



BEEF CARCASS GRADING

O V E R V I E W



Value Discovery



MEASURING BEEF VALUE WITH CARCASS GRADING

Beef value discovery begins with carcass grading, the most used value assessment in the industry. A series of grades serve as dividing lines for consumer acceptance, yield and a report card for producers.

A consistent eating experience hinges on accurate carcass grading by the U.S. Department of Agriculture (USDA) at the packing plant. Consumers have learned that the grades provide a reasonable guarantee of beef consistency and flavor.



Producers know the beef industry's future, like their own, depends on profitably raising cattle that meet consumer demand. The dollars they earn are influenced by the grades assigned at the packing plant.

Purpose and Procedure

Carcass grading started in 1916 to offer uniformity when reporting livestock markets. Unlike meat inspection – a mandatory, tax-funded government process to insure wholesomeness – carcass grading is a voluntary government service that is paid for by the packing plant to assign value.

The process was tested when the government ordered meat for troops during World War I. After the war, the beef trade used quality grades as a product-purchasing tool. Yield grading of carcasses was added to the system in 1965 to

predict red-meat yield. Adjustments have been made since then, but the basic two-tiered system remains.

At harvest, carcasses are “dressed” by removing hide and internal organs, split into right and left halves, and chilled. After at least 24 hours in the cooler, the halves are “ribbed” with a cut between the 12th and 13th rib to expose the ribeye muscle. The process allows 15 minutes for the muscle to “bloom,” when oxygen changes the newly exposed ribeye from purple to a bright, cherry-red color.

USDA Agricultural Marketing Service agents grade carcasses as they pass by in the plant cooler, and assign the grade with an ink stamp. In a matter of 10 to 15 seconds, a carcass may receive a quality grade, yield grade and evaluation for a certified brand or export market.

QUALITY GRADING

USDA Quality Grades are used to indicate the differences in expected eating quality or palatability of beef carcasses. Each grade is determined by examining the marbling and physiological maturity of a carcass.

Eight quality grades differentiate desirability. Prime beef offers the most – and Canner the least – desirable eating experience. Most grain-fed beef grades Choice or Select.

Marbling

The amount of marbling (small flecks of fat within muscle tissue) is the primary determinant of quality grade within a maturity group. Increases in marbling lessen the density of lean muscle, provide more lubrication or juiciness, increase beef flavor, and better protect beef from overcooking.

This intramuscular fat is quantified using marbling scores assigned after a visual appraisal of the quantity, texture and distribution of marbling at the 12th-rib cross section.

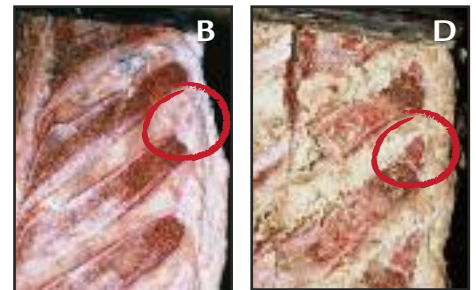
Higher marbling scores result in higher quality grades. The scores are based on nine levels of marbling, which are further subdivided into increments from 0 to 99 degrees. A marbling score is typically listed with its degree of marbling and numeric score. For instance, the lowest degree of marbling a carcass must have to earn the *Certified Angus Beef*® brand is a Modest 0 in the Choice grade.

Maturity

Tenderness decreases as cattle mature, making age a valuable component of quality grade. Only a small number of cattle are harvested with a

traceable birth record, due to the complex structure of the beef industry. However, the physiological age of the carcass can be assessed.

Skeletal characteristics as well as the color, firmness and texture of lean muscle change as cattle mature.



Cartilage buttons that ossify into chine bones (see circled areas) along the top of the backbone are the key indicators of maturity. Note the difference in bone color and texture in the B and D maturity carcasses above.

The size, shape and developmental stage of bones takes precedence over lean characteristics, which can be influenced by stress factors before and after harvest that cause carcass defects.

With age, the cartilage gradually and predictably turns to bone, starting near the rump and progressing forward over time. Meat graders look at the degree of ossification along the vertebral column as a key to carcass maturity. The youngest and most prominent category of fed cattle is “A,” representing estimated ages of 9 to 30 months.

The USDA classifies maturity in five categories from A to E:

- A – 9 to 30 months
- B – 30 to 42 months
- C – 42 to 72 months
- D – 72 to 96 months
- E – more than 96 months

	USDA Prime		USDA Commercial
	USDA Choice		USDA Utility
	USDA Select		USDA Cutter
	USDA Standard		USDA Canner

USDA Beef Grading Chart

Degree of Marbling	CARCASS MATURITY SCORE				
	A	B	C	D	E
ABUNDANT					
MODERATELY ABUNDANT					
SLIGHTLY ABUNDANT					
MODERATE					
MODEST					
SMALL					
SLIGHT					
TRACE					
PRACTICALLY DEVOID					

YIELD GRADING

USDA Yield Grades estimate beef cutability – defined as the percent of closely trimmed, boneless retail cuts from the round, loin, rib and chuck. A yield grade ranging from 1 to 5 is assigned with numerically smaller yield grades indicating higher value:

USDA Yield Grade	% Closely trimmed, boneless retail cuts
1	> 52.3
2	50.0 to 52.3
3	47.7 to 50.0
4	45.4 to 47.7
5	< 45.4

Yield grades are assigned, based on a calculation that includes external fat thickness, carcass weight, ribeye area, and estimated percentage of kidney, pelvic and heart fat (KPH).

External Fat Thickness

Meat graders use a ribeye fat-thickness measurement as an indicator of overall carcass fatness. The measurement is made three-fourths of the length around the outside of the ribeye muscle, starting from the chine or backbone.



Graders may adjust this based on visual appraisal of external fat distribution. Such flexibility improves measurement accuracy by accounting for fat in other areas of the carcass.

Carcass Weight and Ribeye Area

A higher ratio of ribeye area to carcass weight indicates a more muscular carcass.

The relationship between these two factors is linear, so cattle with average muscling and similar weight should have a reasonably predictable ribeye area, based on hot carcass weight:

Hot carcass weight (pounds)	Ribeye area (square inches)
600	11.0
650	11.6
700	12.2
750	12.8
800	13.4
850	14.0
900	14.6
950	15.2
1,000	15.8

Carcass weight is measured “hot,” rather than in the cooler, and that number is affixed to a carcass tag.

Ribeye area is measured at the 12th-rib cross section, often using a grid transparency. With this tool over the ribeye, dots surrounded by lean muscle are counted. The total number of dots divided by 10 equals the area in square inches.



Kidney, Pelvic and Heart Fat

These fat deposits in the kidney, pelvic and heart (KPH) cavities are typically left in the carcass after internal organs are removed. KPH fat accounts for 1% to 4% of carcass weight and has some effect on carcass cutability.

There is no objective standard to evaluate KPH, so graders must estimate the percentage, but the measurement has the least influence of the four yield grade factors.

Calculating Yield Grade

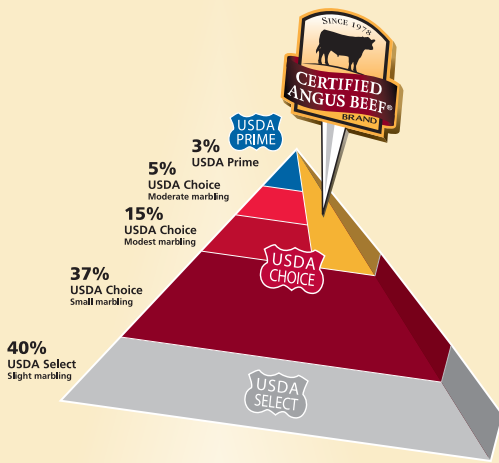
Yield grade is calculated by using the above measurements in a formula:

USDA Yield Grade = 2.5 + (2.5 x adjusted fat thickness, inches) + (0.20 x KPH, percent) - (0.32 x ribeye area, square inches) + (0.0038 x hot carcass weight, pounds)

Official USDA yield grades are calculated to the nearest tenth, but carcasses are only assigned a whole number. For example, the equation above could generate a value of 2.77. The calculated yield grade would be 2.8, and the carcass would be stamped as a USDA Yield Grade 2. The decimal is dropped, not rounded.

The equation serves as the guide and checkpoint for determining yield grade. Most quality and yield grades are assigned by an experienced grader’s visual appraisal in a matter of 10 to 15 seconds. He or she may use this equation to make close decisions or verify a grade when asked. Also, more packing plants are using instrument grading, with color-vision cameras, to help USDA graders make more accurate calls.

CARCASS DEFECTS

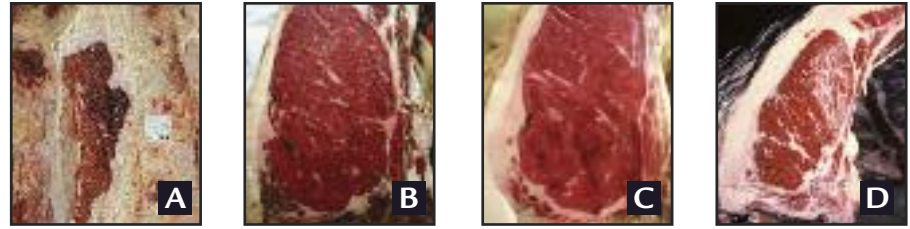


In 1978, the *Certified Angus Beef*® brand became the first USDA certified beef program. Today, there are more than 60 certified programs, and nearly three-fourths have Angus in the name.

The G-1 schedule number and stamp represent the *Certified Angus Beef*® brand. Angus-influenced cattle, with a predominately (51%) solid black hair coat or AngusSource® ear tag, are identified with an “A” stamped on the carcass after the hide is removed. These must then pass 10 carcass specifications to qualify for the brand.

Marbling
1. Modest 0 or higher marbling
2. Medium or fine marbling texture
Maturity
3. “A” maturity for each, lean and skeletal characteristics
Consistent Sizing
4. 10- to 16-square-inch ribeye area
5. Less than 1,000-pound hot carcass weight
6. Less than 1-inch fat thickness
Quality Appearance and Tenderness
7. Superior muscling (restricts dairy influence)
8. Practically free of capillary rupture
9. No dark cutters
10. No neck hump exceeding 2 inches

As the original Angus brand, the *Certified Angus Beef*® brand excels in product quality and availability. It has distanced itself from competing USDA certified beef brands with more than 70% of the premium Choice or higher market share.



Some imperfections can decrease carcass value and exclude them from grading. There are four common defects, although varying in frequency and severity: bruising, dark-cutting beef, blood splash and callused ribeyes.

A) Bruises

Deep tissue bruises and abscesses are the most common beef carcass defects. Poor cattle handling, accidents, or improper needle injections may cause these defects, which must be trimmed out at the packing plant. These defects have a larger influence on carcass value when located in the loin or rib.

B) Dark Cutters

A variety of preharvest-stress factors can produce dark-cutting beef, which is only a visual-appeal defect. When energy stores in the muscle are depleted, metabolic changes affect the acidic balance in meat and keep it from reaching the ideal cherry-red color

when exposed to oxygen. Consumers falsely associate the dark color with a lack of freshness and quality, making it difficult to sell at retail.

C) Capillary Rupture

When a carcass is not dressed and prepared properly at harvest, blood pressure within the carcass can spike and capillaries in the muscle tissue can rupture. This condition is also called blood splash. The resulting product is as safe to eat and flavorful as other beef, but it is not visually appealing to consumers.

D) Callused Ribeyes

Ribeyes can become callused when a preharvest injury to the longissimus muscle causes severe nerve damage. The damaged area develops a callus, or connective and fat tissue within the muscle.

CERTIFIED PROGRAM EVALUATION

The commodity beef industry has evolved in the last 30 years to include a variety of beef brands, each differentiated by a unique set of animal and carcass characteristics, and sometimes production methods.

These brands can be determined by packing companies and marketed as house brands, or USDA graders can evaluate carcasses for government certified programs.

Certification alone doesn't guarantee a higher level of quality. Current certified

programs utilize carcasses from each maturity group and quality grade. It is important to look at a brand's specifications to judge its quality.

Each program's carcass specifications are outlined in a “G schedule,” with corresponding carcass stamps to note acceptance into the program. After grading, plant employees sort potential carcasses for brands. Then, each is re-evaluated by a USDA grader based on specifications for each program.



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Carcass defect and skeletal maturity photos courtesy of United States Department of Agriculture. 2008.