



Australian Intercollegiate Meat Judging

Guide to evaluation of Beef

Table of Contents

1.0 Guide to evaluation of Beef	1
1.1 What is the Australian ICMJ competition?	3
1.2 Objective.....	4
1.3 Learning outcomes	5
2.0 Beef Evaluation	6
2.1 Beef carcass evaluation.....	7
2.2 Beef carcass quality.....	8
2.2.1 Fat colour	9
2.2.2 Meat colour.....	10
2.2.3 Marbling.....	12
2.2.4 Carcass defects	14
2.2.5 Ossification (Maturity)	15
2.2.7 Hump Height (Tropical Breed Content).....	20
2.3 Beef carcass yield.....	21
2.3.1 Fat coverage.....	21
2.3.2 Muscularity	24
2.3.3 Bruising and hidepuller damage	25
2.3.4 Sex Class/Gender	28
2.4 Beef eating quality	29
2.4.1 pH and eating quality	29
2.5 Evaluating beef carcasses.....	31
2.6 Beef pricing class	35
2.7 Beef eating quality class	39
2.8 Beef primal evaluation	41
2.8.1 Evaluating butts	42
2.8.2 Beef rump and loins	46
2.8.3 Beef shortloins	49
2.8.4 Beef ribs	52
3.0 Retail cut identification	55
3.1 Beef retail cut identification	57
4.0 Saleable items identification	58

1.1 What is the Australian ICMJ competition?

The Australian Intercollegiate Meat Judging (ICMJ) Association is an organisation aimed at exposing and encouraging secondary and tertiary students into careers in the meat industry. The Association has been established and coordinated competitions annually since 1990 and is internationally recognised for its role in fostering industry talent.

The objective of ICMJ is to provide an opportunity for students to learn and to build the pool of intelligent young meat industry representatives, fired with enthusiasm who will give the Australian meat industry the expertise and drive to compete in the meat quality world of the future.

In order to foster these interests, the Association provides opportunities for students through the coaching and development of knowledge of meat appraisal and evaluation. This focus aligns with growing global emphasis on eating quality traits influencing meat quality and ensuring participants gain skills relevant to both domestic and international markets.

The competition involves students and young industry professionals competing against each other to potentially reap rewards for themselves and those they are representing, through prizes and career opportunities. Participation in the competition not only enhances technical expertise but serves as a springboard for industry connections and professional development.

Through involvement in the ICMJ competition, participants can be assured of expanding their knowledge of meat quality and evaluation techniques which are considered invaluable skills in this associated industry.

For more information about ICMJ or to keep updated with ICMJ activities, visit www.icmj.com.au or you can find us on Facebook, LinkedIn and Instagram as Australian ICMJ.

1.2 Objective

1. To foster the interest and career aspirations of students in the meat and livestock industries
2. To provide tertiary students with the knowledge of meat attributes required to accurately evaluate beef, lamb and pork carcasses and primals in accordance with customer requirements for each of these categories.

1.3 Learning outcomes

The learning outcomes of the ICMJ competition, through coaching, tutoring and competing include:

- An understanding of customer specifications with regards to quality, trimness/leanness and muscularity.
- An understanding of meat quality attributes of beef, lamb and pork carcasses and primals
- An understanding of how carcass attributes influence eating quality
- An understanding of how to assess meat quality attributes
- An understanding of how to assess trimness/leanness of a carcass and primal
- An understanding of how to assess muscularity of a carcass and primal
- The ability to accurately identify retail cuts and wholesale primals
- The ability to accurately identify the major points and features of a carcass
- The ability to use the information provided to evaluate a range of provided products
- The ability to accurately answer specified questions about a range of provided products

How to use this training manual

This training manual is intended to be used as reference prior to and during training where necessary.



2.0 Beef Evaluation

Carcases and primals

2.1 Beef carcass evaluation

There are three broad attributes of a carcass that contribute to its suitability to a given market specification or to a customer's expectation. These are grouped as:

- Eating Quality
- Yield – Trimness and muscling

When evaluating carcasses according to the above factors, it is important to consider the customer that the carcass will be supplied to. Market specifications are determined by the customer and hence carcasses should be produced and evaluated to ensure conformance to the specifications.

There is not any one carcass trait that makes an ideal product. When evaluating carcasses, the above attributes should be considered independently and then combined to produce an overall evaluation outcome.



2.2 Beef carcass quality

Quality is defined as 'fitness for purpose' indicating that quality can be interpreted as many various things depending on the purpose or end use of the carcass.

For example – Food service outlets may consider marbling to be an important quality attribute of beef whereas a retail butcher may consider fat colour an important quality attribute.

The following attributes can have impact on beef carcass quality and its 'fitness for purpose':

- Meat colour
- Marbling
- Ossification
- Fat colour
- Carcass defects e.g., blood splash (Ecchymosis)
- Hump Height (Tropical breed content)




2.2.1 Fat colour

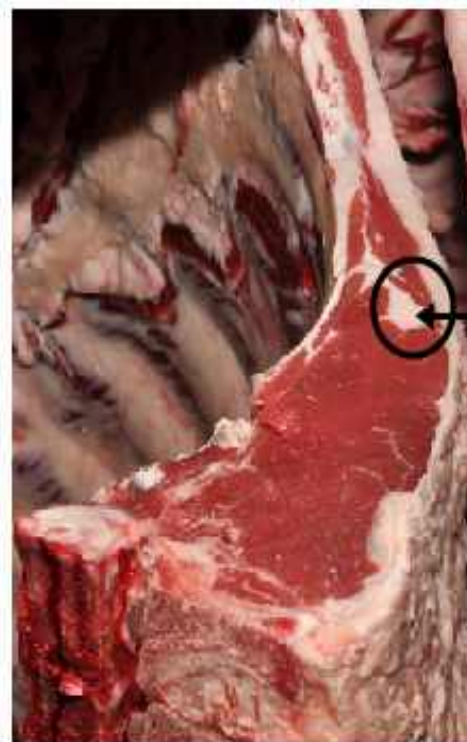
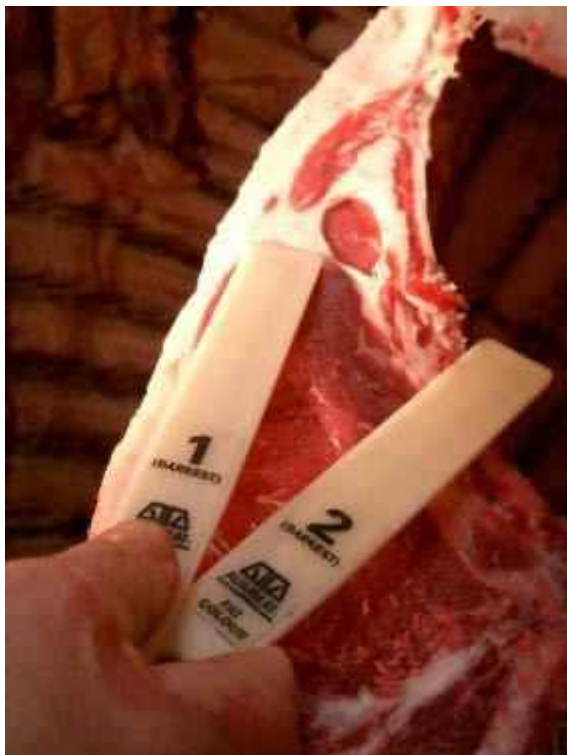
Fat colour is the colour of intermuscular fat adjacent to the rib eye muscle. It is assessed on the chilled carcass and scored against the AUS-MEAT Fat Colour Reference Standards. Fat colour is assessed by comparing the intermuscular fat colour lateral to the M. longissimus dorsi and adjacent to the M. iliocostalis with the reference standards. Where a fat colour score falls between two of the reference standards, the score of the more yellow standard is assigned.

Although, fat colour does not impact eating quality or compliance with Meat Standards Australia (MSA) grading requirements, it can affect the saleability of the carcass due to specific market preferences. Consumer surveys have shown that yellow fat colour is less visually appealing at the retail level.

AUS-MEAT Fat Colour Reference Standards

0	1	2	3	4	5	6	7	8	9
									Colour darker than the 8 chip

Colours displayed show the darkest colour of each grading and is a guide only, not a true representation.



Area of fat colour assessment

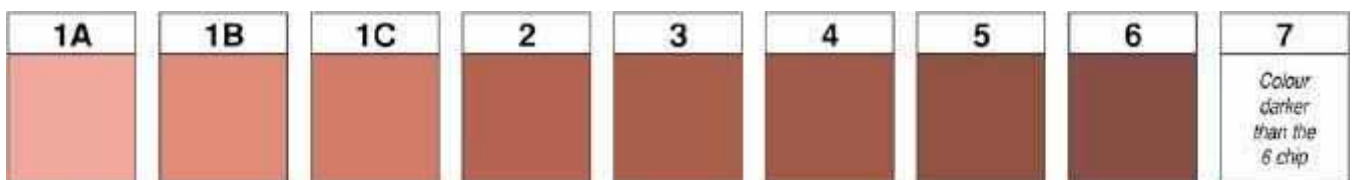
2.2.2 Meat colour

Meat colour is assessed at the rib eye muscle (longissimus dorsi) at the quartering site. It is assessed on the chilled carcass and scored against the AUS-MEAT Meat Colour Reference Standards in the area of the M. longissimus that displays the most predominant colour.

Where there is no clearly predominant colour, the darkest significant colour is assessed and scored accordingly. Where a meat colour score falls between two of the Reference Standards, the darker score is assigned to the carcass.

Meat colour has a scale of 0 –7. Consumers have shown preference for bright cherry red meat colour when purchasing at the retail level. Meat colour is often used by processing companies as specifications on their livestock grid.

AUS-MEAT Meat Colour Reference Standards



Colours displayed show the darkest colour of each grading and is a guide only, not a true representation.



Dark cutting

Meat colour above the AUSMEAT Standard of 3 may be classified as 'dark cutting' by processing companies. Dark meat colour can be attributed to pre-slaughter stress in the live animal and the depletion of glycogen reserves in the live animal. Stress can be in the form of the following:

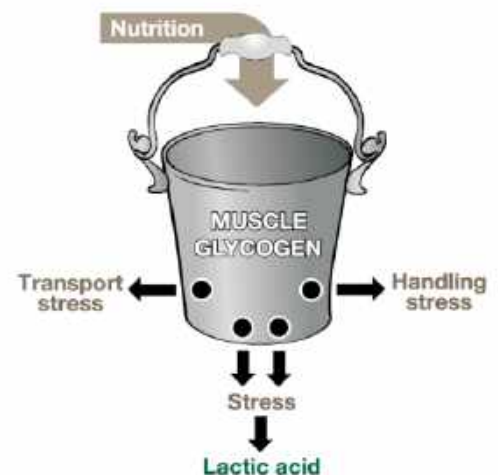
- Poor handling and transport
- Prolonged muscular activity
- Extreme temperatures
- Mixing of unfamiliar cattle
- Drafting of mobs
- Poor nutritional status

Glycogen is the energy store of muscle and can be visualised as a 'bucket' of energy. This energy reserve is used during stressful events, physical activity or after the death of the animal. Once the animal is dead, the muscle glycogen is used as the primary energy source and is converted to lactic acid. This lactic acid accumulates as the animal's blood flow and oxygen supply has ceased. This accumulation reduces the pH of the muscle.

When muscle glycogen is depleted prior to slaughter, the lactic acid production after death is limited resulting in higher ultimate pH levels and dark cutting meat. Therefore, minimising pre-slaughter stress is critical.

Other than the poor eye appeal, dark cutting meat has a range of associated quality issues:

- The pH of the meat is generally higher than the acceptable MSA requirement of pH 5.70
- Shelf life of dark cutting meat is decreased due to the high pH conditions being ideal for microbial growth
- Eating quality inconsistencies
- Cooking inconsistencies

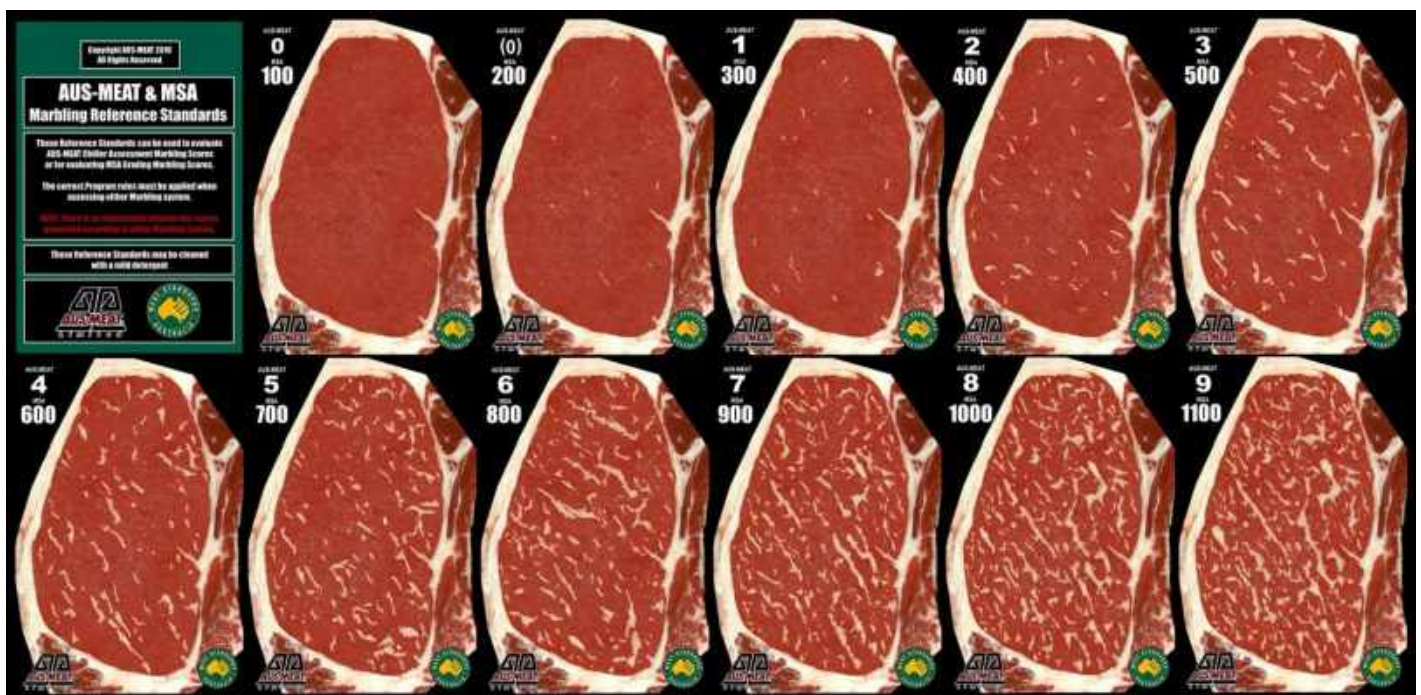


Dark cutting meat has very limited retail use and is heavily discounted.

2.2.3 Marbling

Marbling is the fat that is deposited between individual muscle fibres and is assessed at the M. longissimus dorsi (eye muscle) at the ribbing site of the carcass. Assessment of marbling should encompass three factors:

- A. Distribution of marbling within the eye muscle – ideally, marbling is evenly distributed throughout the eye muscle, ensuring the consumer has a consistent eating experience with every bite of their steak.
- B. Size of marbling pieces.
- C. Amount of marbling.



The extent of marbling expression in a carcass is genetically pre-determined. However, management factors also play a critical role in fulfilling the animal's marbling potential. Nutrition is essential in fostering the expression of marbling. It is the last body fat to be deposited and the first to be utilised by the animal as an energy source. Cattle must maintain a high nutritional plane with minimal interruptions caused by stress or growth restrictions to optimize marbling deposition.

Stressors such as poor handling, extreme temperatures, or inconsistent feeding can negatively impact marbling expression, reducing its consistency and quality in the finished product.

The effect of marbling on eating quality

Marbling has a very positive effect on eating quality but is only one of the many factors influencing it. The relationship between marbling and tenderness is variable and may interact with cooking techniques. The advantage in palatability with increased marbling may not necessarily be attributed to an increase in tenderness, but more to its impact on juiciness and flavour. Marbling is often used as a benchmark measurement for particular market specifications.



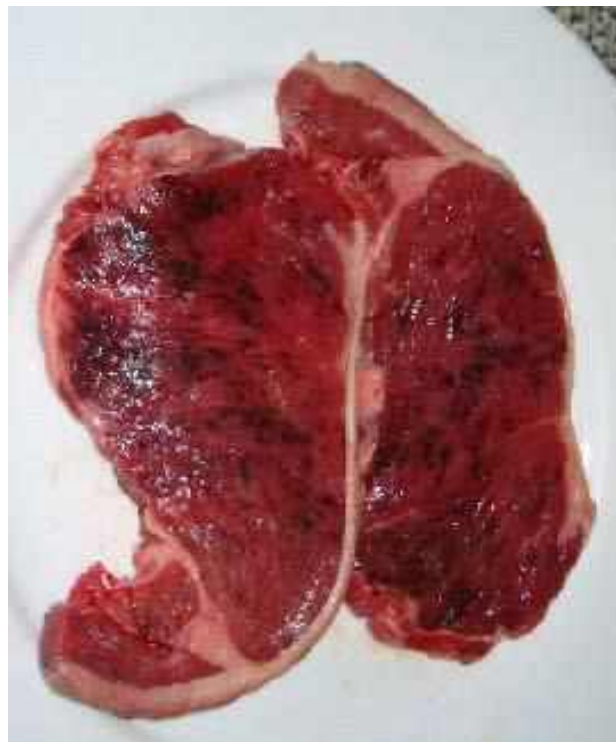
2.2.4 Carcase defects

Blood splash (Ecchymosis)

“Blood splash” or ecchymosis is characterised by localised areas of haemorrhaging within the muscles of a beef carcass. ‘Blood splash’ occurs when the animal’s blood pressure is elevated to an abnormally high level before exsanguination, causing the capillaries in the musculature to rupture. An abnormally long stun-to-stick interval at the time of slaughter is thought to be the primary cause of this condition.

Blood splash does not have any effect on eating quality but can result in a reduced eye appeal for consumers.

Ecchymosis present in the longissimus dorsi muscle



2.2.5 Ossification (Maturity)

Reference: MSA Tips & Tools MSA06 – Ossification and beef eating quality

Reference: AUS-MEAT “Handbook of Australian Beef Processing” The AUS-MEAT Language

The scoring of ossification (or maturity) provides a scale for the assessment of physiological age of a bovine animal. Ossification refers to the process where cartilage turns to bone in the spinous processes in three sections along the backbone - sacral (tail), lumbar (loin) and thoracic (head). The process starts in the sacral region in the form of red spot, which converts to hard yellow bones as ossification increases.

Processors have also realised the benefits of high growth, particularly from a dressing percentage and saleable meat yield perspective. Cattle that have had a faster growth rate and which have not suffered any setbacks do not normally deposit very much seam and/or channel fat. As a result their yields are higher. Cattle that have a consistent growth rate from birth to slaughter at 20-24 months are also likely to have a more even fat distribution.

Effect of ossification on eating quality

Beef is made up of muscle fibre groups surrounded and supported by connective tissue. Connective tissue is made up of elastin and collagen fibres. Collagen fibres form crosslinks to strengthen muscle as the animal ages. As the animal matures, these collagen fibres form crosslinks that strengthen the muscle, making it tougher during cooking and resulting in a tougher eating experience. Ossification measurements provide an indication of this collagen fibre development.

Ossification rates will vary slightly between animals. This can be due to differences in nutrition growth paths. Those animals that have experienced growth setbacks and poor nutrition will exhibit greater levels of ossification than animals of the same chronological age grown in optimal conditions.



Regions of ossification

1. Sacral region

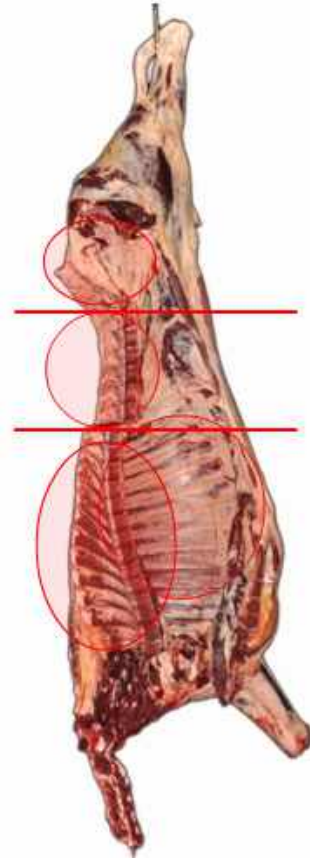
The last 5 vertebrae, tail end of the carcass

2. Lumbar region

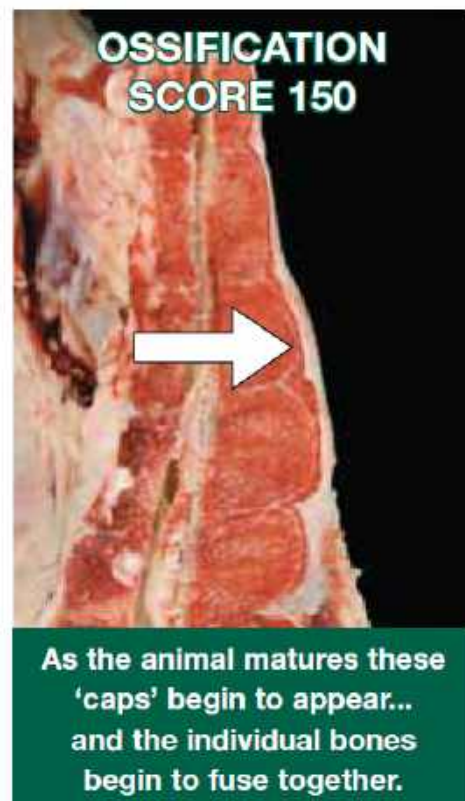
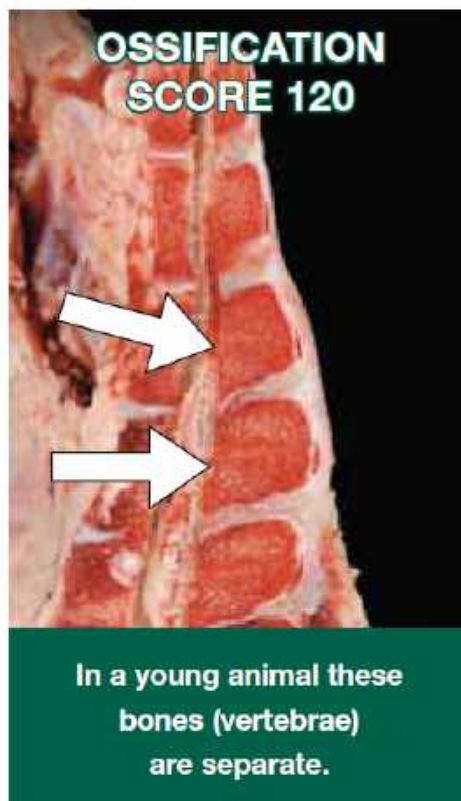
6 vertebrae in the loin region

3. Thoracic region

13 vertebrae to which the ribs are attached



The scale of ossification runs from 100–590 and follows the scale developed by the United States Department of Agriculture grading service (Table below). The following table details these scores with regards to the development of cartilage to bone in the respective regions.



Ossification Standard Table

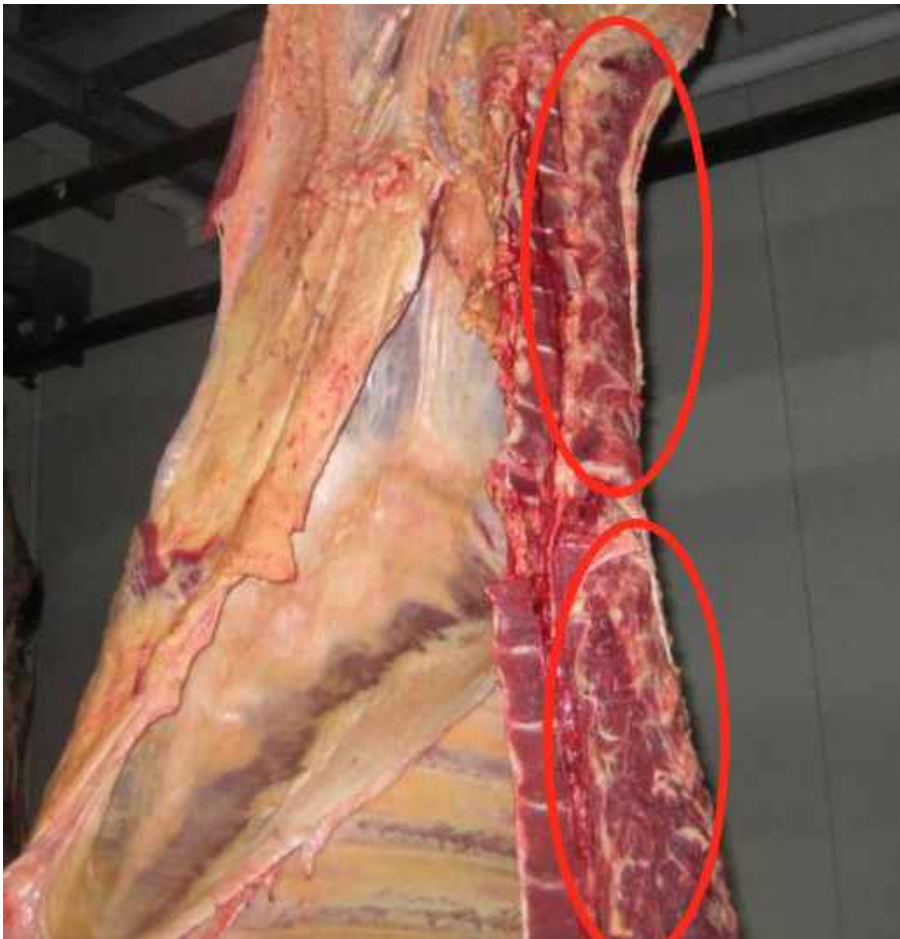
SCORE	APPROXIMATE AGE IN MONTHS	SACRAL VERTEBRAE	LUMBAR VERTEBRAL SPINOUS CHARACTERISTICS	11 th , 12 th , 13 th THORACIC SPINOUS PROCESS CHARACTERISTIC	1 st – 10 th THORACIC SPINOUS PROCESS CHARACTERISTICS	RIB BONE CHARACTERISTICS
100	9	No distinct ossification separation.	No ossification.	No ossification.	No ossification.	Narrow and oval. Lot of blood.
110	10	Capping has started. 10% to 20%.	No ossification.	No ossification.	No ossification.	Slightly narrow Slightly oval. Lot of blood.
120	13	Capping to 30% to 40%. Vertical gaps starting to close.	No ossification.	No ossification.	No ossification.	Slightly wide and flat. Lot of blood
130	15	Advanced capping to 50% to 70%. Vertical gaps closing. Some separation still visible.	No ossification.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood.
140	18	Advanced capping 80% to 90% Vertical Gaps closing, Some separation still visible.	No or minor spots of ossification in one or two vertebrae.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood
150	20	Capping completed but some cartilage visible.	No or small amounts of ossification in some vertebrae.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood.
160	22	Capping completed but small amounts of cartilage visible	10% to 20% ossification in some vertebrae.	No ossification.	No ossification.	Slightly wide. Slightly flat. Moderate blood.
170	24	Capping completed. Almost complete fusing.	30% to 40% ossification.	No ossification.	No ossification.	Slightly wide. Slightly flat. Small amount of blood.
180	27	Capping completed. Almost complete fusing.	50% to 70% ossification in all vertebrae.	No or minor spots of ossification in one or two vertebrae.	No ossification.	Slightly wide. Slightly flat. Small amount of blood.
190	29	Capping completed. Almost complete fusing.	80% to 90% ossification in all vertebrae.	Less than 25% ossification in all 3 Spinal process., or 100% in any 1 Spinal process.	No ossification	Slightly wide. Slightly flat. Small amount of blood.
200	30	Complete fusing.	Almost complete ossification.	>25% ossification in all 3 Spinal process., or 100% in any 1 Spinal process.	Minor ossification Slightly red chine.	Slightly wide.. Moderately flat. Traces of blood.
230		Complete fusing.	Almost complete ossification.	30% to 40% ossification in all 3 Spinal process., or 100% in any 1 Spinal process.	Minor ossification in some of the first 6 thoracic vertebrae. 10% to 20% in 7 th to 10 th vertebrae.	Slightly wide Moderately flat Traces of blood

SCORE	APPROXIMATE AGE IN MONTHS	SACRAL VERTEBRAE	LUMBAR VERTEBRAL SPINOUS CHARACTERISTICS	11 th , 12 th , 13 th THORACIC SPINOUS PROCESS CHARACTERISTIC	1 st – 10 th THORACIC SPINOUS PROCESS CHARACTERISTICS	RIB BONE CHARACTERISTICS
250		Complete fusing.	Almost complete to complete ossification.	>50% ossification in all 3 Spinal process, or 100% in any 1 Spinal process.	10% to 20% ossification in some of the first 6 thoracic vertebrae. 30% to 50% in 7 th to 10 th vertebrae.	Moderately wide Moderately flat Traces of blood.
280		Complete fusing.	Complete Ossification.	>70% Ossification in all 3 Spinal process, or 100% in any 1 Spinal process.	>30% in the 1 st to 10 th vertebrae.	Moderately wide Moderately flat Traces of blood.
300	42	Complete fusing.	Complete ossification.	80% to 90% ossification in all 3 Spinal process, or 100% in any 1 Spinal process.	More than 30% ossification in first 6 th thoracic vertebrae. 50% to 70% in 7 th to 10 th vertebrae.	Moderately wide Moderately flat Traces of blood
350		Complete fusing.	Complete ossification.	Almost complete to complete ossification.	40% to 80% ossification involving all vertebrae.	Wide and flat No blood.
400	72	Complete fusing.	Complete ossification.	Complete ossification. Outlines barely visible.	Almost complete ossification. Outline plainly visible.	Wide and flat No blood.
500	96	Complete fusing.	Complete ossification.	Complete ossification.	Complete ossification. Outline barely visible. White chine.	Wide and flat No blood.
590		Complete fusing.	Complete ossification.	Complete ossification.	Complete ossification. White chine.	Wide and flat No blood.

Soft siding

When a carcass is sawn exactly in the middle of the spine, the spinal processes are clearly visible. This enables accurate evaluation of ossification.

Soft siding occurs when the carcass is not sawn exactly in the middle of the spine and is a result of slaughter floor processes (as circled below). Due to the spine not being clearly visible, it must be assumed that there is complete ossification under the area affected by soft siding. The ossification score for that body may be called unnecessarily higher than it actually is.



Tips for evaluating ossification

- When possible, always evaluate both sides of a carcass when deciding on a score.
- Start assessment from the head and work towards the tail.
- If there is soft siding, assume ossification is fully developed in the region in question.

2.2.7 Hump Height (Tropical Breed Content)

Hump height, a feature of tropical breed cattle like *Bos indicus*, indicates tropical breed content and can affect carcass quality.

- Larger humps correlate with higher tropical breed content.
- Greater tropical content can reduce tenderness due to increased connective tissue and calpastatin levels, which slow tenderisation.
- Hump height can influence processing and marketing for specific consumer preferences.



Hump height is measured by a meat grader using the below process:

1. Typically, a ruler is held horizontally to the surface of the sawn chine and parallel to the ribs
2. The ruler is moved to the widest part of the hump, viewed from an angle that is straight on to the carcass
3. The measurement includes all of the meat from the edge of the paddywhack (ligamentum nuchae) and across to the top surface of the hump muscle. External fat is not included.
4. Record the measurement in 5mm increments.

Note: Rulers or any other unit of measure are not permitted to be used in the competition.

2.3 Beef carcass yield

Carcass or retail product yield refers to the amount of retail or saleable product which can be achieved from a given carcass weight.

A carcass is composed of muscle, bone and fat. Carcasses with high yield percentages have maximum muscle, minimum bone and optimal fat for a particular market.

The highest yielding carcasses are both heavily muscled and lean while the lowest yielding carcasses tend to be lightly muscled and over fat or poorly finished and both lean and lightly muscled.

Carcass yield is influenced by the following factors which require consideration when evaluating a carcass;

- Fat coverage
- Carcass weight
- Muscularity
- Bruising and carcass defects
- Sex

2.3.1 Fat coverage

Reference: MSA Tips & Tools MSA14 – Fat distribution and eating quality

The primary determinant of retail product yield (%) is the amount of fatness or degree of finish on a carcass.

The only accurate way of determining the amount of fatness on a carcass is to completely denude the carcass of all subcutaneous and intermuscular fat. Theoretically this is an exercise which can be done in either a laboratory or boning room, but it is very time consuming, costly and impractical.

As a result, the industry uses indicators to predict degree of carcass fatness. Three fat measurements can be used to provide an indication of fat coverage:

1. Rib fat measurement – made at the rib site where the carcass is quartered
2. P8 fat measurement – made at the P8 site on the rump
3. Fat distribution across the carcass

Measuring P8 fat

Reference: AUS-MEAT "Handbook of Australian Beef Processing" The AUS-MEAT Language

Beef carcass fat depth is measured at a point in the carcass known as the P8 site. To locate the P8 site:

- Locate the third sacral spinal process by counting up from the junction of the lumbar and sacral vertebrae.
- Take an imaginary line from the crest of this process around the side and at right angles to the sawn chine.
- Next, an imaginary line is drawn from the centre of the junction of the sacro-sciatic ligament and the dorsal tuberosity of the pin bone parallel to the sawn chine.
- The point at which these two lines intersect is the P8 site.



(The P8 site is a point defined by the following anatomical description: *The point of intersection of a line from the dorsal tuberosity of the tripartite tuber ischii parallel with the chine, and a line at 90 degrees to the sawn chine centred on the crest of the spinous process of the third sacral vertebrae*).

This measurement is provided to participants in the competition for use in relevant beef carcasses as this measurement cannot be conducted by participants.

Measuring rib fat

Rib fat is measured in the chiller on the chilled, quartered carcasses. MSA requires all carcasses to have a minimum of 3mm rib fat.



Carcases differ in the way they distribute fat and this can be a result of cattle breed or nutritional background. Uniform fat distribution is critical for market specifications. Uneven coverage may indicate poor nutrition, inconsistent growth rates, or issues with animal management. Heavily muscled or late maturing cattle breed (e.g. Limousin, Charolais) tend to distribute fat a little more evenly over the forequarter and tend to be leaner over the hindquarter. Carcasses with extreme muscularity, including cattle breeds such as the Belgian Blue usually lack finish over the butt altogether. Lightly muscled carcasses tend to distribute fat very unevenly with large fat deposits through the flank up over the ribs and into the brisket. Large deposits necessitate costly and time consuming trimming and in doing so reducing the value of the carcase.

In general, carcasse yield is very sensitive to fat. Exceptionally high yield can be obtained from carcasses with no fat e.g.: bulls used for manufacturing beef. However most premium markets require some fat to market the product and ensure satisfactory eating quality.

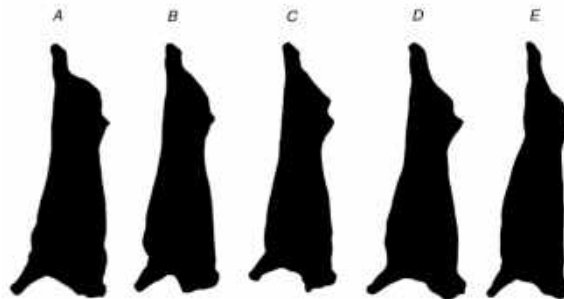
Both excessive and insufficient fat coverage can reduce yield. Excess fat must be trimmed in the boning room, while insufficient fat compromises eating quality (increases toughness) and carcasse protection during chilling (increases weight loss).



Adequate and inadequate fat distribution (left to right respectively).

2.3.2 Muscularity

Muscularity is often used as a predictor of carcass yield. Often carcasses with a muscle score of D or less get heavily discounted as they can have very poor yields regardless of their potential eating quality.



When evaluating carcass muscularity, eye muscle area can be measured to predict carcass yield.

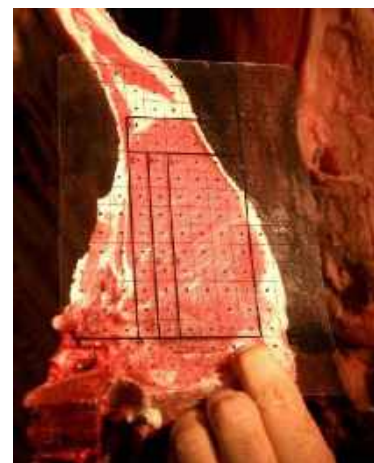
Eye Muscle Area (EMA):

Eye Muscle Area is a measure of the size of the longissimus dorsi muscle also known as the rib eye in square centimetres. This measurement is made at the carcass quartering sites which can be between the 10-13th rib.

Assessment is manually conducted using an AUS-MEAT EMA grid to calculate the area of the eye muscle.

The rib eye area is used because it is practical and has commercial significance. However, it must be remembered that the longissimus dorsi is just one muscle in the body and its relative size at the quartering site is only an indicator of total muscularity.

Eye muscle area does not have any effect on eating quality for the MSA program and is used solely as a feedback tool for vendors/producers.



2.3.3 Bruising and hidepuller damage

Reference: MSA Tips and Tools 14 – Fat distribution and eating quality

Reference: AUS-MEAT “Handbook of Australian Beef Processing” The AUS-MEAT Language

Bruising and hide puller damage can make carcasses unsaleable or less profitable. Bruising in an animal as a result from poor transport or mishandling pre-slaughter can result in large sections of the carcass having to be trimmed by meat inspectors. Hide puller damage occurs when fat is removed during the mechanical removal of the hide, exposing the underlying muscle.

Bruising and hide puller damage has the greatest impact on yield when high value primals are affected. Carcass yield is not only reduced due to muscle damage and limited saleability but is also reduced through the lack of fat coverage that provides protection against chilling regimes which also dehydrate the exposed muscles.

Not only can carcass saleability be reduced, eating quality can be compromised through uneven chilling of carcass muscles. This can cause an irregular pattern of pH and temperature decline in those muscles and result in increased muscle toughening.

Scorable Bruise Description:

1. Where muscle is bruised, it qualifies as a scorable bruise if; an area of muscle (exposed) by trimming into the muscle tissue to the extent that it cannot be covered by a 100mm diameter circle or an irregular shaped equivalent area.
2. Where the trimming of a serious bruise has exposed muscle tissue smaller than 100mm and deeper than 20mm.

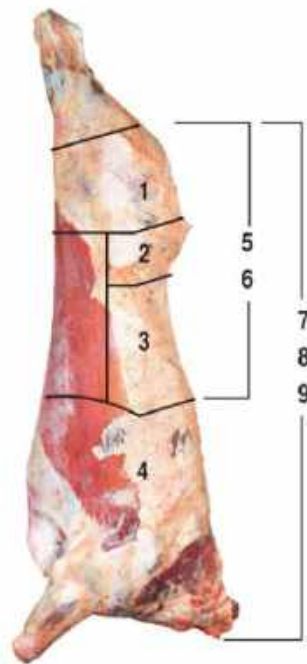
Serious (flank bruise):

A serious bruise located in the thin flank area is recorded as a score (3) when the muscle tissue of the primal (striploin) is damaged.

Where a bruise straddles two scorable areas:

1. The score will be recorded in the area where the bruise is most predominant.
2. A straddle bruise that covers at least 100 mm in both scorable areas will count as separate bruises and be recorded as such.

The AUS-MEAT Bruise Scoring System



SCORE	LOCATION	NUMBER OF SERIOUS BRUISE AREAS
1	BUTT	1
2	RUMP	1
3	LOIN	1
4	FOREQUARTER	1
5	HINDQUARTER	2
6	HINDQUARTER	3
7	FOREQUARTER HINDQUARTER	2
8	FOREQUARTER HINDQUARTER	3
9	SIDE	4



Examples of yield loss due to hide puller damage.



Examples of yield loss due to bruising.

2.3.4 Sex Class/Gender

Reference: AUS-MEAT “Handbook of Australian Beef Processing” The AUS-MEAT Language

Sex can play a role in determining yield of a carcass due to differences in mature weight, mature composition and maturing patterns for individual tissues.

Male carcasses are recognised by the typically rough and irregular fat in the region of the cod, the relatively small pelvic cavity, a small “pizzle eye”, a curved aitch bone, and a lean area above the aitch bone that is about half as large as that in a female carcass.

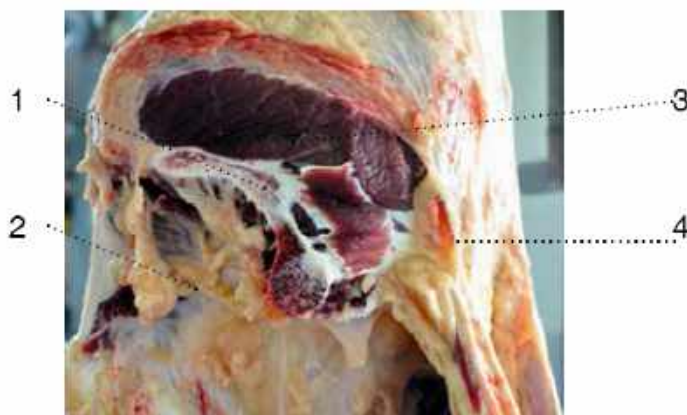
Female carcasses are identified by very smooth fat in the region of the udder, a slightly larger pelvic cavity, a straighter aitch bone than is typical of steers and a lean area above the aitch bone that is about twice as large as that in a steer carcass. This lean area is shaped like a kidney bean.

Identifying a male carcass

1. Penis stub
2. Erector muscle
3. Pelvic channel
4. Smaller triangular muscle
5. Aitch bone



Identifying a female carcass



1. Aitch bone
2. Pelvic channel
3. Larger lean area
4. Udder fat

2.4 Beef eating quality

The eating quality of beef is ultimately determined by the consumer based on their eating experience. When a consumer makes a judgement on eating quality of beef, they consider the following attributes to be of importance:

- Tenderness
- Flavour
- Juiciness
- Overall liking

A combination of carcasses attributes are measured to provide indicators that are used to predict eating quality. In addition to livestock factors, the following attributes can be used to predict eating quality of beef:

- Marbling
- Ossification
- pH

2.4.1 pH and eating quality

Reference: MSA Tips and Tools MSA08 - The effect of pH on beef eating quality & MSA10 - The effect of the pH-temperature decline on beef eating quality

Muscle pH is a measure of the acid or alkaline level the meat. This process depends on the rate of muscle glycogen breakdown and lactic acid accumulation during rigor mortis. The pH drops from a neutral range (~7.0) to its ultimate value, typically between 5.4 and 5.7 in ideal conditions.



Optimal pH decline occurs when chilling effectively manages carcass temperature to avoid cold shortening or heat toughening pH issues. Achieving the correct ultimate pH is critical for meat quality, and food safety as pH > 5.7 can negatively impact tenderness, colour, and shelf life.

Ultimate pH refers to the final pH level of the muscle tissue after the post-mortem pH decline has stabilised. Meat colour is directly associated with pH.

A pH threshold of 5.70 has been set as the maximum acceptable pH level for MSA grading. In addition to unacceptable eating quality high pH meat > 5.7 has the following features:

- It is often found to be dark cutting (refer to carcass quality section for more information)
- A coarse texture
- Reduced shelf life – bacteria grow more rapidly due to high pH conditions
- Lower water-holding capacity – which result in moisture loss during cooking and a less juicy product.

2.5 Evaluating beef carcasses

Key points when evaluating carcasses

- Understand quality and yield attributes and commercial implications of each
- Dark cutting carcasses are always heavily discounted
- A key quality attribute used in carcass evaluation is marbling
- Highest yielding carcasses will be those with heavy muscling and light fat coverage
- Eye muscle area is an important factor used in determining muscling and yield
- Significant bruises on key primals will affect yield
- The sex of a carcass should not impact on your evaluation (judging) of carcass but should definitely be observed
- Always consider ossification in your observations. Ossification should be used in conjunction with marbling when considering overall carcass quality. Small differences in ossification won't largely vary eating quality, but large variances will.

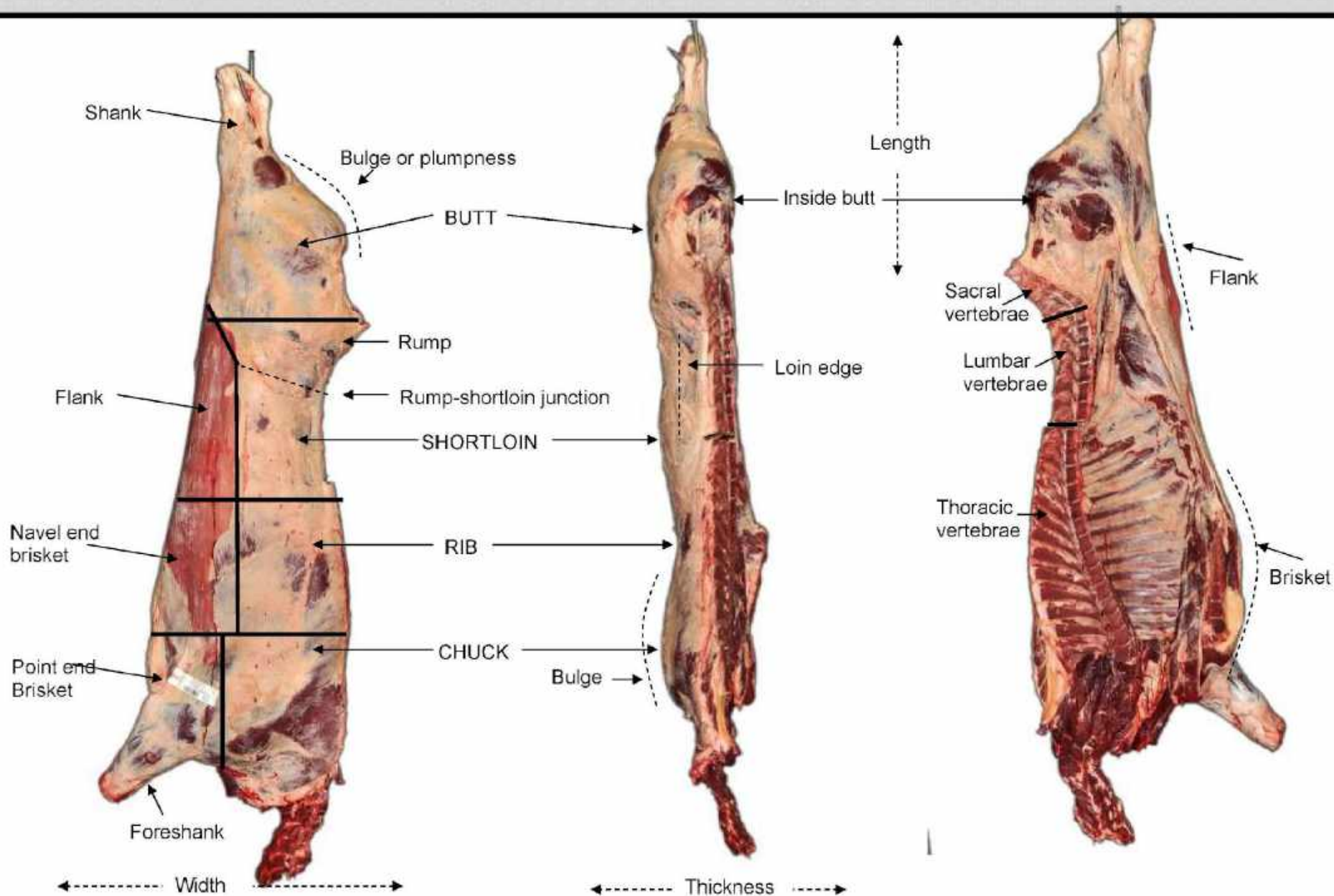
ICMJ Beef Carcass Judging YouTube <https://youtu.be/-pjM738EQQs?si=LAEJqRq0oEDYfpFU>

The following table provides terminology for each major assessment point that can be used to describe and justify appraisal of a carcass.

Evaluation terminology for beef carcasses

Muscling	Trimness	Quality
<p>Rib eye Larger More symmetrically shaped</p> <p>Butt Thicker Plumper More bulging Wider Longer More muscular</p> <p>Sirloin Thicker Fuller More muscular More bulging More prominent</p> <p>Loin Thicker Fuller Wider More muscular</p> <p>Rib Plumper Fuller More muscular</p> <p>Chuck Thicker Wider Deeper More muscular More bulging</p> <p>Shank Shorter</p>	<p>Less fat opposite the:</p> <ul style="list-style-type: none"> • Ribeye <p>Less fat over the:</p> <ul style="list-style-type: none"> • Lower rib • Butt • Sirloin • Rump-shortloin junction • Loin • Loin edges • Rib • Chuck • Brisket • Flanks 	<p>Marbling in the rib eye Higher degree Greater amount More finely dispersed More evenly dispersed</p> <p>Colour of lean in rib eye Brighter More youthful More cherry red</p> <p>Firmer lean in rib eye</p> <p>Finer textured lean in rib eye</p> <p>Ossification</p> <p>Fat More desirable Whiter Firmer textured</p> <p>Ribs More youthful Redder, rounder Feathering between</p> <p>Sex</p>

Beef carcass terminology



Examples of questions asked during ICMJ contest - Beef carcass judging

Questions asked may be based on:

1. Observations over the whole class (e.g. how many males in the class?)
2. Observations made on the extremes (e.g. which carcass had the largest eye muscle area?)
3. Comparisons between carcasses (e.g. Between Carcass 2 and 3, which displayed the greatest amount of ossification?)

Tip: It is likely that a proportion of questions will be based on very noticeable carcass attributes rather than slight differences between carcasses. For example, if one carcass has significantly more yellow fat than the others, this is likely to be a question to test your observation skills, rather than asking you which was fatter over the rib eye if there was only 2mm difference between all carcasses.

Other examples may include, *which carcass (or between carcasses) has:*

- The smallest/largest eye muscle area?
- Least trimmable fat alongside the rib eye?
- The thinnest poorest/heaviest muscled butt?
- Heaviest muscled chuck
- The highest amount of marbling?
- The thickest, widest, deepest, heaviest muscled butt?
- The brightest, most youthful lean (meat) in the rib eye
- Highest yielding (i.e. highest cutability)
- Finest/coarsest meat texture
- Highest/lowest quality
- The most trimmable fat/least fat over the brisket; sirloin; loin; ribset; chuck; rib-eye; butt cushion; centre section (the question could ask about these individually or a combination)
- Younger/older ossifications score
- How many females/males?
- Which is the highest yielding carcass?
- Which carcass displayed the least marbling in the class?
- Which carcass is the fattest lowest yielding?
- Which carcass combined quality and yield to the highest degree?
- Which carcass had the most fat along the side of the rib eye?
- Between 1 and 2, which displayed the darkest coloured lean in the rib eye?
- Which carcass had the lightest muscled butt?
- Between 2 and 4, which carcass displayed the least amount of fat over the brisket?
- Which carcass had the largest eye muscle area?
- Which carcass displayed the most ossification?

2.6 Beef pricing class

The beef pricing class assesses your observation skills in identifying carcass attributes that can affect yield and/or quality of a carcass.

This class is based on current industry practices and uses a pricing grid reflective of a standard processor pricing grid that carcasses must be graded against and how producers are paid.

The main features of a pricing grid may include:

- Carcass weight
- Fat depth (P8)
- Gender
- Dentition
- Maturity
- Fat colour
- Meat colour
- MSA compliance (rib fat and pH)
- Bruising
- Marbling
- HGP Status
- EU eligibility
- Blood splash

Carcass tickets:

During the beef pricing class in the ICMJ contest, some information will be provided to you by ICMJ in the form of a “mock” carcass ticket. This information will include:

- Carcass weight
- Fat depth (P8)
- Dentition

Note - during this class, ignore any carcass tickets that have been generated by the processor (as seen below) and may still be attached to the carcass.

Example of a carcass ticket



Maturity

For the ICMJ beef pricing class you must understand the scoring system for ossification. See above section on ossification.

Meat colour

The pricing grid applies a price penalty when meat colour is assessed as being greater than an AUSMEAT Meat Colour 3. A meat colour above 3 will show signs of being dark and may also look to have a 'sticky' texture. Meat colour may or may not be part of a company grid due to differences in target specification.

Fat colour

Certain pricing grids apply a price penalty to carcasses assessed and found to have a AUS-MEAT Fat Colour above 3. This does not affect eating quality but is primarily due to consumer acceptance of fat colour.

Note this is not an external fat colour measurement.

Bruising

A carcass will be penalised for bruising if the bruise is affecting valuable areas of meat. A serious bruise is determined as an area that is greater than 10cm² on any one single primal. Multiple bruises or individual bruises that greatly exceed this size will incur larger price penalties.

Below are examples of varying degrees of bruising.

**Acceptable bruise
no penalty**



**Minor bruise
equivalent to 1 bruise**

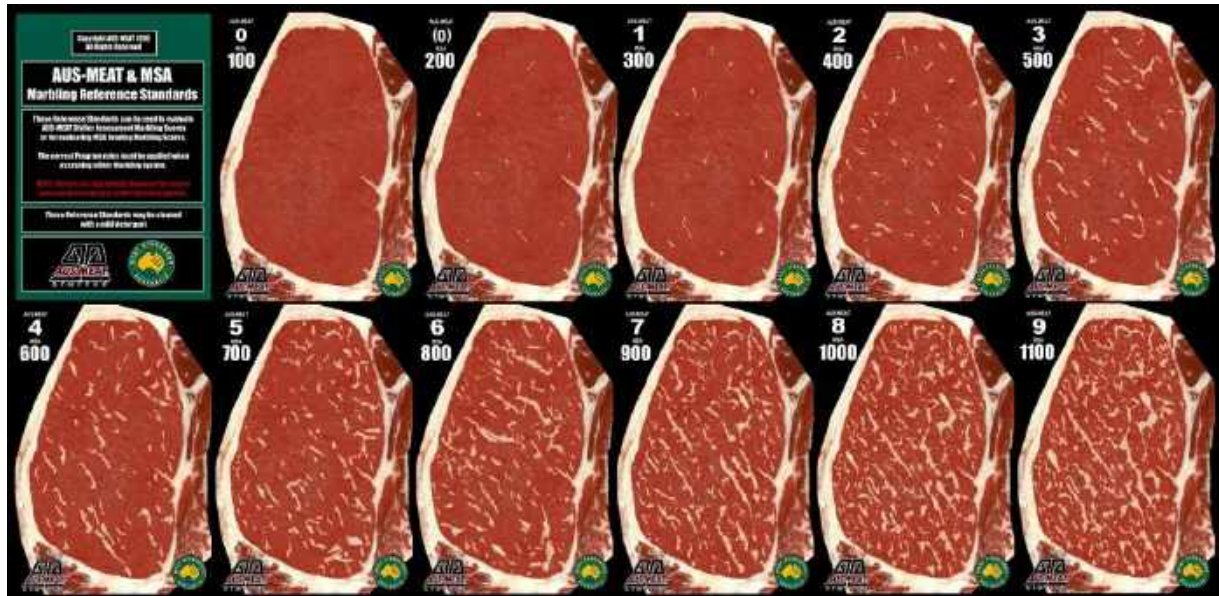


**Severe bruising
equivalent to 2 or more**



Marbling

Marbling increases eating quality of a carcass and so a price adjustment is made in the pricing grid for various marbling scores. Below are examples of the MSA marbling scores which you should be familiar with.



Blood splash

Blood splash must be considered quite severe before a price adjustment is made. Severe ecchymosis would be very obvious in the eye muscle and appears as numerous burst blood vessels throughout the muscle.

Below are pictures of severe ecchymosis that would incur a price penalty.



Beef Traders Carcase Price Grid

Price adjustments in cents per kilogram, plus or minus the benchmark price of \$5.45 per kilogram, HSCW.

Weight and Fat Grid (Price Adjustment)

Hot Standard Carcase Weight (kg)	P8 fat (mm)						
	0-4	5-12	13-22	23-27	28-32	33-39	40+
<200	-50	-30	-30	-30	-50	-50	-80
200-240	-30	-20	-20	-20	-30	-50	-80
241-300	-20	0	0	-10	-15	-20	-30
301-380	-20	0	0	-10	-15	-20	-30
381-420	-25	-5	-5	-15	-20	-30	-50
421+	-30	-10	-10	-20	-30	-50	-80

Additional Assessment Criteria

Sex	Male			Female	
Cents adjustment	0			-10	
Dentition	0 teeth	2 teeth	4 teeth	6 teeth	7+ teeth
Cents adjustment	0	-10	-20	-25	-40
Ossification	≤150	160-200	>200	590	
Cents adjustment	0	-5	-10	-30	
Meat Colour	1A-1B		1C-3	>4	
Cents adjustment	-20		0	-60	
Fat Colour	0-3			>3	
Cents adjustment	0			-30	
Bruising	Nil		1	2 or more	
Cents adjustment	0		-10	-60	
MSA Marbling	Under 210	210-390	400-590	600+	
Cents adjustment	0	5	10	15	
HGP Status	Yes			No	
Cents adjustment	-30			0	
EU eligibility	Eligible			Non-eligible	
Cents adjustment	15			0	
Blood Splash (ecchymosis)	-60 for visible signs				
Hump height	≤80mm	85-120mm	≥125mm		
Cents adjustment	0	-10	-20		

Example of pricing grid. Note \$/kg could change.

2.7 Beef eating quality class

This class will apply the industry practice of carcass eating quality evaluation, based upon the Meat Standards Australia (MSA) grading system. Each carcass attribute is evaluated individually based on a predetermined scoring scale, with points assigned based on the measurements listed below. Adjustments are then made to the initial score using a grid, which factors in positive or negative points for each attribute

Carcass measurements

The eating quality evaluation class requires you to assess a number of carcass attributes including:

- Sex
- Ossification
- MSA Marbling
- Rib fat (no rulers will be provided)
- Fat distribution
- Meat colour
- Hump Height (Tropical Breed Content)

The following carcass attributes are provided by ICMJ:

- Hormonal Growth Promotant (HPG) treatment
- Carcass weight
- pH

Tips for evaluating carcasses for eating quality:

- Have a good understanding of the Meat Standards Australia grading system.
- Read MSA materials, in particular MSA Tips & Tools, on MLA website: www.mla.com.au/msa.
- Ensure you are familiar with MSA marbling standards.
- Have a thorough understanding of the ossification chart (Table above) and have a good knowledge of your 'key' ossification score cut-offs as per the grid.
- Ensure you know where rib fat is measured and have a good idea of what different measurements look like. You can practice this by drawing lines on a page, estimating their length and then measuring them.
- Make sure you have a good idea of what the fat distribution standard is. I.e. carcasses with inadequate fat distribution of an area of 10 x 10cm covering a single primal are classified as ungrades. Again, practice drawing different shapes on a page and guessing the area, then measuring it.
- Make sure you understand the working sheet and answer sheet.
- If you do not have access to beef carcasses, practice by making up carcass details on paper and using the work sheets to increase your speed in recording details and doing calculations.

- We advise downloading the practice carcass detail sheets. These sheets have all carcass assessments filled in and will provide practice using the eating quality grid and applying adjustments.



Eating Quality Evaluation Class

Eating quality grid

Based on your carcass evaluation and information provided on carcass tags, calculate the MSA eating quality score (CMQ4) for each carcass.

Make adjustments using the grid below, from the benchmark CMQ4 score of 52.

Hump height (HH)				
0-60mm	65-80mm	85-100mm	105-120mm	≥125
+ 3	+ 1	0	- 1	- 3

Sex		HGP		Meat colour	
Male	0	Yes	- 8	1A – 3	0
Female	- 1	No	0	4-5	- 1
				6 and above	- 4

Fat distribution		pH		Subcutaneous ribfat	
Adequate	0	Under 5.71	0	Below 3mm	Ungrade
Inadequate	Ungrade	5.71 and over	Ungrade	3 – 10mm	0
				Over 10mm	+ 1
				Over 20mm	+ 2

Carcass weight (kg)		Ossification		MSA marbling	
≤200	- 2	100 - 110	+ 5	Under 210	- 2
200.1 - 250	- 1	120 - 150	+ 3	210 - 390	0
250.1 - 300	0	160 - 200	+ 1	400 - 590	+ 3
300.1 - 400	+ 1	210 - 290	0	600 +	+ 5
400.1 - 500	+ 2	290 - 400	- 2		
500.1 - 800	+ 3	500 & above	- 5		

Example of eating quality grid.

2.8 Beef primal evaluation

When carcasses are boned, they are broken down into primals. The same broad attributes that are used in carcass evaluation are also used when appraising beef primals. These are grouped as:

- Eating Quality
- Yield – most suitable combination of trimness and muscling

Importantly, there are differences between the evaluation of primals within a carcass. This difference is dependent on the relative market value of each primal and therefore the importance of quality and yield for each primal.

There is not any one trait that makes an ideal product. When evaluating beef primals, the above attributes should be considered independently in combination with the market suitability of the individual primal.

Key points for evaluating/judging beef primals

You MUST know your primal face names and terminology – they are critical for answering questions.

2.8.1 Evaluating butts

Emphasis: Yield (muscling plus trimness) followed by quality

Areas of evaluation:

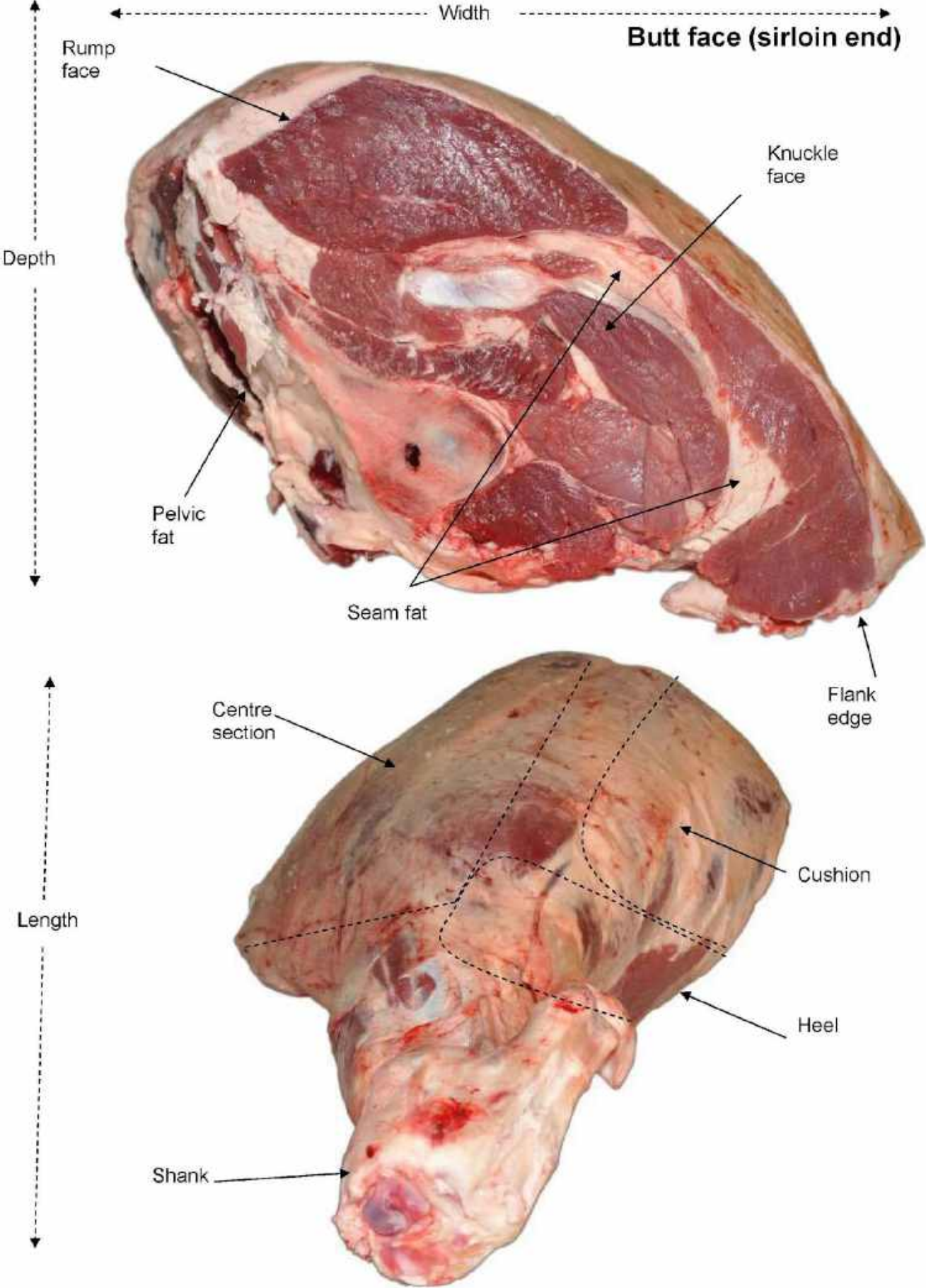
- Exposed lean on the butt face – trimness and quality
- Cushion area (diagonally as well) – trimness and yield
- The heel – trimness and yield

[ICMJ Beef Butts Judging](#) YouTube

Evaluation terminology for beef butts

Muscling	Trimness	Quality
<p>Butt face Larger Greater area of exposed lean</p> <p>Rump and knuckle face Greater area of exposed lean Deeper Wider Meatier Larger</p> <p>Cushion Plumper More bulging More muscular Deeper Thicker</p> <p>Centre section Wider Deeper Longer More muscular</p> <p>Heel Fuller</p> <p>Shank Shorter</p>	<p>Less fat over the:</p> <ul style="list-style-type: none"> • Butt face • Rump face • Knuckle face • Cushion • Centre section • Rump section • Heel • Less internal seam fat in the round face • Less pelvic fat 	<ul style="list-style-type: none"> • Focus on brighter, more cherry-red colour of firmer lean in the round face • Marbling and texture if differences are obvious • External fat – whiteness and firmness

Beef butts terminology



Examples of questions used for beef butt evaluation classes in ICMJ contest

- Which butt displays the greatest area of exposed lean?
- Between 2 and 3, which butt is trimmer over the heel?
- Which is the lightest muscled butt in the class?
- Between 1 and 4, which butt has the larger the knuckle face?
- Between 2 and 3, which butt has the larger rump face?
- Between 1 and 4, which butt is wider through the centre section?
- Which butt has the most trimmable fat over the CC?
- Between 2 and 3, which butt is deeper through the CC?
- Which butt displays the greatest degree of marbling?
- Which butt has the highest retail value?
- Which primal has the smallest rump face in the class?
- Which primal has the least amount of exposed lean in the butt face?
- Which butt has the most marbling in the rump face?
- Which butt is widest in the butt face?
- Which butt has the least seam fat in the class?
- Which primal is the most muscular, highest yielding butt in the class?
- Which primal was the deepest through the centre section?
- Between primals 1 and 2, which displayed the least amount of lean in the knuckle face?
- Which primal displayed the most seam fat in the class?
- Which primal was fattest over the cushion?
- Which primal displayed the most marbling in the rump face?
- Between primals 3 and 4, which displayed the least amount of pelvic fat?
- Which primal was the lowest yielding in the class?



2.8.2 Beef rump and loins

Emphasis: Quality followed by yield (muscling plus trimness)

The rump and loin primals are high value cuts for the Australian and export markets.

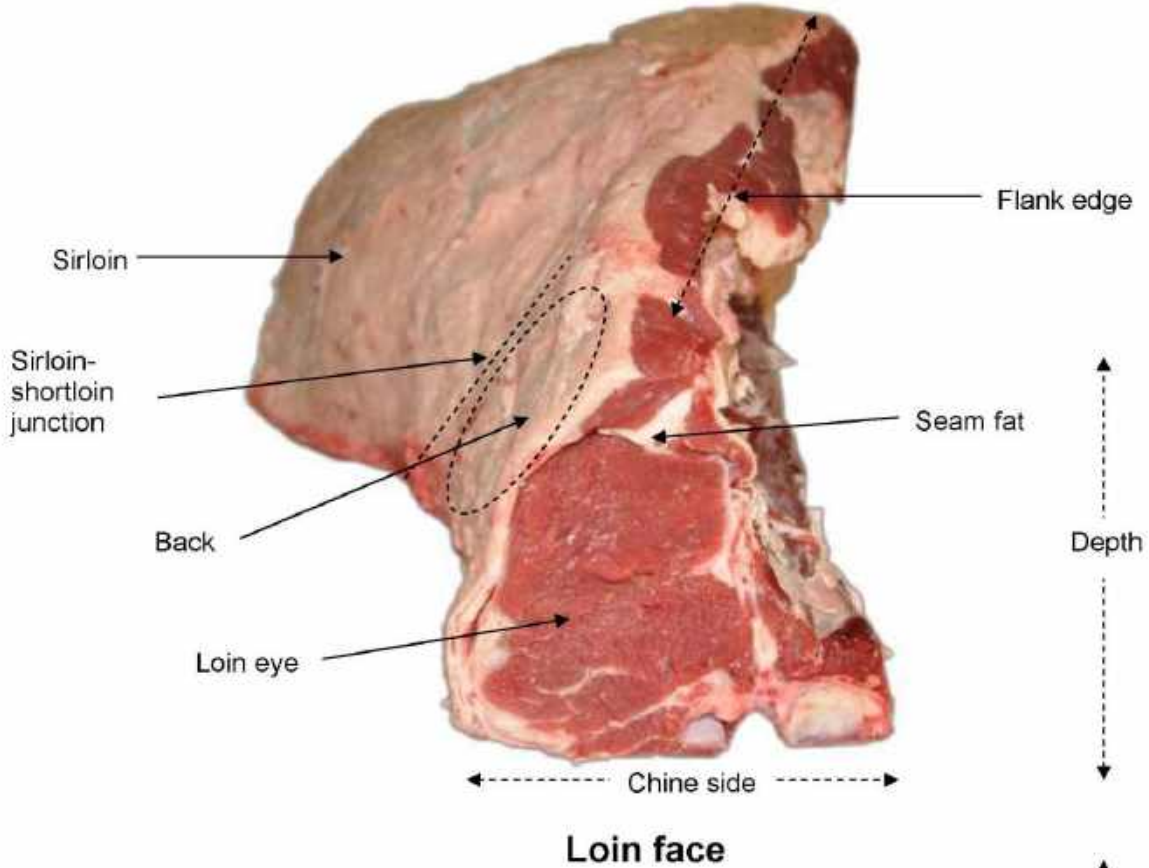
Areas of evaluation for rump and loins:

- Loin eye – muscularity, trimness, quality
- Rump face – quality, muscularity, trimness
- Loin edge – external trimness
- Flank – external trimness

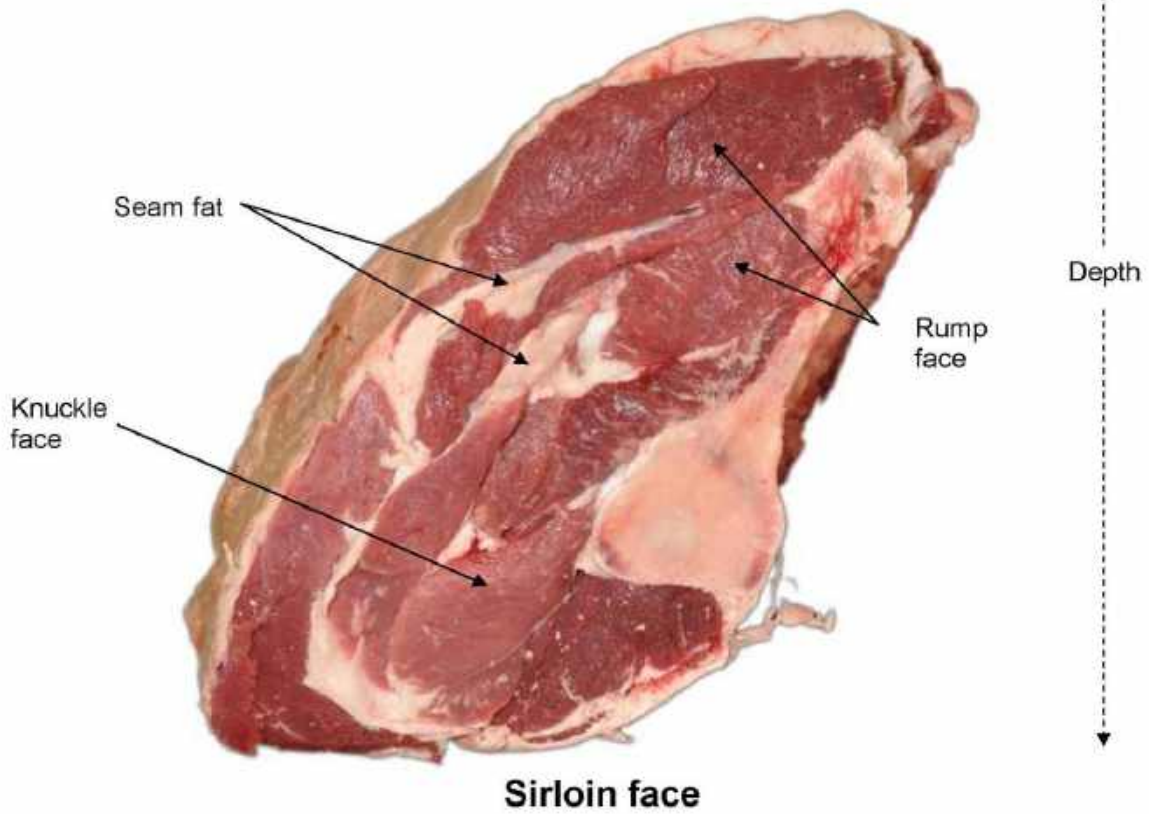
Evaluation terminology for rump and loins

Muscling	Trimness	Quality
Loin eye Larger More symmetrically shaped Sirloin face Greater area of exposed lean Deeper Wider Meatier Larger Shortloin Plumper Wider More muscular Fuller Longer Sirloin section Plumper Fuller Wider More muscular	Less fat over the: <ul style="list-style-type: none"> • Loin eye • Tail region • Sirloin face (top and bottom) • Shortloin section/back • Sirloin section • Sirloin-loin junction • Loin edge • Flank edge Less seam fat in the sirloin face Less kidney and pelvic fat	Marbling in the loin eye and sirloin face <ul style="list-style-type: none"> • Higher degree • Greater amount • More finely dispersed Colour of lean in loin eye and sirloin face <ul style="list-style-type: none"> • Brighter • More youthful • More cherry red Firmer lean in loin eye and sirloin face Finer textured lean in loin eye and sirloin face Fat Whiteness Firmness

Beef rump and loin terminology



Loin face



Sirloin face

Examples of questions used for rump and loin evaluation classes in ICMJ contest

- Which primal has the most seam fat in the sirloin face?
- Which primal has the least amount of exposed lean in the sirloin face?
- Which primal is trimmest over the rump face?
- Between 1 and 3, which primal would yield the lowest percentage of closely trimmed retail cuts?
- Between 2 and 4, which primal has the larger loin eye in the loin face?
- Which primal is trimmest over the sirloin-loin junction?
- Between 1 and 3, which primal has the most exposed lean in the rump face?

2.8.3 Beef shortloins

Emphasis: Quality followed by yield (muscling plus trimness)

Shortloins are a high value cut for Australian and export markets.

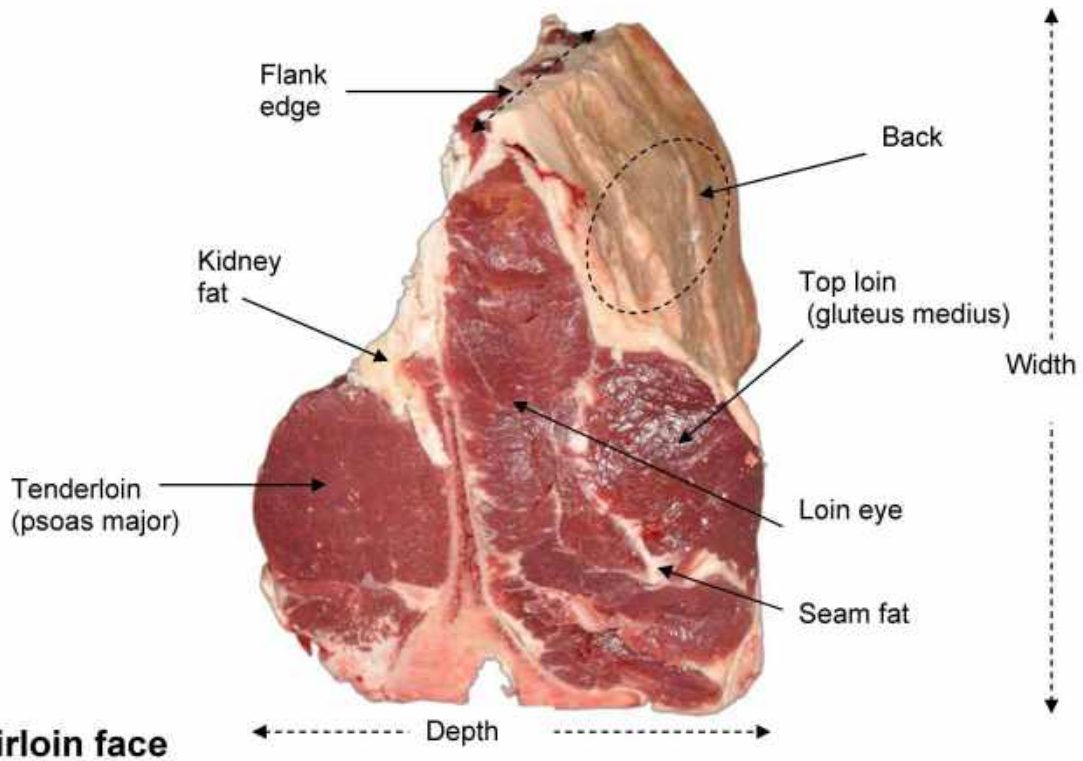
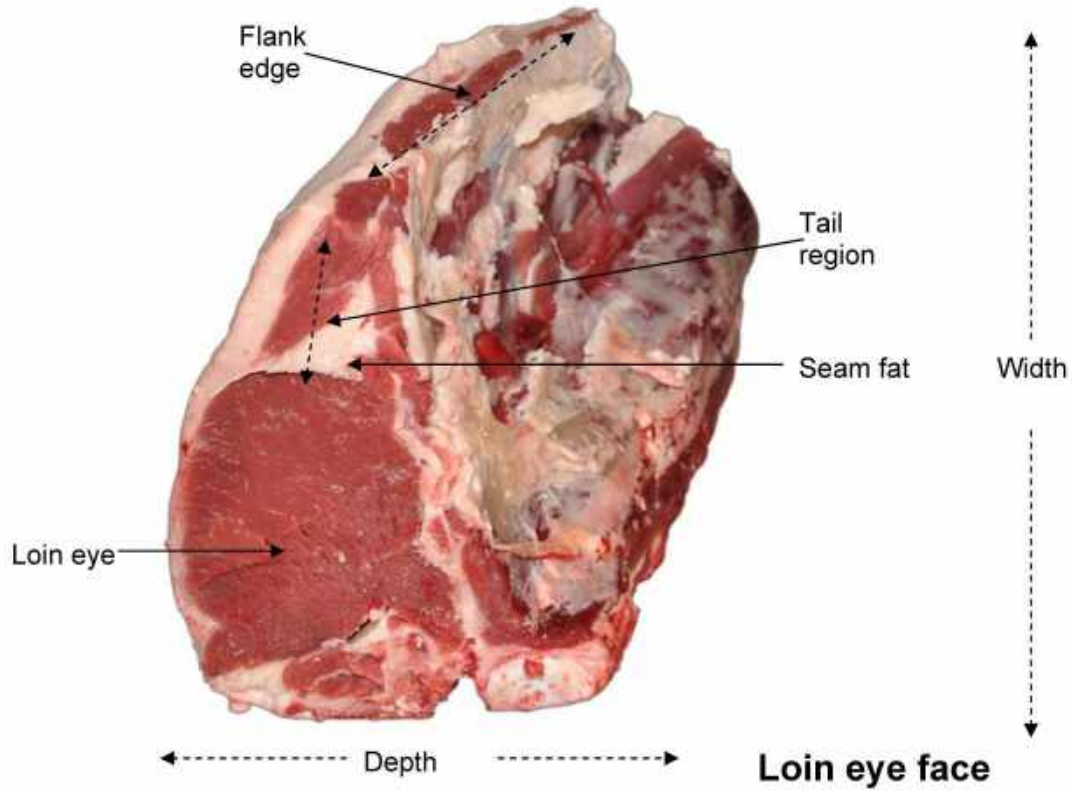
Areas of evaluation for shortloins:

- Loin eye – muscularity, trimness, quality
- Sirloin face – quality, muscularity, trimness
- Back - muscularity
- Top Loin and Tenderloin - muscularity
- Loin edge – external trimness
- Flank – external trimness

[ICMJ Beef Shortloin Judging](#) YouTube

Muscling	Trimness	Quality
Loin eye Larger More symmetrically shaped Sirloin face Greater area of exposed lean Deeper Wider Meatier Larger Back Plumper Wider More muscular Fuller Longer Tenderloin Larger	Less fat over the: <ul style="list-style-type: none"> • Loin eye • Sirloin face (top and bottom) • Back • Flank edge Less seam fat in the sirloin face Less kidney fat	Marbling in the loin eye and sirloin face <ul style="list-style-type: none"> • Higher degree • Greater amount • More finely dispersed Colour of lean in loin eye and sirloin face <ul style="list-style-type: none"> • Brighter • More youthful • More cherry red Firmer lean in loin eye and sirloin face Finer textured lean in loin eye and sirloin face Fat Whiteness Firmness

Beef shortloin terminology



Examples of questions used for shortloin evaluation classes in ICMJ contest

- Which shortloin displays the largest loin eye in the loin eye face?
- Which shortloin has the least amount of kidney fat?
- Between 2 and 3, which shortloin has the lighter coloured lean in the loin eye face?
- Which shortloin has the smallest loin eye in the sirloin face?
- Which shortloin has the most fat along the flank edge?
- Between 2 and 3, which has the larger tenderloin?
- Which shortloin has the largest gluteus medius?
- Between 1 and 3, which has the greater degree of marbling in the loin eye face?
- Which shortloin is the least muscular over the back?
- Which shortloin has the least amount of trimmable fat over the sirloin face?
- Between 1 and 2, which has the most exposed lean in the sirloin face?
- Between 3 and 4, which is the leanest along the flank edge?
- Which shortloin is trimmest over the tail region?
- Between 1 and 2, which displayed the highest degree of marbling in the loin eye face?
- Which shortloin displayed the largest top loin (gluteus medius) in the class?
- Between 3 and 4, which has the more desirable meat colour in the loin eye face?
- Which shortloin has the most kidney fat?

2.8.4 Beef ribs

Emphasis: Quality followed by yield (muscling plus trimness)

The ribs are another high value primal for the Australian and export markets.

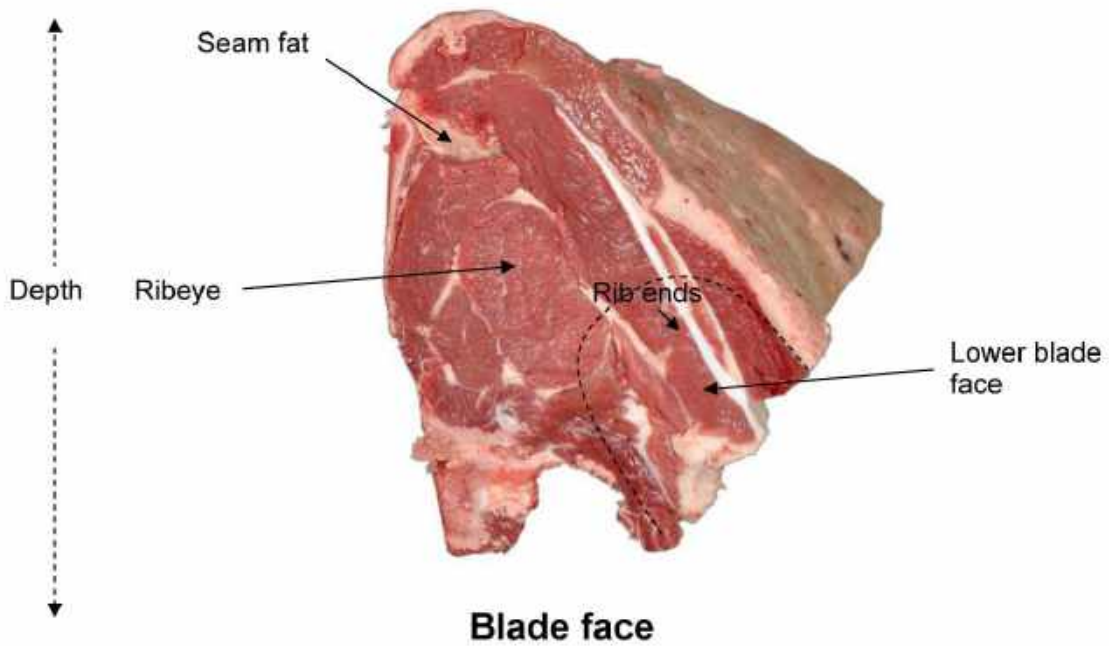
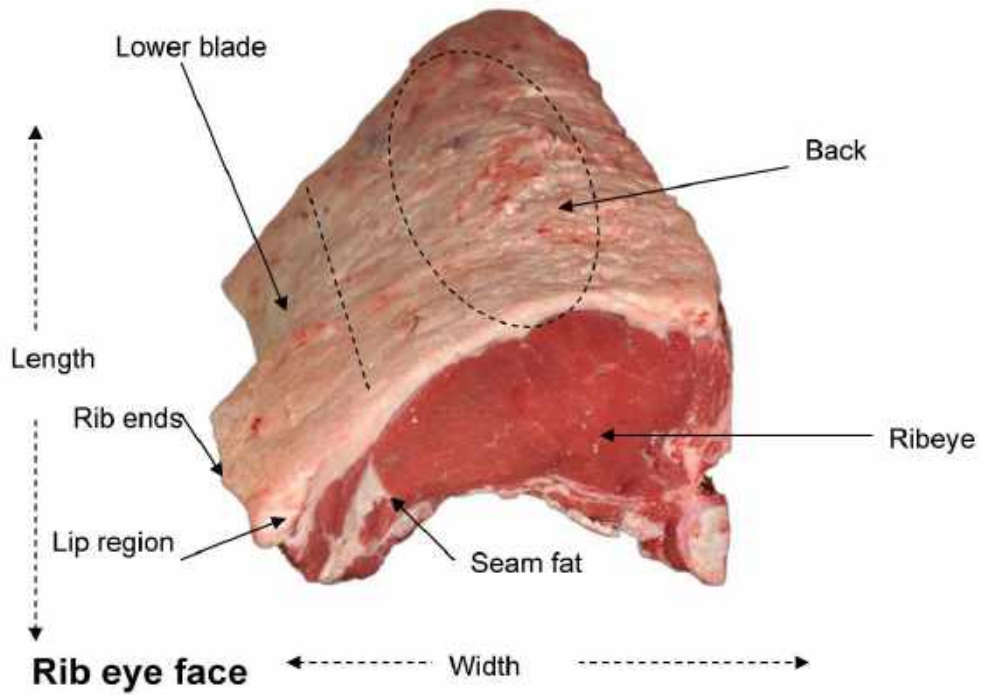
Areas of evaluation for rib sets

- Rib eye – muscularity, external trimness, quality
- Blade face – quality, muscularity, trimness
- Rib ends – external trimness
- Back – trimness and yield
- Flank – external trimness

Evaluation terminology for rib sets

Muscling	Trimness	Quality
Rib eye Larger More symmetrically shaped Blade face Greater area of exposed lean Deeper Wider Meatier Larger eye of the blade face Back Plumper Wider More muscular Fuller Longer	Less fat over the: <ul style="list-style-type: none"> • Rib eye • Lower rib • Blade face • Back • Rib ends • Lower blade Less seam fat in the blade face	Marbling in rib eye and blade face <ul style="list-style-type: none"> • Higher degree • Greater amount • More finely dispersed Colour of lean in rib eye and blade face <ul style="list-style-type: none"> • Brighter • More youthful • More cherry red Firmer lean in rib eye and blade face Finer textured lean in rib eye and blade face Fat Whiteness Firmness

Beef ribset terminology



Examples of questions used for rib set evaluation classes in ICMJ contest

- Between primals 1 and 2, which was the deepest through the blade face?
- Between primals 1 and 4, which had the most fat over the ribeye face?
- Which primal had the smallest ribeye in the blade face?
- Between primals 2 and 3, which had the largest ribeye in the ribeye face?
- Which ribset had the most marbling in the ribeye of the blade face?
- How many ribset's had the feather bones removed?
- Which primal had the least amount of exposed lean in the blade face?
- Between 2 and 3, which had the most fat over the lip region?



3.0 Retail cut identification

Beef

There are three (3) answer areas required for the Retail cut identification class. These are:

- Species (Beef, Lamb or Pork)
- The retail cut name (e.g. Rump steak), and
- The primal name from which the retail cut was derived (e.g. Rump)

Students will have 15 minutes to assess, identify and answer 25 retail cuts.

*(Please note: students will **NO** longer be required to identify a cook method)*

3.1 Beef retail cut identification

SPECIES	RETAIL CUT	PRIMAL
Beef	Rump Steak	Rump
Beef	Rump Cap Steak	Rump Cap
Beef	Fillet Steak	Tenderloin
Beef	Ribeye Steak	Cube Roll
Beef	Rib Steak Bone In	Rib set
Beef	T-Bone Steak	Shortloin
Beef	Sirloin Steak Bone In	Shortloin
Beef	Sirloin Steak Boneless	Striploin
Beef	Oyster Blade Steak	Oyster Blade
Beef	Flat Iron Steak	Oyster Blade
Beef	Flank Steak	Flank
Beef	Round steak	Knuckle
Beef	Topside Steak	Topside
Beef	Silverside Steak	Silverside
Beef	Chuck Steak	Chuck
Beef	Blade Steak Bone In	Blade
Beef	Blade Steak Boneless	Blade
Beef	Short Ribs	Forequarter
Beef	Shin Beef Bone In	Shin
Beef	Shin Beef Boneless	Shin



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4.0 Saleable items identification

Beef primals and offals

There are three (3) answer areas required for the Saleable items identification class. These are:

- The saleable item name
- The region of the carcass from which the saleable item is located (butt, forequarter, flank, loin, rib set or offal)
- The primal name from which the saleable item was derived

Students will have 15 minutes to assess, identify and answer 25 saleable items.

Name	Region	Primal
Thick flank	Butt	Thick flank
Knuckle	Butt	Thick flank
Knuckle centre	Butt	Knuckle
Knuckle cover	Butt	Knuckle
Topside	Butt	Topside
Topside cap-off	Butt	Topside
Eye of topside	Butt	Topside
Flank steak	Flank	Thin flank
Internal flank plate	Flank	Thin flank
External flank plate	Flank	Thin flank
Flap meat	Flank	Internal flank plate
Inside skirt	Flank	Abdominal cavity
Brisket	Forequarter	Brisket
Point end brisket	Forequarter	Brisket
Navel end brisket	Forequarter	Brisket
Chuck	Forequarter	Chuck
Chuck square cut	Forequarter	Chuck
Neck	Forequarter	Chuck
Chuck roll	Forequarter	Chuck
Chuck crest	Forequarter	Chuck
Shin-shank	Butt or forequarter	Shin-shank
Chuck tender	Forequarter	Blade
Blade	Forequarter	Blade
Bolar blade	Forequarter	Blade
Oyster blade	Forequarter	Blade
Cube roll	Forequarter	Cube roll
Cube roll plate	Forequarter	Cube roll
Rib eye muscle	Forequarter	Cube roll
Shortloin	Loin	Shortloin
Striploin	Loin	Shortloin
Tenderloin	Loin	Tenderloin
Butt tender	Butt	Tenderloin
Short ribs	Rib set	Short ribs
Intercostals	Rib set	Intercostals
Rump	Butt	Rump
Tri tip	Butt	Rump

Rump cap	Butt	Rump
Rump centre	Butt	Rump
Eye of rump	Butt	Rump
Rostbiff	Butt	Rump
D-rump	Butt	Rump
Silverside	Butt	Silverside
Outside	Butt	Silverside
Outside flat	Butt	Outside
Heel muscle	Butt	Silverside
Eye round	Butt	Outside



Name	Region	Primal
Heart	Offal	Thoracic cavity
Pizzle	Offal	Pizzle
Liver	Offal	Liver
Kidney	Offal	Kidney
Tendons	Offal	Tendons
Tripe	Offal	Gastro intestinal tract
Large intestine	Offal	Gastro intestinal tract
Tongue	Offal	Head
Beef cheeks	Offal	Head
Rumen pillar	Offal	Gastro intestinal tract
Lungs	Offal	Thoracic cavity
Small intestine	Offal	Gastro intestinal tract
Head meat	Offal	Head
Lips	Offal	Head
Tail	Offal	Tail
Spleen	Offal	Gastro intestinal tract
Thick skirt	Offal	Abdominal cavity
Thin skirt	Offal	Abdominal cavity

