AS/NZS 1554.6:2012

Australian/New Zealand Standard™

# Structural steel welding

# Part 6: Welding stainless steels for structural purposes


This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee WD-003, Welding of Structures. It was approved on behalf of the Council of Standards Australia on 16 February 2012 and on behalf of the Council of Standards New Zealand on 9 May 2012.
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Australian Steel Institute
AUSTROADS
Bureau of Steel Manufacturers of Australia
Engineers Australia
New Zealand Heavy Engineering Research Association
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Australian/New Zealand Standard™

# Structural steel welding

# Part 6: Welding stainless steels for structural purposes

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# PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee WD-003, Welding of Structures, to supersede AS/NZS 1554.6:1994.

The objective of this Standard is to provide rules for the welding of a wide range of stainless steel fabrications (other than pressure vessels and pressure piping), and it applies to statically and dynamically loaded welds.

The objective of this revision is to substantially update the Standard to reflect changes in structural welding since the publication of the original edition in 1994. As this is a major revision, changes from the previous edition are not indicated in this Preface.

This Standard requires that weld preparations, welding consumables and welding procedures be qualified before commencement of welding. Prequalified joint preparations, welding consumables and welding procedures are also given in this Standard.

Strength capacity of welds is not covered in this Standard and designers are referred to relevant design codes or specifications for this purpose.

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.

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## Part 6: Welding stainless steels for structural purposes

## SECTION 1 SCOPE AND GENERAL

### 1.1 SCOPE

This Standard specifies requirements for the welding of stainless steel structures made up of combinations of stainless steel plate, sheet, sections, including hollow sections and built-up sections, or castings and forgings, by the following processes:

(a) Manual metal arc welding (MMAW).

(b) Submerged arc welding (SAW).

(c) Gas metal arc welding (GMAW).

(d) Gas tungsten arc welding (GTAW).

(e) Flux cored arc welding (FCAW).

(f) Plasma arc welding (PAW).

The Standard applies to the welding of steelwork in structures complying with appropriate Standards. Where welded joints are governed by dynamic loading conditions, the Standard applies to those welded joints that comply with the fatigue provisions of the relevant application Standards.

The Standard prescribes materials of construction, weld preparations and weld qualities, surface finish, qualification of welding procedures and welding personnel, and fabrication and inspection requirements for welds related to all stainless steel fabrication including aesthetic, hygienic or other non-structural applications.

NOTE: GMAW includes waveform controlled welding such as "synergic", "programmable", and "microprocessor controlled" processes' e.g. pulsed spray transfer, controlled short circuit transfer.

### 1.2 EXCLUSIONS

The Standard does not cover the selection of grades to suit the corrosion requirements, although an informative appendix is included. The Standard does not cover the design of welded connections or permissible stresses in welds, nor the production, rectification or repair of castings.

The Standard does not apply to the welding of pressure vessels and pressure piping.

NOTE: For further guidance on welding of stainless steel, refer to AWS D1.6, WTIA Technical Note 13, WRC Bulletin 519 and ASSDA Reference Manual. For guidance on selection to suit corrosion requirements, refer to AS/NZS 4673.

## 1.3 INNOVATION

Any alternative stainless steel materials, welding processes, consumables, methods of construction or testing that give equivalent results to those specified, but do not comply with the specific requirements of this Standard or are not mentioned in it, are not necessarily prohibited.

The joint Australian/New Zealand Standards Committee WD-003, Welding of Structures, can act in an advisory capacity concerning equivalent suitability, but specific approval remains the prerogative of the inspecting authority.

## 1.4 NORMATIVE REFERENCES

Documents referenced for normative purposes are listed in Appendix A.

NOTE: Documents referenced for informative purposes are listed in the Bibliography.

## 1.5 DEFINITIONS

For the purpose of this Standard, the definitions given in AS 1101.3 and AS 2812 and those below apply.

### 1.5.1 Fabricator

The person or organization responsible for the welding of the structure during fabrication or erection.

### 1.5.2 Inspecting authority

The authority having statutory powers to control the design and erection of buildings or structures.

NOTE: Where the structure is not subject to statutory jurisdiction, the principal is deemed to be the inspecting authority.

### 1.5.3 Inspector

A person employed by or acceptable to the inspecting authority or principal for the purpose of inspecting welding in accordance with this Standard.

### 1.5.4 May

Indicates the existence of an option.

### 1.5.5 Principal

The purchaser or owner of the structure being fabricated or erected or a nominated representative.

NOTE: The nominated representative should be suitably qualified to deal with the technical issues of this Standard.

### 1.5.6 Shall

Indicates a requirement.

### 1.5.7 Should

Indicates a recommendation.

## 1.6 WELD CATEGORIES AND SURFACE FINISHES

NOTE: For guidance on the selection of weld categories and surface finishes, see Appendix B.

### 1.6.1 Weld categories

The Standard provides six categories of welds based on the type of application. These involve the selection of one of three levels of internal imperfections combined with one of three classes of surface imperfections (see Section 6).

### 1.6.2 Surface finishes

The Standard provides three grades of surface finish based on the type of application (see Section 6).

### 1.6.3 Welds subject to dynamic loading

For welds subject to levels of dynamic loading where AS 4100 and NZS 3404.1 require detail category 112 or lower, weld imperfections shall meet the requirements of category 1B in accordance with Section 6 of this Standard.

Where detail categories greater than 112 are applicable, weld imperfections shall meet the requirements of category FA in accordance with Section 6, and transition of thickness or width for butt welds shall comply with Clause 3.2.5.

NOTE: Category FA may be suitable for austenitic stainless steel structures designed in accordance with the guidelines of AS/NZS 4673 Appendix F.

## 1.7 MANAGEMENT OF QUALITY

### 1.7.1 Quality management

Fabricators shall ensure that all welding and related activities prescribed within Clause 1.7.2 and this Standard are managed under a suitable quality management system.

Such a system should generally comply with the requirements of AS/NZS ISO 3834 and its parts, particularly where fabrication activities require the approval of the principal or inspecting authority, or where the fabrication of large, complex or critical structures is being undertaken.

### 1.7.2 Basic welding requirements

The basis of this Standard is that a weld shall—

(a) be made in accordance with a qualified welding procedure;

(b) be carried out by a welder suitably qualified to carry out such a procedure;

(c) be carried out under the supervision of a welding supervisor who is employed by or contracted to the fabricator; and

(d) comply with the appropriate requirements of this Standard.

For certain conditions prescribed herein, the welding procedure is deemed to be prequalified and may not require full qualification testing (see Clause 4.3 and Table 4.7.1).

## 1.8 HEAT TREATMENT

Postweld heat treatment (PWHT) is not normally required or necessary for austenitic, ferritic or ferritic-austenitic (duplex) stainless steels. Martensitic stainless steels generally require pre and post weld heat treatment. Ferritics generally cannot and should not be heat treated. Heat treatment of these grades is not covered by this Standard.

Where required, heat treatment should be carried out in accordance with the manufacturer's instructions for the grade specified.

It is important to note that heat treatments used for carbon steels can be highly detrimental to both the corrosion and mechanical properties of stainless steels.

NOTE: Expert advice should be sought where dissimilar metal joints are to be heat-treated. Refer to AS 4458 for information on PWHT.

## 1.9 SAFETY

### 1.9.1 Welding safety

Welding shall be carried out in accordance with the relevant requirements of AS 1470, AS 1674.1, AS 1674.2, AS/NZS 1336, AS/NZS 1337, AS/NZS 1338.1 and AS 2865.

### 1.9.2 Welding equipment

Welding plant and equipment shall comply with all the relevant sections of appropriate regulations, and the relevant requirements of AS 1966.1, AS 1966.2, AS 2799, AS/NZS 1995 and AS 60974.1.

### 1.9.3 Pickling and passivation

Both pickling and passivation use acids that can be damaging to health and the environment. For Australia, requirements of the relevant hazardous substances legislation promulgated by the regulatory authorities shall be followed. For New Zealand, requirements of the Environmental Risk Management Authority (ERMA) shall be followed.

NOTE: Pickling treatments also passivate the surface during washing.

### 1.9.4 Other hazards

The fabricator shall identify and manage any other risks and hazards from welding that are not covered by Clauses 1.9.1 and 1.9.2. Due consideration shall be given to the control and dispersal of emitted fumes including when welding through surface coatings, and the safe handling and disposal of surface treatment chemicals including pickling and passivation pastes.

NOTES:

1 Guidance on the management of risk is given in AS/NZS ISO 31000.

2 Further guidance on safety precautions is given in WTIA Technical Notes 7 and 22, and the ASSDA Reference Manual.