

UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Livestock and Seed Program
Washington, D.C. 20250

PROCEDURES FOR APPROVAL AND USE OF INSTRUMENT SYSTEMS
FOR BEEF CARCASS RIBEYE MEASUREMENT

BACKGROUND:

The Department of Agriculture (USDA), Agricultural Marketing Service (AMS), Livestock and Seed (LS) Program will accept beef carcass ribeye area measurements made by approved instruments. To be approved by the LS Program to use an instrument for such a purpose, the instrument must meet certain performance requirements for accuracy and repeatability in the prediction of the ribeye area of carcasses. The performance requirements outlined in this document were established by an Industry Working Group that was convened by the LS Program and the National Cattlemen's Beef Association (NCBA) following a September 2000 meeting of beef production, beef packing, academia, and other interested parties. This group first established requirements that were contained in the "Procedures for Approval and Use of Instrument Augmentation Systems for Beef Carcass Ribeye Measurement, Livestock and Seed Program, Agricultural Marketing Service, February 2001." The Industry Working Group reevaluated the criteria in 2002 and determined a slightly different procedure for determining accuracy was warranted and these procedures are contained in this document. One instrument was approved under the February 2001 procedures and this approval is not affected by the adoption of these new procedures. The Industry Working Group was comprised of representatives of USDA, NCBA, packing companies, an instrument manufacturer, and academia.

The purpose of this document is to provide the meat industry with a blueprint for developing the documentation that is required to gain instrument approval from the LS Program. The process consists of three phases:

- Phase I Demonstration of the accuracy and repeatability of ribeye area prediction on stationary beef carcasses.
- Phase II Demonstration of the accuracy of ribeye area prediction at line speeds.
- Phase III Daily in-plant verification of the approved instrument to validate that the instrument is correctly calibrated and that the correct data is presented to the USDA grader.

PERFORMANCE REQUIREMENTS:

To facilitate the approval process, Phase I and II data may be entered into the MS Excel workbook available at <http://www.ams.usda.gov/lsg/stand/beefribeyeinstrument.xls>. The

workbook contains the formulas to establish if all Phase I and II requirements have been met. Instruments must meet all the performance criteria outlined in Phase I and II to receive approval.

In order to validate the accuracy of an instrument, an *actual mean ribeye area* must be established for each carcass that is measured. Two methods have been approved by the Working Group to determine the *actual mean ribeye area*:

- Expert Mean Gridded Ribeye Area: Three experts experienced in measuring ribeyes will individually grid the ribeye of each carcass with the official USDA ribeye grid. The three individual measurements will be averaged to establish the *actual mean ribeye area*.
- Mean Acetate Traced Ribeye Area: Three experts will each independently trace the ribeye of each carcass. Each of the tracings will then be measured three times using an accurate method (e.g., a compensating polar planimeter, tracing tablet, or scanning with subsequent computer-assisted analysis of the digitized tracing). The nine values (triplicate tracing X triplicate measurement) will be averaged to establish the *actual mean ribeye area*.

Phase I: Stationary measurements

One of two acceptable methods may be used for collecting images (data) from stationary carcasses for Phase I. However, for either method, 200 sides shall each be measured three (3) times to provide a total of 600 observations to measure performance. At least 20% of the sides must be left carcass sides and at least 20% of the sides must be right carcass sides. The two methods are:

Triple Trigger: Properly place the camera head unit (with as much precision as possible) over the 12th-13th rib interface of one side of each carcass, and obtain three sequential but separate images without moving the camera head unit.

Triple Placement: Place the camera head unit (with as much precision as possible) over the 12th-13th rib interface on one side of each carcass and obtain one image; remove the camera head unit; return the camera head unit to the ribeye interface and obtain a second image; remove the camera head unit again; return the camera head unit to the ribeye interface, and obtain a third image.

All three images will be used for the evaluation of repeatability and accuracy. Accuracy will be evaluated by comparing (correlation and regression) the ribeye area output to the *actual mean ribeye area*.

Performance requirements for Phase I:

Stationary Accuracy $R^2 = 0.90$ or greater; 95% of predicted ribeye area observations within 1.5 square inches of the *actual mean ribeye area*, and the residual standard deviation (RSD) shall not exceed 0.76 square inches.

Stationary Repeatability 95% of predicted ribeye area observations within 0.5 square inches of the mean of the three ribeye area observations for that carcass.

Phase II: Operational measurements

Carcasses (n = 200) must be presented for image analysis under normal beef carcass grading conditions (i.e., freshly-ribbed carcasses moving at chain speeds in excess of 350 head/hour). Following collection of images, carcasses should be placed on a stationary rail for determination of *actual mean ribeye area* as described above. Accuracy will be evaluated by comparing (correlation and regression) the ribeye area observation to the *actual mean ribeye area*.

Performance requirements for Phase II:

Operational Accuracy $R^2 = 0.85$ or greater; 95% of ribeye area observations within 2.0 square inches of the *actual mean ribeye area*, and the residual standard deviation (RSD) shall not exceed 1.00 square inches.

Phase III: Operational Process Verification

Procedures for verification of operational accuracy of instruments will be established on a "plant by plant" or "company by company" basis by the applicant and approved by the LS Program. An approved, verifiable process must be in place for a plant to use the instrument for ribeye area determination. Criteria that must be addressed in the Operational Process Verification Program include:

- Instrument set-up and calibration routine.
- Verification of system calibration before instrument use.
- Record of validations.
- Training/control of instrument operators.
- Operator audits.
- Linking of hot carcass weight, carcass image data, and presentation to grader.
- Grade identification/application procedures.
- Submission and approval of any system changes.

LS may change the performance approval criteria when technology improves.

Requests for approval shall be submitted to:

Chief, Standardization Branch

USDA, AMS, LS

Room 2603-South Building, Stop 0254

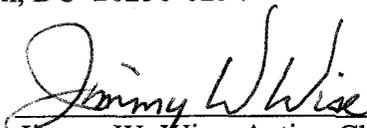
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Approved:


Jimmy W. Wise, Acting Chief
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