

Armidale

Regional Council

ENGINEERING DESIGN CODE SPECIFICATION D3

STRUCTURES BRIDGE DESIGN

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DEVELOPMENT DESIGN SPECIFICATION D3 STRUCTURES/BRIDGE DESIGN

GENERAL

D3.01 SCOPE

1. This section sets out the basic minimum 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 major culverts, retaining walls, major sign support structures)
- Small earth dams, detention basins
- Structures used for public safety (road safety barriers, pedestrian safety rails, street lighting)
- Temporary works

*Structure
Types*

Construction of the structures may be in concrete, timber or steel, but with emphasis placed on low maintenance for design service life.

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. Generally the design life of a major structure utilised for roads infrastructure shall be a minimum of 50 years.

Design Life

D3.03 BASIS 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 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.

*Safety Quality
Qualifications*

2. Specifications shall be notated on the Drawings with sufficient detail to ensure that the strategies described in Clause D3.03(1) are able to be effectively implemented at the construction stage.

D3.04 REFERENCE AND SOURCE DOCUMENTS

(a) Council Specifications

- | | | |
|----|---|---|
| D1 | - | Geometric Road Design |
| D5 | - | Stormwater Drainage Design |
| D7 | - | Erosion Control and Stormwater Management |

(b) Australian Standards

- AS1158 - Lighting for roads and public spaces (SAA Public Lighting Code)
 - AS1170 - Structural design actions (SAA Loading Code)
 - AS1684 - Residential timber – framed construction
 - AS3600 - Concrete structures
 - AS3700 - Masonry structures (SAA Masonry Code)
 - AS/NZS 3845 - Road safety barrier systems
 - AS4100 - Steel structures
 - AS5100 (set) - Bridge Design
- Other relevant codes and guidelines with the above.

(c) Other

- AUSTROADS - Bridge Design Technology Part 4 “Design, Procurement and concept Design”
- Inst. of Eng. - Australian Rainfall and Runoff
- KD Nelson - Design and Construction of Small Earth Dams

D3.05 ROAD TRAFFIC AND PEDESTRIAN BRIDGES

1. Bridge design shall only be carried out by degree qualified civil and structural engineers who are able to be accredited by the IEAust as professional engineers. Any engineer undertaking the structural design of bridges shall have bridge design in their listing of claimed areas of competency. Designers shall submit evidence of their qualifications and experience to Council prior to approval of any bridge design. *IEAust Accreditation*
2. 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 consulting engineering firm for checking. The latter requirement will be at the Developer's cost, if directed. *Design Checking*
3. The AUSTROADS Bridge Design Code shall be used for all bridge design. *Austrroads*
4. Bridges shall have 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. *Finishes*
Debris, Overtopping
5. Preventative maintenance is a key issue affecting the design life of a 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. *Design Life Maintenance*
6. Hydraulic design of bridges shall be in accordance with the requirements for major structures in Specification D5 STORMWATER DRAINAGE DESIGN. *Hydraulic Design*
7. Where structures are designed to be inundated, the effect of the backwater gradient on upstream property shall be identified on the Drawings. *Inundation*
8. 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 should design for the provision of current or future public utilities in bridges. These should be concealed for aesthetic and security reasons. *Public Utilities*

D3.06 PROVISION FOR PEDESTRIANS ON ROAD BRIDGES

1. Provision for pedestrians and cyclists on bridges is required in rural residential as well as urban areas. The minimum provision is a 1.8m footpath with kerb at the road traffic edge and pedestrian safety rails at the external edge. The requirement for the provision of vehicle barriers shall be based on traffic flows and the 85th percentile traffic speed. *Provision for Pedestrians and Cyclists*
2. Council may require the provision of separate pedestrian footpaths in other situations should the anticipated traffic be sufficiently high to warrant it. *Separate Footpaths*
3. Disabled access shall be considered in the design of bridges. *Disabled Access*
4. Urban bridge approaches should be lit in accordance with AS1158. *Lighting*

D3.07 STRUCTURES OTHER THAN BRIDGES, ASSOCIATED WITH ROADS

1. Public utility structures, major culverts, major sign support structures, retaining walls, and the like will be designed by a competent, practicing structural engineer, accredited in the design of such structures. The design shall be in accordance with the AUSTROADS code, all relevant Australian Standards, and the requirements of any utility vendors that may be relevant.

D3.08 SMALL EARTH DAMS AND DETENTION BASINS

1. Small earth dams shall 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. Refer also to the Retarding Basin and Stormwater Detention sections in Specification [D5 STORMWATER DRAINAGE DESIGN](#).
2. Childproof fencing shall be nominated where it is a requirement of relevant statutory regulations, Australian Standards or Council Specifications and where unacceptable risk exists due to the location of a dam or basin in an urban or residential area or where public access is likely. *Fencing*
3. 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. *Risk of Failure*
4. The Designer shall be a qualified civil or structural engineer having accreditation in the design of earth dam structures. *Qualification*
5. The Designer shall be required to certify the design and the work-as-executed Drawings for compliance with the design. All relevant details shall be shown on the Drawings. *Certification*

D3.09 STRUCTURES USED FOR PUBLIC SAFETY

1. As the requirements for road safety barriers and pedestrian safety rails on bridges are different, the design engineer shall consider whether separate traffic and pedestrian barriers should be detailed to satisfy major functional requirements. Refer to Clause 3.06(1) *Barriers and Rails*
2. The AUSTROADS Bridge Design Code and AS/NZS 3845 are recommended references in the design of barriers and rails.

3. It is essential that all safety barriers and rails have been fully tested and accredited for the intended use under quality assurance provisions.

4. Bridge crossings in urban and rural residential areas shall be provided with street lighting in accordance with AS 1158. Requirements for lighting shall be noted accordingly on the Drawings.

Lighting

D3.10 TEMPORARY WORKS

1. Structures which are proposed for the temporary support of roads and services shall be designed by a qualified Engineer experienced and accredited in the design of structures and designed in accordance with the AUSTRROADS Bridge Design Code. A construction programme, indicating the sequence of events leading to the implementation and removal of the temporary structures shall be specified on the Drawings.

Programme of Temporary Provisions

SPECIAL REQUIREMENTS

D3.11 PROVISION FOR MAJOR FLOW PATH

1. Structures shall be designed to allow the free flow of flood water within major flow paths for the 1 in 100 year ARI. The provision of structures shall not impede flood flows or allow debris to collect on their upstream side.

Free flow for 100 year ARI

2. This can be provided through the provision of a low flow culvert and causeway or a bridge structure with a 500mm freeboard to its underside for the 1 in 100 year ARI flood level.

Structure Finished Levels

3. Structures shall be designed to account for the build up and impact of debris against support structural members and decks for a depth of debris of at least 1metre and a velocity of flow of at least 3m/s. Routing calculations to determine the likely stream velocity shall be undertaken to determine the actual velocity of flow.

Debris Build up and Flow Velocity

D3.12 RESERVED

D3.13 RESERVED

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