



BEEF CARCASS INSTRUMENT GRADING PROCEDURES

1 Purpose

The U.S. Department of Agriculture (USDA), Agricultural Marketing Service (AMS), Livestock, Poultry and Seed Program (LPSP), Quality Assessment Division (QAD) will implement a program to predict beef carcass quality and yield factors made by approved instrument systems. This Procedure and references from the Standardization Branch (SB) define all procedures to implement this program. Plants are encouraged to utilize USDA approved technologies to augment the USDA grading process of beef carcasses presented for official grading. This voluntary program may be utilized by a plant at their discretion, but must comply with QAD Procedures and SB requirements in order to be recognized and relied upon by the AMS Agent in conducting official duties.

2 Scope

The intent of utilizing beef carcass instrument grading augmentation is to improve the accuracy and uniformity of grade application nationwide. Instrumentation grade data may be obtained from both sides of a carcass or from either side. When both sides are available and the plant only collects grade data from a single side, the plant instrumentation operator shall determine which side will be used to collect the best quality and/or yield grade data. When neither side of a carcass can be used for instrumentation assessment, the carcass may be presented for traditional grading provided an accurate grade determination can be made by the AMS Agent or re-presented for instrument assessment if further preparations are conducted for proper image capture.

3 References

[GVD Procedure 500 Beef, Bullock, and Bull Grading Methods and Procedures](#)

[QAD 515 Form Instrument Validation](#)

[United States Standards for Grades of Carcass Beef, January 31, 1997](#)

4 Instrument and Cooler Operation

4.1 Applicant Responsibility

4.1.1 Provide the AMS Agent with approved procedures for startup and re-startup in the event of instrumentation failure during a single shift.

4.1.2 Provide documentation that the instrument operator(s) and/or technician(s) is/are trained

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4.1.3 Use only instruments approved by the SB.

4.1.4 Assure carcasses are adequately chilled, properly split, and properly ribbed a minimum of ten minutes prior to presentation to the instrument and presented for grading in accordance with *QAD Procedure 500 Beef, Bullock, and Bull Grading Methods and Procedures*.

4.1.5 Operate instrument technology in accordance with the manufacturer's guidance.

4.1.6 Ensure instrument prediction information and images are provided to the AMS Agent for proper monitoring of the system.

4.2 AMS Responsibility

4.2.1 Review, understand, and apply the approved start-up procedures.

4.2.2 Verify the training of the operator and technicians are current (within the last 12 months) via a training log or other acceptable documentation.

4.2.3 Verify, as applicable, that the instrument(s) is/are on an approved list via serial numbers, etc.

4.2.4 Verify that all components (camera head, cable and controller box) have the same ID number.

4.2.5 Assign a sufficient number of AMS agents to provide an efficient and effective service.

4.2.6 Using *QAD 515 Form Instrument Validation*, monitor calibration/validation start-up immediately prior to the start of operations, as applicable. Additional validation by the applicant (system check) will occur at the mid-shift meal break. If breaks are longer than 30 minutes (See VERSOP dated 10-12-11), a complete validation of the instrument must be done.

A Daily Validation - Ensure that the marbling validation readings are within the daily tolerances established by the SB in the Instrument Marbling Validation Cards - Target and Tolerance Values (Exhibit B).

- 1 Record the average marbling check scores (low, medium, and high) as well as the standard deviation for each card on the Instrument Validation (Exhibit A) form. If the marbling score readings are within the daily tolerances, a "pass" shall be indicated with a "1" (one) for correct or a "0" (zero) for not correct in the "Daily" box. Also record the average value for the USDA marbling card as well as the standard deviation (these values are not considered when validating the instrument and are used for maintenance issues only).
- 2 If the marbling check system fails, notify applicant management, and discontinue use of the instrument until the problem has been corrected. At the option of the applicant, traditional grading by the AMS Agent may occur until corrective action is completed. The system must be rebooted and allowed to warm up a minimum of 45 minutes. After a corrective action, monitoring/validation will be repeated before a restart of instrumentation operations.



B Long Term Validation - Ensure that the long-term readings are within the tolerance four (4) or more times for the last ten (10) checks (see *QAD 515 Appendix Instrument Marbling Validation Cards - Target and Tolerance Values*).

- 1 If two or more of the readings from the Low, Medium or High cards are within the long-term tolerances, (Low and High, Medium and High, Low and Medium, or all three), a “pass” shall be indicated with a “1” (one) in the “Long Term” box. If two or more of the marbling score readings are outside of the long-term tolerances, place a “0” (zero) in the “Long Term” box.

NOTE: The USDA marbling card is not part of the long-term validation check.

- 2 If only three or less of the last ten long term marbling validation checks have passed, notify applicant management, and discontinue use of the instrument until the instrument system has undergone a documented service and recalibration, and the problem causing the noncompliance has been corrected. Management may use an alternate instrument system or may use traditional grading by the AMS Agent until the corrective action is completed.

5 Carcass Presentation Phase

5.1 Applicant Responsibility

- 5.1.1 Ensure carcasses are presented split and ribbed in accordance with the *United States Standards for Grades of Carcass Beef, January 31, 1997*.
- 5.1.2 Provide an employee to identify the carcasses with the official USDA grade shields and acceptance stamps. Staffing and position placement of AMS Agents for this purpose will be determined locally by the AMS supervisor on a case-by-case basis.
- 5.1.3 In chain grading operations, provide a shut-off switch for the AMS grader to stop the operation when additional time is needed to override the instrumentation grade prediction.

5.2 AMS Responsibility

Ensure “common” QAD equipment is used to apply grade and certification identification stamps when accepting instrument grade factor data output. Plant employees applying grade stamps must be in close and visual proximity to the AMS agent so that the proper grade carcass identification can be monitored.



6 Image – Capture Phase

6.1 Applicant Responsibility

- 6.1.1 Ensure images are sharp and clear (properly focused and not blurred).
- 6.1.2 Ensure images are free of processing debris that would negatively impact instrument prediction (cumulative area must not exceed 0.5 square inches).
- 6.1.3 Ensure camera placement includes the 12th-13th rib cross section.
- 6.1.4 Ensure quality control measures are being conducted to verify proper alignment of camera mechanism on carcass surface.
- 6.1.5 Ensure images do not have extra muscles (examples: spinalis dorsi and intercostal) that would negatively impact instrument prediction (cumulative area must not exceed 0.9 square inches) for over tracing or under tracing. If they do, image would be deemed unacceptable for grade.

7 Official Grade Determination Phase

In addition to monitoring the plant operational system as described above, the AMS Agent is responsible for the official grade determination in accordance with the *United States Standards for Grades of Carcass Beef, January 31, 1997*, within the following limitations.

7.1 AMS Responsibility

- 7.1.1 The on-line AMS Agent will accept the instrument grade factor data output for each carcass unless:

A Carcasses are not presented in accordance with official USDA standards and *QAD Procedure 500 Beef, Bullock and Bull Grading Methods and Procedures*. Carcasses not properly presented would include carcasses exhibiting on one or both side as applicable:

- 1. Ribbed on a bias
- 2. Fat trim or fat pulls (if yield grading)
- 3. Mis-splits not allowing proper evaluation of the bone surfaces
- 4. Carcasses exhibiting a surface other than the 12th-13th rib cross section

B Carcasses presented have:

- 1. Frozen ribeyes
- 2. Dark cutting characteristics



3. Advanced maturity for instrument assigned grade
 4. Blood shot area of more than a small amount
 5. Callous areas in excess of ½ square inch
- C Carcass ID number does not match the monitor carcass ID number.
- D Image and data does not match the carcass even if the carcass ID numbers match.
- E Override instrument prediction of Official Quality or Yield Grades if the AMS Agent determines that:
1. Visual assessed marbling is 40 degrees or greater different from the instrument and would result in a different quality grade. All instrument marbling calls will be rounded down for instruments that call marbling to the single degree. (For example, instrument calls marbling a Small-08, we will call it a Small-0. If the instrument calls the carcass a Slight-97, we will call it a Slight-90.)
 2. Ribeye area is 1.0 square inch or greater different from the instrument and would result in a different yield grade, or carcass schedule certification decision. (If applying yield grades.)
 3. Fat thickness is 0.2 inch or greater different from the instrument.
 4. Preliminary yield grade (PYG) is 0.5 inch or greater different from the instrument. (If applying yield grades.)
 5. Final yield grade is 0.50 or greater different from the instrument and would result in a different yield grade. (If applying yield grades.)

Note: The override determination is made independently for 1, 2, 3, and 4 above, and is applied even if only one side of the carcass was properly imaged.

7.1.2 Carcasses will be eligible for instrument or visual (traditional) assessment for the purpose of re-grading as requested by the plant. If presented for visual re-grade evaluation, graders will use the following criteria.

- A Utilize tolerances established by the SB before changing instrument prediction.
- B Override instrument prediction if the AMS Agent determines that:
1. Visual assessed marbling is 40 units or greater different from the instrument and would result in a different quality grade.



2. Ribeye area is 1.0 square inch or greater different from the instrument and would result in a different yield grade, or carcass schedule certification decision. (If applying yield grades.)
3. Fat thickness is 0.2 inch or greater different from the instrument.
4. Preliminary yield grade (PYG) is 0.5 inch or greater different from the instrument.
5. Final yield grade is 0.50 or greater different from the instrument and would result in a different yield grade.

Note: The override determination is made independently for 1, 2, 3, and 4 above, and is applied even if only one side of the carcass was properly imaged.

C Carcasses presented for re-grades using instrument assessment factors may be imaged by the on-line instrument on the grading chain, or by an approved portable instrument on stationary re-grade rails. Both on-line and portable instruments must be calibrated and validated daily in accordance with this Procedure. Carcasses may be imaged one (1) time for re-grade purposes during the time graders are asked to review regrades (similar to the process for traditional regrades when a carcass will be examined once during a review). Over and under tracing of the ribeye muscle is not a consideration for instrument marbling prediction.

7.2 Applicant Responsibility

- 7.2.1 Provide instrument assessment data and ribeye images (color or black and white) to the AMS Agent for each carcass presented for visual re- grading.
- 7.2.2 Ensure a mechanism is in place to reflect any change of grade made by the AMS Agent.
- 7.2.3 Re-grades presented for visual assessment must be presented to the AMS Agent in adequate lighting (100 foot candle power minimum).
- 7.2.4 Provide the AMS Agent daily quality and yield grade counts by shift by grader.

8 **Gross Non-compliance**

The AMS Agent may suspend the use of grade factors from instrumentation systems at any time gross non-compliance is observed and cannot be immediately corrected.

Gross non-compliance will be defined as 10% of the carcasses over a period of one hour being considered to be over or under graded by 40 degrees of marbling or more. For example, carcasses being evaluated as Choice (Small-0) by the instrument and the marbling calls evaluated by the grader as Slight-60 or less marbling will be considered to be incorrectly graded and be over-graded.

8.1 Other examples of gross non-compliance:



- 8.1.1 The displayed instrumentation image or instrument prediction does not match the carcass presented for grading.
- 8.1.2 The monitor does not display carcass information while the grading chain is running.
- 8.1.3 Traditional grading by the AMS Agent may occur until a corrective action has been taken.

9 Report of Numbers Graded

Applicants will provide a count of the total carcasses transferred and presented for grading and the total number of head graded by each quality grade, yield grade, or G Schedule, and the average weight for carcasses transferred for grading, on a daily basis. This information should be made available to the grader on the day following grading.

10 Change Record

The following changes were made to the 09 25 15 revision of this document:

1. Grading and Verification Division was changed to Quality Assessment Division

Instrument Marbling Validation Cards – Target and Tolerance Values

Table 1 lists the target values and tolerance limits for the current 4 card marbling set. Use of the low, medium and high marbling verification cards is discussed in item 4 of section “Prior to the Start of Operation” in the document entitled Instrument Verification Standard Operating Procedure (VERSOP-revised 10-12-11.docx). The USDA marbling card is used to collect data for system maintenance purposes only. The current software versions will automatically acquire and average 3 readings in “Marbling Check.” If the system fails to read within the approved ranges or if the standard deviation exceeds 10 on any card the process is to be repeated. If the system fails to validate after two attempts the system shall be re-booted and allowed to warm up for 30 minutes for the Xenon camera series prior to a third and final test. LED camera series will be allowed to warm up for 20 minutes prior to a third and final test.

Table 1. Verification Card Tolerances

Xenon – Camera #<200

| Name | Marbling Target | Tolerance | Low Limit | High Limit | Long Term Low Limit | Long Term High Limit |
|---------------|-----------------|-----------|-----------|------------|---------------------|----------------------|
| Low Marbling | 297 | 20 | 277 | 317 | 287 | 307 |
| Med Marbling | 543 | 34 | 509 | 577 | 526 | 560 |
| High Marbling | 694 | 38 | 656 | 733 | 675 | 713 |
| USDA | 383 | | | | | |

LED – Camera #>200

| Name | Marbling Target | Tolerance | Low Limit | High Limit | Long Term Low Limit | Long Term High Limit |
|---------------|-----------------|-----------|-----------|------------|---------------------|----------------------|
| Low Marbling | 323 | 23 | 300 | 346 | 312 | 335 |
| Med Marbling | 507 | 20 | 487 | 527 | 497 | 517 |
| High Marbling | 711 | 20 | 691 | 731 | 701 | 721 |
| USDA | 385 | | | | | |

Table 2. RMS Verification Card Tolerances

| Card | Marbling Target | Tolerance | Low Limit | High Limit | Long Term Low Limit | Long Term High Limit |
|---------------|-----------------|-----------|-----------|------------|---------------------|----------------------|
| Low Marbling | 271 | 14 | 257 | 285 | 264 | 278 |
| Med Marbling | 467 | 20 | 447 | 487 | 457 | 477 |
| High Marbling | 641 | 41 | 600 | 682 | 621 | 662 |



Satisfactory raw image and processed image.