

Interim
Australian/New Zealand Standard™

Wool—Measurement of fibre properties

**Part 1: Measurement of the fibre length
after carding of scoured or
carbonised wool**



AS/NZS 4844.1(Int):2002

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Australian Wool Exchange
Australian Wool Processors Council
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CSIRO—Division of Textile and Fibre Technology
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National Council of New Zealand Wool Interests
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PREFACE

This Interim Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TX-012, Wool, to adopt the length after carding method developed by the Wool Research Organisation of New Zealand.

This Standard incorporates Amendment No. 1 (January 2005). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The Standard sets out a method for measuring the fibre length after carding of commercially scoured or carbonised wool and includes sampling and preparation procedures. These are carried out using a mechanical sampling device, a card and a gillbox. Recommendations are made regarding the choice of suitable machines. The measurements are made using a suitable electronic instrument.

A method for the measurement of card waste from commercially scoured or carbonised wool is covered in AS/NZS 4844.2(Int):2002 *Wool—Measurement of fibre properties, Part 2: Measurement of fibre length after carding waste of scoured or carbonised wool*.

Attention is drawn to the fact that this document is an Interim Australian/New Zealand Standard and should be regarded as a developmental Standard and liable to future alteration.

During the life of the document the Committee will monitor all comment as it is received.

This Interim Standard will have a currency of two years from its date of publication. At the conclusion of that period it will either be superseded by another Standard, confirmed as an Interim Standard in its present form for a further two year period or withdrawn.

The terms ‘normative’ and ‘informative’ have been used in this Interim 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

	<i>Page</i>
FOREWORD.....	4
 SECTION 1 SCOPE AND GENERAL	
1.1 SCOPE	5
1.2 OBJECTIVE.....	5
1.3 REFERENCED DOCUMENTS	5
1.4 DEFINITIONS	6
 SECTION 2 SAMPLING AND PREPARATION	
2.1 GENERAL	8
2.2 APPARATUS.....	8
2.3 VARIATIONS TO THIS METHOD	8
2.4 SELECTION OF SAMPLES	9
2.5 SAMPLING METHODS	9
2.6 SAMPLING FREQUENCY	9
2.7 STORAGE OF GRAB SAMPLES	10
2.8 SUBSAMPLING	10
2.9 CONDITIONING OF SAMPLE.....	11
2.10 PROCEDURE FOR ADDING LUBRICANT.....	11
2.11 STORAGE PRIOR TO CARDING	12
2.12 CARDING.....	12
2.13 GILLING.....	14
2.14 SLIVER SUBSAMPLING AND PACKAGING	17
 SECTION 3 MEASUREMENT	
3.1 GENERAL	19
3.2 APPARATUS.....	19
3.3 CALIBRATION	19
3.4 PREPARATION OF TEST SPECIMENS	19
3.5 MEASUREMENT PROCEDURE	19
 SECTION 4 REPORT	
4.1 REPORT INFORMATION.....	24
4.2 PRECISION	24
4.3 MAXIMUM PROBABLE DIFFERENCE.....	25
 APPENDICES	
A GRAB MACHINE.....	26
B CARDING MACHINE.....	28
C GILLBOX	32
D APPARATUS FOR PRODUCING A TWISTED HANK OF SLIVER	33
E CALIBRATION OF A TESTING LINE USING A REFERENCE WOOL	35
F PROCEDURE FOR ACHIEVING THE RECOMMENDED LINEAR DENSITY OF A CARD BATT	41
G DETERMINING THE DRAFT OF THE GILLBOX.....	42
H PROCEDURE FOR THE COMBINATION OF LAC LENGTH VALUES FROM TWO OR MORE TEST LOTS	43

FOREWORD

Data on the fibre length after carding is of value to buyers, sellers, primary processors and manufacturers of wool products. It identifies an important parameter relevant to merchandising of the product as well as its end use, and the appropriate conditions for processing the wool into yarn. Such a parameter, when specified, enables its incorporation in commercial contracts.

Many difficulties have been experienced by the commercial sector through the application of non-standard techniques or by the use of such procedures as the single fibre length measurement of slivers. Variable repeatability and low precision have been experienced.

The length after carding test method addresses these problems, and takes into account the breakage of fibres in the carding and aligning processes.

Mill length after carding results for a given consignment of scoured or carbonised wool, will not necessarily match the results from the standard test. Results from mill production will be affected by the processing performance of the equipment in the mill, however the length after carding test result can be used for benchmarking. In the event of a dispute or challenge to the test result, it is important that any retest is performed in strict accordance with this Interim Standard.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Interim Australian/New Zealand Standard Wool—Measurement of fibre properties

Part 1: Measurement of the fibre length after carding of scoured or carbonised wool

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Interim Standard sets out a method for determining the fibre length after carding and gilling of scoured or carbonised wool, the wool initially being in the form of LAC grab samples. The method covers the following wool types:

- (a) All carbonised wool.
- (b) All scoured wool with a vegetable matter base of $\leq 2.0\%$.
- (c) If the vegetable content is not known, all scoured wool produced from greasy wool that has a measured or appraised vegetable matter base of $\leq 1.0\%$.

The procedures for sampling and for the preparation of the wool before measurement are also described.

NOTE: Whilst this Interim Standard defines the methodology being developed, it has no official status for commercial usage, unless agreed to between contracting parties.

1.2 OBJECTIVE

The objective of this Interim Standard is to provide the wool industry with a means of measuring fibre length after carding of scoured or carbonised wool for the purpose of specifying fibre lengths consistently when trading.

1.3 REFERENCED DOCUMENTS

The following documents are referred to in this Interim Standard:

IWTO AS/NZS*

- | | |
|-----------------|--|
| 0 | Introduction to IWTO specifications. Procedures for the development, review, progression or relegation of IWTO test methods and draft test methods |
| 10 | Method for the determination of the dichloromethane soluble matter in combed wool sliver |
| 12 | Measurement of the mean and distribution of fibre diameter using the SIROLAN-LASERSCAN fibre diameter analyser |
|
IWTO AS/NZS | |
| 17 | Determination of fibre length distribution parameters by means of the Almeter |

* The Australian/New Zealand Standards listed are identical adoptions of the corresponding IWTO documents.

IWTO	AS/NZS	
19	1134	Wool—Determination of wool base and vegetable matter base of core samples of raw wool
26		Glossary of terms related to sampling
28	1133	Wool—Determination by the Airflow Method of the mean fibre diameter of core samples of raw wool
47		Measurement of the mean and distribution of fibre diameter of wool using an optical fibre diameter analyser (OFDA)
52		Conditioning procedures for testing textiles
AS/NZS		
4844		Wool—Measurement of fibre properties
4844.2(Int) Part 2:		Measurement of fibre length after carding waste of scoured or carbonized wool
AS ISO/IEC		
17025		General requirements for the competence of testing and calibration laboratories
NZS		
8716		Method for the measurement of the bulk of raw wool
NZS ISO/IEC		
17025		General requirements for the competence of testing and calibration laboratories

1.4 DEFINITIONS

For the purpose of this Interim Standard definitions in the IWTO-26 and those below apply.

1.4.1 Assigned length after carding

The LAC length assigned to the reference wool by the reference laboratory.

1.4.2 Bale unit

A conventional bale, or a fixed amount of wool (not exceeding 550 kg) used in forming a bale, having a density at the time of sampling in the range appropriate to that of a conventional bale.

1.4.3 Batt

The assembly of carded fibres formed by accumulating the card web on a drum.

1.4.4 Candidate wool

Wool, procured by the reference laboratory, that is specified as a possible new reference wool.

1.4.5 Cotted wool

Wool that has become partially felted on the sheep's back; wool with a matted appearance.

1.4.6 Entangled wool

Wool that has become entangled on the sheep's back or entangled in the process of scouring.

1.4.7 LAC grab sample

A sample of scoured or carbonised wool for the purpose of measuring the fibre length after carding of scoured or carbonised wool.

1.4.8 LAC length

The mean fibre length calculated from the barbe diagram, expressed in millimetres.

1.4.9 LAC length diagram

A graph showing the percentage of fibres, by weight, having a length equal to or longer than a given value over a range of class intervals.

1.4.10 LAC subsample

The randomly drawn portion representative of the sample.

NOTE: In the case of sliver, this is each 1.2 m portion.

1.4.11 LAC test specimen

An assembly of fibres aligned at one end, obtained from the subsamples by the superposition of a series of draws by the grip unit. This is placed in the carriage of the measuring unit.

1.4.12 LAC testing line

Comprises a carding machine, gillbox, a grip unit and an electronic measuring unit, and the facilities for conditioning the wool.

1.4.13 Replicate sample

An additional sample taken in strict accordance with this Interim Standard to be retained for testing if required.

1.4.14 Sample

Wool drawn from a lot, bulk or delivery by appropriate methods.

NOTE: In the case of sliver, this is in the form of a twisted hank.

1.4.15 Sampler

A device for extracting LAC grab samples of wool from a bale unit.

1.4.16 Scoured or carbonised

Wool which has been commercially scoured or carbonised. This does not include wools that have only been fellmongery-washed.

1.4.17 Standard laboratory atmosphere

The Standard atmosphere for testing wool, maintained to IWTO-52.

1.4.18 Test lot

The group of uniquely identified bales of scoured or carbonised wool to be sampled and tested according to this Interim Standard.

SECTION 2 SAMPLING AND PREPARATION

2.1 GENERAL

A representative sample of scoured or carbonised wool is obtained by accumulating LAC grab samples taken after drying, typically from storage bins by hand sampling, or from bales or wool in the pre-compression chamber of a high density press prior to baling.

The sample is prepared for measurement by—

- (a) conditioning the sample (Clause 2.9);
- (b) lubricating the sample (Clause 2.10);
- (c) allowing the sample to reach equilibrium (Clause 2.11);
- (d) carding the conditioned sample to disentangle, blend the fibres and remove vegetable matter (Clause 2.12);
- (e) gilling the carded sliver to align and further blend the fibres (Clause 2.13); and
- (f) drawing a subsample from the gilled sliver to form a twisted hank (Clause 2.14).

2.2 APPARATUS

2.2.1 A means of extracting LAC grab samples of the appropriate mass of scoured or carbonised wool

A suitable machine is a grab machine of the type for extracting grab samples of greasy wool from conventional bales, but fitted with a spear-type grab head as specified in Paragraph A2.

2.2.2 Balance

Capable of weighing up to 4 kg with a minimum readability of 1 g.

2.2.3 Spray device

For applying a measured amount of water and carding lubricant in a fine mist to the sample.

2.2.4 Sealable containers

For the storage of wool samples (e.g. a sealed plastic bag).

2.2.5 Carding machine

Fitted with approved safety guards. Requirements for a suitable carding machine are set out in Appendix B.

2.2.6 Gill box

NOTE: Features of a suitable gillbox are given in Appendix C.

2.2.7 A device for converting a section of sliver into a twisted hank

NOTE: Suitable apparatus is described in Appendix D.

2.3 VARIATIONS TO THIS METHOD

Apparatus and/or procedures that differ from those specified in this Interim Standard shall only be used if the testing line satisfies the following:

- (a) The apparatus and/or procedure(s) shall be approved by an appropriate laboratory accreditation authority.
- (b) The testing line shall be successfully calibrated following the procedures of Appendix E.
- (c) The testing line shall be shown to be equivalent to the test lines defined in this Interim Standard using the procedures defined in IWTO-0.

2.4 SELECTION OF SAMPLES

2.4.1 Test lot size

The maximum test lot size shall be 30 tonne nett mass. Consignments larger than 30 tonne nett mass shall be divided into test lots of between 15 and 30 tonne. These test lots, which should be of approximately equal size, shall be sampled and tested separately.

NOTES:

- 1 Where possible, a test lot should be no larger than the quantity of scoured or carbonised wool required to fill a shipping container.
- 2 Weighing of bales and determination of wool base, in accordance with AS/NZS 1134 (IWTO-19), will be required in cases where LAC length results from two or more test lots are combined. The procedure for the combination of results from two or more test lots is provided in Clause 4.1.2.

2.4.2 Density of bale units

For sampling carried out with a mechanical sampler, the density of any bale unit when it is sampled shall be not less than 75 kg/m³ and not more than 450 kg/m³.

2.5 SAMPLING METHODS

The intent of the sampling procedures described in this Clause is to provide a sample, which represents the bulk material in all aspects.

NOTE: Excessive breakage or stretching of fibres during the sampling process will destroy the representativeness of the sample.

Sampling of scoured or carbonised wool shall be carried out by either of the following methods:

- (a) One or more LAC grab samples shall be taken from a bale unit by means of a mechanically driven probe.

The bale unit shall be at the pre-compression stage of pressing. The probe shall penetrate the wool in a direction that is perpendicular to the direction in which the wool is packed. The positions within the bale unit from which these LAC grab samples are taken shall be at least 100 mm apart and at least 200 mm from any wall or end of the container. The sampling depth shall be set to ensure representative samples are drawn from the bale.

- (b) A sampling method that demonstrates the following:

- (i) The method shall be capable of adjustment to ensure that the required mean LAC grab sample mass can be achieved.

NOTE: The LAC grab sample mass for the test lot should not be less than 17 g and not exceed 25 g. This will ensure that the sample mass is between 500 g to 750 g.

- (ii) The method shall be capable of achieving the precision limits given in Clause 4.2.

2.6 SAMPLING FREQUENCY

The following shall apply:

- (a) If the sampling method outlined in Clause 2.5(a) or any approved method requiring full length samples to be extracted from bale units is used, then the minimum frequency for sampling shall be one LAC grab sample per bale unit. Where the wool is sampled in accordance with Clause 2.5(b), the minimum frequency for sampling shall be not less than one LAC grab per 500 kg of scoured or carbonised wool production.

- (b) The actual sampling frequency depends on test lot size, and shall ensure that, irrespective of the sampling method used—
 - (i) the precision for the test as given in Clause 4.2 can be achieved; and
 - (ii) a minimum of 3 LAC samples, each of at least 500 g are obtained from the lot.

In the case of mechanical sampling, the minimum frequency of samplings shall be as defined in Table 1. In the case of hand sampling, the frequency of samplings shall be as to provide a minimum of 120 LAC grab samples, each of which are randomly allocated to one of the three LAC samples.

- (c) A minimum of 30 LAC grab samples in total shall be taken from a test lot for each sample. A constant frequency of sampling shall be maintained throughout the test lot.

NOTE: It is impractical to sample test lots consisting of less than 5 bale units using the recommended sampler.

- (d) For the mechanical probe method, Clause 2.5(a), the samples shall be withdrawn by either—
 - (i) a single probe penetrating the bale units as required; or
 - (ii) identical probes operating in unison or sequentially and penetrating the bale units as required.

2.7 STORAGE OF GRAB SAMPLES

2.7.1 General

The LAC grab samples shall be directed alternatively to three receptacles. The samples collected in the three receptacles shall be kept separate, and all samples shall be forwarded for testing.

2.7.2 Selection of test and replicate grab samples

One sample shall be randomly chosen to be the test sample. The other two samples shall remain separate and be stored according to Clause 2.7.3 for the purpose of retesting if required.

2.7.3 Storage of grab samples

All LAC samples shall be stored so that—

- (a) the density of the sample does not exceed that of a conventional bale (300 kg/m^3); and
- (b) the LAC samples are protected from deterioration, including insect damage, excessive moisture and direct sunlight.

2.8 SUBSAMPLING

2.8.1 General

Subsampling of the test sample or duplicate samples shall not be carried out unless required to reduce the mass of cotted or highly entangled wool.

2.8.2 Cotted or entangled wool

Where cotted or entangled wool has been sampled and the mass of the cott is greater than 20 g, the wool cott or entanglement shall be subsampled by randomly pinch sampling until a mass of 20 g has been taken.

TABLE 1
LAC GRAB SAMPLING RATES FOR DIFFERENT
TEST LOT SIZES

Number of bale units in test lot	Number of probe penetration points per bale unit	Number of LAC grab samples per probe penetration point*	Total number of LAC grab samples per bale unit
5–9	4	5	20
10–14	2	5	10
15–29	2	3	6
	1	6†	
30–45	2	2	≥3
	1	3	
46–89	1	2	2
	2	1	
> 90	1	1	1

* See Clause 2.5(a).

† Note minimum separation of grab sample positions.

NOTES:

- 1 The sampling point may be fixed relative to the bale unit boundaries provided the wool is moved relative to the sampling point between successive penetrations by at least 100 mm.
- 2 In the case where sampling is performed upon the pre-compression section of high density presses, the penetrations should not commence until the minimum allowable density (75 kg/m³) has been exceeded. Sampling should proceed from then at regular intervals until the required number of penetrations is completed. No sampling should occur once the density within the pre-compression chamber has reached or exceeded the maximum allowable density (450 kg/m³).

2.9 CONDITIONING OF SAMPLE

2.9.1 General

All LAC sample preparation processes and measurement procedures shall be carried out in the standard laboratory atmosphere as specified in IWTO-52.

2.9.2 Conditioning

The sample shall be exposed to the standard laboratory atmosphere until the sample reaches equilibrium. The sample shall be considered to have reached a stable regain when the mass change between two measurements, not less than 2 hours apart, is not more than 1% of the total mass. In the process of attaining this measurement, the sample shall be opened to a density not exceeding 25 kg/m³.

2.10 PROCEDURE FOR ADDING LUBRICANT

The procedure shall be as follows:

- (a) Weigh the sample.
- (b) Spread the sample out to cover a minimum surface area of 1 m²/kg of wool.

- (c) Spray (see Clause 2.2.3) a solution of water containing $5 \pm 0.5\%$ carding lubricant (by mass) at a rate of 6 g per 100 g (conditioned mass) of wool, evenly distributed over the entire sample.

NOTE: Selbana 4554 has been found to be a suitable lubricant. Other carding or spinning lubricants may be used provided the testing line can be calibrated in accordance with Appendix E.

- (d) To facilitate uniform dispersal of the carding lubricant, turn and thoroughly mix the sample after 10 ± 1 mL of the emulsion has been applied.

2.11 STORAGE PRIOR TO CARDING

The wool shall be stored after lubricating and before carding in a sealed container (see Clause 2.2.4) for not less than 12 hours, or more than 7 days. The sample should be stored at a density not exceeding 25 kg/m^3 .

2.12 CARDING

2.12.1 Prior to carding

The procedure shall be as follows:

- (a) The card feed sheet shall be divided into two zones that have similar width. The zones shall be separated by at least 250 mm and they shall be located at least 100 mm from the outer edge of the feed sheet as shown in Figure 1.
- (b) Samples with a mass between 500 g and 520 g shall be divided in two. Each portion of the wool sample shall be distributed uniformly along the length of the feed sheet within the marked zones.

NOTE: A suitable guide marking the zones on the feed sheet may be used to assist with spreading the sample.

- (c) The carding shall commence within 10 minutes of removal from the container.
- (d) For samples in excess of 520 g, additional portions shall be distributed over the feed sheet at the same density as the preceding portions until all of the sample is distributed. The carding machine shall not be stopped to lay further portions on the feed sheet.
- (e) The feed sheet shall be marked in intervals representing the space taken up by 100 g of wool distributed lengthways.

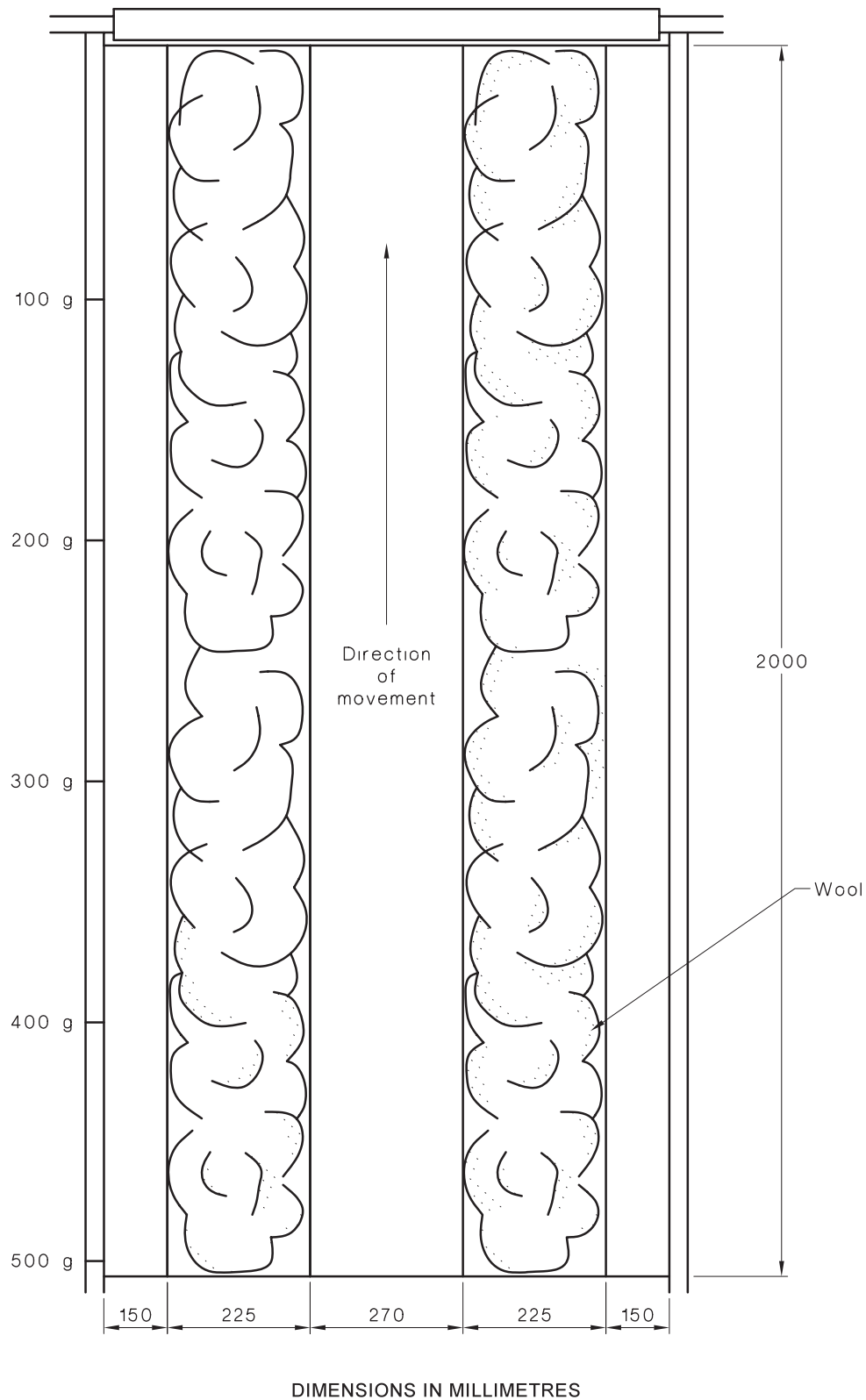


FIGURE 1 DISTRIBUTION OF WOOL ON THE FEED SHEET FOR THE RECOMMENDED CARDING MACHINE

2.12.2 Carding procedure

The procedure shall be as follows:

- (a) Remove a 500 ± 20 g portion from the container (see Clause 2.2.4) and distribute it on the feed sheet according to Clause 2.12.1.
- (b) Start the carding machine (see Clause 2.2.5) and when a consistent density has reached the doffer roller, bring the web of carded fibre over the wooden roller and across the batt drum (Figure 2).

To encourage the first fibres to adhere to the drum and thus commence the formation of a batt, hold the first fibres against the surface for one revolution of the drum.

- (c) Remove the batt from the drum after the appropriate number of drum revolutions and commence the formation of another batt. Check the batt linear density once a month (see Appendix F).

NOTE: Approximately 35 revolutions of the batt drum will produce a batt conforming to the recommended linear density if a feed rate of 4.5 kg/h is employed for the carding machine (as described in Appendix B).

- (d) Identify the leading end (L_1) of each batt for the next stage (see Figure 2).
- (e) Continue to form batts until the last of the sample enters the feed roller.
- (f) Stop accumulating fibres on the batt drum immediately wool has ceased entering the feed rollers. Discard all subsequently carded wool. Discard any batts having linear densities less than 60 g/m that cannot be combined in the manner described below. A minimum of four batts of the required linear density is necessary for subsequent processing. Combine batts by laying one on the other(s) with the leading (L_1) ends together.

NOTE: Two or more batts may be combined for subsequent processing provided the sum of their linear densities is in the range of 75 ± 20 g/m.

- (g) Run the carding machine with no wool entering the feed rollers for sufficient time that thorough self-cleaning can occur.
- (h) Before the carding of the next sample commences, clear away loose wool from the doffer/batt drum area to avoid cross-contamination of samples.

NOTE: If a card waste test is required refer to AS/NZS 4844.2(Int).

2.13 GILLING

2.13.1 Setting the draft

The draft settings and the number of ends recommended in Clause 2.13.2 ensure that the linear density of the final gilled sliver is in the range appropriate for the test.

Three gillings shall be carried out.

2.13.2 Setting the gill

The following settings are recommended:

- (a) Draft— 4.0 ± 0.5 .
- (b) Ratch— 35 ± 1 mm.

The draft defined above is the total draft of the device used. A procedure for determining the draft is specified in Appendix G.

NOTE: These settings have been determined on New Zealand wool and are under review for Australian wool.