Economic and Social Council

Economic Commission for Europe

Steering Committee on Trade Capacity and Standards

Working Party on Agricultural Quality Standards

Specialized Section on Standardization of Meat

Thirty-first session
Geneva, 28 and 29 August 2023
Item 5 of the provisional agenda
Revision of standards: Bovine Meat – Carcases and Cuts

Proposed revisions to the Standard for Bovine Meat – Carcases and Cuts – text on meat quality standards with images

Submitted by the rapporteur's group

Summary

This document is complementary to, and should be read with, document ECE/CTCS/WP.7/GE.11/2023/3. It includes images and photos for the proposed revised text on meat quality standards which are important for the understanding of the proposed revised text, but which had not yet been received when document ECE/CTCS/WP.7/GE.11/2023/3 was submitted for translation.

The Specialized Section is invited to consider the images in this document alongside document ECE/CTCS/WP.7/GE.11/2023/3.

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Proposed revised text on meat quality standards

1. Bovine carcase assessment

The following bovine meat quality standards are a benchmark for the measurement of the saleability and eating quality characteristics of bovine carcases using a uniform set of standards under controlled conditions. Assessments are to be made by qualified eligible assessors and the results are recorded for each carcase assessed, and provide a means of (carcase) selection according to individual contract specifications prior to packaging.

Assessment results also allow producers to select breeding stock based on performance and to customize feeding regimes to suit particular markets.

These characteristics include the colour of meat and fat, the amount of marbling of the carcase skeletal ossification and pH measurement standards.

Figure 1
Carcase assessment

Source: AUS-MEAT Limited.

2. Carcase pre-assessment conditions

Carcase presentation for assessment

Carcases, sides, or quarters are presented in a manner that will allow sufficient time and space for the assessor to effectively perform the assessment. All sides or quarters must be present at the time of assessment.

Beef carcases may be ribbed at any site between (caudal) to the 5th and 13th rib except for veal carcases which may be assessed at any site between (caudal) to the 4th and 13th rib.

The assessment site must be below the assessor's eye level and at a height that allows the assessor to use approved viewing angles.

Assessment site presentation

There are two approved ribbing methods for carcase assessment

  (i) Full ribbing method

  (ii) Spencer roll method

The full ribbing method

The *M. longissimus dorsi* must be sufficiently exposed using the full ribbing method to provide an unrestricted view of the assessment site and allow unrestricted use of lighting, marbling, meat colour and fat colour reference standards and the calculation of the eye muscle area (EMA).

Figure 2
Full ribbing method

Source: AUS-MEAT Limited.

The Spencer roll method

The Spencer roll must be sufficiently freed from its rib attachment to provide an unrestricted view of the assessment site and allow effective use of lighting, marbling, meat colour (beef/veal) and fat colour reference standards. The Spencer roll method is unsuitable for measurement of EMA.

Figure 3
Spencer roll ribbing method

Source: AUS-MEAT Limited.

Prior to assessment commencing, the assessment site must be inspected to ensure that the site does not have traces of bone dust or any other defects that may affect the accuracy of the assessment.

The assessment site surface must not be twisted or undulating.

Carcase ribbing and assessment time constraints

To ensure carcases have met their ultimate pH prior to assessment, ribbing and assessment must only proceed after the following period post slaughter has elapsed:

> (i) 8 hours, where carcases have been effectively electrically stimulated; or

> (ii) 18 hours, where carcases have not been effectively electrically stimulated

(iii)   Other time periods approved under a controlled pH decline system.

Ultimate pH

Electrical inputs accelerate the rate of pH decline and, therefore, will reduce the time for the ultimate pH to be reached. Carcases that receive no electrical inputs and are chilled rapidly may take 24 or even 48 hours for the ultimate pH to be achieved; however, in commercial practice, most carcases will be at, or very close to, their ultimate pH by 18 hours. Chiller assessment cannot be undertaken until the loin muscle has reached its ultimate pH.

Carcases that have received several electrical inputs may reach their ultimate pH within a few hours of slaughter and, thus, can be assessed at an earlier time than would otherwise be permissible.

Controlled pH decline system

The rate of pH decline can impact on the predictability of eating quality, specifically by falling too slow and therefore increasing the potential for cold shortening or by falling too fast and increasing the probability of heat shortening.

The well documented "cold shortening" effect can be controlled by ensuring that electrical input levels are set so that the pH of the *M. longissimus dorsi* falls to below pH 6.0 before the temperature falls below 15°C.

The potential for "heat shortening" can be controlled by ensuring that electrical input levels are set so that the pH of the *M. longissimus dorsi* does not fall below pH 6.0 with the temperature above 35°C.

To ensure optimal eating quality the pH of the *M. longissimus dorsi* must

(i)   remain at or above pH 6.0 while the temperature of the muscle is at or above 35°C; and

(ii)   be below pH 6.0 prior to the temperature of the muscle falling below 15°C.

Figure 4
pH / Temperature window requirements
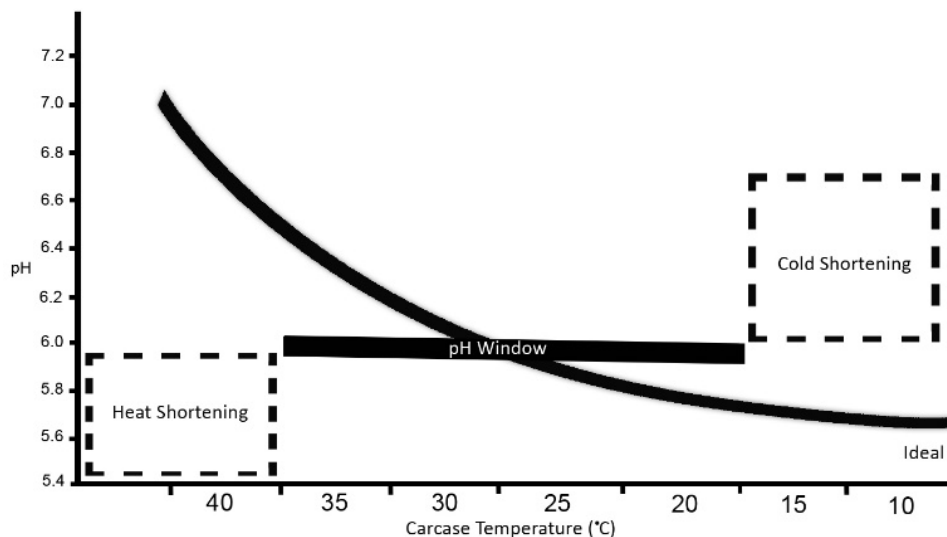
Source: AUS-MEAT Limited.

Assessment must not commence until 20 minutes has elapsed after ribbing or refacing, or until an additional period has concluded if a greater time lapse is necessary to allow the meat surface to effectively bloom.

Assessment may continue until 3 hours post ribbing or refacing. Assessment may only continue whilst there is no evidence that the colour at the assessment site has progressed past the blooming stage.

Where an oxygen impermeable film has been applied to the exposed *M. longissimus dorsi* immediately after ribbing, the time requirements of these standards apply from the time at which the film is removed.

Where the time post ribbing has exceeded 3 hours without the application of an oxygen impermeable film, the assessment site shall be refaced prior to assessment by removing a minimum of 3 mm of meat and fat tissue. The assessment site will also need to be refaced where there is evidence of assessment site damage.

Temperature of carcase prior to assessment

Assessment may only proceed providing the temperature of the *M. longissimus dorsi* is 12°C or below. The recommended temperature for assessment is between 4°C and 8°C.

The muscle temperature must be taken by inserting the thermometer probe or shaft into the centre of the *M. longissimus dorsi* parallel to and approximately 25 mm cranial to the assessment surface.

3. Carcase assessor technique

Assessment position

Measurements conducted at the assessment site must be determined with the assessor standing within the position boundaries. The assessment site must be always below the assessor's eye level.

The angle from the assessor's eye to the assessment surface must be between 35 and 50 degrees for beef and between 45 and 70 degrees for veal and should remain constant for all assessments. The assessment standards must be held in a position that eliminates light reflection and shadows.

Figure 5
Technique and positioning
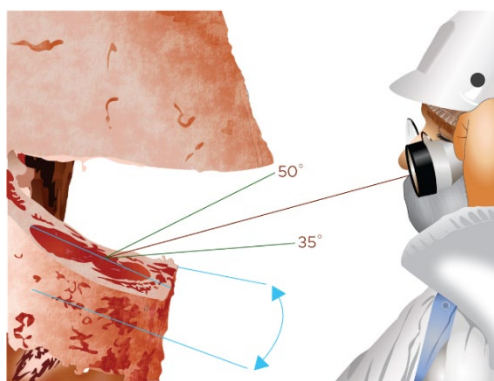
Source: AUS-MEAT Limited.

Lighting requirements

The standard light source must be held at a distance from the assessment site that provides a light intensity at the *M. longissimus dorsi* of between 1,400 lux and 3,000 lux with an even distribution of light.

The light intensity must be determined using a light meter that is held as close as possible to the assessment site and at a similar distance from the torch to the distance between the torch and the assessment site during assessment. The light must be aimed directly at the light meter receptor and the light meter receptor must be at as near as possible to 90 degrees to the direction of the light beam.

4. Meat quality standard measurements

Meat quality standards are made available to persons who have participated in a certified training course and have the recognised knowledge and skills to be able to perform the duties as described in this chapter.

Meat colour

Meat colour is the predominant colour of the rib eye muscle (*M. longissimus dorsi*). Meat colour (beef and/or veal) is assessed on the chilled carcase at the bloomed surface of the rib eye muscle area (*M. longissimus dorsi*) and is scored against the colour reference standards.
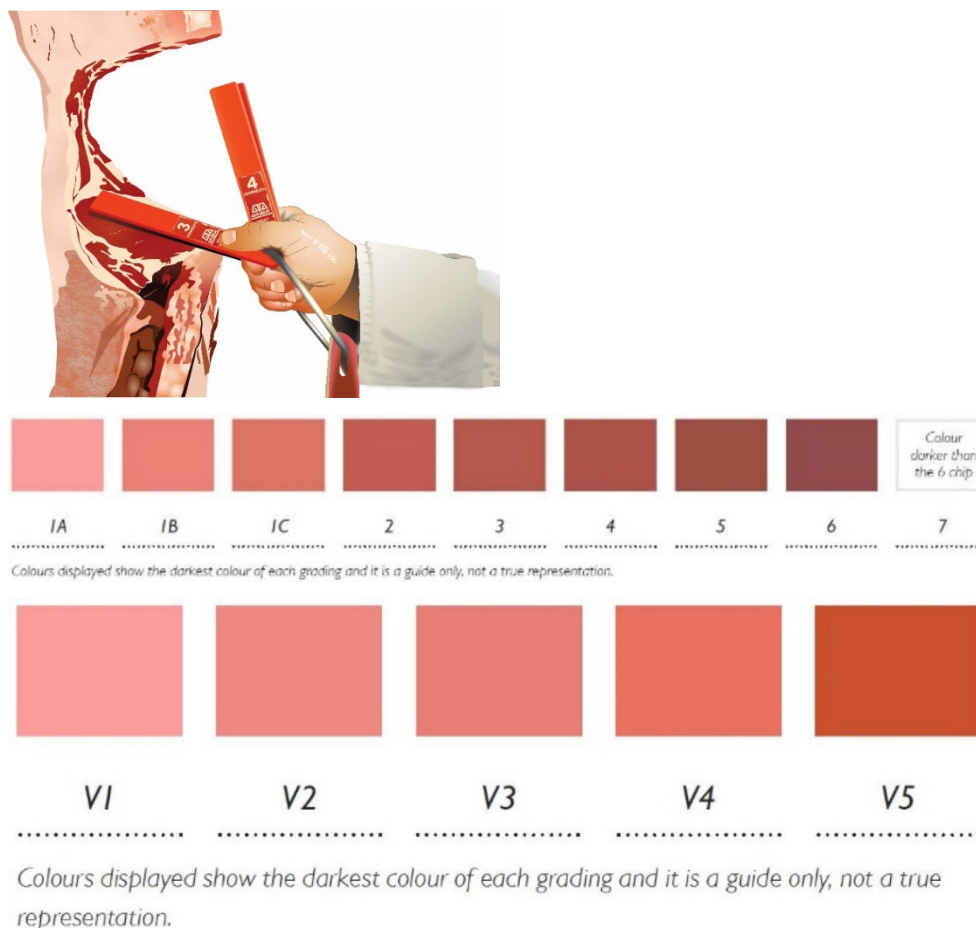
Where the meat colour falls between two of the reference standards, the number corresponding to the darker of the reference standards shall be assigned to the carcase.

If the meat colour matches that of an individual meat colour reference standard the carcase is given the score of that reference standard.

Beef meat colour standards range – (1A) to (7). Veal meat colour standards range – (V1) to (V5)

Figure 6
Meat colour and reference standards

Source: AUS-MEAT Limited.

Fat colour

Fat colour is the intermuscular fat lateral to the rib eye muscle. Fat colour is assessed on the chilled carcase and scored against the fat colour reference standards. Fat colour is assessed by comparing the intermuscular fat colour lateral to the *M. longissimus dorsi* muscle and adjacent to the *M. iliocostalis* with reference standards.

Where the fat colour falls between two of the reference standards, the number corresponding to the more yellow of the reference standards shall be assigned to the carcase.

If the colour matches that of one of the standards, the carcase is given the score of the matching standard.

Fat colour standards range – (0) to (9).

Figure 7
Fat colour reference standards

Source: AUS-MEAT Limited.

Marbling

Marbling is the intramuscular fat that is deposited between muscles fibres of the *M. longissimus dorsi* muscle.

Marbling is assessed on the chilled carcase and scored by comparing the proportion of marble fat to meat at the surface of the assessment site which lies within the *M. longissimus dorsi* boundary.

Fat within the *M. longissimus dorsi* that is attached to the edge of the *M. longissimus dorsi* may be included as marbling fat from the point of intrusion at which it narrows to 1 mm in width, in an undisturbed state, for the first time.

Marbling is assessed and scored against marbling reference scores (see image below). The marbling scores can be used to assess

(i) The amount of marbling: (0) to (9)

(ii) The fineness and distribution of marbling (100) to (1,190) in increments of 10.

Both scores may be used together to provide more detail about the product.

Marbling scores may be used in the prediction of eating quality.

Figure 8
Marbling reference scores
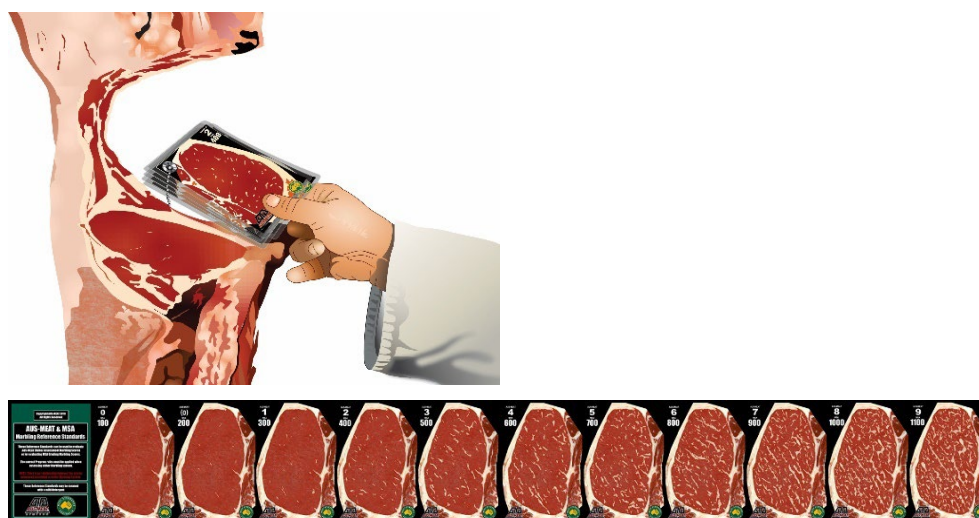
Source: AUS-MEAT Limited.

Eye muscle area

Eye muscle area (EMA) is the area of the surface of the *M. longissimus dorsi* at the ribbing site. Calculated in square centimetres, EMA may be measured at the 10th, 11th, 12th or 13th rib.

EMA can be measured manually or by using approved equipment.

When EMA is measured manually a plastic grid is used. The grid is placed over the *M. longissimus dorsi* and the number of square centimetres in the eye muscle boundary are counted. If any part of the centre dot of a grid square falls on or in the eye muscle boundary that square is counted. If a centre dot falls outside the eye muscle boundary the square is not counted.

The *M. longissimus dorsi* must be in situ and its shape must not be distorted.

EMA is not reported where carcases have been assessed using the Spencer roll ribbing method.

Carcase maturity

Carcase maturity is an assessment of the physiological development of a beef carcase determined by the degree of ossification of the dorsal spinous processes of the vertebrae, the fusing of vertebrae, and the shape and colour of the rib bones.

The score applied to each carcase should be that which most closely represents the descriptions provided in the carcase maturity chart.

The carcase maturity chart represents the ossification and rib characteristics of the average carcase. The rate of ossification of individual spinous processes varies between individual carcases and therefore, in individual carcases, not all areas of the spine may correlate with the chart. In these cases, the shaded area of the chart should be treated as the primary evaluation position. The most mature characteristic must be evaluated and is used to complete the maturity score.

Carcase maturity range 100 to 590

Carcase maturity scores may be used in the prediction of eating quality.

Figure 9
Carcase maturity chart
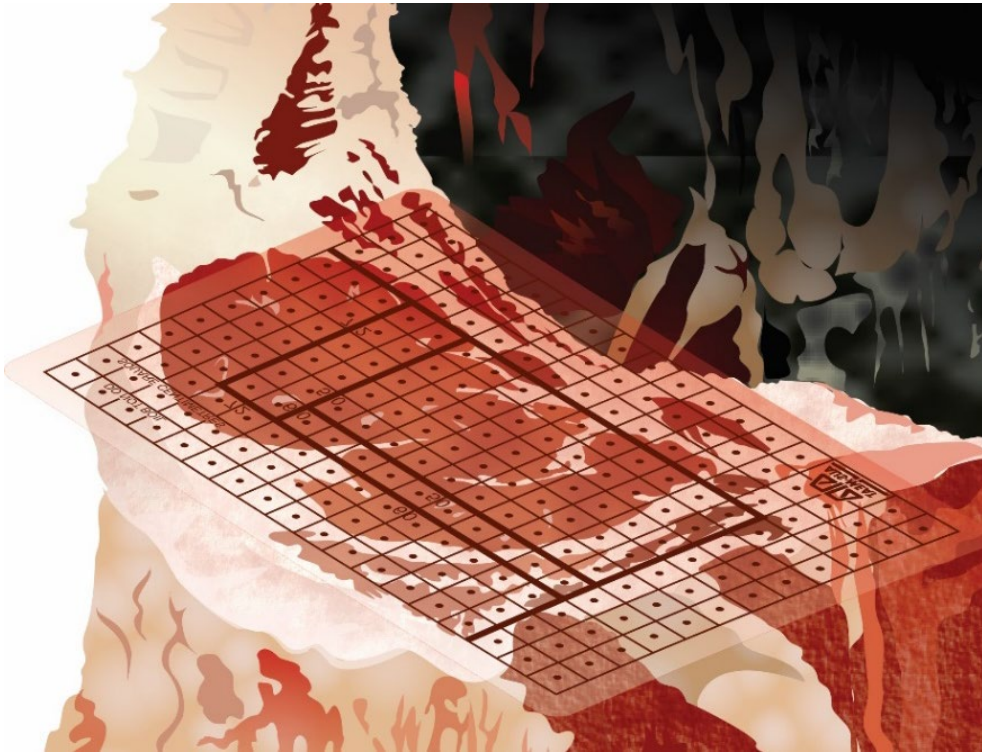
Source: AUS-MEAT Limited.

Carcase maturity chart

| Score | Approx. Age in Months | Sacral Vertebral Characteristics | | Lumbar Vertebral Spinous Process (S.P.) Characteristics | 11th–13th Thoracic Spinous Processes (S.P.) Characteristics | 1st–10th Thoracic Vertebral Spinous Process (S.P.) Characteristics | Rib Bone Characteristics |
		Capping Characteristics	Vertebra Characteristics				
100	9	No Ossification of cartilage.	1) Distinct separation of vertebra. 2) Red, soft.	No Ossification Red, soft.	No Ossification Red, soft.	No Ossification Very red chine. Soft	Narrow & oval. Lot of blood.
110	10	Cartilage capping has started. 10%–20%	Distinct separation of vertebra.	No Ossification	No Ossification	No Ossification Red chine.	Slightly narrow. Slightly oval. Lot of blood.
120	13	Cartilage capping 30%–40%	Vertebral gaps starting.	No Ossification	No Ossification	No Ossification Red chine.	Slightly wide. Slightly flat. Lot of blood.
130	15	Advanced capping 50%–70%	Vertebral gaps closing, some separation still visible.	No Ossification	No Ossification	No Ossification Red chine.	Slightly wide. Slightly flat. Moderate blood.
140	18	Advanced capping 80%–90%	Vertebral gaps closing, some separation still visible.	No Ossification or minor spots of Ossification in one or 2 S.P.	No Ossification	No Ossification	Slightly wide. Slightly flat. Moderate blood.
150	20	Capping completed but some cartilage visible.	Vertebral gaps closing, some separation still visible.	No Ossification or minor spots of Ossification in some S.P.	No Ossification	No Ossification	Slightly wide. Slightly flat. Moderate amount of blood.
160	22	Capping completed but small amounts of cartilage visible.	Vertebral gaps closing, some separation still visible.	10%–20% Ossification in some S.P.	No Ossification	No Ossification	Slightly wide. Slightly flat. Moderate amount of blood.
170	24	Capping completed. Almost complete fusing.	Vertebra almost totally fused.	30%–40% Ossification	No Ossification	No Ossification	Slightly wide. Slightly flat. Small amount of blood.

Score	Approx. Age in Months	Sacral Vertebral Characteristics		Lumbar Vertebral Spinous Process (S.P.) Characteristics	11th–13th Thoracic Spinous Processes (S.P.) Characteristics	1st–10th Thoracic Vertebral Spinous Process (S.P.) Characteristics	Rib Bone Characteristics
		Capping Characteristics	Vertebra Characteristics				
180	27	Capping completed. Almost complete fusing.	Vertebra almost totally fused.	50%–70% Ossification in all S.P.	No Ossification or minor spots of Ossification in 1 or 2 S.P.	No Ossification	Slightly wide. Slightly flat. Small amount of blood.
190	29	Capping completed.	Vertebra almost totally fused.	80%–90% Ossification in all S.P.	Less than 25% Ossification in all 3 S.P., or 100% in any 1 S.P.	No Ossification	Slightly wide. Slightly flat. Small amount of blood.
200	30	Complete fusing.	Vertebra fused.	Almost complete Ossification.	>25% Ossification in all 3 S.P., or 100% in any 1 S.P.	Minor Ossification. Slightly red chine.	Slightly wide. Moderately flat. Traces of blood.
230	34	Complete fusing	Vertebra fused.	Almost complete Ossification.	30%–40% Ossification in all 3 S.P., or 100% in any 1 S.P.	Minor Ossification in some of the first 6 thoracic vertebrae. 10–20% in 7th–10th	Slightly wide. Moderately flat. Traces of blood.
250	36	Complete fusing.	Vertebra fused.	Almost complete to complete Ossification.	>50% Ossification in all 3 S.P., or 100% in any 1 S.P.	10%–20% Ossification in some of the first 6 thoracic S.P. 30%–50% in 7th–10th S.P.	Moderately wide. Moderately flat. Traces of blood.
280	40	Complete fusing.	Vertebra fused.	Complete Ossification.	>70% Ossification in all 3 S.P., or 100% in any 1 S.P.	>30% in the 1st–10th vertebrae.	Moderately wide. Moderately flat. Traces of blood.
300	42	Complete fusing.	Vertebra fused.	Complete Ossification.	80%–90% Ossification in all 3 S.P., or 100% in	> 30% Ossification in some of the first 6 thoracic vertebrae. 50%–70% in 7th–10th S.P.	Moderately wide. Moderately flat. Traces of blood.

| Score | Approx. Age in Months | Sacral Vertebral Characteristics | | Lumbar Vertebral Spinous Process (S.P.) Characteristics | 11th–13th Thoracic Spinous Processes (S.P.) Characteristics | 1st–10th Thoracic Vertebral Spinous Process (S.P.) Characteristics | Rib Bone Characteristics |
		Capping Characteristics	Vertebra Characteristics				
					any 1 S.P.		
350	57	Complete fusing. White.	Vertebra fused.	Complete Ossification.	Almost complete to complete Ossification.	40%–80% Ossification involving all S.P.	Wide & flat. No blood.
400	72	Complete fusing. White, extremely hard.	Vertebra fused.	Complete Ossification. White, hard.	Complete Ossification. Outlines barely visible.	Almost complete Ossification. Outline plainly visible.	Wide & flat. No blood.
500	96	Complete fusing. White, extremely hard.	Vertebra fused.	Complete Ossification. White, extremely hard.	Complete Ossification. White, extremely hard.	Complete Ossification. Outlines barely visible. White, hard.	Wide & flat. No blood.
590		Complete fusing.	Vertebra fused.	Complete Ossification.	Complete Ossification.	Complete Ossification, white chine	Wide & flat. No blood.

Source: AUS-MEAT Limited.

Subcutaneous rib fat

Subcutaneous rib fat measurement is a measurement in millimetres (mm) of the thickness of subcutaneous fat at the assessment site. Subcutaneous rib fat is measured at a specific position on the 10th, 11th, 12th, or 13th rib. Where the rib site is damaged, the other side of the carcase may be measured. Where both sides of the carcase have a damaged rib fat site, an estimated depth may be applied.

Figure 10
Subcutaneous rib fat measurement
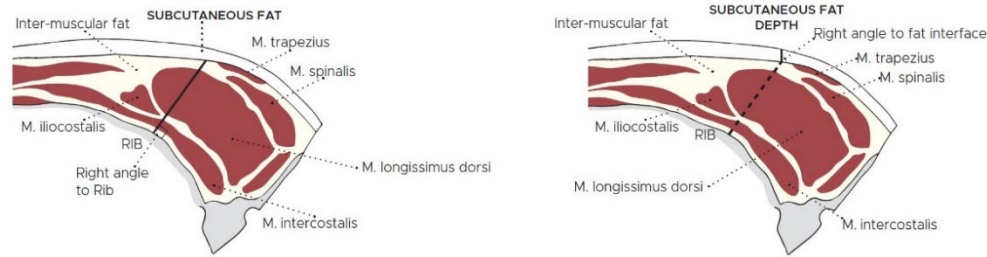
Source: AUS-MEAT Limited.

Subcutaneous rib fat measurement may be used in the prediction of eating quality.

Total rib fat

Total rib fat measurement is a measurement in millimetres (mm) of the thickness of subcutaneous and intermuscular fat at the assessment site. Total rib fat is measured at a specific position on the 10th, 11th, 12th, or 13th rib. Where the rib site is damaged, the other side of the carcase may be measured. Where both sides of the carcase have a damaged rib fat site, an estimated depth may be applied.

Figure 11
Total rib fat measurement
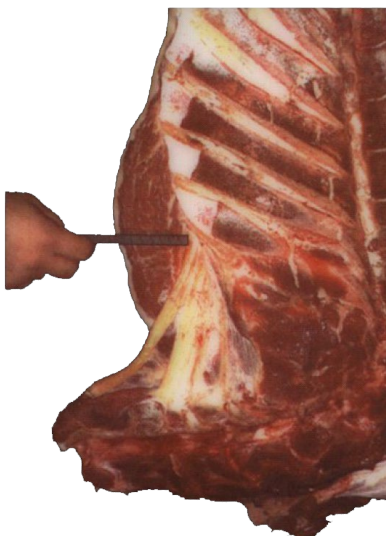

Source: AUS-MEAT Limited.

Hump height

Hump height is used to measure the greatest width of the hump muscle (*M. rhomboideus*). Research has shown a strong correlation between hump height and eating quality particularly for the predication of tropically adapted cattle and entire male cattle.

Hump height is measured using a metric ruler in gradients of 5 mm. The ruler is held horizontally to the surface of the sawn chine and parallel to the rib bones. The ruler is moved to the position of the greatest width of the hump and the measurement is taken by viewing from a site that eliminates parallax errors.

The measurement includes all the meat from the ligamentum nuchae (paddywack) and across to the most dorsal edge of the *M. rhomboideus* (hump) muscle. It does not include the subcutaneous fat on the lateral surface of the carcase.

The ligamentum nuchae and cervical vertebrae must remain in situ for hump height to be measured.

Figure 12
Hump height measurement

Source: AUS-MEAT Limited.

Ultimate pH measurement

The ultimate pH (pHu) of meat will vary from carcase to carcase depending on the amount of glycogen in the live animal prior to slaughter. The ultimate pH is an important determinant of meat eating quality. Prior to carcases being assessed they must have met their ultimate pH.

Ultimate pH must be measured using an approved device and must be undertaken with a calibrated pH meter and recorded in conjunction with temperature. The approved device must contain the Bendall correction factor for reporting pH.

Ultimate pH is measured in the *M. longissimus dorsi* (assessment site) at the quartered rib site, between the 5th and 13th ribs and is recorded to two decimal places with temperature recorded to one decimal place.

Figure 13
Ultimate pH measurement

Source: AUS-MEAT Limited.

The measurement of ultimate pH may be used in the prediction of eating quality.

5. Carcase assessor competence and eligibility

Competence

Each assessor must hold the appropriate knowledge and skills to perform the duties of a carcase assessor.

Maintaining eligibility

To ensure that meat quality assessment standards are accurately and consistently applied it is necessary for carcase assessors to meet the ongoing minimum accuracy standards to maintain their eligibility to collect carcase meat quality information.

In order to maintain currency as a carcase assessor, assessors are required to conduct successful correlations on an (8) eight weekly cycle meeting the minimum accuracy standards for eligibility.

Assessor vision standards

Assessors must meet the following vision standard criteria

(i)   Be able to determine colour in the red and yellow spectrums

(ii)   Must have visual acuity at distances from 300 mm to 1,200 mm

(iii)   Must be able to provide evidence of their ability to comply with the above vision standards.

6. Feedback and labelling standards

Assessment attribute statements are used to describe meat quality attributes relating to carcase assessment. The use of an assessment attribute statement may be incorporated into feedback and trade description labels after carcase assessment has been performed.

Feedback is defined as the detailed quality information provided at the completion of carcase assessment. Feedback may be used within the livestock and meat supply chains to benchmark carcase performance.

Where quality assessments are used to provide carcase information through feedback sheets, and as part of the trade description on product labels, there are minimum requirements for the use of symbols and the order on the labelling (see below).

Inclusion of assessment attribute statements is optional on both feedback sheets and trade description labels.

Application of symbols

When used in feedback sheets and on trade description labels the following symbols must be used if the product is described using bovine carcase assessment language and must be in the following order:

Assessment attribute	Symbol
Marbling (amount)	MB
Marbling (fineness)	ECEMB
Meat colour	MC
Veal colour	VC
Fat colour	FC

Assessment attribute	Symbol
Maturity	OM
Subcutaneous rib fat	RF
Total rib fat	TRF
Eye muscle area	EMA
Ultimate pH	pHU

Additional labelling information

Marbling (MB) – may be shown as an individual score or ranges or as a minimum score only (e.g. MB: 2, MB: 2up, MB: 9+).

Beef Meat Colour (MC) – can be shown as individual scores or ranges.

Veal Meat Colour (VC) – can be shown as individual scores or ranges.

Fat Colour (FC) – can be shown as individual scores or ranges.

A colon (:) should follow the symbols e.g. MB: 1-4 MC: 1B-4 FC: 1-3.