



Roundslings—Synthetic fibre



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-

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Standards Australia wishes to acknowledge the participation of the expert individuals that contributed to the development of this Standard through their representation on the Committee and through the public comment period.

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Australian Standard®

Roundslings—Synthetic fibre

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PREFACE

This Standard was prepared by the Standards Australia Committee ME-025, Lifting Tackle, to supersede AS 4497.1 *Roundslings—Synthetic fibre, Part 1: Product specification* and AS 4497.2 *Roundslings—Synthetic fibre, Part 2: Care and use*.

The objective of this Standard is to combine the two previously separate Parts for manufacturing and safe use into a single document.

This revision also incorporates the following changes:

- (a) New figures throughout the Standard.
- (b) New clauses on the following:
 - (i) Competent persons.
 - (ii) Effective lengths.
 - (iii) Protective pads and corners.
 - (iv) End fittings and interfacing components.
 - (v) Markings.
 - (vi) Working load limit tags/labels.
 - (vii) Colour and stripes.
 - (viii) Materials including high modulus polyethylene (HMPE).
 - (ix) Cut protection.
 - (x) Engineered lifts.
 - (xi) Connecting to the loads.
- (c) New Table 6, Working load limits, storage, inspection and discard.
- (d) Two new appendices, Appendix D, *Visual inspection checklist* (normative), and Appendix E, *Symmetry of loading* (informative).

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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STANDARDS AUSTRALIA

Australian Standard

Roundslings—Synthetic fibre

S E C T I O N 1 S C O P E A N D G E N E R A L

1.1 SCOPE AND APPLICATION

1.1.1 Scope

This Standard specifies requirements and recommendations for manufacture, care and use of roundslings made of synthetic fibre, which may include end fittings that are intended for lifting purposes.

This Standard does not address the use of roundslings for the lifting of personnel.

1.1.2 Application

Section 2 specifies requirements and recommendations to manufacturers and importers on the design and manufacture of new roundslings.

NOTE: This Section does not cover repairs to roundslings.

Section 3 provides the test methods for verification of product conformity.

Section 4 provides requirements and recommendations on the selection, care and use of roundslings that are aimed at all parties including end users and inspectors of roundslings.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

NOTE: See also Appendix A for a full list of Standards for components used in lifting systems.

AS	
2193	Calibration and classification of force-measuring systems
2741	Shackles
3585	End fittings for synthetic flat-webbing and round slings
3776	Lifting components for Grade T(80) and V(100) chain slings
3777	Shank hooks and large eye hooks—Maximum 60 t
3850	Prefabricated concrete elements (series)
4991	Lifting devices
AS ISO/IEC	
17025	General requirements for the competence of testing and calibration laboratories

1.3 DEFINITIONS

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

1.3.1 Choke hitch

The hitch or reeved sling where one end of the sling is passed around the load and through the other eye and placed onto the hook—the sling then bites down onto the load.

NOTE: This hitch will never provide full 360° contact with the load. If required, an additional pass of the sling around the load to form a double wrap choke hitch will provide this facility.

1.3.2 Competent person

A person who has acquired through training, education and experience, or a combination of these, the knowledge and skills enabling that person to safely and effectively perform the task required.

NOTE: Requirements for competent persons for specified tasks are specified in Clause 1.4.

1.3.3 Complex lift

A non-routine crane lift requiring detailed planning and that may need unusual or additional safety precautions.

NOTE: A complex lift may be indicated by one of the following:

- (a) Loads of irregular shape or uneven weight distribution.
- (b) Use of multiple cranes or winch systems.
- (c) Lifts with less than the recommended multicrane factors of safety.
- (d) Lifts out of line of sight of the crane operators.
- (e) Technically difficult rigging system or design.
- (f) Lifting involving personnel.
- (g) Lifting hazardous materials.
- (h) Lifting submerged loads.
- (i) Lifting with no or partial outriggers.
- (j) Lifting on rubber surfaces.
- (k) Any such lift the crane operators deem to be classed as such.

1.3.4 Effective length

The distance between the bearing points of the sling, including any end fittings.

NOTE: See Figure 1.1.

1.3.5 End fitting

A load-bearing fitting that is designed to be attached to the end of a sling.

NOTE: See Figure 1.1(b).

1.3.6 Engineered lift

A lift where the slings to be used are designed for the specific purpose.

NOTE: Engineered lifts may require that lower design factors are used than for those specified for general applications.

1.3.7 Hank

Coil of yarn.

1.3.8 Load-bearing core

A hank of high-tenacity continuous-multifilament yarn that comprises the load-bearing part of a roundsling.

NOTE: See Figure 1.2.

1.3.9 Lot

The total number of components from which samples are selected for testing purposes.

1.3.10 Marked working load limit

The working load limit markings of the sling in a straight lift configuration.

1.3.11 Protective sleeve

A sleeve placed over the woven cover providing protection but having no effect on the breaking force of a sling.

NOTE: See Figures 1.1(d), 1.1(e) and 1.1(f).

1.3.12 Roundsling

An endless sling comprising a load-bearing core of high-tenacity continuous-multifilament yarn that is completely enclosed in a woven cover, with or without end fittings, as referred to in Clause 2.2.8.

1.3.13 Shall

Indicates that a statement is mandatory.

1.3.14 Should

Indicates a recommendation.

1.3.15 Sling with end fittings

A sling having one or both ends terminated with a fitting.

NOTE: See Figure 1.1(b).

1.3.16 Strop

A roundsling modified by holding the two legs together to form an eye at each end.

NOTE: See Figure 1.1(c).

1.3.17 Tenacity

The tensile force per unit of linear density of the unstrained specimen, expressed in centinewtons per tex.

1.3.18 Working load limit (WLL)

The maximum load applied to the sling, in a given configuration, under general conditions of use.

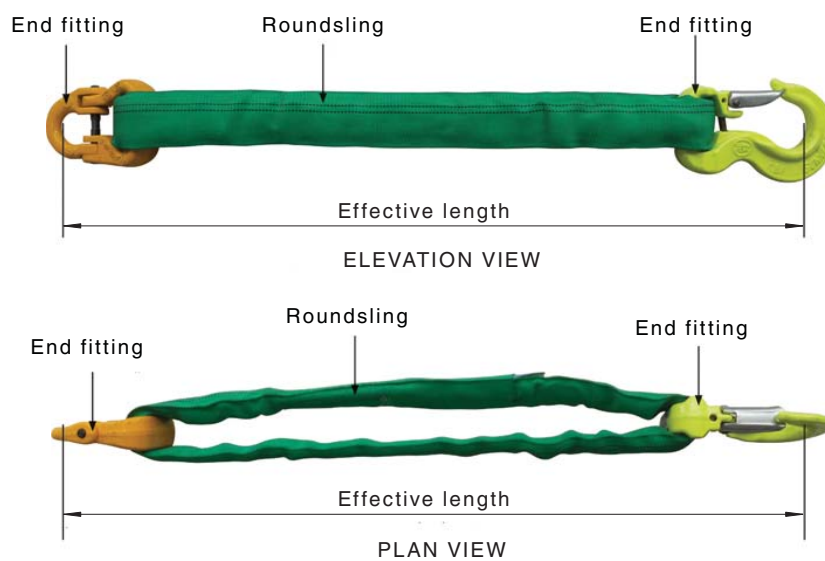
NOTE: The working load limit may be de-rated for particular conditions of use.

1.3.19 Woven cover

A tube of woven fabric or woven webbing joined along its length to enclose a load-bearing core of a roundsling.



(a) Roundsling in basic configuration

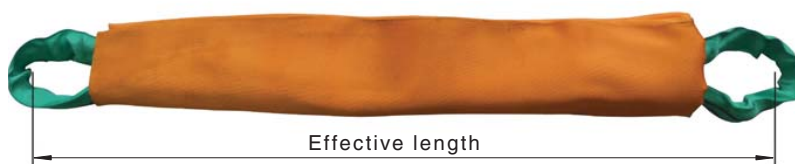


(b) Roundsling (with typical end fittings)

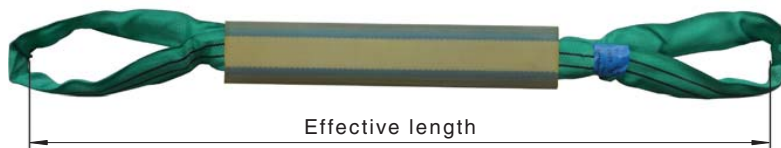


(c) Strop

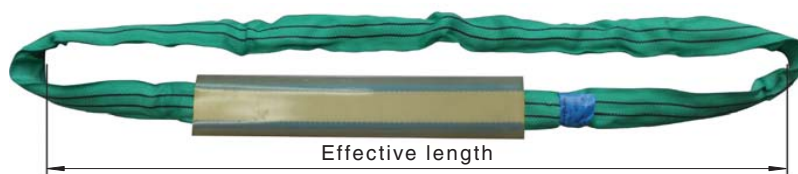
FIGURE 1.1 (in part) TYPICAL ROUNDSLINGS



(d) Roundslings with protective sleeve



(e) Roundslings with protective sleeve and both sides reinforced



(f) Roundslings with protective sleeve and one side reinforced

FIGURE 1.1 (in part) TYPICAL ROUNDSLINGS

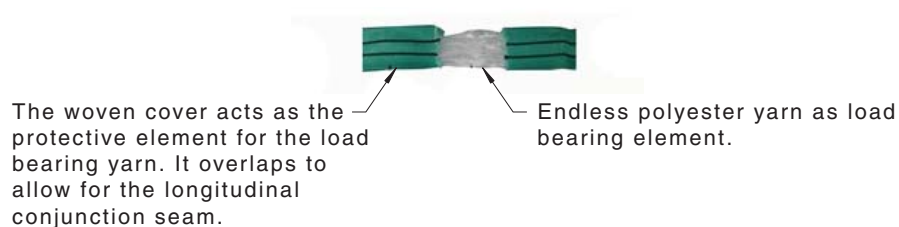


FIGURE 1.2 EXAMPLE OF ROUNDSLING SEGMENT SHOWING CUTAWAY OF INTERNAL LOAD-BEARING ELEMENT

1.4 COMPETENT PERSON REQUIREMENTS

1.4.1 General

Persons manufacturing, testing and using roundslings shall be competent persons for the tasks they are performing, including being competent to detect and evaluate defects and weaknesses that may affect the intended performance of the roundslings.

1.4.2 Manufacture and test roundslings

A competent person shall be provided with the necessary instruction for the tasks they perform in the manufacture, testing and related inspections of roundslings. They shall be able to demonstrate competency in the tasks they perform.

1.4.3 Use of roundslings

A competent person shall be able to demonstrate the ability to choose the correct roundslings and inspect them based on the following:

- (a) Assess the mass of the load to be lifted.
- (b) Assess whether the load, inclusive of any lifting points, will withstand the lifting operation.
- (c) Check that the lifting machine or lifting appliance is rated to lift the load.
- (d) Select a suitable roundslings, taking into account the following:
 - (i) The condition of the roundslings.
 - (ii) The geometry of the assembly, including the number of legs, the included angles between each leg and the connections.
 - (iii) The manner in which the load is attached (i.e. straight, choked or basket configuration). This includes the angle in the reeving and the de-rating effect due to the higher stresses caused by reeving.
 - (iv) The shape of the load, the centre of gravity and load distribution on the roundslings legs. Uneven loading may cause a reduction of the lifting capacity of the roundslings. It may also cause instability and tilting of the load.
 - (v) The determination of WLL including any required deration.
 - (vi) Protection of the roundslings from sharp corners of the load using corner protectors or protective sleeves as appropriate to prevent damage to the roundslings and/or load.
 - (vii) When attaching a roundslings to an end fitting ensure that there are no detrimental high stress areas in contact with the roundslings. High stress areas may be due to overcrowding, sharp edges or the like.
 - (viii) Environmental conditions such as temperature and corrosive atmospheres, etc.
- (e) Ability to identify the hazards associated with the task and apply controls that will mitigate the risk.

1.4.4 Periodic and post repair inspection of roundslings

A competent person shall be suitably trained, qualified by knowledge and practical experience to understand and interpret the requirements of Clause 4.17 covering the following:

- (a) Frequency of periodic inspections.
- (b) Defects requiring withdrawal from service.
- (c) Discard criteria.

For repairs, the competent person shall interpret and implement the requirements as outlined in Clause 4.17.

1.4.5 Competency standards and procedures

Competency standards and procedures relating to the role and duties of competent persons shall include the requirements of this Standard. They shall incorporate an established competency-based training course. Documentation of competency standards and procedures shall be maintained.

1.4.6 Visual acuity

The competent person shall have satisfactory near and medium range vision. The visual acuity of a competent person shall be tested periodically, with a maximum duration of 2 years between each test by a suitably trained person or an optometrist. The competent person shall be able to demonstrate clear near vision. Near vision acuity (Jaeger No. 1) shall permit reading a minimum of Times Roman 4.5 points vertical height at not less than 300 mm with one or both eyes, either corrected or uncorrected.

NOTE: The potential for colour blindness should be accounted for in these circumstances.

SECTION 2 DESIGN, MANUFACTURING AND MECHANICAL PROPERTIES

2.1 MATERIAL

The load-bearing core and the sewing thread of roundslings shall be constructed from a high-tenacity continuous-multifilament synthetic fibre. Load-bearing fibres shall have a tenacity of not less than 60 cN/tex.

Woven covers should be constructed of thermofixed fibres of the same material type as those of the core.

Typical fibre materials include—

- (a) aramid polyamide for the core together with another material that resists ultraviolet radiation for the cover;
- (b) nylon (i.e. polyamide), for both the core and the cover;
- (c) polyester, for both the core and the cover;
- (d) ultraviolet-light-stabilized polypropylene, for both the core and the cover; and
- (e) new or high performance fibres [including high modulus polyethylene (HMPE)] in accordance with the requirements of this Standard.

2.2 DESIGN AND MANUFACTURE

2.2.1 Core

The core shall be formed from one or more yarns, wound together with 11 turns or more, and joined to form a single or multiple hanks. Any joins in the yarns, other than those at the start and finish of the core, shall be separated from the start and finish of the core by four or more turns. In addition, there shall be an extra turn for each additional join.

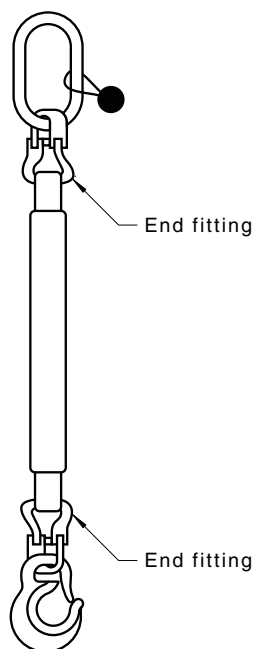
The core shall be uniformly wound to provide for even distribution of the load.

2.2.2 Multi-leg slings

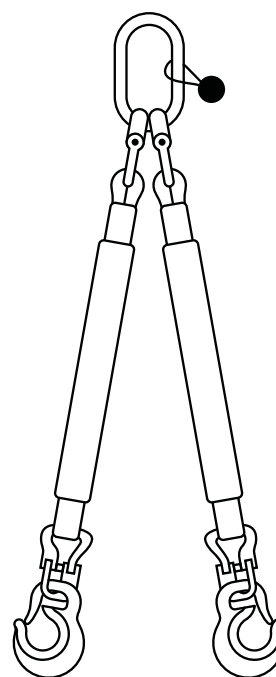
The legs of multi-leg slings shall be interconnected by one of the following arrangements:

- (a) For two-leg slings, by attaching each of the legs directly to a master link.
NOTE: See Figure 2.1(b).
- (b) For three-leg or four-leg slings, by using a master link assembly with two intermediate links, and attaching two of the sling legs directly to one of the intermediate links and the other sling leg or sling legs directly to the other intermediate link.

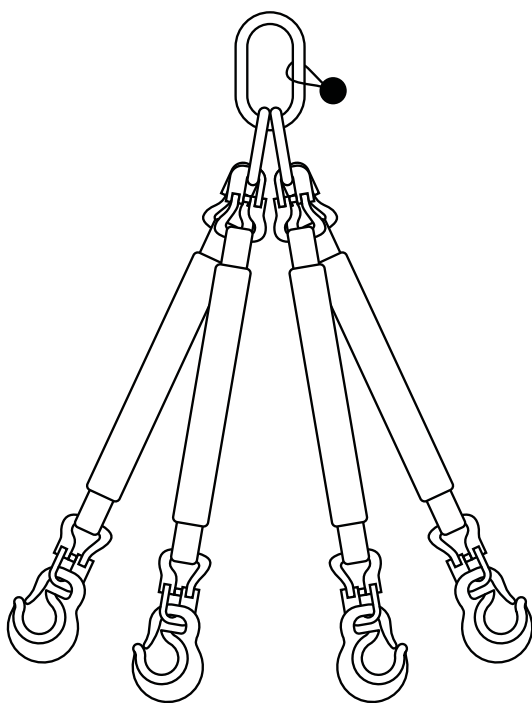
NOTE: See Figure 2.1(c).



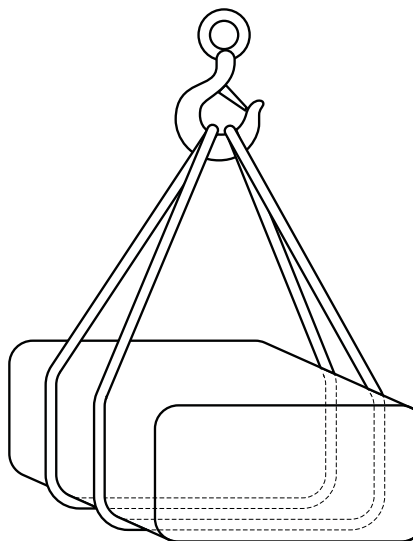
(a) Single-leg roundsling strop with metal end fittings



(b) Two-leg roundsling strop with metal end fittings



(c) Four-leg roundsling strop with metal end fittings



(d) Basket hitch

FIGURE 2.1 TYPICAL ROUNDSLING ASSEMBLIES

2.2.3 Overcrowding

To prevent overcrowding of multi-leg slings, each link that supports two legs of a sling shall be of an adequate size that will allow these legs to support a load with an included angle between the legs of 60°, without the slings bunching or riding over each other.

2.2.4 Cover

The cover shall inhibit abrasion and the ingress of abrasive particles, be free from any defect likely to adversely affect performance and be made with the ends overlapped and sewn. The edges of the cover material shall be finished in such a way that they cannot unravel. The colour of the cover shall be in accordance with Table 2 of Clause 2.2.10.4.2.

NOTES:

- 1 Finishes and coatings should not impair the performance of roundslings.
- 2 Sealing can be achieved by a variety of processes, such as close weaving or heat setting (also known as thermofixing).
- 3 Care should be taken that any heat sealing of a cover does not affect the core adversely.

2.2.5 Effective length

The effective length of roundslings shall be measured after being stretched out by hand (without noticeable tension) on a flat surface. Measurement shall be performed more than 10 min after the release of any forces. Such a measured length shall be within $\pm 2\%$ of the nominal length and shall be expressed in metres.

NOTES:

- 1 At 2% allowable variance, two 20 m slings from different batches can potentially have lengths of between 19.6 m and 20.4 m, a variance of 0.8 m, and still be within specification.
- 2 More precise measurements of finished length may be necessary, such as when identified during design of an engineered lift.
- 3 More precise measurements may be made by applying a pre-determined load to the sling in a pre-determined configuration that is acceptable to the purchaser.

2.2.6 Sewing seam

Stitching thread shall be of the same material as that of the cover. The stitches shall be made with a locking stitch.

NOTE: To facilitate inspection, stitching threads may be of a different colour from that of the cover.

2.2.7 Protective sleeves and pads

2.2.7.1 General

Protective sleeves and pads on roundslings are used to provide an increased resistance to heat or protection against damage from weld spatter, abrasion or cuts. The sleeve or pad shall have a suitable protective capability for the purpose that it is designed for.

2.2.7.2 Protective sleeves

If the sleeve is sewn to the sling, it shall be of the same fibre material, have the same mechanical and chemical properties as the cover and conform with Clause 2.2.10.4.2.

The sleeve may be of dissimilar material to the cover if it is not sewn to the sling. It shall be capable of being moved, to enable the full length of the cover of the sling to be inspected.

Where the protective sleeve completely covers the roundslings the manufacturer shall ensure that adequate labelling by tag markings in accordance with Clause 2.2.10 are visible. Where the colour of the protective sleeve is not used to identify the WLL of the round sling the colour shall not be any of the colours listed in Table 2 of Clause 2.2.10.4.2.

2.2.8 End fittings supplied with a roundsling

2.2.8.1 General

End fittings shall have a working load limit of not less than the WLL of the sling.

2.2.8.2 Interface between cover and end fitting

The interface between the cover and the end fitting shall be such that the strength of the sling leg will not be compromised by either overcrowding or the interface contact region.

Two end fittings on a sling need not be identical. If a sling is designed for choked slinging, one fitting should be able to pass through the other fitting.

The radius of end fitting interfaces shall be no less than the compressed thickness of the roundsling.

NOTE: See Figure 2.2.

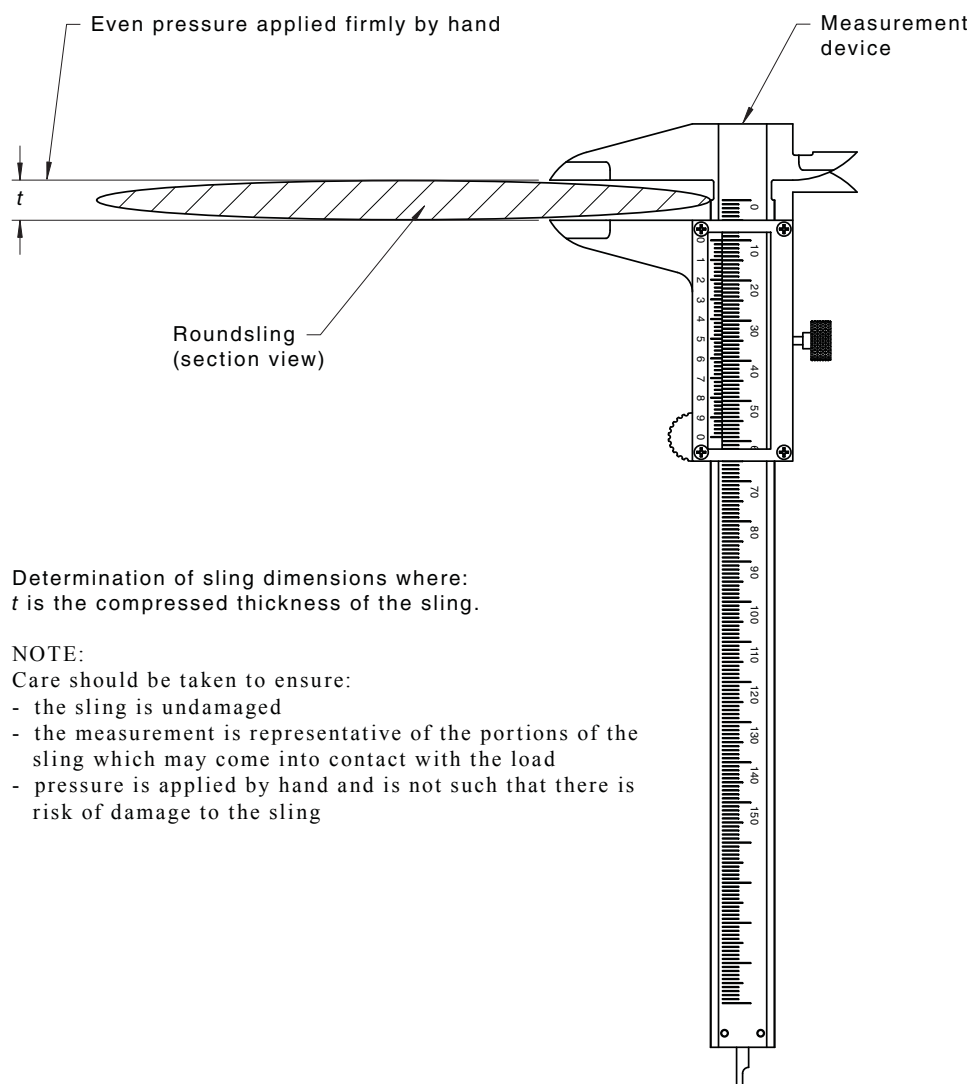


FIGURE 2.2 EXAMPLE OF COMPRESSED THICKNESS MEASUREMENT

The interface width of the end fitting shall be greater than the width of a compressed roundsling when tested in accordance with Clause 3.3 (see Figure 2.3).

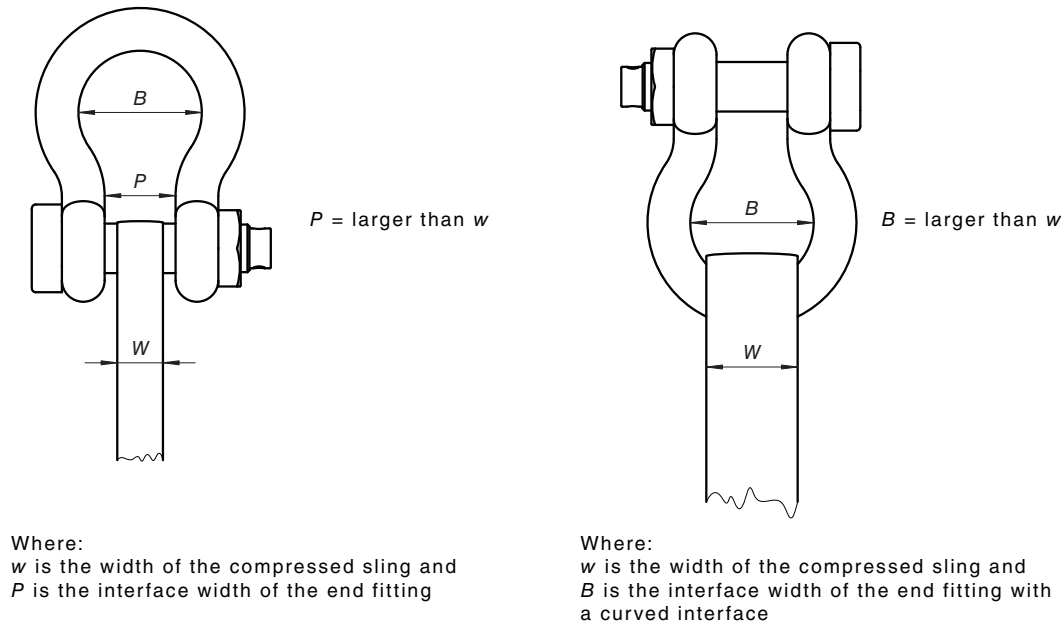


FIGURE 2.3 INTERFACE DIMENSIONS SLING AND END FITTING

2.2.8.3 End fittings

Any end fittings of roundslings shall be compatible with hooks or other lifting devices to which they are connected. There shall be axial loading and free articulation of the end connection.

The interface between the roundsling and the end fitting shall be in accordance with Clause 2.2.8.2 and such that the WLL of the roundsling leg will not be compromised by either overcrowding or the interface contact area.

In addition, metallic end fittings shall be sufficiently resistant to attack by acid or alkali where intended for use in acidic or alkaline environments, respectively.

2.2.9 Mechanical properties

The yarn component of each sling (i.e. the roundsling except for any metal end fittings) shall be capable of withstanding a test force equivalent to T times the marked working load limit of the sling under the conditions specified in Appendix C, where $T = 8.2$ for nylon fibres and $T = 7$ for other fibres.

NOTES:

- 1 This test force is generally referred to as the minimum breaking strength.
- 2 The higher factor for nylon fibres is to allow for a 15% reduction of strength when wet by water.
- 3 Clause 2.2.8.2 requires any end fitting to conform with AS 3585, which include requirements for mechanical properties.
- 4 Fittings and coupling components may have different design factors from that for the yarn components of the roundsling to which they are connected.

2.2.10 Marking

2.2.10.1 Sling information

Each sling shall be permanently and legibly marked with the following information in English:

- (a) Working load limit for direct load and various lifting configurations in tonnes or kilograms.

The WLL of multi-leg slings shall be stated on the tag attached to the master link. The WLL on the master link tag of the sling assembly shall override the WLLs of the individual components.
- (b) Fibre material (e.g. nylon, polyester, polypropylene or aramid polyamide, as applicable).
- (c) Month and year of manufacture of the sling.
- (d) Identification marking to correlate the sling to a test certificate or batch number, and a unique individual identification for inspection traceability.
- (e) The nominal length in metres.
- (f) Manufacturer's identification, manufacturer's name, symbol, trade mark or other unambiguous identification and, where applicable, the name and address of the authorized representative.
- (g) A section of the tag shall be stitched under the cover, which shall also be marked with information from Clause 2.2.10.1(a), (c) and (d) for reference purposes.

NOTE: Other information such as nominal compressed width and nominal compressed thickness may also be included on the tag.

2.2.10.2 Warnings

The following list of precautionary warnings shall also be provided as a minimum on the tag in English:

- (a) Consult sling manufacturer or supplier for configurations not shown on the sling tag or a relevant load chart.
- (b) Do not use any sling that does not have a tag.
- (c) Inspect sling for damage before each use.
- (d) Do not use sling if there is any sign of a cut cover, snagging, heat or chemical damage, excessive wear, damaged seams, any other defects or presence of grit, abrasive materials or other deleterious matter.
- (e) Do not tie knots in sling.
- (f) Protect sling from sharp edges of load (e.g. steel sections).
- (g) Do not expose sling to temperatures above ... degree Celsius.
NOTE: Manufacturer to insert a safe maximum temperature. Information on safe temperatures is given in Clause 4.3.
- (h) Do not allow abrasive or other damaging grit to penetrate the fibres.
- (i) Keep away from ...
NOTE: Manufacturer to insert 'acids', 'alkalis', or 'phenolic compounds', etc. as applicable.
- (j) Consult with manufacturer's recommendations, before exposing a sling to a chemical environment.