

Australian/New Zealand Standard™

Wool—Fleece testing and measurement

Method 2: Determination of washing yield and clean fleece weight

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee TX/12, Wool to supersede AS/NZS 4492.2(Int):1997.

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.

METHOD

1 SCOPE This Standard sets out procedures for determining the washing yield of a sample taken from a greasy fleece, and the clean fleece weight of the fleece from which that sample was drawn.

2 OBJECTIVE The objective of this Standard is to provide the wool industry with a method of determining the washing yield and clean fleece weight of wool for the purpose of ranking sheep.

3 APPLICATION When this Standard is used for making direct comparisons between sheep, the sheep shall be from the same drop (age group); they shall have been run together under the same conditions for the period of wool growth to which the measurements refer; and all wool samples shall have been taken from the same site on each sheep.

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

AS/NZS

4492 Wool—Fleece testing and measurement

4492.1 Method 1: Weighing and sampling greasy wool for fleece testing and measurement

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

5.1 Clean fleece weight—the mass of the fleece obtained by multiplying the greasy fleece weight by the washing yield divided by 100.

5.2 Greasy fleece weight—the mass of greasy wool shorn from the sheep prior to skirting, excluding the belly wool.

5.3 Washing yield—the oven-dry mass of scoured wool expressed as a percentage of the greasy mass of wool, corrected to a regain of 16%.

6 PRINCIPLE When the size of the sample exceeds that required for the test, a subsample is taken, representative of the sample and hence of the fleece. The subsample mass is used in the calculation of washing yield.

The subsample is weighed, scoured to remove material other than wool fibre or vegetable matter, dried to constant mass in known conditions of temperature and humidity, and weighed.

Washing yield is calculated from these masses, and clean fleece weight may be calculated from the washing yield and the greasy fleece weight (see AS/NZS 4492.1).

7 APPARATUS The following apparatus is required:

- (a) A scouring device.
- (b) A drying device.
- (c) A balance with a readability of 0.1 g or better

NOTE: An analogue balance with marked increments of not more than 0.2 g or a digital balance with a least count of not more than 0.1 g is suitable.

8 PROCEDURE FOR DETERMINING WASHING YIELD AND CLEAN FLEECE WEIGHT

8.1 Subsampling The following shall apply:

- (a) The subsample shall remain representative of the sample from which it was taken.
- (b) For the determination of washing yield and the measurement of mean fibre diameter only, a mass of not less than 30 g shall be used. When residual grease and residual ash are determined in conjunction with an airflow determination for fibre diameter, a subsample mass of not less than 50 g shall be used.
- (c) The subsample mass shall not exceed that which results in acceptable levels of residuals after scouring (see Clauses 8.2(c) and 8.2(d)).
- (d) Weigh the subsample to 0.1 g.
- (e) Record the mass of the subsample to 0.1 g.

NOTE: Where fibre diameter is to be measured, the scoured subsample resulting from measurement of washing yield may be used.

8.2 Scouring The following procedures apply:

- (a) Scouring shall be by an aqueous method.
- (b) Where applicable, when determined in accordance with either Appendix A or Appendix B, the mass of the sieve contents as a percentage of the combined mass of the greasy subsamples shall not exceed 0.3% of the mass of the subset of subsamples before scouring.

NOTE: Good laboratory practice indicates that fibre loss during scouring should be monitored systematically on a subset of subsamples. Any preparation of the sample before scouring, and scouring methods, should not cause excessive loss of fibre, damage the wool, or render it invalid for any subsequent testing.

- (c) Where applicable, when determined in accordance with Appendix C, the number of subsamples with more than 2% grease shall not be more than 5% of the number of subsamples in the analysis group.

- (d) Where applicable, when determined in accordance with Appendix D, the number of subsamples with more than 2.5% ash, shall not be more than 5% of the number of subsamples in the analysis group.

NOTES:

- 1 Residual levels of less than 2% for grease, and less than 2.5% for ash are achievable for most wools, but very greasy or dusty samples may require a more rigorous scouring program to achieve this result.
- 2 It is good laboratory practice to undertake systematic monitoring of the residual grease and dust (ash) levels as described in Appendix C and Appendix D or equivalent methods. When fleece testing laboratories do not have the facilities or expertise to conduct these analyses, they should have the analyses done in a laboratory equipped to conduct the measurements.

8.3 Determining oven-dry mass The following shall apply:

- (a) Wool or vegetable matter shall not be lost from the subsamples on transferral from the scour or during drying or weighing.
- (b) Drying cans or other containers used to hold the subsamples shall be clean and free of debris from previous subsamples.
- (c) Drying shall be carried out using air at a temperature of $105 \pm 2^\circ\text{C}$ (see Note 1).
- (d) If a forced air drier and drying cans are used—
 - (i) the size and shape of the drying can shall be such as to minimize uneven flow of air through the subsample (see Note 2);
 - (ii) the drying can shall be fitted with mesh ends, with apertures not larger than $150 \mu\text{m}$, to prevent loss of either wool fibre or vegetable matter during drying;
 - (iii) the mesh ends of the drying can shall be strong enough to retain the subsample under the full force of the drying air;
 - (iv) the subsample shall be packed evenly into the drying can so as to achieve a uniform packing density (see Note 2); and
 - (v) drying positions not in use shall be blocked off.
- (e) If the subsample is to be weighed hot while inside a drying oven, the inlet and outlets ports of the oven shall be closed during weighing so that draughts or convection currents do not interfere (see Note 3).
- (f) The balance shall be shielded to shut out draughts (see Note 3).
- (g) Weighing shall be undertaken using a balance with a readability of 0.1 g or better.
- (h) The subsample shall be considered dry when the mass loss, at the end of the estimated drying time, is less than 0.1% per minute of the previously recorded mass of the subsample over an interval equal to at least 30% of the estimated drying time, but not less than 5 min. The following is an example:

Estimated drying time	=	30 min
30% of estimated drying time	=	9 min
Scoured, dried mass after 30 mins	=	20.0 g
Scoured, dried mass re-measured after 39 mins	=	19.7 g

The loss is 0.3 g and therefore the sample
is not dry, as 0.1% of $20.0 \text{ g} \times 9 \text{ mins}$ = 0.18 g

Scoured, dried mass re-measured after 48 mins = 19.6 g

The loss is 0.1 g and therefore the sample
is dry, by definition, as 0.1% of $19.7 \text{ g} \times 9 \text{ mins}$ = 0.1773 g

- (i) Where electronic monitors are used to detect completeness of drying, the mass need only be recorded once.
- (j) Record the mass of the oven-dry, scoured subsample, to 0.1 g.

NOTES:

- 1 105 ±2°C is the temperature range used during drying for IWTO certification. Departure from this range may result in under-drying or over-drying of the subsamples.
- 2 Low density or uneven packing of the subsample in the drying can may permit air channelling (i.e. when the air flows more easily through one part of the subsample than another), which may cause the subsample to attain a constant mass before drying is complete.
- 3 A simple test for freedom from interfering effects is to observe the fluctuations in scale reading of a subsample which has been dried for twice the normal drying time. Variations in reading during 30 s of continuous observation should not exceed 0.1 g.
- 4 The recorded oven-dry mass is influenced by the ambient temperature and the relative humidity of the air used for drying, where they differ from 20°C 65% RH. The correction for this effect is small and considered unnecessary for fleece measurement. For information, these correction factors are given in the table in Appendix E.
- 5 The oven-dry mass recorded is influenced by the size of the drying can and the volume of wool therein, as the air remaining in the can becomes lighter when heated. This is known as the 'buoyancy' effect. The correction for this effect is small and considered unnecessary for fleece measurement. For example, from core testing, buoyancy correction factors for approximately 90 g of wool in a hot can weighing approximately 220 g cold are typically 0.1 to 0.25 g.
- 6 When drying cans are used on a forced air drier, to maintain a uniform temperature of 105 ±2°C throughout the subsample, it may be necessary to shroud the cans on the drier with a shield which ensures a flow of the exhaust air around the cans inside the shield.

9 CALCULATIONS

9.1 Calculation of washing yield The washing yield shall be calculated using the following equation:

$$\text{Washing yield} = \frac{\text{mass of the oven-dry scoured subsample}}{\text{mass of the greasy subsample}} \times 116 \quad \dots (1)$$

$$\text{e.g. Mass of the greasy subsample} = 30.0 \text{ g}$$

$$\text{Mass of oven-dry scoured subsample} = 20.0 \text{ g}$$

$$\begin{aligned} \text{Therefore, washing yield} &= \frac{20.0}{30.0} \times 116 \\ &= 77.3333 \\ &= 77.3\% \text{ (rounded to the nearest } 0.1\%) \end{aligned}$$

9.2 Calculation of clean fleece weight The clean fleece weight shall be calculated using the following equation:

$$\text{Clean fleece weight} = \frac{\text{greasy fleece weight} \times \text{washing yield}}{100} \quad \dots (2)$$

$$\text{e.g. Greasy fleece weight} = 4.5 \text{ kg}$$

$$\text{Washing yield} = 65.5\%$$

$$\begin{aligned}\text{Therefore, clean fleece weight} &= \frac{4.5 \times 65.5}{100} \\ &= 2.9475 \\ &= 2.9 \text{ kg (rounded to the nearest} \\ &\quad 0.1 \text{ kg)}\end{aligned}$$

10 REPORT The following shall be reported:

- (a) The washing yield to 0.1%.
- (b) If required, the clean fleece weight to 0.1 kg.
- (c) A reference to this Australian/New Zealand Standard, i.e. AS/NZS 4492.2.

APPENDIX A

SYSTEMATIC MONITORING OF FIBRE LOSS FROM SUBSAMPLES SCoured INDIVIDUALLY

(Normative)

A1 SCOPE This Appendix sets out a method for monitoring loss of fibre from wool subsamples scoured one at a time, e.g. manually in beakers.

A2 PRINCIPLE Scour liquor is filtered and the residue is collected, dried and weighed. The mass of the residue is expressed as a percentage of the mass of all the greasy subsamples used for the test.

A3 APPARATUS The following apparatus is required:

- (a) A 75 μm sieve of sufficiently large capacity to prevent flooding during measurement of fibre loss.
- (b) A flotation vessel of 1 to 2 L capacity for separating, by flotation, the short wool fibres retained by the 75 μm sieve from associated sand and other heavy impurities.
- (c) A balance with a readability of 0.01 g or better.

NOTE: An analogue balance with marked increments of not more than 0.02 g or a digital balance with a least count of not more than 0.01 g is suitable.

- (d) A ventilated drying oven, capable of maintaining a temperature of $105 \pm 2^\circ\text{C}$.

A4 GENERAL RECOMMENDATIONS The following practice should be observed:

- (a) All types of wools tested by a laboratory should, over time, be included in the measurements of fibre loss.
- (b) The fibre loss should be measured on not less than 50 subsamples within a two-week period after adoption of this Standard by the laboratory and thereafter fibre lots of 100 subsamples should be measured at intervals of 6 months or less for monitoring purposes.
- (c) If the fibre loss expressed as a percentage of the mass of the dried subsample exceeds 0.3, the scouring system should be reviewed and procedures implemented to reduce the percentage fibre loss to 0.3 or less.

A5 PROCEDURE The procedure shall be as follows:

- (a) After removing the subsample from the container in which it was scoured and rinsed, pour all liquid used to scour and rinse each subsample, through the 75 μm sieve prior to discarding the liquid.
- (b) Repeat for the further subsamples (see Paragraph A4(b)) without removing any material from the sieve.
- (c) Place the sieve in the flotation vessel containing clean, warm water and agitate, preferably with a water spray. Leave to stand until any sediment such as dirt settles.
- (d) Pour any floating wool and vegetable matter into the 75 μm sieve which has previously been weighed dry and empty to 0.01 g.
- (e) Dry sieve and contents in an oven at $105 \pm 2^\circ\text{C}$.
- (f) Weigh the dry sieve and contents and, by subtracting the dry, empty tare weight of the sieve, determine the mass of the contents to 0.01 g.
- (g) Calculate the mass of the contents as a percentage of the total mass of all the greasy subsamples used for the test.