AS/NZS 4671:2001
(Incorporating Amendment No. 1)

Australian/New Zealand Standard™

Steel reinforcing materials

Standards Australia

STANDARDS NEW ZEALAND
Paerewa Aotearoa

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee BD-084, Reinforcing and Prestressing Materials. It was approved on behalf of the Council of Standards Australia on 18 January 2001 and on behalf of the Council of Standards New Zealand on 9 March 2001. It was published on 2 April 2001.

The following are represented on Committee BD-084:

Association of Consulting Engineers, Australia
Australian Chamber of Commerce and Industry
Australian Post Tensioning Association
Australian Steel Association
AUSTROADS
Bureau of Steel Manufacturers of Australia
Cement & Concrete Association of New Zealand
Galvanizers Association of Australia
Institution of Professional Engineers New Zealand
Master Builders Australia
National Precast Concrete Association Australia
New Zealand Manufacturers' Federation
Steel Reinforcement Institute of Australia

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Originated in Australia as part of AS A81—1958, AS A82—1958, AS A83—1958, AS A84—1958, AS A92—1958 and AS A97—1965.
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Originated in New Zealand as part of NZS 197:1949 NZS 1255:1956, NZS 1693:1962, NZS 1879:1964 and NZS 3423P:1972.
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PREFACE

This Standard was prepared by the Standards Australia/Standards New Zealand Committee BD/84, Reinforcing and Prestressing Materials, to supersede the following Standards:

AS 1302—1991	*Steel reinforcing bars for concrete*
AS 1303—1991	*Steel reinforcing wire for concrete*
AS 1304—1991	*Welded wire reinforcing fabric for concrete*
NZS 3402:1989	*Steel bars for the reinforcement of concrete*
NZS 3421:1975	*Specification for hard drawn mild steel wire for concrete reinforcement. Metric units*
NZS 3422:1975	*Specification for welded fabric of drawn steel wire for concrete reinforcement*

This Standard incorporates Amendment No. 1 (5 June 2003). 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.

To permit the reinforcing steel and reinforced concrete design industries with time to adjust to the new Standard, the above six standards will remain current and will be withdrawn 12 months from the date of publication of this Standard.

The objective of the Standard is to provide a single specification of material requirements for steel bars, wire and mesh, intended for use in reinforced concrete structures which have been designed in accordance with AS 3600 or NZS 3101.1.

Differences between this Standard and current Standards are briefly outlined below.

1 General

A major departure from the current Standards is that this document applies to reinforcement generally, irrespective of the process of its manufacture.

Although closely aligned technically with both ISO 6935, *Steel for the reinforcement of concrete,* and the European Pre-Standard DDENV 10080, *Steel for the reinforcement of concrete—Weldable ribbed reinforcing steel B500 — Technical delivery conditions for bars, coils and welded fabric,* the Standard is not classed as ‘technically equivalent’ to either of these documents primarily because—

(a) both ISO 6935 and ENV 10080 require mandatory third party assessment of compliance, contrary to the principles of Standards Australia and Standards New Zealand in this regard (see Appendix A);

(b) ISO 6935 does not contain specific requirements appropriate for reinforcement for earthquake-resistant structures; and

(c) consequent differences in both the text and numerical values, although minor in nature, are too numerous to meet the strict definition of ‘technically equivalent’.

In choosing to vary the above documents where they considered it necessary, the Committee took into account the fact that, to date, neither document has found wide acceptance.

2 Strength grades

Only three strength Grades have been considered, i.e., those having lower characteristic yield strengths of 250 MPa, 300 MPa and 500 MPa respectively. The 500 Grade material replaces the Grade 400/450 Australian and the Grade 430/485 New Zealand materials, while

the Grade 300 material corresponds closely to the current New Zealand Standard. Plain round material other than grade 300E is required to correspond to AS/NZS 3679.

Requirements for Grade 500 steel have been developed from ENV 10080, while those for earthquake-resistant applications have been developed from the current edition of NZS 3402.

3 Ductility classes

The need to provide reinforcement with ductility appropriate to earthquake-resistant concrete structures, coupled with recent investigations into the structural consequences of the relatively low ductility of cold-worked reinforcement, has led to the introduction of three ductility classes. These are distinguished in requirements by the letters 'L' (low), 'N' (normal) and 'E' (earthquake), placed immediately after the strength-grade number, corresponding with different minimum values for uniform elongation and maximum stress to yield stress ratio.

4 Chemical and mechanical properties

Adjustments have been made to the chemical composition, carbon equivalent, and mechanical properties parameters, as necessary, to satisfy the (sometimes conflicting) requirements of strength, ductility and weldability.

5 New inclusions

In addition to the items noted above the following new material has been included:

(a) *Production control* in all stages of manufacture is a specific requirement (Clauses 6.3 and 8) with the details of how it is to be achieved being spelt out in Appendix B.

(b) *Purpose-made meshes* are covered in Clause 7.5.4 and distinguished from the commonly available meshes, whereas only stock meshes were previously specified.

(c) *Identification* rules for the standard strength grades and ductility classes are given and illustrated in Clause 9 so that the different materials can be readily differentiated visually on site and distinguished from previously manufactured materials.

(d) *The bond test* in Appendix C has been introduced as an alternative means for demonstrating the ability of deformed reinforcement to develop sufficient bond to achieve its characteristic yield strength when embedded in concrete.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

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FOREWORD

Prior to 1995, responsibility for the Australian/New Zealand Standards on steel reinforcing and prestressing materials lay with Committee BD-023, Structural Steels, whose interest and expertise were mainly oriented toward materials for steel structures rather than for concrete structures. In recognition of this and in pursuance of the Memorandum of Understanding between Standards Australia and Standards New Zealand, a new joint Australian/New Zealand committee (BD-084) was formed in December 1994 to take on the specific responsibility of upgrading and harmonizing the relevant reinforcing and prestressing materials Standards of both countries.

At about this time, the results of international and local research indicated markedly different ductile behaviour between concrete members containing either hot-rolled or cold-rolled reinforcement. As this has consequent implications in the design and detailing for both normal and earthquake-resistant structures, concerns were being expressed regarding the status of the current high strength steels and, in particular, welded mesh.

The Australian Standards most directly affected by the latter material are AS 2870, *Residential slabs and footings,* and AS 3600, *Concrete structures*. The Committees responsible for those Standards (BD-025 and BD-002 respectively) have reviewed the implications of the proposals in this Standard and as a result have taken the following actions:

(a) The latest edition of AS 2870 (June 1996) permits the substitution of ribbed-wire meshes, on an equivalent strength basis with a minimum uniform elongation requirement, for the plain-wire meshes generally specified in that Standard and foreshadows the introduction of this Standard.

(b) Committee BD-002 has set up a special Working Group to investigate the consequences, in both design and detailing requirements, of using low ductility steels for reinforcement. As an interim measure, Amendment 1 to AS 3600—1994 (August 1996) introduced limitations on the use of this material in negative moment regions and flagged other areas where caution in its use should be exercised. When the investigations have been completed and all the results assessed, it is anticipated that further amendments will be necessary and that they will be published at or about the same time as this Standard.

While this Standard theoretically provides for three ductility classes and three strength grades, it should be realized that some of the possible combinations are not technically achievable in practice. Furthermore, from a simple commercial viewpoint, it is unlikely that all achievable combinations will be produced in either country. Specifically, it is envisaged that 500E steels are unlikely to be used in Australia, it being considered that Australia's generally low seismicity can be adequately accounted for by using Normal (N) class steels. Conversely, Normal class steels are unlikely to be used in New Zealand where the seismicity is generally high.

It is felt that this joint Standard will enable a number of significant benefits to the concrete construction industry, namely—

(i) more efficient use of materials, and for designers to detail less congested reinforcing layouts (particularly in columns and walls) with the use of higher strength steels;

(ii) more reliable member performance as a result of the clarification of minimum ductility levels;

(iii) more uniform product as a result of tighter conformance requirements; and

(iv) greater compatibility between ‘design’ and ‘production’ parameters (e.g. characteristic values),

all of which should lead to more efficient, reliable and cost effective concrete structures.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

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1 SCOPE

This Standard specifies requirements for the chemical composition and the mechanical and geometrical properties of reinforcing steel used for the reinforcement of concrete in the form of—

(a) deformed or plain bars and coils;

(b) machine-welded mesh; and

(c) continuously threaded bars.

This Standard does not apply to prestressing steels, stainless steel reinforcement, epoxy-coated steels and galvanized steels.

NOTES:

1 Means for demonstrating compliance with this Standard are given in Appendix A.

2 Prestressing steels are covered by AS 1310, AS 1311, AS 1313.

3 Information on stainless steel reinforcement may be found in other internationally (accepted) Standards such as BS 6744 or ASTM A955M.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard.

AS	
1199	Sampling procedures and tables for inspection by attributes
1310	Steel wire for tendons in prestressed concrete
1311	Steel tendons for prestressed concrete — 7-wire stress-relieved steel strand
1313	Steel tendons for prestressed concrete — Cold-worked high-tensile alloy steel bars for prestressed concrete
1391	Methods for tensile testing of metals
1399	Guide to AS 1199—Sampling procedures and tables for inspection by attributes
1554	Structural steel welding
1554.3	Part 3: Welding of reinforcing steel
2193	Methods for calibration and grading of force-measuring systems of testing machines
AS/NZS	
1050	Methods for the analysis of iron and steel
3679	Structural steel
3679.1	Part 1: Hot-rolled bars and sections
ISO	
A1 15630-1	Steel for the reinforcement and prestressing of concrete—Test methods, Part 1: Reinforcing bars, wire rod and wire
15630-2	Steel for the reinforcement and prestressing of concrete—Test methods, Part 2: Welded fabric