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Main Roads

Drawing Presentation Guidelines

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Contents

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Amendments

Revision Number	Revision Date	Description of Key Changes	Section / Page No.
2	13-Aug-2020	Removed Chapters 5 and 6, updated Title Block files, updated hyperlinks.	All
3	12-Sep-2022	Updated sections 4.1.3, 4.1.10, 4.2.5, 4.2.6, 4.2.14, 4.2.15.	Section 4
4	02-Dec-2022	Updated sections 3.1.1, 3.1.2.	Section 3
5	22-Aug-2023	Main Roads Directorates updated.	Section 2.4
5.1	21-Feb-2024	2022.dwt template added, new format incorporated.	Section 3.3, All
5.2	16 – May-2024	Design and Construct Contracts - drawing number issued date changed.	2.3

1 GENERAL STANDARDS AND APPLICATION

The purpose of this document is to standardise drawing information and presentation relating to the preparation of road construction drawings, including road design, road safety barriers, on and off-road drainage, shared and principal shared paths, signs and pavement marking works.

Main Roads drawings shall conform to "Australian Standard AS1100.101 Technical Drawing General Principles" unless otherwise stated in this guideline.

2 ELECTRONIC DATA STANDARDS

2.1 Software

Main Roads, Road and Traffic Engineering Branch currently use ***Bentley and Autodesk software*** for civil engineering design and drawing production.

Consultants shall check with the Main Roads drawing asset owner, that when lodging drawing files, they are compatible with the current versions of AutoCAD or Microstation being used by Main Roads.

The project drawing format, AutoCAD.dwg or Microstation.dgn should be agreed with the asset owner before drawings are prepared.

2.2 File Naming

- The drawing file shall be named as per the drawing number.

i.e., Drawing Number 202011-0363 = File Name 202011-0363.dwg (dgn)

- Amended drawings will retain the same drawing file name as the original.

i.e., Drawing Number 202011-0363-1 = File Name 202011-0363.dwg (dgn)

2.3 Drawing Numbers

Upon request, drawing numbers will be issued by the asset owner for all drawings prepared for Main Roads.

All cross references to other drawings, including match lines, must be to the Main Roads drawing numbers.

All drawings are to be supplied with the correct Main Roads drawing numbers.

Drawing numbers consist of three variables. These are as follows: -

- The calendar year in which the drawing numbers were provided, expressed as **2020**.
- The Main Roads Region, Branch or Directorate number. This number represents the custodian or owner of the final drawings. This is expressed as **11**.
- A sequential identifying number expressed as **-0363**.

2.3.1 Main Roads Directorates and Regions

- REGIONAL MANAGEMENT AND OPERATIONS DIRECTORATE
  - 01 Great Southern Region
  - 02 South West Region
  - 05 Goldfields-Esperance Region
  - 06 Kimberley Region

- 08 Wheatbelt Region
- 11 Pilbara Region
- 14 Mid-West Gascoyne Region

- OFFICE OF THE MANAGING DIRECTOR
  - 48 Metropolitan Region

- PLANNING AND TECHNICAL SERVICES DIRECTORATE
  - 18 Road Planning Branch
  - 31 Road and Traffic Engineering Branch (Standard, Guideline and Presentation drawings only, not for external use)

- INFRASTRUCTURE DELIVERY DIRECTORATE
  - 44 Major Projects (Project or Contract management purposes only)

A sequential block of numbers issued for each project can be obtained through the Main Roads asset owner or the Main Roads officer responsible for the project. Only drawing numbers issued by Main Roads shall be used.

Example of typical Main Roads drawing number - **202011-0063**

Consultants may use design lots if required to manage projects with a large number of drawings.

Consultants may use their own drawing numbering system if required, however Main Roads drawing numbers in addition to the Consultants drawing numbers shall be applied to all drawings.

Main Roads drawing numbers shall be added to the drawings as described below.

Design Only Contracts - No later than "100% Design Stage"

Design and Construct Contracts - At "Issued For Construction"

All drawing files shall be named as per the Main Roads drawing number and are not to be supplied with a Contractors naming convention.

2.4 Design Data

2.4.1 OpenRoads Design Software

All designs prepared using OpenRoads Design Software shall use the standard Main Roads "Corridor Templates" and "Design Feature Definitions" as defined below.

2.5 Drawing Data

At the document handover stage of all projects, completed drawings shall be supplied electronically. Main Roads retains copyright over all completed designs.

All drawings lodged are to be listed in a drawing register, supplied in an MS Excel spreadsheet. This register shall contain the following:

- Main Roads drawing number
- Contractor's or Consultant's drawing number
- Drawing Title
- SLK start & end
- PDF of design drawing supplied

- As constructed signed PDF supplied
- Consultant Name
- Main Roads - Road number and name
- Local Authority and number
- Main Roads file number (if available)

Unless requested by the Project Manager, hard copy plots of completed drawings are not required. However, when requested these drawings shall reflect all changes to the design including that identified in design reviews, re-design, or on-site modifications.

3 DRAWING STANDARDS

85% and 100% road design drawings shall be presented on A1 sheets.

Major sign drawings such as Intersection Direction Signs, Reassurance Direction Signs and Sign Post Schedules, may be presented on A3 sheets without the endorsement of the Principal Design Consultant Road and Traffic Engineering Branch.

3.1 Title Blocks

MRWA title blocks must be used for all Main Roads related drawings.

The title block type, horizontal or vertical style must be consistent throughout the drawing set.

On any particular project horizontal or vertical style title blocks may be used, but not a combination of the two.

The title block must be inserted into paper space.

Title blocks must be fully completed as per Main Roads Presentation Drawings including the survey metadata information.

The current version of all Main Roads title blocks can be downloaded from the Presentation Drawings area located under the "Technical Library" link on the Main Roads website. Alternatively, a link for each title block has been included below.

3.1.1 Design Only Contracts

- Vertical Style Title Block Drawings for projects undertaken by **Main Roads Personnel**
  - A1 size title block with vertical information area: A1 mrwa vtblk.zip
  - A3 size title block with vertical information area: A3 mrwa vtblk.zip
  - Roll Plan title block with vertical information area: Roll Plan mrwa vtblk.zip

- Horizontal Style Title Block Drawings for projects undertaken by **Main Roads Personnel**
  - A1 size title block with horizontal information area: A1 mrwa htblk.zip
  - A3 size title block with horizontal information area: A3 mrwa htblk.zip
  - Roll Plan title block with horizontal information area: Roll Plan mrwa htblk.zip

- Standard/Guideline Drawing Style Title Blocks for projects undertaken by **Main Roads Personnel**
  - A1 size title block with vertical information area: A1 mrwa vtblk std.zip
  - A3 size title block with vertical information area: A3 mrwa vtblk std.zip
  - A1 size title block with horizontal information area: A1 mrwa htblk std.zip

    - A3 size title block with horizontal information area: A3 mrwa htblk std.zip

- Vertical Style Title Block Drawings for projects undertaken by **Consultants**
    - A1 size title block with vertical information area: A1 cons vtblk.zip
    - A3 size title block with vertical information area: A3 cons vtblk.zip
    - Roll Plan title block with vertical information area: Roll Plan cons vtblk.zip

- Horizontal Style Title Block Drawings for projects undertaken by **Consultants**
    - A1 size title block with horizontal information area: A1 cons htblk.zip
    - A3 size title block with horizontal information area: A3 cons htblk.zip
    - Roll Plan title block with horizontal information area: Roll Plan cons htblk.zip

3.1.2 Design and Construct Contracts

- A1 size title block with vertical information area: A1 dc vtblk.zip
- A1 size title block with horizontal information area: A1 dc htblk.zip

3.1.3 Consultant's Logo

Provision for one Consultant's logo has been made available on all title blocks. For the production of all new drawings, the Consultant who is responsible for the majority of the design shall place their logo into the space provided within the title block. This logo shall remain on the drawings at all times.

In the circumstance that another Consultant may amend the drawings, the new Consultant's logo shall be included in the amendment box. The original Consultant's logo shall always remain on the drawing, unless the content of the original drawing has been completely replaced with new content.

For Design & Construct projects provision has been made available for Design Consultant's and Contractor logo and the Independent Design Verification Consultant's logo.

3.2 Pen Colours

All pen colours are to be set ByLayer only and shall conform to the following table for monochrome and colour plots.

Text height and line thickness shall be consistent for all layers and conform to the following table.

Pen Colour (No.)	Pen Number	Line Thickness (mm)	Text Height (mm)
Red (1)	7	0.25	2.5
Yellow (2)	7	1.00	10.0
Green (3)	7	0.35	3.5
Cyan (4)	7	0.18	1.8
Blue (5)	7	0.70	7.0
Magenta (6)	7	0.25	2.5
White (7)	7	0.50	5.0
Dark Grey (8)	8	0.25	2.5
Light Grey (9)	9	0.25	2.5
Colours (10-255)	10-255	0.25	2.5

3.3 AutoCAD Drawing Template

The drawing template file is the default AutoCAD drawing used when creating a new drawing.

The drawing template file (.dwt) contains the following information:

- Unit format and precision
- Default layer names
- Default text styles
- Default dimension styles
- Default page setups

It is essential that all new AutoCAD drawings prepared for Main Roads use the "MRWA Acad 2022.dwt" template file, inclusive of external reference files.

3.4 Drawing Layers, Line Types and Text

Named layers other than the standard MRWA layers in the drawing template may be used where necessary.

Layer naming should be meaningful and descriptive.

Layer colours and line types shall be set to ByLayer only.

Only the MRWA text styles and dimension styles as defined in the MRWA Acad 2022.dwt template file may be used.

All text annotation within an A1 drawing should be T35 (layer T35 - 3.5mm high). The exception being drawing amendments and A3 sized drawings where T25 (layer T25 - 2.5mm high) may be used.

On plan drawings, chainages shall read in the direction of increasing chainage.

All other lettering shall read from the lower right-hand corner of the drawing.

Oblique text may be used for identifying cadastral lot numbers.

Text is not to be obscured by line work. Where this occurs, the line shall be broken, the text moved, or a wipeout or background mask used.

3.5 External Reference Files

The use of external reference files is recommended to enable content to be changed globally across all drawings.

Model space external reference files such as OpenRoads generated survey, cadastral or design drawings must be inserted at 0,0 in the World UCS.

The coordinate system used should match the design project grid as specified in the design brief.

File naming should be representative of the external reference file drawing.

External reference files should be attached on a matching layer name.

Final drawings shall be supplied to Main Roads along with all external reference files and images used to create the final drawings.

The external reference files shall be contained within the same directory as the final drawings.

The drawing is to be purged to ensure a minimum sized file for storage.

3.6 Raster Image Reference Files

All raster image references must be inserted at true scale in the project coordinate system.

Compressed image file formats such as *.ecw are preferred.

Raster images should be attached on a separate layer i.e., Raster Image.

3.7 AutoCAD Drawing Setup

3.7.1 Model Space and Paper Space Layouts

- All drawing entities except for drawing annotation and title blocks must be in model space.
- All drawing entities should be 2D (Z=0) With the exception of visualisation and other 3D drawings. This ensures that line types display correctly, 2D snaps work and lengths are measured in 2D.
- Plan view entities such as survey and design models that have been exported from OpenRoads or other design packages must be inserted into AutoCAD in 2D at 0,0 in the World UCS to retain the original design coordinate system.
- Entities must not be moved or scaled. This is essential in retaining the correct design coordinate system.

- The MRWA AutoCAD template file contains a standard MRWA A1 paper space layout. It is recommended that this layout be used for all drawings except for roll plans.
- A1 and A3 title blocks should be inserted into paper space layout at 0,0.

3.7.2 Project Coordinate Systems

- OpenRoads and other design packages design to a specific project grid.
- OpenRoads plan view entities must be inserted into model space at their original coordinates in the World UCS.

These entities must not be scaled or moved to maintain the design project coordinates.

3.7.3 Multiple Paper Space Layouts

The use of multiple layout tabs with separate title blocks within a single AutoCAD.dwg file is permitted.

3.8 Microstation Drawing Setup

The presentation of drawings supplied in Microstation *.dgn format shall be consistent in appearance with that specified for AutoCAD drawings.

This must include the tile block and dimension styles.

3.9 Drawing Signatories

Drawing signatories on all Main Roads drawings shall conform to the following Delegation of Authority requirements.

All drawings are to be Verified, Recommended and Approved, preferably with wet signatures.

Electronic signatures may be used.

Amended drawings may receive a wet initial or electronic signature in the amendment box.

3.9.1 For Projects Undertaken by Main Roads Personnel

- **Designed/Drawn** The name of the Designer certifying that the design requirements for the project (including technical standards and procedures) have been met; and the name of the drafting officer who prepared the drawing. Include the month and year the drawing was finalised.
- **Verified** The signature of the appropriate Design Team Leader verifying that an independent examination of the engineering design and drawing has been carried out to confirm compliance with design standards, accuracy of content and conformance with accepted good practice. Include the date the drawing was signed.
- **Approved** The signature of the Delegated Officer confirming that the product described by the drawing meets the requirements of the project and that the drawing can be issued for use and that an approved check print process has been undertaken. Include the date the drawing was signed.
- **Recommended (for Construction)** The signature of the Client Project Manager confirming that the product described by the drawing meets the requirements of the project and that the drawing is recommended for construction. Include the date the drawing was signed.

- **Approved (for Construction)** The signature of the Client Project Director confirming that the product described by the drawing meets the requirements of the project and that the drawing is approved for construction. Include the date the drawing was signed.
- **Amendments** When the drawing is to be amended, all wet drawing signatures ("Verified", "Recommended", "Approved" and "Amendments" boxes) shall be replaced with the names of the signatories and date of signing. The approval of the new amendment shall be signed by the appropriate design team leader verifying that an independent examination of the engineering design and drawing has been carried out to confirm compliance with design standards, accuracy of content and conformance with accepted good practice. Include the date the drawing was signed.

3.9.2 For Projects Undertaken by Consultants

- **Designed/Drawn** The name of the Designer certifying that the design requirements for the project (including technical standards and procedures) have been met; and the name of the drafting officer who prepared the drawing. Include the month and year the drawing was finalised.
- **Verified** The signature of the Consultant Design Team Leader verifying that an independent examination of the engineering design and drawing has been carried out to confirm compliance with design standards, accuracy of content and conformance with accepted good practice. Include the date the drawing was signed.
- **Director** The signature of a Principal on behalf of the company confirming that the design has been prepared by suitably qualified personnel in accordance with the design requirements for the project and that an approved check print process has been undertaken. Include the date the drawing was signed.
- **Recommended (for Construction)** The signature of the Client Project Manager confirming that the product described by the drawing meets the requirements of the project and that the drawing is recommended for construction. Include the date the drawing was signed.
- **Approved (for Construction)** The signature of the Client Project Director confirming that the product described by the drawing meets the requirements of the project and that the drawing is approved for construction. Include the date the drawing was signed.
- **Amendments** When the drawing is to be amended, all wet drawing signatures ("Verified", "Recommended", "Approved" and "Amendments" boxes) shall be replaced with the names of the signatories and date of signing. The approval of the new amendment shall be signed by the appropriate design team leader verifying that an independent examination of the engineering design and drawing has been carried out to confirm compliance with design standards, accuracy of content and conformance with accepted good practice. Include the date the drawing was signed.

3.9.3 Amendments

When the drawing is to be amended: -

- Refer to Item 3.8.1 - For Projects Undertaken by Main Roads Personnel.
- Refer to Item 3.8.2 - For Projects Undertaken by Consultants.
- Amendments on drawings that occur during the design phase shall be "Alpha" characters starting with amendment "A" and increasing until the drawing is approved and issued for tender.

- Upon drawing approval, all "Alpha" character amendments shall be removed from the drawing, amendment, and title blocks. All ensuing amendments will be "Numeric" characters starting at "0" (Issued for Construction) and increasing accordingly.
- The nature of the amendment along with the amendment number shall be noted in the amendment block.
- An amendment triangle with amendment number shall be placed next to the relevant amendment, and all triangles from previous amendments (if any) removed.
- The drawing number will be suffixed with the relevant amendment number.
    - e.g., 202011-0063-1. Amendment numbers are to be sequential, starting at "1" and increasing accordingly.
- Amended drawings, as discussed in Item 2.2 File Naming, will retain the same drawing file name as the original drawing.

Before a drawing is to be amended, a full-size hard copy of the original signed drawing shall be saved to PDF and named accordingly. Electronic versions of previously amended drawings are not required.

3.10 Completion Format

Drawings shall be supplied "plot ready" at a 1 = 1 plot scale. All unreferenced blocks, layers, styles and linetypes shall be purged. Drawings shall be saved at extents with the lower left corner of the title block at "0,0" coordinates.

4 DRAWING CONTENT

4.1 Concept Design Stage, 5% Design Stage and 15% Design Stage

Some drawings produced for the concept design, 5% design and 15% design stages must be supplied in roll format.

It may be preferable for the Consultant to provide plan/profile, cross sections, and drainage strategy drawings in roll format, rather than on standard Main Roads drawing sheets with title blocks. These drawings may be submitted as either colour or monochrome plots and shall contain the following information:

- Scales
- Project titles
- SLK's
- Date
- Sketch and/or drawing numbers
- Metadata information.

Particular drawings showing locality plan, drawing index, typical cross sections, typical details, shall be produced on standard Main Roads A1 drawing sheets with title blocks in accordance with the project requirements.

If the 15% design is presented on standard A1 drawing sheets, then they must be accompanied by a roll plan showing the full extents of the proposed works. Each roll plot should be no longer than 3.0m.

Chainages to be adopted for road design should desirably correspond to Main Roads Straight Line Kilometres (SLK's). The designer should consult the latest version of Main Roads SLK books for Highways and Main Roads to obtain the current data.

4.1.1 Scheme Plan

To include: -

- Existing survey, topography or mapping background information
- Aerial photography / imagery (if available)
- Proposed design including any ultimate design
- Cadastral and MRS boundaries
- Site boundary
- Proposed land requirements
- Significant features and constraints including bridges, rivers, major roads
- North point
- Road names
- Main reference line names
- Existing contours

Scale – 1:1000, 1:2000, 1:5000 or to suit

Note:

- It is Main Roads preference that this drawing be submitted as a roll plan showing the full extents of the proposed works.

4.1.2 Typical Cross Sections

To include: -

- Typical / Key / Representative cross sections
- Typical dimensions
- Pavement details
- Separate cross sections for varying pavement types
- Crossfall and slopes
- Cut and fill batter slope details
- Open drains
- String labels
- Road safety barriers (where applicable)
- Road reserve boundary (where applicable)

Scale – 1:50, 1:100, 1:200 or to suit

4.1.3 Plan and Profile

Plan to include: -

- Proposed design
- Existing survey, topography, or mapping background information
- Existing services
- Aerial photography / imagery (if available)
- Cadastral and MRS boundaries
- Proposed land requirements
- Existing contours
- Major stream/river crossings
- Road reference marks
- Reference line and chainage
- String labels for reference line and edge strings
- Labels for side roads, driveways and culverts
- Road names
- North point
- Carriageway and shoulder widths (where applicable)

- Road safety barriers (where applicable)

Profile to include: -

- Main reference line string
- Adjacent dual carriageway reference line string (where applicable)
- Edge strings
- Existing ground string
- Ground water level (where applicable)
- String labels for reference line, edge lines and existing ground strings
- Levels on reference line
- Levels on existing ground string
- Levels on edge strings (where applicable)
- Cut and fill information
- Chainage and horizontal change points
- Superelevation
- Horizontal and vertical geometry for reference line

Scale – 1:1000H /1:100V, 1:2000H/1:200V*, (the horizontal / vertical exaggeration **MUST** be 10:1)

Note:

- Both main reference lines of a dual carriageway may be drawn on a single profile where chainage differences will not cause problems.
- Separate plan and profiles shall be produced for side roads, crossroads, service roads and freeway ramps.
- Vertical geometry can be detailed in "V.P.I. Box" layout style and/or "Profile Box" layout style.
- It is Main Roads preference that this drawing be submitted as a roll plan showing the full extents of the proposed works.

* 1:2000H/1:200V scale is to be used only on large rural projects longer than 5km in length.

4.1.4 Intersection Layout

To include: -

- Existing survey, topography, or mapping background information
- Aerial photography / imagery (if available)
- Proposed design
- Reference line and chainage
- Cadastral and MRS boundaries
- Proposed land requirements
- Existing and proposed services
- Culverts, on-road, and off-road drainage
- Road safety barriers
- Typical dimensions – carriageway, lane, and shoulder widths
- Design vehicle turn paths and reference to design vehicle used

Scale – 1:250 or 1:500

Note:

For rural type projects, intersection layouts may not be required at this stage.

4.1.5 Cross Sections

To include: -

- Proposed and existing sections
- Proposed offset and levels
- Existing levels

- String labels
- Existing road formation
- Reference line chainage
- Interval of 10m, 20m, 40m or 50m as required

Scale – 1:100, 1:200 or 1:400 Horizontal and Vertical with no vertical exaggeration

4.1.6 Drainage Strategy Plan

To include: -

- Existing survey, topography, or mapping background information
- Aerial photography / imagery (if available)
- Proposed design
- Reference line and chainage
- Cadastral and MRS boundaries
- Proposed land requirements
- Existing and proposed drainage networks (where applicable)
- Existing and proposed drainage sumps and basins
- Existing and proposed off-road drainage
- Existing and proposed services
- Critical infrastructure (bus stops, traffic islands, pedestrian crossings, driveways etc).
- Existing contours
- Catchment areas
- Overland flow arrows (where applicable)
- North point
- Road names

Scale – 1:250, 1:500, 1:1000, 1:2000 or to suit

4.1.7 Road Safety Barriers and Kerbing Plan

To include: -

- Proposed design
- Reference line and chainage
- North point
- Road names
- Existing survey, topography, or mapping background information
- Aerial photography / imagery (if available)
- Cadastral and MRS boundaries
- Proposed and existing road safety barriers
- Proposed barrier terminal treatments
- Proposed and existing fencing

Scale – 1:500 or 1:1000

Note:

It may be possible to combine this drawing with the roll plan and profile and/or intersection layout if room permits.

4.1.8 Lane Configuration Plan

Note:

- Pavement Marking and Minor and Major Signing drawings are not to be submitted for review at 15% design stage.
- Only Lane Configuration Plans will be reviewed at this early stage of the design process.

To include: -

- Proposed lanes
- Proposed CD roads
- Proposed ramps
- Legend
- Road names
- North point

Scale – 1:500, 1:1000, 1:2000, 1:5000 or to suit

4.1.9 Major Signs Strategy

To include: -

- Reference line and chainage
- Lane configuration
- All existing major signs, including VMS within project area
- All existing major signs within 5km (for major projects) of the project area
- Any other major signs impacted by the project
- Proposed major signs, including VMS and LUMS gantries

Scale – 1:500, 1:1000, 1:2000, 1:5000 or to suit

4.1.10 Bicycle Direction Signage Strategy

To include: -

- Reference line and chainage
- PSP configuration
- All existing bicycle direction signs
- All proposed bicycle direction signs

Scale – 1:500, 1:1000, 1:2000, or to suit

4.1.11 Speed Zone Strategy

To include: -

- Reference line and chainage
- Lane configuration
- Colour coded proposed / existing speed zones

Scale – 1:500, 1:1000, 1:2000, 1:5000 or to suit

4.2 85% Design Stage and 100% Design Stage

4.2.1 Cover Sheet

To include: -

- Road / Highway name
- Project name
- Road section
- Main Roads Directorate and/or Region name
- Straight line kilometres
- Local Authority and number
- Contract number
- Main Roads and State Government logos

4.2.2 Locality Plan and Index Sheet

To include: -

- Locality Plan and/or Key Plan

- Road / Highway name
- Project name
- Road section
- Main Roads Directorate and/or Region name
- Straight line kilometres
- Local Authority and number
- Main Roads and State Government logos
- List of all design drawings
- List of Main Roads referenced standard drawings

Scale – to suit

Note:

- It may be necessary to produce a separate drawing for the Locality Plan and a separate drawing for the Index Sheet.
- A separate drawing may also be required for the list of Main Roads Standard Drawings required for the project.

4.2.3 Scheme Plan

To include: -

- Existing survey, topography, or mapping background information
- Proposed design including any ultimate design
- Cadastral and MRS boundaries
- Site boundary
- Proposed land requirements
- Significant features and constraints including bridges, rivers, major roads
- Aerial photography / imagery (if available)
- North point
- Road names
- Main reference line names
- Existing contours

Scale – 1:1000, 1:2000, 1:5000 or to suit

4.2.4 Typical Cross Section and Details

To include: -

- Typical / Key / Representative cross sections for each construction type
    - Reconstruction
    - Widening
    - Intersection fillets
    - Overlay and widening
    - Local roads
    - Kerbed and unkerbed
    - Additional carriageway features (i.e., Overtaking Lane)
- Typical dimensions
- Pavement details
- Width for payment dimensions
- Project specific details
- Superelevation transition and rounding details
- Crown treatment detail
- Seal overlap details
- Kerb types and details

- Crossfall and slopes
- Cut and fill batter slope details
- Open drains
- String labels
- Roadside furniture (barriers, street lighting, fences)
- Site boundary / road reserve boundary
- Drainage structures
- Open drains
- Basins – applicable if located adjacent to the road
- Critical services
- Major/minor structures (bridge piers, abutments and retaining walls)

Scale – 1:50, 1:100, 1:200 or to suit

Note:

- It may be necessary to produce a separate drawing for the Typical Cross Sections and a separate drawing for the Typical Details.

4.2.5 Plan and Profile

Plan to include: -

- Proposed design
- Existing survey, topography, or mapping background information
- Existing services
- Cadastral and MRS boundaries
- Proposed land requirements
- Existing contours
- Culverts, on-road, and off-road drainage
- Floodway locations
- Road reference marks
- Reference line and chainage
- String labels for reference line and edge strings
- Road names
- North point
- Carriageway and shoulder widths
- Road safety barriers (where applicable)
- Legend
- Services

Profile to include: -

- Main reference line string
- Adjacent dual carriageway reference line string (where applicable)
- Edge of seal strings (where applicable)
- Existing ground string
- Ground water level (where applicable)
- String labels for reference line, edge lines and existing ground strings
- Labels for side roads, driveways, and culverts
- Levels on reference line
- Levels on existing ground string
- Levels on edge strings (where applicable)
- Cut and fill information
- Chainage and horizontal change points
- Superelevation

- Horizontal and vertical geometry for reference line
- Pavement type locations
- Road safety barrier locations (where applicable)
- Culvert locations
- Side road locations
- Driveway locations

Scale – 1:1000H /1:100V, 1:2000H/1:200V*, (the horizontal / vertical exaggeration **MUST** be 10:1)
Note:

- Both main reference lines of a dual carriageway may be drawn on a single profile where chainage differences will not cause problems and the edge lines are clearly visible.
- Separate plan and profiles shall be produced for side roads, crossroads, service roads and freeway ramps.
- Vertical geometry can be detailed in "V.P.I. Box" layout style and/or "Profile Box" layout style.
- For rural type projects road safety barriers may only need to be shown on plan and profile drawings. For urban type projects, road safety barrier plans should be provided as separate drawings.

* 1:2000H/1:200V scale is to be used only on large rural projects longer than 5km in length.

4.2.6 Intersection Layout

To include: -

- Existing survey, topography, or mapping background information
- Existing services
- Aerial photography / imagery (if available)
- Proposed design
- Reference line and chainage
- Cadastral and MRS boundaries
- Proposed land requirements
- Existing and proposed services
- Culverts, on-road, and off-road drainage
- Road safety barriers
- Typical dimensions – carriageway, lane and shoulder widths
- Pavement marking
- Design vehicle turn paths and reference to design vehicle used (If not previously provided at 15% design stage) These can also be provided as separate sketches.
- Tangent points and radius
- String labels
- Blend areas
- North point
- Road names
- Legend

Scale – 1:250 or 1:500

- Note: For rural type projects services may only need to be shown on plan and profile drawings. For urban type projects, services plans should be provided as separate drawings.

4.2.7 Cross Sections

To include: -

- Proposed and existing sections
- Proposed offset and levels

- Existing levels
- String labels
- Existing road formation
- Reference line chainage
- Interval of 10m, 20m, 40m or 50m as required
- Specific underground services as required
- Road safety barriers
- Pavement layers (where applicable)
- Open drains (where applicable)
- Basins (where applicable)
- Road reserve boundary location

Scale – 1:100, 1:200 or 1:400 Horizontal and Vertical with no vertical exaggeration

4.2.8 Drainage Plan

To include: -

- Existing survey, topography, or mapping background information
- Aerial photography / imagery (if available)
- Proposed design
- Reference line and chainage
- Proposed line marking
- Cadastral and MRS boundaries
- Proposed land requirements
- Existing and proposed drainage networks
- Existing and proposed drainage sumps and basins, including basin/sump RL (base and top), TWL (design storm and major storm), MGL, capacity and side slope grades
- Existing and proposed off-road drainage
- Proposed levels or grades of any independently graded drains
- Existing and proposed services
- Existing drainage pipe network, structures, and details
- Proposed drainage and subsoil drainage pipe networks, structures, and rock protection
- Drainage structures table including set-out coordinates, surface elevation, base elevation (or structure depth) and type
- Pipe details including pipe size, inverts, grade, class, length, and minimum cover
- Existing contours (on and off road)
- Proposed contours
- Road safety barriers
- Kerbing
- Roadside furniture (where applicable)
- Major/minor structures
- Maintenance access
- North point
- Road names
- Pedestrian ramps
- Legend (showing existing and proposed drainage)
- Floodway locations and lengths of stabilised pavement
- Identify water quality improvement and oil spill control devices and approximate locations

Scale – 1:250, 1:500 or 1:1000

Note:

- Where proposed and existing contours are shown together, avoid showing the proposed contours over the top of existing contours.
- Drainage plans must cover the full extents of the project works (limit of works) as a minimum, in some cases it may be necessary to go beyond the limit of works to include adjacent intersections, but stops etc.

4.2.9 Road Safety Barrier and Kerbing Plan

To include: -

- Proposed design
- Reference line and chainage
- Proposed line marking
- Existing survey, topography, or mapping background information
- North point
- Road names
- Legend showing different road safety barrier types
- Cadastral and MRS boundaries
- Proposed and existing road safety barriers, including traffic barriers
- Proposed barrier terminal treatments
- Existing road safety barrier to be removed
- Set-out details for proposed road safety barriers
- Barrier details (dimensions, lateral restraint, transitions etc)
- Proposed kerbing types and extent
- Existing kerbing to be removed
- Retaining walls and noise walls
- Bridge piers and abutments
- Sign and VMS gantries
- Multi post signs
- Basins, kerb openings and headwalls

Scale – 1:500 or 1:1000

Note:

- It may be possible to combine this drawing with the plan and profile, drainage plan and/or intersection layout if room permits.

4.2.10 Services / Utilities Plan

To include: -

- Existing survey, topography, or mapping background information
- Proposed design
- Reference line and chainage
- Cadastral and MRS boundaries
- Proposed land requirements
- North point
- Road names
- Legend showing existing and proposed services
- Existing drainage pipes and structures
- Proposed drainage and subsoil drainage pipe network, structures, basins, sumps, and rock protection
- Existing and proposed services
- Existing and proposed lighting poles, pits, ducts etc
- Existing and proposed emergency telephones, ducts, pillars etc

- Existing and proposed general service ducts
- Existing and proposed traffic signal poles, pits, ducts etc
- Existing and proposed road safety barriers
- Proposed pedestrian ramps

Scale – 1:250, 1:500 or 1:1000

Note:

- It may be possible to combine this drawing with the plan and profile, drainage plan and/or intersection layout if room permits.
- Services plans should be generated in colour, highlighting the different proposed and existing services, while the background information and proposed design should be shown in monochrome.
- For complex services projects, separate drawings may be required for each individual service authority.

4.2.11 Fencing Noise Wall and Retaining Wall Plan

To include: -

- Proposed design
- Reference line and chainage
- North point
- Road names
- Legend
- Existing and proposed fences, noise walls and retaining walls
- Existing fences, noise walls and retaining walls to be removed, replaced, relocated and/or to remain
- Proposed fence, noise wall and retaining wall types
- Proposed fence, noise wall and retaining wall alignments
- Proposed noise wall and retaining wall footing details
- Proposed noise wall and retaining wall material types
- Set-out dimensions and/or coordinates
- Reference to standard fence, noise wall and retaining wall details
- Proposed noise wall and retaining wall profiles

Scale – 1:500, 1:1000 or 1:2000

4.2.12 Pavement and Surfacing Plan

To include: -

- Proposed design
- Reference line and chainage
- Cadastral and MRS boundaries
- Proposed land requirements
- North point
- Road names
- Legend
- Proposed pavement markings, arrows gore and hold lines
- Coloured hatching to differentiate the different pavement types
- Limits of pavement types

Scale – 1:500, 1:1000 or 1:2000

4.2.13 Culvert Schedule

To include: -

- Structure numbers
- Reference line name and chainage
- Culvert types and number of barrels
- Set out coordinates for inlet and outlet locations
- Pipe size, class, length, and slope
- Pipe invert levels
- Culvert outlet rock protection details
- Ground conditions
- Project specific details
- Wingwall slope
- Apron length
- Batter slope at culvert
- Headwall height

4.2.14 Culvert Cross Sections

To include: -

- Proposed and existing sections showing proposed and existing pavement
- Proposed offsets and levels
- Existing offsets and levels
- Existing drainage pipes and structures
- Existing pipe details i.e., pipe diameter, invert level and length and flow direction
- Proposed pipe details i.e., pipe diameter, invert levels, length and class and flow direction
- Cover at edge of shoulder
- Cut-off wall and extent of rock protection
- End treatment
- 'F' drains length and slope
- Locally fill and grade batter to buried/exposed headwall (if required)
- Offset of inlet and outlet set out point from road reference line
- Proposed barriers including post depths (where applicable)

Scale – 1:100 or 1:200

4.2.15 Pavement Marking and Minor Signing

To include: -

- Proposed design
- Reference line and chainage
- North point
- Road names
- Legend
- Proposed pavement markings, arrows, gore marking and stop & give way lines
- Proposed minor and major sign locations, including direction signs and variable message signs (VMS) (where applicable)
- Layout and positions of all vehicle detector stations (VDS) (where applicable)
- Location of lane use management system (LUMS) gantries (where applicable)
- Proposed retroreflective raised pavement markers (RRPMs)
- Existing pavement markings (e.g., tie into xx m of existing double two-way barrier line) and carriageway to remain
- Existing pavement markings and signs to be removed, replaced, relocated or to remain
- Carriageway, lane, and shoulder widths
- Tactile ground surface indicators (TGSIs) (where applicable)

- Pedestrian ramps
- Minor Projects set out information required for installation of pavement marking and signs (i.e., length and quantity) Refer to Main Roads Presentation Guideline Drawing 200931-0083 for example
- Major projects set out information – abbreviated terminology for line and pavement markings is acceptable

Scale – 1:250, 1:500 or 1:1000*
Note:

- It may not be possible to combine Minor and Major Signing on the same drawing if room does not permit. In this situation then separate plans should be prepared for Minor Signing and Pavement Marking and for Major Signing.
- It is important to indicatively show major sign locations on the minor sign drawings and minor sign locations on the major sign drawings to allow assessment of sign spacing and possible masking issues.

* 1:1000 scale is to be used only on large rural projects longer than 5km in length without the need for detailed intersections.

4.2.16 Major Sign and Bicycle Direction Sign Plan

To include: -

- Proposed design
- Reference line and chainage
- North point
- Road names
- Legend
- Proposed pavement markings, arrows gore and hold lines
- Proposed major sign locations
- Proposed bicycle sign locations
- Proposed retroreflective raised pavement markers (RRPMs)
- Existing pavement markings and carriageway to remain

Scale – to suit
Note:
Refer to Main Roads Presentation Guideline Drawing 200331-0047 for example.

4.2.17 Major Direction Sign Design

To include: -

- Sign panel details and dimensions
- Sign installation details
- Stiffener and post design criteria
- Material types and colours
- Sign Post schedule (Refer 4.2.18)

Scale – to suit

4.2.18 Sign Post Schedule (Major and Minor)

To include: -

- Drawing number and reference of signs
- Chainage and position
- Sign number
- Sign description
- Location number

- Class of retroreflective material
- Post schedule details including
    - Speed limit
    - Soil type
    - Mounting height
    - Post size
    - Footing type
    - Size of sign
    - Post details

Scale – to suit
Note:
Refer to Main Roads Presentation Guideline Drawing 200331-0050 for example.

4.2.19 Smart Freeways – Additional Information for 85% and 100% Design Drawings Presentation

Design drawings need to conform to Main Roads' guidance and requirements for drawing presentation as indicated in this document. Where changes are made during construction, 'As-Constructed' drawings shall also be provided by the project.

Mainline Design Drawings

The mainline layout drawings for Smart Freeways shall include the following design features and devices **on the same layout / alignment drawings** for ease of design review and setting up the freeway in the central control system:

- Chainages along the carriageway.
- Layout of pavement and lane markings, including ramp connections, tapers, lane reductions (exclusive exit lanes, lane drops), etc.
- Locations of major signs including direction signs and variable message signs (VMS), etc.
- Layout and positions of all vehicle detector stations (VDS).
- Locations of LUMS gantries, if applicable.

Ramp Signal Plans

Each ramp shall be shown on a dedicated ramp signals drawing, generally along the lines of the Main Roads' guideline drawings for ramp signals, i.e., not be part of the mainline alignment drawings design grid. For long ramps two drawings may be needed, or up to three drawings for long freeway-to-freeway ramps. Inserts may be provided for assets at a distance from the ramp signals, if necessary.

The following design features and devices shall generally be shown **on the same layout drawings** for ease of design review and setting up the ramps and ramp signals in the central control system:

- Ramp layout (lane lines, edge lines, continuity lines, pavement arrows, etc.), including number of lanes at the ramp entrance, stop line, at ramp nose, and the layout entering the mainline (consistent with mainline alignment drawings).

- Either a chainage line along the ramp (to enable calculation of lane / ramp storages) or specific dimensions (or tabulation) of the lane / ramp storages upstream of the stop line.
- Location of stop line dimensioned to ramp nose and/or ramp entrance.
- Vehicle detector locations along the ramp including dimensions to the stop line and start of ramp as well as AP and RP locations, etc., if applicable.
- Controller location.
- Ramp control signs and locations (RC1, RC2, RC3 etc.), and other electronic signs, if applicable, e.g., overhead lane control signs, VSL signs, etc.
- Location and type of signal posts or structure.
- Associated static traffic signs.
- Conduit locations for the ramp, including connections to electrical power supply and the telecommunications network, including location, size and number of conduits and pits.

Other assets as may be relevant, e.g., safety barriers and light poles.

4.3 Issued For Construction

Upon drawing approval, all "Alpha" character amendments shall be removed from the drawing, amendment, and title blocks. All ensuing amendments will be "Numeric" characters starting at 0 (Issued For Construction) and increasing accordingly.

Any amendments made to the drawings during the construction stage shall be reflected on the As Constructed drawings.

4.4 As Constructed Drawings

Upon completion of construction for a road design project, all drawings shall be updated to reflect any changes from the original design implemented during the construction phase.

Each drawing in the drawing set shall be amended to reflect the "As Constructed" changes and a description added to the amendments box describing the changes to the drawing. No revision clouds or amendment triangles shall be present on the completed drawings.

Each drawing in the drawing set, even if unchanged shall also have an "As Constructed" drawing block inserted, to reflect that it is now an as constructed drawing. The amendment to an unchanged drawing should read "No Change" in the description box.

Cross section drawings do not need to be "As Constructed" amended.

Notes on drawings relating to "install" or "proposed" or "new" do not need to be amended when updating drawings to "As Constructed".

As constructed drawings must include the name of the Project Manager, designers and verifiers that signed the original Issued For Construction (IFC) drawings. As constructed drawings must receive a "digital signature" in the amendment box.

The as constructed drawings must include an index sheet, which relates the Contractor's or Consultant's drawing numbers to the Main Roads drawing numbers. All cross references to other drawings, including match lines, must be to the Main Roads drawing numbers.

4.5 Design Submission

For information relating to design submission standards refer to Survey and Geospatial Services Data Management Guidelines - Data Lodgement Guideline

All drawings prepared for Main Roads shall be supplied in AutoCAD *.dwg or Microstation *.dgn and PDF format.

Electronic PDF versions of the drawings must be scanned at full size from hardcopy signed original drawings and must be scanned in 400 dpi minimum resolution in full colour.

At the document handover stage of all projects, completed drawings shall be supplied electronically. All CAD plan model space drawing files including external references must be supplied in the coordinate system as prescribed by document 67-08-43 Digital Ground Survey. Main Roads retains copyright over all completed designs.

All drawings shall be named as per the Main Roads drawing number and are not to be supplied with a Contractors naming convention.