

TWEED SHIRE COUNCIL

DEVELOPMENT
DESIGN
SPECIFICATION

D3

**STRUCTURES,
BRIDGE DESIGN**

VERSION 1.3

SPECIFICATION D3 – STRUCTURES, BRIDGE DESIGN

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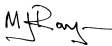
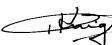

CITATION

This document is named "Tweed Shire Council, Development Design Specification D3 - Structures, Bridge Design".

ORIGIN OF DOCUMENT, COPYRIGHT

This document was originally based on AUS-SPEC Development Design Specification D3 - Structures, Bridge Design, May 2000 (Copyright SWR-TM). Substantial parts of the original AUS-SPEC document have been deleted and replaced in the production of this Tweed Shire Council Development Specification. The parts of the AUS-SPEC document that remain are still subject to the original copyright.

VERSIONS, D3 STRUCTURES, BRIDGE DESIGN

| VERSION | AMENDMENT DETAILS | CLAUSES AMENDED | DATE ISSUED (The new version takes effect from this date) | Authorised by the Director of Engineering Services |
|---------|---|-------------------------------------|--|--|
| 1.1 | Original Version | | 1 July 2003 |  |
| 1.2 | Amend references to Bridge Design Code AS5100 | D3.04, various | 9 July 2012 |  |
| 1.3 | Add traffic barrier requirements of AS5100 Update AUSTRoads references | D3.05, D3.09 D3.04, D3.05, D3.07 | 18 December 2015 |  |
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DEVELOPMENT DESIGN SPECIFICATION D3

STRUCTURES, BRIDGE DESIGN

GENERAL

D3.01 SCOPE

1. This specification sets out design considerations to be adopted in the design of structural engineering elements for development. Such activities will include:
 - (a) Road traffic bridges
 - (b) Pedestrian bridges
 - (c) Structures other than bridges, but associated with roads (eg retaining walls)
 - (d) Small earth dams, detention basins
 - (e) Structures used for public safety (traffic barriers, pedestrian barriers, street lighting)
 - (f) Major sign support structures
 - (g) 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 | - | Road Design |
| D5 | - | Stormwater Drainage Design |
| D9 | - | Cycleway and Pathway Design |

(b) Australian Standards

- AS1170 - Structural Design Actions
 - AS3600 - Concrete structures
 - AS3700 - Masonry Structures
 - AS4100 - Steel Structures
 - AS5100 - Bridge Design
- Other relevant codes and guidelines with the above.

(c) Other

- AUSTROADS - Guide to Bridge Technology
- AUSTROADS - Guide to Road Design
- Inst. of Eng. - Australian Rainfall and Runoff
- KD Nelson - Design and Construction of Small Earth Dams
- GH & D - Tweed Shire Bicycle Plan Report May 1995
- BCA
- NAASRA - (1976) Bridge Design Specification

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 Consult Australia (formerly 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 Consult Australia firm for checking. The latter requirement will be at the proponent's cost, if directed. **Checking**
3. Bridge design shall conform with the Bridge Design Code which references the loads from the standard vehicles defined in the 1976 NAASRA Bridge Design Specification.
4. Council normally 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 where not required by AS5100.1. Flood depth indicators are to be provided in such cases. **Debris Overtopping**
5. The design life shall be 100 years. The ultimate limit state, that is the capability of the bridge to withstand a flood without collapse, shall be 1:2000 years. 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. See D1 and D5 for the design ARI of bridges. **Design Life Maintenance**
6. Bridges shall be designed in accordance with ARI values in Table D1.14 of D1. **Design ARI**
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 event identified in D1 or D5. Where no inundation is permitted, a 500mm freeboard to the underside of the bridge **Freeboard**

STRUCTURES, BRIDGE DESIGN

superstructure is to be provided.

9. Designers should enquire regarding current or likely provision for public utilities in bridges. **Public Utilities**
10. The design shall be consistent with AUSTRROADS Guide to Bridge Technology and Guide to Road Design.
11. The increased velocities caused by afflux under the bridge are to be calculated.
12. Where velocities are sufficient to cause scour or erosion, the Design Plans are to show the mitigating techniques to be constructed.

D3.06 PEDESTRIAN BRIDGES

1. Provision for pedestrians and bicycles 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 for pedestrians and 2.5m width minimum for shared pedestrian and cycleway. Reference to Council's Tweed Shire Bicycle Plan is required when designing new bridges. **Pedestrians**
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. **Carriage of Utilities**

D3.07 STRUCTURES OTHER THAN BRIDGES, ASSOCIATED WITH ROADS

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 design shall be consistent with AUSTRROADS Guide to Road Design, Bridge Design Code and any other Australian standards.

D3.08 SMALL EARTH DAMS/DETENTION BASINS

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. **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.
4. The designer shall be a qualified civil or structural engineer having accreditation in the design of such structures. **Qualification**
5. The designer 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.

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 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. Traffic barriers shall be capable of rapid repair or replacement
5. In order to minimise damage to bridge decks, and for safety considerations, bridge barriers shall be designed as progressive strength systems in which barriers and then their connections fail prior to the failure of the supporting elements
6. Urban and rural residential bridge crossings shall be provided with prestige style street lighting that conforms with the 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 on the design plans. **Programme of Temporary Provisions**

SPECIAL REQUIREMENTS**D3.11 BRIDGES ON PRIVATE LAND**

1. Where a vehicular bridge is not going to be dedicated as a public road, the minimum design vehicle loading considerations are No Heavy Loaded Platform, No Abnormal Loading, 75% Standard Vehicle Loading.

Council may provide separate written approval for a lesser design loading (minimum of 13 tonnes) following the consideration of site constraints and supporting reasons for the particular situation. The bridge would be required to support any emergency service vehicle which currently operates within the Tweed Shire.
2. The bridge design shall conform with the relevant Australian Standards. Reference shall be made to the Bridge Design Code.

D3.12 RESERVED**D3.13 RESERVED**