

# **Drafting and Design Presentation Standards Manual**

## **Volume 1: Chapter 2 – General Standards**

**March 2021**

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## Amendment Register

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	2.4.3	Removal of copyright and GILF sections		
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<b>Issue / Rev no.</b>	<b>Reference section</b>	<b>Description of revision</b>	<b>Authorised by</b>	<b>Date</b>
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	2.1.6.3	Bridge naming convention and examples removed		
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	2.4.5.1 2.4.5.2	Changes to the format of Project and Contract Numbers due to 3PCM numbers		
	Table 2.4.3.1	Update to table		
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	Appendix 2E	Minor updates		
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	2.4.4.1	Update to media requirements		
	2.4.4.3	Update to final drawings requirements		
	Appendix 2E	Minor update		

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## 2 General Standards

### 2.1 Data modelling

The purpose of this section is to provide guidance in the modelling and transfer of data, to ensure uniformity of both data generated, using internal systems, or data supplied to the Department of Transport and Main Roads (department) from external sources.

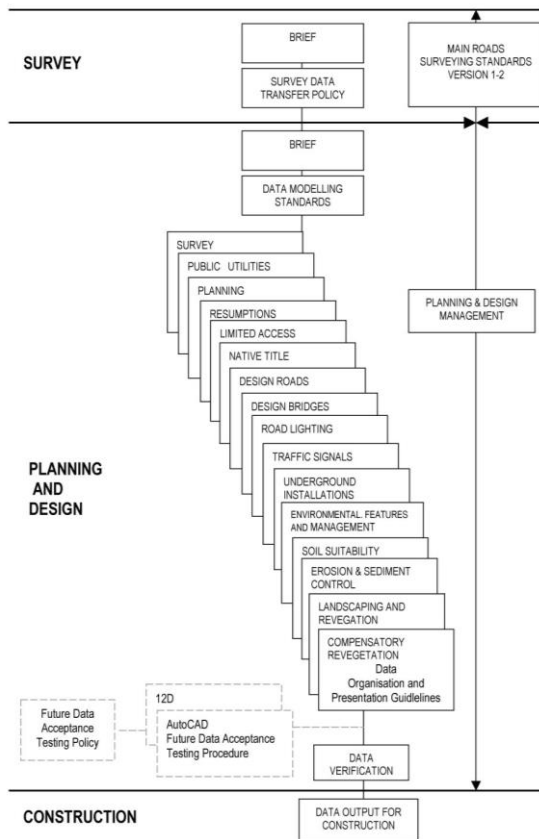
#### 2.1.1 Scope

Generally, all documents prepared by or on behalf of the department, are in electronic format and use data modelled with Computer Aided Design and Drafting (CADD) software. The general standards outlined in this Chapter detail data modelling standards that are acceptable to the department. They are to be read in conjunction with the requirements for preparation and presentation of each specific type of CADD data used by the department, which are detailed in the following sections of this document. Figure 2.1.2 provides an overview of CADD Data Modelling Components.

#### 2.1.2 Media

A Standard Operating Environment (SOE) based on the Microsoft Windows platform, is the default desktop across the department. It is recommended that advice is sought from the department in relation to the current platform in use.

**Figure 2.1.2 - Overview of CADD data modelling components**





### **2.1.2.1 Type**

The media on which the data is to be supplied, is to be agreed to by the Project Manager and the data supplier and set out in the brief. Hardware compression on devices must not be used under any circumstances.

### **2.1.2.2 Format**

Only media formatted using the Windows format command is acceptable. It is the data supplier's responsibility to supply data in a media format appropriate to the department's systems.

### **2.1.2.3 Compression**

Data may be supplied in compressed format agreed to by the Project Coordinator. This must be detailed on accompanying documentation and a copy of the software to reverse the process. Also, instructions on how to use the programme to extract the file(s) shall be provided. Hardware compression on devices must not be used under any circumstances. The use of utilities that produce compressed files compatible with the SOE detailed in Section 2.1.2, is the only acceptable method of file compression.

It is the data supplier's responsibility to supply data using a compression format appropriate to the department's systems.

### **2.1.3 CADD software**

The department currently uses both propriety and in-house developed software for modelling a drawing presentation. This software is continually developed and customised to meet the department's needs.

The current CADD software systems used in design offices throughout the department and a description of their uses are as follows:

- **12D**

12D Model is an interactive three-dimensional modelling package designed to quickly build terrain, conceptual and detail design string models. The survey features of the software are extensively used by the Survey section of the department for inputting terrain and feature data. Large survey data models can be triangulated and contoured to build an initial terrain model. Roads, channels and other design features can be added interactively and a merged model containing the initial terrain and the new design features formed to produce conceptual design models.

All models can be examined in plan, section or perspective views including extensive visualisation and drive through facilities.

To maintain uniformity throughout the department, customised features have been developed and added to the 12D Model to simplify the planning and design process. The TMR 12D Customisation software is a collection of custom files incorporating departmental standard features which include standard drawing sheets, line styles, mapping files, title files, plot parameter files, definition files, fonts and various macros. The department's 12D customisation, used in the design process and conforming to the Data Modelling Standards, is detailed in Appendix 2C.

- **AutoCAD / MAP 3D**

A general-purpose Computer Aided Drafting system designed with an open architecture that can be customised to individual requirements. For departmental purposes, AutoCAD has been customised to include standard plan sheets, blocks (or shapes) containing survey symbols and traffic signs and a layer-naming convention with assigned line styles for use in survey, design and environmental drawings. The TMR AutoCAD Customisation software is also used to simplify the importing of survey data from other systems with TMR Customisation, such as 12D.

- Data is to be supplied in a format suitable for the receiving CADD package.

### 2.1.3.1 Data format

In many instances, information is required to be transferred between various software systems. There is no simple or perfect mechanism for data transfer that satisfies all systems. Some systems are specialised in their application requiring specific software to operate.

CADD data is to be supplied in a data format agreed to by the Project Manager and compatible with currently used versions of the supported CADD software listed above. The more common data exchange systems used in the department are shown in Table 2.1.3.1.

**Table 2.1.3.1 – Data format description**

Data Format	Description
AutoCAD drawing (DWG)	AutoCAD's binary drawing file format (.dwg). Guidelines for AutoCAD drawing exchange are included in Appendix 2B.
Data eXchange Format (DXF)	An ascii based data transfer system developed by AutoDesk. The exchange of data in this format may vary across packages possibly causing some incompatibilities. If this format is to be used, it is the data supplier's responsibility to supply data compatible with the department's CADD software.
12D Ascii	A proprietary model file format developed by 12D Solutions for the modelling of road infrastructure design using 12D Model.

Not all design offices are able to accept all of the data formats listed above. It is the data supplier's responsibility to supply data in a format agreed to by the issuing office.

### 2.1.3.2 Target data formats

The following Table 2.1.3.2 shows a matrix of data formats and the CADD packages they can receive.

**Table 2.1.3.2 – Data format / CADD package matrix**

Data Formats	Receiving CADD Package	
	12D	AutoCAD
AutoCAD drawing	Y	Y
12D Models	Y	N

## **2.1.4 Data delivery**

### **2.1.4.1 Data presentation**

CADD data will be presented in accordance with the following sections for preparation and presentation of each specific type of CADD data used by the department.

### **2.1.4.2 Data delivery**

CADD data is to be delivered as detailed in the following chapters of this manual for preparation and presentation of each specific type of CADD data used by the department. A copy of all data files, as delivered to the department, will be stored in accordance with the issuing office's quality system.

### **2.1.4.3 Data ownership**

All data supplied by the data supplier, shall become the property of the department. Nominal ownership shall reside with the officer responsible for the provision of funds, for the acquisition of such data.

It shall not be used, copied or reproduced by the data supplier for any other purpose without the prior written approval by the owners, or the department.

## **2.1.5 CADD data transmission**

Transmission of data is to be carried out in accordance with the Project Manager's quality system. Data may be transferred as an attachment to an email, memo or letter, or made available over the Internet. Regardless of the method of transmission, the following information should typically be included with the data:

- direction of transfer (From:... – To:..)
- name and address details of data supplier
- contact person for data supply
- date
- road number
- job number and location
- media type
- media format
- compression method
- authoring software and version number
- data format
- CADD filename(s) and description(s)
- adequacy of data and data verification (proof plot etc.), and
- person responsible for data verification.

## **2.1.6 Naming convention for modelling systems**

For uniformity throughout all departmental design offices within the state, a standard naming convention for models and strings has been developed for use within all design software modelling packages.

### **2.1.6.1 Model naming convention**

To take full advantage of current and future automated procedures within our modelling packages (i.e. TMR Customisation software), a standard model naming convention is required. Designers and constructors will then have immediate recognition of model contents, regardless of the design office the project originated from.

This naming convention follows closely the names associated with the types of models and the surfaces they contain. Appendix 2C contains a list of the model names to be adopted, together with a brief description of their contents.

### **2.1.6.2 Survey feature codes**

All survey feature coding and modelling must be in accordance with the department's current standards as set out in the department's *Surveying Standards*. No variations will be allowed to the codes, symbols, line styles or designated models for each code.

### **2.1.6.3 Design string naming convention**

The department has adopted a standard naming convention for labelling design model strings. The use of a labelling convention during design, will allow for a more efficient use of current and future automated features. These features, such as transferring data, are available within existing design software.

A further benefit of a standard String Naming Convention (SNC), is that a string label signifies the same feature throughout all design offices and to all constructors. This results in easier understanding of any project model, regardless of the origin of the design.

Appendix 2A, represents the department's design string naming convention. In most cases, only the first two characters of the string label are relevant for string recognition. The number of characters in the string label and its definition, will be dependent on the modelling software used. Line style names have also been included. See also Section 2.3.

Examples showing design elements for roadways of the string naming convention, are included as Figure 2.1.6.3(a) to Figure 2.1.6.3(i). Bridge and structural components naming convention is detailed in Volume 3, Chapter 20.

**Figure 2.1.6.3(a) – Typical cross section of two lanes two-way rural road**

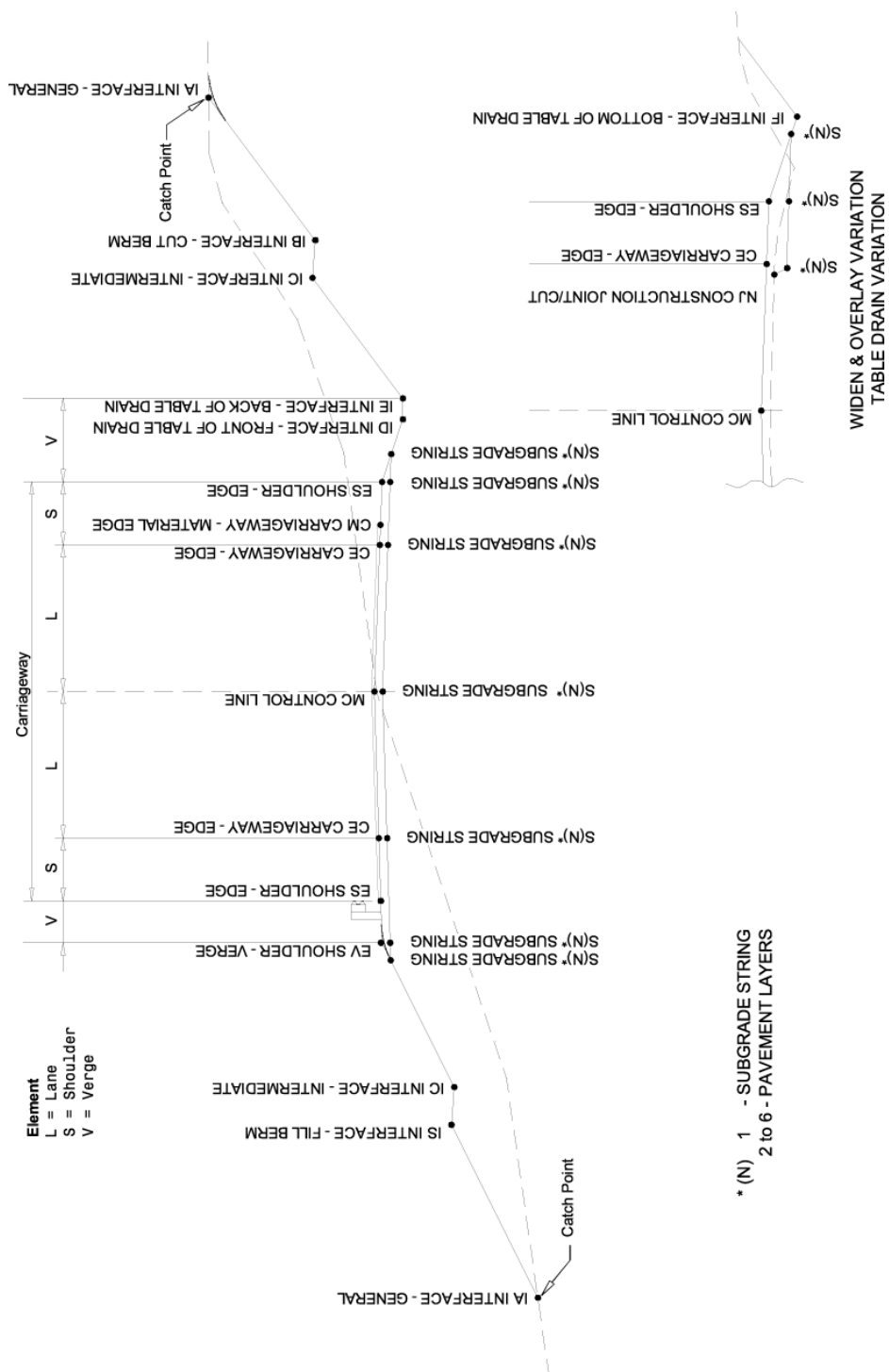


Figure 2.1.6.3(b) – Typical cross section of multilane rural road – independently aligned

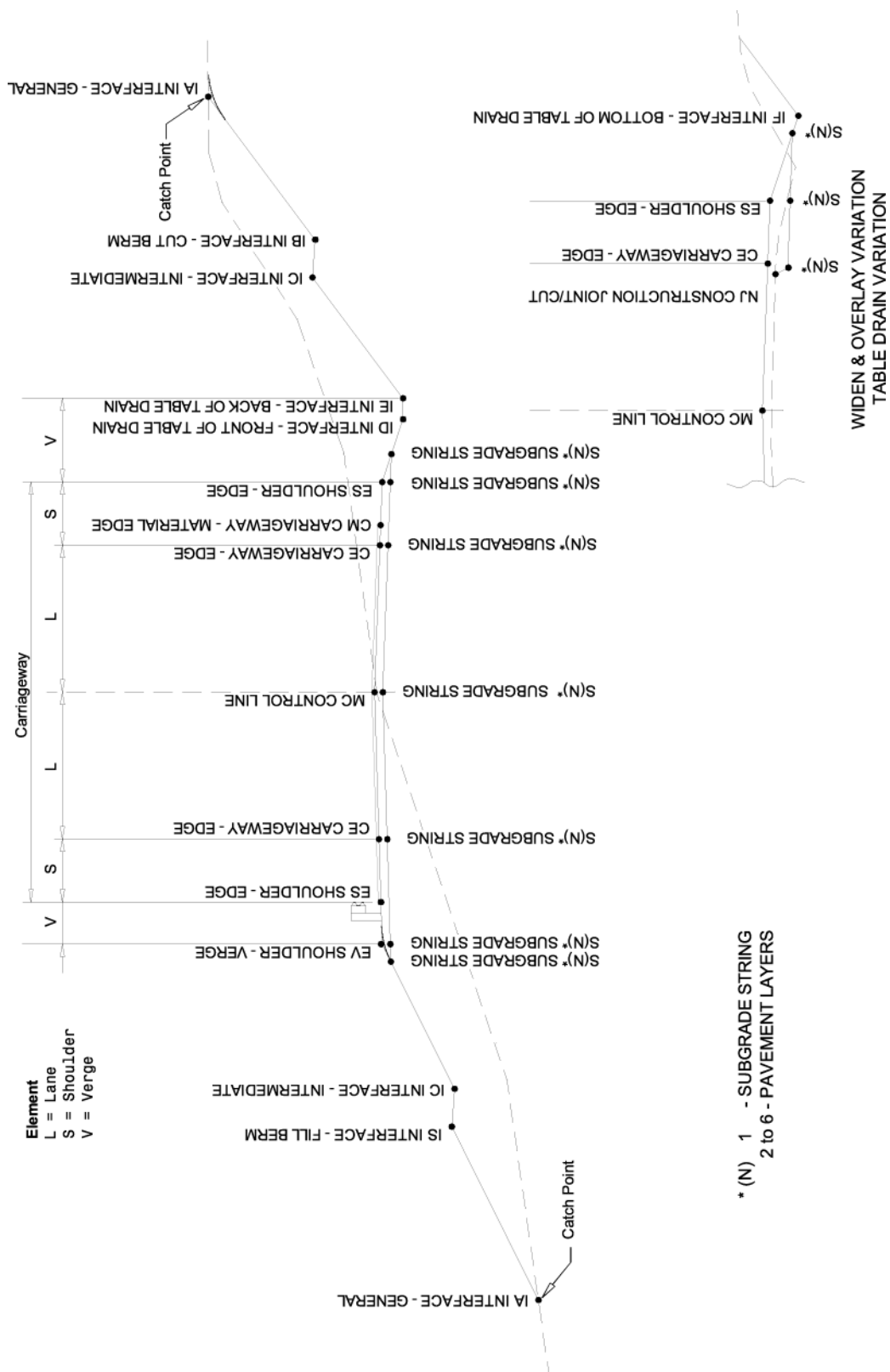


Figure 2.1.6.3(c) – Typical cross section of undivided urban road

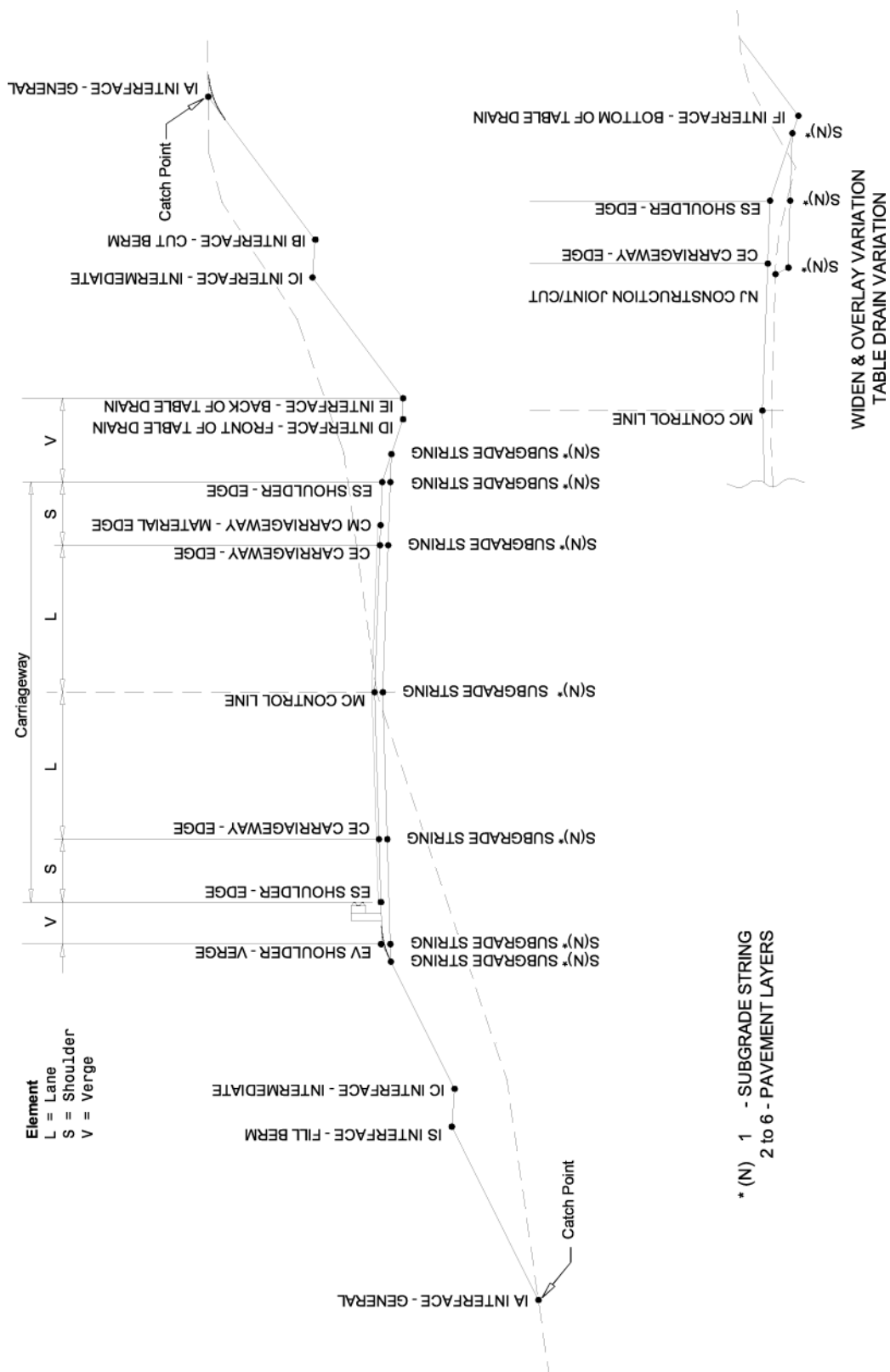
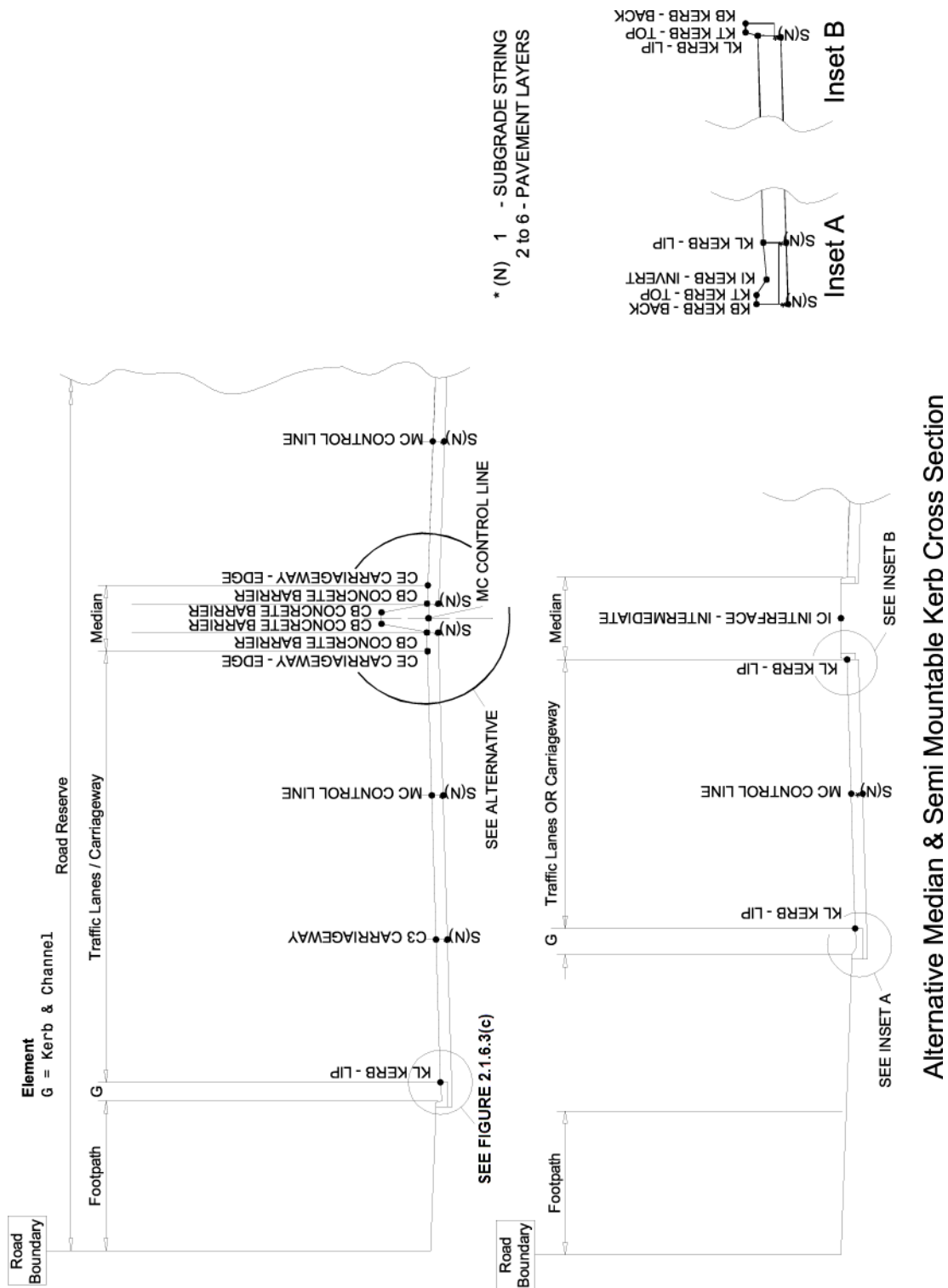


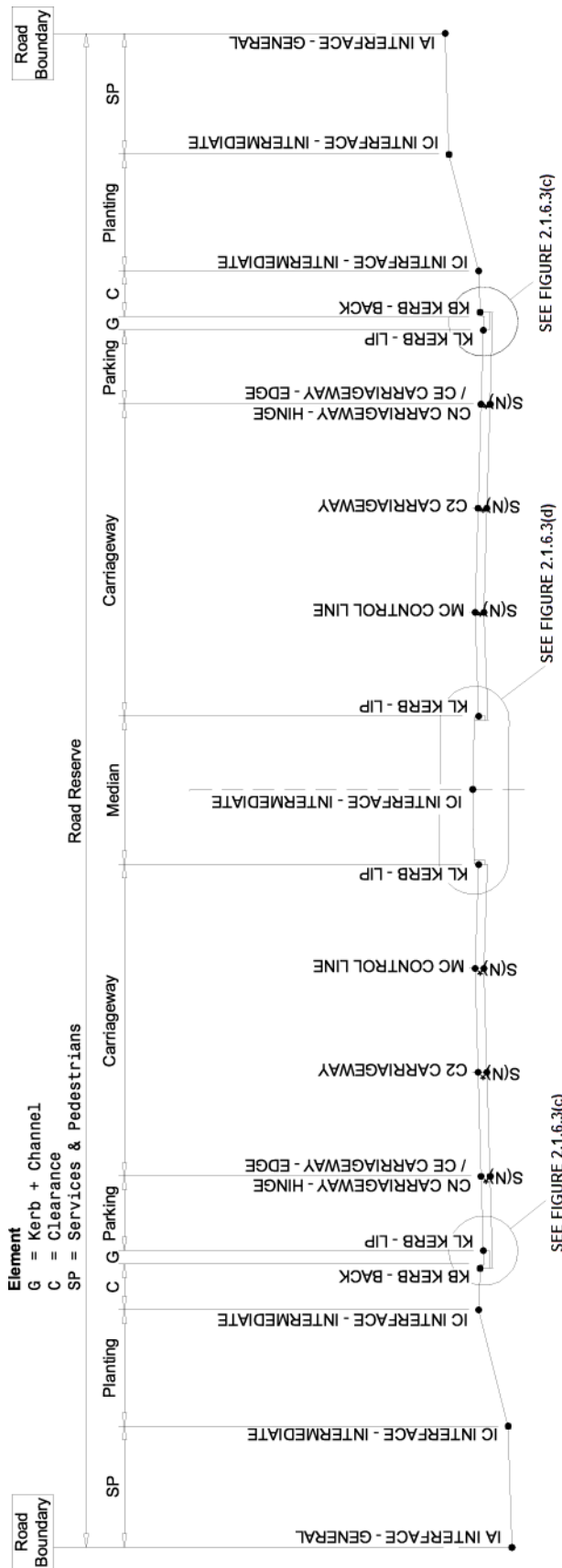
Figure 2.1.6.3(d) – Typical cross section of multilane urban road



Alternative Median & Semi Mountable Kerb Cross Section



Figure 2.1.6.3(e) – Typical cross section of urban arterial road – separated function type



**Element**  
 G = Kerb + Channel  
 C = Clearance  
 SP = Services & Pedestrians

**String Abbreviation**  
 S(N)\* = SUBGRADE STRING

\* (N) 1 - SUBGRADE STRING  
 2 to 6 - PAVEMENT LAYERS

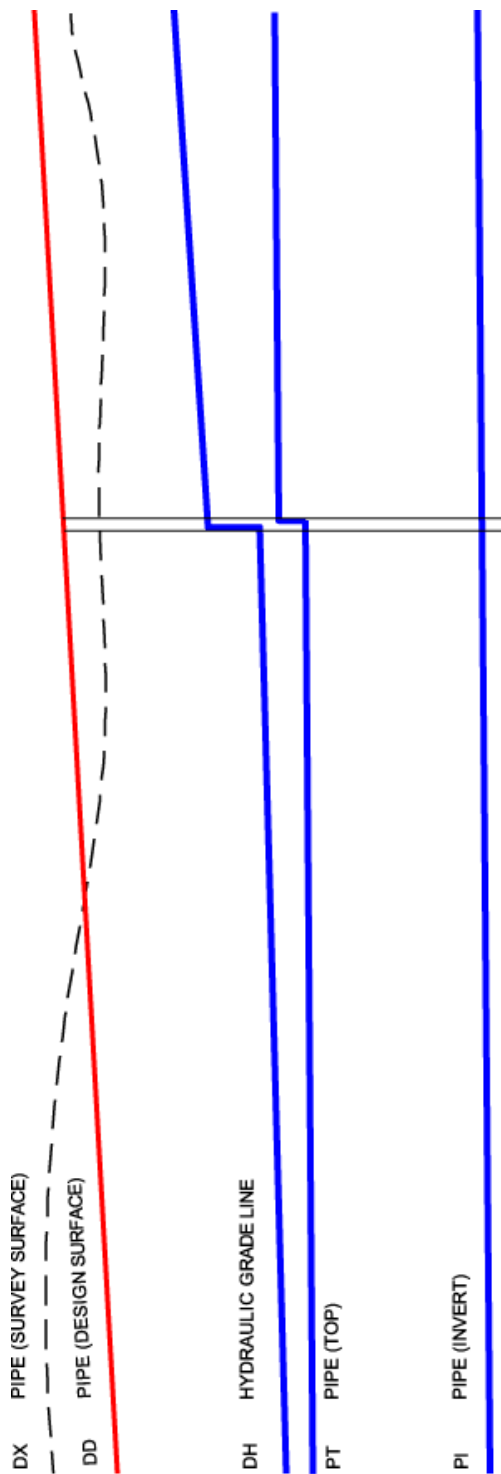
Six Lane Divided with Parking







**Figure 2.1.6.3(i) – Design string labels – drainage profile example**



#### 2.1.6.4 Project data file structure

To facilitate data retrieval and other processes within the department, it is necessary to have a common file structure for the long-term storage of relevant project data information.

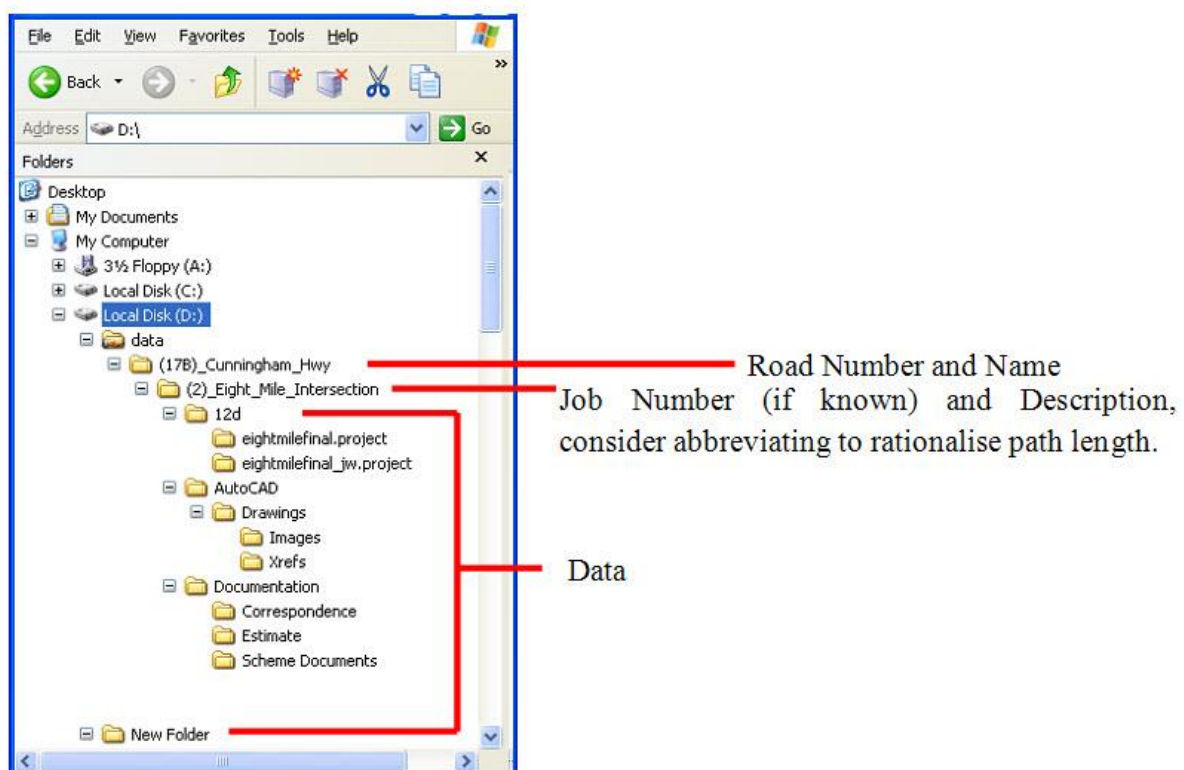
All internal and external designers should adopt the following file structure. It divides the data directory path into Roads under which are placed relevant Projects. Under each project, is placed the data for the software used under their various application names such as 12D, and AutoCAD / Map 3D.

Advantages to be achieved in using this method are:

- all relevant project files are kept together
- a common directory path is easily accessed by all users, and
- copying and archiving a project's data files is more easily achieved.

An example of this project data file structure is shown in Figure 2.1.6.4 and is recommended as a standard to be used in all design offices and by all consultants. It shows a typical road project folder for (17B)\_Cunningham\_Highway. Under this, are held relevant Jobs such as (2)\_Eight\_Mile\_Intersection. This folder then contains the project data for each of the software applications used for that project (e.g. 12D, AutoCAD/Map 3D). Also included, is any project documentation as well as provision for Management Correspondence. On completion of the design, the entire content of the Project Folder is to be placed on CD(s) / DVD for distribution and archiving.

**Figure 2.1.6.4 – Example of project data file structure**



## 2.2 AutoCAD drawing environments and attributes

There are several components in a CAD drawing, which are required to be understood properly when preparing a drawing for the department in order to efficiently manage the data within such AutoCAD drawing for the long-term, and simultaneously producing a drawing complying with the department's *Design and Drafting Presentation Standards*.

*Appendix 2E Transport and Main Roads AutoCAD Drawing Environments* and *Appendix 2F Transport and Main Roads Drawing Attributes* provide guidelines in preparing CAD drawings to accomplish the above requirements.

## 2.3 Line types, symbols and text

### 2.3.1 Line types

Line types are divided into categories, those that are generic as shown in Table 2.3.2 and those that are applicable to specific disciplines. Table 2.3.1 shows each category, the prefix used for the category and the corresponding reference, which provides examples of each line type.

**Table 2.3.1 – Line type / symbol categories**

Prefix	Category	Reference
MR	Generic	Table 2.3.3.2
MRR	Road Design	Appendix 2A
MRB	Bridge Design	Appendix 2A
MRE	Erosion and Sediment Control	Appendix 2A
MRT	Traffic Signals	Appendix 2A
MRL	Roadway Lighting	Appendix 2A
MRG	Geotechnical	Appendix 2A
MRLR	Landscaping & Revegetation	Appendix 2A
MRS	Survey	Departmental Surveying Standards

#### 2.3.1.1 Spacing of parallel lines

To allow for drawing reduction or enlargement for reproduction purposes, it is necessary to draw parallel lines on the original, with a clear space between them as shown in Table 2.3.1.1

Minimum line spacing should not be less than 0.5 mm on an A3 drawing.

**Table 2.3.1.1 – Spacing of parallel lines**

Reduction		Minimum Line
Size	Ratio	Spacing
A0 to A2	2.0:1	0.8 mm
A0 to A3	3.0:1	1.2 mm
A1 to A3	2.0:1	0.8 mm

### 2.3.2 Symbols

Symbols are also divided into categories applicable to specific disciplines. Refer to Appendix 2A for design symbols and string naming conventions.

The department's customised features in AutoCAD contain blocks of all the required symbols and features used for scheme presentation purposes as follows:

- kerb types as shown on Standard Drawing 1033 *Kerb and channel – Kerbs, channels and ramped vehicular crossing* of the *Standard Drawings Manual*
- selected traffic signs and pavement markings as shown in the *Manual of Uniform Traffic Control Devices (MUTCD)*
- North Points
- Scale Bars, and
- selected standard notes.

**Table 2.3.2 – Standard line types (generic)**

Description of Line Type	Line Type name	CAD Line Type
<b>Continuous lines</b>		
Continuous lines 0.18 mm	MR_CON_018	CONTINUOUS
Continuous lines 0.25 mm	MR_CON_025	CONTINUOUS
Continuous lines 0.35 mm	MR_CON_035	CONTINUOUS
Continuous lines 0.50 mm	MR_CON_050	CONTINUOUS
Continuous lines 0.70 mm	MR_CON_070	CONTINUOUS
Continuous lines 1.00 mm	MR_CON_100	CONTINUOUS
<b>Chain lines</b>		
Chain lines 0.18 mm	MR_CHN_018	MR_CHN
Chain lines 0.25 mm	MR_CHN_025	MR_CHN
Chain lines 0.35 mm	MR_CHN_035	MR_CHN
Chain lines 0.50 mm	MR_CHN_050	MR_CHN
Chain lines 0.70 mm	MR_CHN_070	MR_CHN
Chain lines 1.00 mm	MR_CHN_100	MR_CHN
<b>Double dashed chain lines</b>		
Double dashed chain lines 0.18 mm	MR_DCH_018	MR_DCH
Double dashed chain lines 0.25 mm	MR_DCH_025	MR_DCH
Double dashed chain lines 0.35 mm	MR_DCH_035	MR_DCH
Double dashed chain lines 0.50 mm	MR_DCH_050	MR_DCH
Double dashed chain lines 0.70 mm	MR_DCH_070	MR_DCH
Double dashed chain lines 1.00 mm	MR_DCH_100	MR_DCH



Description of Line Type	Line Type name	CAD Line Type
<b>Dashed lines</b>		
Dashed lines 0.18 mm	MR_DSH_018	MR_DSH
Dashed lines 0.25 mm	MR_DSH_025	MR_DSH
Dashed lines 0.35 mm	MR_DSH_035	MR_DSH
Dashed lines 0.50 mm	MR_DSH_050	MR_DSH
Dashed lines 0.70 mm	MR_DSH_070	MR_DSH
Dashed lines 1.00 mm	MR_DSH_100	MR_DSH
<b>Construction Lines</b>		
Construction lines 0.25 mm	MR_CON	CONTINUOUS
<b>Phantom Lines</b>		
Phantom lines 0.25 mm	MR_PHM	MR_PHM

### 2.3.2.1 Arrowheads

Dimension leader lines should terminate in arrowheads rather than in dots. Arrowheads should be drawn to suit detail scale.

### 2.3.3 Text

The photocopier is the means by which most drawings are reproduced for issue. A scanner is the means by which original wet blue signed drawings are converted into digital format for electronic archival. These methods dictate a need to produce original drawings capable of being reduced, enlarged and photocopied without losing the original details and that the intended information on the plans is not lost through these processes.

Drawings, therefore, must be dense and clear with lettering size and thickness of line complying with minimum standards. Drawings must be planned to avoid cramping of detail and a bold, open-spaced original should produce a clear print.

Lettering, numerals and dimensions should be drawn to be readable from the bottom or right-hand side of the sheet.

Contour values should be arranged to be read in the direction of increasing height.

Chainage values should be located on the left-hand side of the base/control line(s) when looking in the direction of increasing chainage.

#### 2.3.3.1 Font

Characters shall be of a simple open form, without serifs. They must remain legible when reduced for documentation purposes and when scanned as an image in electronic format (also see Table 2.3.3.2 for minimum character height).

One style of character should be used generally throughout a drawing, with preference for vertical characters. Vertical characters must be used for title, drawing numbers and reference numbers.

Underlined lettering should be avoided. Special emphasis may be achieved by using larger characters, different character font, sloping versus vertical characters or with care, different pen size.

Vertical characters/numerals are to be used where they refer to either established or existing data and features. Referencing to design information and design details should be shown in italic. For example, height values established by survey as recorded in the survey books, such as for spot and benchmarks, would be shown vertical. Interpolated height values would be shown sloping. In addition, designed heights would be shown sloping.

Various approved fonts, for general use in the preparation of departmental drawings, have been selected because of their acceptable legibility when producing drawings on printers and reproducing drawings in photocopiers. These shapes and their proportions have been included as standards in the department's computer aided drafting (CAD) package, TMR AutoCAD Customisation.

### 2.3.3.2 Height of characters

The height, in millimetres, of characters on original (full scale) drawings should preferably be one of the following:

- 2.5\*, 3.5, 5, 7, 10, 14, 20 (\*note – not suitable for reduction).

These text heights are included as standard sizes in the TMR AutoCAD Customisation system. Other heights may be used, provided that the minimum height requirements of this clause are met.

The minimum height of characters is shown in Table 2.3.3.2 and is to be adopted on original drawings for the various reductions required for documentation purposes. TMR Customisation requires that text be shown in upper and lower case. Some notes and text have been forced to upper case in the TMR Customisation for their importance. When reduced for scheme documentation the character height for capitals should desirably be not less than 1.5 mm. Table 2.3.3.2 shows the minimum heights of characters.

**Table 2.3.3.2 – Minimum height of characters on drawings**

Reduction		Character Size		Character Size	
		Original drawings		Reduced Drawings	
Size	Ratio	Caps	Caps/ lower case	Caps	Caps/ lower case
A0>A3	≈3:1	4.5	5.0	1.5	≈1.7
A1>A3	2:1	3.0#	3.5	1.5	1.75

# Note – 3.0 mm is not a standard text height and may only be used where all characters are capitals and where its use can be justified due to limited space on a drawing.

### 2.3.3.3 Thickness of character pen strokes

TMR Customisation applies the following ratio of lettering thickness to height:

- 1:10 medium thick.

### 2.3.3.4 Spacing between lines of lettering

Line spacing is not to be less than 1.6 'h', where 'h' is the height of capitals. This is normally a predefined standard in CAD packages.

### 2.3.3.5 Fractions / decimals

All values that are not whole numbers, shall be expressed in decimal form to two decimal places. Where the quantity is less than one, the decimal should be preceded by the number '0', e.g. 0.45. The number of decimal places is two. Chainages to be to three decimal places. Concrete to one decimal place. Reference MRS01 *Introduction to Specifications*.

### 2.3.3.6 Abbreviations, contractions and acronyms

This section details the abbreviations, contractions and acronyms, glossary of terms and units of measurements, which have been selected from those commonly used in civil engineering drawings and documents.

It is necessary that consistency of usage be maintained throughout the department, particularly in relation to the presentation in contract documents.

The object of using shortened forms is to save space and make reading easier by avoiding needless repetition. They should not be used for their own sake, but only when appropriate. Their best use is with words and phrases which are important in context, but become so familiar to the reader, from constant repetition, that all the reader needs is some simple code to identify them.

The word 'contraction' refers to a shortened form of a word that ends in the same letter as the word itself (e.g. Dept for Department). The word 'abbreviation' refers to a shortened form consisting of the initial letter alone, or of the initial letter followed by other letters of the word except the final one (e.g. Mon. for Monday). Contractions normally have no full stop, abbreviations normally do. Avoid using apostrophes in abbreviations and contractions.

An acronym is a word developed usually from the initial letters of other words. These letters are always in capitals, e.g. Reinforced Concrete Slab Deck Culvert (RCSDC). Common departmental usage is shown in Table 2.3.3.8(a).

The correct names of local authorities and roads must be used. Some minor abbreviations and contractions of road names will be permitted as indicated below but in general, if space is available, the full names should be given:

Highway	Hwy
Road	Rd
Shire	Sh.
Developmental	Dev.
Town	T.
City	C.

Note that, although highways and developmental roads have numbered and lettered sections to assist in identification, they are known by name only, never by number.

Contractions in place names are discouraged, but if it should be decided to shorten place names, care must be taken that the contraction is well known with no misinterpretation.

For example, the following may be acceptable:

Townsville	Tville
Rockhampton	Rton
Bundaberg	Bberg
Charters Towers	Ch. Towers

Reference 2 tabulates further abbreviations outside normal departmental usage.

### 2.3.3.7 Glossary of terms

Words and terms that have specific meaning in road design and construction, are generally to be adopted from Australian Standard AS 1348.1. Where conflict arises between departmental terminology and the Australian Standard, the departmental standard shall prevail.

### 2.3.3.8 Units of measurements

There are many units of measurements commonly used in society, e.g. centimetre, which are not to be used in departmental documents. Table 2.3.3.8(b) lists the approved units of measurements, together with their abbreviations that are to be used in the department's documentation.

**Table 2.3.3.8(a) – Approved shortened forms**

Description	Abbreviation
About	Abt
Approximate	Approx.
Authorisation	Auth.
Auxiliary	Aux
Bitumen	Bit_
Boundary	Bdy
Centre Line	CL (prefer C)
Chainage	Ch
Communication Cables:	
Low Band	L (line type use)
High Band	H (line type use)
Coaxial	Cx
FibreOptics	FO
Coordinate Geometry System	COGO
Roadway Earthworks Design System	REDS
Control	Ctl
Crossfall	Cfall
Culvert	Clvt
Corrugated Steel Helical Pipe	CSHP
Corrugated Steel Nestable Pipe	GSNP
Corrugated Steel Plate Arch	CSPA

<b>Description</b>	<b>Abbreviation</b>
Corrugated Steel Plate Pipe	CSPP
Corrugated Steel Plate Pipe-Arch	GSPPipe-Arch
Reinforced Concrete Box Culvert	RCBC
Reinforced Concrete Culvert	RCC
Reinforced Concrete Pipe	RCP
Reinforced Concrete Slab Deck Culvert	RCSDC
Reinforced Concrete Spanning Slab	RCSS
Slab Link Box Culvert	SLBC
Special RC Spanning Slab	SRCSS
Curve Widening	CW
Deck Wearing Surface	DWS
Distance	Dist.
District	Dist
Drawing	Drg
Earthworks	Ewks
Excavation Inlet and Outlet	Excav. I&O
Except or Excluding	Ex.
Existing	Exist.
Formation	Form.
Gravel	No abbreviation
Height	Ht
Australian Height Datum	AHD
Australian Height Datum Correction	AHD Corr_
Australian Height Datum Derived	AHDD
Job Number	Job No,
Left or left hand	L or LH
Limited Access Drawing	LA Drg
Opposite	Opp.
Pavement	Pvt
Pavement Marking	Pvt Mkg
Pegged	Pgd (in context P}
Real Property Plans	RP Plans
Reinforced Concrete	RC
Reinforcing.	Reinf.
Right or right hand	R or RH
Remaining	Rem.
Required	Reqd

<b>Description</b>	<b>Abbreviation</b>
Restricted Visibility Widening	RVW
Resumption Drawing	RDrg
Rock	No abbreviation
Crushed	Cr.
Uncrushed	Uncr.
Handpacked	Hndpkd
Round Fence Post	RFP
Square Fence Post	SEP
Shift	Sh (in contex 5)
Special	Spcl
Superelevation	Super.
Surfacing or Surface	Surf.
Survey	Svy
Benchmark	BM
Cadastral Survey Mark	CSM
Field Book	FB
Geocentric Datum of Australia	GDA
Level Book	LB
Universal Survey Book	USB
Instrument (traverse Station) Station	IS
Land Survey Pin	LSPin
Land Survey Plans	LS Plans
Land Survey Post	LS Post
Map Grid of Australia	MGA
Offset Peg	OP
Offset Mark	OM
Permanent Reference Point	PRP
Permanent Survey Mark	PSM
Project Control Station	PCS
Survey Mark	SM
Vertical Curve	VC
Working Drawing	W Drg

**Table 2.3.3.8(b) – Approved units of measurement**

Quantity	Unit	Abbreviation
length/height	kilometre	km
	metre	m
	millimetre	mm
area	square kilometre	km <sup>2</sup>
	hectare	ha
	square metre	m <sup>2</sup>
volume	cubic metre	m <sup>3</sup>
	litre	L
mass	tonne	t
	kilogram	kg
	gram	g
density	kilogram/cubic metre	kg/m <sup>3</sup>
	kilogram/litre	kg/L
velocity	kilometre/hour	km/h
	metre/second	m/s
acceleration	metre/second squared	m/s <sup>2</sup>
flow	cubic metres/second	m <sup>3</sup> /s
energy	joule	J (kgm <sup>2</sup> /s <sup>2</sup> =Nm)
force	newton	N (kgm/s <sup>2</sup> =J/m)
power	watt	W
pressure and stress	pascal	Pa (N/m <sup>2</sup> )
	kilopascal	kPa
	megapascal	Mpa
temperature	degree Celsius	°C
time	second	s
angle	degree	...°
	degree minute second	dms
	minute	...'
	radian	rad
	second	..."
luminous flux	lumen	lm
luminous intensity	candela	cd
illumination (illuminance)	lux	lx
luminance	candela/square metre	cd/m <sup>2</sup>

Quantity	Unit	Abbreviation
PREFIXES	10 <sup>-6</sup> - micro	μ
	10 <sup>-3</sup> - milli	m
	10 <sup>3</sup> - kilo	k
	10 <sup>6</sup> - mega	M

### 2.3.3.9 Chainages

Standard alignment descriptions and notation are shown in Figure 2.3.3.10(a) and Table 2.3.3.10.

Chainages are shown on the drawing sheets generally left to right in the direction of increasing chainage (road gazettal).

Chainages are to be given at the beginning and end of each plan and are normally shown at the top of the control line. These chainages are normally at intervals of 100 m and at a regular offset from the control line.

Control line chainages are generally to be clear of road boundaries and details and positioned in such a way as to identify the relevant chainage mark. All chainages and references to the alignment are to be in italic. In extreme cases of curved alignment, it may be necessary to draw lead lines (thin, short, and broken) to the points to which they refer.

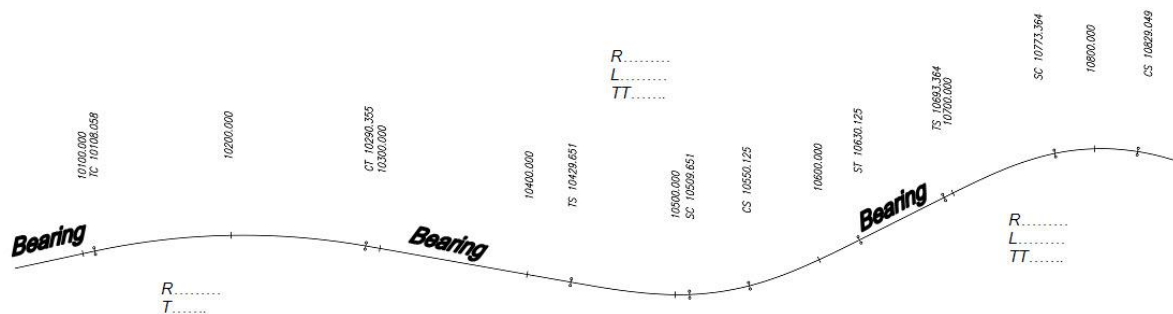
### 2.3.3.10 Curve components

Standard curve component descriptions and notation are shown in Figure 2.3.3.10(b) and Table 2.3.3.10.

In urban schemes, where complex geometry is used, it may be necessary to show the full geometric details for use by field staff during construction. Normally, all that is required for a control line, are the tangent points that occur between straights for transitioned curves and circular curves.

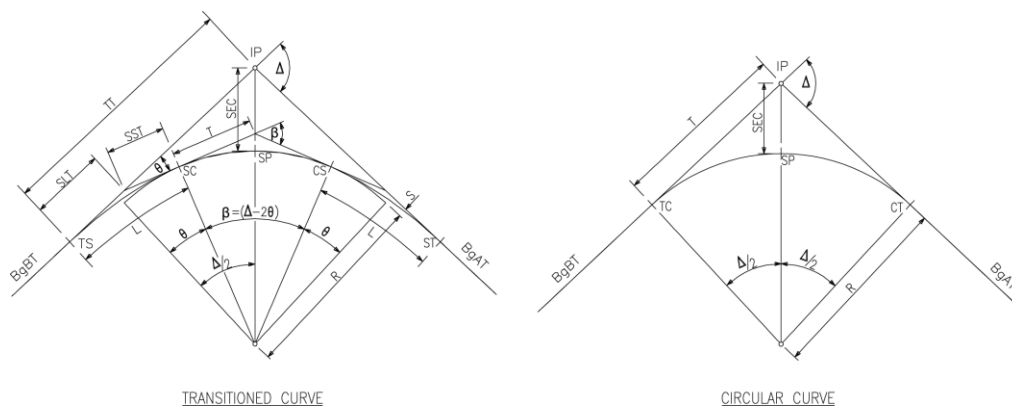
These should be shown on the drawings in the form of their relevant abbreviation and corresponding chainage.

**Figure 2.3.3.10(a) – Standard alignment**





**Figure 2.3.3.10(b) – Standard curve components**



**Table 2.3.3.10 – Standard curve notations**

XXXX	Control Line Label		
Q	Alignment part or alignment segment number	SLT	Long Tangent of spiral
BgBT	Bearing Back Tangent	SST	Short Tangent of spiral
BgAT	Bearing Ahead Tangent	SEC	Secant length
R	Radius of circular curve	TC	Tangent to Circle
T	Tangent length of circular curve	CT	Circle to Tangent
TT	Total Tangent length	CC	Circle to Circle
$\Delta$	Intersection Angle at point of intersection (in degrees)	SS	Spiral to Spiral
L	Spiral Length	TS	Tangent to Spiral
S	Shift Distance	SC	Spiral to Circle
$\theta$	Spiral Angle	CS	Circle to Spiral
$\beta$	Intersection Angle of circular curve (Vertex angle)	ST	Spiral to Tangent
ARC	Total arc length	IP	Intersection Point
	(circular curve plus spirals)	SP	Secant Point

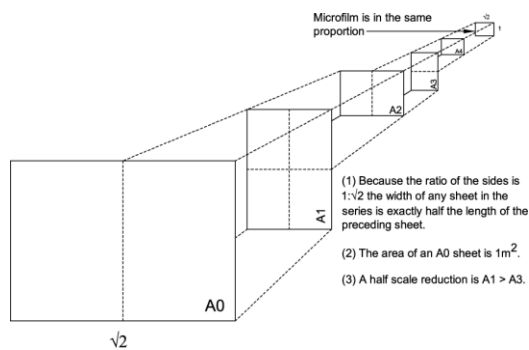
For transitioned curves with unequal spiral lengths, the abbreviations TT, L, S,  $\theta$ , SLT, SST, are to be suffixed by the letter A (ahead) or B (back), e.g. LA=Spiral Length Ahead.

## 2.4 Drawings

### 2.4.1 General

This section sets out the department's general requirements for drawing size, borders and media to be used for preparing and presenting drawings.

AS 1612 lists the standard specification for paper sizes in millimetres. The department uses the standard 'A' series drawing sheets that have the characteristics shown in Figure 2.4.1.

**Figure 2.4.1 – Characteristics of 'A' series paper size**

A standard drawing sheet depicts a standard title block and border with the overall sheet sizes outlined in Table 2.4.1.

**Table 2.4.1 – Standard drawing sheets**

Sheet Designation	Trimmed Width (W) mm	Trimmed Length (L) mm
A0	841	1189
A1	594	841
A2	420	594
A3	297	420
A4	210	297

A drawing refers to a standard drawing sheet with project design and construction information included together with a completed title block. When completed this forms part of a scheme prototype document.

## 2.4.2 Drawing size

The cost and time in drawing preparation and the serviceability of the finished product in use, must be taken into account when making initial decisions as to the basic drawing sheet material and size. Throughout a particular scheme, it is necessary to adopt a standard drawing size. Therefore, when drawing work is undertaken by more than one office, early liaison is necessary.

A4 or smaller is not to be used for final drawing presentation.

## 2.4.3 Drawing sheets

### 2.4.3.1 Electronic drawing sheets

The department has developed standard electronic drawing sheets in the sizes and for the uses specified in Table 2.4.3.1 and as shown in *Appendix 2D: Transport and Main Roads Drawing Sheets*.

These drawing sheets are included in the electronic drawing and are output when the drawing is plotted. These frames are available as part of the department's standardised drafting system and are made available to outside parties engaged to prepare drawings for the department as requested.

Title block formats have been standardised to facilitate inclusion of the necessary information in a uniform manner.

The information presented in Appendix 2D provides guidelines for predefined information associated with drawings created using the TMR Customisation.

**Table 2.4.3.1 – Standard electronic drawing sheets**

Drawing Type Discipline	Drawing Sheet Name	Usage
<b>GENERAL</b> <i>E.g. Locality Plan and Drawing List</i>	MRR_Detail <i>E.g. MRR_Detail with 'scheme scope approval statement' and 'drawing list table'</i>	Miscellaneous <i>E.g.: First sheet(s) in series</i>
<b>ROAD DESIGN AND CIVIL WORKS</b>	MRR_Detail	Detail plan drawings
<b>STRUCTURAL DESIGN</b>	MRB_Detail	Structural detail drawings <i>For all structures that carry BIS numbers, such as bridges, tunnels, jetties, weirs, culverts, cattle grids, LTMS, retaining walls, obstructions, etc.</i>
<b>ROADWAY LIGHTING</b>	MRR_Detail	Detail Plan drawings
<b>TRAFFIC SIGNALS</b>	MRT_Detail	Traffic signals cabling table
		Detail Plan drawings
<b>GEOTECHNICAL</b>	MRG_Detail	Geotechnical drawings
	MRG_Invest	Geotechnical Investigations
<b>RIGHT OF WAY</b>	MRR_Resumption	Resumption drawings
	MRR_Native Title	Native Title drawings
	MRR_Limited Access	Limited Access drawings
<b>ROAD DECLARATION</b>	These plans are prepared in MapInfo	Road Declaration drawings

Notes:

1. All the above standard drawing sheets are size A1.
2. Refer to Appendix 2D for detailed drawing sheets.
3. When using the MRB\_Detail sheet for Structures Other than Bridges, the 'Bridge' related fields are not required to be filled out, bridge fields can be left blank, or these fields can be removed from the title block if not applicable and any applicable criteria can be inserted in lieu of the bridge criteria.

### 2.4.3.2 North point

Where possible, it is preferred that all plans in a drawing set share the same orientation on the drawing sheet.

Where practicable, north points are to occupy the same position within the standard border for each sheet throughout the drawing set.

### 2.4.3.3 Sheet overlap

The plan information depicted on sheets, is to overlap marginally with immediately preceding and succeeding drawings within the documentation set.

This will assist in the overall legibility of site drawings, by demonstrating each drawing's relationship to adjoining ones.

A minimum of 15 mm page space overlap (at A1 size) is recommended, depending on the road alignment.

#### **2.4.3.4 Adjoins lines and numbers**

Each drawing must bear a reference to preceding and succeeding drawings within the drawing set.

The drawing number of adjoining preceding and succeeding drawings, is to be printed parallel to and against the right and/or left-hand borders of the drawing.

The line at which adjoining drawings abut, is also to be clearly marked along the width of the drawing.

#### **2.4.3.5 Issue identifier**

The department has developed plot stamps. If used, each page of the drawing set is to be clearly marked near the top left-hand corner, with the relevant drawing sets issue identifier during drawing development stages prior to completion and release approval:

- Concept Only
- Preliminary
- Preliminary Advice Only
- Issued for Pricing Only
- Issued for Constructability
- Issued for Review
- Issued for Check
- Issued for Tender.

The names are for the different stages of each drawing issued and must have the date and time clearly within this plot stamp detailing when the drawing is plotted.

#### **Concept Only**

This stamp is to be used for concept phase drawings which are produced for information only and not to be used for construction purposes, such as project proposals, options analysis, business case, community consultation, and so on.

#### **Preliminary**

These are preliminary drawings comprising the workings / building up, or development of the design i.e. design work in progress.

#### **Preliminary Advice Only**

Typically, Preliminary Advice Only drawings would still be under development. These drawings may be transmitted to other parties and signifies the drawings are not final and may change.

#### **Issued for Pricing Only**

Issued for Pricing Only drawings are provided for obtaining quantities and development of unit rates.

### **Issued for Constructability**

Issued for Constructability drawings are those prepared for review/check by all stakeholders that is, public utility plant services managers, electrical, structural, landscaping specialists, environmental, maintenance and construction personnel and other officers necessary to provide input into design.

### **Issued for Review**

These drawings are typically issued during the design review process, to ensure broad compliance with engineering standards and technical governance across the department, to meet the intent of the documented policies, standards and systems.

### **Issued for Check**

These drawings are issued for checking prior to final completion, to ensure the design meets the brief's requirements, expectations of the district and a rigorous scheme prototype check.

### **Issued for Tender**

For Transport Infrastructure Contracts - Construct Only (TIC-CO), these are final detailed design drawings (they are Issued For Construction drawings) issued for tender purposes so that tenderers/proponents submit a price for constructing the project. Drawings show sufficient detail so that there is not significant change and subsequently no significant change of the construction cost.

The above also applies for Transport Infrastructure Contracts - Sole Invitation (TIC-SI).

For Transport Infrastructure Contracts - Design and Construct (TIC-DC), these are drawings of the preliminary design, also known as reference design, issued for tender purposes. Drawings show sufficient detail, but tenderers/proponents are expected to further develop the design and fine tune it to provide a tender proposal including cost which demonstrates fit for purpose, value for money and best design practices. Further changes to the design are expected throughout the design and construct process.

#### **2.4.3.6 Consultants logo**

Where drawing/s are prepared by a consultant, their logo is to appear in the top right corner of the drawing sheet.

#### **2.4.3.7 Drawing Revisions**

'Revision clouds' with corresponding 'alphabetical revision identifier' inside a triangle positioned next to the revision clouds, are to be used when there have been amendments on previously approved drawings. This revision cloud outlines the modification being made to that particular drawing. The revisions area in the bottom left of the title block, is to be filled in outlining the modification being made to the drawing. Also refer to Chapter 1, Section 1.7.1.2.

### **2.4.4 Drawing media**

#### **2.4.4.1 Use of print and electronic media**

Tracing, bond and high gloss papers and double matte polyester films can be supplied for general drafting purposes in sheets or rolls, to suit most ink jet printers or plotters.

Print media can be used in the concept phases such as project proposals, options analysis, business case, community consultation and so on.

It is essential that the correct plotting media, suitable for the required presentation standard, be used when plotting on electronic printers or plotters.

Electronic media is increasingly becoming the most used medium to present and share drawings, the department finds Portable Document Format (PDF) drawings produced from AutoCAD as an acceptable electronic media to present project drawings.

#### **2.4.4.2 Preliminary drawings**

Drawings provided for preliminary purposes, are to be plotted on plain paper and they can also be produced as PDFs from AutoCAD.

#### **2.4.4.3 Final drawings**

The use of electronic signatures on all engineering drawings is the department's default position, unless otherwise approved by the department on a project-by-project basis, therefore electronically signed final drawings (Issued For Construction to As Constructed) are to be submitted in PDF format. Refer to Chapter 1, Section 1.7.1.5.2 for PDF specifications.

In the event that electronic signatures are not possible and hard copy wet signed drawings are provided as final drawings, they are to be produced in A3 size. Permanent drawings are to be printed in a media called Permanent Paper, ranging from 100 mic to 135 mic, this media has been found suitable for final drawing presentation for 'Permanent' drawings, as this type of paper will not rip or smudge and produces drawings suitable for storage. Temporary drawings can be printed to normal weight paper (usually 80 gsm). Refer to Chapter 1, Section 1.7.1.5.2 for definitions of Temporary and Permanent drawings and their legislative archive requirements, or contact your local district's Plan Room representative for more information.

A1 size film is also a suitable medium for approval and release, as it is a stable medium to store and archive.

The colours of all standard departmental line types and symbols, have been chosen so that they are reproducible when photocopied and retain their legibility.

Drawings are to be printed on the media and at the size set out in the brief.

### **2.4.5 Title block data**

#### **2.4.5.1 Job numbers**

The job number is a unique project identifier used on Issued For Construction, Revision and As Constructed drawings.

The job number on the drawings assists departmental personnel to quickly identify the overall location of the works and it is represented as a three-part number by three distinctive sections, which provide the following information:

LGA number / Road ID / Project Number

For example, 160/12A/1234567, gives the following information:

- 160 = City of Gold Coast
- 12A = Pacific Highway
- 1234567 = **Project Number**

where the '**Project Number**' is the 'OPPM Project ID' from 3PCM (Portfolio, Program, Project and Contract Management).

#### **2.4.5.2 Contract numbers**

A contract number is issued for the purpose of the administration of a construction contract. This number is in addition to the job number/s and will be shown on all the drawings, documents and correspondence with the construction contractor.

The common format of the construction contract number to be used on the project drawings is **CN1234567**, where **1234567** is the unique contract number generated automatically by the 3PCM system and issued to each project for every single construction contract.

***Note:** The Contract Number is NOT the same as the 3PCM Project Number 'OPPM Project ID'.*

The issue of the contract numbers is the district's responsibility. Only one contract number will be issued for each contract, irrespective of how many job numbers.

#### **2.4.5.3 Associated job numbers**

On each drawing, other job numbers in the scheme are to be shown.

Where a project is located within more than one local government area, or on more than one state-controlled road, multiple job numbers may be required. The job number relating to the coverage of the drawing shall be shown as the primary job number.

#### **2.4.5.4 Auxiliary drawing numbers**

A listing of all drawings in the scheme is to be shown on all drawings. The Drawing Index Sheet will also detail all drawings. This list will be identical on all drawings.

#### **2.4.5.5 Through distance**

The through distance (measured in kilometres to two decimals) from the start of gazettal, shall be shown on all drawings. The origin point for the through distance, may be a town or intersection but should be consistent with the department's ARMIS system. The through distance will be measured to the start and end of the job.

#### **2.4.5.6 Scales**

The scale/s of the drawing shall be shown by the placing of a drawn scale bar annotated by numbers indicating the metric distance with the added wording 'Metres'. The original A1 scale is not necessary.

## **2.5 References**

- Australian Standard 1348.1, *Road and Traffic Engineering – Glossary of Terms, Part 1 – Road Design and Construction*. Standards Association of Australia, Sydney
- *Engineering Handbook – Basic Principles and Techniques – ASCZ1, Part 1*. Institute of Engineers, Australia
- *Style Manual for Authors, Editors and Printers*. Australian Government Publishing Service
- *Standard Drawings Roads Manual*. Department of Transport and Main Roads
- *Manual of Uniform Traffic Control Devices*. (MUTCD Queensland)
- Australian Standard 1612, *Paper sizes*. Standards Association of Australia, Sydney
- *TMR Surveying Standards*. Department of Transport and Main Roads



