



Chapter 14

Shell Egg - Equipment

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14.1 OBJECTIVE OF ACTIVITY

Shell egg inspectors have, at their disposal, all equipment necessary to perform their duties. The equipment must be properly maintained and calibrated and must operate accurately. It is the responsibility of the inspector to operate their equipment according to the manufacturer's instructions and to perform tests as required to verify that the equipment is functioning properly.

14.2 REFERENCES

[Egg Regulations](#)

Inspector's ID Card

Shell Egg Inspection Manual

14.3 REQUIRED EQUIPMENT

Inspectors require the following standardized list of equipment and supplies. This equipment must be issued to inspectors before they undertake specific inspection tasks.

- ↪ Air Cell Gauge
- ↪ Candling Light
- ↪ Disinfectant (as per Reference Listing) - Pail, spray bottle, brush
- ↪ Environmental Sampling Kit
- ↪ Freezer Packs
- ↪ Flashlight
- ↪ Sanitary Footwear
- ↪ Haugh Unit Kit (includes spatula, tripod stand with glass, plastic tray, micrometer)
- ↪ Hygrometer / Psychrometer
- ↪ CFIA Inspection Stamp
- ↪ Lab Coats/Coveralls
- ↪ Protective Inspection Gloves (disposable)
- ↪ Hairnets / Beard net (where applicable)
- ↪ Log Book
- ↪ Marking Pen
- ↪ Masking Tape
- ↪ CFIA Official Seal (CFIA/ACIA 4561) (yellow tape)
- ↪ pH Papers (BDH 8-12)
- ↪ Sample Cups (plastic)
- ↪ Scale and Check Weights
- ↪ Styrofoam Cooler
- ↪ Thermometer (for field use)

The inspector should also have access to the following:

- ↪ Calculator
- ↪ Light Meter (certified)
- ↪ Reference Thermometer (certified)
- ↪ Weights (certified)

14.4 CALIBRATION AND VERIFICATION

All equipment must be operated and maintained as per manufacturer's instructions. Failure to do so may result in errors in measurements, which could result in inappropriate enforcement action. The following list of equipment requires verification and/or a calibration to ensure proper operation:

- ↪ Haugh Unit Micrometer
- ↪ Gram Scale and Check Weights
- ↪ Thermometer (for field use)
- ↪ pH papers or Electronic pH Measuring Device
- ↪ Reference Thermometer (certified)
- ↪ Hygrometer / Psychrometer (certified)

- ↪ Light Meter (certified)
- ↪ Weights (certified)

14.4.1 HAUGH UNIT MICROMETER, MODEL S-8400

To ensure that the micrometer is accurate, set the unit on the glass stand and turn the measurement spindle down until it touches the surface of the glass. The micrometer indicator should read zero. Minor adjustments to the unit can be made. If minor adjustments do not correct the problem the unit should be calibrated by someone qualified to adjust scientific instruments or the instrument should be replaced.

For instructions on how to use the Haugh Unit Micrometer, see Appendix I.

14.4.2 GRAM SCALE

Inspectors may be using either a mechanical or electronic scale. In either case, these scales should be operated as per the manufacturer's instructions. Instructions must be kept readily available for the purpose of inspection or internal audits.

14.4.2.1 Verification Procedures to Ensure Accuracy of Gram Scale

When: All egg scales should be verified for accuracy immediately upon receiving and then at least quarterly thereafter.
In addition, the scale should be verified using the check weight every time before it is used.

Tolerance: The tolerance on a scale should not exceed the manufacturer's specifications, usually ± 0.1 g for electronic scales and ± 0.25 g for mechanical scales. See manufacturer's instructions for details.

How: Verification will be performed by weighing two certified weights, preferably 40 g to 70 g to show the scale is accurate in the range egg inspectors are assessing (Jumbo - 70 g to Peewee - 42 g). Before starting, set up the scale for reading, making sure there are no environmental conditions which may disrupt the scale (draft, vibrations or other factors which may give false readings). Prior to weighing any object, make sure the scale reads zero. The two certified weights should be weighed separately on the egg scale and then on an accurate electronic scale (the type used for net weight verifications). This should be repeated 9 times for repeatability purposes. Take measurements at one minute intervals for each set of results. For electronic egg scales, four measurements from each corner of the scale's platform should be included. The tolerance will be measured against the difference of the two scale measurements for the same weights.

Repeatability is the closeness of agreement of readings for successive weighings of the same test load. For electronic scales, since the test load is not placed in the same spot each time, corner load assessment is included in the verification.

Corrective Action:

Any scales operating outside of these tolerances should be re-calibrated (if possible) and rechecked to verify accuracy. If the scale is still inaccurate, it should be sent out for repairs or discarded.

Records: The verification and results should be recorded along with the identity of the scale, any corrective action required, date, name of individual performing the test and his or her signature. These records should be

maintained on file and be made available upon request.

14.4.2.2 Handling and Storage of gram scales

- Scales are to be protected from rough handling
- Do not store in a vehicle where they can be exposed to extremes in temperature. It is preferred they be stored at room temperature away from high humidity conditions.
- Store the scales in such a manner that the weighing pan is not under a load.

14.4.2.3 Verification Procedures to Ensure Accuracy of Check Weight for Gram Scale

When: All check weights for egg scales should be verified upon receipt and on a quarterly basis thereafter.

Tolerance: The tolerance for check weights should not exceed ± 0.1 g as compared against a certified check weight using a scale of the type used to perform net weight verifications (i.e. Setra Scale).

How: Verification will be performed by comparing the weight of a certified weight against that of an equivalent certified weight. The difference is used to determine if the check weight falls within tolerance.

Corrective Action:

When check weights are first received from the manufacturer, they should be checked to ensure they fall within the tolerance. Check weights that do not fall within the tolerance should be returned to the supplier, as calibration of such an item is not practical. Thereafter, check weights which do not fall within tolerance should be discarded to prevent further use and replaced with ones that fall within tolerance.

Records: Records should indicate the difference between check weights and certified weights, corrective actions taken, date of verification, name of person performing the verification and his or her signature. Records should also include the identification number of the certified weights and the date last certified.

14.4.3 THERMOMETERS

Temperature is critical in controlling the growth and survival of pathogenic micro-organisms during the cooling and washing of eggs. It is important that the inspector's thermometer is accurate.

14.4.3.1 Verification Procedures to Ensure Thermometers Used Measure Cooler and Wash Water Temperatures Are Accurate

When: All thermometers, not subject to certification, should be verified quarterly. New thermometers should also be verified before they are used, unless they are certified thermometers (also referred to as the Reference Thermometer).

Tolerance: The difference between the inspector's thermometer and the reference thermometer should fall within $\pm 0.5^{\circ}\text{C}$ (1.0°F)

How: Verification should be performed by placing the inspector's thermometer and the reference thermometer into the middle of an agitated water bath at approximately 10°C . Let the thermometer

readings stabilize and record the temperature shown on each. The difference between the two thermometers is used to determine if the thermometer is within tolerance. Repeat in a second water bath at 40°C.

Corrective Action: Any thermometers outside of the tolerance should be adjusted and rechecked to verify accuracy. If it cannot be adjusted, it should be discarded and replaced.

Records: Records should indicate the temperature of each water bath, the thermometer readings and their respective difference. Also record corrective actions taken, date of verification, identification for thermometers, name of person performing verification and his or her signature.

14.4.3.2 Storage and Handling of Thermometers

- ↪ If a mercury in glass thermometer is used as the reference thermometer,
 - Keep in an upright position when in storage or use.
 - Before using check for any air bubbles, cracks or other incorrect functioning.
- ↪ All thermometers are to be protected from rough handling
- ↪ Do not store thermometers in a vehicle where they could be exposed to extremes in temperature. It is preferred that they are stored at room temperature.
- ↪ Mercury in glass thermometers are not to be used by inspectors in food production areas of a plant.

14.4.4 HYGROMETERS / PSYCHROMETERS

The sling type hygrometers consist of a dry bulb thermometer and wet bulb thermometer. Testing of the thermometers that comprise a sling hygrometer should follow the same procedure as that identified under the section for thermometers.

For information on how to use a sling hygrometer, see the instructions that accompany the instrument.

14.4.4.1 Electronic hygrometers / psychrometers

Hygrometers and psychrometers must be operated, handled and stored as per manufacturer's instructions.

Before using this instrument the inspector must have access to the calibration record for the meter which is to be calibrated as per manufacturer's recommendations.

14.4.5 LIGHT METERS

There are a number of different light meters used by inspectors and often these are used across other commodities. It is the inspector's responsibility to ensure that the light meter is working properly and operated as per manufacturer's instructions. The inspector must have access to the calibration record for the light meter which is to be calibrated as per manufacturer's recommendations.

Before using a light meter the inspector should ensure the meter has been calibrated.

14.4.6 pH PAPER (BDH 8-12)

In the washing of eggs, the wash water pH is critical for basket washers and recirculating washers. To ensure inspectors are obtaining an accurate reading they must follow instructions regarding usage, storage and where applicable, the best before date of the pH strips.

When the best before date exists and is only on the master container of test strips the inspector must transfer that information to the individual containers.

14.4.6.1 Electronic pH Meters

See appendix III, Generic Operating and Quality Assurance Measures for an Electronic pH Measuring Device. Such equipment must be operated, handled and stored as per manufacturer's instructions.

14.4.7 CERTIFIED EQUIPMENT

For all equipment requiring certification (certified weights, light meter and reference thermometer), a record of its certification by the manufacturer or calibration service provider should be available. Inspectors should verify that the equipment has been certified annually or at the recommended frequency.

A list of SCC approved calibration service providers is available at the following website http://palcan.scc.ca/SpecsSearch/SpecsSearchAction.do?psa_ID=2

14.5 RECORDS

Verification tests and any adjustments required are to be recorded for audit purposes. See Appendix II for an example of an Equipment Calibration Report for Eggs and Processed Egg.

When two or more pieces of the same equipment are used, the potential exists for equipment to miss the scheduled verification or calibration or equipment that was intended to be discarded, could be placed back into use by mistake if the equipment does not have positive identification to distinguish it from other equipment. Inspectors must provide their equipment with positive identification and record it on all records associated with verification and calibration.

14.6 USEFUL LINKS RELATED TO CALIBRATION SERVICES

Canada

<http://www.nrc-cnrc.gc.ca/eng/rd/mss/index.html/>

USA

<http://ts.nist.gov/MeasurementServices/Calibrations/>

INSTRUCTIONS ON HAUGH UNIT DETERMINATION**MODEL S-8400 HAUGH UNIT MICROMETER**

B.C. Ames Co., 78 Stone Place, Melrose, MA 02176

Telephone: (781) 893-0095 / (800) 438-4249, Fax: (781) 647-3356, www.bcames.com

The Ames Haugh Unit Micrometer is a precision instrument used for checking albumen height of eggs. It has a special two part dial which permits you to read the Haugh unit values directly.

1. The dial face consists of two parts. The inner part is fixed. The outer part of the dial face is adjustable by turning the knurled rim of the Dial Indicator.
2. The inner, fixed part of the dial has 3 segmented scales printed in black and reading in ounces per dozen (OZ/DOZ) at top of dial; in ounces per egg (OZ/EGG) at lower right of dial; and in grams per egg (GRAMS/EGG) at lower left of dial. The pointers or indices for these scales are small black triangles on the inner edge of the outer dial, overprinted on the red scale.
3. The outer dial has two scales. One, printed in red, reads in tenths of a millimeter. The other, printed in black reads in Haugh units.
4. The indicating hand follows the movement of the micrometer spindle as it is raised or lowered by turning the knurled knob at the top of the Indicator.

NOTE:

Before measuring the albumen, always withdraw the spindle of the micrometer (counter-clockwise turn of the knob), then bring it down slowly upon the albumen to be measured by a clockwise turn of the knob.

IMPORTANT:

This instrument has been factory adjusted so the Indicating Hand aligns with the graduation representing 24 OZ/DOZ when the spindle tip makes contact with a plane, flat surface supporting the instrument. If, at some later time, the Indicating Hand points to some other graduation under these conditions, the set screw on the neck of the tripod should be loosened slightly and the Indicator re-positioned vertically to re-establish the previous Hand alignment. Then the set screw should be firmly tightened.

General procedure to determine Haugh units:

1. Weigh eggs to be tested. For speed in operation, sort the eggs into groups of like weights. By grouping the eggs according to common weights, it is necessary to adjust the dial for weight differences only between the measurements taken for each group. Weight may be determined in "ounces per dozen", (OZ/DOZ), "ounces per egg" (OZ/EGG) or "grams per egg" (GRAMS/EGG), as the operator desires. The 3 scales on the inner part of the dial may be used interchangeably by using the index and scale desired.
2. Set the index for the weight of the first group of eggs to be tested by twisting the knurled rim of the Indicator.
3. Break out the first egg on a plane, flat surface.
4. Retract the spindle of the micrometer by a counter-clockwise turn of the micrometer knob.
5. Place the micrometer over the egg, being careful to place it so the legs do not pierce any part of the firm albumen envelope.
6. By sliding the micrometer, position the spindle over the firm albumen about mid-way between the yolk and edge of the envelope and bring the stem down SLOWLY by a clockwise turning of the Indicator knob. Watch the tip of the spindle and the albumen closely. The proper reading is obtained when the albumen appears to snap up to the specially designed tip of the spindle. Stop

twisting the knob promptly when this occurs.

7. Read the Haugh unit value directly from the position of the Indicating hand on the outermost scale (printed in black), each division of the black scale equals 1 Haugh unit.
8. Wipe the spindle with a clean cloth or tissue after each use. Retract the spindle and the instrument is ready for use again.

The micrometer may also be used as an ordinary spherometer by placing the index marked "SET" at 24 OZ/DOZ and reading height of firm albumen (or of any other object placed on a plane surface) on the red scale. Each division of the red scale equals 0.1mm.

GUIDELINES FOR HAUGH UNIT MEASUREMENT

1. Comparable results can be obtained only if uniform procedures are used.
2. The use of a breaking knife to break the shell is preferable, since blunt edges such as table edges may cause splintering of the shell with the possibility of puncturing the thick white. Care must be taken in using the breaking knife so that the thick white is not ruptured.
3. At the time of breaking, the egg should be held as near to the glass as possible and the contents emptied very gently from the shell.
4. When the envelope of thick white is firmly attached to the shell membrane (usually in the small end) rupture of the thick white can usually be prevented by slowly raising the half shell.
5. A section of the shell may be left in contact if it does not interfere with the reading.
6. Albumen heights should be measured immediately after breaking, therefore, break one egg at a time. A delay of a few minutes can make a significant difference in the Haugh unit reading.
7. Check the micrometer before using. Set it on the glass and turn the spindle down until it touches the surface of the glass. The micrometer indicator should read zero. This should be repeated from time to time, to ensure that the micrometer is properly adjusted.
8. The micrometer reading must be taken on a flat area on the surface of the widest expanse of the thick white.
9. Eggs with a very high albumen will not have a flat surface. In such cases, a point about halfway between the yolk and the edge of the widest expanse of thick white should be selected to measure the Haugh unit.
10. Measurements should be taken so as to avoid measuring areas over air bubbles or chalaza.
11. The spindle should be rolled down slowly until it just makes contact with the surface of the albumen. After the reading is measured, the spindle should be raised and cleaned before re-using.
12. Albumen heights should not be recorded when the thick white has been mechanically ruptured or when the yolk membrane is ruptured from any cause.

CFIA Equipment Calibration Report for Egg and Processed Egg

Calibration Frequency: Quarterly

Physical Year Ending:

Name	1 st Quarter						2 nd Quarter						3 rd Quarter						4 th Quarter																
	Calibrated Test Weight	Scale	50 gram weight	30 Gram Weight	Initial	Test Thermometer	Thermometer	Initial	Calibrated Test Weight	Scale	50 gram weight	30 Gram Weight	Initial	Test Thermometer	Thermometer	Initial	Calibrated Test Weight	Scale	50 gram weight	30 Gram Weight	Initial	Test Thermometer	Thermometer	Initial	Calibrated Test Weight	Scale	50 gram weight	30 Gram Weight	Initial	Test Thermometer	Thermometer	Initial			

Comments: _____

Name	1 st Quarter					2 nd Quarter					3 rd Quarter					4 th Quarter									
	Test Thermometer	Sling Wet	Sling Dry	Initial	Initial	Test Thermometer	Sling Wet	Sling Dry	Initial	Initial	Test Thermometer	Sling Wet	Sling Dry	Initial	Initial	Test Thermometer	Sling Wet	Sling Dry	Initial	Initial					

Comments:

CFIA Equipment Calibration Report for Egg and Processed Egg (Yearly)

Equipment	Make and Model	Date Tested	Test Equip. result	Equipment results	Tested By:
Light Meter					
Test Thermometer					
Test Weight					

Supervisor's Signature

GENERIC OPERATING PROCEDURES AND QUALITY ASSURANCE MEASURES FOR A PH METER**OPERATING PROCEDURE**

- (i) Standardization of each meter is performed regularly for accuracy and linearity using commercially prepared NIST traceable buffers by following the manufacturer's instructions. The frequency of these checks will vary with usage but should occur at least once each day the instrument is used. Each time the machine is calibrated, record and file.
- (ii) Standardization is performed as follows:
 - a) Turn pH meter on by touching the screen, and selecting pH from the start-up menu
 - b) Immerse the electrode and a thermometer in pH 7 buffer. Lower the rubber sleeve on the electrode to expose the filling hole.
 - c) The temperature will automatically set to ambient temperature, provided the automatic temperature control (ATC) probe is attached. This temperature will be displayed in the appropriate box at the bottom of the screen.
 - d) Select **std** from the pH menu options.
 - e) Select **clear** to remove previous standards from the memory.
 - f) Select **std** again. pH meter will beep once the standard has stabilized and been read.
 - g) Remove the electrode from the buffer and rinse thoroughly with distilled water.
 - h) Do not wipe the electrode dry as this will cause interference from static electricity.
 - i) Immerse the electrode in the second buffer, either 4 or 10 depending on the expected pH of your sample.
 - j) Select **std** from the pH menu options.
 - k) Do not select clear, as this will remove the pH 7 buffer that has just been standardized. Select **std** again. The pH meter will beep once the standard has stabilized and been read. Once both buffers have been read, the slope will appear in the appropriate box at the bottom of the screen.
 - l) Record the slope and temperature measurement on the appropriate worksheet. If the slope does not fall between 92 and 102%, repeat the standardization steps above. If the slope is still not in this range, clean the electrode as described in the maintenance procedures. If this fails to remedy the problem, obtain a new electrode before proceeding.
 - m) Remove the electrode from the buffer and rinse with distilled water.
 - n) Fresh buffer is used each time the meter is standardized. Never pour buffer solutions back into the bottle.
- (iii) Quality Assurance is performed as follows:
 - a) Any manipulations to the meter (electrode change, servicing, etc.) are recorded.
 - b) Daily standardization is recorded and filed.
- (iv) Determine unknown pH values as follows:
 - a) Rinse the electrode in distilled water. Lower the rubber sleeve on the electrode to expose the hole.
 - b) Determine the pH by the appropriate method
 - c) Immerse the electrode in the sample. For flat-bottomed electrodes, ensure adequate contact is made with the agar.
 - d) Select **meas** from the pH menu options.
 - e) Read the pH measurement from display once it has stabilized (pH meter will beep).
 - f) Remove the electrode from the sample and rinse with distilled water. Between buffers and samples, rinse the electrodes well with distilled water to prevent carry-over of solution.
- (v) For media testing, one pH measurement is sufficient.
- (vi) After use, replace the rubber sleeve over electrode filling hole. Store the electrode with its tip in electrode storage solution to prevent damage.

(vii) To turn pH meter off, choose stbby.

MAINTENANCE PROCEDURE

- 1) Weekly - inspect the electrode for scratches, cracks, salt crystal build-up, or membrane/junction deposits. Rinse off any salt build-up with distilled water, and remove any membrane/junction deposits as directed in cleaning procedures below.
- 2) Monthly - drain reference chamber, flush it with fresh filling solution and refill the chamber. Record that this procedure has been performed.
- 3) Semi-annually - clean by soaking in 0.1 M HCL for half an hour. Drain and refill the reference chamber and soak the electrode in storage solution for at least one hour.
- 4) Removal of Membrane/Junction Deposits (as required).
 - a) Protein - soak in 1% pepsin in 0.1 M HCL, for 15 minutes.
 - b) Inorganic - soak in 0.1 M tetrasodium EDTA solution for 15 minutes.
 - c) Grease and oil - rinse with mild detergent or methanol solution.

After any of these cleaning procedures, rinse the electrode thoroughly with distilled water. Drain and refill the reference chamber and soak the electrode in storage solution for at least one hour.