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Bridge design—Steel and composite construction—Commentary (Supplement to AS 5100.6—2004)

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AS 5100.6 Supplement 1—2007

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PREFACE

This Commentary was prepared by the Standards Australia Committee BD-090, Bridge design to supersede HB 77.6 Supp 1, *Australian Bridge Design Code—Steel and Composite Construction—Commentary (Supplement to SAA HB 77.6—1996)*.

The objective of this Commentary is to provide users with background information and guidance to AS 5100.6—2004.

The Standard and Commentary are intended for use by bridge design professionals with demonstrated engineering competence in their field.

In this Commentary, AS 5100.6—2004 is referred as 'the Standard'.

The clause numbers and titles used in this Commentary are the same as those in AS 5100.6, except that they are prefixed by the letter 'C'. To avoid possible confusion between the Commentary and the Standard, a Commentary clause is referred to as 'Clause C…..' in accordance with Standards Australia policy.

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Australian Standard

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SECTION C1 SCOPE AND GENERAL

C1.1 SCOPE AND APPLICATION

The Section sets out the requirements for the design of steel and composite construction in bridges, including road, railway and pedestrian bridges. The Section should also be used when structures of wrought or cast iron are being rated, but the appropriate material properties need to be used, as well as capacity reduction factors that reflect any reduced ductility.

Steel elements less than 3 mm in thickness are excluded for reasons of practicality, concern about corrosion, and because such sections are not used for bridges. Members from thinner material are usually cold-formed and fall within the scope of AS/NZS 4600. In addition, the connections in elements less than 3 mm thick are better handled by the provisions of AS/NZS 4600 than by the Standard.

The limit of 450 MPa for the yield stress used in design stems from a lack of research data on steel grades above this value, and the applicability of all of the member design provisions for a higher design yield stress cannot be confirmed. Australian steel Standards generally contain no steel grades with a specified yield stress greater than 450 MPa, with the exception of one grade (XF500) specified in AS/NZS 1594. Additional provisions to those in the Standards may be required for steels of higher yield stress.

The Clause does not preclude the use of steels having a specified yield stress greater than 450 MPa provided the yield stress used in design (f_y) is limited to 450 MPa.

Hollow section members specified in AS 1163 are most commonly cold-formed, but have traditionally been designed using the previous editions of the Standard since they were for many years hot-rolled. Tests carried out on members manufactured in accordance with AS 1163 confirm the applicability of the provisions of the Standard for such members. All other cold-formed members should be designed in accordance with AS/NZS 4600. Cold-formed hollow section members specified in AS 1163 with a wall thickness less than 3 mm should be designed in accordance with AS/NZS 4600, since the Clause excludes such members.

Composite steel construction is covered by Sections 6 and 7 of the Standard.

C1.1.1 Scope

(No Commentary.)

C1.1.2 Application

(No Commentary.)

C1.2 REFERENCED DOCUMENTS

The Standards listed in the Clause are subject to revision from time to time and the current edition should always be used. The currency of any Standard may be checked with Standards Australia.

C1.3 NOTATION

The basis of the notation is generally in accordance with ISO 3898, *Bases for Design of Structures—Notations—General Symbols*. Standards Australia's policy is to use ISO recommendations on notation wherever practicable in structural design Standards such as AS/NZS 1170 series, *Structural design actions*, AS 2327.1, *Composite structures—Simply supported beams*, AS 3600, *Concrete structures*, AS 4100, *Steel structures* and AS/NZS 4600, *Cold-formed steel structures*.

SECTION C2 MATERIALS

C2.1 YIELD STRESS AND TENSILE STRENGTH USED IN DESIGN

The yield stress and tensile strength given in material Standards are the minimum values for acceptance of a steel as satisfying the requirements of the appropriate Standard.

Both yield stress and tensile strength are defined, since some clauses use one while other clauses use the other or both. The values of the yield stress and tensile strength given in Table 2.1 of the Standard are those quoted in the appropriate Standard. Such Standards are regularly updated.

Variations in the yield stress and tensile strength, which occur during manufacture, are accounted for in the derivation of the capacity factor (ϕ) (see Clause C3.2). Because of this fact, the actual values of yield stress or tensile strength recorded on mill test reports or certificates cannot be used for design. The values given in Table 2.1of the Standard should not be exceeded in design or else the derived capacity factors given in Table 3.2 of the Standard are rendered invalid.

C2.1.1 Yield stress

(No Commentary.)

C2.1.2 Tensile strength

(No Commentary.)

C2.2 STRUCTURAL STEEL

C2.2.1 Compliance

The Standard has been written around the range of structural steels manufactured in Australia to the Standards listed in the Clause. The Standards listed are product type Standards.

All material specifications relevant to the product chemistry, mechanical properties, methods of manufacture, supply requirements, tolerances and dimensions are contained in the Standard for that product. This applies irrespective of steel type, including ordinary weldable grades, weather-resistant grades, formable grades and impact-tested grades. A review of AS/NZS 1594, *Hot-rolled steel flat products*, AS/NZS 3678, *Structural steel—Hot-rolled plates, floorplates and slabs*, AS/NZS 3679.1, *Structural steel—Hot-rolled bars and sections* and AS/NZS 3679.2, *Structural steel—Welded I sections*, may be found in Ref. 1.

C2.2.2 Acceptance of steel

(No Commentary.)

C2.2.3 Unidentified steel

Where the design yield or ultimate strength of steel is based on the testing of samples in accordance with AS 1391, and statistical methods are to be used to establish the mean yield or ultimate tensile stress and associated standard deviations, the procedure described in the Clause may be deemed to be an acceptable procedure. For parameters other than yield stress, the same procedure may be used.

Where only a small number of samples is tested, and there is a significant difference between the measured results, the characteristic yield strength ($f_{y.ch}$) may be calculated as follows:

$$f_{y.ch} = f_{y.mean} - ks \qquad \text{. . . C2.2.3}$$