

17. Corn

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Determination of dockage

Definitions

In eastern Canada the terms of delivery or terms of a contract will determine if dockage is to be assessed. In western Canada dockage may only be assessed on tough, damp, moist or wet corn. The Canadian Grain Commission will only assess dockage upon request. Dockage is assessed and recorded to the nearest 0.1%. Once dockage material has been removed it will not be reintroduced to the sample to determine the grade.

Cracked corn and foreign material (CCFM) is a grading factor and will be assessed when determining the grade.

Dockage is defined under the *Canada Grain Act* as “any material intermixed with a parcel of grain, other than kernels of grain of a standard of quality fixed by or under this Act for a grade of that grain that must and can be separated from the parcel of grain before that grade can be assigned to the grain”. Dockage is removed by following the cleaning procedure described in this chapter.

The sample as it arrives is referred to as the uncleaned or dirty sample. Its weight is the gross weight of the sample. Dockage is assessed on the gross weight of the sample.

Dockage not reported

- ▲ **Important:** Dockage is not reported for
 - Corn, Sample CE Account Fireburnt
 - Corn, Sample Salvage
 - Corn, Sample Condemned
 - Unofficial samples declared as processed

Normal cleaning procedure:

- ▲ **Important:** Wear gloves and a mask to handle any sample which you suspect may contain hazardous substances.

Assess dockage before assessing test weight.

Procedures for normal cleaning of corn require

- No. 12 round-hole hand sieve for corn with 25% moisture or less
 - No. 14 round-hole hand sieve for corn over 25% moisture
1. Using a Boerner-type divider, divide the uncleaned sample to obtain a representative portion.
 - Official samples shall be at least 1kg.
 - Unofficial samples shall be at least 1 kg.
 2. Sieve approximately 250 g at a time on the appropriate hand sieve until all possible material has fallen through the sieve.
 3. Handpick material remaining on top of the sieve as described under **Composition of dockage**.

Composition of dockage

- All material which passes through the No. 12 or No. 14 round-hole sieve
- All foreign material and pieces of cob handpicked from the sample, excluding stones (STNS)

Estimating test weight of well-matured corn after drying

Note: Test weight is determined on corn prior to removal of cracked corn and foreign material (CCFM). When the terms of delivery or terms of a contract state that dockage can be deducted then test weight is determined after the removal of dockage.

Corn samples that contain a high percentage of moisture typically show an increase in test weight after drying. Use the following table to predict the test weight of well-matured corn before drying.

- ▲ **Important:** This is only a guide and works only with well matured corn. Samples should be checked yearly to ensure that the formula applies for that crop condition.

Moisture range	Amount to add	
	kg/hL	g/0.5 L
15.8 - 16.4	0.5	2.6
16.5 - 16.9	1.0	5.2
17.0 - 17.3	2.0	10.5
17.4 - 17.6	2.1	11.0
17.7 - 17.9	2.2	11.5
18.0 - 18.3	2.3	12.0
18.4 - 18.6	2.4	12.5
18.7 - 18.9	2.5	13.0

1. Find the moisture range for the test weight of the sample.
2. Add the amount for that moisture range in the appropriate units, either kg/hL or g/0.5 L.

- ▲ **Important:** Corn samples are not to be downgraded on the basis of an estimated test weight. Questionable samples must be dried by exposure and then have the test weight determined.

For example,

The moisture for the tested sample is 17.5%, and the test weight is in kg/hL.

Moisture range	Amount to add	
	kg/hL	g/0.5 L
17.4 - 17.6	2.1	11.0

Add 2.1 to the test weight in kg/hl.

Grading

Important definitions

Net weight of sample

The sample after cleaning and removal of dockage is referred to as the cleaned sample. Its weight is the net weight of the sample. Percentages by weight for grading refer to percentages of the net weight.

Hazardous substances in samples

Wear gloves and a mask to handle any samples that you suspect may contain hazardous substances. Hazardous substances are defined in section 1 of the *Canada Grain Regulations* as “any pesticide, desiccant or inoculant”.

Processed sample

An unofficial sample of grain declared to be conditioned or cleaned to meet end user specifications, and whereas, the determination of dockage and/or determination of commercially clean are not performed or reported.

Rounding rules

Rounding rules are outlined in [schedule 3 of the *Canada Grain Regulations*](#). When official inspection results are expressed numerically, they should be expressed to the same decimal precision as the applicable tolerance in the primary and export grade determination tables.

Non-registered varieties

A registered variety refers to varieties of crops that have been granted variety registration in Canada. Species, kinds or types of crops subject to variety registration in Canada are listed in Schedule III of the *Seeds Regulations*. Not all crops are subject to registration. The Canadian Food Inspection Agency (CFIA) is responsible for the registration of varieties in Canada. Consult the CFIA’s [database of varieties registered in Canada](#) online to determine if a given variety is registered in Canada.

Where grain of any kind is not a registered variety under the *Seeds Act*, no person shall, except with the permission of the Canadian Grain Commission, assign a statutory grade to that grain which is higher than the lowest grade established by regulation for that kind of grain. The [Non-Registered Varieties of Chickpeas, Soybeans and Corn order](#) is issued annually to allow non-registered varieties of corn to be graded higher than the lowest statutory grade.

Representative portions for grading

All grading is done on representative portions divided down from the clean sample, using a Boerner-type divider.

The optimum representative portion is the representative sample size within the minimum and maximum range used to obtain the most accurate result when assessing an objective factor. It is determined by taking into consideration the tolerance and concentration of the objective factor being assessed.

Representative portion of corn for grading (in grams)

Grading factor	Sample portion size range	
	Minimum	Maximum
Caramelized kernels	100 g	250 g
Classes	100 g	working sample
Cracked corn and foreign material	working sample	working sample
Damage	100 g	250 g
Excreta	working sample	working sample
Fertilizer pellets	working sample	working sample
Fireburnt	working sample	working sample
Heated and rotted	100 g	working sample
Odour	working sample	working sample
Stones	working sample	working sample
Treated seed	working sample	working sample

Grading factors

 Images available on web version

Blue eye mould (BEM)

Germ of kernels appear dark blue with mould, or there may be just a visible mouldy blue streak under the hull of the germ. In the second case, peel back the hull from the germ to examine the germ.

Blue-eye mould is included in the tolerance for damage (DMG).

Caramelized kernels

Caramelized kernels are kernels that were very immature when dried at a high temperature in a dryer, and the heat has turned the kernel to a scorched colour similar to that of heated kernels. The outer hull of the kernel may be peeled off showing a slightly damaged kernel inside. These kernels are considered damaged (DMG).

Classes

Corn is classed as yellow, white, or mixed. The class forms part of the grade name; for example, 'Corn, Sample CW Yellow Account Heated'.

Samples of yellow and white corn containing less than 95% of one class are designated Mixed; for example, 'Corn No. 1 CE Mixed'.

Contaminated grain (CONTAM GRN)

▲ **Important:** Wear gloves and a mask to handle any sample that is suspected of containing contaminated grain.

Grain is contaminated for the purposes of the *Canada Grain Act* if the grain contains any substance in sufficient quantity that the grain is either

- (a) adulterated for the purposes of the *Food and Drugs Act*; or
- (b) contaminated within the meaning of the regulations made under section 51 of the *Safe Foods for Canadians Act*.

Treated seed

Treated seed is grain that has been adulterated with an agricultural chemical for agronomic purposes. The types of agricultural chemicals used to treat seed include pesticides, fungicides and inoculants. These seed dressings contain a dye to render the treated seed visually conspicuous. The colour of the dye varies depending upon the type of treatment and the type of grain. The current Canadian colour standard for pesticide and fungicide seed treatments for cereal (including corn) is red or pink. The colour standard for pesticide and fungicide seed treatments for canola is blue; however, green has also been used. Pulse crop (including soybeans) pesticide and fungicide seed treatments are typically blue or green. The coatings or stains may appear greasy or powdery and the surface area covered may range from tiny flecks to complete coverage.

Other chemical substances

Other chemical substances refers to any chemical residues either adhering to the kernel or remaining in the sample and to samples having a chemical odour of any kind.

Extraneous material

Can be defined as glass, metal, wood (including wood pellets), plastic or any other material not already defined in the Official Grain Grading Guide.

Procedure

If a sample is suspected of being coated with a pesticide, desiccant, inoculant or if the sample contains evidence of extraneous material, including any foreign chemical substance other than fertilizer pellets (FERT PLTS), the sample shall be graded 'Corn, Held IP Suspect Contaminated Grain' and submitted to the Canadian Grain Commission. Determination as to whether grain is contaminated will be made by the Grain Research Laboratory in consultation with the Chief Grain Inspector for Canada. Samples deemed to be contaminated are graded 'Corn, Sample Condemned'.

Cracked corn and foreign material (CCFM)

Cracked corn and foreign material includes any of the following:

- All material including kernels and pieces of kernels of corn or any other grains which pass through a No. 12 round-hole sieve or, for samples with a moisture level over 25.0%, through the No. 14 round-hole sieve
- All foreign material (FM) other than stones handpicked from the sample, including pieces of cobs that were not removed by sieving

Procedure

▲ **Important:** Follow the procedure for assessing dockage.

Note: Because breakage occurs during handling at terminal elevators, round down percentages by weight of CCFM to the nearest whole number on all officially sampled and inspected domestic or export shipments from a terminal elevator.

For example, a sample containing 4.7% CCFM by weight is recorded as containing 4% CCFM for grading purposes only on officially sampled and inspected shipments from a terminal elevator.

Damage (DMG)

Damaged kernels include whole kernels or pieces of kernels which are

- Affected by blue-eye mould and other types of moulds
- Sprouted
- Ground-damaged
- Weathered
- Diseased
- Frosted
- Scorched, from a dryer
- Heated (HTD), naturally, or from a dryer, or caramelized
- Rotted (ROT)

Earth pellets (EP)

- Hard earth pellets are pellets that do not crumble under light pressure. See **Stones (STNS)**.
- Soft earth pellets are pellets that crumble under light pressure. See **Cracked corn and foreign material (CCFM)**.

Excreta (EXCR)

Excrement from any animal including mammals, birds and insects.

▲ Important: Wear gloves and a mask to handle any samples that you suspect may contain excreta.

Extraneous material

See **Contaminated grain (CONTAM GRN)**

Fertilizer pellets (FERT PLTS)

Fertilizer pellets are a manufactured plant nutrient product used by producers in the production of grain. They are typically small, round or irregular shaped and usually white, grey, brown, pink or reddish in colour.

Procedures

- Handpick any fertilizer pellets and determine the concentration in the net working sample.
- Fertilizer pellets are assessed as stones (STNS) when the concentration does not exceed 1.0% of the net sample weight.
- Samples containing fertilizer pellets in excess of 1.0% of the net sample weight are graded 'Corn, Held IP Suspect Contaminated Grain'. The sample should be submitted to the Canadian Grain Commission. Determination as to whether grain is contaminated will be made by the Grain Research Laboratory in consultation with the Chief Grain Inspector for Canada. Samples deemed to be contaminated are graded 'Corn, Sample Condemned'.

Fireburnt (FBNT)

Fireburnt kernels are kernels charred or scorched by fire. A cross-section of a fireburnt kernel resembles charcoal with numerous air holes. The air holes result in a low weight kernel which crumbles easily under pressure.

Procedures

Samples of corn containing fireburnt kernels are graded 'Corn, Sample CW/CE (class) Account Fireburnt'.

Foreign material (FM)

See **Cracked corn and foreign material (CCFM)**.

Heated (HTD)

Heated kernels have at least one of the following characteristics:

- Whole kernels or pieces of kernels which range in colour from amber to dark brown over the entire kernel
- Kernels which are totally discoloured by fermentation and show no natural colour on the crowns or backside, or both
- The germ of the kernel is amber to dark brown and is severely puffed in the germ area when heated in a dryer
- Heated seeds of other grains are included in the tolerance for heated

If kernels exhibit none of the above characteristics, but are not whole or sound, they are considered damaged (DMG).

Note: Cracked corn and foreign material (CCFM) that is heated is included with heated corn for grade assessment.

Reference the visual image guide for heated corn to assist in the determination of heated kernels. Industry members may contact the Canadian Grain Commission at 1-800-853-6705 or QAStandards-NormesAQ@grainscanada.gc.ca to request a copy of this guide.

Odour (ODOR)

There is no numeric tolerance for odour. Consider

- The basic quality of the sample
- The type and degree of the odour
- The presence of visible residue causing the odour

Grains grading No. 1 through 4 must be cool and sweet. Corn grading No. 5 may have a slight odour associated with the low quality, but the odour cannot be sour or musty.

If odour is the grade determinant and there is . . .	Then the grade is . . .
An excessive objectionable odour not associated with the quality of the grain, but not heated or fireburnt	Corn, Sample CW/CE Account Odour
An excessive heated odour	Corn, Sample CW/CE Account Heated
An excessive fireburnt odour	Corn, Sample CW/CE Account Fireburnt

Red streak (RSTRK)

A condition in corn where reddish streaks appear on the kernels and is primarily cosmetic. Kernels are considered sound and not assessed as damage (DMG).

Rotted (ROT)

Rotted kernels are whole kernels or pieces of kernels which are visibly in advanced stages of decomposition and feel spongy under pressure. Rotted kernels are included in the percentage of heated (HTD) kernels for grade assessment.

Stones (STNS)

Stones are hard shale, coal, hard earth pellets, and any other nontoxic materials of similar consistency. Fertilizer pellets are assessed as stones when constituting 1.0% or less of the net sample weight. See **Fertilizer pellets (FERT PLTS)** for the specific procedure to be followed when samples contain fertilizer pellets.

Procedures

1. Handpick stones from a representative portion of the cleaned sample.
 2. Determine stone concentration in the net sample.
- Samples of grain grown in western Canada samples of grain containing stones in excess of basic grade tolerances, up to 2.5% are graded 'Corn, Rejected (basic grade) Account Stones'. The 'basic grade' refers to a grade established in the *Canada Grain Regulations* (grades listed in the first column in grade determination tables) that would have been assigned to the sample if it contained no stones.
 - Samples of grain grown in eastern Canada samples of grain containing stones in excess of grade tolerances are degraded to lower grades. Samples containing stones in excess of the tolerance of the lowest grade established by regulation up to 2.5% are graded 'Corn, Sample CE (class) Account Stones'.
 - Samples of western and eastern Canadian grain containing more than 2.5% stones are graded 'Corn, Sample Salvage'.

Examples: Western Canada

Excerpt from grade determination tables for
Corn, Canada Western, White, Yellow or Mixed

Grade name	Stones %
No. 1 CW	0.15
No. 2 CW	0.15
No. 3 CW	0.15
No. 4 CW	0.15
No. 5 CW	0.15

Basic grade:..... Corn, No. 2 CW Yellow

Reason for basic grade:..... 3% Cracked corn and foreign material

If the above sample contained	Grade in Western Canada
0.5% stones	Corn, Rejected No. 2 CW Yellow Account Stones
3.0% stones	Corn, Sample Salvage

Examples: Eastern Canada

Excerpt from grade determination table for
Corn, Canada Eastern, White, Yellow or Mixed

Grade name	Stones %
No. 1 CE	0.15
No. 2 CE	0.15
No. 3 CE	0.15
No. 4 CE	0.15
No. 5 CE	0.15

Basic grade:..... Corn, No. 2 CE Yellow

Reason for basic grade:..... 3% Cracked corn and foreign material

If the above sample contained	Grade in Eastern Canada
0.5% stones	Corn, Sample CE Yellow Account Stones
3.0% stones	Corn, Sample Salvage

Test weight (TWT)

Test weight is the weight of a known volume of grain expressed in kilograms per hectolitre. For procedures, see Chapter 1 of this guide, **Test weight**.

Test weight on corn is determined prior to removal of cracked corn and foreign material (CCFM). When the terms of delivery or terms of a contract state that dockage can be deducted, then test weight is determined after the removal of dockage.

Treated seed and other chemical substances

See **Contaminated grain (CONTAM GRN)**

Variety (VAR)

The Canadian Food Inspection Agency (CFIA) is responsible for the registration of varieties in Canada. Consult the CFIA's [database of varieties registered in Canada](#) online to determine if a given variety is registered in Canada.

Corn is not required to be registered in Canada under the *Seeds Act*.

[The Non-Registered Varieties of Chickpeas, Soybeans and Corn order](#) is issued annually to allow non-registered varieties of corn to be graded higher than the lowest statutory grade.

Primary and export grade determination tables

Corn, Canada Western Yellow, White or Mixed (CW), standard of quality

Grading factor	No. 1 CW	No. 2 CW	No. 3 CW	No. 4 CW	No. 5 CW	Grade, if No. 5 specs not met
Degree of soundness	Cool and sweet, uniform size	Cool and sweet	Cool and sweet	Cool and sweet	May have a slight odour, not sour or musty	
Minimum test weight kg/hL (g/0.5 L)	68 (343)	66 (333)	64 (322)	62 (311)	58 (291)	Corn, Sample CW (class) Account Light Weight
Variety	Any variety of corn	Any variety of corn	Any variety of corn	Any variety of corn	Any variety of corn	
Other classes %	5	5	5	5	5	Over 5% - Use all other grading criteria and grade as Corn (grade) Mixed

Note: The colour is added to the grade name.

Corn, Canada Western Yellow, White or Mixed (CW), damage

Grading factor	No. 1 CW	No. 2 CW	No. 3 CW	No. 4 CW	No. 5 CW	Grade, if No. 5 specs not met
Heated %	0.1	0.2	0.5	1.0	3.0	Corn, Sample CW (class) Account Heated
Total % Damage	3	5	7	10	15	Corn, Sample CW (class) Account Damaged

Corn, Canada Western Yellow, White or Mixed (CW), foreign material

Grading factor	No. 1 CW	No. 2 CW	No. 3 CW	No. 4 CW	No. 5 CW	Grade, if No. 5 specs not met
Excreta %	0.02	0.02	0.02	0.02	0.02	Corn, Sample CW (class) Account Excreta
Total % Cracked corn and foreign material	2	3	5	7	12	50% or less - Corn Sample CW (class) Account CCFM Over 50% - sample Cracked Corn and Foreign Material
Stones %*	0.15	0.15	0.15	0.15	0.15	2.5% or less - Corn, Rejected (grade) (class) Account Stones Over 2.5% - Corn, Sample Salvage

* Stones are not included in total cracked corn and foreign material (CCFM)

Corn, Canada Eastern Yellow, White or Mixed (CE), standard of quality

Grading factor	No. 1 CE	No. 2 CE	No. 3 CE	No. 4 CE	No. 5 CE	Grade, if No. 5 specs not met
Degree of soundness	Cool and sweet, uniform size	Cool and sweet	Cool and sweet	Cool and sweet	May have a slight odour, not sour or musty	
Minimum test weight kg/hL (g/0.5 L)	68 (343)	66 (333)	64 (322)	62 (311)	58 (291)	Corn, Sample CE (class) Account Light Weight
Variety	Any variety of corn	Any variety of corn	Any variety of corn	Any variety of corn	Any variety of corn	
Other classes %	5	5	5	5	5	Over 5% - Use all other grading criteria and grade as Corn (grade) Mixed

Note: The colour is added to the grade name.

Corn, Canada Eastern Yellow, White or Mixed (CE), damage

Grading factor	No. 1 CE	No. 2 CE	No. 3 CE	No. 4 CE	No. 5 CE	Grade, if No. 5 specs not met
Heated %	0.1	0.2	0.5	1.0	3.0	Corn, Sample CE (class) Account Heated
Total % Damage	3	5	7	10	15	Corn, Sample CE (class) Account Damaged

Corn, Canada Eastern Yellow, White or Mixed (CE), foreign material

Grading factor	No. 1 CE	No. 2 CE	No. 3 CE	No. 4 CE	No. 5 CE	Grade, if No. 5 specs not met
Excreta %	0.02	0.02	0.02	0.02	0.02	Corn, Sample CE (class) Account Excreta
Total % Cracked corn and foreign material %	2	3	5	7	12	50% or less - Corn Sample CE (class) Account CCFM Over 50% - sample Cracked Corn and Foreign Material
Stones %*	0.15	0.15	0.15	0.15	0.15	2.5% or less - Corn, Sample CE (class) Account Stones Over 2.5% - Corn, Sample Salvage

* Stones are not included in total cracked corn and foreign material (CCFM).

Export shipments

Grading

Corn on export is graded in accordance with primary grade and export grade determination tables.

Cracked corn and foreign material (CCFM)

Because breakage occurs during handling at terminal elevators, round down percentages by weight of CCFM to the nearest whole number on all officially sampled and inspected domestic or export shipments from a terminal elevator.

For example, a sample containing 4.7% CCFM by weight is recorded as containing 4% CCFM for grading purposes only on officially sampled and inspected shipments from a terminal elevator.

