United States Department of Agriculture
Agricultural Marketing Service
Federal Grain Inspection Service

Directive

9180.70 May 1, 2013

INSPECTION OF CRACKED CORN

Contents

1. PURPOSE

This directive establishes uniform procedures for the analysis of cracked corn as “Not Standardized Grain” under the U.S. Grain Standards Act (USGSA).

2. REPLACEMENT HIGHLIGHTS

This directive is revised to establish the approximate sample size for the GAC2500-UGMA and Perten AM 5200-A instruments, and other minor editorial changes. This directive supersedes FGIS Directive 9180.70, “Inspection of Cracked Corn” dated 10/17/05.

3. GENERAL INFORMATION

a. Inspection of cracked corn is upon request and on a factor only basis.

b. The instructions included in this directive are for cracked corn only. Cracked corn inspection criteria is not applicable to corn screenings.

c. All quantities referenced in this directive are approximate unless otherwise specified.

d. There are no classes, subclasses, or numerical grades for cracked corn.

e. In addition to the whole kernel and cracked corn analysis described in this directive, an applicant may request an analysis for other quality factors such as moisture, test weight per bushel, damaged kernels, heat-damaged kernels, and aflatoxin.

f. Odor analysis is required on all cracked corn.

g. Use an approved divider to obtain sub portions of a sample for analysis unless otherwise specified.

h. Official inspection personnel shall document inspection information during sampling and inspection.

i. Four inspection levels (original, reinspection, appeal, and board appeal) are available under USGSA regulations for single lot and composite lot inspections. For shiplots and unit trains loaded to specific contract requirements, only three levels of inspection (original, review (reinspection or appeal inspection), and board appeal inspection are available.

4. DEFINITION OF CRACKED CORN

a. Cracked corn, as described in this directive, is Not Standardized Grain that consists of broken kernels of shelled dent corn and/or shelled flint corn. Cracked corn kernels are kernels that are chipped or broken and not 100 percent intact from their original shape and size.

b. The sample must not meet the definition of corn (i.e., grain consisting of 50 percent or more of whole kernels of shelled dent corn and/or shelled flint corn and not more than 10 percent of other standardized grains) to be considered as cracked corn.

c. Visually examine the sample to determine if it meets the definition of corn or cracked corn. If an analysis is necessary, make the determination on a 250-gram representative portion on the basis of the sample as a whole. From the 250-gram portion remove all whole kernels (i.e., kernels with less than one fourth broken off) of corn and, if necessary, other standardized grains and calculate the percentage of whole kernels of corn and other standardized grains.

5. ODOR

a. Determine odor on evidence obtained from the sample or lot as a whole using classification examples as listed below.

Sour	Musty	Commercially Objectionable Foreign Odors
Boot	Ground	Animal hides
Fermenting	Insect	Decaying animal and vegetable matter
Insect (acrid)	Moldy	Fertilizer
Pigpen		Fumigant
		Insecticide
		Oil products
		Skunk
		Smoke
		Strong weed

b. Record the words “Musty,” “Sour”, or “Commercially Objectionable Foreign Odor” in the “Remarks” section of the certificate. If samples have no odor, enter “OK” on the work record.

7. TEST WEIGHT PER BUSHEL

a. Test weight per Winchester bushel (2,150.42 cubic inches) is determined using an approved device according to procedures prescribed in FGIS instructions.

b. Determine test weight on a representative portion of the original sample with a quantity sufficient to overflow the kettle. Record test weight results on the work record as displayed on the electronic scale or in whole and tenth pounds to the nearest tenth pound. Record the test weight on the certificate in whole and tenth pounds.

c. If requested, convert the pounds per bushel (lbs./Bu) result to kilograms per hectoliter (kg/hl) using the following formula: lbs./Bu x 1.287 = kg/hl and record in the “Remarks” section in whole and tenths.

8. MOISTURE

a. Moisture is the water content in cracked corn and is determined by using the GAC2500-UGMA and Perten AM 5200-A instruments utilizing the corn calibrations (see FGIS Directive 9180.61).

b. Determine moisture on a representative portion of approximately 650 gram and record the percentage of moisture on the certificate to the nearest tenth percent.

9. DAMAGED AND HEAT-DAMAGED KERNELS

a. Damaged kernels are whole kernels or pieces of corn kernels that are badly ground-damaged, badly weather-damaged, diseased, frost-damaged, germ-damaged, heat-damaged, insect-bored, mold-damaged, sprout-damaged, or otherwise materially damaged.

b. Heat-damaged kernels are whole kernels or pieces of corn kernels that are materially discolored and damaged by heat.

c. Determine damaged kernels and heat-damaged kernels on the basis of a 250-gram portion. Using an approved sizer or hand sieve, sieve (5 strokes) the 250-gram portion with a 12/64 round-hole sieve. Analyze the portion (whole kernels and pieces of kernels) that remains on top of the sieve for damaged kernels and heat-damaged kernels.

   Note: A dockage tester equipped with a #3 corn sieve (12/64 round-hole) may be used in lieu of the sizer or hand sieve method.

d. Report the percentage of damaged kernels and heat-damaged kernels to the nearest tenth percent on the work record and certificate.

10. WHOLE KERNELS, CRACKED CORN, AND OTHER MATERIAL

a. Determine the percentage of whole kernels, cracked corn, and other material in a sample using a 250-gram portion of the original sample. Determine all whole kernels of corn. For this instruction consider only kernels that are 100 percent intact.

b. Remove all recognizable pieces of corn from the remainder of the work portion. This material functions as cracked corn. The material remaining in the sample after the removal of whole corn kernels and cracked corn is “other material.”

c. Calculate the percentage of whole kernels, cracked corn, and other material to the nearest tenth percent on the work record and certificate.

Note: A hand sieve or dockage tester equipped with a corn sieve may be used to help separate whole kernels, cracked corn, and other material.

	Weight of Sample Portion (grams)	**Weight of Separation (grams)**	**Actual %**	**Certified %**
Whole Kernels	250	32.10	12.80	12.8
Cracked Corn	250	210	84.00	84.0
Other Material	250	7.90	3.20	3.2

11. AFLATOXIN TESTING

a. Samples may be tested for aflatoxin using only FGIS-approved quantitative or qualitative test kits.

b. The minimum sample size is based on the type of lot. Applicants may request a sample size larger than the minimum sample size.

Lot Type	**Minimum Sample Size (lbs.)/ grams**
Trucks	2 pounds / approximately 908 grams
Railcars	3 pounds / approximately 1,362 grams
Barges/Sublots	10 pounds / approximately 4,540 grams

NOTE: A 10-pound sample size is also recommended, but not required, for submitted samples.

c. Perform aflatoxin testing and certification in accordance with the applicable instructions in the Aflatoxin Handbook.

12. STARLINK TESTING

a. Samples may be tested for the presence of StarLink™ corn using FGIS-approved lateral flow test kits. The applicant must state the sample size (e.g., 400 kernels, 800 kernels) for the basis of testing.

b. Testing is based on the gram weight that is equivalent to the test portion size (e.g., 400 kernels is equal to 115 grams) as shown in the table on the next page.

Sample Size (Kernels)	Sample Size (Grams)
100 kernels	29 (+ 5 grams)
200 kernels	58 (+ 5 grams)
300 kernels	86 (+ 5 grams)
400 kernels	115 (+ 5 grams)
500 kernels	143 (+ 5 grams)
600 kernels	172 (+ 5 grams)
700 kernels	200 (+ 5 grams)
800 kernels	229 (+ 10 grams)
1600 kernels	458 (+ 5 grams)
2400 kernels	687 (+ 15 grams)

c. Follow the testing and certification procedures as found in FGIS Directive 9181.1, “Testing for StarLink™ Corn - Lateral Flow Test Strip Method.”

13. OTHER FACTORS/CONDITION

Examine samples for other factors or conditions (e.g., insect infestation) that may have an effect on the overall quality of the cracked corn. Make the determination(s) on a 1,000-gram portion if an analysis is necessary. When a condition/factor exists that may not appear in the representative sample, the determination may be made on the basis of the lot as a whole at the time of sampling according to procedures prescribed in FGIS instructions. Note any of these factors/conditions in the “Remarks” section of the certificate.

14. LOADING REQUIREMENTS

a. Unit Trains.

(1) The inspection for cracked corn factors (whole kernels, cracked corn, and other material), other factors (e.g., moisture, test weight per bushel), and official criteria (e.g., aflatoxin) can be performed on either an individual carrier basis, a 5-car composite basis, or a sublot basis using uniform loading requirements when inspected as a single lot unit train.

(2) The maximum size sublot is 5 railcars [less than 50 cars per train] or 10 railcars [50 cars or more per train].

(3) The minimum number of sublots per unit train is 2 for 5-car sublots, or 5 for 10-car sublots.

(4) Individual railcars that are combined to form a sublot or composite sample must be checked for odor, insects, and condition.

b. Shiplots.

(1) Sublots must conform to the number and size limitations as specified in Book III of the Grain Inspection Handbook.

(2) Component analysis is available for one or more factors.

c. Uniform Loading Requirements.

(1) CuSum plan tolerances (e.g., breakpoints, starting values) are not applicable to these shipments.

(2) Limits placed on individual factors (e.g., maximum moisture 14.5%) are interpreted as “no sublot to exceed” limits. A material portion will occur if the individual sublot result exceeds the specified limit.

(3) If the shipper specifies a minimum or maximum limit on the load order for any factor (e.g., moisture) and the individual sublot result exceeds the limit, the applicant may request a field review inspection (reinspection or appeal) of the sublot. If the sublot remains a “material portion” after the field review analysis the applicant can request a Board appeal of the sublot.

(4) For factors analyzed on a component basis, minimum/maximum limits do not apply to individual component analysis. A material portion occurs when the sublot average of the component results exceed the specified limit for the sublot.

(5) Review inspection results replace results of the previous inspection.

(6) If component analysis is utilized and a material portion occurs because the sublot result exceeds the specified limit, the review inspection for the component factor can be performed on the composite sample representing the sublot, or on each individual component sample analyzed within the sublot.

(7) If a review inspection is requested on a sublot that meets the load order requirements, the reviewed sublot is certified separately (at the review inspection level) from the remainder of the shiplot/unit train.

(8) To certify the final shiplot/unit train average (weighted/mathematical, as applicable), consider all acceptable sublots included in the shipment. Certify results as an original inspection unless all sublots are reviewed.

15. CERTIFICATION

a. Cracked corn is certified as “Not Standardized Grain” on Official Grain Inspection Certificates. To certify cracked corn, cross out the words “Grade and Kind” on the grade line of the certificate and write/type the words “Not Standardized Grain.”

b. For certificates that have preprinted factor result blocks (e.g., test weight per bushel, moisture, damage, heat-damage) enter the appropriate test results.

c. For all other determined factors without preprinted results blocks (whole/cracked kernels, other material, aflatoxin, StarLink™), enter the test results in the “Remarks” section of the certificate. The percentages of cracked corn, whole kernels, and other material are certified to the nearest tenth percent.

d. The applicant for service has the option of requesting certification of one individual factor (e.g., cracked corn), two factors (e.g., cracked corn, whole kernels), or all factors (i.e., cracked corn, whole kernels, other material).

e. List the applicable result(s) on the certificate using the example listed below as a guideline.

   Cracked corn ( )%, Whole kernels ( )%, Other Material ( )%

f. At the request of the applicant for service, the percentages of cracked corn and other material can be combined and reported as a single factor using the following statement.

   Cracked corn and other material ( )%, Whole kernels ( )%

16. QUESTIONS

Direct any questions concerning this directive to the Policies, Procedures, and Market Analysis Branch at (202) 720-0228.

/s/Robert Lijewski

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