AS 4497.1—1997

Australian Standard®

Roundslings—Synthetic fibre

Part 1: Product specification

This Australian Standard was prepared by Committee ME/25, Lifting Tackle. It was approved on behalf of the Council of Standards Australia on 8 August 1997 and published on 5 October 1997.

The following interests are represented on Committee ME/25:

Australian Chamber of Commerce and Industry

Australian Chamber of Manufactures

Australian Forging Group

Australian Maritime Safety Authority

Department of Defence

Institution of Engineers, Australia

Metal Trades Industry Association of Australia

National Association of Testing Authorities, Australia

Victorian WorkCover Authority

Work Health Authority, N.T.

WorkCover N.S.W.

Workplace Standards Authority (Tasmania)

This Standard was issued in draft form for comment as DR 96096.

AS 4497.1—1997

Australian Standard®

Roundslings—Synthetic fibre

Part 1: Product specification

First published as AS 4497.1— 1997.

PUBLISHED BY STANDARDS AUSTRALIA
(STANDARDS ASSOCIATION OF AUSTRALIA)
1 THE CRESCENT, HOMEBUSH, NSW 2140

ISBN 0 7337 1437 4

PREFACE

This Standard was prepared by the Standards Australia Committee ME/25 on Lifting Tackle.

Cognizance was taken of the CEN draft for comment 94/709222 DC, *Draft European Standard Textile slings—Safety*, Part 2: *Specification for round slings made of man-made fibres* (prEN 1492-2).

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.

CONTENTS

STANDARDS AUSTRALIA

Australian Standard

Roundslings—Synthetic fibre

Part 1: Product specification

1 SCOPE This Standard specifies requirements for roundslings made of synthetic fibre that are intended for lifting purposes.

This Standard does not apply to slings that have been repaired.

NOTES:

1 Guidance on information that should be supplied with enquiries and orders is given in Appendix A.

2 Recommendations for the care and use of roundslings are given in AS 4497.2.

2 REFERENCED DOCUMENTS The following documents are referred to in this Standard:

AS	
1199	Sampling procedures and tables for inspection by attributes
1399	Guide to AS 1199—Sampling procedures and tables for inspection by attributes
2193	Methods for calibration and grading of force-measuring systems of testing machines
3585	End fittings for flat-webbing slings
3776	Lifting components for Grade T chain slings
4497	Roundslings—Synthetic fibre
4497.2	Part 2: Care and use
AS/NZS	
ISO 9000	Quality management and quality assurance standards
ISO 9000.1	Part 1: Guidelines for selection and use
ISO 9904	Quality management and quality system elements
ISO 9004.1	Part 1: Guidelines
SAA	
HB18	Guidelines for third-party certification and accreditation
HB18.28	Guide 28—General rules for a model third-party certification scheme for products

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

3.1 Competent person—a person having practical and theoretical knowledge and relevant experience, sufficient to enable that person to detect and evaluate any defects and any weaknesses that may affect the intended performance of the equipment.

3.2 Effective length—the distance between the bearing points of the sling, including any end fittings, while stretched out by hand (without noticeable tension) on a flat surface (see Figure 1 and Clause 5.5).

3.3 End fitting—a load-bearing metal fitting that is designed to be attached to the end of a sling (see Figures 1(b) and 3).

3.4 Load-bearing core—a hank of high-tenacity continuous-multifilament yarn that comprises the load-bearing part of a roundsling (see Figures 2(b), 2(c), 2(d) and 2(e)).

3.5 Protective sleeve—a sleeve placed over the woven cover (see Clause 3.12), providing protection but having no effect on the breaking force of a sling.

3.6 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 fittings or coupling components.

3.7 Shall—indicates that a statement is mandatory.

3.8 Should—indicates a recommendation.

3.9 Sling with end fittings—a sling having one or both ends terminated with a metal fitting (see Figure 3(a)). 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.

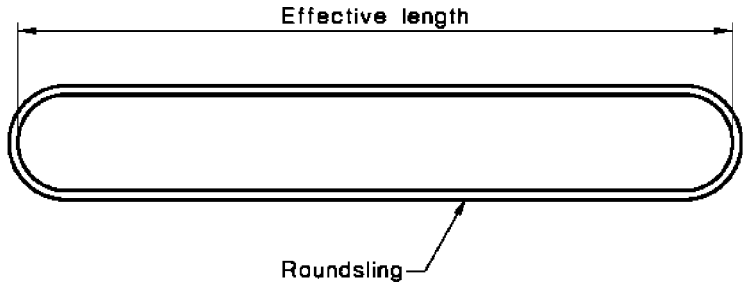
3.10 Strop A roundsling modified by holding the two legs together to form an eye at each end (see Figures 2(d) and 2(e)).

3.11 Working load

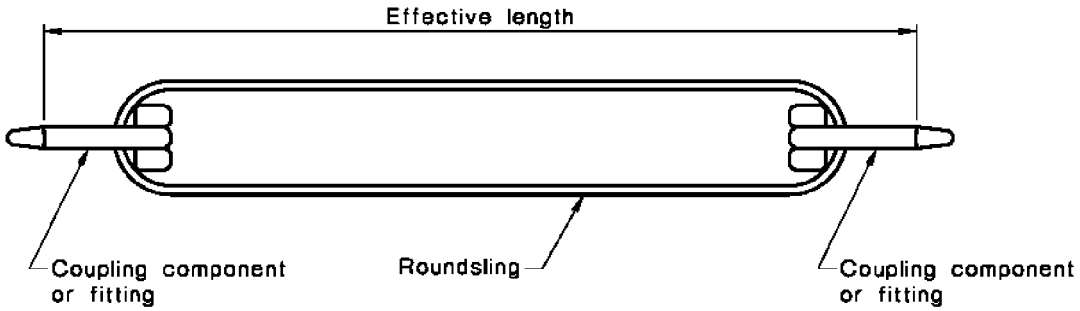
3.11.1 *Working load limit (WLL)*—the maximum load that may be applied to the sling, in tension, under general conditions of use.

3.11.2 *Safe working load (SWL)*—the maximum load that may be applied to the sling under the particular conditions of use (see AS 4497.2).

3.12 Woven cover—a tube of woven fabric or woven webbing that is joined along its length to enclose a load-bearing core of a roundsling.

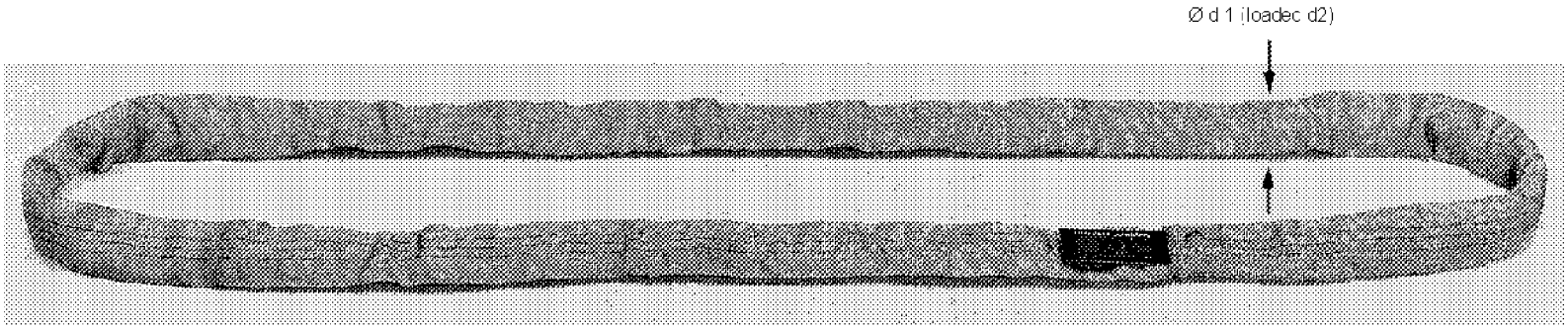


(a) Roundsling in basic configuration

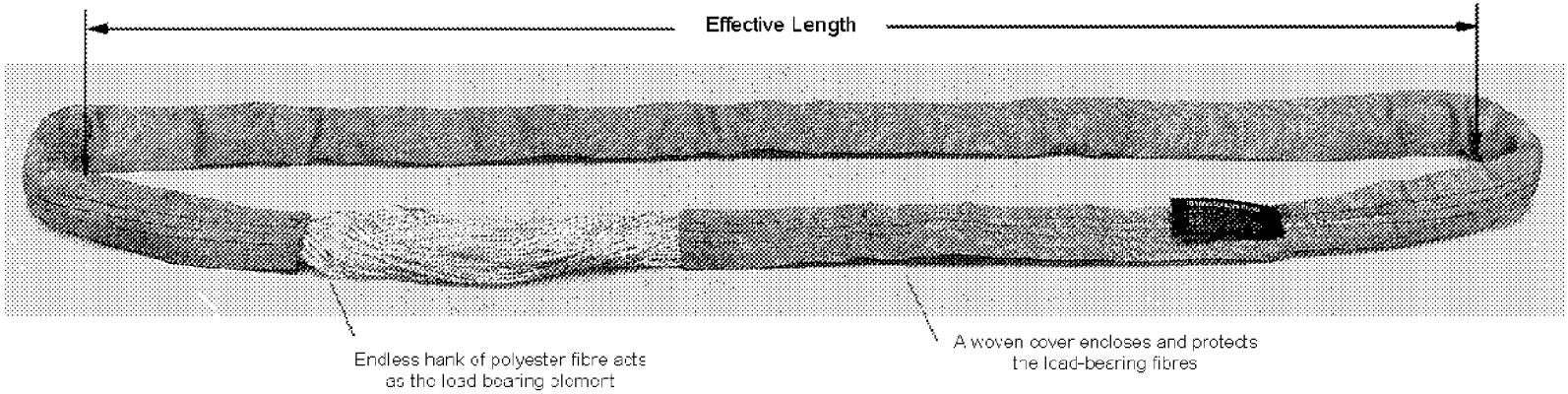


(b) Roundsling (with coupling components/fittings)

FIGURE 1 ROUNDSLING

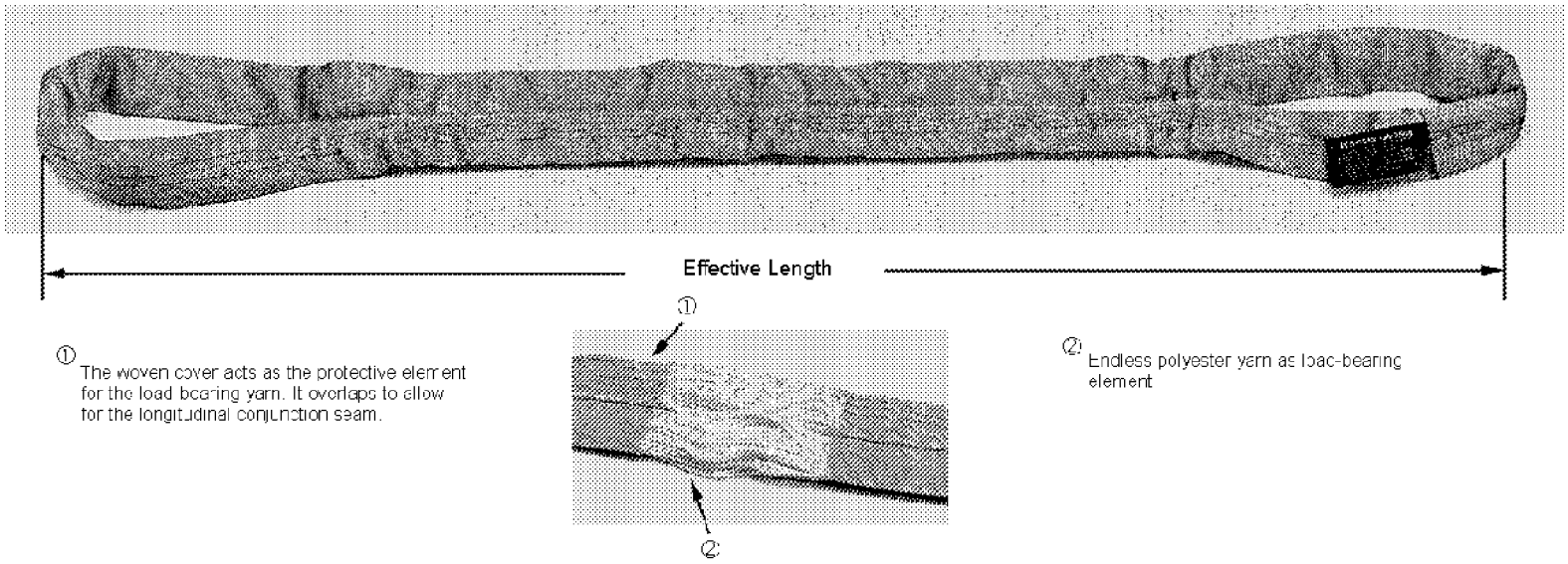


(a) Roundsling



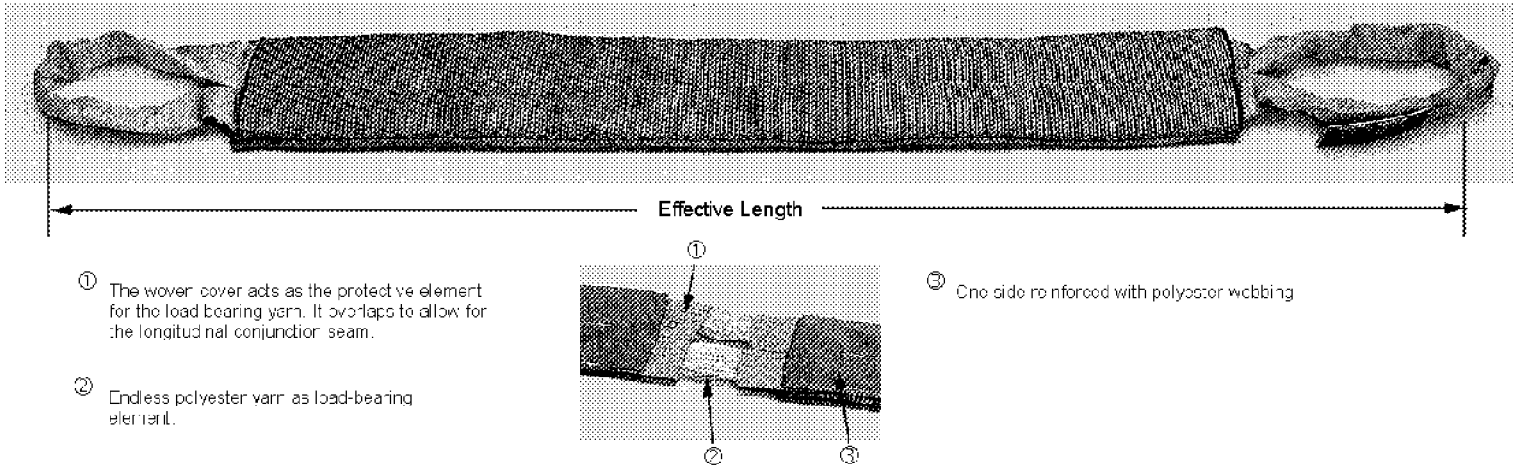
(b) Construction of a Roundsling

FIGURE 2 (in part) TYPICAL ROUNDSLINGS



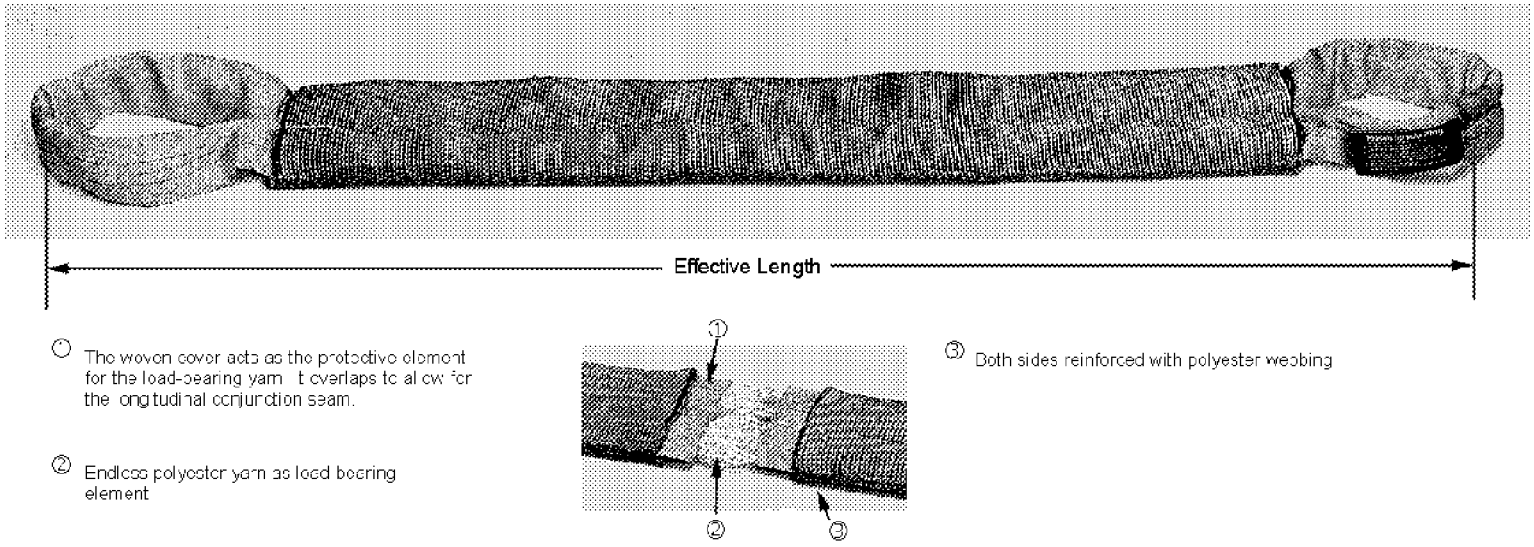
(c) Roundsling

FIGURE 2 (in part) TYPICAL ROUNDSLINGS



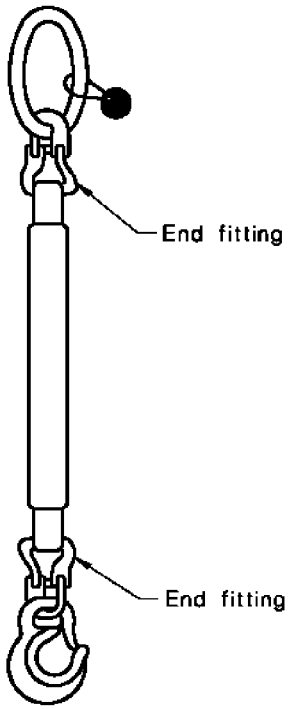
(d) Roundsling strop with protective sleeve and one side reinforced

FIGURE 2 (in part) TYPICAL ROUNDSLINGS

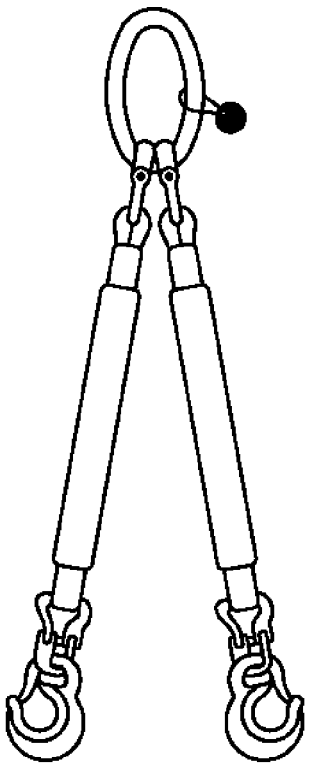


(e) Roundsling strop with protective sleeve and both sides reinforced

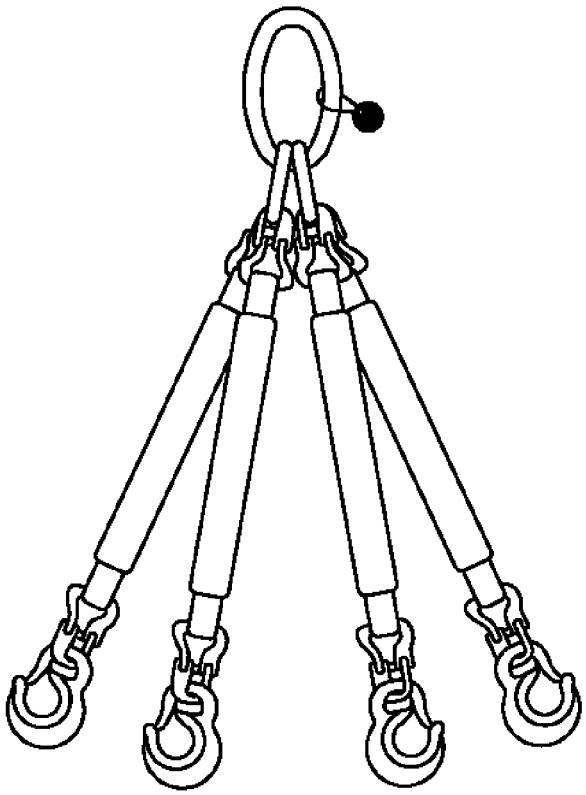
FIGURE 2 (in part) TYPICAL ROUNDSLINGS



(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

FIGURE 3 TYPICAL ROUNDSLING STROP ASSEMBLIES

4 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; and

(d) ultraviolet-light-stabilized polypropylene, for both the core and the cover.

5 DESIGN AND MANUFACTURE

5.1 Core The core shall be formed from one or more yarns, wound together with 11 turns or more, and joined to form a single hank. 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. Also, there shall be an extra turn for each additional join.

NOTE: The core should be uniformly wound to ensure even distribution of the load.

5.2 Multileg slings The legs of multileg slings are normally interconnected by one of the following arrangements:

(a) For two-leg slings, by attaching each of the legs directly to a master link.

(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 two sling legs directly to the other intermediate link.

5.3 Overcrowding To prevent overcrowding of multileg slings, each link that supports two or more legs in 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 legs contacting each other.

5.4 Cover The cover shall inhibit abrasion and the ingress of abrasive particles, be free from any defect likely to affect safety 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.

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.

5.5 Effective length The effective length (see Clause 3.2) of slings of synthetic fibre shall be measured more than 10 min after the release of any forces and shall be expressed in metres. Such a measured length shall have an accuracy of ±3 percent of the nominal length.

5.6 Sewing Seam-stitching thread shall be of the same material as that of the cover and the core, except where the core is of aramid polyamide. 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.

5.7 Protective sleeves Any protective sleeves used on roundslings—

(a) if completely enclosing the woven cover specifically to provide an increased resistance to heat or protection against damage from weld splatter, may be of dissimilar materials; or

(b) if not covered by Item (a) above—

(i) *not sewn to sling*—if not sewn to the sling, shall be capable of being moved, to enable the full length of the cover of the sling to be inspected; or

(ii) *sewn to sling*—if sewn to the sling, shall be of the same fibre material and have the same mechanical properties as the cover.

5.8 End fittings Any end fittings shall have a working load limit of not less than that of the sling and comply with AS 3585 or AS 3776. 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 area.

6 MECHANICAL PROPERTIES

6.1 Yarn component 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 working load limit of the sling under the conditions specified in Appendix B, 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 percent reduction of strength when wet by water.

6.2 End fittings Clause 5.8 requires any end fitting to comply with AS 3585 or AS 3776, which include requirements for mechanical properties.

NOTE: Fittings and coupling components may have different factors of safety from that for the yarn components of the roundsling to which they are connected.

7 MARKING

7.1 Information

7.1.1 *Mandatory* Each sling shall be permanently legibly marked with the following information:

(a) Working load limit.

(b) SWL for various lifting configurations.

The SWL of multileg slings shall be stated on the tag attached to the master link.

NOTE: Where multileg sling assemblies are configured, ensure that there is no confusion between the working load limit of each leg with the SWL of the whole assembly. Also, refer to AS 4497.2.

(c) Fibre material (e.g. nylon, polyester, polypropylene or aramid polyamide, as applicable).

(d) Month and year of manufacture of the sling.

(e) Identification marking to correlate the sling to a test certificate or batch number.

(f) Manufacturer's identification.

NOTE: In any lifting or handling system that consists of components of different capacities, it is dangerous for each of these components to be tagged with its different capacity. A tag specifically marked for a higher capacity component could inadvertently be understood to refer to the complete lifting system.

7.1.2 *Optional* The following list of precautionary warnings should also be provided:

(a) Consult sling manufacturer or supplier for configurations not shown on the sling tag or a relevant load chart.

(b) Do not use sling if tag is removed.

(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.

(g) Do not expose sling to temperatures above ...

NOTE: Insert a safe maximum temperature. Information on safe temperatures is given under selection of material in AS 4497.2.

(h) Do not allow abrasive or other damaging grit to penetrate the fibres.

(i) Consult with manufacturer's recommendations, before immersing a sling in a chemical solution.

(j) Keep away from ....

NOTE: Insert 'acids', 'alkalis', or 'phenolic compounds', as applicable.

NOTES:

1 A typical label is shown in Figure 4.

2 Manufacturers making a statement of compliance with this Standard on a product, packaging or promotional material related to that product are advised to ensure that such compliance is capable of being verified.

7.2 Means The marking required by Clause 7.1 shall be given on—

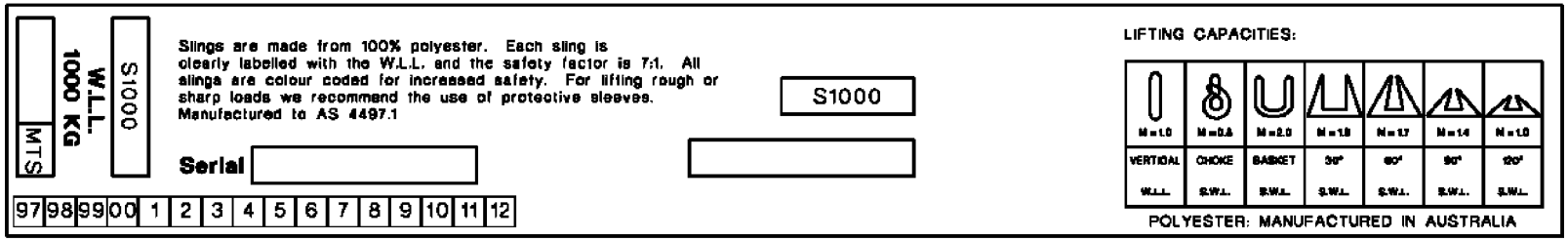
(a) for single-leg slings, a label of a suitable material that is permanently attached to the woven cover of the sling by sewing; or

(b) for multileg slings, a durable and corrosion-resistant tag that is permanently affixed to the master link.

7.3 Colour The colour of the label of the sling leg shall be used to identify the fibre material, using the following colour code:

Fibre material	Colour
Nylon	Green
Polyester	Blue
Polypropylene	Brown
Aramid polyamide	Yellow

Where the colour of the sling leg is used to identify its WLL, the following colour code shall be used:



10 hints for safe lifting

1. Consult sling load for conformations not shown.
2. Do not use sling if this tag is removed.
3. Inspect sling for damage between each use.
4. Do not use sling if there is any sign of cut webbing, snagging, heat or chemical damage, excessive wear, damaged seams, any other defects, or presence of grit, abrasive materials or other deterious matter.
5. Do not tie knots in sling.
6. Protect sling from sharp edges of load. Use protective sleeves.
7. Do not expose sling to temperatures above 90°C.
8. Do not allow abrasive or other damaging grit to penetrate the fibres.
9. Consult with manufacturer's recommendations before immersing a sling in a chemical solution.
10. Keep away from strong alkalies & phenolic compounds.

FIGURE 4 TYPICAL LABEL FOR A ROUNDSLING

Working load limit, t	Colour
1	Violet
2	Green
3	Yellow
4	Grey
5	Red
6	Brown
8	Blue
≥ 10	Orange

8 TESTING OF MECHANICAL PROPERTIES Compliance of each design with the requirements of Clause 6 shall be demonstrated.

NOTES:

1 The test of each design is known as the type test, which determines the adequacy of the design for achieving the required performance.

2 Each change in manufacturing process, grade of material, design, end fittings and size other than length necessitates separate type testing, to demonstrate compliance with the requirements of Clause 6.

3 In addition to type testing, effective quality control necessitates systematic testing of each lot or batch to ensure continuing compliance with the requirements of Clause 6. Such a lot may include slings that only vary in length.

4 Methods for demonstrating compliance with this Standard are given in Appendix C.

9 PROOF TESTING

9.1 Proof loading Each sling shall be subjected to a proof force that is not less than [2 × 9.81 × (WLL, in tonnes)] kN applied under the conditions specified in Appendix B.

9.2 Requirements The sling shall—

(a) withstand the application of the proof force, without sustaining damage that could affect its intended function or safety; and

(b) after testing, be free from any deleterious permanent set or visible defects.

A competent person (see Clause 3.1) shall be satisfied that the sling complies with these requirements.

9.3 Test certificate The proof testing shall be recorded on a test certificate, which shall bear the following information:

(a) Type of any end fittings.

(b) Sling material.

(c) Effective length.

(d) For single-leg slings or endless slings, working load limit.

(e) For multileg slings, working load limit or safe working load.

(f) Proof force.

(g) Date of proof test.

(h) Number tested.

(i) Identification marking correlating with the slings.

(j) A declaration that the slings comply with this Standard.

(k) The name and address of the manufacturer or supplier.

(l) The name and address of the testing establishment.

(m) The name of the signatory.

(n) Type of certificate (e.g. NATA, certifying authority, supplier).

NOTE: The manufacturer or supplier should retain the original test certificate for not less than 10 years.

APPENDIX A

INFORMATION THAT SHOULD BE SUPPLIED WITH ENQUIRIES AND ORDERS

(Informative)

The following information should be supplied with enquiries and orders for roundslings:

(a) Working load limit.

(b) Effective length (see Clause 3.2).

(c) Material.

(d) End fittings, if any, which may be different on each end.

(e) Any protective sleeves or coatings.

(f) Nature of loads to be handled.

(g) Manner of use (e.g. direct loading, basket hitch, choke hitch).

(h) Size of hook or details of other lifting devices with which the sling is to be used.

(i) Significant environmental conditions (e.g. exposure to chemicals, heat, moisture, sunlight, abrasive substances including grit).

(j) Any required means for demonstrating compliance with this Standard (see Appendix C).

(k) Any required additional testing such as non-destructive testing.

(l) Type of certificate (e.g. NATA, certifying authority, supplier).

(m) Whether a copy of the test certificate is to be supplied.

APPENDIX B
CONDITIONS FOR APPLICATION OF TEST FORCES
(Normative)

The following conditions apply to the application of test forces to roundslings:

(a) The testing machine shall be calibrated in accordance with AS 2193 and shall be capable of Class A results when testing mechanical properties (see Clause 6) and Class C results when proof testing (see Clause 9).

(b) Manufacturing processes, other than any proof loading and any application of temporary protective coatings for storage purposes, shall be completed.

(c) Where end fittings are part of the slings, either—

  (i) test the complete sling; or

  (ii) test the sling components separately, including—

    (A) the end fittings in accordance with AS 3585 or AS 3776; and

    (B) the components, incorporating an interface that is similar to that of the end fittings.

(d) Each end of the sling shall be held as follows:

  (i) For slings without end fittings—by means of an attachment with a suitable contact radius and with the seam of the sling away from the attachment.

  (ii) For slings with end fittings—by means of an attachment with a contact radius.

(e) The sling shall not be twisted along its length during the test.

(f) Distribute the core evenly over the attachment, without any fold in the cover at the contact section.

(g) Keep the ends of the protective cover clear of the attachment.

(h) The test force shall be applied to the sling in tension.

APPENDIX C
MEANS FOR DEMONSTRATING COMPLIANCE WITH THIS STANDARD
(Informative)

C1 SCOPE This Appendix sets out the following different means by which compliance with this Standard can be demonstrated by the manufacturer or supplier:

(a) Evaluation by means of statistical sampling.

(b) The use of a product certification scheme.

(c) Assurance using the acceptability of the supplier's quality system.

(d) Other such means proposed by the manufacturer or supplier and acceptable to the customer.

C2 STATISTICAL SAMPLING Statistical sampling is a procedure which enables decisions to be made about the quality of batches of items after inspecting or testing only a portion of those items. This procedure will only be valid if the sampling plan has been determined on a statistical basis and the following requirements are met:

(a) The sample shall be drawn randomly from a population of product of known history. The history shall enable verification that the product was made from known materials at essentially the same time, by essentially the same processes and under essentially the same system of control.

(b) For each different situation, a suitable sampling plan needs to be defined. A sampling plan for one manufacturer of given capability and product throughput may not be relevant to another manufacturer producing the same items.

In order for statistical sampling to be meaningful to the customer, the manufacturer or supplier needs to demonstrate how the above conditions have been satisfied. Sampling and the establishment of a sampling plan should be carried out in accordance with AS 1199, guidance to which is given in AS 1399.

C3 PRODUCT CERTIFICATION The purpose of product certification is to provide independent assurance of the claim by the manufacturer that products comply with the stated Standard.

The certification scheme should meet the criteria described in SAA HB18.28 in that, as well as full type testing from independently sampled production and subsequent verification of conformance, it requires the manufacturer to maintain effective quality planning to control production.

The certification scheme serves to indicate that the products consistently conform to the requirements of the Standard.

C4 SUPPLIER'S QUALITY SYSTEM Where the manufacturer or supplier can demonstrate an audited and registered quality management system complying with the requirements of the appropriate or stipulated Australian or international Standard for a supplier's quality system or systems, this may provide the necessary confidence that the specified requirements will be met. The quality assurance requirements need to be agreed between the customer and supplier and should include a quality or inspection and test plan to ensure product conformity.

Guidance in determining the appropriate quality management system is given in AS/NZS ISO 9000.1 and AS/NZS ISO 9004.1.

C5 OTHER MEANS OF ASSESSMENT If the above methods are considered inappropriate, determination of compliance with the requirements of this Standard may be assessed by being based on the results of testing coupled with the manufacturer's guarantee of product conformance.

Irrespective of acceptable quality levels (AQLs) or test frequencies, the responsibility remains with the manufacturer or supplier to supply products that conform with the full requirements of the Standard.