



United States
Department of
Agriculture

Agricultural
Marketing
Service

Livestock,
Poultry,
and Seed
Program

United States Standards for Grades of Carcass Beef

Effective date December 18, 2017

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The following is a reprint of the Official United States Standards for Grades of Carcass Beef promulgated by the Secretary of Agriculture under the Agricultural Marketing Act of 1946 (60 Stat. 1087; 7 U.S.C. 1621-1627) as amended and related authority in the annual appropriation acts for the United States Department of Agriculture (USDA). The standards are reprinted with amendments effective December 18, 2017.

The United States Classes, Standards, and Grades of Carcass Beef were removed from the Code of Federal Regulations (CFR) on June 30, 1998. They are maintained by the USDA, Agricultural Marketing Service (AMS), as AMS 54.100 et seq. This document contains the classes, standards, and grades that are the most current to date.

Development of the Standards

The tentative U.S. Standards for the Grades of dressed beef were formulated in 1916. They provided the basis of uniformly reporting the dressed beef markets according to grades, which was inaugurated as a national service early in 1917. The grade specifications were improved from time to time as experience gained through their use indicated what changes were necessary. They were published first in mimeograph form in June 1923. After slight changes, they were included in the Department's Bulletin No. 1246 "Market Classes and Grades of Dressed Beef", which was published in August 1924.

Public hearings were held at Portland, OR, Chicago, IL, and New York, NY, in 1925 to give producers, slaughterers, wholesale and retail meat dealers, agricultural college workers, and others interested in the marketing of livestock and meat an opportunity to make suggestions for improving the standards. The sentiment registered at those meetings was overwhelmingly in favor of the grades as presented. The few suggestions and criticisms offered were carefully considered in subsequent revisions of the standards.

The tentative standards, although designed primarily for meat market reporting purposes, were put to further practical uses in numerous ways. During World War I, they were used in the selection of beef for the Army, Navy, and Allies. Later they were included in the specifications of the Emergency Fleet Corporation for the purchase of its beef supplies. Soon thereafter they were incorporated in the specifications of many commercial concerns including: steamship lines, restaurants, hotels, dining car services, and hospitals.

The revised grade descriptions were promulgated by the Secretary of Agriculture, June 3, 1926, as the Official United States Standards for the Grades of Carcass Beef and published in Service and Regulatory Announcements No. 99 (B.A.E.). These standards provided the basis for grading when the voluntary beef grading and stamping service began in May 1927.

The official standards were amended in July 1939 to provide a single standard for the grading and labeling of steer, heifer, and cow beef according to similar inherent quality characteristics.

The amendment also changed certain grade terms for steer, heifer, and cow beef from "Medium," "Common," and "Low Cutter" to "Commercial," "Utility," and "Canner," respectively. An amendment in November 1941 made similar changes in the grade terms for

bull and stag beef and established the following grade terminology for all beef: Prime¹, Choice, Good, Commercial, Utility, Cutter, and Canner. An amendment in October 1949 eliminated all references to color of fat.

In December 1950, the official standards for grades of steer, heifer, and cow beef were amended by combining the Prime and choice grades and designating them as Prime, renaming the Good grade as Choice, and dividing the Commercial grade into two grades by designating the beef produced from young animals included in the top half of the grade as Good while retaining the Commercial grade designation for the remainder of the beef in that grade. Other revisions in the standards for the Prime, Choice, Good, and Commercial grades were made for clarification and to facilitate their interpretation. Standards for the Utility, Cutter, and Canner grades were not affected. These changes in the standards were a modification of a proposal by USDA to revise the standards in August 1949, and were adopted after careful consideration of comments received in writing over a period of months and those presented orally at a public hearing in Chicago, IL, on June 28, 1950.

In June 1956, the official standards for grades for steer, heifer, and cow beef were amended by dividing the Commercial grade into two grades strictly on the basis of maturity with beef produced from young animals being designated as Standard while Commercial was retained as the grade name for beef produced from mature animals. This change, which was suggested by the Cattle and Beef Industry Committee, was identical in principle to that proposed by USDA in August 1949.

The official standards for grades of steer, heifer, and cow beef were revised in June 1965 to place less emphasis on changes in maturity in the Prime, Choice, Good, and Standard grades. This change was made to reflect the latest research information available regarding the effect of maturity on beef palatability. The minimum marbling permitted in these grades was not changed for the very youngest beef. However, the rate of increase in required marbling to offset increasing maturity was changed, and the minimum marbling permitted was reduced for more mature carcasses by as much as 1-1/2 degrees in Prime, 1 degree in Choice, and 3/4 of a degree in Good and Standard. In addition, the revision eliminated consideration of the two degrees of marbling in excess of that described as abundant. The manner of evaluating conformation also was clarified by providing that carcasses may meet the conformation requirements for a grade either through a specified development of muscling or a specified development of muscling and fat combined.

This revision also included a requirement that all carcasses be ribbed prior to grading and made other minor changes to clarify the intent of the standards and simplify their application. An added provision established standards for cutability grades of carcasses and certain wholesale cuts of all classes of beef. A dual grading system for beef carcasses, involving separate identification of differences in quality and in cutability, had been proposed by USDA in April 1962 and made available for use on a trial basis for a one-year period beginning July 1, 1962. The cutability standards adopted in 1965 were similar to those included as a part of the dual grading system, but modified on the basis of comments from industry and experience gained during the trial period of the dual grading system.

In July 1973, the official standards were revised to provide separate quality grades for beef

¹ The use of the grade specified as “Prime” for beef carcasses and wholesale cuts was suspended for the period September 18, 1942, to December 3, 1946, pursuant to amendment 5, Maximum Price Regulation 169 of the Office of Price Administration. During that period all carcass beef and wholesale cuts that met the specifications of the “Prime” grade were identified with and graded as “Choice.”

from young bulls. Interest in such grades primarily stemmed from earlier research which showed that young bulls were superior to steers in rate and efficiency of feedlot gain and from a belief by many producers that requiring such beef to be identified as "Bull" was a deterrent to its acceptance. Research comparing the palatability of beef from steers and young bulls indicated that young bull beef was slightly less palatable and slightly more variable in palatability than steer beef. These palatability differences were considered sufficient to preclude the grading of young bull beef without a sex identification, therefore this class was designated as "Bullock." The quality grade standards for bullock beef were essentially the same as those for steer, heifer, and cow beef but provided for only five grades--Prime, Choice, Good, Standard, and Utility. "Bull" was retained as the class designation for beef from more mature bulls but the quality grades for such beef were eliminated. As a result, the yield grade standards only applied to the grading of "Bull" beef. The quality grade standards for "Stag" beef also were eliminated and beef formerly included in this class were redesignated as "Bullock" or "Bull" dependent on its evidences of maturity. Related changes also were made in the "Application of Standards" section and, throughout the standards references to "cutability groups" were changed to "yield grades."

In April 1975, the official standards were revised to eliminate the consideration of maturity in determining the quality grade (1) of all bullock beef and (2) of all steer, heifer, and cow beef included in the youngest maturity group referenced in those standards. That change resulted from research reported because a related change was made in the standards for grades of steer, heifer, and cow beef in 1965, and which showed that, for beef in this youngest maturity group, increases in maturity did not have a detrimental effect on palatability. In the Prime, Choice, and Standard grades, the minimum marbling requirements for all such beef were revised to be the same as previously required for the youngest beef in each of these grades. However, for the Good grade, the minimum marbling requirements for the very youngest beef were increased one-half degree. For the more mature beef in each of these grades of steer, heifer, and cow beef, the previous rate of increase in marbling with increased maturity was retained but the minimum marbling requirements were reduced to coordinate them with the changed marbling requirements for beef in the youngest maturity group. In the Prime, Choice, and Standard grades, this reduction was one full degree. In the Good grade, the reduction was one-half a degree. In this same revision, conformation also was eliminated as a quality grade factor and all carcasses graded were required to be identified for both quality grade and yield grade. Variations in conformation had been shown to be unrelated to differences in palatability and their effect on yields of retail cuts was better measured by the yield grades. The combination of these two changes (1) eliminated a factor (conformation) whose use had contributed to variations in the quality of beef in the quality grades, and (2) provided an improved measure of carcass value. Both of these changes were originally proposed by USDA in 1962. An additional change reduced the maximum maturity permitted for steer, heifer, and cow beef in the Good and Standard grades to the same as that permitted in Prime and Choice. The changes that were made in the Good grade were designed to reduce the variability of the beef in that grade and to make it a very restrictive, leaner grade than Choice which might be more widely used than the previous Good grade. These revised standards were originally scheduled to become effective on April 14, 1975, but because of a series of court actions, they were not implemented until February 23, 1976.

In October 1980, the official standards for grades of steer, heifer, cow, and bullock beef and the related regulations were amended. The conditions necessary for removal of yield grade designations from officially graded beef were clarified by 1) specifying a maximum fat thickness (3/4 inch) to be met prior to removal and, 2) by specifying the items to which the requirement applies. Specific language was added to make carcasses which have had the characteristics of the ribeye or the thickness of fat over the ribeye altered ineligible for grading and to specify that the presentation of such carcasses for an official grade determination shall be considered a fraudulent or deceptive practice. Changes were made in the regulations to provide generally for grading only in carcass form and only in the establishment where the animal was slaughtered or initially chilled. In addition, a 10-minute minimum period between ribbing and presentation for grading was established. These changes were designed to increase the accuracy and uniformity of beef grade determinations and to provide more accurate grade information to purchasers of beef by reducing the variation in conditions under which grading could be accomplished.

In November 1987, the official standards were revised to change the name of the U.S. Good grade to U.S. Select for steer, heifer, cow, and bullock carcasses. The revision did not change the requirements for the grade, only the grade name. Although the 1975 changes in the Good grade had made a very restrictive, leaner grade than Choice, the Good grade had not been widely used. This change provided the industry an improved grade term to use in the marketing of this type of beef to consumers who desire an alternative to Choice.

In April 1989, the official standards were revised to allow the official grade to consist of the quality grade only, the yield grade only, or a combination of both. No changes were made in the actual yield grade or quality grade requirements. The change was made to allow the industry greater flexibility in the use of the beef grading system in order to provide consumers with the trimness levels desired.

In January 1997, the official standards were revised to restrict the Select grade to A maturity only and to raise the marbling degree required for Choice to minimum modest throughout B maturity. These changes were made to improve the uniformity and consistency within the Choice and Select grades.

In August 2001, a grading instrument was approved for use in determining the size of the ribeye area. Instrument assessment of yield grade was approved for use in March 2007, followed by assessment for marbling in September 2009. Implementing instrument technology helped the beef processing industry to provide more detailed carcass information to cattle producers.

In March 2016, changes were made that informed the public of administrative updates to the United States Standards for Grades of Carcass Beef. The updates included a reference to the removal of this standard from the Code of Federal Regulations in 1998; incorporated language that documents the use of photographs, objective aids or devices (e.g., instrument grading and other future technologies) used for grading; updated the examples for yield grading to reflect gains in carcass weights; and updated the names of organization units that resulted from the merger of Poultry Programs and Livestock and Seed Program into the Livestock, Poultry, and Seed Program (LPS).

In April 2016, AMS received a petition from industry stakeholders requesting that the beef standards be amended to include dentition and documentation of actual age as an additional determination of maturity grouping for official quality grading. The beef standards relied solely on skeletal and lean (physiological) maturity, and although never intended to be a definitive method to determine the age of cattle at the time of slaughter and instead utilized to predict beef palatability, the maturity groupings have historically been roughly correlated to different age categories.

Recent research, however, indicated that carcasses from grain-fed steers and heifers that are

deemed less than 30 months of age (MOA), based on dentition, are similar in palatability to A maturity carcasses determined via physiological maturity and thus could be classified A maturity for grading purposes even though the physiological maturity characteristics of B or older maturity groupings may be present. Further, dentition was already used by the Food Safety Inspection Service (FSIS) to determine animal age at time of slaughter on all cattle in order to determine whether their age is less than or greater than 30 MOA.

In June 2017, AMS sought public comment on proposed revisions to the beef standards through a notice in the *Federal Register*. Based on comments received, AMS proceeded with this revision to incorporate dentition and documentation of actual age as means of determining maturity groupings, and thus eligibility for Prime, Choice, and Select grade designations. A final notice indicating the changes published to the *Federal Register* on December 5, 2017.

§54.102 Scope.

These standards for grades of beef are written primarily in terms of carcasses. However, they also are applicable to the grading of sides. To simplify phrasing of the standards, the words “carcass” and “carcasses” are used to also mean “side” or “sides.”

§54.103 Classes of beef carcasses.

(a) Class determination of beef carcasses is based on evidences of maturity and apparent sex condition at the time of slaughter. The classes of beef carcasses are steers, bullocks, bulls, heifers, and cows. Carcasses from males -- steers, bullocks, and bulls -- are distinguished from carcasses from females -- heifers and cows -- as follows:

(1) Steer, bullock, and bull carcasses have a “pizzle muscle” (attachment of the penis) and related “pizzle eye” adjacent to the posterior end of the aitchbone.

(2) Steer, bullock, and bull carcasses have, if present, rather rough, irregular fat in the region of the cod. In heifer and cow carcasses, the fat in this region, if present, is much smoother.

(3) In steer, bullock, and bull carcasses, the area of lean exposed immediately ventral to the aitchbone is much smaller than in heifer and cow carcasses.

(b) Steer, bullock, and bull carcasses are distinguished by the following:

(1) In steer carcasses, the “pizzle muscle” is relatively small, light red in color, and fine in texture and the related “pizzle eye” is relatively small.

(2) In bullock and bull carcasses, the “pizzle muscle” is relatively large, dark red in color, and coarse in texture and the related “pizzle eye” is relatively large.

(3) Bullock and bull carcasses usually have a noticeable crest.

(4) Bullock and bull carcasses also usually have a noticeably developed small round muscle adjacent to the hipbone commonly referred to as the “jump muscle.” However, in carcasses with a considerable amount of external fat, the development of this muscle may be obscured.

(5) Although the development of the secondary sex characteristics is given primary consideration in distinguishing steer carcasses from bullock or bull carcasses, this differentiation is also facilitated by consideration of the color and texture of the lean. In bullock and bull carcasses, the lean is frequently at least dark red in color with a dull, “muddy” appearance -- and in some cases it may have an iridescent sheen. Also, it frequently has an “open” texture.

(6) The distinction between bullock and bull carcasses is based solely on their evidences of skeletal maturity. Carcasses with the maximum maturity permitted in the bullock class have slightly red and slightly soft chine bones, and the cartilages on the ends of the thoracic vertebrae have some evidence of ossification; the sacral vertebrae are completely fused; the cartilages on the ends of the lumbar vertebrae are nearly completely ossified; and the rib bones are slightly

wide and slightly flat. Bull carcasses have evidences of more advanced maturity.

(c) Heifer and cow carcasses are distinguished by the following:

(1) Heifer carcasses have a relatively small pelvic cavity and a slightly curved aitchbone. In cow carcasses, the pelvic cavity is relatively large and the aitchbone is nearly straight.

(2) In heifer carcasses, the udder usually will be present. In cow carcasses, the udder usually will have been removed. However, neither of these are requirements.

§54.104 Application of standards for grades of carcass beef.

(a) The carcass beef grades identify two separate general considerations 1) the indicated yield of closely trimmed (1/2 inch fat or less), boneless retail cuts expected to be derived from the major wholesale cuts (round, sirloin, short loin, rib, and square-cut chuck) of a carcass, herein referred to as the “yield grade,” and, 2) characteristics of the meat which predict the palatability of the lean, herein referred to as the “quality grade.” When officially graded, the grade of a steer, heifer, cow, or bullock carcass may consist of the quality grade only, the yield grade only, or a combination of the quality grade and the yield grade. The grade of a bull carcass consists of the yield grade only.

(b) The carcass beef grade standards are written so that the quality grade and yield grade standards are contained in separate sections. The quality grade section is divided further into two separate sections applicable to carcasses from: (1) steers, heifers, and cows, and (2) bullocks. Eight quality grade designations -- Prime, Choice, Select, Standard, Commercial, Utility, Cutter, and Canner -- are applicable to steer and heifer carcasses. Except for Prime, the same designations apply to cow carcasses. The quality grade designations for bullock carcasses are Prime, Choice, Select, Standard, and Utility. There are five yield grades applicable to all classes of beef, denoted by numbers 1 through 5, with Yield Grade 1 representing the highest degree of cutability.

(c) When officially graded, bullock and bull beef will be further identified for its sex condition; steer, heifer, and cow beef will not be so identified. The designated grades of bullock beef are not necessarily comparable in quality or cutability with a similarly designated grade of beef from steers, heifers, or cows. The cutability of a designated yield grade of bull beef is not necessarily comparable with a similarly designated yield grade of steer, heifer, cow, or bullock beef.

(d) USDA uses photographs and other objective aids or devices designated by the Agricultural Marketing Service (AMS)² in the correct interpretation and application of the standards.

(e) To determine the grade of a carcass, it must be split down the back into two sides and one or both sides must be partially separated into a hindquarter and forequarter by cutting it with a saw and knife insofar as practicable, as follows: A saw cut perpendicular to both the long axis and split surface of the vertebral column is made across the 12th thoracic vertebra at a point which leaves not more than one-half of this vertebra on the hindquarters. The knife cut across the ribeye muscle starts -- or terminates -- opposite the above-described saw cut. From that point it extends across the ribeye muscle perpendicular to the outside skin surface of the carcass at an angle toward the hindquarter which is slightly greater (more nearly horizontal) than the angle made by the 13th rib with the vertebral column of the hindquarter posterior to that point. As a

² Information concerning such devices and their use may be obtained from the AMS Livestock, Poultry, and Seed Program.

result of this cut, the outer end of the cut surface of the ribeye muscle is closer to the 12th rib than is the end next to the chine bone. Beyond the ribeye, the knife cut shall continue between the 12th and 13th ribs to a point which will adequately expose the distribution of fat and lean in this area. The knife cut may be made prior to or following the saw cut but must be smooth and even, such as would result from a single stroke of a very sharp knife.

(f) Other methods of ribbing may prevent an accurate evaluation of the grade determining characteristics. Therefore, carcasses ribbed by other methods will be eligible for grading only if an accurate grade determination can be made by the official grader under the standards.

(g) Beveling of the fat over the ribeye, application of pressure, or any other influences which may alter the characteristics of the ribeye or thickness of fat over the ribeye prevent an accurate grade determination. Therefore, carcasses subjected to such influences shall not be eligible for grade determinations, and the presentation of such carcasses for official grade determinations shall be considered a fraudulent or deceptive practice in connection with the services requested for such carcasses. Carcasses that have had more than minor amounts of external fat removed shall not be eligible for a yield grade determination, although carcasses with only minor amounts of external fat removed may be yield graded if the official grader determines that an accurate yield grade determination can be made. Although entire carcasses with more than minor amounts of lean removed from the major wholesale cuts (round, sirloin, short loin, rib, or square-cut chuck) shall not be eligible for grade determinations, the remaining portions of these carcasses which are unaffected by the removal of lean shall remain eligible for grade determinations, provided that a cross section at the 12th-13th rib is available and accurate grade determinations may be made.

(h) When both sides of a carcass have been ribbed prior to presentation for grading and the characteristics of the two ribeyes (area, marbling, color, texture, and firmness) would justify different quality and/or yield grades, the final grade of the carcass shall reflect the "highest" of each of these grades as determined from either side.

(i) To meet the demand of export trade or changing trade practices, grading of carcasses ribbed other than between the 12th and 13th ribs may be approved by the Director, LPS Quality Assessment Division. In such cases, grading shall be based on the requirements specified in these standards and shall be consistent with the normal development of grade characteristics in various parts of a carcass of the quality level involved. When an exception is granted for export trade, such carcasses shall be identified with the word "EXPORT" in such a manner that will clearly distinguish them from other officially graded beef.

(j) Carcasses qualifying for any particular grade may vary with respect to their relative development of the various grade factors. There will be carcasses that qualify for a particular grade, some of whose characteristics may be more nearly typical of another grade. For example, in comparison with the descriptions of maturity contained in the standards, a particular carcass might have a greater relative degree of ossification of the cartilages on the ends of its lumbar vertebrae than its other evidences of maturity. In such instances, the maturity of the carcass is not determined solely by the ossification of the lumbar vertebrae but neither is this ignored. All of the maturity-indicating factors are considered. In making any composite evaluation of two or more factors, it must be remembered that they seldom are developed to the same degree. Because it is impractical to describe the nearly limitless number of recognizable combinations of characteristics, the standards for each quality grade and yield grade describe only beef which has a relatively similar degree of development of the various factors affecting its quality and yield. Also, the quality grade and yield grade standards each describe beef which is representative of the lower limits of each quality grade and yield grade.

(k) For steer, heifer, and cow beef, quality of the lean is evaluated by considering its marbling

and firmness as observed in a cut surface in relation to carcass evidences of maturity. The maturity of the carcass is determined through one of three methods:

(1) Dentition as monitored by the Food Safety and Inspection Service (FSIS). Carcasses determined to be less than 30 months of age (MOA) will be classified as A maturity, and with the exception of dark cutting lean characteristics, the final quality grade will be determined by the degree of marbling. Any carcasses under 30 MOA exhibiting advanced skeletal maturity traits (as described for D- and E maturity) will not be eligible for the Prime, Choice, Select, or Standard grades and will be graded according to their skeletal, lean, and marbling traits accordingly;

(2) Documentation of age as verified through USDA-approved programs and by FSIS at the slaughter facility. Carcasses determined to be less than 30 MOA by age verification will be classified as A-maturity and, with the exception of dark cutting lean characteristics, the final quality grade will be determined by the degree of marbling. Any carcasses under 30 MOA exhibiting advanced skeletal maturity traits (as described for D- and E-maturity) will not be eligible for the Prime, Choice, Select, or Standard grades and will be graded according to their skeletal, lean, and marbling traits accordingly; or

(3) Through evaluation of the size, shape, and ossification of the bones and cartilages, especially the split chine bones, and the color and texture of the lean flesh. Carcasses determined to be greater than 30 MOA will be eligible for all quality grade classifications with the final quality grade being determined by the evaluation of the degree of marbling and any adjustment factors based on advanced skeletal maturity characteristics. In the split chine bones, ossification changes occur at an earlier stage of maturity in the posterior portion of the vertebral column (sacral vertebrae) and at progressively later stages of maturity in the lumbar and thoracic vertebrae. The ossification changes that occur in the cartilages on the ends of the split thoracic vertebrae are especially useful in evaluating maturity and these vertebrae are referred to frequently in the standards. Unless otherwise specified in the standards, whenever reference is made to the ossification of cartilages on the thoracic vertebrae, this shall be construed to refer to mature beef whose ribs will be very wide and flat.

(l) In steer, heifer, and cow beef, the color and texture of the lean flesh also undergo progressive changes with advancing maturity. In the very youngest carcasses considered as “beef,” the lean flesh will be very fine in texture and light grayish red in color. In progressively more mature carcasses, the texture of the lean will become coarser and the color of the lean will become darker red. In very mature beef, the lean flesh will be very coarse in texture and very dark red in color. Since the color of lean also is affected by variations in quality, references to the color of lean in the standards for a given degree of maturity vary slightly with different levels of quality. In determining the maturity of a carcass in which the skeletal evidences of maturity are different from those indicated by the color and texture of the lean, slightly more emphasis is placed on the characteristics of the bones and cartilages than on the characteristics of the lean. In no case can the overall maturity of the carcass be considered more than one full maturity group different from that indicated by its bones and cartilages.

(m) The preceding two paragraphs also are applicable to the determination of quality in bullock beef, except for carcasses having darker colors of lean than specified in the standards for the quality level for which they would otherwise qualify. In such carcasses, maturity will be evaluated on the basis of skeletal characteristics only, and the final grade will be determined in accordance with the procedures specified in the standards for grading “dark-cutting beef.”

(n) In determining compliance with the maximum maturity limits for the Prime, Choice, and Standard grades for steer, heifer, and cow carcasses, color and texture of the lean are considered only when the maturity-indicating factors, other than color and texture of the lean, indicate only

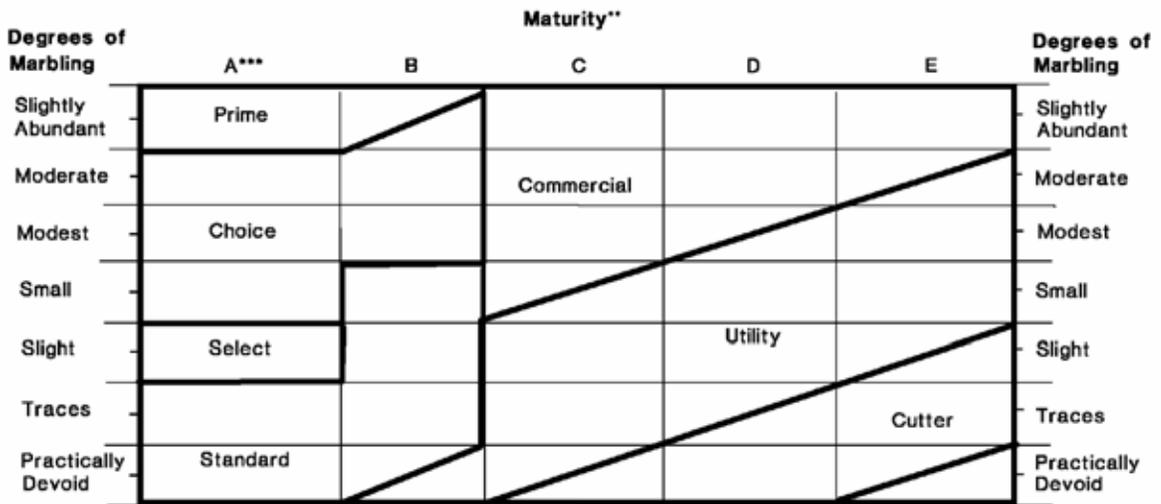
a slightly more advanced degree of maturity than that specified as maximum for these grades, and provided further that the lean is considerably finer in texture and lighter in color than normal for the grade and maturity involved. The same principle, in reverse, is likewise applicable to determining compliance with the minimum maturity limits of the Commercial grade.

(o) These standards are applicable to the grading of beef throughout the full range of maturity within which cattle are marketed. However, in steer, heifer, and cow carcasses, the range of maturity permitted within each of the grades varies considerably. The Prime, Choice, Select, and Standard grades are restricted to beef from young cattle; the Commercial grade is restricted to beef from cattle too mature for Prime, Choice, and Standard; and the Utility, Cutter, and Canner grades may include beef from animals of all ages. By definition, bullock carcasses are restricted to those whose evidences of maturity do not exceed those specified for the juncture of the two youngest maturity groups referenced in the standards for steer, heifer, and cow carcasses. Except for the youngest maturity group and the Choice grade in the second maturity group, within any specified grade, the requirements for marbling increase progressively with evidences of advancing maturity. In the youngest maturity group, the marbling requirements do not increase progressively with evidences of advancing maturity. For each grade, the firmness requirements are different for each maturity group, but, within each maturity group, the firmness requirements do not increase progressively with evidences of advancing maturity. Also, regardless of the extent to which marbling may exceed the minimum of a grade, a carcass must meet the minimum firmness requirements for its maturity to qualify for that grade. To facilitate the application of these principles, the standards recognize five different maturity groups and seven different degrees of marbling. The five maturity groups are identified in Figure 1 as A, B, C, D, and E in order of increasing maturity. The limits of these five maturity groups are specified in the grade descriptions for steer, heifer, and cow carcasses. The A maturity portion of the figure is the only portion applicable to bullock carcasses. The degrees of marbling referenced in the specifications, in order of descending quantity are: Slightly abundant, moderate, modest, small, slight, traces, and practically devoid. However, for carcass evaluation programs and other purposes, three higher degrees are recognized -- moderately abundant, abundant, and very abundant. Illustrations of the lower limits of nine of these ten degrees of marbling are available from the USDA.

(p) The relationship between marbling, maturity and quality grade is shown in Figure 1. This figure assumes that the firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter." From this figure it can be seen, for instance, that the minimum marbling requirement for Choice varies from a minimum small amount for carcasses throughout the youngest maturity group to a maximum small amount for carcasses having the maximum maturity permitted in Choice. Likewise, in the Commercial grade the minimum marbling requirement varies from a minimum small amount in beef with the minimum maturity permitted to a maximum moderate amount in beef from very mature animals. The marbling and other lean flesh characteristics specified for the various grades are based on their appearance in the ribeye muscle of properly chilled carcasses that are ribbed between the 12th and 13th ribs.

For carcass evaluation programs and other purposes, in the Prime and Commercial grades, each additional degree of marbling (up to three) greater than specified as minimum for each of these grades is equal to one-third of a grade of higher quality.

Relationship Between Marbling, Maturity, and Carcass Quality Grade*



* Assumes that firmness of lean is comparably developed with the degree of marbling and that the carcass is not a "dark cutter."

** Maturity increases from left to right (A through E).

*** The A maturity portion of the Figure is the only portion applicable to bullock carcasses.

Figure 1

(q) References to color of lean in the standards for steer, heifer, and cow beef involve only colors associated with changes in maturity. They are not intended to apply to colors of lean associated with so-called "dark-cutting beef." "Dark-cutting beef" is believed to be the result of a reduced sugar content of the lean at the time of slaughter. As a result, this condition does not have the same significance in grading as do the darker shades of red associated with advancing maturity. The dark color of the lean associated with "dark-cutting beef" is present in varying degrees from that which is barely evident to so-called "black cutters" in which the lean is actually nearly black in color and usually has a "gummy" texture. Although there is little or no evidence which indicates that the "dark-cutting" condition has any adverse effect on palatability, it is considered in grading because of its effect on acceptability and value. Depending on the degree to which this characteristic is developed, the final grade of carcasses which otherwise would qualify for the Prime, Choice, or Select grades may be reduced as much as one full grade. In beef otherwise eligible for the Standard or Commercial grade, the final grade may be reduced as much as one-half of a grade. In the Utility, Cutter, and Canner grades, this condition is not considered.

(r) The yield grade of a beef carcass is determined by considering four characteristics: (1) the amount of external fat, (2) the amount of kidney, pelvic, and heart fat, (3) the area of the ribeye muscle, and (4) the carcass weight.

(s) The amount of external fat on a carcass is evaluated in terms of the thickness of this fat over the ribeye muscle, measured perpendicular to the outside surface at a point three-fourths of the length of the ribeye from its chine bone end. This measurement may be adjusted, as necessary, to reflect unusual amounts of fat on other parts of the carcass. In determining the amount of this adjustment, if any, particular attention is given to the amount of fat in such areas as the brisket, plate, flank, cod or udder, inside round, rump, and hips in relation to the actual thickness of fat over the ribeye. Thus, in a carcass which is fatter over other areas than is indicated by the fat measurement over the ribeye, the measurement is adjusted upward. Conversely, in a carcass which has less fat over the other areas than is indicated by the fat

measurement over the ribeye, the measurement is adjusted downward. In many carcasses no such adjustment is necessary; however, an adjustment in the thickness of fat measurement of one-tenth or two-tenths of an inch is not uncommon. In some carcasses a greater adjustment may be necessary. As the amount of external fat increases, the percent of retail cuts decreases -- each one-tenth inch change in adjusted fat thickness over the ribeye changes the yield grade by 25 percent of a yield grade.

(t) The amount of kidney, pelvic, and heart fat considered in determining the yield grade includes the kidney knob (kidney and surrounding fat), the lumbar and pelvic fat in the loin and round, and the heart fat in the chuck and brisket area which are removed in making closely trimmed retail cuts. The amount of these fats is evaluated subjectively and expressed as a percent of the carcass weight. As the amount of kidney, pelvic, and heart fat increases, the percent of retail cuts decreases -- a change of 1 percent of the carcass weight in these fats changes the yield grade by 20 percent of a yield grade.

(u) The area of the ribeye is determined where this muscle is exposed by ribbing. This area usually is estimated subjectively; however, it may be measured. An increase in the area of ribeye increases the percent of retail cuts -- a change of 1 square inch in area of ribeye changes the yield grade by approximately 30 percent of a yield grade.

(v) Hot carcass weight (or chilled carcass weight x 102 percent) is used in determining the yield grade. As carcass weight increases, the percent of retail cuts decreases -- a change of 100 pounds in hot carcass weight changes the yield grade by approximately 40 percent of a yield grade.

(w) The standards include a mathematical equation for determining yield grade. This grade is expressed as a whole number. For example, if the computation results in a designation of 3.9, the final grade is 3 -- it is not rounded to 4. If yield grade is determined through objective means (e.g. instrumentation), the resulting designation may include a fractional part. Regardless of the means of determination, the aggregate is dropped for consideration of grade application.

(x) The yield grade standards for each of the first four yield grades list characteristics of two carcasses of two different weights together with descriptions of the usual fat deposition pattern on various areas of the carcass. These descriptions are not specific requirements -- they are included only as illustrations of carcasses which are near the borderlines between groups. For example, the characteristics listed for Yield Grade 1 represent carcasses which are near the borderline of Yield Grades 1 and 2. These descriptions facilitate the subjective determination of the yield grade without making detailed measurements and computations. The yield grade for most beef carcasses can be determined accurately on the basis of a visual appraisal. Objective detailed measurements extend the accuracy to fractional parts.

§54.105 Specifications for official United States standards for grades of carcass beef (yield).

(a) The yield grade of a beef carcass is determined on the basis of the following equation: Yield grade -- $2.50 + (2.50 \times \text{adjusted fat thickness, inches}) + (0.20 \times \text{percent kidney, pelvic, and heart fat}) + (0.0038 \times \text{hot carcass weight, pounds}) - (0.32 \times \text{area ribeye, square inches})$.

(b) The following descriptions provide a guide to the characteristics of carcasses in each yield grade to aid in determining yield grades subjectively.

(1) *Yield Grade 1.* (i) A carcass in Yield Grade 1 usually has only a thin layer of external fat over the ribs, loins, rumps, and clods, and slight deposits of fat in the flanks and cod or udder. There is usually a very thin layer of fat over the outside of the rounds and over the tops of the shoulders and necks. Muscles are usually visible through the fat in many areas of the carcass.

(ii) A 700-pound carcass of this yield grade, which is near the borderline of Yield Grades 1 and 2, might have two-tenths inch of fat over the ribeye, 12.5 square inches of ribeye, and 1.5

percent of its weight in kidney, pelvic, and heart fat.

(iii) A 1,100-pound carcass of this yield grade, which is near the borderline of Yield Grades 1 and 2, might have four-tenths inch of fat over the ribeye, 19.1 square inches of ribeye, and 2.0 percent of its weight in kidney, pelvic, and heart fat.

(2) *Yield Grade 2.* (i) A carcass in Yield Grade 2 usually is nearly completely covered with fat, but the lean is plainly visible through the fat over the outside of the rounds, the tops of the shoulders, and the necks. There usually is a slightly thin layer of fat over the loins, ribs, and inside rounds and the fat over the rumps, hips, and clods usually is slightly thick. There are usually small deposits of fat in the flanks and cod or udder.

(ii) A 700-pound carcass of this yield grade, which is near the borderline of Yield Grades 2 and 3, might have five-tenths inch of fat over the ribeye, 12.3 square inches of ribeye, and 2.5 percent of its weight in kidney, pelvic, and heart fat.

(iii) A 1,100-pound carcass of this yield grade, which is near the borderline of Yield Grades 2 and 3, might have six-tenths inch of fat over the ribeye, 18.1 square inches of ribeye, and 3.0 percent of its weight in kidney, pelvic, and heart fat.

(3) *Yield Grade 3.* (i) A carcass in Yield Grade 3 usually is completely covered with fat and the lean usually is visible through the fat only on the necks and the lower part of the outside of the rounds. There usually is a slightly thick layer of fat over the loins, ribs, and inside rounds and the fat over the rumps, hips, and clods usually is moderately thick. There usually are slightly large deposits of fat in the flanks and cod or udder.

(ii) A 700-pound carcass of this yield grade, which is near the borderline of Yield Grades 3 and 4, might have seven-tenths inch of fat over the ribeye, 11.0 square inches of ribeye, and 3.0 percent of its weight in kidney, pelvic, and heart fat.

(iii) A 1,100-pound carcass of this yield grade, which is near the borderline of Yield Grades 3 and 4, might have eight-tenths inch of fat over the ribeye, 16.9 square inches of ribeye, 3.5 percent of its weight in kidney, pelvic, and heart fat.

(4) *Yield Grade 4.* (i) A carcass in Yield Grade 4 usually is completely covered with fat.

The only muscles usually visible are those on the shanks and over the outside of the plates and flanks. There usually is a moderately thick layer of fat over the loins, ribs, and inside rounds and the fat over the rumps, hips, and clods usually is thick. There usually are large deposits of fat in the flanks and cod or udder.

(ii) A 700-pound carcass of this yield grade, which is near the borderline of Yield Grades 4 and 5, might have nine-tenths inch of fat over the ribeye, 9.8 square inches of ribeye, and 3.5 percent of its carcass weight in kidney, pelvic, and heart fat.

(iii) A 1,100-pound carcass of this yield grade, which is near the borderline of Yield Grades 4 and 5, might have one inch of fat over the ribeye, 15.6 square inches of ribeye, and 4.0 percent of its weight in kidney, pelvic and heart fat.

(5) *Yield Grade 5.* A carcass in Yield Grade 5 usually has more fat on all of the various parts, a smaller area of ribeye, and more kidney, pelvic, and heart fat than a carcass in Yield Grade 4.

§54.106 Specifications for official United States standards for grades of carcass beef (quality-steer, heifer, cow).

(a) *Prime.* (1) Depending on their degree of maturity, beef carcasses possessing the minimum requirements for the Prime grade vary in their other indications of quality as evidenced in the ribeye muscle. Minimum quality characteristics are described for two maturity groups which cover the entire range of maturity permitted in the Prime grade.

(2) Carcasses in the younger group, range from the youngest that are eligible for the beef class to those at the juncture of the two maturity groups, which have slightly red and slightly soft chine bones and cartilages on the ends of the thoracic vertebrae that have some evidence of ossification. In addition, the sacral vertebrae are completely fused and the cartilages on the ends of the lumbar vertebrae are nearly completely ossified. The rib bones are slightly wide and slightly flat and the ribeye muscle is light red in color and is fine in texture. In carcasses throughout the range of maturity included in this group, a minimum slightly abundant amount of marbling is required (see Figure 1) and the ribeye muscle is moderately firm.

(3) Carcasses in the older group, range from those described above as representative of the juncture of the two groups to those at the maximum maturity permitted in the Prime grade, which have chine bones tinged with red and cartilages on the ends of the thoracic vertebrae that are partially ossified. In addition, the sacral vertebrae are completely fused, the cartilages on the ends of the lumbar vertebrae are completely ossified, and the cut surface of the lean tends to be fine in texture. The minimum degree of marbling required increases with advancing maturity throughout this group from minimum slightly abundant to maximum slightly abundant (see Figure 1) and the ribeye muscle is firm.

(4) Beef produced from cows is not eligible for the Prime grade.

(b) *Choice.* (1) Depending on their degree of maturity, beef carcasses possessing the minimum requirements for the Choice grade vary in their other indications of quality as evidenced in the ribeye muscle. Minimum quality characteristics are described for two maturity groups, which cover the entire range of maturity permitted in the Choice grade.

(2) Carcasses in the younger group, range from the youngest that are eligible for the beef class, to those at the juncture of the two maturity groups, which have slightly red and slightly soft chine bones and cartilages on the ends of the thoracic vertebrae that have some evidence of ossification. In addition, the sacral vertebrae are completely fused and the cartilages on the ends of the lumbar vertebrae are nearly completely ossified. The rib bones are slightly wide and slightly flat and the ribeye muscle is moderately light red in color and is fine in texture. In carcasses throughout the range of maturity included in this group, a minimum small amount of marbling is required (see Figure 1) and the ribeye muscle may be slightly soft.

(3) Carcasses in the older group range from those described above as representative of the juncture of the two groups, to those at the maximum maturity permitted in the Choice grade, which have chine bones tinged with red and cartilages on the ends of the thoracic vertebrae are partially ossified. In addition, the sacral vertebrae are completely fused, the cartilages on the ends of the lumbar vertebrae are completely ossified, and the cut surface of the lean tends to be fine in texture. In carcasses throughout the range of maturity included in this group, a minimum modest amount of marbling is required (see Figure 1) and the ribeye muscle is slightly firm.

(c) *Select.* (1) In carcasses throughout the range of maturity permitted in the Select grade, the minimum marbling required is a minimum slight amount (see Figure 1) and the ribeye may be moderately soft.

(2) Carcasses in the maturity group permitted range from the youngest that are eligible for the beef class, to those at the juncture of the two maturity groups, which have slightly red and slightly soft chine bones and cartilages on the ends of the thoracic vertebrae that have some evidence of ossification. In addition, the sacral vertebrae are completely fused and the cartilages on the ends of the lumbar vertebrae are nearly completely ossified. The rib bones are slightly wide and slightly flat and the ribeye muscle is slightly light red in color and is fine in texture. In carcasses throughout the range of maturity included in this group, a minimum slight amount of marbling is required (see Figure 1) and the ribeye may be moderately soft.

(d) *Standard.* (1) Depending on their degree of maturity, beef carcasses possessing the

minimum requirements for the standard grade vary in their other indications of quality as evidenced in the ribeye muscle. Minimum quality characteristics are described for two maturity groups which cover the entire range of maturity permitted in the Standard grade.

(2) Carcasses in the younger group range from the youngest that are eligible for the beef class to those at the juncture of the two maturity groups, which have slightly red and slightly soft chine bones and cartilages on the ends of the thoracic vertebrae that have some evidence of ossification. In addition, the sacral vertebrae are completely fused and the cartilages on the ends of the lumbar vertebrae are nearly completely ossified. The rib bones are slightly wide and slightly flat and the ribeye muscle is slightly dark red in color and is fine in texture. In carcasses throughout the range of maturity included in this group, a minimum practically devoid amount of marbling is required (see Figure 1) and the ribeye muscle may be soft.

(3) Carcasses in the older group range from those described above as representative of the juncture of the two groups to those at the maximum maturity permitted in the Standard grade, which have chine bones tinged with red and cartilages on the ends of the thoracic vertebrae that are partially ossified. In addition, the sacral vertebrae are completely fused, the cartilages on the ends of the lumbar vertebrae are completely ossified, and the cut surface of the lean is moderately fine in texture. The minimum degree of marbling required increases with advancing maturity throughout this group from minimum practically devoid to maximum practically devoid (see Figure 1) and the ribeye muscle may be moderately soft.

(e) *Commercial*. (1) Commercial grade beef carcasses are restricted to those with evidences of more advanced maturity than permitted in the Standard grade. Depending on their degree of maturity, beef carcasses possessing the minimum requirements for the Commercial grade vary in their other indications of quality as evidenced in the ribeye muscle. Minimum quality characteristics are described for the youngest and the most mature of these groups. The requirements for the intermediate group are determined by interpolation between the requirements indicated for the two groups described.

(2) Carcasses in the youngest group permitted in the Commercial grade range from those with indications of maturity barely more advanced than described as maximum for the Standard grade, to those with moderately hard, rather white chine bones and with cartilages on the ends of the thoracic vertebrae that show considerable ossification but the outlines of the cartilages are still plainly visible. In addition, the rib bones are moderately wide and flat and the ribeye muscle is moderately dark red and slightly coarse in texture. The minimum degree of marbling required increases with advancing maturity throughout this group from a minimum small amount to a maximum small amount (see Figure 1) and the ribeye muscle is slightly firm.

(3) The youngest carcasses in the most mature group included in the Commercial grade have hard, white chine bones and the outlines of the cartilages on the ends of the thoracic vertebrae are barely visible, the rib bones are wide and flat, and the ribeye muscle is dark red and coarse in texture. The range of maturity in this group extends to include carcasses from the oldest animals marketed. The minimum degree of marbling required increases with advancing maturity throughout this group from a minimum moderate amount to a maximum moderate amount (see Figure 1) and the ribeye muscle is firm.

(f) *Utility*. (1) Depending on their degree of maturity, beef carcasses possessing the minimum requirements for the Utility grade vary in their other indications of quality as evidenced in the ribeye muscle. Carcasses within the full range of maturity classified as beef are included in the Utility grade. Thus, five maturity groups are recognized. Minimum quality requirements are described for three of these groups -- the first or youngest, the third or intermediate, and the fifth or the most mature. The requirements for the second and fourth maturity groups are determined by interpolation between the requirements described for their

adjoining groups.

(2) Carcasses in the first or youngest maturity group range from the youngest that are eligible for the beef class, to those at the juncture of the first two maturity groups, which have slightly red and slightly soft chine bones and cartilages on the ends of the thoracic vertebrae that have some evidence of ossification. In addition, the sacral vertebrae are completely fused and the cartilages on the ends of the lumbar vertebrae are nearly completely ossified. The rib bones are slightly flat and the ribeye muscle is slightly dark red in color and fine in texture. In carcasses throughout the range of maturity included in this group, the ribeye muscle is devoid of marbling and may be soft and slightly watery.

(3) Carcasses in the third or intermediate maturity group range from those with indications of maturity barely more advanced than described as maximum for the Standard grade, to those with moderately hard, rather white chine bones and with cartilages on the ends of the thoracic vertebrae that show considerable ossification but the outlines of the cartilages are still plainly visible. In addition, the rib bones are moderately wide and flat and the ribeye muscle is dark red in color and slightly coarse in texture. The minimum degree of marbling required increases with advancing maturity throughout this group from minimum practically devoid to maximum practically devoid (see Figure 1) and the ribeye muscle may be moderately soft.

(4) The youngest carcasses in the fifth or oldest maturity group have hard, white chine bones, and the outlines of the cartilages on the ends of the thoracic vertebrae are barely visible, the rib bones are wide and flat, and the ribeye muscle is very dark red in color and coarse in texture. The range in maturity in this group extends to include carcasses from the oldest animals produced. The minimum degree of marbling required increases with advancing maturity throughout this group from a minimum slight amount to a maximum slight amount (see Figure 1) and the ribeye muscle is slightly firm.

(g) *Cutter.* (1) Depending on their degree of maturity, beef carcasses possessing the minimum requirements for the Cutter grade vary in their other indications of quality as evidenced in the ribeye muscle. Carcasses within the full range of maturity classified as beef are included in the Cutter grade. Thus, five maturity groups are recognized. Minimum quality requirements are described for three of these groups -- the first or youngest, the third or intermediate, and the fifth or the most mature. The requirements for the second and fourth maturity groups are determined by interpolation between the requirements described for their adjoining groups.

(2) Carcasses in the first or youngest maturity group range from the youngest that are eligible for the beef class to those at the juncture of the first two maturity groups, which have slightly red and slightly soft chine bones and cartilages on the ends of the thoracic vertebrae that have some evidence of ossification. In addition, the sacral vertebrae are completely fused and the cartilages on the ends of the lumbar vertebrae are nearly completely ossified. The rib bones are slightly wide and slightly flat and the ribeye muscle is slightly dark red in color and fine in texture. In carcasses throughout the range of maturity included in this group, the ribeye muscle is devoid of marbling and may be very soft and watery.

(3) Carcasses in the third or intermediate maturity group range from those with indications of maturity barely more advanced than described as maximum for the Standard grade, to those with moderately hard, rather white chine bones and with cartilages on the ends of the thoracic vertebrae that show considerable ossification but the outlines of the cartilages are still plainly visible. In addition, the rib bones are moderately wide and flat and the ribeye muscle is dark red in color and slightly coarse in texture. In carcasses throughout the range of maturity included in this group, the ribeye muscle is devoid of marbling and may be soft and watery.

(4) Carcasses in the fifth or oldest maturity group have hard white chine bones and the

outlines of the cartilages on the ends of the thoracic vertebrae are barely visible, the rib bones are wide and flat, and the ribeye muscle is very dark red in color and coarse in texture. The range in maturity in this group extends to include carcasses from the oldest animals produced. The minimum degree of marbling required increases with advancing maturity throughout this group from minimum practically devoid to maximum practically devoid (see Figure 1) and the ribeye muscle is soft and slightly watery.

(h) *Canner*. The Canner grade includes only those carcasses that are inferior to the minimum requirements specified for the Cutter grade.

§54.107 Specifications for official United States standards for grades of carcass beef (quality -- bullock).

(a) *Prime*. For the Prime grade, the minimum degree of marbling required is a minimum slightly abundant amount for carcasses throughout the range of maturity permitted in the bullock class. The ribeye muscle is moderately firm and, in carcasses having the maximum maturity for this class, the ribeye is light red in color.

(b) *Choice*. For the Choice grade, the minimum degree of marbling required is a minimum small amount for carcasses throughout the range of maturity permitted in the bullock class. The ribeye muscle may be slightly soft and, in carcasses having the maximum maturity for this class, the ribeye is moderately light red in color.

(c) *Select*. For the Select grade, the minimum degree of marbling required is a minimum slight amount for carcasses throughout the range of maturity permitted in the bullock class. The ribeye muscle may be moderately soft and, in carcasses having the maximum maturity for this class, the ribeye is slightly light red in color.

(d) *Standard*. For the Standard grade, the minimum degree of marbling required is a minimum practically devoid amount for carcasses throughout the range of maturity permitted in the bullock class. The ribeye muscle may be soft and, in carcasses having the maximum maturity for this class, the ribeye is slightly dark red in color.

(e) *Utility*. The Utility grade includes only those carcasses that do not meet the minimum requirements specified for the Standard grade.