

**Drafting and Design Presentation Standards
Volume 3: Structural Drafting Standards**

Chapter 1: Introduction

November 2015

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Chapter 1 Amendments

Revision register

Issue/Rev No.	Reference section	Description of revision	Authorised by	Date
1	-	First issue	Manager (Structural Drafting)	Apr 2011
2	-	Document name change	Manager (Structural Drafting)	Nov 2011
	1.5	Add section Departures from Austroads Guide to Bridge Technology, Part 5: Structural Drafting		
3	1.2	Glossary of terms revised	Team Leader (Structural Drafting)	Sep 2015
	1.4	Combined with previous version 1.5 to eliminate repeated information	Team Leader (Structural Drafting)	Sep 2015
	All	Minor rewording	Team Leader (Structural Drafting)	Sep 2015
	Appendix A	Update image to current BDIR form	Team Leader (Structural Drafting)	Sep 2015

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1 Introduction

1.1 Figures and examples shown in this volume

The figures and examples shown in this volume are for presentation purposes only, and may contain some details that are now superseded. These details have been included for ease of reference, to illustrate typical solutions, and to show the required standard of drafting presentation. The details are not to be used without an engineering check and certification by a Structural RPEQ to confirm that the details are appropriate for the specific project.

1.2 Glossary of terms

Glossary of Terms	
Alignment	The geometric form of the centreline (or other reference line) of a carriageway in both the horizontal and vertical directions
Bridge Control	The line of reference used throughout bridge drawings. It may be the same line as the Road Control
Continuous Deck	Where a concrete bridge deck continues over a pier without an expansion or fixed joint
Crest Curve	A convex vertical curve in the longitudinal profile of a road
Crossfall	The slope of the running surface, measured at right angles to the alignment
Crown	The highest point on the cross section of a carriageway with two-way crossfall
Dead Load	Static Load created by the mass of the static components on a structure, like self weight
DWS	Deck Wearing Surface
Expansion Joint	Where the superstructure of a bridge is attached to a headstock with a joint that is designed to slide longitudinally as the bridge expands and contracts
Fixed Joint	Where the superstructure of a bridge is attached to a headstock with a connection that is not designed to move i.e. it is fixed
HC	A horizontal curve in the plan or horizontal alignment of a carriageway
Height (Ht)	TMR uses this term in place of Reduced Level (RL). Vertical or Z value of any point
HLP	Heavy Load Platform
Hog	Magnitude of upward deflection in prestressed deck units and girders due to the action of prestressing forces. Refer Chapter 15 - Prestressed Concrete Deck Units
Kerb	A kerb with a profile and height sufficient to prevent or deflect vehicles from moving off the carriageway
LHS	Left hand side
Live Load	Dynamic Load created by the mass of the moving components on a structure, like vehicular traffic
TMR	Department of Transport and Main Roads
No Off	Quantity of items to be fabricated / cast / manufactured. (in place of No Required or No)
Pavement	That portion of a road designed for the support of, and to form the running surface for, vehicular traffic
PSC	Prestressed Concrete

Glossary of Terms	
RC	Reinforced Concrete
RHS	Right hand side
RPEQ	Registered Professional Engineer of Queensland
Road Control	The line of reference used throughout road drawings
Sag Curve	A concave vertical curve in the longitudinal profile of a road
SM1600	Combination of S1600, stationary traffic load, and M1600, moving traffic load AS 5100.2 - Bridge Design
Superelevation	The slope of the running surface, measured at right angles to the alignment, usually on a horizontally curved pavement
VC	A vertical curve (generally parabolic) in the longitudinal profile of a carriageway to provide for a change of grade
Vertical Alignment	The longitudinal profile along the centreline of a road
WH&S	Workplace Health and Safety
WMS	Works Management System

1.3 References

This manual has been written to conform to (unless noted otherwise), and should be read in conjunction with, the following publications:

- *TMR Bridge Design Criteria for Bridges and other Structures*
- *TMR Departmental Standard Drawings*
- *TMR Departmental Specifications*
- *TMR Transport Infrastructure Contract*
- *TMR Road Planning and Design Manual*
- *TMR Drafting and Design Presentation Standards Manual*
- *Standard for Transport and Main Roads Engineering Surveys*
- *Australian Standard AS 5100 - Bridge Design*
- *Australian Standard AS/NZS 1100 - Technical Drawing Parts 101, 401 and 501.*

1.4 Departures from AS/NZS 1100 – Technical Drawing and Austroads Guide to Bridge Technology, Part 5: Structural Drafting

Drafters should be familiar with the contents of AS/NZS 1100 - Technical Drawing Parts 101, 401 and 501 and Austroads Guide to Bridge Technology, Part 5: Structural Drafting. Directions contained in this volume are intended to compliment these publications, but do depart from them in certain areas.

The following are important departures:

Reinforcing bar shapes

Reinforcing details shall be in accordance with TMR Standard Drawings 1043 *Standard Bar Shapes* and 1044 *Standard Hook Lap and Bend Details, and General Steel Reinforcement Information*.

Reinforcing bar marking and identification

Reinforcing bars shall be shown on drawings in accordance with Chapter 3 *Concrete and Reinforcement Detailing*.

Text height

4 mm high text shall be used for sub-titles, Ht's, section arrows, and when labelling the Bridge Control. Refer Chapter 2 *Standard of Presentation*, Table 2.6-1 Text Styles.

Use of characters

Upper/lower case lettering shall be used for labelling, dimensioning and notes. Refer to examples in this manual.

Scales

TMR accept a larger range of drawing scales. Refer Table 2.18-2 Scale Format.

Abbreviations

Additional abbreviations may be used. Not all abbreviation are in upper case. Refer Chapter 2 *Standard of Presentation*, 2.16 *Abbreviations*.

Detail cross referencing

Details shall be labelled with numbers rather than letters. The labels shall be shown in circles rather than hexagons. Refer Chapter 2 *Standard of Presentation*, 2.7 *Sections Views and Details*.

Section and view cross referencing

Sections and views shall be labelled with letters rather than numbers. Refer Chapter 2 *Standard of Presentation*, 2.7 *Section, Views and Details*.

1.5 Information to be supplied to the designer

A range of information is required to be confirmed and supplied to the Designer in order that the structural design and drafting can be completed. The type of information required will depend on the structure being designed. For a typical bridge design, this information may include, but is not limited to:

- survey information
- design alignment including road profile and horizontal and vertical geometry
- hydraulic reports including flood velocities and flood immunity Heights
- environmental reports
- Geotechnical reports. These may be supplied in various stages, for example bore logs are sufficient in the early stages to commence drafting. Preliminary reports may follow but a final Foundation Report is needed before release of a project
- relevant information required by the Designer to undertake the design. TMR, Bridge Design obtains this information using a Bridge Design Information Request, refer Appendix A - Example Bridge Design Information Request.

- Other Designers' may obtain the information a different way. The information needed to complete the design includes, but is not limited to:
 - name of structure
 - contract and Job Numbers
 - Bridge Information System (BIS) number
 - design speed
 - preferred scheme documentation/contract type
 - common elements of the bridge/roadworks and their relevant schedule (bridge or roadworks schedule)
 - principal supplied items and their point of supply
 - environmental management and any restrictions at the bridge site both on and in the immediate vicinity of the site
 - details of existing structures
 - bench mark/permanent survey marks
 - permanent reference points
 - type of connection to bridge barriers
 - details of existing utilities and services including overhead power lines
 - details of existing utilities and services to be relocated and their relocated position
 - restrictions to transportation of precast prestressed concrete elements
 - any restrictions to clearances or construction space
 - details of any vibration sensitive structures adjacent to the site
 - any requirements for sequencing of works i.e. maintaining traffic flows during construction
 - type of deck drainage
 - provision for conduits on the bridge (electrical, telecommunications or future)
 - embankment slopes of the road immediately adjacent to the bridge
 - type of media for final printing of drawings. A3 permanent paper is preferred for ease of copying and handling
 - is WMS to be used? Extent of documentation (full scheme documents or 'basic' documentation).

1.6 Information to be supplied by the designer

The Designer shall supply information to the Client in order to complete the detailed design and drafting of the project. Refer 1.8 *Bridge Scheme Deliverables*. In addition, the Designer may be required to prepare preliminary General Arrangement drawings to confirm details of the project, refer Chapter 11 *General Arrangement Drawings*.

1.7 Bridge scheme deliverables

The Designer shall provide drawings and documentation as specified in the Terms of Engagement Contract.

Shown below is a typical set of Transport Infrastructure Contract – Construction Only (TIC-CO) scheme documents to be delivered by the Designer. Other types of contract, i.e. Design and Construct, Alliance, Early Contractor Involvement, will have different deliverables.

- Covering letter detailing particular aspects of the project, for example:
 - the location of items that may be contained in different schedules, for example, free draining granular material behind abutments, relieving slabs, DWS and so on
 - details of any action in response to the site verification
 - preboring for precast piles (a supplementary specification is needed to limit the maximum size of material in the embankments to 50 mm so that pre-boring is possible)
 - the close proximity to the construction site of the overhead power lines
 - Queensland Rail contacts and train operation times nominated to TMR from Queensland Rail
 - estimate and schedule of all quantities for the project, including detailed calculations, using the agreed software, and itemised as defined in Standard Specifications Roads.
 - structural drawings.

One complete set of all original certified drawings on either A1 film or A3 permanent paper, signed in blue. A1 drawings shall be clearly legible when copied to A3 size.

- one A3 paper copy of all drawings
- scanned electronic copy of all signed drawings in portable document format (pdf).

Supporting documentation, for example:

- environmental design report
- supplementary specifications.

Reinforcing Steel Schedule consisting of a tabulated listing, using the TMR steel scheduling program, of all reinforcing steel in the project. Refer Chapter 3 *Concrete and Reinforcement Detailing*.

Design Report as detailed in the Design Brief. The Design Report must include a section on future bridge inspection and maintenance.

3D EPM. Refer Chapter 20 *Electronic Project Model (EPM)*.

A complete set of Contract Documentation, as defined in the Project Brief and defined in Transport Infrastructure Contracts. When only 'basic' contract documents are required, they shall be prepared in the following order:

- estimate(s)
- form C7825 - Standard Document List
- annexures
- form C6826 - Drawing List

- form C7827 - Principal Supplies Material List
- supplementary specifications
- drawings
- environmental reports (Not Environmental Design Reports)
- steel schedules(s).

1.8 15%, 50% and 85% TMR review requirements

During the design process, the Designer shall supply information to TMR-Structures for review. Typically these reviews are held at 15%, 50% and 85% completeness, though additional reviews may be required. The following is a guide to the amount of drafting detail required at each stage:

15%

- draft general arrangement drawings including a superstructure section view
- articulation (location of expansion joints)
- service requirements
- barrier requirements
- lighting requirements
- drainage requirements
- vertical clearances to road and rail traffic
- draft abutment and pier drawings including preliminary founding Heights. These drawings need not show reinforcement at this stage.

50%

- foundation types confirmed
- complete set of draft drawings. These drawings need not show reinforcement at this stage.

85%

- complete set of checked drawings
- draft version of estimate, annexures, supplementary specifications, steel schedules and contract documents. Note that these are only required when they form part of the agreed deliverables that TMR are to review.

For additional engineering requirements, refer to the *TMR Bridge Design Criteria for Bridges and other Structures*.

Appendix A - Example Bridge Design Information Request Letter – Sheet 1

Structures, B&ME, Bridge Design	B&ME-PM-16_BDR		
BRIDGE DESIGN INFORMATION REQUEST			
Engineering & Technology	Version 2.0, Issue Date 17-10-2013		
NOTE: Document is uncontrolled when printed			
PROJECT DETAILS			
Project Name:	Gooseponds Creek Bridge Widening		
Job No:	242/10H/1	Contract No:	MACD-1552
BIS No (New bridge):	TBA	BIS No (Existing bridge):	7329 (S'bound), 16997 (N'bound)
CONTRACT DOCUMENTATION			
Type of Contract:	Combined Bridge & Road	Type of Scheme Documentation:	Road Construction Contract
Extent of documentation:	Basic	Use Works Management System (WMS):	Yes
<small>Basic documentation consists of estimate, schedule of quantities, annexure, steel schedule, supp specs & relevant contract documents</small>			
Do you require steel schedules?	Yes		
<small>3rd party steel suppliers do schedule independantly due to proprietary software requirements</small>			
ESTIMATES & SCHEDULE ITEMS			
<small>Note that items for sheet/strip filter drains, abutment protection (MRS 11.03), bridge site preparation, excavation for structures, blinding concrete (MRS 11.04), bridge substructure(MRS 11.62), piles MRS 11.63 - 68), units & girders (MRS 11.74 - 76), bridge deck (MRS 11.77), bridge barriers (MRS 11.80), bridge bearings (MRS 11.81), repainting steel bridges (MRS 11.85), preparation for bridge widening (MRS 11.86) will be in the bridge schedule unless otherwise advised.</small>			
Provision for traffic:	Approach Schedule	DWS on bridge:	Bridge Schedule
Free draining granular material behind abutments:	Bridge Schedule	Expansion joints:	Bridge Schedule
Reinforced soil structures:	n/a	Anti-graffiti protection:	n/a
Environmental management:	Approach Schedule	Other (Please describe):	
Relieving slabs:	Bridge Schedule	Other (Please describe):	
PRINCIPAL SUPPLIED ITEMS			
PSC deck units / girders:	Yes	Where are they to be supplied?	MR Registered Supplier
PSC piles:	Yes	Where are they to be supplied?	MR Registered Supplier
Bridge barriers:	No		
Other:			
EXISTING STRUCTURES			
Are any existing structures to be removed?:	No		
DESIGN SPEED			
Design speed:	90	kph	
CONNECTION TO APPROACH BARRIERS			
Connection to approach barriers:	Thrie Beam Guardrail	<small>Thrie Beam guardrail may be tapered to W Beam off bridge</small>	
SERVICES TO BE RELOCATED			
Telecommunications:	No	Other: <input style="width: 100%;" type="text"/>	
Electrical:	No		
Water Mains:	No		
Sewerage:	No		
OVERHEAD LINES IN BRIDGE VICINITY			
Are any overhead lines within 10m of the bridge?	No		

Appendix A - Example Bridge Design Information Request Letter – Sheet 2

Structures, B&ME, Bridge Design		B&ME-PM-16_BDR	
BRIDGE DESIGN INFORMATION REQUEST			
Engineering & Technology		Version 2.0, Issue Date 17-10-2013	
NOTE: Document is uncontrolled when printed			
RESTRICTIONS TO TRANSPORT OF PRECAST PSC COMPONENTS			
Are there restrictions to transporting items to site?	No	<i>Restrictions may include small radius HC & for VCs, steep grade or obstructions.</i>	
DECK DRAINAGE			
Drain water direct to waterway through scuppers: Drain water off bridge by road designer:	Yes	Drain water through scuppers and channelled off bridge: Are there any special drainage needs?	
CONDUIT IN KERBS/PARAPETS OR FOOTWAY			
Is conduit needed in kerbs, parapets or footway?	Yes	Please describe:	
EMBANKMENT SLOPES			
What are the embankment slopes adjacent to the bridge?	1 on 2		
SURVEY INFORMATION			
Type of survey:	GDA	Combined Scale Factor	1.000209
BENCH MARKS			
	Bench Mark 1		Bench Mark 2
Description:	PM116673	Description:	PM45488
Type:	Brass Plaque	Type:	Brass Plaque
Easting:	724418.884	Easting:	724725.008
Northing:	7662246.479	Northing:	7662074.175
Ht:	9.172	Ht:	6.871
Ht Datum:	AHD	Ht Datum:	AHD
AHD Correction Factor:	~	AHD Correction Factor:	~
PRP INFORMATION			
Preceding PRP:	3	Following PRP:	4
Distance from preceding PRP to centre of bridge:	0.37km	Distance from centre of bridge to following PRP:	0.7km
THROUGH CHAINAGE			
Through Chainage:	2.440	km	from: Showground Intersection
ENVIRONMENTAL MANAGEMENT			
Review of Environmental Factors (REF) been prepared?	No	Environmental Management Plan (EMP) been prepared?	No
Traffic Noise Study been prepared?	No		
Items of importance in reports	<div style="border: 1px solid black; padding: 10px;"> <p>Only an Environmental Scoping Report has been prepared at this stage (copy attached). Further works required to produce an REF and EAR. There have not been any issues identified that are likely to require non-standard bridge design treatments.</p> </div>		
FINAL DRAWING MEDIA			
What final drawing media is required?	A3 Permanent Paper		

