

AS/NZS 2810:1997
IWTO-30-93

AS/NZS 2810

Australian/New Zealand Standard[®]

**Wool—Determination of staple
length and staple strength**

[IWTO title: Determination of staple length and staple strength]

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The following interests are represented on Committee TX/12:

Australian Council of Wool Exporters
 Australian Testing Interests
 Australian Wool Exchange
 Australian Wool Research and Promotion Organisation
 CSIRO—Division of Wool Technology, Australia
 Department of Defence, Australia
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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TX/12 on Wool. It is identical with and has been reproduced from IWTO-30-93 *Determination of staple length and staple strength* which is largely based on AS 2810—1991 *Wool—Measurement of mean staple length and mean staple strength*. Amendment No 1 to IWTO-30-93 which was issued in October, 1995 has been incorporated.

In Australia, the Standard is proposed to supersede AS 2810—1991.

The objective of the Standard is to provide the wool industry with a method for the measurement of mean staple length, mean staple strength and the position of break in greasy wool suitable for worsted processing.

As this Standard is reproduced from an Australian Standard, the following applies:

- (a) Its number appears on the cover and title page while the International Standard number appears only on the cover.
- (b) In the source text, *substitute* the word 'shall' for the word 'must', wherever it appears, and *insert* the word 'normative' beneath the title of Appendix A.

A 'normative' appendix is an integral part of a Standard.

References to IWTO Standards should be replaced by equivalent Australian/New Zealand Standards, as follows:

<i>Reference to IWTO Standard</i>		<i>Australian/New Zealand Standard</i>	
IWTO		AS/NZS	
7	Subsampling staples from grab samples	2721	Wool—Subsampling staples from grab samples
32	Determination of the bundle strength of wool fibres	—	
38	Method for grab sampling greasy wool from bales	1363 1363.1	Wool—Grab sampling—Greasy wool Part 1: Method for grab sampling greasy wool from bales

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AUSTRALIAN/NEW ZEALAND STANDARD

Wool—Determination of staple length and staple strength**0. Brief History**

The following details the development of this Standard.

- Originally provided as an Australian Standard AS 2810.
- Prepared as a Test Method Under Examination by the Raw Wool Length Working Group of the Technical Committee.
- Adopted by the Standardisation Committee in January 1986 as a TME.
- Adopted by the Standardisation Committee and Technical Committee as a full Test Method in December 1991.
- Adopted by the Statutes and Agreements Committee in April 1992.

1. Scope

This standard sets out a method for measurement of mean staple length, mean staple strength, and position of break, of greasy wool suitable for worsted processing. Other wools may be unsuitable for testing by this method.

It is not intended that this standard should prescribe any method of performing these functions, but rather that it should provide the means of standardising each technique to the point where results are self-consistent to a high degree, can be related consistently to other techniques included in the standard, and correlate well with length after processing.

The method is applicable to staples of greasy wool drawn in accordance with IWTO-7-92*.

The method is only applicable to greasy wool. Within that category two other restrictions apply.

- (i) It is not applicable to wools with poorly defined staples.
- (ii) In determining mean staple strength, the method can only be applied to staples of sufficient length and thickness to be gripped completely in two sets of jaws used for measurement.

*The method may also be applied to staples drawn in any other way. However, the precision of the measurements will depend upon the method of drawing staples, the number of staples drawn and measured, and, if the value is to be referred to the bulk, the method of obtaining the sample. Moreover, such applications are not covered by this method for the purpose of any certification.

2. Principle

Staples drawn from greasy wool are measured to determine four characteristics for each staple; length, average linear density (clean basis), maximum force to rupture under extension, position along the length of the staple where rupture occurs (position of break).

The mean staple length and its distribution parameters are calculated; the mean staple strength is calculated in units of force per unit linear density, together with its distribution characteristics. A summary is prepared of the position of break.

3. Definitions

For the purpose of this standard, the following definitions apply:

3.1 *Average Linear density*

The clean staple mass per unit staple length at standard conditions.

3.2 *Grab sample*

The greasy wool drawn by a single operation of a grab machine in accordance with IWTO-38.

3.3 *Greasy Wool*

Wool, from sheep or shorn from sheep skins, which has not been scoured, solvent degreased, or carbonised.

3.4 *Position of break*

A value indicating where a staple breaks during extension.

3.5 *Sample*

The combined grab samples representative of the wool in a lot drawn in accordance with IWTO-38.

3.6 *Staple*

A well-defined bundle of fibres which has been removed from the greasy wool as a unit. Second cuts (see Section 3.7) are considered as staples.

3.7 *Second cut*

Staples resulting from a second attempt to shear wool from a sheep. A second cut differs from a normal staple in that both ends are severed and no tip is evident.

3.8 *Staple axis*

An imaginary line, which may be curved, along the staple in the direction of the bundle of fibres.

3.9 *Staple length*

The length of a staple projected along its axis obtained by measuring the staple without stretching or disturbing the crimp of the fibres.

3.10 *Staple strength**

The maximum force of rupture per unit of average linear density (measured on the full span of the staple, apart from the portions gripped at each end, which should be the minimum length necessary for the purpose).

4. Apparatus

4.1 Staple trays for storing staples after preparation as described in IWTO-7. Section 4.3.

4.2 A means of measuring staple length.

4.3 A means of measuring staple strength, consisting of the following:

- (a) Jaws for gripping the ends of a staple without damage or slippage.
- (b) A means for extending a staple gripped at both ends at a rate of extension in the range 50mm/s to 300mm/s.
- (c) A force transducer capable of measuring, to 1N, the peak force during extension.
- (d) A means of determining or estimating the average linear density of each staple.
- (e) A means of determining or estimating where a staple breaks during extension.

Note: A suitable instrument to perform the functions in 4.2 and 4.3 is described in Appendix A.

4.4 A means of producing the standard atmosphere of $20 \pm 2^{\circ}\text{C}$ and $65 \pm 2\%$ r.h.

5. Procedure

5.1 *Preparation of staples*

Staples shall be subsampled and prepared in accordance with IWTO-7. Approximately 60 staples shall be subsampled and at least 55 staples shall be prepared for measurement. The staples shall be kept in the standard atmosphere for at least 8 hours prior to measurement.

*Attention is drawn to differences in procedure from the method of measurement of bundle strength by IWTO-32, particularly with respect to the length of the test specimen. As defined in this clause, the characteristic of staple strength is the tenacity of the greasy staple, measured at the maximum gauge length possible for the staple and calculated on the basis of clean linear density. In some instances an additional test on staples, similar to the present one but where the staples are tested on a short gauge length that does not include the thinnest place, may add power to the prediction of processing performance.

5.2 Measurement

The procedure shall be as follows:

- (a) Before any series of measurements is made, carry out any pre-measurement checks required to ensure that the instrument is performing within its specifications. For examples, see A2.2.10 and A2.3.
- (b) Make all measurements in the standard atmosphere (see Section 4.4).
- (c) Measure and record the staple length of each prepared staple to the nearest 1mm.
- (d) Measure and record the staple strength. Record the number of staples for which there is a length result.

Note: All prepared staples shall be submitted for measurement. If the instrument fails to measure the length of some of these staples, but this rejection occurs at random, no bias in the mean value will be introduced.

- (e) If the number measured is 55 or more and represents at least 90% of the number of staples prepared for measurement, calculate and record the mean staple length and the standard deviation, each to the nearest 1mm.
- (f) Load each staple into the jaws of the instrument and extend it to rupture.
- (g) Measure and record the maximum force required to rupture each staple.
- (h) Measure and record the average linear density and position of break of each staple.

Note: In some cases, where the staple length or thickness, or both, lie outside the instrument range, an erroneous result may be recorded. These are the results to be rejected.

- (i) Calculate the staple strength of each staple.
- (j) Reject the staple strength result of a staple if its characteristics are outside the range specified for the instrument.

Note: This instruction is necessary because in some cases where the staple length and/or thickness lie outside instrument limits, an erroneous result may be obtained.

- (k) If the number of staples measured for strength is 40 or more and represents at least 66% of staples measured for length, record this number. Calculate and record the mean staple strength to the nearest 1N/ktex.

If insufficient staples are measured, the data are discarded and the lot may be subsampled again and remeasured. If it is not possible to obtain valid strength