Australian/New Zealand Standard™

Cold-formed stainless steel structures

Standards Australia

STANDARDS NEW ZEALAND

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee BD-086, Stainless Steel Structures. It was approved on behalf of the Council of Standards Australia on 22 June 2001 and on behalf of the Council of Standards New Zealand on 24 August 2001. It was published on 9 November 2001.

The following interests are represented on Committee BD-086:

Association of Consulting Engineers Australia
Australasian Railway Association
Australian Industry Group
Australian Stainless Steel Development Association
Bureau of Steel Manufacturers of Australia
Institution of Engineers Australia
New Zealand Stainless Steel Development Association
The University of Sydney
Welding Technology Institute of Australia

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Australia web site at www.standards.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia International or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR 00011.

Australian/New Zealand Standard™

Cold-formed stainless steel structures

First published as AS/NZS 4673:2001.

Jointly published by Standards Australia International Ltd, GPO Box 5420, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 3979 2

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD-086, Stainless Steel Structures.

The objective of this Standard is to provide designers of stainless steel structures with specifications for cold-formed stainless steel structural members used for load-carrying purposes in buildings and other structures.

Sections 1, 2, 3, 4 and 5 of this Standard are based on ANSI/ASCE-8-90 Specification for the Design of Cold-formed Stainless Steel Structural Members. Section 6 is based on AS/NZS 4600 and AS/NZS 1664.1.

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 a Standard, whereas an ‘informative’ appendix is only for information and guidance.

CONTENTS

Page

Page

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Cold-formed stainless steel structures

S E C T I O N 1 S C O P E A N D G E N E R A L

1.1 SCOPE

This Standard sets out minimum requirements for the design of stainless steel structural members cold-formed to shape from annealed or temper-rolled sheet, strip, plate or flat bar stainless steels used for load-carrying purposes in buildings. It may also be used for structures other than buildings provided appropriate allowances are made for dynamic effects.

For the purpose of this Standard, steels with at least 10.5% chromium and up to 1.2% carbon are considered as stainless steels.

1.2 REFERENCED DOCUMENTS

The documents referred to in this Standard are listed in Appendix A.

1.3 DEFINITIONS

For the purpose of this Standard, the definitions below apply. Definitions peculiar to a particular clause or section are also given in that clause or section.

NOTE: In this Standard, terms in square brackets relate to New Zealand use.

1.3.1 Action [Effect]

The cause of stress, dimensional change, or displacement in a structure or a component of a structure.

1.3.2 Action effect [Action] or load effect [action]

The internal force, moment, deformation, crack, or like effect caused by one or more actions [effects].

1.3.3 Arched compression element

A circular or parabolic arch-shaped compression element having an inside radius-to-thickness ratio greater than 8, stiffened at both ends by edge stiffeners. (See Figure 1.3(d).)

1.3.4 Bend

Portion adjacent to flat elements and having a maximum inside radius-to-thickness ratio (r_i/t) of 8. (See Figure 1.1.)

1.3.5 Braced member

One for which the transverse displacement of one end of the member relative to the other is effectively prevented.

1.3.6 Can

Implies a capability or possibility and refers to the ability of the user of the Standard, or to a possibility that is available or that might occur.

1.3.7 Capacity [Strength reduction] factor

A factor used to multiply the nominal capacity to obtain the design capacity.

1.3.8 Cold-formed stainless steel structural members

Shapes that are manufactured by press-braking blanks sheared from sheets, cut lengths of coils or plates, or by roll-forming cold- or hot-rolled coils or sheets; both forming operations being performed at ambient room temperature, that is, without manifest addition of heat as required for hot-forming.

1.3.9 Design action effect [Design action] or design load effect [design action]

The action [effect] or load effect [action] calculated from the design actions [design forces] or design loads.

1.3.10 Design action [Design force] or design load

The combination of the nominal actions [nominal effects] or loads and the load factors, as specified in the relevant loading Standard.

1.3.11 Design capacity

The product of the nominal capacity and the capacity [strength reduction] factor.

1.3.12 Effective design width

Where the flat width of an element is reduced for design purposes, the reduced design width is termed the effective width or effective design width.

1.3.13 Elements

Simple shapes into which a cold-formed structural member is considered divided and may consist of the following shapes:

(a) Flat elements—appearing in cross-section as rectangles. (See Figure 1.2.)

(b) Bends—appearing in cross-section as sectors of circular rings, having the inside radius-to-thickness ratio less than or equal to eight ($r_i/t \leq 8$). (See Figure 1.2.)

(c) Arched elements—circular or parabolic elements having the inside radius-to-thickness ratio greater than eight ($r_i/t > 8$). (See Figure 1.2.)

1.3.14 Feed width (w_f)

Width of coiled or flat steel used in the production of a cold-formed product.

1.3.15 Flat-width-to-thickness ratio

The flat width of an element measured along its plane, divided by its thickness.

1.3.16 Flexural-torsional buckling

A mode of buckling in which compression members can bend and twist simultaneously without change of cross-sectional shape.

1.3.17 Initial Young's modulus

The initial slope of the stress-strain curve. (See Appendix B.)

1.3.18 Length (of a compression member)

The actual length (l) of an axially loaded compression member, taken as the length centre-to-centre of intersections with supporting members, or the cantilevered length in the case of a freestanding member.

1.3.19 Limit state

A state beyond which the structure no longer satisfies the design performance requirements.

NOTE: Limit states separate desired states [no failure] from undesired states [failure].

1.3.19.1 *Limit state, serviceability*

A state that corresponds to conditions beyond which specified service requirements for a structure or structural element are no longer met.

NOTE: Requirements are based on the intended use and may include limits on deformation, vibratory response, degradation or other physical aspects.

1.3.19.2 *Limit state, stability*

A limit state corresponding to the loss of static equilibrium of a structure considered as a rigid body.

NOTE: In New Zealand, the stability limit state is part of the ultimate limit state.

1.3.19.3 *Limit state, ultimate*

A state associated with collapse, or with other similar forms of structural failure.

NOTE: This generally corresponds to the maximum load-carrying resistance of a structure or structural element but in some cases to the maximum applicable strain or deformation.

1.3.20 Load

An externally applied limit state force including self-weight.

1.3.21 Local buckling

A mode of buckling involving plate flexure alone without transverse deformation of the line or lines of intersection of adjoining plates.

1.3.22 May

Indicates the existence of an option.

1.3.23 Multiple-stiffened element

An element that is stiffened between webs, or between a web and a stiffened edge, by means of intermediate stiffeners that are parallel to the direction of stress. (See Figure 1.3(c).)

1.3.24 Nominal action [Nominal effect] or nominal load

An unfactored action [effect] or load determined in accordance with the relevant loading Standard.

1.3.25 Nominal capacity

The capacity of a member or connection calculated using the parameters specified in this Standard.

1.3.26 Point-symmetric section

A section symmetrical about a point (centroid) such as a Z-section having equal flanges. (See Figure 1.5(b).)

1.3.27 Proof stress

The stress at a nominated plastic strain. (See Appendix B.)

1.3.28 Proof testing

The application of test loads to a structure, sub-structure, member or connection to ascertain the structural characteristics of only that one unit under test.

1.3.29 Prototype testing

The application of test loads to one or more structures, sub-structures, members or connections to ascertain the structural characteristics of that class of structures, sub-structures, members or connections that are nominally identical to the units tested.

1.3.30 Segment (in a member subjected to bending)

The length between adjacent cross-sections that are fully or partially restrained, or the length between an unrestrained end and the adjacent cross-section that is fully or partially restrained.

1.3.31 Secant modulus

The slope of a line from the origin to a point on the stress-strain curve. (See Appendix B.)

1.3.32 Shall

Indicates that a statement is mandatory.

1.3.33 Should

Indicates a recommendation.

1.3.34 Special study

A procedure for the analysis or design, or both, of the structure, agreed between the authority having statutory powers to control the design and erection of a structure, and the design engineer.

1.3.35 Stiffened or partially stiffened compression element

A flat compression element (i.e. a plane compression flange of a flexural member or a plane web or flange of a compression member) of which both edges parallel to the direction of stress are stiffened by a web, flange, edge stiffener, intermediate stiffener, or the like. (See Figure 1.3(a).)

1.3.36 Stiffener(s)

1.3.36.1 *Edge stiffener*

Formed element at the edge of a flat compression element. (See Figure 1.4(a).)

1.3.36.2 *Intermediate stiffeners*

Formed elements, employed in multiple stiffened segments, and located between edges of stiffened elements. (See Figure 1.4(b).)

1.3.37 Structural ductility factor

A numerical assessment of the ability of a structure to sustain cyclic inelastic displacements.

1.3.38 Structural performance factor

A numerical assessment of the ability of a building to survive cyclic displacements.

1.3.39 Structural response factor

The level of force reduction available for a given system compared with an elastic structural system.

1.3.40 Sub-element

The portion between adjacent stiffeners, or between web and intermediate stiffener, or between edge and stiffener.

1.3.41 Tangent modulus

The slope tangential to the stress-strain curve. (See Appendix B.)

1.3.42 Temper rolling

Cold-working of annealed stainless steel by rolling to achieve increased strength.