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# DEVELOPMENT DESIGN SPECIFICATION

D3

# STRUCTURES BRIDGE DESIGN

## Amendment Record for this Specification Part

This Specification is Council's edition of the AUS-SPEC generic specification part and includes Council's primary amendments.

Details are provided below outlining the clauses amended from the Council edition of this AUS-SPEC Specification Part. The clause numbering and context of each clause are preserved. New clauses are added towards the rear of the specification part as special requirement clauses. Project specific additional script is shown in the specification as italic font.

The amendment code indicated below is 'A' for additional script 'M' for modification to script and 'O' for omission of script. An additional code 'P' is included when the amendment is project specific.

Amendment Sequence No.	Key Topic addressed in amendment	Clause No.	Amendment Code	Author Initials	Amendment Date
1	IPWEA Mid North Coast Working Party Review of D2 15/9/2000	D03	AMO	HC	16/1/01
2	Additional Australian Standard added	D3.04 (b) (c)	AM	AS	January 2005
2	Australian Standard Reference updated	D3.05 3	M	AS	January 2005
2	"Concent" to "Consent"	D3.05 6	M	AS	January 2005
2	Addition of extra road carriageway requirements.	D3.05 10	M	AS	January 2005
2	Re-wording of title to include "and reserves"	D3.07	A	AS	January 2005
2	Addition of four (4) new paragraphs	D3.07 1, 2, 3	A	AS	January 2005
2	Addition of reference to "The Blue Book"	D3.08 1	A	AS	January 2005
2	Addition of limitation on small earth dams	D3.08 5	A	AS	January 2005

2	Addition of risk assessment	D3.09 1	AO	AS	January 2005

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## DEVELOPMENT DESIGN SPECIFICATION D3 STRUCTURES/BRIDGE DESIGN

### GENERAL

#### D3.01 SCOPE

1. This section sets out design considerations to be adopted in the design of structural engineering elements within the GTCC LGA. Such elements will include:

- Road traffic bridges
- Pedestrian bridges
- Structures other than bridges, but associated with roads and reserves (eg retaining walls)
- Small earth dams, detention basins
- Structures used for public safety (traffic barriers, pedestrian barriers, street lighting)
- Major sign support structures
- Temporary works

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

#### D3.02 OBJECTIVE

1. The objective 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.

***Design Life***

#### D3.03 BASES OF DESIGN

1. The design shall be based on current standards, best practice and provide for innovative solutions. Management control and supervision by experienced and qualified engineers shall be required at all stages of the design.

***Safety Quality  
Qualifications***

2. Specifications shall be cross referenced on the design plans. The safety and service performance of a structure depends also on the quality control exercised in fabrication, supervision on site, the control of unavoidable imperfections and the qualifications, experience and skill of all personnel involved. Adequate attention shall therefore be given to these factors

#### D3.04 REFERENCE AND SOURCE DOCUMENTS

##### (a) Council Specifications

- |    |   |                            |
|----|---|----------------------------|
| D1 | - | Geometric Road Design      |
| D5 | - | Stormwater Drainage Design |
| D8 | - | Water front development    |

**(b) Australian Standards**

- AS1170 - Minimum design loads on structures (SAA Loading Code)
  - AS1684 - National Timber Framing Code
  - AS3600 - Concrete structures
  - AS3700 - Masonry in buildings (SAA Masonry Code)
  - AS4100 - Steel structures
  - AS 1720 - Timber Design
  - AS5100 - Bridge Design
  - AS4360 - Risk Management
  - AS4678 - Earth-Retaining Structures
- Other relevant codes and guidelines with the above.

**(c) Other**

- AUSTROADS - Bridge Design Code
- Inst. of Eng. - Australian Rainfall and Runoff
- KD Nelson - Design and Construction of Small Earth Dams
- DLWC - NSW Flood Plain Manual
- RTA - Road Design Guide
- Land Com. - Managing Urban Stormwater : Soils and Construction Edition 4 2004

**D3.05 ROAD TRAFFIC BRIDGES**

1. Structural design of large bridges is a complex matter generally falling outside the scope of many small civil engineering consultancies. If the design of these structures cannot be completed in house, council would generally prefer this work to be referred to a firm whose A.C.E.A. listing includes structural design of bridges in its claimed area of competency. **A.C.E.A. Listing**
2. Submissions are not precluded from other qualified persons in which cases Council reserves the right to call for evidence of the qualifications and experience of the responsible designer; or to seek referral of the design calculations to an appropriate A.C.E.A. firm for checking. The latter requirement will be at the proponent's cost, if directed. **Checking**
3. Australian Standard AS5100 Bridge Design shall be used for all bridge designs. Abutments and earth retaining structures in relation to bridges shall be designed in accordance with AS4678 Earth-Retaining Structures. The terms "should" and "may" contained within these standards shall be interpreted as "shall" unless Council approves otherwise in writing. Appendix A of AS5100 shall be submitted to Council with adopted/proposed values for all Clauses specified within AS5100 in addition to the AUS-SPEC DQS already required for designs. **Design**
4. Council requires bridges to have low maintenance finishes; therefore timber and steel are not usually acceptable construction materials, unless suitable precautions are adopted. Heavy debris and bed loads may be characteristic of some streams so that large spans with slender piers are encouraged. If overtopping is permitted, handrails and guardrails are usually omitted. Flood depth indicators will be required in such cases. **Debris Overtopping**
5. Preventative maintenance is a key issue affecting the design life of the structure. The design plans 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 design plans. **Design Life Maintenance**
6. Unless otherwise indicated on the Development Consent, Where inundation of **Small Bridges**

small Bridges is permitted by Council, the Bridge shall be designed to Convey at least the 20 year ARI storm event 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 designer, such certification is impractical, the structure shall be designed to convey the 100 year ARI storm event without inundation.

***Design Storm Event***

7. Where structures are designed to be inundated, it shall be limited to ensure that the degree hazard, as specified in the NSW Governments Flood Plain development manual is not exceeded, for the stability and safety of pedestrians and vehicles` the effect of the backwater gradient on upstream property shall be identified on the design plans.

8. 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 the underside of the bridge deck.

***Freeboard***

9. Designers shall provide for public utilities, including the provision of conduits..in bridges.

***Public Utilities***

10. Bridge carriage way widths shall comply with tables D1.5 and D1.8 of "Geometric Road Design- D1", Austroads, RTA RDG, and AS5100. Where there is conflict in any of these guidelines, standards, and specifications, this shall be brought to the attention of Council as soon as is practicably possible so that a determination may be made on the criteria for the specified bridge.

***Carriageway Widths***

### **D3.06 PEDESTRIAN FACILITIES**

1. Provision for pedestrians on bridges is required in rural residential and urban areas. The minimum provision is a 2.0m footpath with kerb at the road traffic edge and handrail. Traffic separation barrier may be required where traffic speeds or volumes warrant.

***Pedestrians***

2. Council may require the provision of separate pedestrian carriageways in other situations should the anticipated traffic warrant it. Urban bridge approaches shall be lit.

***Carriage of Utilities***

3. Pedestrian access and Carriage ways shall be designed in accordance with Austroads Part 13 and 14 "Pedestrians and bicycles"; Australian Standards and relevant RTA guidelines.

4. Designs for separate pedestrian bridges shall be based ,on current standards, best practice, and provide for innovative solutions. Pedestrian bridge width shall be in accordance with pathway requirements of AUSTROADS, PART 13; relevant Australian Standards and RTA guidelines.

### **D3.07 STRUCTURES OTHER THAN BRIDGES, ASSOCIATED WITH ROADS AND RESERVES**

1. Structures shall be designed and certified by a qualified engineer experienced and accredited in the design of the structures.

2. The certification shall include relevant design and serviceability criterion in accordance with the applicable Australian Standard and include the following as a minimum:

- (i) design life
- (ii) structure capacity; and
- (iii) design loads



3. Structural design report shall be submitted with the final engineering structural drawings. Full structural calculations shall be kept by the designer for a minimum of seven (7) years or as applicable by law.
4. Permanent structures shall be designed for a minimum life of 60 years unless Council approves otherwise.

### **D3.08 SMALL EARTH DAMS**

1. Small earth dams may be designed following guidelines of the following:
  - (i) "Design and Construction of Small Earth Dams" by K D Nelson
  - (ii) "Managing Urban Stormwater: Soils and Construction" condition (The Blue Book)
2. The designer shall carry out the design with recognition of the potential risk on existing and planned infrastructure downstream, assuming the probability of dam/basin failure.
3. The designer shall be a qualified civil or structural engineer having accreditation in the design of such structures. **Qualification**
4. The designer shall be required to certify the design and ultimately certify the work-as-executed plans for compliance with the design. In doing so, the designer is expected to conduct sufficient site inspections to justify the certification of the structure. All relevant details shall be shown on the design plans.
5. Dams in excess of 600 mm deep and/or upstream of infrastructure shall be designed in accordance with D5 and D7.

### **D3.09 STRUCTURES USED FOR PUBLIC SAFETY**

1. The designer shall undertake a risk assessment in accordance with the RTA Road Design Guide, risk assessment Australian Standards, and best management practices to determine the warrant for pedestrian and vehicular guard rail system. Other safety requirements shall satisfy OHS legislation and applicable Australian Standards. **Barriers**
2. It is essential that all barriers have been fully certified for each design and accredited for the intended use under quality assurance provisions.
3. Urban and rural residential bridges shall be provided with adequate street lighting to comply with relevant Australian Standards. Such requirements will be noted accordingly on the design plans. **Lighting**

### **D3.10 TEMPORARY WORKS**

1. Structures which are proposed for the temporary support of roads, services and the like shall be designed by a qualified Engineer experienced and accredited in the design of such structures. A construction programme, indicating the sequence of events leading to the implementation and removal of the temporary structures shall be specified. **Programme of Temporary Provisions**

## SPECIAL REQUIREMENTS

### D3.11 CERTIFICATION

1. The designer shall be required to certify the design and ultimately certify the work-as-executed plans for compliance with the design. In doing so, the designer is expected to conduct sufficient site inspections to justify the certification of the structure. All relevant details shall be shown on the design plans.
2. It is essential that all barriers have been fully certified for each design and accredited for the intended use under quality assurance provisions.

### D3.12 RESERVED

### D3.13 RESERVED