AS 5100.3—2004
AP-G15.3/04
(Incorporating Amendment No. 1)

AS 5100.3—2004

Australian Standard®

Bridge design

Part 3: Foundations and soil-supporting structures

This Australian Standard® was prepared by Committee BD-090, Bridge Design. It was approved on behalf of the Council of Standards Australia on 1 August 2003.
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The following are represented on Committee BD-090:

- Association of Consulting Engineers Australia
- Australasian Railway Association
- Austroads
- Bureau of Steel Manufacturers of Australia
- Cement and Concrete Association of Australia
- Institution of Engineers Australia
- Queensland University of Technology
- Steel Reinforcement Institute of Australia
- University of Western Sydney

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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PREFACE

This Standard was prepared by the Standards Australia Committee BD-090, Bridge Design to supersede HB 77.3—1996, *Australian Bridge Design Code*, Section 3: *Foundations*.

This Standard incorporates Amendment No. 1 (April 2010). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The AS 5100 series represents a revision of the 1996 HB 77 series, *Australian Bridge Design Code*, which contained a separate Railway Supplement to Sections 1 to 5, together with Section 6, *Steel and composite construction*, and Section 7, *Rating*. AS 5100 takes the requirements of the Railway Supplement and incorporates them into Parts 1 to 5 of the present series, to form integrated documents covering requirements for both road and rail bridges. In addition, technical material has been updated.

This Standard is also designated as AUSTROADS publication AP-G15.3/04.

The objectives of AS 5100 are to provide nationally acceptable requirements for—

(a) the design of road, rail, pedestrian and bicycle-path bridges;

(b) the specific application of concrete, steel and composite steel/concrete construction, which embody principles that may be applied to other materials in association with relevant Standards; and

(c) the assessment of the load capacity of existing bridges.

These requirements are based on the principles of structural mechanics and knowledge of material properties, for both the conceptual and detailed design, to achieve acceptable probabilities that the bridge or associated structure being designed will not become unfit for use during its design life.

Whereas earlier editions of the *Australian Bridge Design Code* were essentially administered by the infrastructure owners and applied to their own inventory, an increasing number of bridges are being built under the design-construct-operate principle and being handed over to the relevant statutory authority after several years of operation. This Standard includes clauses intended to facilitate the specification to the designer of the functional requirements of the owner, to ensure the long-term performance and serviceability of the bridge and associated structure.

Significant differences between this Standard and HB 77.3 are the following:

(i) *Foundation design principles* In recognition that geotechnical engineering design principles differ from structural engineering design principles, the design procedures have been extensively revised. Designers are required to use geotechnical engineering methods appropriate to the foundation problem at hand, together with appropriate characteristic values and factors, when deriving economical and safe solutions. It is further required that designers apply engineering judgement to the application of sound rational design methods outlined in texts, technical literature and other design codes to supplement the design requirements of this Standard.

(ii) *Design procedures* Substructures have been classified as either foundations, where most of the loads on the substructure come from the bridge structure and loads on it, or as soil-supporting structures, where most of the applied loads are from earth pressure. Different design procedures are required for each. The loads and resistances for a soil-supporting structure will largely depend on the soil properties, whereas the loads for a foundation will not be as dependent on the soil properties.

(iii) *Relevant Standard* The philosophy used for the design of earth-retaining structures in this Standard differs from that contained in AS 4678, *Earth-retaining structures*, which was prepared by Standards Australia Committee CE-032. It is considered that for bridges and road-related structures, where soil/structure interaction occurs and the loads are predominantly soil-imposed, the design method adopted is more realistic. However, AS 4678 contains much useful information that can be used to supplement the design of structures covered by this Standard.

In line with Standards Australia policy, the words ‘shall’ and ‘may’ are used consistently throughout this Standard to indicate respectively, a mandatory provision and an acceptable or permissible alternative.

Statements expressed in mandatory terms in Notes to Tables are deemed to be requirements of this Standard.

The terms ‘normative’ and ‘informative’ have been used in this Standard to define the application of the appendix to which they apply. A ‘normative’ appendix is an integral part of the Standard, whereas an ‘informative’ appendix is only for information and guidance.

CONTENTS

STANDARDS AUSTRALIA

Australian Standard
Bridge design

Part 3: Foundations and soil-supporting structures

1 SCOPE

This Standard sets out minimum design requirements and procedures for the design in limit states format of foundations and soil-supporting structures for road, rail and pedestrian bridges, culverts not specifically covered by other Standards, and subways of conventional size and form.

Foundations include shallow footings, piles and anchorages.

Soil-supporting structures include retaining walls, abutments and buried structures.

The provisions also covers the design of foundations for road furniture, such as lighting poles and sign support structures and noise barriers.

The Standard does not cover the design of—

(a) corrugated steel pipes and arches (see AS 1762, AS/NZS 2041 and AS 3703.2);

(b) underground concrete drainage pipes (see AS 3725 and AS 4058); and

(c) reinforced soil structures.

The requirements for structural design and detailing of concrete and steel are specified in AS 5100.5 and AS 5100.6; however, a number of specific structural design provisions that result from soil-structure interaction are covered by this Standard.

2 APPLICATION

For the design of foundations for overhead wiring structures for electrified railway lines, the requirements of the relevant authority shall apply.

The loads to be applied shall be those specified in AS 5100.2, together with earth pressure loads determined in accordance with this Standard.

The general design procedures to be adopted shall be as specified in this Standard. Unless specified otherwise by the relevant authority, the detailed methods and formulae to be used shall be those specified in the relevant Standard for the geotechnical or structural element. Where no Australian Standard exists covering the design of the geotechnical or structural element, rational design methods outlined in texts or other design Standards and technical literature shall be used, as approved by the relevant authority.

3 REFERENCED DOCUMENTS

The following Standards are referred to in this Standard:

AS	
1597	Precast reinforced concrete box culverts
1597.2	Part 2: Large culverts (from 1500 mm span and up to and including 4200 mm span and 4200 mm height)
1726	Geotechnical site investigations
1762	Helical lock-seam corrugated steel pipes—Design and installation