Steel structures Standard
Part 1: Materials, fabrication, and construction

Supersedes in part NZS 3404 Parts 1 and 2:1997
COMMITTEE REPRESENTATION

This Standard was prepared under the supervision of the P 3404 Committee for the Standards Council established under the Standards Act 1988.

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The P 3404 Committee and Standards New Zealand also wishes to thank the P 3404 Part 1 Subcommittee:

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for its drafting work in the preparation of this Standard.

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REFERENCED DOCUMENTS

Reference is made in this document to the following:

NEW ZEALAND STANDARDS

NZS 1170: - - - - Structural design actions
Part 5:2004 Earthquake actions – New Zealand

NZS 3101: - - - - Concrete structures Standard
Part 1:2006 The design of concrete structures
Part 2:2006 Commentary on the design of concrete structures

NZS 3104:2003 Specification for concrete production

NZS 3109:1997 Concrete construction

NZS 3404: - - - - Steel structures Standard
Part 1:1997 Steel structures Standard
Part 2:1997 Commentary to the steel structures Standard

NZS 3404: - - - - Steel structures Standard
Part 2: - - - - Structural analysis (in preparation)
Part 3: - - - - General design of members and connections (in preparation)
Part 4: - - - - Design of composite members (in preparation)
Part 5: - - - - Design for fire (in preparation)
Part 6: - - - - Design for fatigue (in preparation)
Part 7: - - - - Design for earthquakes (in preparation)

JOINT AUSTRALIAN/NEW ZEALAND STANDARDS

AS/NZS 1170: - - - - Structural design actions
Part 0:2002 General principles
Part 1:2002 Permanent, imposed and other actions
Part 2:2002 Wind actions
Part 3:2003 Snow and ice actions

AS/NZS 1252:1996 High-strength steel bolts with associated nuts and washers for structural engineering

AS/NZS 1365:1996 Tolerances for flat-rolled steel products

AS/NZS 1554: - - - - Structural steel welding
Part 1:2004 Welding of steel structures
Part 2:2003 Stud welding (steel studs to steel)
Part 5:2004 Welding of steel structures subject to high levels of loading

AS/NZS 1559:1997 Hot-dip galvanized steel bolts with associated nuts and washers for tower construction

AS/NZS 1594:2002 Hot-rolled steel flat products

AS/NZS 1873: - - - - Powder-actuated (PA) hand-held fastening tools
Part 1:2003 Selection, operation and maintenance
Part 2:2003 Design and construction
Part 3:2003 Charges
Part 4:2003 Fasteners

AS/NZS 2312:2002 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings

AS/NZS 3678:1996 Structural steel – Hot-rolled plates, floorplates and slabs

AS/NZS 3679: - - - - Structural steel
Part 1: 1996 Hot-rolled bars and sections
NZS 3404.1:2009

Part 2: 1996  Welded I-sections
AS/NZS 3750: - - - -  Paints for steel structures
   Part 9:2009  Organic zinc-rich primer
   Part 15:1998  Inorganic zinc silicate paint
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AS/NZS ISO 9000: - - - -  Quality management systems set
   9000: - - - -  Fundamentals and vocabulary
   9000:2006  Requirements
   9001:2008  Guidelines for performance improvements

INTERNATIONAL STANDARDS
ISO 2566: - - - -  Steel – Conversion of elongation values
   Part 1:1984  Carbon and low alloy steels
ISO 9224:1992  Corrosion of metals and alloys – Corrosivity of atmospheres –
   Guiding values for the corrosivity categories

AMERICAN STANDARDS
ANSI/AISC 341:2005  Seismic provisions for structural steel buildings
ASTM A106/A106M 2008  Standard specification for seamless carbon steel pipe for high-
   temperature service
ASTM A193/A193M 2009  Standard specification for alloy-steel and stainless steel bolting
   materials for high temperature or high pressure service and
   other special purpose applications
ASTM A514/A514M 2005  Standard specification for high-yield-strength, quenched and
   tempered alloy steel plate, suitable for welding

AUSTRALIAN STANDARDS
AS 1110: - - - -  ISO metric hexagon bolts and screws – Product grades A and B
   Part 1:2000  Bolts
   Part 2:2000  Screws
AS 1111: - - - -  ISO metric hexagon bolts and screws – Product grade C
   Part 1:2000  Bolts
   Part 2:2000  Screws
AS 1112: - - - -  ISO metric hexagon nuts
   Part 1:2000  Style 1 – Product grades A and B
AS 1163:1991  Structural steel hollow sections
AS 1210:1997  Pressure vessels
AS 1275:1985  Metric screw threads for fasteners
AS 1391:2007  Metallic materials – Tensile testing at ambient temperature
AS 1418: - - - -  Cranes, hoists and winches
   Part 1:2002  General requirements
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Part 1:2003 Removal of oil, grease and related contamination
Part 2:2002 Power tool cleaning
Part 4:2005 Abrasive blast cleaning
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AS 2074:2003 Cast steels
AS 2159:1995 Piling – Design and installation
AS 2382:1981 Surface roughness comparison specimens
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AS 3828:1998 Guidelines for the erection of building steelwork
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Part 3:2002 Determination of dry film thickness
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Part 6:2004 Steel and composite construction

BRITISH STANDARDS
BS 4:2005 Structural steel sections
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EUROPEAN COMMITTEE FOR STANDARDIZATION (CEN)
EN 1090-2:2008 Execution of steel structures and aluminium structures – Part 2: Technical requirements for steel structures
EN 10025:2004 Hot rolled products of structural steels
Part 1 General technical delivery conditions
Part 2 Technical delivery conditions for non-alloy structural steels.
Part 3 Technical delivery conditions for normalized/normalized rolled weldable fine grain structural steels
Part 4 Technical delivery conditions for thermomechanical rolled weldable fine grain structural steels
Part 5 Technical delivery conditions for structural steels with improved atmospheric corrosion resistance
Part 6 Technical delivery conditions for flat products of high yield strength structural steels in the quenched and tempered condition
EN 10029:1991 Hot rolled steel plates 3 mm thick or above – Tolerances on dimensions, shape and mass
EN 10210:2006 Hot finished structural hollow sections of non-alloy and fine grain steels
Part 1 Technical delivery conditions
EN 10219:2006 Cold formed welded structural hollow sections of non-alloy and fine grain steels
Part 2 Tolerances, dimensions and sectional properties
EN 12812:2008 Falsework – Performance requirements and general design

JAPANESE STANDARDS
JIS G 3101:2004 Rolled steel for general structure
JIS G 3106:2008 Rolled steels for welded structure
JIS G 3114:2008 Hot-rolled atmospheric corrosion resisting steels for welded structure
JIS G 3132:2005 Hot-rolled carbon steel strip for pipes and tubes
JIS G 3136:2005 Rolled steel for building structure
JIS G 3192:2008 Dimensions, mass and permissible variations of hot rolled steel sections
JIS G 3193:2005 Dimensions, mass and permissible variations of hot rolled steel plates, sheets and strip

OTHER PUBLICATIONS
American Institute of Steel Construction, Quality criteria and inspection Standards.
AWS D1.5:2008 *Bridge welding code*

NEW ZEALAND LEGISLATION
Building Act 2004 and New Zealand Building Code
Chartered Professional Engineers Act 2002

WEBSITES
New Zealand Legislation http://www.legislation.govt.nz
New Zealand Welding Centre http://www.hera.org.nz/nzwc

LATEST REVISIONS
The users of this Standard should ensure that their copies of the above-mentioned New Zealand Standards are the latest revisions. Amendments to referenced New Zealand and Joint Australian/New Zealand Standards can be found on http://www.standards.co.nz.

REVIEW OF STANDARDS
Suggestions for improvement of this Standard will be welcomed. They should be sent to the Chief Executive, Standards New Zealand, Private Bag 2439, Wellington 6140.
NZS 3404 has now been in use since the first edition in 1989, the second in 1992, and the third in 1997. With increasing use of steel structures and changes to the regulatory framework a full review of the Standard was therefore commissioned by the Department of Building and Housing.

The committee made the decision to divide NZS 3404 into seven parts that interrelate but also can be used largely in a stand-alone manner by the relevant user groups. This revision of NZS 3404 has been divided into separate parts so that users can better access the requirements of this Standard, and the knowledge that underpins them. To this end NZS 3404.1 was devised to be the first part. Its user base includes architects, structural engineers, steel distributors, steel constructors, builders, and building control authorities. It was recognised that when many of the provisions were bound within the design standard in previous editions, the construction end users often did not recognise the relevance of the document to them. The potential benefits of having commonly recognised requirements were therefore not fully achieved. In addition the commentary clauses have been brought into the body of the Standard to facilitate access to the background knowledge and principles embodied in the provisions. It is hoped that the new format will lead to greater realisation of those benefits by all users.

A specialist subcommittee was formed to develop provisions for the committee, including representatives from architectural, engineering, fabrication, precast concrete, and building companies, as well as from Steel Construction New Zealand Inc., and the New Zealand Heavy Engineering Research Association.

In addition to reformatting the Standard significant new provisions have been added. These include specific guidance for identifying corrosivity of steelwork and selection of protective coatings in the New Zealand environment. This complements the coatings Standard AS/NZS 2312. A means of categorising the finishing requirements of architecturally exposed steelwork drawing on work by the Canadian Institute of Steel Construction has been established.

The extent of weld testing is now more consistently and easily determined by use of a loadings demand, and consequence of a weld failure assessment approach. Seismic grade steel types 2S and 5S have been introduced following the performance specification requirements set in Amendment No.2 of the 1997 edition, and in line with subsequent changes to AS/NZS 3679.1 and AS/NZS 1554.

The tolerances for steel fabrication have been reviewed and compared with current international Standards and codes of practice and adjusted and expanded accordingly. Alignment has been sought with related materials Standards where practicable, however more stringent construction tolerances at the interface of reinforced concrete and structural steelwork are now required by this Standard.

Composite construction provisions have been included.

At the request of the New Zealand Transport Agency and Ontrack, provisions for highway and railway bridges have been significantly updated. These now incorporate the relevant requirements of AS 5100.6, the American AREMA design guidelines and
NZS 3404.1:2009

AWS D1.5 *Bridge welding code* contextualised for the New Zealand market. This includes the introduction of the fracture critical member (FCM) designation and the requirements for fracture control plans (FCP) necessary for quality management control in the fabrication of railway bridges.

Knowledge of the content of this Standard will be one of the indicators of competency for steel structures licensed building practitioners (LBP), for which restricted work requirements will commence in 2012.

To assist users of NZS 3404 Parts 1 and 2:1997, Appendix B outlines the clauses, figures, and tables from the 1997 version which are superseded by NZS 3404.1:2009.

**Outcome Statement**

NZS 3404.1 provides an authoritative single source of guidance to design and construction practitioners, and building control officials. Better communication and understanding of the requirements for achieving good quality, durable, and earthquake resistant steel construction for building and bridge structures will result in improved practice for the selection of materials, the fabrication, and construction of steel structures in New Zealand.
1 GENERAL

1.1 Scope

1.1.1 Inclusions
NZS 3404.1 sets out minimum requirements for the selection of materials, corrosion protection systems, and the fabrication, erection, and construction of steel structures. It will supersede the relevant provisions in NZS 3404 Part 1 and 2:1997 and will be referenced by NZS 3404.2 to NZS 3404.7 once those parts are complete.

This Standard applies to building structures; crane support girders; highway, railway, and pedestrian bridges; and composite steel and concrete beams and columns.

1.1.2 Exclusions
This Standard does not apply to the following structures and materials:

(a) Steel elements less than 3 mm nominal thickness, except for packers and square or rectangular hollow sections to 2.2.1; and

(b) Steel members for which the value of yield stress used in design ($f_y$) exceeds 450 MPa. An exception is the use of quenched and tempered steel for which $f_y = 690$ MPa. This steel may be used as splice cover plates, in fully bolted connections only, and the appropriate grade for general structural use is selected (ASTM A514 or equivalent grade). Any welding of such steel shall only be to the approval of the Design Engineer and in accordance with AS/NZS 1554, with due regard for the changes in mechanical properties that will result from the fabrication process.

1.2 Use of this Standard as a means of compliance with the New Zealand Building Code (NZBC)

It is intended that once all parts of the revised steel structures Standard (that is, NZS 3404.1 to NZS 3404.7) are published, this Standard will be referenced in the Compliance Document for the NZBC Clause B1 Structure, Verification Method B1/VM1, and Clause D2 Durability, Acceptable Solution D2/AS1.

Where this Standard contains provisions that are expressed in non-specific or unquantified terms (such as the required use of appropriate or rational design procedures) then these do not form part of the verification method and shall be treated as an alternative solution.

1.3 Interpretation
For the purposes of this Standard, the word 'shall' refers to requirements that are essential for compliance with the Standard, while the word 'should' refers to practices that are advised or recommended.

Clauses prefixed by ‘C’ and printed in italic type are intended as comments on the corresponding clauses. They are not to be taken as the only or complete interpretation. The Standard can be complied with if the comment is ignored.

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 and contains requirements. An 'Informative' Appendix gives additional information, and is only for guidance. It does not contain requirements.