

Australian Standard[®]

Fibre ropes

Part 1: Care and safe usage

This Australian Standard was prepared by Committee TX/4, Ropes and Cordage. It was approved on behalf of the Council of Standards Australia on 9 August 1993 and published on 22 November 1993.

The following interests are represented on Committee TX/4:

Australian Chamber of Commerce and Industry
Australian Chamber of Manufactures
Australian Lightweight Vertical Rescue Instructors
Australian Maritime Safety Authority
Department of Defence
Emergency Management Australia
New South Wales Fire Brigades
Police Department, N.S.W.
South Australian State Emergency Service
State Emergency Services, N.S.W.
Textile Clothing and Footwear Council of Australia

Review of Australian Standards. To keep abreast of progress in industry, Australian Standards are subject to periodic review and are kept up to date by the issue of amendments or new editions as necessary. It is important therefore that Standards users ensure that they are in possession of the latest edition, and any amendments thereto.

Full details of all Australian Standards and related publications will be found in the Standards Australia Catalogue of Publications; this information is supplemented each month by the magazine 'The Australian Standard', which subscribing members receive, and which gives details of new publications, new editions and amendments, and of withdrawn Standards.

Suggestions for improvements to Australian Standards, addressed to the head office of Standards Australia, are welcomed. Notification of any inaccuracy or ambiguity found in an Australian Standard should be made without delay in order that the matter may be investigated and appropriate action taken.

This Standard was issued in draft form for comment as DR 90138.

Australian Standard[®]

Fibre ropes

Part 1: Care and safe usage

First published as part of AS L18—1963.
Second edition 1971.
AS L56 first published 1971.
AS L57 first published 1971.
AS L18—1971, AS L56—1971 and AS L57—1971
revised, amalgamated and redesignated
AS 1504—1974.
AS 1752 first published 1975.
Second edition 1983.
Second edition AS 1504—1983.
AS 1054—1983 and AS 1752—1983 revised,
amalgamated and redesignated in part as
AS 4142.1—1993.

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

ISBN 0 7262 8502 1

 **Documents**
Document Sharing Hub

PREFACE

This Standard was prepared by the Standards Australia Committee on Ropes and Cordage to supersede Appendix D of AS 1504—1983, *Fibre rope—Three-strand, hawser laid* and Appendix D of AS 1752—1983, *Fibre rope—Eight-strand plaited*.

The Standard has been greatly expanded to include information related to the handling of large ropes on ships.

This Standard is part of a series on fibre ropes. Other Standards in the series include—

- (a) AS 4142.2 *Fibre ropes, Part 2: Three-strand hawser-laid and eight-strand plaited*;
- (b) AS 4142.3 *Fibre ropes, Part 3: Man-made fibre rope for static life rescue lines*; and
- (c) AS 4143 *Methods of test for fibre ropes*

The term ‘informative’ has been used in this Standard to define the application of the appendices. An ‘informative’ appendix is only for information and guidance.

© Copyright — STANDARDS AUSTRALIA

Users of Standards are reminded that copyright subsists in all Standards Australia publications and software. Except where the Copyright Act allows and except where provided for below no publications or software produced by Standards Australia may be reproduced, stored in a retrieval system in any form or transmitted by any means without prior permission in writing from Standards Australia. Permission may be conditional on an appropriate royalty payment. Requests for permission and information on commercial software royalties should be directed to the head office of Standards Australia.

Standards Australia will permit up to 10 percent of the technical content pages of a Standard to be copied for use exclusively in-house by purchasers of the Standard without payment of a royalty or advice to Standards Australia.

Standards Australia will also permit the inclusion of its copyright material in computer software programs for no royalty payment provided such programs are used exclusively in-house by the creators of the programs.

Care should be taken to ensure that material used is from the current edition of the Standard and that it is updated whenever the Standard is amended or revised. The number and date of the Standard should therefore be clearly identified.

The use of material in print form or in computer software programs to be used commercially, with or without payment, or in commercial contracts is subject to the payment of a royalty. This policy may be varied by Standards Australia at any time.

CONTENTS

	<i>Page</i>
SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	4
1.2 REFERENCED DOCUMENTS	4
1.3 DEFINITIONS	4
1.4 CLASSIFICATION	4
SECTION 2 CAUSES OF DAMAGE TO ROPES	
2.1 GENERAL	6
2.2 CHEMICAL DAMAGE	6
2.3 PHYSICAL DAMAGE AND DEGRADATION	6
SECTION 3 SELECTION OF ROPES AND FITTINGS	
3.1 SELECTION OF ROPES	12
3.2 SELECTION OF FITTINGS	12
SECTION 4 USE OF ROPES	
4.1 REMOVAL OF ROPE FROM A COIL	13
4.2 REMOVAL OF ROPE FROM A TURNTABLE OR FLANGED REEL	13
4.3 ROPE STORAGE AND STOWAGE	13
4.4 PROTECTION FROM ABRASION	13
4.5 PROTECTION IN THE CASE OF SLUNG LOADS	13
4.6 KINKS IN LAID ROPES	14
4.7 COUPLING LAID ROPES	14
4.8 SHARP BENDS IN ROPES	14
4.9 FIBRE AND WIRE ROPES	14
SECTION 5 MAINTENANCE	
5.1 INSPECTION	17
5.2 ACTION FOLLOWING INSPECTION	18
SECTION 6 SAFE WORKING	
6.1 MATERIAL AND LOAD	19
6.2 DANGER FROM SNAPPING ROPES	19
6.3 RECOMMENDATIONS ON THE USE OF ROPE ON DRUM ENDS	19
6.4 PERSONAL PROTECTION	20
6.5 ROPE CONTAMINATION	20
6.6 STRENGTH LOSS DUE TO KNOTS AND SPLICES	21
6.7 TERMINATING ROPE ENDS	22
APPENDICES	
A METHOD OF CALCULATING SAFE WORKING LOADS	23
B EQUIVALENT DEADWEIGHT BREAKING LOADS FOR THREE-STRAND HAWSER-LAID AND EIGHT-STRAND PLAITED ROPES	24

STANDARDS AUSTRALIA

Australian Standard**Fibre ropes****Part 1: Care and safe usage**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard gives guidelines on the care, inspection and maintenance of fibre ropes, and recommendations on safe use of ropes.

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

AS

1380 Fibre rope slings (of natural or synthetic rope)

2089 Sheave blocks (including ships' cargo blocks) of maximum lift 60 t

4142 Fibre ropes

4142.2 Three-strand hawser-laid and eight-strand plaited

4142.3 Man-made fibre rope for static life rescue lines

Admiralty Manual of Seamanship, Vol. II.

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

1.3.1 Safe working load (SWL)—the maximum working load which should be applied to a rope consistent with the factor of safety recommended for the conditions under which the rope is to be used.

1.3.2 Twist—twist is defined as S twist (left-hand lay) or Z twist (right-hand lay), according to which of these letters has its centre inclined in the same direction as the surface elements of a given twisted yarn (or strand).

NOTE: When applying this rule it is essential that the yarn (or strand) axis be parallel with the major axis of the letter as shown in Figure 1.1.

1.3.3 Shall—indicates that a statement is mandatory.

1.3.4 Should—indicates a recommendation.

1.3.5 May—indicates the existence of an option.

1.4 CLASSIFICATION Fibre ropes are divided into two basic classes: natural fibre ropes and man-made fibre ropes. Each class is subclassified according to the specific material used. The classification system is shown in Table 1.1.

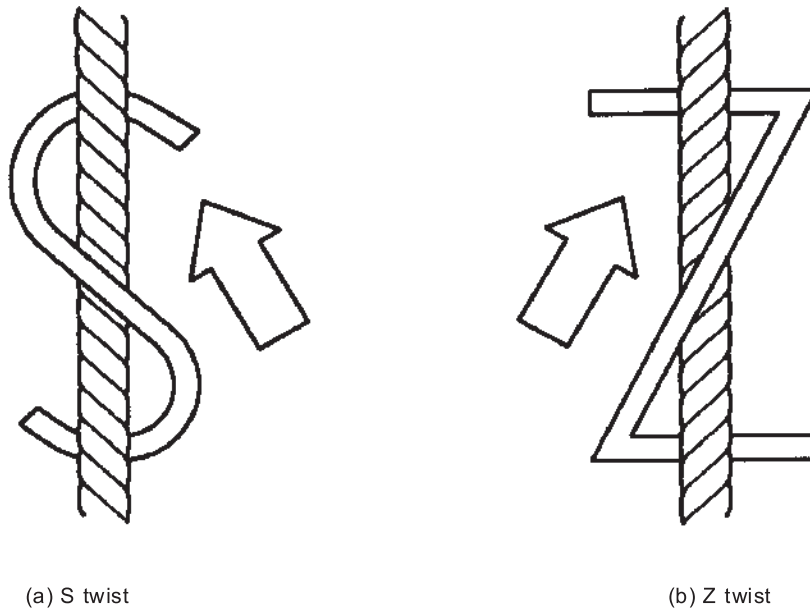


FIGURE 1.1 TWIST DIRECTION

TABLE 1.1
CLASSIFICATION OF FIBRES

Natural fibre	Man-made fibre
Manila	Polyamide (nylon)
Sisal	Polyester
Cotton	Polyethylene
Coir (coconut fibre)	Polypropylene
Hemp	Aramid
Flax	Vinylal
	High-modulus polyolefin

SECTION 2 CAUSES OF DAMAGE TO ROPES

2.1 GENERAL Damage to ropes can be caused by a number of chemical and physical factors. Clauses 2.2 and 2.3 give information on chemical and physical factors relevant to all fibre ropes. Tables 2.1 and 2.2 provide detailed information on each of the specific fibre types listed in Table 1.1.

2.2 CHEMICAL DAMAGE Each type of fibre is sensitive to certain chemicals. These sensitivities are listed in Table 2.1 for natural fibres and Table 2.2 for man-made fibres.

The utmost care should be taken, both in use and storage, to reduce exposure of the rope to harmful agents. When such exposure is unavoidable, the sensitivity of the fibre should be considered when selecting the rope and in setting expectations for its durability and performance.

2.3 PHYSICAL DAMAGE AND DEGRADATION

2.3.1 External wear External wear due to dragging the rope over a rough surface will damage any rope to a certain degree, resulting in broken fibres projecting from the surface. This is noticeable on comparing a well-used rope with a new one. If not too extensive, this disarrangement and breakage of external fibres is harmless, and the broken fibres projecting outward may even protect the inner fibres from further damage.

2.3.2 Local abrasion Local abrasion, caused by dragging the rope over a sharp edge whilst under tension, may cause serious loss of strength. Slight damage to the outer fibres and an occasional torn yarn may be considered of negligible importance, but serious damage to one strand in three-stranded or eight-stranded ropes or moderate damage to more than one strand warrants rejection.

2.3.3 Cuts and contusions Cuts caused by a rope being under tension over a sharp edge, and contusions caused by dropping or landing heavy masses on a rope, or similar careless usage, can cause internal as well as external damage. Such damage may be indicated by local rupturing or loosening of the yarns or strands but contusion damage may not be apparent except on very close examination. Without obviating the need for proper inspection procedures, care should be taken to prevent contusions occurring.

2.3.4 Internal wear Internal wear may be caused by particles of grit picked up off surfaces, blown by the wind, or forced in as a result of the rope being trodden on or driven over, also by salt crystals formed after a rope dries out following contact with sea water. It may be indicated by excessive looseness of strands or yarns, or by the presence of powdered fibre.

2.3.5 Overloading Overloading may cause permanent elongation; consequently the extension available in an emergency may be reduced. Overloading could also cause breaking of more highly stressed fibres, leading to eventual failure at loads well below the normal breaking force.

2.3.6 Mildew Mildew and similar micro-organisms will attack natural fibre rope under certain conditions of dampness and warmth. Mildew does not, in general, damage man-made fibre rope.

2.3.7 Heat Heat will damage most ropes but the effect is worst on man-made fibre ropes, some of which will soften or melt at temperatures readily reached in use. Figure 2.1 shows the effect of heat on the breaking strength of three-strand ropes of several different fibre types. Ropes should not be used in conditions where the softening point is approached. In particular, surging (slipping while under load) of man-made fibre ropes on drum ends should be avoided as surging causes melting and fusing with resultant strength loss.

2.3.8 Cold Where rope is for use in temperatures below -10°C , advice should be sought from the manufacturer. Frozen ropes should not be used; not only will ice crystals damage the fibres, but their rigidity will prevent the adjustment that enables the load to be distributed over the entire cross-section when passing over a sheave or fairlead, and the breaking strain may well be exceeded, even if only the 'safe working load' is applied.

2.3.9 Weathering and sunlight Excessive exposure of all textile fibres to weathering and sunlight will weaken the fibres. Unnecessary exposure should be avoided. However, weathering and sunlight will degrade polyolefin fibres (polyethylene and polypropylene) more rapidly than others. Additives may be used during manufacture to reduce the rate of degradation caused by sunlight.

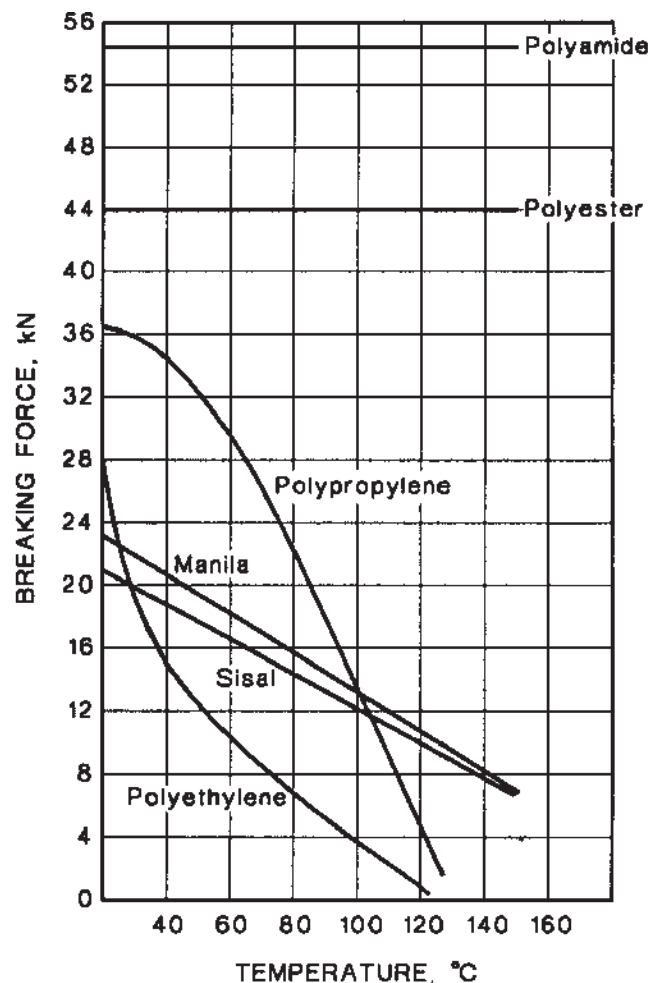


FIGURE 2.1 THE EFFECT OF HEAT ON 16 mm DIAMETER THREE-STRAND ROPES