

Australian Standard®

Methods of test for fibre ropes

Method 2: Knotability and knot breaking force

PREFACE

This Standard was prepared by the Standards Australia Committee on Ropes and Cordage. The Standard is based on the method used by the International Union of Alpinist Associations (UIAA) for testing ropes for mountaineering.

METHOD

1 SCOPE This Standard sets out methods for measuring the knotability and knot breaking force of fibre rope.

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

AS

2193 Method for calibration and grading of force-measuring systems of testing machines

4142 Fibre ropes

4142.1 Part 1: Care and safe usage

4142.2 Part 2: Three-strand hawser-laid and eight-strand plaited

4142.3 Part 3: Man-made fibre rope for static life rescue lines

4143 Methods of test for fibre ropes

4143.1 Method 1: Dimensions, linear density, breaking force and elongation

3 DEFINITIONS For the purpose of this Standard, the definitions given in AS 4142.1, AS 4142.2 and AS 4142.3 and that below apply.

3.1 Breaking force—the maximum force recorded in breaking a test specimen.

NOTE: This is also the minimum force needed to break a test specimen.

4 PRINCIPLE

4.1 Knotability Knotability is obtained by making an overhand knot in the test specimen and inserting a tapered rod through the knot whilst the sample is under a given tension, measuring the maximum diameter to which it can be inserted.

4.2 Knot breaking force Knot breaking force is obtained by making an overhand knot in the test specimen and then determining the breaking force in accordance with AS 4143.1.

5 APPARATUS The following apparatus is required:

- (a) A conical test rod consisting of a tapered pin having a uniform increase in diameter of 1 mm for each 10 mm of length.
- (b) A tensile testing machine capable of exerting tension sufficient to break the rope being tested, allowing a constant rate of travel of the moving element and complying with the requirements for Grade B machines specified in AS 2193.
- (c) A conditioning facility for providing and maintaining a standard atmosphere of $20 \pm 2^\circ\text{C}$ and relative humidity of $65 \pm 2\%$.

6 SAMPLES AND TEST SPECIMENS

6.1 Sample A test sample shall be taken from one end of a coil selected for testing. Each test sample shall be representative of the balance of the coil.

6.2 Conditioning Condition the sample for 24 h in the atmosphere specified in Clause 5(c). Preparation of test specimens and subsequent testing shall, if possible, be conducted without removal from the standard atmosphere, otherwise within 30 min after removal from that atmosphere.

6.3 Test specimens Four test specimens, each 1000 mm in length shall be prepared.

NOTE: Two test specimens may be sufficient if knotability is determined before the knot breaking force.

7 PROCEDURE

7.1 Procedure for knotability The procedure shall be as follows:

- (a) Make an overhand knot (see Figure 1) in one of the test specimens.
- (b) Subject the length of rope to a force of 98 N for 1 min.
- (c) Remove the force and replace it with a force of 9.8 N.
- (d) Insert the conical test rod through the knot without allowing the test rod to exert any pressure on the knot and note the maximum diameter of the test rod which was able to be inserted into the knot.
- (e) Repeat the procedure on a new test specimen using an overhand knot of the opposite hand.

7.2 Procedure for knot breaking force The procedure shall be as follows:

- (a) Make an overhand knot (see Figure 1) in one of the test specimens.
- (b) Measure the breaking force of the knotted test specimen in accordance with AS 4143.1 making sure that the knot lies in the centre of the clamped region.
- (c) Record the force at which the knotted specimen broke. Note whether the specimen broke at the knot.
- (d) Repeat the procedure on a new test specimen using an overhand knot of the opposite hand.

8 EXPRESSION OF RESULTS

8.1 Knotability The knotability shall be expressed as the ratio of the maximum diameter of the test rod which could pass through the knot, to the diameter of the rope. Average the two results obtained by testing knots of each hand.

8.2 Knot breaking force The knot breaking force shall be expressed in newtons. The lower of the two breaking forces measured shall be taken as the result.