



ENGINEERING DESIGN GUIDELINES

STRUCTURES / BRIDGE DESIGN

Planning Scheme Policy No. 15.03

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1 Scope and general

1.1 Scope

This section sets out the guidelines developed specifically for the design considerations to be adopted in the design of structural engineering elements for land subdivisions. The Guideline is to also apply to appropriate structurally elements designed on behalf of Council.

Such elements include:

1. Road traffic bridges
2. Pedestrian bridges
3. Structures other than bridges, but associated with roads (eg. major culverts, retaining walls, major sign support structures)
4. Small earth dams, detention basins
5. Structures used for public safety (road safety barriers, pedestrian safety rails, street lighting)
6. Temporary works

Such structures may be of concrete, timber or steel constructions, but with emphasis placed on low maintenance.

1.2 Objective

The aim of design shall be the achievement of acceptable probabilities that the structure being designed will not become unfit for use during its design life, having regard to economic, physical, aesthetic and other relevant constraints.

1.3 Basis of Design

The design shall be based on scientific theories, experimental data and experience, interpreted statistically as far as possible. The safety and service performance of a structure depends also on the quality control exercised in fabrication, supervision onsite, the control of unavoidable imperfections and the qualifications, experience and skill of all personnel involved. Adequate attention shall therefore be given to these factors.

In addition, adequate management control and supervision by experienced engineers shall be required at all stages of design and construction to prevent the occurrence of gross errors.

The minimum design load for all road traffic bridges shall be determined from AS5100, either using the S or M 1600 load, and based the particular traffic loadings reasonably expected to be imposed on the structure. The use of lesser design loads (eg T44) shall require specific Council approval and will require consideration of the most foreseeable load during the life of the bridge (for 100 years). The engineer will need to consider the likely future use of the bridge by heavy loads – eg cranes used in building works, as to whether the structure may have to be designed using higher design loads eg HLP 400. Approval for a design load lower than S or M 1600 will not be provided for a single-lane bridge.

Maintenance is a key factor affecting the design life of a structure/bridge. The Designer shall note on the drawings the adopted design life of the structure/bridge, together with the relevant maintenance program to be adopted by asset owner (generally Council)

upon which the design life has been based. Parameter used in the design shall also be shown on the design drawings.

Specifications shall be notated on the Drawings with sufficient detail to ensure that the above described strategies are able to be effectively implemented at the construction stage.

1.4 Reference and Source documents

Council Guidelines and Specifications

D1	- Geometric Road Design
D5	- Stormwater Drainage Design
D7	- Erosion Control and Stormwater Management
D20	- Drawings and Documentation

Australian Standards

AS1158	- The lighting of urban roads and other public thoroughfares (SAA Public Lighting Code)
AS1170	- Minimum design loads on structures (SAA Loading Code)
AS1684	- National Time Framing Code
AS3600	- Concrete structures
AS3700	- Masonry in buildings (SAA Masonry Code)
AS4100	- Steel structures
AS5100	- Bridge Design
AP 23/94	- Waterway Design – A Guide to the Hydraulic Design of Bridges
AS/NZS3845	- Road Safety barrier systems

Other relevant codes and guidelines with the above.

Other

AUSTROADS	- Bridge Design Code
Inst. Of Eng.	- Australian Rainfall and Runoff
Queensland Department of Natural Resources	- <i>Queensland Urban Drainage Manual</i>
Department of Main Roads	- <i>Road Planning and Design Manual</i>

1.5 Road Traffic and Pedestrian Bridges

Suitably qualified professional engineers who hold pre-registration with Department of Main Roads for design of bridges shall carry out bridge designs on behalf of Council or associated with any proposed development. The level of pre-registration must be commensurate to the monetary sum of the proposed structure.

The engineer shall submit evidence of their pre-registration to Council with the bridge design. The person must also be RPEQ certified.

The above pre-registration requirement does not preclude designs being submitted by other qualified professional engineers, (who are RPEQ registered) however Council reserves the right to call for evidence of the qualifications and experience of the nominated engineer; and may require referral of the design calculations to a nominated Consultant for checking.

If Council seeks to have the design calculations checked, the cost for doing so will be borne by the Developers.

The Australian Standard AS5100 *Bridge Design* and AP-23/94 *Waterway Design – A Guide to the Hydraulic design of Bridges* shall be used as the basis for all bridge designs. Where bridges are to be constructed from materials other than those covered specially by this Standard, reference shall be made to other specific Standards and current technical literature for materials performance and durability requirements.

The engineer shall incorporate current industry best practices into the bridge design to ensure the bridge has low maintenance finishes. Adequate precautions shall be taken for protection of the materials used in the bridge design; for example, timber and steel require special consideration.

Heavy debris and bed loads may be characteristic of some streams so that large spans with slender piers are encouraged. If overtopping is permitted, pedestrian safety rails and road safety barriers are usually omitted. Flood depth indicators and appropriate signposting will be provided in such cases.

Preventative maintenance is a key issue affecting the design life of the structure. The Drawings shall specify the design life of the structure together with the relevant maintenance programs to be adopted upon which the design life is based.

Parameters used in the design shall also be shown on the Drawings.

Unless otherwise indicated on the Development Application or in writing by Council, small bridges within the development shall be designed with afflux as determined by Council with certification stating that the bridge is capable of withstanding the inundation loadings for up to the 100 year ARI storm event.

If in the opinion of the engineer, such certification is impractical, the structure shall be designed to convey the 100 year ARI storm event without inundation.

Where structures are designed to be inundated, the effect of the backwater gradient on upstream property shall be identified on the Drawings.

The engineer shall also identify the current and possible future implications issues created because of the backwater effect on upstream properties.

Bridges located in roadways which are to be dedicated as public roads shall be designed to convey the stormwater event identified in the drainage design specification. Where no inundation is permitted, appropriate afflux shall be adopted together with a 500mm freeboard to underside of the bridge deck.

Designers should enquire regarding current or likely provision for public utilities on bridges. These should be concealed for aesthetic reasons.

The clear width for a pedestrian bridge shall be 2.0m minimum. Barrier kerb shall be provided on both sides with adequate provision for drainage of the bridge surface.

1.6 Provision for Pedestrians on Road Bridges

Provision for pedestrians on bridges is required in rural residential as well as urban areas. The minimum provision is a 2.0m footpath with kerb at the road edge and pedestrian safety rails at the external edge.

Council may require the provision of separate pedestrian footpaths in other situations should the anticipated traffic warrant it.

Disabled access shall be considered, and incorporated, into the design.

Urban road and footbridges shall be lit in accordance with the appropriate Australian Standard.

1.7 Structures Other than Bridges, Associated with Roads

A suitably qualified and experienced professional engineer (RPEQ) shall undertake all aspects of the design of any public utility structures, major culverts, major sign support structures, retaining walls, and the like.

The design shall comply with all relevant requirements of:

- This Guideline
- All Reference and Source Documents listed in section 1.4
- Any relevant Australian Standard
- Any relevant requirements of the utility owner
- Any Development Approval conditions relevant to the design, and
- Any specific relevant and reasonable request provided by Council in writing

1.8 Structures Used for Public Safety

A suitably qualified and experienced professional engineer (RPEQ) shall undertake all aspects of the design of any structure to be used for public safety.

The design shall comply with all relevant requirements of:

- This Guideline
- All Reference and Source Documents listed in section 1.4
- Any relevant Australian Standard
- Any Development Approval conditions relevant to the design, and
- Any specific relevant and reasonable request provided by Council in writing

The RPEQ shall sign all plans associated with the project, certifying that the design complies with this section.

Since the requirement of road safety barriers and pedestrian safety rails on bridges are different, the design engineer shall consider whether separate traffic and pedestrian barriers can be detailed to satisfy the major functional requirements.

The AUSTRROADS Bridge Design Code and Department of Main Roads "*Road Planning and Design Manual*" are recommended references in this regard.

It is essential that all safety barriers and rails have been fully tested and accredited for the intended use under quality assurance provision. The engineer is to ensure that appropriate corrosion protection shall be considered in specifying the materials to be used.

Bridge crossings in urban and rural residential areas shall be provided with streetlighting in accordance with AS 1158. Such requirements will be noted accordingly on the Drawings.

1.9 Temporary Works

A suitably qualified and experienced professional engineer (RPEQ) shall undertake all aspects of the design of any temporary works required.

The design shall comply with all relevant requirements of:

- This Guideline
- All Reference and Source Documents listed in section D3.03
- Any relevant Australian Standard
- Any Development Approval conditions relevant to the design, and
- Any specific relevant and reasonable request provided by Council in writing

The RPEQ shall sign all plans associated with the project, certifying that the design complies with this section.

A construction programme, indicating the sequence of events leading to the implementation and removal of the temporary structures shall be specified on the Drawings.

1.10 Drawings and Documentation

All drawings and documentation to be submitted to Council for approval shall conform to the requirements of Council's *Drawings and Documentation Guidelines D20*. A copy of these Guidelines will be made available on request.

Failure to comply with Council's *Drawings and Documentation Guidelines D20* may result in the drawings and/or documentation being returned to the engineer without consideration by Council.

1.11 Special Requirements

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