

Australian Standard[®]

Stainless steel chain for lifting purposes



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 - Department of Defence (Australia)
 - Engineers Australia
 - Institute of Quarrying Australia
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 - Victorian WorkCover Authority
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Stainless steel chain for lifting purposes

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-025, Lifting Tackle.

The objective of this Standard is to provide requirements for the safe and fit-for-purpose specification of stainless steel chain for lifting purposes for reference by users, manufacturers, suppliers and regulators.

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.

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

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STANDARDS AUSTRALIA

Australian Standard
Stainless steel chain for lifting purposes**1 SCOPE**

This Standard specifies requirements for non-calibrated short-link stainless steel chain for lifting purposes, manufactured from electrically welded round stainless steel short links.

NOTES:

- 1 Guidance on information that should be supplied with enquiries and orders is given in Appendix A.
- 2 Standards for components that are used in lifting systems are listed in Appendix B.

2 APPLICATION

Stainless steel chains are typically used in corrosive environments for a wide range of specialized industrial lifting applications. Such specialized applications include, but are not limited to, the food, pharmaceutical, chemical, fishing, water and waste water industries.

Where stainless steel chain is selected for properties other than corrosion resistance, subject to competent assessment, chain in the as-welded condition may be adequate.

Care and use of chain shall be in accordance with Appendix C.

3 NORMATIVE REFERENCES

The following documents are indispensable to the application of this Standard:

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

AS

- | | |
|-----------|--|
| 1418 | Cranes, hoists and winches |
| 1418.1 | Part 1: General requirements |
| 2193 | Methods for calibration and grading of force-measuring systems of testing machines |
| 2205 | Methods for destructive testing of welds in metal |
| 2205.10.1 | Method 10.1: Corrosion test for welded austenitic stainless steel |

ASTM

- | | |
|------------|--|
| A276 | Standard Specification for Stainless Steel Bars and shapes |
| A580/A580M | Standard Specification for Stainless Steel Wire |

4 DEFINITIONS

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

4.1 Barrel

The straight side of a link, which may include the weld zone adjoining the curved ends.

4.2 Breaking force

The maximum force that a chain test sample withstands during a destruction test.

4.3 Competent person

Designated person, suitably trained, qualified by knowledge and practical experience, and with the necessary instruction to enable the required test and examination to be carried out.

4.4 Design factor

The numerical value, generally expressed as a ratio, by which the minimum breaking force is divided to determine the WLL of the chain.

$$\text{Design factor} = \frac{(\text{Minimum breaking force, in kilonewtons})}{(9.81 \times \text{WLL, in tonnes})}$$

4.5 Electropolishing

An electrolytic process that removes metal from the surface leaving it with a bright, smooth surface that has greater resistance to corrosive environments.

4.6 Finished condition

The condition of chain after completion of all processing and proof-loading. The finished condition may be unpolished or polished.

4.7 Gauge length

The portion of the tensile test sample containing the number of links for the purpose of undertaking a specified destructive test.

4.8 Mean diameter (d_m)

The mean of two measurements, at right angles to each other, of a section (of the material of a chain link) clear of the weld.

4.9 Mean stress

The quotient of the tensile force on a chain (dividend) and the total area of the two circular cross-sections of the sides of a link of nominal material diameter (divisor).

4.10 Mechanically polished

A mechanical process that cleans and polishes the chain surface and does not result in embedding of ferrous material in the surface.

4.11 Nominal chain size (d)

The designated size of a chain.

4.12 Nominal material size (d_n)

The nominal diameter of the material from which a chain is made.

4.13 Non-calibrated chain

Chain manufactured to specified link dimensions, tolerances and mechanical properties, but not to a dimensional accuracy over a series of links.

NOTE: Non-calibrated chain is not intended for use with a sprocket or a pocketed wheel.

4.14 Passivation

The treatment of the surface of stainless steels, usually with acid solutions or pastes, to remove contaminants and promote the formation of the passive film on a freshly created surface.

4.15 Pickling

The removal of any high temperature scale and the underlying low chromium layer of metal by chemical means, to restore corrosion resistance lost during welding or heat treatment.

4.16 Processing

Any treatment of a chain subsequent to welding, but excluding proof-testing.

4.17 Proof force

The minimum force to which the whole of a chain is subjected, after processing.

4.18 Quality grade 5 or 50

Refers to chain for which the mean stress in the chain is 500 MPa at the minimum breaking load.

4.19 Shall

Indicates that a statement is mandatory.

4.20 Should

Indicates a recommendation.

4.21 Tensile test sample

A length of chain that is representative of the lot from which it has been taken and containing the gauge length and any adjoining links that may be necessary to engage with the jaws of the tensile testing machine.

4.22 Total elongation

The elongation at the point of fracture of a chain, expressed as a percentage of the gauge length, and comprising plastic elongation and elastic elongation.

4.23 Working load limit (WLL)

The maximum load that can be applied to the chain.

NOTE: The WLL may be derated for particular conditions of use.

5 MATERIAL AND HEAT TREATMENT

Chain shall be manufactured from drawn wire. The analysis limits shall be in accordance with ASTM A276, ASTM A580/A580M or equivalent. Chain shall be suitable for the forming and welding processes employed.

NOTES:

- 1 Although stainless steel chain is generally manufactured from austenitic grades 304L and 316L material, alternative grades that meet the intent of this Standard are not precluded.
- 2 Austenitic stainless steels cannot be hardened by heat treatment.
- 3 Annealing or stress relieving of stainless steel chains can cause the precipitation of chromium carbides and reduce their corrosion resistance.

6 DESIGN AND MANUFACTURE

6.1 Dimensions and tolerances

The chain shall conform to one of the nominal sizes, dimensions and tolerances specified in Table 1, Figure 1 and Figure 2.

TABLE 1
DIMENSIONS OF LINKS

millimetres												
1	2	3	4	5	6	7	8	9	10	11	12	
Nominal chain size d	Material size			Link dimensions				Weld protrusion				
	Nominal d_n	Limits (see Figure 2) d_m		Inside length p		Width		Max. from centre- line e	Type 1	Type 2		
		Max.	Min.	Max.	Min.	Outside max.	Inside min.		Max.	Max.	Max.	
				($3.09d_n$)	($2.91d_n$)	($3.5d_n$)	($1.25d_n$)		($0.6d_n$)	($1.1d_n$)	($1.35d_n$)	($0.1d_n$)
						W	W_1			d_w	G	H
5	5.0	5.2	4.8	15.4	14.6	17.5	6.3	3.0	5.5	6.7	0.5	
6	6.0	6.2	5.8	18.5	17.5	21.0	7.5	3.6	6.6	8.1	0.6	
7	7.0	7.3	6.8	21.6	20.4	24.5	8.8	4.2	7.7	9.4	0.7	
8	8.0	8.3	7.7	24.7	23.3	28.0	10.0	4.8	8.8	10.8	0.8	
10	10.0	10.4	9.6	30.9	29.1	35.0	12.5	6.0	11.0	13.5	1.0	
13	13.0	13.5	12.5	40.1	37.9	45.5	16.3	7.8	14.3	17.5	1.3	
16	16.0	16.6	15.4	49.4	46.6	56.0	20.0	9.6	17.6	21.6	1.6	

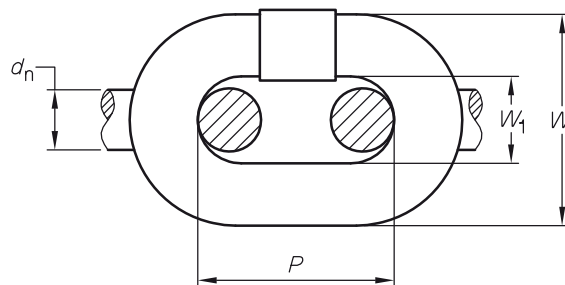


FIGURE 1 LINK

6.2 Welding

Chain shall be manufactured by electric welding and finished to the required dimensions (see Figure 2 and Table 1). The links and welds shall not show fissures, notches or similar faults that are detrimental to the chain. The thickness of the weld material shall be not less than the diameter of the material of the link.

For smooth welded chain (Type 1), fins caused by welding shall be removed and the weld shall be smoothly finished all around. For asymmetric welded chain (Type 2), the fins caused by welding shall be removed from the outside of the link surface, leaving the projections on the inside and thus forming a smooth exterior asymmetric weld.

The positioning of the weld at the centre of the straight barrel and the tolerances imposed on protrusions at the weld should provide the required clearances.

The chain should be surface-treated to remove residual contamination and discolouration, which would otherwise affect corrosion resistance.