

**ENGINEERING DESIGN
SPECIFICATION**

D3

**STRUCTURES/BRIDGE
DESIGN**

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ENGINEERING 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 for land subdivisions. Such activities will include:

- Road traffic bridges
- Pedestrian bridges
- Structures other than bridges, but associated with roads (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.

D3.02 OBJECTIVE

1. 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.

Design Life

D3.03 BASES OF DESIGN

1. 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 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. 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.
2. Specifications shall be notated on the design plans with sufficient detail to ensure that the above described strategies are able to be effectively implemented at the construction stage.

*Safety Quality
Qualifications*

D3.04 REFERENCE AND SOURCE DOCUMENTS

(a) Council Specifications

- D1 – Geometric Road Design
- D2 – Stormwater Drainage Design

(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

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

D3.05 ROAD TRAFFIC BRIDGES

1. Structural design of bridges is a complex matter generally falling outside the scope of many small civil engineering consultancies. 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. However, this does not preclude submissions by 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 proponents cost, if directed. **Checking**
3. The Austroads Bridge Design Code is the appropriate general reference for bridge proposals.
4. Council normally requires bridges to have low maintenance finishes; therefore timber and steel are not usually acceptable construction materials. 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 provided 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 Application, small bridges, culverts within rights of carriageways shall be designed with appropriate afflux to convey the 5 year ARI storm event without afflux together 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. **Small Bridges Design Storm Event**
7. Where structures are designed to be inundated, 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 1% probability event. Where no inundation is **Freeboard**

permitted, appropriate afflux shall be adopted together with a 500mm freeboard to the underside of the bridge deck.

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| 9. | Designers should enquire regarding current of likely provision for public utilities in bridges. | <i>Public Utilities</i> |
| 10. | Bridges within residential areas shall have a carriageway width equal to that of the street in which it is located, together with a minimum footpath of 3.5 metres on each side. | <i>Urban Areas</i> |

D3.06 PEDESTRIAN BRIDGES

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|----|---|------------------------------|
| 1. | Provision for pedestrians on bridges is required in rural residential as well as urban areas. The minimum provision is a 1.5m footpath with kerb at the road traffic edge and handrail. | <i>Pedestrians</i> |
| 2. | Council may require the provision of separate pedestrian carriageways in other situations should the anticipated traffic warrant it. Urban bridge approaches should be lit. Designers should enquire regarding the current and future utility services which the bridge may be required to carry. These should be concealed for aesthetic reasons. Disabled access shall be considered in the design. | <i>Carriage of Utilities</i> |

D3.07 STRUCTURES OTHER THAN BRIDGES, ASSOCIATED WITH ROADS

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| 1. | Public utility structures, retaining walls, and the like will be designed by a competent, practicing engineer, accredited in the design of such structures. The consultant shall refer to the Austroads code and any other Australian standards to execute the design. |
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D3.08 SMALL EARTH DAMS/DETENTION BASINS

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| 1. | Small earth dams may be designed following the guidelines in "Design and Construction of Small Earth Dams" by K D Nelson together with relevant geotechnical recommendations. The structural design of weir outlets to resist failure shall be considered in design. | |
| 2. | Childproof fencing shall be nominated where unacceptable risk exists due to the location of the dam/basin in relation to the urban nature of the area. This requirement shall be determined by Council. | <i>Fencing</i> |
| 3. | The consultant shall carry out the design with recognition of the potential risk on existing and planned infrastructure downstream, assuming the probability of dam/basin failure. | |
| 4. | The consultant shall be a qualified civil or structural engineer having accreditation in the design of such structures. | <i>Qualification</i> |
| 5. | The consultant shall be required to certify the design and ultimately certify the work-as-executed plans for compliance with the design. All relevant details shall be shown on the design plans. | |
| 6. | A dam may be prescribed under the Dam Safety Act 1978 depending on the recommendation of the NSW Dams Safety Committee. A dam is normally prescribed if it is: | <i>Dam Safety</i> |
| | <ul style="list-style-type: none"> ▪ 10 metres or more in height with a storage capacity of more than 20 | |

megalitres; or

- 5 metres or more in height with a storage capacity of 50 megalitres or more.

D3.09 STRUCTURES USED FOR PUBLIC SAFETY

1. Since the requirement of traffic 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. **Barriers**
2. The Austroads Bridge Design Code is the recommended reference in this regard.
3. It is essential that all barriers have been fully tested and accredited for the intended use under quality assurance provisions.
4. Urban and rural residential bridge crossings shall be provided with adequate street lighting. 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 on the design plans. **Programme of Temporary Provisions**

SPECIAL REQUIREMENTS

D3.11 RESERVED

D3.12 RESERVED

D3.13 RESERVED