

# Engineering Drawings and Documentation

EGP-04-01

## Applicability

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SMS

## Publication Requirement

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1.1	21 Feb 14	3.1	More detail added regarding version of AutoCAD files to be supplied for addition to DMS.
1.2	14 Oct 15		Document rebranded
1.3	9 May 16	3.1, 3.2 & 3.6	Further detail added regarding approval of drawings, including addition of approval information on drawing templates
2.0	17 Nov 17	Various	Addition of requirement for combined pdf file of updated

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master records included to standardise requirement across all disciplines and in line with new DMS system requirements. Addition of note regarding update of drawings when infrastructure is decommissioned. Also clarification of requirement for As Commissioned drawings for civil and structures works and the revision format on drawing templates. Clarification of the timeframes for supply of drawings. Addition of naming convention for scanned NSW signal drawings.

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## 1 Introduction

### 1.1 Purpose

This document sets out ARTC's standards, practices and procedures for the preparation, presentation and use of drawings and documentation required for new and altered infrastructure.

### 1.2 Procedure Owner

The Configuration Manager is the Procedure Owner and is the initial point of contact for all queries relating to this procedure.

### 1.3 Overview

Engineering drawings and related documentation are required to show how infrastructure has been designed and constructed and are part of the permanent records of our organisation as required by law. They are used for maintenance purposes and to enable repairs to be performed in case of an accident, structural failure or natural event which has caused damage to our infrastructure. They provide vital information required by ARTC for the safe use of our infrastructure by our customers.

The ARTC Drawing Management System (DMS) holds As Designed/For Construction, As Commissioned and As Built drawings relating to ARTC infrastructure and reference copies of drawings for other infrastructure contained within the rail corridor.

As Built drawings for the Victorian part of the ARTC network are held in the Public Transport Victoria (PTV) DMS. Drawings relating to infrastructure in Victoria shall follow the requirements of the PTV Infrastructure Drafting Standards and PTV DMS Processes document.. Further information is available from the website <https://dms.ptv.vic.gov.au> or by email to [dms@ptv.vic.gov.au](mailto:dms@ptv.vic.gov.au)

As Designed/For Construction and As Commissioned versions of drawings relating to Victoria are not held in the PTV DMS. These drawings shall be held in the ARTC DMS for reference purposes but will not be relied upon as the most current version.

Drawings in the ARTC DMS will be managed by DMS Administrators based in each corridor with requests and updates processed electronically through the Drawing Management System. Refer to EGP-04-02 Drawing Management System for information on these processes.

Drawings of ARTC infrastructure are required for each of the engineering disciplines. The types of drawings applicable to these disciplines include but are not limited to:

#### Signals

- Circuit Book
- Control Panel
- Control Table
- Driver's Diagram
- Locking Table
- Signalling Plan
- Track Insulation Plan

#### Track and Civil

- Cross Section
- General Arrangement
- Horizontal Alignment
- Locality Plan and Schedule of Drawings
- Longitudinal Section
- Survey
- Track Layout

**Structures**

- General Arrangement
- Elevations
- Sections
- Details
- Locality Plan and Schedule of Drawings

**Electrical**

- Location

**1.4 Definitions**

The following terms and acronyms are used within this document:

Term or acronym	Description
Design Interface Agreement	An agreement detailing the roles and responsibilities of multiple parties required to work together to achieve complete and accurate update of drawings which reflect the changes associated in multiple simultaneous works.
Drawings	Drawings shall be defined in this context as site specific or standard documented layouts, plans, diagrams, tables, schematics and the like that set out the design and/or configuration of infrastructure assets (e.g. physical dimensions and composition, temporal and/or spatial arrangements, physical and/or logical interconnections) either existing, pre-existing, or proposed.

**1.5 Applicable Documents**

This standard shall be read in conjunction with the project specification, any general conditions attached thereto and other standards and documents comprising the Contract.

In particular, this standard shall be read in conjunction with the following publications:

- Australian Standard AS1100 Technical Drawing
- EGP-04-02 Drawing Management System
- ESD-25-01 CAD and Drafting Manual for Signalling Drawings
- ESI-07-02 Signals Design Documentation
- EGP0401F-01 Drawing Alteration Request – Field and Other Alterations
- EGP0401F-02 Drawings for Submission Checklist
- EGP0401F-03 Maintenance Copies Drawings Transmittal
- EGP0401F-04 Design Interface Agreement Template
- PEO-PR-008 Engineering, Design and Project Management Identification of Competence
- EGP-03-01 Rail Network Configuration Management

## 2 Projects / Maintenance Activities Responsibilities

### 2.1 General Requirements

The production and delivery of new and/or altered drawings that fit into ARTC's existing drawing series to form a comprehensive, consistent and cohesive set. They are to follow ARTC's standard documentation and drawing practices, including drawing numbering. Refer to procedure EGP-04-02 Drawing Management System for further information on drawing numbering.

If it is necessary for other existing drawings, not directly affected by the works, to be renumbered or otherwise modified to achieve an ordered, consistent and cohesive set, those drawings shall also be included in the work under the Contract and shall be modified to comply with these requirements.

All documents and drawings being used at any time are to be the latest version and the appropriate copies for the purpose required.

Drawings are to include notes relating to any deviation from standards and are to include the waiver number that authorised the deviation.

Drawings are required to be supplied for each stage of the project or activity as follows:

#### **As-Designed also known as Issued for Construction (IFC)**

These drawings are to be supplied as individual editable files as described in section 3.1.

A combined pdf set of each master file is also to be accepted on behalf of ARTC by the project manager and supplied for inclusion in the DMS.

#### **As-Commissioned also known as As-Constructed (Mark up Copy)**

These drawings are the marked up hard copies of design drawings signed by delegated personnel (preparers of drawings and acceptance by ARTC) and scanned into a single file.

These are updated to the DMS as well as being used as interim maintenance copies.

An acceptable alternative is the design drawing file, applicable Drawing Change Notes and the Drawing Change Note Register.

For civil and structures works where no changes to the Issued for Construction file have been required during the construction phase, As Commissioned drawings will not be required to be supplied for update to the DMS.

#### **As-Built also known as Work as Executed (WAE)**

These drawings are the individual As-Designed CAD version drawings updated to include all changes required during the construction and commissioning phases of the project or maintenance activity.

A combined pdf set of each master file is also to be accepted on behalf of ARTC by the project manager and supplied for inclusion in the DMS.

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*NOTE: Projects or maintenance activities involving decommissioning of redundant infrastructure need to consider any related drawings and ensure that the files are archived in the DMS and their metadata is updated to indicate the reason for this change in status.*

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## 2.2 Configuration Management Requirements

All drawings shall be subject to version control. Each revision shall be clearly shown on the drawing with its own revision number / letter, date and the description of the changes involved.

If a drawing is superseded for reasons other than a revision update, this shall also be indicated on the drawing with reference to a new drawing number if applicable.

All metadata relating to the drawings shall be completed and supplied on the standard ARTC template provided with the issued drawings and / or new drawing numbers.

Transmittal of all documents and drawings requires a standard transmittal form detailing the issue and following up receipt acknowledgments.

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*Note: The ARTC DMS automatically generates transmittal notes*

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A drawing register is required to keep track of all drawings and copies of drawings issued for work under the Contract, showing all identification details of each drawing issued (e.g. drawing number and/or title, type of drawing, purpose of copy, version number and date, copy number, copy holder name and receipt acknowledgment, issue date, history and current status).

## 2.3 Design Requirements

ARTC requires submission of design drawings for consideration prior to commencing construction or maintenance work. The design drawings shall be signed by the contractor's designer, checker, independent reviewer / verifier and design approver and accepted by ARTC before construction commences.

Where the specialised nature of the design requires checking of particular portions by different individuals, then the contractor must allocate a checking representative that is responsible for the review of the overall design.

Construction will be authorised to commence once any corrective action required to the review copies has been performed, signed off and accepted by ARTC (in accordance with requirements of original submission).

## 2.4 Commissioning & Testing Requirements

Interim maintenance drawing hard copies shall be provided on completion of commissioning. The required number of copies will be advised by the ARTC point of contact. One copy shall be forwarded to the corridor DMS Administrator.

Where applicable, delivery of the final master copy of the drivers diagram is required at least four weeks prior to commissioning. Delivery of the text for the applicable Safe Notice / Train Notice is required at least three weeks prior to commissioning.

## 2.5 Project Completion and Handover Requirements

Where submitted documents, drawings and software have been advised as unacceptable, resubmission of the corrected documents, drawings and software shall be provided within 30 days of the commissioning. All deliverable documentation including all work packages are to be supplied.



## 2.6 Managing Drawing Updates for Multiple Simultaneous Works

Where particular drawings are required for update by more than one party at the same time, a Design Interface Agreement is to be produced and agreed upon by the relevant parties.

This agreement is designed to clearly detail the roles, responsibilities and process to achieve complete and accurate update of all drawings.

The Design Interface Agreement (DIA) shall contain the following types of information:

- Scope
- Timetable
- Responsible persons/roles
- Key milestones
- Transfer of designs between parties
- What happens if project delivery changes
- As Built delivery/transfer
- Transfer of custodianship of drawing masters
- Advice of updates to the DIA
- Change to scope or design plan

The DIA shall be signed by a representative of all organisations that are updating drawings and by an ARTC representative.

A Design Interface Agreement template EGP04-01F07 is available on the ARTC website [http://extranet.artc.com.au/eng\\_all\\_form.html](http://extranet.artc.com.au/eng_all_form.html)

## 3 General Requirements

### 3.1 Drawing Format

All drawings are to be produced to Australian Standard AS1100 Technical Drawing or ARTC agreed equivalent.

- Designs shall be produced in accordance with designated ARTC Standards and contract requirements.
- All new designs or amendments shall be produced in CAD format up to and including AutoCAD 2010 (AutoCAD .dwg preferred or Microstation if agreed by ARTC).
- ARTC drawing sheet templates are to be used. See section 3.1.1 for further details.
- Each CAD file shall contain only one drawing sheet. Two drawings shall not be on the one CAD file layer or on separate layers on the CAD file.
- Each CAD file shall be self-contained with no external links or references which may result in an incomplete file being accessible for future use.
- Where an existing drawing requiring changes is not in CAD format, it shall be put in CAD format for any amendments.

- Amending drawings on hard copy printout is only permitted for As Commissioned drawings with the changes being incorporated into the As Designed CAD file at the time of updating to As-Built.
- The initial issue of all drawings shall be hand signed by the designer, checker, independent reviewer / verifier, approver and acceptor, except where permission has been given by the Configuration Manager for secure digital signatures to be utilised.
- The name (in the form J. Smith) of the designer, checker, independent reviewer / verifier, approver and ARTC acceptor of the original drawing, is to be included in the drawing sheet of the electronic copy of each drawing in the blocks provided for original signatures on initial issue. The date of each respective action shall also be included.

The CAD cell library for NSW signal drawings is available on the website

[http://extranet.artc.com.au/eng\\_signal\\_drawing.html](http://extranet.artc.com.au/eng_signal_drawing.html) The CAD cell library for other signal drawings is available from the DMS Administrators or the Victorian PTV DMS. Further information on CAD Standards can be found in procedure ESD-25-01 CAD & Drafting Manual for Signalling Drawings.

### 3.1.1 Drawing Templates

A standard drawing template is available in metric 'A' size sheets. Where a drawing won't reasonably fit within a standard metric A size sheet, the template may be expanded as necessary as long as the required metadata is still provided.

These templates are available from the ARTC website [http://extranet.artc.com.au/eng\\_network-config\\_drawing.html](http://extranet.artc.com.au/eng_network-config_drawing.html).

## 3.2 Revision of Existing Drawings

When an existing CAD drawing is to be revised, approval shall be sought through the Drawing Management System approval process. Refer to procedure EGP-04-02 Drawing Management System for further details.

The corridor DMS Administrator will then supply an electronic copy of the current version to the Contractor. In the case of non-CAD drawings, the corridor DMS Administrator will supply an electronic copy in the available format.

Drawings shall be booked-out of the DMS for a maximum of 30 days following commissioning, after which an extension must be granted via the ARTC DMS by the Authorised Manager.

The ARTC DMS automatically identifies drawings booked-out for revision. Periodic reviews of outstanding drawing requests will be performed by the corridor DMS Administrators.

All revisions are to be described in the next available revision box on the drawing sheet. Initial designs utilise an alphabetical character (beginning with A) with the finalised design being revision 0. All following revisions then use the next available number. The revision is also to be shown in the revision boxes above the drawing number on the drawing sheet.

The name (in the form J. Smith) of the designer, checker, independent reviewer / verifier, approver and ARTC acceptor and the date of the approver's signature shall be shown on the electronic copy in the revision area of the drawing sheet.

Standard engineering drawings require approval from the Standards Manager refer to procedure EGP-04-02 Drawing Management System section 7.3 for more information.

### 3.3 Corrections to Existing Drawings Identified Onsite

Where the need for alterations to existing drawings are identified by personnel in the field, these changes can be advised to the corridor DMS Administrator by the use of EGP0401F-01 Drawing Alteration Request Form – Field or Other Alterations.

These changes might relate to missing content or corrections of content as it appears on the field versions. This form will be reviewed by an appropriate corridor discipline engineer who will check if the field copies match the ones held in the DMS and if the changes are required. The discipline engineer will approve each request and make arrangements for the corrections to be made as appropriate. Refer to the Rail Safety Worker Competency Matrices available on the Safety Management section of the website.

If approved, the current electronic version of the document held in the DMS will be booked out and the changes will be updated. Once the changes have been confirmed and approved, the updated version will be uploaded into the DMS and the previous version archived. The updated version will become the current version and will show as available for booking out.

A copy of the updated drawing will also need to be put into the field location(s) to replace the one which required the update. A transmittal will be forwarded with the updated field copy. The transmittal is to be completed, signed and returned to the DMS Administrator as a record of compliance for this action.

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*Note: The field copy should always be maintained to show the infrastructure in its current state.*

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### 3.4 Checking of Drawings

The organisation producing the new or revised drawings is responsible for the accuracy and correctness of all new or revised drawings provided to ARTC.

Drawings completed by the designer are to be checked by another applicable discipline qualified person for compliance to technical drawing requirements and ARTC general drawing requirements.

### 3.5 Independent Review / Verification of Drawings

An independent reviewer / verifier will check the drawings for compliance to ARTC project requirements and standard design practices and principles.

The independent reviewer / verifier may be from the same organisation as the designer or from another organisation. Where the designer and independent reviewer / verifier are from the same organisation, the reviewer / verifier must work sufficiently separate from the designer to assure that no conflict of interest can occur.

Minor corrections to drawings e.g. typographical errors, may not require Independent Third Party checking. Any minor corrections not subject to Independent Third Party checks shall be accompanied by a statement signed personally by the applicable ARTC discipline engineer.

This statement shall be as follows:

“I certify that the changes made to this drawing are of a minor nature only and do not affect the integrity of the design and Independent Third Party checking is not required.”

### **3.6 Approval of Drawings**

The organisation which produces the new or revised drawings is responsible for approving the drawings. The approver accepts responsibility for ensuring that the drawings have been appropriately reviewed and the content accurately reflects the design calculations.

For larger projects which require drawings for multiple disciplines, the approver for each discipline must check with other approvers to ensure all project requirements are being met and that no conflicts to other designs are identified.

### **3.7 ARTC Acceptance of Drawings**

All drawings shall be accepted on behalf of ARTC by the applicable discipline competent project or maintenance engineer.

The drawings shall be accepted as complying with the engineering requirements of the project.

### 3.8 Timeframes

The design contractor shall provide drawings to ARTC to be registered in the DMS at each stage of a project as follows:

Drawing Type	Submit to DMS Administrator
As Designed / For Construction	Within 10 working days following issue for construction or no later than 30 days before commissioning
As Commissioned	Interim maintenance copies at the time of commissioning into service Electronic files within 10 working days of commissioning into service
As Built	Within 30 working days of commissioning into service

Any deviation from these timeframes must be agreed with the relevant corridor Asset Manager with sufficient controls in place to ensure that all necessary changes (especially where multiple works are involved) are captured and the updated records are provided within the agreed amended timeframe.

### 3.9 Cancelled or Deferred Projects

When a project is cancelled or deferred and drawings have already been issued for update, the corridor DMS Administrator shall be advised within 10 working days so that details within the Drawing Management System can be updated.

If final design has been achieved, the documents can be registered in the DMS.

If the project was cancelled or deferred in an earlier design phase, the unused design drawings are to be archived in the project file.

Refer to procedure EGP-04-02 Drawing Management System for details on how to update the system for this occurrence.

### 3.10 Third Party Project Drawings

All third party projects undertaken on ARTC infrastructure shall produce drawings in accordance with ARTC requirements. Other drawings relating to the same project which are past the defined ARTC interface may be supplied in the third party's format.

Third party projects in the ARTC rail corridor undertaken in accordance with procedure ETG-17-01 Installation of Utility Services and Pipelines within Railway Boundaries shall provide Issued for Construction drawings in the third party's format.

Drawings provided in the third party's format will be for reference purposes only and their status will need to be confirmed with the issuer if required for future works.

## **4 Electrical Drawings**

### **4.1 Location Drawing**

Location drawings are to be supplied on completion of work to the corridor DMS Administrator for inclusion in the DMS.

Location drawings are to incorporate the following:

- Location of UG cables measured from fixed reference points i.e. Rail lines, buildings
- Depth, size, number and type of cables
- Enclosure type
- Voltage of enclosed cables
- Marking tape type and depth
- GPS points at entry & exit points plus every 50 metres
- Date installed
- Other cables and services found on installation

## 5 Signalling Specific Requirements

For signal projects the drawings for a location or interlocking shall be configured into a circuit book. The Circuit Book Control Sheets and Amendment Sheets shall be updated to reflect the new work. The design date for all new or amended drawings shall be the date of the Design Check. Any changes during independent checking, construction, testing or commissioning shall be the date of the design check of these changes.

A complete history of all signal jobs including the reference number and title and all affected circuit book sheets relating to each job is to be maintained in the circuit book file. Additional amendment and control sheets can be added as required and each one noted in the relevant field as being part of a set of these sheets.

The date field on the circuit book amendment sheet relates to the date that the infrastructure was changed in the field and not the date the drawings were amended.

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*Note: The Circuit Book control sheet shall list all drawings that form the circuit book and not just the new or amended drawings.*

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### 5.1 Signal Drawings

Signal drawings are to be supplied on completion of work to the corridor DMS Administrator for inclusion in the DMS.

Typical signal drawing types and their content are described as follows:

#### 5.1.1 Circuit Book

- Automatic signals
- Section controls
- Level crossings
- Panel controls
- Interlocking and signal controls
- Points
- Miscellaneous vital
- Diagram
- Power
- Indicators and alarms
- Communications
- Analysis

#### 5.1.2 Drivers Diagram

- Track layout – not to scale
- Level Crossings – names, km
- Permanent signage and km
- Release switches and ground frame locations

Signal km and indications

Point km

Line description (main, loop, siding)

### **5.1.3 Signal Plan**

Track layout

Glued Insulated Joint (GIJ) location

Cable plan

Mechanical Interlocking

Axle Counter Heads

Mains power supply information

Level crossing approach information

Kms for signals, points, level crossings, permanent signs

Track circuit information

Curve and gradient details

### **5.1.4 Track Insulation Plan**

Signals

Signal rail

Glued Insulated Joint (GIJ) location

Axle Counter Heads

Track circuit name, polarity, type, bonding

### **5.1.5 Detail Site Survey (to scale)**

Kilometre and half kilometre posts

Cable routes

Underline crossings

Station buildings

Signal boxes

Relay rooms, housings and location cases

Line-side equipment

Existing buildings

Overhead wiring structures

For more detailed information relating to Signal drawing requirements refer to:

ESI-07-02 Signals Design Documentation and related forms

ESD-25-01 CAD & Drafting Manual for Signalling Drawings



## 5.2 NSW Signal Drawings Scanned Copies Naming Convention

Document Name	Document Number
Circuit Book	CBxxx
Control Tables	CTxxx
Drivers Diagram	DDxxx
Detailed Site Survey	DSSxxx
Signal Plan	SPxxx
Track Insulation Plan	TIPxxx
Aspect Sequence Chart	ASCxxx
Focussing Diagram (linked with SP)	FOCxxx