

Australian/New Zealand Standard™

Structural steel

Part 2: Welded I sections



AS/NZS 3679.2:2016

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Australian/New Zealand Standard™

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Part 2: Welded I sections

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee BD-023, Structural Steel to supersede AS/NZS 3679.2:2010.

The objective of this Standard is to specify requirements for manufacturers and suppliers of welded I sections for general structural and engineering functions. These functions include the possibility of such welded I sections being subjected to dynamic and other special loads.

This edition includes the following major changes from the previous edition:

- (a) Requirements for type testing and minimum production testing and inspections have been included in the normative Appendix on product conformity.
- (b) Test certificates with the listed minimum requirements are required to be available for all products produced to this Standard.
- (c) Labelling requirements have been added to enable products compliant with this Standard to be traceable back to their corresponding test certificate.
- (d) Definitions, clause numbering and layout across the four steel-product Standards AS/NZS 1163, AS/NZS 3678, AS/NZS 3679.1 and AS/NZS 3679.2 are consistent wherever practicable.

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.

A statement expressed in mandatory term in a note to a table is deemed to be a requirement of this Standard.

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Australian/New Zealand Standard
Structural steel

Part 2: Welded I sections

1 SCOPE

This Standard specifies requirements for the production and supply of welded I sections for general structural and engineering purposes.

This Standard is intended for general structural and engineering applications. All grades specified in this Standard are suitable for—

- (a) welding in accordance with AS/NZS 1554, parts 1, 2, 5 and 7; and
- (b) fastening as specified in, AS 3990, AS 4100, AS/NZS 4600, AS 5100.6 and NZS 3404.

This Standard does not cover the following:

- (i) Structural steel—Hot-rolled bars and sections.
- (ii) Built-up I sections fabricated in accordance with AS 3990, AS 4100 or NZS 3404.1.

Requirements for product conformity to this Standard is specified in Appendix B.

NOTE: Guidelines for purchasers on requirements that should be specified by the purchaser and those that should or may be agreed on at the time of enquiry and order are given in Appendix A.

2 NORMATIVE REFERENCES

The following normative documents are referenced in this Standard:

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

AS	
1391	Metallic materials—Tensile testing at ambient temperature
2706	Numerical values—Rounding and interpretation of limiting values
3990	Mechanical equipment—Steelwork
4100	Steel structures
5100	Bridge design
5100.6	Part 6: Steel and composite construction
AS/NZS	
1365	Tolerances for flat-rolled steel products
1554	Structural steel welding
1554.1	Part 1: Welding of steel structures
1554.2	Part 2: Stud welding (steel studs to steel)
1554.5	Part 5: Welding of steel structures subject to high levels of fatigue loading
1554.7	Part 7: Welding of sheet steel structures
3678	Structural steel—Hot-rolled plates, floor plates and slabs
4600	Cold-formed steel structures

NZS
3404 Steel Structures Standard
3404.1 Part 1: Materials, fabrication, and construction

WTIA
Technical Note 5 Flame cutting of steels

3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

3.1 Automatic welding

Mechanized welding with equipment that performs the complete welding operation without adjustment of the controls by a welding operator.

3.2 Can

To denote a capability or possibility that is available or that might occur.

3.3 Crack

Narrow line of fracture on the surface.

3.4 Defects

Surface discontinuities, including cracks, laps and seams, with a depth or area, or both, greater than a specified limiting value.

3.5 Factory production control

Operational techniques and all measures necessary to regulate and maintain the conformity of the product to the requirements of the relevant product standard.

3.6 Imperfections

Surface discontinuities, other than cracks, laps and seams, with a depth or area, or both, less than or equal to a specified limiting value.

3.7 Inspection

Judgement by competent personnel to determine acceptability against requirements.

3.8 Lap

Overlapping material partially connected with the base material.

3.9 Longitudinal direction

Direction parallel to the longitudinal weld seam.

3.10 Manufacturer

The business operating the plant producing the finished welded sections.

3.11 May

Indicates the existence of an option.

3.12 Mechanized welding

Welding with equipment that performs the welding operation under present conditions and constant observation and control of a welding operator.

3.13 Plate

Hot-rolled product supplied flat, with width greater than or equal to 900 mm and nominal thickness greater than or equal to 4.50 mm.

3.14 Purchaser

Organization or person who is a recipient from a supplier, of a steel product manufactured to this Standard.

3.15 Seams

Caused when surface discontinuities in the semi-finished product are elongated and extended during rolling.

3.16 Sections

Welded I sections produced by automatic welding processes from three individual plate components with trimmed edges and dimensions (see Appendix D).

3.17 Shall

Indicates that a statement is mandatory.

3.18 Should

Indicates a recommendation.

3.19 Supplier

An organization or person that provides steel products manufactured to this Standard.

3.20 Testing

Mechanical tests, undertaken by an accredited laboratory as required by this Standard.

3.21 Test piece

Piece prepared for testing, made from a test specimen by a mechanical operation.

3.22 Test sample

Portion of material or product, or a group of items selected from a batch or group by a sampling procedure.

3.23 Test specimen

Portion or a single item taken from the test sample for the purpose of eventually applying a particular test.

3.24 Thermal cutting

Parting or shaping of materials by the application of heat with or without a gas stream.

3.25 Trimmed edge

Edge produced by the removal of material by thermal or mechanical cutting.

3.26 Type testing

Testing performed to prove that the material is capable of conforming to the requirements of this Standard.

3.27 Unit

Length of a welded section.

3.28 Welding procedure

Detailed methods and practices involved in the making of a weld or in the production of a welded component or assembly.

3.29 Welding process

Particular method of welding involving the application of certain metallurgical, electrical, physical, chemical or mechanical principles.

4 DESIGNATION

All grades shall be designated in the format shown in the following examples:

<i>Examples</i>	AS/NZS 3679.2-300
	AS/NZS 3679.2-400
	AS/NZS 3679.2-300L15
	AS/NZS 3679.2-400L15

where

AS/NZS 3679.2	=	number of this Standard
300 and 400	=	nominal minimum yield stress of the steel, in MPa
L	=	guaranteed impact properties of the material (when applicable)
15	=	low temperature impact test at 15°C (when applicable)

5 MANUFACTURING PROCESS

5.1 Steel feed

Welded I sections shall be manufactured from hot-rolled structural steel plates complying with AS/NZS 3678.

All plates shall be free of scale or other defects that would prevent proper welding during manufacture of welded I sections. The acceptability of surface defects and method of repair shall be in accordance with AS/NZS 3678.

5.2 Plate cutting or preparation

Plates shall be stripped to size using either thermal or mechanical cutting processes to produce an edge condition that ensures the welds comply with AS/NZS 1554.1, Category SP.

The procedure used shall produce cut edges equal to the quality resulting from thermal cutting.

Edges, not incorporated in welds, shall have a surface finish of Class 3 or better. Edges, incorporated in welds, shall have a surface finish of Class 2 or better as defined in WTIA, Technical Note 5.

NOTE: WTIA, Technical Note 5 gives guidance on cutting procedures together with replicas of cut surfaces.

5.3 Welding

5.3.1 General

Welding shall be in accordance with AS/NZS 1554.1, including the documentation of all welding or repair procedures.

The weld quality shall be Category SP throughout.

5.3.2 Welding consumables

Welding consumables used in the manufacture of welded I sections shall be in accordance with AS/NZS 1554.1.

5.3.3 Fillet welds

Web-to-flange joints shall be made with welds produced by an automatic welding procedure. The size of the fillet welds shall be sufficient to develop the specified minimum tensile strength requirements given in Table 1, and shall be tested in accordance with Clause 10.

Web-to-flange welds may be complete or incomplete penetration joints, depending on the web thickness or the welding procedure.

NOTES:

- 1 For automatic welding, the equipment may or may not perform the loading and unloading of the work.
- 2 Additional welding or strengthening may be undertaken by the purchaser, if necessary.
- 3 The availability of welded I sections with complete penetration joints is subject to negotiation between manufacturer and purchaser.

TABLE 1

TENSILE TEST REQUIREMENTS FOR WELDED WEB-TO-FLANGE TEST

Grade to AS/NZS 3678	Specified minimum tensile strength MPa	Nominal thickness of web mm	Minimum test load per unit flange/web length kN/mm
300 and 300L15	430	10	4.30
		12	5.16
		16 and greater	6.88
400 and 400L15	480	10	4.80
		12	5.76
		16 and greater	7.68

NOTE: For web plate thicknesses greater than 16 mm, the web-to-flange weld is to develop the specified minimum tensile strength of a 16 mm thick web only (see Clause 10.2).

5.3.4 Butt welds

Butt welds in flange or web components are permitted if the required length of the member is greater than the available rolled length of the component. The joints shall be complete-penetration butt welds, ground flush in the longitudinal direction of the section and subject to 100% ultrasonic testing. Butt joints in any component shall be completed before the component is welded to another component of the member.

5.4 Welding used in the repair of production welding

Weld repair of defects in production welding shall result in the penetration and joint properties equivalent to those produced by automatic welding. Welding shall be in accordance with AS/NZS 1554.1, Category SP. The repair weld shall be ground to make it flush with the original production weld.

6 CHEMICAL COMPOSITION

The chemical composition of the steel feed shall comply with the requirements of AS/NZS 3678.

7 MANUFACTURING TOLERANCES

7.1 General

Variations from nominal dimensions of a welded I section shall not exceed the appropriate limits given in Table 2 for straightness and Table 3 for length. Appendix E provides methods of measurement for camber and sweep.

7.2 Cross-sectional dimensions

Figure 1 illustrates and specifies permissible variations in cross-sectional dimensions of welded beams. Figure 2 shows permissible variations in cross-sectional dimensions for welded columns.

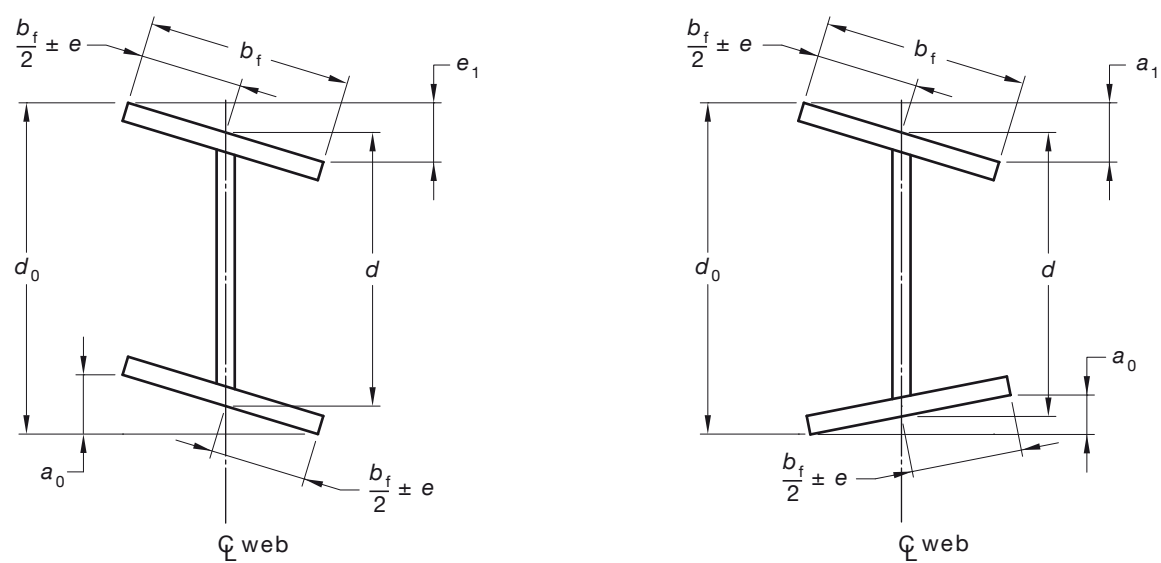
TABLE 2
PERMISSIBLE VARIATIONS IN STRAIGHTNESS
FOR WELDED I SECTIONS

Nominal size	Sweep or camber
Sections with a flange width (b_f) approximately equal to the depth (d):	millimetres
(a) Lengths of 14 m and less	$\frac{\text{Length}}{1000}$ but not more than 10 mm
(b) Lengths greater than 14 m	$10 \text{ mm} + \frac{\text{Length} - 14000}{1000}$
All other sections	$\frac{\text{Length}}{1000}$

NOTE: Owing to the extreme variation in the elastic flexibility of welded sections about the y axis, difficulty may be experienced in obtaining reproducible sweep measurements. Measuring of sweep shall be in accordance with Appendix E.

TABLE 3
PERMISSIBLE VARIATIONS IN
LENGTH FOR WELDED I SECTIONS

Specified length	Permissible variation from specified length, mm	
	Under	Over
All lengths	Nil	+50

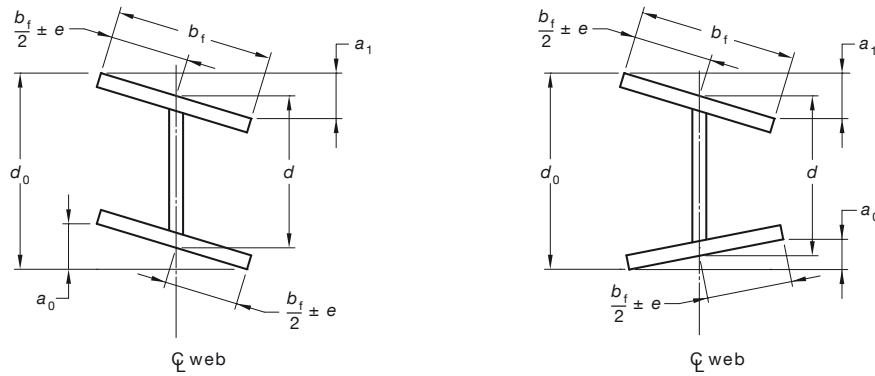


NOTES:

- 1 Dimensions d_0 , d , a_1 and a_0 are measured parallel with the centre-line of the web. Dimensions b_f and $b_f/2 \pm e$ are measured parallel with the plane of the flange.
- 2 Dimension d is measured at the centre-line of the web.

1		2	3	4	5	6
Designation		Permissible variation of depth	Permissible variation of flange width	Permissible out-of-square on each flange	Permissible total out-of-square	Permissible web off-centre
Depth	kg/m	(d) mm	(b _f) mm	(a ₁ or a ₀) mm	(a ₁ + a ₀) mm	(e) mm
1200 WB	455 423 392 342 317 278 249	±4.0	+6.0 to –5.0	±5.0	±8.0	±5.0
1000 WB	322 296 258 215	±3.3				
900 WB	282 257 218 175	±3.0				
800 WB	192 168 146 122					
700 WB	173 150 130 115					

FIGURE 1 PERMISSIBLE VARIATIONS IN CROSS-SECTIONAL DIMENSIONS FOR WELDED BEAMS



NOTES:

- 1 Dimensions d_0 , d , a_1 and a_0 are measured parallel with the centre-line of the web. Dimensions b_f and $b_f/2 \pm e$ are measured parallel with the plane of the flange.
- 2 Dimension d is measured at the centre-line of the web.

1		2	3	4	5	6
Designation		Permissible variation of depth (d) mm	Permissible variation of flange width (b_f) mm	Permissible out-of-square on each flange (a_1 or a_0) mm	Permissible total out-of-square ($a_1 + a_0$) mm	Permissible web off-centre (e) mm
Depth	kg/m					
500 WC	440 414 383 340 290 267 228	± 3.0	+6.0 to -5.0	± 5.0	± 8.0	± 5.0
400 WC	361 328 303 270 212 181 144					
350 WC	280 258 230 197					

FIGURE 2 PERMISSIBLE VARIATIONS IN CROSS-SECTIONAL DIMENSIONS FOR WELDED COLUMNS

7.3 Web and flange tolerances

The tolerances on web and flange thicknesses shall be in accordance with those specified for plates in AS/NZS 1365. The flatness and verticality tolerances shall be in accordance with Figures 3 and 4.

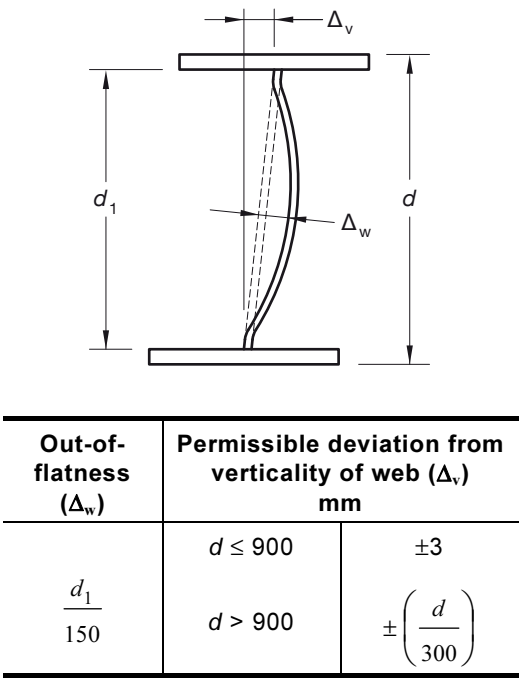


FIGURE 3 TOLERANCE ON A WEB

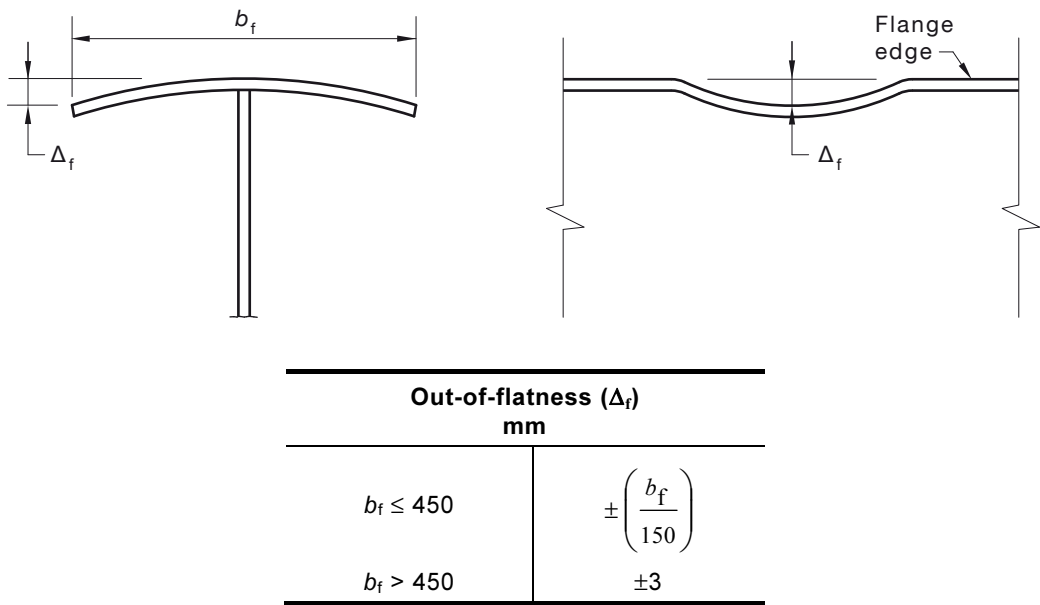


FIGURE 4 TOLERANCE ON A FLANGE

8 FREEDOM FROM DEFECTS

The finished steel product shall be free of defects in accordance with the requirements of Clause 8 of AS/NZS 3678:2016.

9 TESTING

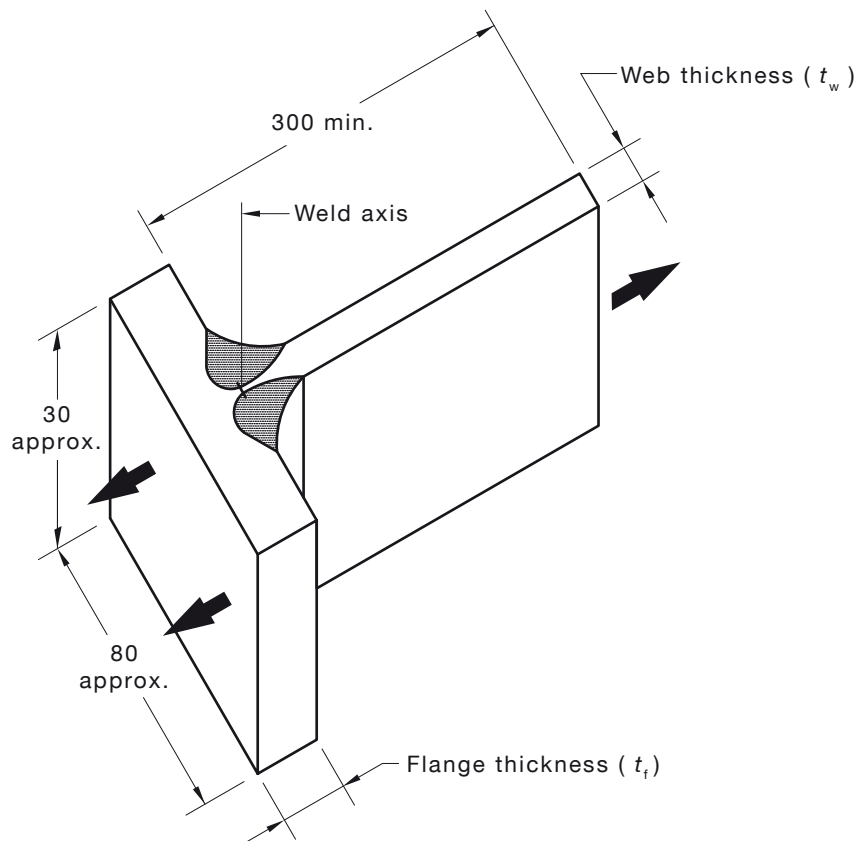
9.1 Selection of test samples

Test samples for the preparation of test pieces for web-to-flange shall be taken in accordance with Clause 9.2. Test pieces shall be in the same condition as the finished product. Samples shall be representative of the body of the product.

Specimens prepared for **welded web-to-flange tension tests** and for macro examination shall be fully representative of the welds throughout the length of the welded I section, and the welded I section shall be fully representative of a production run. Specimens shall not be taken at any place where a weld has been repaired or differs in any way from the standard weld produced during the production run.

9.2 Position and orientation of test samples

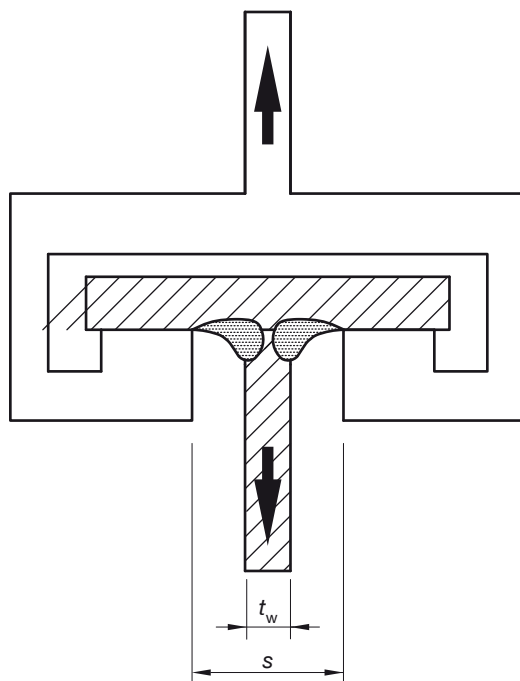
Test specimens for determining the web-to-flange capacity shall be taken from the test sample, as shown in Figure 5.



NOTE: Test load is applied normal to the weld axis in the plane of the weld centre-line.

DIMENSIONS IN MILLIMETRES

FIGURE 5 TEST PIECE FOR WEB-TO-FLANGE WELD TEST



NOTE: To reduce the possibility of errors due to bending of the flange, the span (s) between bottom supports should not exceed three times the web thickness (t_w).

FIGURE 6 TYPICAL FIXTURE FOR WEB-TO-FLANGE WELD TEST

10 MECHANICAL PROPERTIES

10.1 Weld quality, testing and examination

To assess compliance with Clause 5.3 and Table 1, the following shall be performed:

- (a) Visual examination of welds produced.
- (b) Welded web-to-flange tensile test (see Figures 5 and 6) in accordance with Clause 10.2.
- (c) Macro test of welds at the same test frequency as specified in Appendix B, Paragraph B2.2 and Figures 5 and 6.
- (d) Non-destructive examination by suitable means of weld repair to establish that all repairs are of equal quality to production welds.

10.2 Tensile tests



Welded web-to-flange tensile tests shall be carried out in accordance with AS 1391.

The tensile strength determined by the welded web-to-flange test shall meet the specified minimum tensile strength for web plate thickness less than or equal to 16 mm. For web plate thicknesses greater than 16 mm, the web-to-flange welds shall be proportioned to develop the specified minimum tensile strength for a 16 mm thick web in the same grade of steel.

The tensile strength determined by the welded web-to-flange test shall conform to the limits given in Table 1, as appropriate.

11 IDENTIFICATION, TEST AND INSPECTION CERTIFICATES

11.1 Identification

The welded I section sizes shall be clearly and legibly identified as follows:

- (a) The manufacturer's name or mark, or both.
- (b) The grade of steel and designation (see Clause 4).
- (c) The product designation to be identified with this Standard (see Appendix D).
- (d) The welded section number for quality control/assurance and traceability purposes.

Records shall be maintained identifying the heat numbers of the steel used in each welded I section.

Where identification is by means of die-stamping, low-stress stamps shall be used for impact tested grades.

If the identified portion of the product is subsequently removed, then these identifications shall be transferred to each remaining portion of the product.

11.2 Test and inspection certificates

11.2.1 General

A test and inspection certificate shall be available to the purchaser for all products manufactured to this Standard for each section produced.

11.2.2 Transmission of test and inspection certificates by an intermediary

An intermediary shall only pass on either an original or a copy of the inspection documents provided by the manufacturer or its approved representative without any alteration except as noted below. This documentation shall be accompanied by suitable means of identification of the product, in order to ensure the traceability between the product and the documentation.

Copying the original document is permitted, provided that—

- (a) traceability of product is maintained; and
- (b) the original document is available on request.

When producing copies of the original manufacturer's document, it is permissible to replace the original delivered quantity with the subsequent partial quantity.

NOTE: In the context of this Standard, an intermediary is a supplier and not a manufacturer (see Clauses 3.10 and 3.19 respectively).

11.2.3 *Qualifications on test and inspection certificates*

A test and inspection certificate shall provide the following:

- (a) Tests performed by a laboratory accredited by signatories to the International Laboratory Accreditation Corporation (ILAC) through their Mutual recognition Agreement (MRA) for the specific tests described in this Standard. The appropriate logo or further details of the ILAC (MRA) signatory shall be noted on the document.

NOTE: In Australia, ILAC (MRA) accredited bodies include National Association of Testing Authorities (NATA), and in New Zealand they include International Accreditation New Zealand (IANZ).

- (b) Additional tests as agreed between the purchaser and manufacturer.

NOTE: See Appendix A.

11.2.4 *Minimum requirements for tests and inspection certificates*

All tests and inspection certificates shall be in English alphanumeric characters, issued by the manufacturer and include the following:

- (a) Manufacturer's name.
- (b) Test certificate number.
- (c) Date of certification.
- (d) Product, testing specification and grade, e.g. AS/NZS 3679.2-300 Grade (see Clause 4).
- (e) Product designation (see Appendix D).
- (f) Product steelmaking process, e.g. basic oxygen—slab cast (see Clause 5.1).
- (g) Unique product identifier to which the test certificate applies (see Clause 11.1).
- (h) Feed plate serial numbers to identify the steel used in manufacturing each welded I section and the heat numbers for each feed plate.
- (i) Chemical analysis type, e.g. cast analysis 'L' or product 'P' (see AS/NZS 3678, Clauses 6.1, 6.2 and 6.3).
- (j) For each test a laboratory identification providing traceability to the laboratory accreditation of the test.
- (k) Chemical composition of carbon (C), phosphorus (P), manganese (Mn), silicon (Si), sulphur (S), chromium (Cr), molybdenum (Mo), vanadium (V), nickel (Ni), copper (Cu), aluminium (Al), titanium (Ti), niobium (Nb), boron (B), carbon equivalent (CE) and any element intentionally added (see AS/NZS 3678, Clauses 6.1, 6.2, 6.3 and 6.4).
- (l) Where relevant, mechanical or alternative information as noted below:
 - (i) **Tensile tests:** Yield stress, in MPa, tensile strength, in MPa, and % elongation (see AS/NZS 3678, Clause 9).

- (ii) *Impact test results*: At the specified test temperature for low temperature and seismic grades (see AS/NZS 3678, Clause 9).
- (iii) *Web-to-flange weld test*: Achievement of the required minimum web-to-flange **tensile strength for web-to-flange weld** (Table 1).
- (m) The manufacturing facility's quality management system's certifier and certification number.
- (n) The body assessing the product conformity to this Standard. For self-assessment this is the manufacturer, the default scheme is this Standard.
- (o) A declaration from the manufacturer that the products supplied comply with the requirements of this Standard [refer to Clause 12 and Items (a) to (n) above]. This shall be validated by the manufacturer's authorized inspection representative, including their name and position. A signature is not required.

If the document has been validated by the purchaser's authorized representative or by an inspector designated by a third party their name and position shall be on the document.

12 SAMPLING AND TESTING TO DEMONSTRATE PRODUCT CONFORMITY

The minimum, the sampling and testing procedures shall conform to Appendix B. Additional testing may be agreed between the manufacturer and the purchaser.

13 ROUNDING OF NUMBERS

For the purpose of deciding whether a particular requirement of this Standard is complied with, the determined value, observed or calculated, shall be rounded off in accordance with AS 2706.

The number of significant places retained in the rounded-off value shall be the same as that of the specified value in the appropriate material Standard.

14 SECTION DESIGNATIONS, DIMENSIONS AND MASSES

Appendix D provides information on section designations, nominal section dimensions and masses for common welded I sections.

APPENDIX A
PURCHASING GUIDELINES
(Informative)

A1 GENERAL

Australian/New Zealand Standards are intended to include the technical provisions necessary for the supply of materials referred to in the particular Standard, but do not purport to comprise all the necessary provisions of a contract. The purchaser may specify additional requirements or be given a choice of optional requirements. These are contractual matters to be agreed upon between the purchaser and the manufacturer, or the supplier.

This Appendix contains detailed explanations, advice and recommendations on the information to be supplied by the purchaser at the time of order.

The objective of this Appendix is to avoid misunderstandings and to result in the purchaser receiving satisfactory products.

A2 INFORMATION TO BE SUPPLIED BY THE PURCHASER

The purchaser should consider and supply the following information at the time of order, after making due reference to the explanation, advice and recommendations contained in this Appendix:

- (a) Quantity and delivery instructions (e.g. dates, schedules, delivery point).
- (b) Dimensions of product (e.g. section, length, mass per unit length).
- (c) Designation of grade and Standard number (see Clause 4).
- (d) Whether a test certificate and or an inspection certificate is required (see Clause 11.2).
- (e) Whether documentation certifying the product conformity requirements (see Appendix B) is required.
- (f) Whether it is the intention of the purchaser to inspect the steel at the manufacturer's works (see Paragraph A4).
- (g) Any information concerning processing or end use that the purchaser considers would assist the manufacturer.
- (h) Whether special tolerances or dimensions are required.
- (i) Whether any cambers are required.
- (j) Lengths of sections and end conditions.
- (k) Any exceptions to the Standard and any special or supplementary requirements, such as non-destructive examination (see Paragraph A3).
- (l) If repair by welding is not allowed.
- (m) If the ends of the beams are to be trimmed.
- (n) Zinc coating requirements. As a guide, recommendations for suitable chemistry of steels are provided in AS/NZS 2312.2.

Further information is available from the Galvanizers Association of Australia (GAA) and Galvanizing Association of New Zealand (GANZ).

NOTE: Any special or supplementary requirements of this Standard are subject to agreement between the purchaser and the manufacturer, or the supplier at the time of enquiry and order, and should be stated on the order.

A3 NON-DESTRUCTIVE EXAMINATION

If non-destructive examination is required by the purchaser, the method to be used and the limits of acceptance should be determined at the time of order.

The method should be in accordance with AS 1171, AS 2062, AS 2177 or AS 2207, as appropriate.

A4 INSPECTION

If it is the purchaser's intention to undertake any of the following functions at the manufacturer's works, this should be notified at the time of order, and should be accomplished in a manner that will not interfere with the operation of the works. The functions are as follows:

- (a) Inspect the product during manufacture.
- (b) Select and identify the test samples.
- (c) Witness the tests being made.

The manufacturer should provide all reasonable facilities to enable the purchaser to be satisfied that the product is in accordance with this Standard.

APPENDIX B
PRODUCT CONFORMITY
(Normative)

B1 SCOPE

This Appendix sets out the means by which product conformity evaluation shall be demonstrated by the manufacturer or supplier by:

- (a) Initial type testing.
- (b) Factory production control including a minimum sampling and testing frequency plan.

Testing and inspection of one or two samples does not provide an acceptable representation of actual variability in a batch of unidentified steel.

NOTE: The result of testing and inspecting such a sample could fall within or outside the standard range by chance and does not present a valid picture of the characteristics being evaluated.

The product conformity requirements shall enable conformity assessment to be made by a manufacturer or supplier (first party), a user or purchaser (second party), or an independent body (third party), and shall not be dependent on a quality management systems Standard.

NOTE: An example of a quality management system Standard is AS/NZS ISO 9001.

B2 INITIAL TYPE TESTING**B2.1 General**

An initial type testing program shall be carried out in accordance with Paragraph B2.2 under the sole responsibility of the manufacturer of the products before they are first placed onto the market.

Such a program shall be carried out in each case for each grade designation with the highest strength and impact properties which a manufacturer places on the market. For each section it is permissible in the testing program to test only the thickest section in each of the thickness ranges specified in Table 1 of this Standard

Initial type testing shall be performed on first application of this Standard. Tests previously performed in accordance with the provisions of this Standard (same product, same characteristic(s) test method, sampling procedure, system of attestation of conformity, etc.) may be taken into account.

In addition the initial type testing shall be performed at the beginning of a new method of production, and/or using a new facility or equipment.

B2.2 Minimum sampling and testing plan

The initial type testing program comprises of routine testing and inspection at a higher frequency to establish the capabilities of the manufacturing process to produce the steel product. Table B1 provides the minimum testing and inspection frequency plan for type testing. The results of all type tests shall meet the requirements of this Standard.

TABLE B1
MINIMUM SAMPLING AND TESTING FREQUENCY PLAN FOR TYPE TESTS
AND INSPECTIONS

Characteristic	Clause	Requirement	Test method	Frequency
Designation	4	Correct steel grade designation	Visual	Once
Manufacturing process	5.1	Steel feed	Records inspection to AS/NZS 3678	Each plate
	5.3.2	Welding consumables	Records inspection to AS/NZS 1554.1	Each lot
	5.2	Plate cutting and preparation	Visual	Each length minimum 5 after set-up*
	5.3	Fillet welds	Visual	Each length minimum 5 after set-up*
		Butt welds	Ultrasonic testing	Each butt weld minimum 5 after set-up*
Chemical composition	6	Plate material	Records inspection	All plates
Manufacturing tolerances	7.1 and 7.2	Nominal dimensions	Gauging equipment	Each length minimum 5 after set-up*
	7.1 and 7.2	Straightness	Straightedge, string line or gauges	
Mechanical properties	10	Web-to-flange tensile strength	To Clause 10	Each length minimum 5 after set-up*
Identification	11.1	Individual length markings	Visual	Each length

* Set-up is achieved after the manufacturing process is stable.

B3 PRODUCTION TESTING—MINIMUM BATCH SAMPLING AND TESTING

The manufacturer shall ensure that all products conform to the minimum frequency requirements of production testing as defined in Table B2.

TABLE B2
MINIMUM SAMPLING AND TESTING
FREQUENCY PLAN FOR PRODUCTION TESTS AND INSPECTIONS

Characteristic	Clause	Requirement	Test method	Frequency
Manufacturing process	5.1	Steel feed	Records inspection	Each plate
	5.3.2	Welding consumables	Records inspection	Each lot purchased
	5.2	Plate cutting or preparation	Visual	1 each hour*
	5.3.3	Fillet welds	Visual	Each section
	5.3.4	Butt welds	Ultrasonic testing	Each weld produced
Chemical composition	6.1	Plate material	Records Inspection	Each batch*
Manufacturing tolerances	7.1 and 7.2	Nominal dimensions	Gauging equipment	1 every section
	7.1 and 7.2	Straightness	Straight edge, string line or gauges	1 every section*
Mechanical properties	10	Web-to-flange tensile strength	To Clause 10	1 each commencement of production shift, then 1 every 400 m
Identification	11.1	Individual length markings	Visual	Each length
Test and inspection certificates	11.2	Certification	Records	Each certificate

* Time is operating hours.

B4 FACTORY PRODUCTION CONTROL

B4.1 General

The manufacturer shall establish, document and maintain a factory production control (FPC) system to ensure that the products placed on the market conform with the stated performance characteristics. The FPC system shall consist of procedures, regular inspections and tests and/or assessments and the use of the results to control raw and other incoming material or components, equipment, the production process and the product.

A quality management system covering the requirements of this document shall be considered to satisfy the above requirements of FPC.

NOTE: An example of an appropriate quality management system Standard is AS/NZS ISO 9001.

B4.2 Equipment

B4.2.1 Testing

All weighing, measuring and testing equipment shall be calibrated and regularly inspected according to documented procedures, frequencies and criteria.

B4.2.2 Manufacturing

All equipment used in the manufacturing process shall be regularly inspected and maintained to ensure use, wear or failure does not cause inconsistency in the manufacturing process. Inspections and maintenance shall be carried out and recorded in accordance with the manufacturer's written procedures.

B4.3 Raw materials

The specification of all incoming raw materials shall be documented, as shall the inspection scheme for ensuring their conformity. All manufacturing process and steel feed shall comply with the requirements of Clause 5.

B4.4 Product testing and evaluation

The manufacturer shall establish procedures to ensure that the stated values of all the characteristics are maintained. The characteristics and the means of control shall be in accordance with the minimum requirements listed in Table B2.

B5 NONCONFORMING PRODUCTS**B5.1 General**

The manufacturer shall have written procedures specifying the processing of nonconforming product.

B5.2 Retests**B5.2.1 Tensile tests**

Test an additional sample from the failed welded I section, taken from a position as near to practicable to the failed sample, and test an additional sample taken at random from the remainder of the welded I section under examination.

If one of these additional samples fails to comply, the steel of the applicable test batch does not comply with this Standard.

B5.3 Repair

All repaired product shall be inspected and meet the requirements of this Standard.

B6 DOCUMENTATION

The results of all testing programs shall be recorded and such records shall be maintained and be made available for inspection for a period of at least 5 years after the date when that last product to which the test program refers to was delivered. Results for initial type testing shall be maintained for the period of manufacture of the product.

Documentation shall include information to be supplied to the purchaser, plus manufacturing process, physical and mechanical properties, inspection and testing, and test procedures.

APPENDIX C

NOT USED

This appendix is intentionally left blank to maintain consistency of appendix sequence with AS/NZS 1163, AS/NZS 3678 and AS/NZS 3679.1.

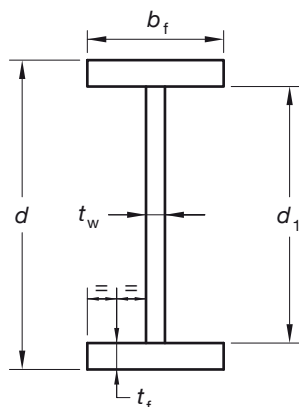
APPENDIX D

SECTION DESIGNATIONS, DIMENSIONS AND MASSES

(Normative)

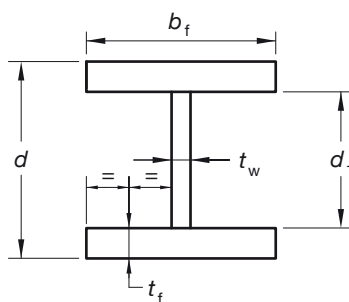
This Appendix provides lists of common welded I sections produced in Australia and New Zealand. The lists provide their section designation, respective nominal dimensions and mass. These nominal values shall be used to calculate their section properties.

Figures D1 and D2 are not restrictive or exhaustive. Other sizes with different designations dimensions and masses may be produced to this Standard. Manufacturers shall provide the designation dimensions and mass for bars and sections produced that are not listed in Figures D1 and D2.



1	2	3	4	5	6
Designation	Depth of section (d) mm	Flange		Web thickness (t_w) mm	Depth between flanges (d_1) mm
		Width (b_f) mm	Thickness (t_f) mm		
kg/m					
1200 WB 455	1 200	500	40.0	16.0	1 120
423	1 192	500	36.0	16.0	1 120
392	1 184	500	32.0	16.0	1 120
342	1 184	400	32.0	16.0	1 120
317	1 176	400	28.0	16.0	1 120
278	1 170	350	25.0	16.0	1 120
249	1 170	275	25.0	16.0	1 120
1000 WB 322	1 024	400	32.0	16.0	960
296	1 016	400	28.0	16.0	960
258	1 010	350	25.0	16.0	960
215	1 000	300	20.0	16.0	960
900 WB 282	924	400	32.0	12.0	860
257	916	400	28.0	12.0	860
218	910	350	25.0	12.0	860
175	900	300	20.0	12.0	860
800 WB 192	816	300	28.0	10.0	760
168	810	275	25.0	10.0	760
146	800	275	20.0	10.0	760
122	792	250	16.0	10.0	760
700 WB 173	716	275	28.0	10.0	660
150	710	250	25.0	10.0	660
130	700	250	20.0	10.0	660
115	692	250	16.0	10.0	660

FIGURE D1 WELDED BEAMS



1	2	3	4	5	6
Designation kg/m	Depth of section (d) mm	Flange		Web thickness (t_w) mm	Depth between flanges (d_1) mm
		Width (b_f) mm	Thickness (t_f) mm		
500 WC	440	480	500	40.0	400
	414	480	500	40.0	400
	383	472	500	36.0	400
	340	514	500	32.0	450
	290	506	500	28.0	450
	267	500	500	25.0	450
	228	490	500	20.0	450
400 WC	362	430	400	40.0	350
	328	430	400	40.0	350
	303	422	400	36.0	350
	270	414	400	32.0	350
	212	400	400	25.0	350
	181	390	400	20.0	350
	144	382	400	16.0	350
350 WC	280	355	350	40.0	275
	258	347	350	36.0	275
	230	339	350	32.0	275
	197	331	350	28.0	275

FIGURE D2 WELDED COLUMNS

APPENDIX E

MEASUREMENT OF CAMBER AND SWEEP IN WELDED I SECTIONS

(Normative)

E1 GENERAL

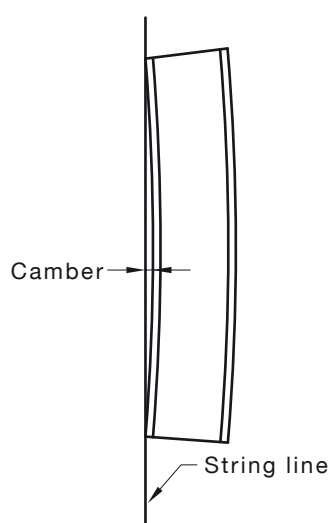
Refer to Table 2 for permissible variations in straightness.

E2 CAMBER

The length of section to be tested shall be placed with its web horizontal on a test surface. Camber shall be measured as shown in Figure E1.

E3 SWEEP

The length of section to be tested shall be placed with its web vertical on a test surface. Sweep shall be measured as shown in Figure E2.

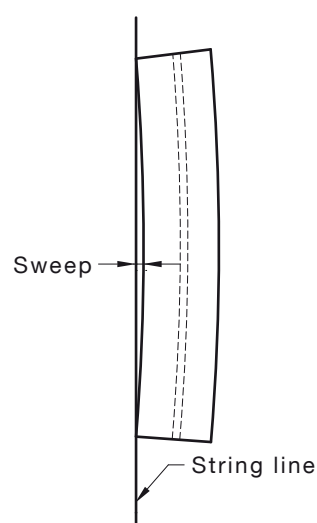


(a) Top view



(b) Section

FIGURE E1 CAMBER



(a) Top view



(b) Section

FIGURE E2 SWEEP

APPENDIX F
WELDED SECTIONS FOR FRACTURE CRITICAL APPLICATIONS
(NEW ZEALAND ONLY)

(Normative)

F1 ADDITIONAL REQUIREMENTS FOR FRACTURE CRITICAL APPLICATIONS

Additional requirements for welded steel sections used for fracture critical applications, such as Fracture Critical Members (FCM) in highway and railway bridge girders, are set out in NZS 3404.1. Where welded steel sections are required to be supplied for these applications, the sections shall comply with those additional requirements and as set out in this Appendix.

F2 WELDED STEEL SECTIONS FOR FRACTURE CRITICAL MEMBERS

The Manufacturer shall prepare a Fracture Control Plan (FCP), conforming to NZS 3404.1, Appendix A, that shall be available for review by the Purchaser upon request at time of order. The FCP shall document how the following processes shall be controlled during fabrication of the welded sections:

- (a) Materials selection.
- (b) Welding processes.
- (c) Consumables selection.
- (d) Welding procedure specification.
- (e) Quality control systems and qualifications of welding personnel.
- (f) As-received inspection of materials.
- (g) Thermal cutting.
- (h) Repair of parent metal laminar discontinuities.
- (i) Straightening, curving and cambering.
- (j) Tack welds and temporary welds.
- (k) Preheat and interpass control.
- (l) Post weld heat treatments.
- (m) Weld inspection.
- (n) Repair welding.

BIBLIOGRAPHY

AS

- 1171 Non-destructive testing—Magnetic particle testing for ferromagnetic products, components and structures
- 2062 Non-destructive testing—Penetrant testing of products and components
- 2177 Non-destructive testing—Radiography of welded butt joints in metal
- 2207 Non-destructive testing—Ultrasonic testing of fusion welded joints in carbon and low alloy steel

AS/NZS

- 2312 Guide to the protection of structural steel against atmospheric corrosion by the use of protective coatings
- 2312.2 Part 2: Hot dip galvanizing

AS/NZS ISO

- 9001 Quality management systems—Requirements

NOTES

NOTES

Standards Australia

Standards Australia is an independent company, limited by guarantee, which prepares and publishes most of the voluntary technical and commercial standards used in Australia. These standards are developed through an open process of consultation and consensus, in which all interested parties are invited to participate. Through a Memorandum of Understanding with the Commonwealth government, Standards Australia is recognized as Australia's peak national standards body.

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The first national Standards organization was created in New Zealand in 1932. The New Zealand Standards Executive is established under the Standards and Accreditation Act 2015 and is the national body responsible for the production of Standards.

Australian/New Zealand Standards

Under a Memorandum of Understanding between Standards Australia and Standards New Zealand, Australian/New Zealand Standards are prepared by committees of experts from industry, governments, consumers and other sectors. The requirements or recommendations contained in published Standards are a consensus of the views of representative interests and also take account of comments received from other sources. They reflect the latest scientific and industry experience. Australian/New Zealand Standards are kept under continuous review after publication and are updated regularly to take account of changing technology.

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Standards Australia and Standards New Zealand are responsible for ensuring that the Australian and New Zealand viewpoints are considered in the formulation of international Standards and that the latest international experience is incorporated in national and Joint Standards. This role is vital in assisting local industry to compete in international markets. Both organizations are the national members of ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission).

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