by the use of alphabet letters commencing at A for the first amendment and continuing in sequence to Z, then AA to AZ followed by BA to BZ etc.
 - 6.4.3.3 The amendment letters I and O are not to be used as these can be confused with numbers one and zero.
- 6.4.4 External parties shall formally issue as-built drawing files to Brookfield Rail on a CD-ROM, in AutoCAD format with a .dwg file extension, together with 2 hard copies of each drawing, with the amendment preparation block fully signed and dated. These shall be issued to the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative for particular projects as appropriate.
- 6.4.5 CD-ROMs shall only contain drawing files relevant to the works involved. The directory structure should be organised in line with Brookfield Rail's circuit books, sub-divided into individual locations as appropriate. Each individual location shall be sub-divided into three directories containing the following: -
- 6.4.5.1 New and/or altered drawing files produced for the works.
 - 6.4.5.2 Drawing files issued but unaltered under the works.
 - 6.4.5.3 Drawing files required to be cancelled by Brookfield Rail.
- The CD-ROM shall be labelled, as a minimum, with the Job Number and Creation Date.
- 6.4.6 The issue of CD-ROMs to Brookfield Rail by External Parties shall be controlled and recorded on a Transmittal Notice or similar containing the following information: -
- 6.4.6.1 The name and location of the respective project.
 - 6.4.6.2 The name of the External Party.
 - 6.4.6.3 The Job Number allocated to the works.
 - 6.4.6.4 The filename of each new or altered drawing contained on the disk.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	8 of 13

Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control and Communications Systems

- 6.4.6.5 The filename of each existing drawing issued but unaltered under the works.
- 6.4.6.6 The filename of each existing drawing required to be cancelled by Brookfield Rail.
- 6.4.6.7 The Disk Creation Date.
- 6.4.7 External Parties shall ensure data file security of drawing files being prepared for Brookfield Rail or files received from and/or being held on behalf of Brookfield Rail. Drawing files shall be protected against accidental erasure, fire, theft or destruction by the use of back-up copies. Back-up copies of all files to be transmitted to Brookfield Rail shall be held until Brookfield Rail acknowledges receipt of the respective files.
- 6.4.8 External Parties shall supply drawing files to Brookfield Rail in an uncompressed format.
- 6.4.9 External Parties shall ensure that all CD-ROMs issued to Brookfield Rail are free of computer viruses.
- 6.4.10 The hard copies of the drawing files shall be reviewed for acceptance by the Signal Manager Projects & Standards, Communications Systems Manager or nominated representative. Drawings that are not accepted shall be returned to the External Party for rework as required.
- 6.4.11 Once the hard copies have been accepted, the Signal Manager Projects & Standards, Communications Systems Manager or their nominated representative will forward the As-Built drawing files to the Drafting Coordinator. The Drafting Coordinator shall arrange for these to be reviewed for conformance with the drafting standards set out in this procedure, identifying any non-conformances in a written report.
- 6.4.12 Where any non-compliances are identified the Signal Manager Projects & Standards or Communications Systems Manager, as appropriate, shall review the non-conformance report and decide whether these are acceptable. Drawings with non-conformances that are not acceptable shall be returned to the External Party for rework as required.

6.5. Processing of As-Built Drawing Files by Brookfield Rail

- 6.5.1 As-Built drawings approved by either the Signal Manager Projects & Standards or Communications Systems Manager shall be issued and stored by the Drafting Coordinator as set out in procedure W110-600-014 – Handling, Issuing and Storage of a Drawing

6.6. AutoCad Drawing Requirements – General

- 6.6.1 All Drawing Files are to be generated using AutoCad 2005 or later version, or AutoCad Light 2005 or later version unless otherwise agreed with the Drafting Coordinator.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	9 of 13

Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control and Communications Systems

- 6.6.2 Drawing origin shall be the lower left hand corner of all drawings and shall be set at 0,0 coordinates.
- 6.6.3 Drawing limits are set in the size of the respective Brookfield Rail standard drawing master.
- 6.6.4 All drawing files submitted as As-Builts must be fully PURGED and saved to EXTENTS.
- 6.6.5 Plans and part plans shall generally be orientated such that North is towards the top of the sheet.
- 6.6.6 Drawing files shall be at a 1:1 PLOT SCALE, i.e. drawings shall be scaled to suit the respective standard drawing sheet size.
- 6.6.7 The referenced menu for each drawing shall be set to AutoCAD.
- 6.6.8 Only Layer 0 is to be used, except where Red/Blue and/or Orange/Purple work is involved – Refer to 6.7.2
- 6.6.9 All drawings showing circuits must use Block B14, B15 or B16 which defines the size of wire – this must not be altered. Where other size wire is used a different symbol is to be created and used to denote that wire.
- 6.6.10 Where a new Wblock is considered necessary it must be presented to the Drafting Coordinator in electronic form and approval obtained before any drawings are submitted to Brookfield Rail. WBlock file names shall consist of a maximum of 8 characters that provide a brief description of the block. ie: BOOM-PSU = Boomgates Power Supply Unit. Blocks must be created on LAYER 0 and inserted on the relevant layer. Where a Wblock is available it must be used. Where a Wblock that can be exploded and utilised is available it must be used.
- 6.6.11 All drawings are generally to have a white background with black lines and text when printed.

6.7. AutoCad Drawing Colour Assignments

6.7.1 Colours shall be set BYLAYER

6.7.2 Colour Coding of Drawings

6.7.2.1 The following colours shall be used to distinguish the changes to the drawing.

RED - Equipment and/or wiring to be added.

BLUE - Equipment and/or wiring to be removed.

6.7.2.2 If additional amendments are required for stage works on a drawing already coloured red and/or blue, the following colours are to be used.

ORANGE - Equipment and/or wiring to be added.

PURPLE - Equipment and/or wiring to be removed.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	10 of 13

Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control and Communications Systems

6.7.2.3 The colour GREEN shall be used to show existing equipment and/or wiring, that has not been shown previously on the drawing.

6.7.2.4 Any notes or comments needed for clarification are to be added in MAGENTA.

6.7.2.5 All equipment that is Re-used is to be shown in BROWN.

6.7.3 Only the following AutoCAD colours shall be used:

Colour	Number
Red	1
Cyan	4
Purple	200
Orange	30
White	7
Magenta	6
Brown	44
Green	3

6.7.4 For Illuminated Diagrams only, the following colours shall be used:

Colour	Number
Cyan	4
Blue	5
Magenta	6
White	7
Lt Grey	9
Orange	40
Brown	44
Light Green	70
Dark Green	102

6.8. AutoCad Drawing Line Types and Hatch Patterns

6.8.1 Use only standard line types and hatch patterns that are supplied with AutoCAD.

6.8.2 Line types may be set at either BYLAYER or at individual entity mode.

6.9. AutoCad Drawing Spacing

6.9.1 Draw parallel lines with a minimum clear spacing between them of 5 times the line thickness or 1mm, whichever is the greater.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	11 of 13

6.9.2 The spacing between hatch lines shall be proportional to the area covered, but not less than 2mm.

6.10. AutoCad Drawing Units and Line Type Scale

6.10.1. Set the DRAWING UNITS “Insertion Scale” as indicated.

Drawing Type	Insertion Scale
Signalling Circuits	Unitless
Scale Drawings	Millimeters
Scale Signalling Plans	Meters

6.10.2 Set the LINETYPE SCALE to enable the selected linetype to display correctly on CAD screens and printed drawings.

6.11. AutoCad Drawing Shading

Manually applied shading, applied toner, colour pencil work, etc shall not be used on CAD Drawings under any circumstances. Use only the equivalent features provided with AutoCAD.

6.12. AutoCad Drawing Text

6.12.1 Text styles are built into the master drawing files. These styles must not be altered. No other text styles are to be used.

6.12.2 All text names, e.g. D102 HR, MUST be one entity. Use only single line D Text. Where text does not fit, use the FIT command. Do not alter the text width.

Do not use M Text.

6.13. AutoCad Drawing Dimensioning

Dimension standards are built into the master drawing files. These styles must not be altered. No other dimension styles are to be used.

6.14. AutoCad Drawing External Referencing

6.14.1 Unless otherwise agreed with the Drafting Coordinator, no drawings shall incorporate externally referenced drawings X-REFs

Where agreed, the following conditions shall apply:

Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control and Communications Systems

- 6.14.2 The PATH for the X-REF file(s) shall be set to default to the current working directory. Each X-REF file shall be inserted into the drawing on a layer with the same name as the respective X-REF file.
- 6.14.3 Externally referenced drawing files shall not be bound into the main drawing file, i.e. do not use the BIND sub-command in the X-REF command.
- 6.14.4 All X-REF drawing files shall be supplied to Brookfield Rail on the same CD-ROM as the main drawing file.

6.15. AutoCad Drawing Model Space / Paper Space

All Drawings shall be produced as a 2D Drawing file using only MODEL SPACE, with TILEMODE set to 1, unless otherwise agreed with the Drafting Coordinator.

6.16. AutoCad Drawing Unused Items and Styles

Prior to the issue of drawing files to Brookfield Rail *PURGE* all unused layers, blocks, dimension styles, line types, text styles, etc from the drawings.

6.17. AutoCad Drawing Layer Names for Illuminated Diagrams ONLY

- 6.17.1. The following table provides a list of the standard layer names to be used.

LAYER	COLOUR	LAYER DESCRIPTION
0	White	All drafting except as shown below
Roads	Light Green	Roads
Platforms	Light Grey	Station platforms
Track	White	Track outlines and names text
LED	Magenta	LED locations and Numbers text
Blue	Blue	Track blue fill
Orange	Orange	Track orange fill
Brown	Brown	Track brown Fill
Green	Dark Green	Track dark green fill

7. Documentation

Drawings W-CM-37, W-CM-38 and W-CM-39.

Document Id:	Procedure for the Preparation of a Computer Aided Drafting (CAD) Drawing for Control an Communications Systems	Issue Date:	25/09/2014
Rev #:	2.00	Pages:	13 of 13