

Reinforced Concrete - Australian Standards Update

Updated February 2007

This article is updated from time to time as a service to our readers.

Steel reinforcement is regulated by the following Australian Standards:

AS4671:2001. Steel Reinforcing Materials

- it covers 500 MPa rebar, rod, wire & mesh and supersedes AS1302, 1303 & 1304.
Amendment 1 – June 2003

AS4672:2007 Parts 1 & 2. Steel Prestressing Materials

- a new Standard to replace AS1310, AS1311 and AS1313.

AS3600:2001. Concrete Structures

- the expanded 2001 version covers design using 500 MPa steels.
Amendment 2 – Oct 2004

AS 2870:1996. Residential Slabs and Footings

- it covers slab on ground for houses.

Amendment 1 – January 1997

Amendment 2 – June 1999

Amendment 3 - November 2002

Amendment 4 – May 2003

AS 2327:2003. Composite Structures

- it covers composite slabs and structural decking.

AS 1170:2002. Structural Design Actions (Loading Code)

- the 2002 version includes a Part 0 for general requirements.

Amendment 1, 1170.1 – April 2005

Amendment 4, 1170.2 – April 2005

AS 1554, Part 3: 2002. Structural Steel Welding – Welding of Reinforcing Steel

-the 2002 version upgrades the rules for welding 500 grade rebar.

Amendment 1 – Feb 2003

AS 1100, Part 501:2002 Technical Drawing

- it covers bending margin and standard shapes of reinforcement.

AS 5100:2004 Bridge Design, Part 5 Concrete

- the full revision of the bridge code covers the design of reinforced concrete in bridges.

AS 3727:1993 Guide to Residential Pavements

This standard recommends mesh sizes ranging from SL52 to SL82 for concrete slabs depending on the service requirements. Loading categories cover foot traffic, light vehicles and medium vehicles as well as joint spacing

AS 4534:2006 Zinc and zinc/aluminium-alloy coatings on steel wire

This Standard specifies the requirements for zinc coatings on steel wire and fabricated wire products. This new addition contains improved guidelines for the selection of appropriate coatings. ISO 7989 was taken into account in the drafting of this Standard.

AS2423:2002. Coated steel wire fencing products

This Standard refers to fencing products and includes the fencing products that we manufacture in Brisbane & Sydney.

OneSteel Reinforcing and SRIA Technical Notes on bending and re-bending of rebar are also important documents for our industry. For more information see 500PLUS Rebar Application Guide and the SRIA web site.

The current status of each Standard is summarised as follows :-

AS/NZS 4671:2001 – Steel Reinforcing Materials

Standards AS1302 (rebar), 1303 (wire) & 1304 (mesh) were replaced with a combined Standard, AS4671 in April 2001.

The principal changes to the existing AS1302, 1303, and 1304 Standards can be summarised as follows :-

- The new Standard is performance based rather than prescriptive,
- The minimum characteristic value for yield strength is 500 MPa for all steels,
- Reinforcement is classified by ductility in two classes, being Class L (Low) and Class N (Normal) ductility - Class L typically being cold worked wire which is used in mesh and Class N being hot rolled steel which is used for bar,
- The reinforcing steel class is based on two critical measures of ductility -
- The elongation at maximum force in the tensile test (uniform elongation). It will be designated by the symbol, A_{gt} , (ϵ_{us} in AS3600), and the ratio of ultimate tensile strength to yield (or proof) stress, R_m to R_e .
- Important steel properties covering strength and ductility will have to be statistically assessed by steel producers and steel processors and be required to meet characteristic minimum and in some cases, maximum values,
- Current bar diameters are to be maintained, (changed from previous proposals). Current RF mesh wire diameters are to be maintained.
- New identification rules for reinforcement.
- Nomenclature changes – eg. Y bar now becomes N bar. RF meshes now become SL or RL meshes. For more details see Bar and mesh designations – AS4671.

Amendment 1 to AS4671 was published in June 2003. The main amendments include -

- The new (reference) ISO Standards, 15630-1 and 15630-2, have been included to replace the superseded ISO Standards, 10287 and 10606.
- In the case of disputes with crack determination issues in rebend tests, a tensile test is now provided to resolve this problem.
- The note under Table 6A to explain the edge wire requirement has been clarified.
- The rib and indentation geometry requirements for wire in mesh have been modified to only require a minimum rib height (or indentation depth) of 0.03d.

- A note 3 has been included in B3 to provide a simpler rib geometry measurement procedure.

Amendment 4 – May 2003.

Articulated masonry was redefined as Articulated masonry veneer.

AS4672:2007 Parts 1 & 2. Steel Prestressing Materials

Part 1 – General requirements

Part 2 – Conformance requirements.

This is a new Standard that has just been published and it will replace AS1310, AS1311 and AS1313.

AS 3600: 2001 - Concrete Structures

AS 3600-2001 was published in July 2001. It incorporated Amendment 1, 1996 and the 1999 draft of Amendment 2.

It provides rules for the design of reinforced concrete structures using 500 MPa reinforcement in Class N (Normal ductility) and Class L (Low ductility) steels. The new 500 Class N steels are capable of unrestricted use in all reinforced concrete elements referred to in the revised AS3600 Standard. Both Class L and Class N mesh are referred to in the revised Standard and some further restrictions apply to the design and use of Class L steel in structures – see clauses (1.1.2), (5.9), (7.6.8.1), (7.6.8.3), (7.9.1), (19.2.1.1) & (A12.1),

The new revised Standard was referenced in the BCA in July 2001.

Amendment 2 was published in October 2004 and it provided modified rules for the design of Class L steel in slabs. Crack control rules for slabs were modified.

The BD/2 Committee is now undertaking a full revision of the Standard and a number of sub-committee working groups have been formed. A public review draft was circulated for comment in May 2005.

AS 2870: 1996 - Residential Slabs & Footings - Construction

This Standard was issued in 1996 and since then there have been two amendments.

Amendment 1, 1997 contained mainly minor changes and correction to text.

Amendment 2 was published in mid 1999 and accepted in the BCA in June 1999.

Amendment 2 contained a number of significant changes that included: -

- Restatement of the general expectations of footing systems – refer to (1.3.1).
- Ductility requirement for 500 MPa reinforcing steels – refer to (1.9.4).
- Changes to reinforcement – refer to (Figure 3.1).
- Changes to the diagram and reinforcement - refer to (Figures 3.6).
- Modification to design rules for flange width of beams – refer to (4.4(c)).
- Clarification of formulae – refer to (4.6) & Figure 4.1.
- Addition to clauses for shrinkage control – refer to (5.3.7).
- Curing of concrete – refer to (6.4.7).

- Modification to zone area – refer to (Figure D1).
- Corrections to Figure E1.
- Corrections to Figure E2.
- Changes and additions to Walsh design procedure – refer to Section F3.
- Changes to a formula – refer to F4 (b).

Amendment No. 3 was published as a green slip in November 2002. The amendments include reference to the new Standard, AS4671, as the basis for the reinforcing steel to be used in slabs and footings. Substitution of Y12 (or N12) rebar with 10.7 mm Class L bar will no longer be sanctioned unless the Supervising Engineer approves the design. The Standard now cover slabs of up to 30 metres in length. The BD/25 Committee has commenced a full revision of the Standard and a number of sub-committee working groups have been formed.

AS 2327.1:2003 - Composite Structures, Part 1: Simply Supported Beams

This Standard sets out the requirements for the design, detailing and construction of simply supported beams composed of a steel beam and a concrete slab interconnected with shear connectors and includes applications where the slab incorporates profiled steel sheeting.

The Standard was revised in 2003 with the main changes related to the design of shear connectors, stud location, distinction between open and closed rib profiles, 500 MPa longitudinal shear reinforcement and some new reference material.

The BD/032 Committee has been reconstituted and four working groups have been established to develop further parts of the code to include beams, slabs, columns and a new General Provisions section.

AS/NZS 1170 – Structural Design Actions : (Loading Code)

Three parts of the new joint loading Standards were published in June 2002. The new parts are :-

Part 0 – General Principles,

Part 1 - Permanent, imposed and other actions (see Amendment 1, April 2005).

Part 2 – Wind actions.

Commentaries have also been published for each Part.

Part 0 is a new section that sets out design procedure, load combinations, methods of analysis, confirmation methods and the new concept of structural robustness.

Four amendments have been issued for Part 0.

Amendment 4 – The annual probability of exceedance table was modified.

Part 3 – Snow and ice actions was published in Feb 2003.

Amendment 1 to AS1170.3 has been drawn up for public review.

A postal ballot has also been issued for Part 4 - Earthquake actions in Australia in May 2005. This will be issued as an Australian Standard rather than in combination with New Zealand.

AS 1554.3: 2002 Part 3 - Welding of Reinforcement

The Standard, AS1554.3: 2002, **Structural steel welding, Part 3: Welding of reinforcing steel** was published in October 2002.

The revised Standard provides welding rules for reinforcing steels that are covered by AS/NZS4671: 2001, Steel Reinforcing Materials.

The main revisions include:

- Requirements for hydrogen controlled electrodes (Table 4.11.6).
- Requirements for higher strength electrodes for butt welds (4.5.1).
- Requirements for single-sided lap welds and new types of indirect butt splice welds. (3.2.1)
- A new classification (locational tack welds) for welds used for the prefabrication of reinforcing steel cages (3.3)

Pre-qualification tests are required for the use of locational tack welds (3.3.4). This will entail tensile and bend testing of at least two bar sizes for all fabricators of reinforcing steel cages. (see Appendix C).

Locational tack welds may only be used where they will not be subjected to lifting stresses and they are assumed to have no quantifiable structural performance. (3.3.4).

Tack welds and locational tack welds are now permitted on bends (1.6.2.).

A full revision of the Standard will soon be undertaken and it will take heed of the current revised ISO Standard.

AS1100 - Part 501:2002 - Technical Drawing – Structural engineering drawing

The new revised Standard was issued in February 2002. This Standard now references the Reinforcing Materials Standard, AS4671 and thus covers the use of 500PLUS reinforcing bars and mesh.

If designers wish to use abbreviated bar designations then we refer you to **Bar and mesh designations – AS4671.**

AS5100:2004 – Bridge Design : Part 5 - Concrete

This Standard supersedes HB 77.5–1996, Australian Bridge Design Code, Section 5 : Concrete. This Standard is also designated as AUSTROADS publication AP-G15.5/04.

The most significant changes in the new Standard are the introduction of 500 grade reinforcing steel and the crack control requirements of AS3600.

Although AS5100 closely follows the design rules of AS3600 there are some differences in regard to the detailing of reinforcing steel in concrete elements.

Contact Winston Marsden, Manager Technical Development, (02 9794 1007) or email marsdenw@onesteel.com for further information.