

DEVELOPMENT DESIGN SPECIFICATION

D3

CIVIL STRUCTURES, TEMPORARY WORKS & BRIDGE DESIGN

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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
0	Customisation for Hastings Council Local Government Area	D03.01 to D03.13	OAM	HC	31/7/03
1	Relocation of Contents page to beginning of document.	N/A	OAM	HC	26/02/04
2	Reference to Australian Standard for Bridge Design AS5100.	D3.04 D3.05 D3.06	A A A	HC	02/09/04

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DEVELOPMENT DESIGN SPECIFICATION D3 CIVIL STRUCTURES, TEMPORARY WORKS & BRIDGE DESIGN

GENERAL

D3.01 SCOPE

1. This section sets out design considerations to be adopted in the design of structural engineering elements for public works. 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
- Revetment 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. | <i>Design Life</i> |
| 2. | Design considerations shall, in addition to Objective 1, include but not be limited to: economic; physical; aesthetic; and other relevant constraints. | <i>Design Considerations</i> |

D3.03 BASIS 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. | <i>Safety Quality Qualifications</i> |
| 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

- AS1158 - Road Lighting
 - AS1170 - Minimum design loads on structures (SAA Loading Code)
 - AS1684 - National Timber Framing Code
 - AS3600 - Concrete structures
 - AS3700 - Masonry in buildings (SAA Masonry Code)
 - AS 3845 - Road Safety Barrier Systems
 - AS4100 - Steel structures
 - AS5100 - *Bridge Design Standard*
 - AS4678 - Earth-Retaining Structures
- Other relevant codes and guidelines with the above.

(c) Other

- AUSTROADS - Bridge Design Code
- AUSTROADS - Guide to Traffic Engineering Practice: Pedestrians
- AUSTROADS - Waterway Design
- Inst. of Eng. - Australian Rainfall and Runoff
- KD Nelson - Design and Construction of Small Earth Dams
- DLWC - NSW Flood Plain Manual
- Dept. Housing - Managing Urban Stormwater: Soils and Construction
- RTA - Road Design Guide Stormwater Management and Drainage Design
- US Army - US Army Waterways Experiment Station Streambank Protection Guidelines.
- QLD Govt. - QLD Urban Drainage Manual

D3.05 ROAD TRAFFIC BRIDGES

1. The Design Engineer must be an experienced and qualified engineer in accordance with Aus-Spec DQS-Quality Assurance of Engineering Design, Section DQS.06. **Qualified Engineer**
2. *The Australian Standard AS5100 Bridge Design shall be adopted for all bridge designs in the Hastings Council Local Government Area.* **Australian Standard**
3. 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**
4. 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**
5. Unless otherwise indicated on the Development Consent, where inundation of 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. **Small Bridges Design Storm Event**
6. Where structures are designed to be inundated, the degree hazard, as specified in the NSW Governments Flood Plain development manual 2000 shall not be exceeded. For the stability and safety of pedestrians and vehicles the effect of the backwater **Backwater Gradient**

gradient on upstream property shall be identified on the design plans.

7. 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

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

Public Utilities

9. Bridge carriage way widths shall comply with tables D1.5 and D1.8 of "Geometric Road Design- D1"

Carriageway Widths

D3.06 PEDESTRIAN FACILITIES ON BRIDGES

1. Provision for pedestrians on bridges is required in rural residential and urban areas. The minimum provision shall be a 2.0m footpath (*or as required by the governing Australian Standard*) 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.

3. Pedestrian access and Carriage ways shall be designed in accordance with Austroads Part 13 and 14 "Pedestrians and bicycles", *and the governing Australian Standard. Where there is a conflict between the Austroads guides and the governing Australian Standard the Australian Standard shall have precedence.*

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 *and the governing Australian Standard. Where there is a conflict between the Austroads guides and the governing Australian Standard the Australian Standard shall have precedence.*

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, experienced in the design of such structures. The designer shall refer to the AUSTROADS code and any other relevant Australian standards to execute the design.

2. Retaining walls, reinforced soil structures, and reinforced rock structures are to be designed in accordance with AS 4678 Earth Retaining Structures, AUSTROADS, and any other relevant Australian Standards. The Designer shall adopt the recommendations in AS 4678 where no other Standard governs.

Retaining Walls

3. Revetment works shall be designed in accordance with all relevant Australian standards. Factors to be designed for, include, but are not limited to, the following:

Revetment Works

- a. scour protection, designed in accordance with "RTA Road Design Guide: Stormwater Management and Drainage Design" Section 7, Chapter 24 Other Drainage Elements, "US Army Streambank Protection Guidelines", "AUSTROADS Waterway Design", and any other relevant Australian standards
- b. rapid drawn down effects;
- c. piping or material loss;
- d. wave action and over topping; and
- e. durability.

4. In the absence of a governing Australian standard, the structure classification and performance monitoring shall be in accordance with AS 4678 Sections 1 and 7 respectively.

D3.08 SMALL EARTH DAMS & DETENTION BASINS

1. A small earth dam or wet retention basin is classified as being:

Small Earth Dam - Definition

- a. less than 10 metres in height with a storage capacity of less than 20 megalitres; or
- b. less than 5 metres in height with a storage capacity of less than 50 megalitres.

2. 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. Refer also to the Retarding Basin, Stormwater Detention and Wetland sections in Aus-spec D5.15, D7.19, and D7.22 respectively.

Small Earth Dams - Design

The following design criterion shall apply in addition to those specified in K D Nelson, and in Aus-spec D5.15, D7.19, and D7.22:

- a. freeboard – 1 metre minimum;
- b. design height – construction height shall exceed design height by 5% for settlement;
- c. wall slopes shall be a maximum of 6H:1V; and
- d. crest width – 2.5 metre minimum.

3. Small detention basins for the purpose of this Specification are defined by "QLD Urban Drainage Manual" Section 6.02 as:

Small Detention Basin - Definition

- a. Small basins placed at the lowest points of individual development sites, and which can also serve as sediment traps and possibly assist in pollution reduction;
- b. Ponds and low-points located within larger development areas;
- c. Playing-fields and car-parks, either excavated into natural surface or surrounded by a low bund or kerb;

- d. Underground tanks in highly built-up areas; and
- e. Devices such as soakage pits, trenches and basins.

4. Small detention basins shall be designed in accordance with ANCOLD "Guidelines on Design Floods for Dams", the recommendations outlined in "Managing Urban Stormwater Soils and Construction" by the NSW Department of Housing, "QLD Urban Drainage Manual", Aus-Spec D5.15, D7.19, and D7.22 specifications, and any other relevant Australian standards or guidelines.

***Small
Detention
Basin - Design***

5. 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 Analysis
Assessment***

6. The designer shall be qualified in accordance with Aus-Spec DQS.

Qualification

D3.09 STRUCTURES USED FOR PUBLIC SAFETY

1. The requirement of traffic barriers and pedestrian safety rails on bridges is to be determined by the Design Engineer who shall consider whether separate traffic and pedestrian barriers are required. AUSTROADS Bridge design guide and AUSTROADS Part 13 may be used as guides. If a barrier system is adopted, it should be designed in accordance with AS 3845 Road Safety Barrier Systems, AUSTROADS, RTA Road Design Guide and any other relevant Australian guides and 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 bridges shall be provided with adequate streetlighting to comply with AS 1158 and any other 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 an engineer who is qualified in accordance with Aus-Spec DQS. 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 in accordance with Aus-Spec DQS.

D3.12 RESERVED

D3.13 RESERVED