

GRAIN INSPECTION HANDBOOK

BOOK III, CHAPTER 1

INSPECTION OF SHIPLOTS, UNIT TRAINS, AND LASH BARGES

CHAPTER 1

INSPECTION OF SHIPLOTS, UNIT TRAINS, AND LASH BARGES

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1.1 INTRODUCTION

- a. This chapter establishes procedures for inspecting bulk grain loaded to or unloaded from ships, unit trains, and lash barges as single lots in accordance with section 800.86 of the regulations under the U.S. Grain Standards Act (USGSA). Sacked grain is inspected according to procedures found in FGIS Program Directive 9180.41, Sacked Grain. Sacked grain lots inspected online (inspected prior to or during the sacking operation) are inspected according to the procedures in this chapter.
- b. The Uniform Shiplot and Combined Lot Inspection Plan, commonly known as the CuSum plan, set forth in this chapter represents an online acceptance sampling plan that provides continuous quality information with the objective of obtaining a consistent minimum quality throughout the lot. This is achieved by using statistically based tolerances which accept occasional portions of a lot that, due to known sampling and grading variations, may grade below the desired lot quality. There is no limit to the amount of better quality grain permitted in a lot.
- c. The grade of a lot informs the buyer of the overall or average quality of a lot. The applicant for inspection indicates the contracted lot quality in a load order document submitted to inspection personnel prior to loading. Although the grade on portions of a lot may fluctuate above or below the indicated grade, the average quality of all factors in the certified lot must meet or be of better quality than that stated in the load order document once loading or unloading is completed.
- d. The inspection process requires continuous sampling during loading or unloading. The grain sampled is accumulated in a systematic process and is examined at periodic intervals - subsamples, component samples, and subplot samples. Subsamples represent up to 5,000 bushels. Several subsamples are combined to form a component sample which represents a minimum of approximately 10,000 bushels for ships and lash barges. For unit trains, each railcar is considered a component. Component samples are combined to form a subplot sample, which may represent as much as 80,000 bushels for ships and lash barges or 10 cars in a unit train. Unit train components are combined in the order they are sampled. Ship subplot samples may represent as much as 160,000 bushels if component sample analysis is requested as an optional inspection service.
- e. Each subsample, component sample, and subplot sample is analyzed for specific quality criteria in accordance with the Official U.S. Standards for Grain and the sales contract. Any grain not meeting required quality levels is declared a “material portion” and separately certified. All grain meeting the quality requirements is certified as a single lot based on the combined average of the subplot results.

1.2 LOAD ORDER DOCUMENT

- a. General. Prior to loading or unloading and before inspection can begin, the applicant for inspection must provide a load order document to official personnel, reflecting contract requirements for quality and quantity. The individual issuing the load order must sign the document.

The load order document must reflect the same quality and condition factors contained in the sales contract. Specifically, the document must declare:

- (1) the exact grade and the percent moisture and dockage, when applicable;
- (2) the approximate quantity of grain in the lot;
- (3) the subplot size;
- (4) “Option 1” or “Option 2” certification or the term “or better”;
- (5) the specified protein and/or oil information, when applicable;
- (6) any special requirements, such as aflatoxin, TCK smut, ergot, falling number, zero infestation, or other maximum or minimum limits for factor determinations; and
- (7) any other specific requirements needed to fulfill contract requirements.

A load order grade is not required prior to loading if the applicant does not know the exact grade to be loaded or plans to load grain of different quality without cutoffs or separations (i.e., barge-to-ship operations). When a load order grade is not declared, the lot is certified to the best, uniform grade. If the lot is not uniform for any grade, combine the sublots of the **same grade** and certify them together as individual lots. Certification requirements are discussed in Chapter 2.

The applicant may change load order requirements after official personnel receive a load order provided the contract was amended to reflect the new requirements. When a contract is amended, a revised load order document is required. Official personnel may request a copy of the amended contract or confirmation of sale as verification if a load order requirement is revised after loading begins.

- b. Establishing Sublot Size. The size of the subplot determines the frequency at which inspection personnel examine subplot samples. The number and size of sublots in a lot are dependent on certain restrictions. The applicant may establish the subplot size best suited for the size of the lot, the quality control of the elevator, and efficiency of inspection. Sublot restrictions are listed in the adjoining table. Applicants may not request a change to the subplot size once the subplot size is established and loading begins.

SUBLOT RESTRICTIONS 1/

<u>Carrier</u>	<u>Lot Size</u>	<u>Minimum Number of Sublots</u>	<u>Maximum Size of Each Sublot</u>
Vessels and Lash Barges	80,000 bushels or less	1	-----
	80,001 to 160,000 bushels	2	80,000 bushels
	Over 160,000 bushels	3	80,000 bushels <u>2/</u>
Unit Trains	Less than 200,000 bushels (Less than 50 cars)	2	5 cars
	200,000 bushels or more (50 cars or more)	5	10 cars
<p><u>1/</u> Bushels, or the equivalent in tons or pounds, may be used interchangeably throughout this chapter.</p> <p><u>2/</u> 160,000 bushels when component sample analysis is requested.</p>			

- (1) All sublots loaded, except for the last subplot in the lot, must be “reasonably uniform in size.” That is, the largest sized subplot loaded shall not be more than 25 percent larger than the smallest subplot. To determine the allowable variation in size, multiply the smallest size subplot by 1.25, the resulting figure is the maximum subplot size. For example: if the smallest size subplot is 40,000 bushels then the maximum subplot size would be 50,000 bushels. $40,000 \times 1.25 = 50,000$
- (2) The last subplot shall not amount to less than 5 percent of the average size of the sublots in the lot, unless after the final subplot is loaded aboard, the National Cargo Bureau (NCB) surveyor, port surveyor, stevedoring personnel, ship’s captain, or other persons responsible for the security of the vessel, indicates that more grain must be loaded for vessel security. The additional amount ordered is considered the last subplot and is graded accordingly.
- (3) The last subplot in a unit train may not be more than one car larger than the maximum subplot size allowed for the size of train.

c. Electing the Certification Option. Option 1 and Option 2 are two methods of certifying the grade of a lot. Under Option 1, the exact grade of the grain is shown on the certificate. Under Option 2, the lot is certified as being equal to or better than the grade specified by the contract.

(1) The applicant for inspection must select the certification option and indicate this choice on the load order document. Option 2 certification is used if the load order specifies “or better” as part of the load order grade or if Option 2 is specifically requested.

(2) The applicant may change the certification option at a later date provided the certificates have not been issued or all of the original certificates are returned.

d. Declaring the Grade to be Loaded. The applicant shall use the following guidelines when declaring the grade to be loaded.

(1) Declare the numerical grade consistent with the lowest quality factor limit established for the lot.

EXAMPLE: A contract is signed for a shipment of U.S. No. 2 Dark Northern and/or Northern Spring Wheat. The applicant requests certification under Option 2.

State the load order grade as “U.S. No. 2 or better Northern Spring Wheat.”

(2) Include the phrase “or better” immediately following the numerical or Sample grade designation for Option 2 certification. The “or better” designation is applicable to all numerical (except U.S. No. 1) and Sample Grades, subclasses (except Soft White Wheat subclasses), special grades, special factor requirements, dockage, class in Mixed Wheat, Mixed Corn, Mixed Sorghum, Mixed Soybeans, and Mixed Grain.

(3) Include special factor requirements that are more stringent than the declared numerical grade. Adjust the numerical grade designation on the load order document to correspond to the special factor requirements if special factor requirements are of a lower quality than the contracted numerical grade.

EXAMPLE: The contract stipulates U.S. No. 2 or better Yellow Soybeans, maximum 4.0 percent foreign material (FM).

State the load order grade as: “U.S. No. 4 or better Yellow Soybeans, maximum 4.0 percent FM, all other factors U.S. No. 2 Yellow Soybeans.”

NOTE: Special factor limits are used in determining uniformity, but are not shown on the grade line of an official certificate.

- (4) Request “No subplot to exceed” when applicable.
- (5) Declare any other official inspection or testing requirements needed to fulfill the sales contract.

e. Interpretation of Load Order Specifications.

- (1) Maximum, Minimum, and Average Limits. Load orders generally specify maximum or minimum limits as quality criteria. Inspection plan tolerances are applied to a specific factor if the load order indicates a maximum or minimum limit. Factors that do not have tolerances (e.g., sprout damage) must meet contract specifications for each subplot unless specifically designated otherwise (e.g., soybean oil and protein).
 - (a) Load orders which specify a quality limit without the term “maximum” or “minimum” are treated as a maximum for factors having maximum limits [e.g., damaged kernels total (DKT), foreign material, moisture (M)] or as a minimum for factors having minimum limits (e.g., test weight per bushel, sound barley). Applicants must indicate on the load order wheat protein as a maximum, minimum, or average amount if a specific wheat protein level is shown on the load order. Wheat protein expressed as “ordinary” is considered as an average.
 - (b) Some load orders express specific factor limits as “maximum average” or “average maximum.” When factors are expressed this way or in similar ways, disregard the term “average” and consider the factor as a maximum limit. This also applies for factors expressed as a minimum.
 - (c) Inspection plan tolerances are not used when average quality certification is requested. The load order must indicate “average,” “average not more/less than,” or “average not to exceed” if an applicant wants certification of average quality when a specific percentage or count is declared.

The average quality of a factor is also certified when a specific percentage is not declared on the load order (e.g., undeclared dockage, undeclared moisture) or wheat protein is expressed as “ordinary.”

When “average” factor result inspection is requested, it is the loading elevator’s responsibility to meet the quality level specified in the contract. The final inspection certificate for “average” factors is based on the final factor average. No statements of “average” factor range results or which factor(s) were requested on an “average” basis are shown on the certificate unless specifically requested.

- (2) Range Limits. Some load orders specify a minimum limit as well as a maximum limit for factors to establish an acceptable range. Inspection plan tolerances are applied to both the minimum and maximum limits. Therefore, official personnel will use two factor columns for the single factor. One column is for the minimum limit and the other column is for the maximum limit. CuSum values are calculated for each column based on the inspection results.
- (3) “No Sublot to Exceed” Limits. Some load orders indicate that certain factors must be within a specified limit per subplot. If an applicant indicates this type of request on the load order, tolerances are not applied to the factor(s). A material portion occurs if the specific factor(s) exceeds the load order limit. This provision applies to the subplot result but not to component sample results.
- (4) Dockage Terms. Dockage is usually considered as a deductible amount from the weight of a lot. Some sales, however, limit the maximum amount of acceptable dockage in a shipment. The following examples provide guidelines for applying maximum limits or average quality for commonly used dockage terms.

<u>Dockage Term</u>	<u>Interpretation</u>
All deductible	Average Dockage
Clean Basis	Average Dockage
0.5% nondeductible	Average Dockage
0.5% dockage	0.5% maximum
0.5% nondeductible, 0.8% maximum	0.8% maximum
0.8% maximum, clean basis	0.8% maximum
0.1% nondeductible, 0.1% maximum excess all deductible	Average Dockage

- (5) Special Factor Requirements. Some load orders contain factor limitations that are not at the numerical grade limit. For example, a contract for U.S. No. 2 Yellow Soybeans may contain a clause limiting the amount of foreign material (FM) to a maximum of 1.5 percent. The grade limit for foreign material in U.S. No. 2 Yellow Soybeans is 2.0 percent. Any special factor requirements stated in the load order are considered the allowable grade limit for the lot. In the above example, 1.5 percent is the allowable limit for foreign material.
- (a) To apply the uniformity criteria for the inspection plan, official personnel must establish both the “more than one numerical grade” limit and a “breakpoint” limit. The “more than one grade” limit is used to determine uniformity between component samples (see section 1.3, b). The breakpoint limit is used to establish uniformity for subplot samples (see section 1.3, c).
- (b) The “more than one grade” limit is computed by determining the difference between the numerical grade encompassing the special factor limit and the next inferior grade and adding this difference to the special factor limit. For instance, a load order grade of U.S. No. 2 Yellow Soybeans with a maximum of 1.5 percent foreign material is requested. The 1.5 percent foreign material is within the U.S. No. 2 grade limit. The difference between the foreign material grade limit for U.S. No. 2 (2.0 percent) and U.S. No. 3 (3.0 percent) is 1.0 percent.

Add the 1.0 percent to the allowable limit which will yield the “more than one grade” limit of 2.5 percent.

- (c) The breakpoint for the grade factor is the same as that of the numerical grade, which encompasses the factor limit. Using the same example, 1.5 percent foreign material is within the grade limit for U.S. No. 2 Yellow Soybeans. The breakpoint for foreign material in U.S. No. 2 Yellow Soybeans is 0.3. Thus the breakpoint for the special grade of 1.5 percent foreign material is also 0.3.

- (6) Metric Test Weight Requirements. Some contracts contain grain density requirements expressed as a minimum amount in kilograms per hectoliter (kg/hL). For example, a contract for U.S. No. 2 or better Hard Red Winter Wheat may contain a clause that restricts the grain density to a minimum of 76 kg/hL. In this example, 76 kg/hL (or its pounds per bushel equivalent) is the allowable limit for grain density or test weight per bushel (TW). The corresponding TW is 57.7 lbs. (See example below)

Note: Official personnel may use the formulas listed below to make the appropriate conversions, or refer to Appendix 2, “Test Weight/Kilograms Per Hectoliter Conversion Charts for Wheat and Other Grains” of Grain Inspection Handbook II.

- (a) To apply the uniformity criteria for the inspection plan, official personnel must convert the metric bulk density (MBD) in kg/hL to test weight in pounds per bushel (lbs/bu) using the following applicable formula.

$$\text{Durum Wheat} \quad \text{TW} = (\text{MBD} - 0.630) \div 1.292$$

$$\text{Other Wheat} \quad \text{TW} = (\text{MBD} - 1.419) \div 1.292$$

$$\text{Other Grains} \quad \text{TW} = \text{MBD} \div 1.287$$

Example: $\text{TW} = (76 - 1.419) \div 1.292$
 $\text{TW} = (74.58 \div 1.292)$
 $\text{TW} = 57.725 \text{ lbs/bu}$
Rounded minimum limit = 57.7 lbs

- (b) The final certificate will show the average test weight (pounds per bushel) result using approved rounding and reporting procedures. Report the metric equivalent in the “Remarks” section of the certificate based on the average test weight per bushel value before rounding. Use the following conversion formula to determine the MBD to be shown in the certificate “Remarks” section.

$$\text{Durum Wheat} \quad \text{MBD} = (\text{TW} \times 1.292) + 0.630$$

$$\text{Other Wheat} \quad \text{MBD} = (\text{TW} \times 1.292) + 1.419$$

$$\text{Other Grains} \quad \text{MBD} = \text{TW} \times 1.287$$

1.3 UNIFORMITY CRITERIA

Samples (subsamples, component samples, and subplot samples) are continuously obtained and examined by official inspection personnel during the loading or unloading of shiplots, unit trains, or lash barges to determine uniformity. Official personnel are responsible for determining when subsamples, component samples, and subplot samples are analyzed.

- a. Subsamples. Subsamples representing up to 5,000 bushels of grain are taken from each belt, mechanical sampler, moving stream of grain, etc., continuously throughout the loading or unloading of shiplots and lash barges. Subsamples are not applicable to unit trains.

- (1) At the applicant’s request, official inspection personnel may examine each subsample for the factors heating, odor [sour, musty, or commercially objectionable foreign odor (COFO)], distinctly low quality (DLQ), and other unusual conditions. If a subsample includes one or more of these conditions (unless the load order grade includes the condition), the grain represented by that subsample is declared a material portion (MP).

CuSum values are not recalculated and breakpoints are not reset when a subsample is declared a material portion. For material portion subsamples, official inspection personnel shall record the factor analysis information on the inspection log, and carry forward the CuSum values from the previous subplot.

- (2) Quality factors, which are normally checked on a component basis such as broken corn and foreign material (BCFM), FM, and DKT, can be checked on a subsample basis if requested by the applicant, or so stipulated in the load order contract. If an applicant elects to return a subsample, do not report any factor information on the inspection log. Instead, indicate the quantity of grain rejected and returned by the shipper's request.
- b. Component Samples. Acceptable subsamples are combined to form a component sample. Component samples should be reasonably uniform in size during the loading or unloading operation. The minimum component sample size for shiplots and lash barges is approximately 10,000 bushels. Each railcar is considered a component sample when unit trains are inspected.
- (1) Official inspection personnel visually examine component samples to determine whether any factor exceeds the limits for the declared grade by more than one numerical grade. The "more than one grade limit" criteria does not apply to nonnumeric grading factors, such as dockage, subclass, protein, oil, etc.
 - (2) Component samples are also examined for insect infestation, heating, odor, DLQ, and other unusual conditions.
 - (3) Official inspection personnel combine component samples to form a subplot when all factors in the component samples are within the "one grade" limit or when the component is infested and the applicant decides to fumigate according to FGIS procedures.

If a component sample does not appear to meet the inspection criteria, official personnel must analyze the component sample for the nonuniform factor. If the factor result(s) does not exceed the inspection criteria, do not record the factor result on the inspection log. The component sample is combined with other uniform component samples and graded as a subplot.
 - (4) When a component sample factor result exceeds the grade limit by more than one numerical grain or contains a condition not included in the load order (i.e., heating, odor, DLQ, etc.) after the factor analysis, the grain represented by that component sample is declared a material portion.
 - (5) If the applicant elects to remove the material portion from the lot, do not calculate CuSum values for the component sample. If the applicant elects to leave the material portion on board the carrier and receive separate certificates, inspect the component as a subplot. Analyze all factors, record the results on the inspection log beneath the last subplot inspected, and calculate CuSum values.

- (6) Upon request, official inspection personnel will inspect component samples for factors specified by the applicant provided sufficient advance notice is given. Inspection procedures for requested component sample services are found in section 1.6.
 - (7) Should the applicant decide to return a component sample to the house after it is graded and the component is known to be good, the entire subplot graded to that point must be returned.
 - (8) Unit train components are considered removed from the train when official personnel receive verbal intent to remove (unload) from the applicant. Railcars can be reloaded and considered as new components and included back into the train. Reloaded railcars must be introduced back into the unit train in the order that reloading was completed.
- c. Sublot Samples. A component sample not designated as a material portion is combined with other uniform component samples in the order that sampling was completed to form a subplot sample. Official inspection personnel may combine more than two shipping bins/railcars to form a subplot as long as the combination does not exceed the maximum allowable subplot size and they are combined in the order in which they are filled. Official inspection personnel are responsible for determining when each subplot is completed and graded.
- (1) Official inspection personnel must proportionately combine grain when sublots are formed from different sources in order for the sample to accurately represent the subplot. Official personnel must also obtain a large enough sample to maintain an unworked file sample after completing the original inspection and any subsequent review inspections on material portions. Review inspections of material portions are performed on unworked samples.
 - (2) Each subplot sample is analyzed for all factors and results are recorded on the inspection log. The results of the subplot analysis are used to calculate each factor's CuSum value.

A subplot is designated a material portion if any factor has a CuSum value which exceeds the allowable breakpoint or the subplot is U.S. Sample Grade. A subplot is also designated a material portion if a factor result exceeds the load order limit when the contract specifies the subplot factor result cannot exceed the specified limit. If a subplot is designated a material portion, all components that comprise the subplot are included in the material portion.

1.4 GENERAL PROCEDURES

The inspection plan for shiplots, lash barges, and unit trains involves the comparison of the accumulated differences between inspection results and the grade limit or contracted limit. To determine if a lot of grain is uniform, it is necessary to calculate a CuSum value for each factor in all sublots. When any factor's CuSum value exceeds its breakpoint, a material portion is declared.

NOTE: To further illustrate the inspection plan procedure, a series of examples is included in this chapter which demonstrates an inspection under this plan.

The series of examples is based on a load order grade of U.S. No. 2 Yellow Soybeans with a stated minimum of 54.0 pounds per bushel test weight. CuSum values are calculated for three factors: test weight per bushel, damaged kernels, and foreign material. In addition, a completed log coinciding with the examples is shown as Attachment 1.

- a. Preparing the Inspection Log. Immediately below each factor heading is a box for recording the grade limit, breakpoint, and starting value. (See Figure 1.) Each factor column is divided into two portions: the left side for recording the factor inspection result; the right side for recording the factor CuSum value.

Figure 1 – Inspection Log Factor Column

	FM	
Sublot Number	Grade Limit	Breakpoint Starting Value
	Factor Result Column	CuSum Column
	↓	↓

- (1) Prior to loading, the inspector records the grade limit, breakpoint, and starting value on the inspection log for each factor examined. (See Figure 2.) Tables 1-24 contain grade limits and breakpoints for all grains. A starting value is needed for each grading factor examined during loading. Starting values are based on breakpoints. To find the proper starting value for a given factor, first determine the breakpoint for that factor then find the corresponding starting value from Table 28. Breakpoints and starting values for factors with minimum limits are recorded as negative figures.

Figure 2 – Recording grade limits, breakpoints, and starting values on the inspection log

SUBLOT NUMBER	TW		DKT		FM	
		- 0.4	0.9	0.3		
	54.0	- .1	3.0	.3	2.0	.1

- (2) Inspection personnel must consider the rounding requirements for certain factors when recording the grade limit on the inspection log. For instance, fractions of a percent are added to the grade limit for maximum limit factors that disregard a fraction when rounding.

EXAMPLE

<u>Factor</u>	<u>Load Order Grade</u>	<u>Grade Limit on Log</u>
Wheat Subclass	Dark Northern Spring (75% minimum)	74.5
Barley Dockage	Maximum 1.0% dockage	1.49

- b. Recording Sublot Factor Results. The inspector records each factor result in the appropriate factor column on the inspection log after grading the sublot. Round and record results to the same number of decimal places as its corresponding breakpoint. (See Figure 3.) Factors which have fractions disregarded are recorded on the inspection log without rounding.

EXAMPLE

<u>Factor</u>	<u>Inspection Results</u>	<u>Recorded Result</u>
Soybean FM	1.96	2.0
Sorghum Dockage	0.779	0.77
Wheat Test Weight	58.26	58.3

Figure 3 – Recording sublot factor results on the inspection log

SUBLOT NUMBER	TW		DKT		FM	
		54.0	- 0.4 - .1	3.0	0.9 .3	2.0
1	55.1		2.9		2.0	

- c. Computing CuSum Values. A CuSum value is calculated for each factor for every sublot inspected and for every component declared a material portion that is not removed from the lot. CuSum values are not calculated on:

- (1) Subsamples,
- (2) Grain returned to the elevator before a sublot is designated by inspection personnel, or
- (3) A sublot is inspected and found acceptable under the inspection plan, but the elevator elects to return the sublot.

The following table summarizes when CuSum values are calculated and recorded on the inspection log.

RECORDING CUSUM VALUES

Sample Basis	Material Portion		Acceptable	
	Returned	Onboard	Returned	Onboard
Sublot	*	*		*
Component		*		
Subsample				
* Denotes CuSum values are calculated and recorded on log.				

Calculate the CuSum values as follows:

Step 1. Determine the factor deviation by subtracting the grade limit, as determined by the declared grade, from the inspection result.

EXAMPLE: (Inspection result) minus (grade limit) = (deviation)

$$3.1 \text{ minus } 3.0 = + 0.1$$

$$2.9 \text{ minus } 3.0 = - 0.1$$

Step 2. Add the factor deviation to the previous CuSum value. For the first subplot, add the factor deviation to the starting value.

EXAMPLE: (Factor deviation) plus (previous CuSum or starting value) = (new CuSum value for that factor)

$$+ 0.1 \text{ plus } + 0.3 = + 0.4$$

$$-0.1 \text{ plus } + 0.3 = + 0.2$$

- (1) CuSum values for factors listed as “maximum limits” (e.g., FM, DKT, DEF (total defects), CCL (contrasting class), WOCL (wheat of other class), etc.) are never less than zero. When the total from **Step 2** is a positive number, record the total as that factor’s CuSum value. When the total from **Step 2** is a negative number, record the CuSum value as “0.” It is not necessary to continually record “0” CuSum values on the inspection log as long as a factor’s CuSum value remains at zero.

- (2) CuSum values for factors listed as “minimum limits” (e.g., TW) are never greater than zero. When the total from **Step 2** is a negative number, record the total as that factor’s CuSum value. It is not necessary to show the negative sign. When the total from **Step 2** is a positive number, record the CuSum value as “0.” It is not necessary to continually record “0” CuSum values on the inspection log as long as a factor’s CuSum value remains at zero.

EXAMPLE: Calculate the CuSum values for Sublot No. 1 when the factor deviation is added to the starting value.

Sublot No. 1	<u>TW</u>	<u>DKT</u>	<u>FM</u>
Factor result	55.1	2.9	2.0
Subtract grade limit	54.0	3.0	2.0
Factor deviation	+ 1.1	- 0.1	0.0
Add starting value	- 0.1	+ 0.3	+ 0.1
Total	+ 1.0	+ 0.2	+ 0.1
CuSum value	0	0.2	0.1

- (3) Record each CuSum value in the appropriate factor column. (See Figure 4.)

Figure 4. Recording CuSum values for first subplot

SUBLOT NUMBER	TW		DKT		FM	
		54.0	- 0.4 - .1	3.0	0.9 .3	2.0
1	55.1	0	2.9	.2	2.0	.1

EXAMPLE: Calculate the CuSum values for Sublot No. 2 when the factor deviation is added to that factor’s previous CuSum value.

Sublot No. 2	<u>TW</u>	<u>DKT</u>	<u>FM</u>
Factor result	53.8	2.7	2.2
Subtract grade limit	54.0	3.0	2.0
Factor deviation	- 0.2	- 0.3	+ 0.2
Add CuSum value from preceeding subplot	0.0	+ 0.2	+ 0.1
Total	- 0.2	- 0.1	+ 0.3
CuSum value	- .2	0	.3

Record each CuSum value under the appropriate factor’s CuSum column. (See Figure 5.)

Figure 5. Recording CuSum values for subsequent sublots

SUBLOT NUMBER	TW		DKT		FM	
		54.0	- 0.4 - .1	3.0	0.9 .3	2.0
1	55.1	0	2.9	.2	2.0	.1
2	53.8	- .2	2.7	0	2.2	.3

In all subsequent sublots, calculate each factor’s CuSum value in the same manner as in the above example. Starting values are only used to determine CuSum values on the first subplot.

- d. Declaring a Material Portion. When a subsample exceeds acceptable quality conditions, a component is more than one numerical grade lower than the declared load order grade, or a subplot factor or official criteria factor result causes the CuSum value to exceed its breakpoint, the subsample/component/sublot is declared a material portion. Only the subsample/component/sublot that exceeds the inspection plan criteria is considered the material portion.
- (1) If subsample analysis is requested by the applicant and a subsample is designated a material portion, the applicant may elect to leave the subsample onboard the carrier or remove the subsample from the carrier. If the subsample is left onboard the carrier it is considered as a separate lot and all factors are analyzed. If the material portion subsample is removed from the lot (returned to the elevator or discharged from the carrier), record the factor result for the degrading factor. In either instance, do not calculate CuSum values for the material portion subsample.
 - (2) Once a component is designated a material portion (because it is more than one grade inferior to the load order grade) and the applicant elects to leave the component on board the carrier, it is considered as a separate lot and all factors are analyzed and CuSum values calculated. If the material portion component is removed from the lot (returned to the elevator or discharged from the carrier), record the factor result for the degrading factor but do not calculate CuSum values. Include railcar identification(s) in all documentation and logs involving material portions for unit trains.
 - (3) A material portion subplot or material portion component on board is indicated on the log by:
 - (a) Placing a diagonal line through the CuSum column for any factor that exceeded its breakpoint;
 - (b) Recording the CuSum value above the diagonal line;
 - (c) Recording the breakpoint value below the diagonal line;
 - (d) Re-identifying the subplot as MP #1 for the first material portion, MP #2 for the second, etc. For unit trains, also identify railcar identification(s) for each material portion. (See Figure 6.)

Figure 6. Inspection log showing breakpoint violation

SUBLOT NUMBER	TW		DKT		FM	
		- 0.4		0.9		0.3
	54.0	- .1	3.0	.3	2.0	.1
1	55.1	0	2.9	.2	2.0	.1
2	53.8	-2	2.7	0	2.2	.3
3	54.7	0	3.7	.7	2.2	.5

- (3) Whenever a breakpoint is exceeded, the CuSum value for that factor is reset to the breakpoint value. Reset the CuSum value by recording the breakpoint value below the diagonal line drawn through the CuSum column for each factor that exceeded its breakpoint. Do not reset the CuSum value for factors that did not exceed the breakpoint. (See Figure 7.)

Figure 7. Resetting the CuSum value to the breakpoint

SUBLOT NUMBER	TW		DKT		FM	
	54.0	- 0.4 - .1	3.0	0.9 .3	2.0	0.3 .1
1	55.1	0	2.9	.2	2.0	.1
2	53.8	-2	2.7	0	2.2	.3
3 MP-1	54.7	0	3.7	.7	2.2	.5 .3

- (5) The reset CuSum value(s) and the CuSum values for the factors that did not exceed the breakpoint are used to determine the CuSum values for the next subplot. Identify the next subplot with the same number that would otherwise have been assigned to the material portion subplot. (See Figure 8.)

Figure 8. Sublot following a material portion.

SUBLOT NUMBER	TW		DKT		FM	
		- 0.4		0.9		0.3
	54.0	- .1	3.0	.3	2.0	.1
1	55.1	0	2.9	.2	2.0	.1
2	53.8	-2	2.7	0	2.2	.3
3 MP-1	54.7	0	3.7	.7	2.2	.5 .3
3	53.9	-1	2.2	0	1.8	.1

e. Holding Grain in Shipping Bins. Occasionally, extra grain is elevated, graded, and held in a shipping bin at the end of loading. When this occurs, a shipping bin can be held over for a subsequent shipment, provided that the next lot is for the same or lower (inferior) quality grade and loading begins within 88 hours of the inspection.

- (1) If a portion of a completed and graded shipping bin is loaded aboard the carrier, do not use the remainder of the shipping bin towards the different lot. The partial bin must be returned to the elevator.
- (2) If a subplot is comprised of two or more shipping bins and only one bin is loaded aboard the carrier, the final subplot grade is that of the grain sample representing the single bin loaded if the shipping bins contain different qualities. Official personnel should alert the shipper that this inspection will occur before grain in the bin is released to the carrier.
- (3) When an acceptable subplot is transferred as part of a new (second) lot, calculate CuSum values for this subplot on the inspection log of the new (second) lot. If the transferred subplot becomes the first subplot on the new (second) lot, starting values must be applied.

1.5 REVIEW INSPECTIONS

Applicants may request review inspections (reinspection, appeal inspection, Board appeal inspection) of a material portion subplot or of the entire lot. Review inspection procedures depend on the kind of request received.

Review inspections are not permitted on sublots that are not material portions (i.e., inspection results over the load order limit but within the breakpoint). Applicants may request a review of the entire lot.

The applicant for service may specify that official personnel perform review inspection service on only the factor(s) that caused the material portion, or on multiple subplot factor results. Official personnel performing the review inspection will perform analyses on the factor(s) as specified by the applicant, and any other factor that is deemed necessary by the inspector.

For grains that have official criteria factors (e.g., protein, aflatoxin) analyzed in conjunction with grade analysis, special review inspection rules apply. If a subplot factor result causes a material portion, and the official criteria results are within CuSum tolerances, then a review inspection can be performed on all grade and official criteria factors performed on the original subplot. However, if a material portion is caused by an official criteria result (e.g., protein), and the grade factor results are within CuSum tolerances, then the review inspection will be restricted to the official criteria factor, unless the inspector determines that a review of all or some of the grade factors is necessary.

- a. Review Inspection of a Material Portion. When a review inspection is requested on a material portion (subsample, component, or subplot), only one field review is permitted (i.e., reinspection (REX) or appeal inspection).
 - (1) In addition to limiting the number of field review inspections, field review inspection results for each factor analyzed are compared to the original inspection results to determine if a material error exists. A material error is defined as any change in inspection results in excess of two standard deviations.
 - (2) If a material error exists, the field review inspection result will replace the original inspection result. If a material error does not exist, the factor results are averaged. Factors which are not expressed numerically (i.e., odor) are replaced by the determination made during the last review.

- (3) Averaging review results with previous results also applies to Board appeal inspections. The Board appeal inspection result is compared to the previous subplot inspection result recorded on the log (average of original/field review result or field review result replacing the original result) to determine if a material error exists.
- (4) Inspection results are compared on a factor basis. Therefore, some factors are averaged when other factors are replaced. FGIS will use tables as the basis for determining when a material error occurs. Table 29 lists the allowable differences for factors having breakpoints. Table 30 lists the allowable difference for factors not having breakpoints.
- (5) A review inspection result is averaged with the previous inspection result when the difference does not exceed the allowable difference listed in Tables 29 and 30. A review inspection result replaces the previous inspection result when the differences exceed the value in Table 29 and 30.
- (6) When a review inspection is requested, the previous inspection results are lined out on the inspection log with a note in the “Remarks” section that the applicant requested a review inspection. Results of the review inspection are recorded on the inspection log. Then compared to the previous results to determine what factors are averaged or replaced. The final results (averaged or replaced) are recorded on the inspection log and CuSum values are recalculated for the subplot. It is necessary to record the review inspection results on the inspection log in order to verify if correct procedures were followed when determining which factors are averaged or replaced or if a subsequent review of the entire lot is requested.

NOTE: The auto CuSum program does not allow for circling or lining out entries on the log.

EXAMPLE: Determine which review inspection results are averaged with the original results and which replace the original results.

<u>Sublot No. MP-1</u>	<u>TW</u>	<u>DKT</u>	<u>FM</u>
Original Inspection	54.7	3.7	2.2
Review Inspection	54.0	2.4	2.0
Inspection difference	- 0.7	- 1.3	- 0.2
Allowable difference (from table #29)	+/- 0.5	+/- 1.2	+/- 0.4
Average/Replace results	Replace	Replace	Average
Results shown on log	54.0	2.4	2.1

- (8) When a field review inspection (reinspection or appeal inspection) is requested on a material portion, official personnel will:
- (a) Draw a line through the previous inspection results of the subplot under review. Include a notation in the “Remarks” section of the inspection log that the applicant requested a field review inspection (specify type as “REX” or “APPEAL”).
 - (b) Record the field review inspection results on the inspection log. Do not calculate CuSum values for these results.
 - (c) Based on the field review results, determine which factors are averaged and which factor results are replaced.
 - (d) Record the averaged/replaced factor results in the factor columns on the inspection log. Draw a line through the field review results so only the averaged/replaced factor results are used to calculate new CuSum values.
 - (e) Reidentify the subplot by including a notation of the type of review with its corresponding subplot number.
 - (f) Recalculate the CuSum values for the material portion subplot to determine if the material portion designation is removed.

- (g) Reidentify the subplot as a material portion (MP - 1, etc.) if a CuSum value exceeds the breakpoint value. (See Figure 9.)

Figure 9. Recording review inspection results on the inspection log.

SUBLOT NUMBER	TW		DKT		FM		Remarks
		- 0.4		0.9		0.3	
	54.0	/ - .1	3.0	/ .3	2.0	/ .1	
1	55.1	0	2.9	.2	2.0	.1	
2	53.8	- .2	2.7	0	2.2	.3	
3 MP - 1	54.7	0	3.7	.7	2.2	.5 .3	Applicant requests Field Review (REX) of MP - 1
Field Review MP - 1			2.4		2.0		
Rex MP - 1			2.4	0	2.1	.4 .3	Field Review does not eliminate MP. Applicant elects to discharge MP - 1.
						/	

- (9) If a material portion is not removed from the lot, draw a circle around the factor results on the inspection log. If a material portion is removed from the lot, draw a line through the factor results on the inspection log.
- (10) When the results of the review inspection eliminate a material portion, do not issue inspection certificates for the reviewed material portions unless they are requested by the applicant or deemed necessary by inspection personnel. When certificates are requested or deemed necessary, show the following statement in the “Remarks” section:

“The results shown on this certificate replaced the results shown on the inspection log for the above identified subplot loaded aboard the (name of carrier), dated (date), and were included in the average of the lot. This certificate is not valid for trading purposes.”

- (11) When a component material portion is eliminated by the review inspection results, official personnel will combine the component with other acceptable components to form a subplot.
 - (12) If the field review does not eliminate the material portion, the applicant for inspection has the option of:
 - (a) requesting a Board appeal inspection of the material portion;
 - (b) discharging the material portion;
 - (c) requesting a review inspection of the entire lot; or
 - (d) allowing the material portion to remain on board.
 - (13) Agencies must alert their respective field office when a Board appeal inspection is requested so that immediate arrangements for service may be made.
 - (14) When the results of the review inspection do not eliminate the material portion, do not issue an inspection certificate unless the material portion remains on board. Certify discharged and returned sublots when requested by the applicant or deemed necessary by official personnel.
- b. Review Inspection of Entire Lot. When a review inspection is requested on the entire lot, the review inspection results replace the previous results and are placed on a new inspection log noting the level of inspection. A reinspection, an appeal inspection, and a Board appeal inspection are permitted when the entire lot is reviewed.
- (1) All sublots offered for inspection (loaded or returned/discharged) are included in the review. The entire lot is reviewed at the same level (e.g., reinspection, appeal) of field review. For example, an applicant previously appealed (field review) a material portion subplot and the results did not remove the material portion designation. If the applicant wants to review the entire lot, it must be at the appeal inspection level because at least one subplot was reviewed at the appeal inspection level.

When the applicant appeals the entire lot, the material portion inspection results used to determine if the results are averaged or replaced are used instead of analyzing the sample again. Review inspection results are not averaged with previous results when the entire lot is reviewed.

- (2) The tolerances of the inspection plan are reapplied to the review inspection results to determine if any material portions are observed. Material portions are certified accordingly. The applicant may request the next level (e.g., Board appeal) of inspection for the entire lot in order to eliminate a material portion designation.

1.6 COMPONENT INSPECTION

a. General.

Applicants may request a component inspection service on specific factors. Component inspection results are averaged to obtain subplot inspection values. Factors not requested to be analyzed on the component sample basis are analyzed on a subplot sample basis. In order to arrange for inspection personnel to provide the requested service, official personnel must receive this request as early as possible prior to loading. Once loading begins, the applicant is not permitted to change the factor(s) analyzed on a component sample basis, withdraw the request for component analysis, or ask to begin a component inspection service.

- b. Sampling Criteria. In order not to delay loading, applicants may request a subplot size larger than the normal 80,000 bushel maximum limit. Sublots must not exceed 160,000 bushels. Component size is dependent on the subplot size. A minimum of three component samples and a maximum of five component samples are analyzed for sublots up to 120,000 bushels. For sublots between 120,001 and 160,000 bushels, a minimum of four component samples and a maximum of six component samples are analyzed.

- c. Assigning Breakpoints. The breakpoint values assigned to the factors analyzed on a component sample basis are adjusted to reflect the reduced variability associated with the subplot result. The breakpoint value is dependent on the number of component samples analyzed as part of the subplot. The breakpoint value for the subplot reduces as the number of component samples increase.

- (1) Tables 25, 26, and 27 are used to determine the reduced breakpoint value when component analysis is requested. Determine the reduced breakpoint as follows:

- (a) Determine the number of component samples in a subplot.

- (b) Determine the normal breakpoint value (from Tables 1-24) for the factor(s) analyzed.
- (c) Locate the normal breakpoint value in Tables 25-27 and find the reduced breakpoint value corresponding to the number of component samples analyzed per subplot.
- (d) Use the corresponding reduced breakpoint value as the inspection plan tolerance for that factor.

EXAMPLE: An applicant requests component analysis for foreign material for U.S. No. 2 or better Yellow Soybeans.

Step 1. Official personnel will inspect four components for each subplot.

Step 2. The normal breakpoint value for the factor is 0.3. (From Table 17)

Step 3. The corresponding reduced breakpoint value when four components are analyzed is 0.2. (From Table 25)

Step 4. Record 0.2 on the inspection log as the breakpoint value.

- (2) Some factors are based on the sum of the results of other factors (e.g., defects in wheat). Apply a reduced breakpoint value to these factors when 50 percent or more of the factors needed to obtain this result are determined on a component sample basis.

For example, if shrunken and broken kernels and damaged kernels are determined on a component sample basis and foreign material is determined on a subplot basis for a wheat shipment, a reduced breakpoint is used for the factors shrunken and broken kernels, damaged kernels, and defects. The normal breakpoint is used for foreign material.

- d. Recording Results. Official personnel may record component sample results on the same inspection log as the subplot results or on a separate log. The subplot result (average of the component results) for the factor(s) is recorded on the same log as the other subplot inspection results. If a separate log is used for the component sample results, maintain this log with the official inspection log. When recording component sample results, official personnel must identify which inspection result is for which component.

- e. Declaring Material Portions. Material portions occur whenever a component sample inspection result exceeds the more than one grade limit uniformity requirement for component samples (refer to section 1.3, b) or the average of the component results cause the CuSum value to exceed the reduced breakpoint value. Procedures for recording CuSum values on the inspection log are discussed in section 1.4, d.
- f. Review Inspections. When a material portion occurs, the applicant is entitled to one field review (reinspection or appeal inspection) and a Board appeal inspection in an attempt to remove the material portion designation. As discussed in section 1.5, review results are compared to the previous results to determine if a material error exists which determines if the results are averaged or replaced. Procedures for determining when and how to average inspection results are dependent on the type of material portion observed.
- (1) Component is a Material Portion. When the component exceeds the more than one grade limit uniformity requirement, only that component is reviewed. Initiate the review inspection with a factor analysis of the degrading factor.
- (a) Determine if the review inspection result is averaged with the previous inspection result or if it replaces it. Use the normal breakpoint value (from Tables 1-24) for the factor reviewed to determine the allowable difference for averaging (from Table 29). If the factor in question does not have a breakpoint, use Table 30 to determine the allowable difference. Average those results that are within the allowable difference. Replace those results which exceed the allowable difference.
- (b) Determine if the material portion designation is removed based on the review inspection action.
- Use the final result (averaged or replaced, whichever is applicable) to determine if the component is a material portion (more than one grade over the grade limit).
- (c) If the material portion is not eliminated, the applicant may request a Board appeal inspection, remove the material portion from the lot, or receive a separate certificate if it remains on board.

- (d) If the review inspection does not eliminate the material portion designation and the applicant elects to leave the component on board the carrier, it is considered as a separate lot and all factors are analyzed and CuSum values calculated. If the material portion component is removed from the lot (returned to the elevator or discharged from the carrier), only a factor analysis of the degrading factor is necessary and CuSum values are not calculated.
 - (e) If the material portion is eliminated, use the final component result when determining the subplot average result.
- (2) Sublot is a Material Portion. When the subplot CuSum value exceeds the breakpoint causing a material portion, all components comprising that subplot factor are reviewed as part of the review inspection procedure. Only those factors, which were previously determined on a component sample basis, are review inspected on a component sample basis. All other factors are reviewed on a subplot basis. Factors other than the factor that caused the material portion designation are reviewed only when it is deemed necessary by the inspector.
- (a) The procedure for determining if the review component inspection results are averaged or replaced with the previous component inspection results do not apply when the subplot is a material portion and all components are reviewed. Official personnel will review all components for the applicable factor(s) then average the revised component results to obtain a subplot result.
 - (b) Use the reduced breakpoint value for the factor analyzed on a component sample basis to find the corresponding allowable difference value in Table 29. Then determine if the average subplot result is averaged with the previous average subplot result.
 - (c) Record the subplot results on the inspection log and recalculate CuSum values as described in section 1.5. Determine if the material portion designation was eliminated based on the new CuSum values. If the material portion was not eliminated, the applicant may request a Board appeal inspection, remove the subplot from the lot, or certificate it separately.

- (d) Official personnel must maintain a sufficient quantity of sample for each component involved in a material portion in order to provide for a review inspection on an unworked portion. After the material portion designation is eliminated, official personnel may dispose of the excess grain sample after saving an unworked file sample to represent the subplot.
- (3) Review Entire Lot. Official personnel are not responsible for maintaining a file sample for components that are part of an acceptable subplot. Therefore, if a request is received for a review inspection of the entire lot, the review inspection is completed on a subplot basis instead of a component sample basis because file samples are not available for the components. Review inspection results replace the previous results and the normal breakpoints are applied.
- g. Returning Components. Official personnel may release component inspection information to the applicant as results are available. When a component is inspected and the results are released to the applicant, the acceptable component becomes part of the subplot.
- (1) An applicant may return a component to the elevator before inspection results are known or when it is designated as a material portion. Returning an acceptable component after inspection results are known and replacing it with another component adversely affects the overall operation of the inspection plan. Therefore, if an applicant returns an acceptable component after the inspection results are known, the entire subplot graded to that point must be returned.
 - (2) Failure to comply with this provision will result in official personnel not releasing subsequent component inspection information to the applicant until the subplot is completed or a component is designated as a material portion. This restriction is applicable to the remainder of the lot and, at the field office manager's discretion, to future lots which have components inspected during loading.

1.7 DISPOSITION OF MATERIAL PORTIONS

- a. Disposition Options. At the option of the applicant for inspection, any grain designated as a material portion may, in lieu of separate certification, be:
- (1) Returned to the elevator.
 - (2) Fumigated in accordance with the FGIS Fumigation Handbook when the material portion is a result of “infested” grain.
 - (3) Removed from a unit train line up.
 - (4) Removed by discharging from the carrier.
 - (5) Loaded to another lot for lower quality grain (not higher quality).
- b. Loading a Material Portion to Another Lot. A material portion from one lot may be loaded as part of another lot in lieu of returning the material portion to the elevator provided sufficient information is available to complete the inspection and weighing functions of the other lot. This is permitted only when the original inspection results for the material portion subplot are within the load order grade limits of the other (second) lot. A material portion having results over the grade limit but within the inspection plan tolerances is not acceptable for loading to the other (second) lot.
- (1) This method of material portion disposition applies only to sublots designated as material portions and does not apply to components or subsamples.
 - (2) When a material portion is loaded as part of another (second) lot, do not calculate CuSum values for this subplot on the inspection log of the other (second) lot. Instead carry forward the CuSum values from the subplot recorded on the other (second) lot inspection log immediately before it. Include a note in the “Remarks” section that the CuSum values were carried forward because the subplot was a material portion intended for another lot. (See Figure 10.)

If the transferred subplot is the first subplot on the new (second) lot, do not calculate CuSum starting values. Starting values will be calculated on the first subplot actually loaded for the new (second) lot.

Figure 10. Recording CuSum values when a material portion is loaded to another lot.

SUBLOT NUMBER	TW		DKT		FM		Remarks
			- 0.4		1.2		
	52.0	- .1	5.0	.4	3.0	.1	
1	54.0	0	5.2	.6	3.2	.3	
2	54.7	0	3.7	.6	2.2	.3	CuSum values brought forward for Sublot #2 because it was an MP on another lot
3	54.0	0	4.8	.4	2.9	.2	

- (3) The inspection results and the CuSum values for the material portion are recorded on the first lot according to procedures when a material portion occurs and is subsequently returned or removed.
- c. Inspection Log Notations. Regardless of which option the applicant elects, the CuSum value is reset back to the breakpoint value on the subplot factor whose CuSum value exceeded the breakpoint. Do not reset the CuSum values on the factors that did not exceed their breakpoints.
- (1) Indicate in the “Remarks” section of the inspection log what disposition option as selected by the applicant or if the material portion remained on the carrier.
- (2) Draw a line through the component or subplot inspection results if the material portion is removed from the lot.
- (3) Draw a circle around all factor results in the material portion if the applicant elects to leave the material portion on the carrier.

- d. Issuing Certificates. It is not necessary for official personnel to issue inspection certificates for material portions removed from the lot unless they are requested by the applicant or deemed necessary by inspection personnel. If a certificate is requested or deemed necessary, an “out” or “local” inspection certificate is issued.

1.8 DETERMINING MATHEMATICAL OR WEIGHTED AVERAGE

The automated CuSum program automatically calculates factor averages by the weighted average method. At domestic locations where a hand written loading log is used, the applicable mathematical or weighted average method should be used.

- a. Determining Factor Averages for Sublots that are Uniform in Quality.
 - (1) Mathematical Average. When a lot is composed of 10 or more sublots “reasonably uniform” 1/ in size, or any number of sublots “uniform” 2/ in size, a mathematical average is used to determine each factor in the following manner:
 - (a) Total each factor column recorded on the log.
 - (b) Record the sums in the appropriate space on the inspection log.
 - (c) Divide the sum of each factor column by the number of sublots in the lot. The quotient is the mathematical average for the factor.
 - (d) Record the mathematical average to one extra decimal place in the factor blocks termed “Average” located at the bottom of the inspection log.

NOTE: When there are 10 or more sublots “reasonably uniform” in size, there is very little difference between the mathematical average and the weighted average results when no material portion is present. However, if it appears that the mathematical average will cause the grain in a lot to grade differently than the weighted average, use the weighted average procedure.

1/ The largest sized subplot loaded shall not be more than 25 percent larger than the smallest subplot. Multiply the smallest subplot by 1.25. The resulting figure is the maximum subplot size.

2/ The sublots are one standard size or within 1,000 bushels (or equivalent) of the standard.

(2) Weighted Average. When a lot does not meet the criteria for using a mathematical average, compute the weighted average as follows:

(a) Multiply each subplot factor result by the number of pounds (bushels, tons, or railcars as applicable) represented by the subplot.

EXAMPLE		
<u>Quantity</u>	<u>Factor</u>	<u>Product</u>
60,000	2.3	138,000
58,000	2.5	145,000
<u>42,000</u>	2.8	<u>117,600</u>
160,000		400,600

(b) Total the products for each factor column.

(c) Divide the sum of each factor column by the number of pounds (bushels, tons, or railcars as applicable) in the lot. The quotient is the weighted average for the factor.

EXAMPLE: $\frac{400,600}{160,000} = 2.50$

(d) Record the weighted average to one extra decimal place in the factor blocks termed “Average” located at the bottom of the inspection log.

b. Determining Factor Averages for Sublots that are not Uniform in Quality. When a lot is not uniform in quality and is certified as two or more lots, the factor information is determined and recorded for each lot in accordance with the aforementioned procedures.

c. Rounding Procedures. Round the average factor results for each factor column as described in the applicable Official U.S. Standards for Grain or in the Grain Inspection Handbook, Book II, Grain Grading Procedures. Record the results in the bottom portion of the log marked “Rounded Average” as they are to be certified. For factors expressed as counts, such as smut balls, round the average result to the nearest whole number. Record garlic bulblets in wholes and/or in decimals to the hundredths place. When a fraction is something other than a 0.33, disregard that fraction and use the 0.33 that is lower (e.g., 1.36 rounds to 1.33).

d. Adjustment of Factors. In certain cases, individual factors are combined in an end factor (e.g., damaged kernels, foreign material, and shrunken and broken kernels are mathematically combined to calculate total defects in wheat). The end factor is not obtained by averaging the subplot results for the end factor but is obtained by the addition of the average (recorded to the nearest hundredth percent) of the individual factor results.

- (1) Occasionally, the rounded averages for the individual factors will not correspond to the rounded average of the end factor. When this occurs, it is necessary to adjust the rounded average results of one of the individual factors. Adjustments are made by subtracting or adding 0.1 to the rounded result of the individual factor result that is nearest a midpoint (e.g., 0.05, 0.15, 0.25, 0.35, etc.).

EXAMPLE

	<u>DKT</u>	<u>FM</u>	<u>SHBN</u>	<u>DEF</u>
Weighted Average	2.59	0.78	3.26	6.63
Rounded Average	2.6	0.8	3.3 = (6.7)	6.6
Adjustment	None	None	-0.1	
Adjusted Rounded Average	2.6	0.8	3.2	6.6

- (2) Since the sum of the rounded averages for DKT, FM, and SHBN (6.7) in the above examples does not equal the rounded average for total defects (6.6), an adjustment of -0.1 is needed for the rounded average of one of the individual factors. The rounded average for SHBN (3.3) was adjusted downward to 3.2 because it was nearer a midpoint (0.25) than the other factor averages
- (3) When an adjustment in a combination factor is necessary, record the adjusted result on the inspection log directly below the rounded results and report the adjusted result on the inspection certificate.

1.9 FINAL GRADE

In addition to meeting the uniformity requirements of the inspection plan, the final rounded factor averages must be within the load order grade.

If the final average indicates the grade of the lot is inferior to the load order grade and no breakpoints were violated, the lot is certified as separate lots according to the grade of the individual sublots.

Unit Train loaders may remove or reload any subplot in an effort to improve grade quality. If the final average indicates a better grade than the load order grade and the applicant requests the better grade certification, official personnel shall review for the quality uniformity conditions for the better grade.

1.10 TOLERANCE TABLES

The following tables identify the breakpoints, starting values, and material error ranges for factors analyzed under this inspection plan.

TABLE 1 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR SIX-ROWED MALTING BARLEY AND SIX-ROWED BLUE MALTING BARLEY

Grade	Minimum limits of-						Maximum limits of-									
	Test weight per bushel (pounds)		Suitable malting type (percent)		Sound barley <u>1/</u> (percent)		Damaged kernels <u>1/</u> (percent)		Foreign material (percent)		Other Grains (percent)		Skinned and broken kernels (percent)		Thin barley (percent)	
	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	47.0	- 0.5	95.0	- 1.3	97.0	- 1.0	2.0	0.8	0.5	0.1	2.0	0.8	4.0	1.1	7.0	0.6
U.S. No. 2	45.0	- 0.5	95.0	- 1.3	94.0	- 1.4	3.0	0.9	1.0	0.4	3.0	0.9	6.0	1.4	10.0	0.9
U.S. No. 3	43.0	- 0.5	95.0	- 1.3	90.0	- 1.6	4.0	1.1	2.0	0.5	5.0	1.3	8.0	1.5	15.0	0.9
U.S. No. 4	43.0	- 0.5	95.0	- 1.3	87.0	- 1.9	5.0	1.3	3.0	0.6	5.0	1.3	10.0	1.6	15.0	0.9

1/ Injured-by-frost kernels and injured-by-mold kernels are not considered damaged kernels or considered against sound barley.

TABLE 2 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR TWO-ROWED MALTING BARLEY

Grade	Minimum limits of-						Maximum limits of-							
	Test weight per bushel (pounds)		Suitable malting types (percent)		Sound barley <u>1/</u> (percent)		Wild Oats (percent)		Foreign material (percent)		Skinned and broken kernels (percent)		Thin barley (percent)	
	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	50.0	- 0.5	97.0	- 1.0	98.0	- 0.8	1.0	0.6	0.5	0.1	5.0	1.3	5.0	0.4
U.S. No. 2	48.0	- 0.5	97.0	- 1.0	98.0	- 0.8	1.0	0.6	1.0	0.4	7.0	1.3	7.0	0.5
U.S. No. 3	48.0	- 0.5	95.0	- 1.3	96.0	- 1.1	2.0	0.8	2.0	0.5	10.0	1.8	10.0	0.9
U.S. No. 4	48.0	- 0.5	95.0	- 1.3	93.0	- 1.1	3.0	0.9	3.0	0.6	10.0	1.8	10.0	0.9

1/ Injured-by-frost kernels and injured-by-mold kernels are not considered damaged kernels or considered against sound barley.

TABLE 3 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR BARLEY

Grade	Minimum limits of-				Maximum limits of-									
	Test weight per bushel (pounds)		Sound barley (percent)		Damaged kernels ^{1/} (percent)		Heat damaged kernels (percent)		Foreign material (percent)		Broken kernels (percent)		Thin barley (percent)	
	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	47.0	- 0.5	97.0	- 1.1	2.0	0.8	0.2	0.1	1.0	0.4	4.0	1.0	10.0	0.9
U.S. No. 2	45.0	- 0.5	94.0	- 1.4	4.0	1.0	0.3	0.1	2.0	0.4	8.0	1.5	15.0	0.9
U.S. No. 3	43.0	- 0.5	90.0	- 1.6	6.0	1.4	0.5	0.2	3.0	0.5	12.0	1.8	25.0	1.3
U.S. No. 4	40.0	- 0.5	85.0	- 2.2	8.0	1.5	1.0	0.5	4.0	0.5	18.0	1.8	35.0	1.9
U.S. No. 5	36.0	- 0.5	75.0	- 2.2	10.0	1.8	3.0	0.6	5.0	0.6	28.0	2.4	75.0	2.3

^{1/} Includes heat-damaged kernels. Injured-by-frost kernels and injured-by-mold kernels are not considered damaged kernels.

TABLE 4 - BREAKPOINTS FOR BARLEY SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Dockage	As specified by contract or load order	0.23
Two-rowed Barley	Not more than 10.0% of Six-rowed in Two-rowed <u>1/</u>	1.8
Six-rowed Barley	Not more than 10.0% of Two-rowed in Six-rowed <u>1/</u>	1.8
Malting (Blue Aleurone Layers)	Not less than 90.0%	-1.3
Malting (White Aleurone Layers)	Not less than 90.0%	-1.3
Smutty	More than 0.20%	0.06
Garlicky	3 or more in 500 grams	2.33
Ergoty	More than 0.10%	0.13
Infested	Same as standards	0
Blighted	More than 4.0%	1.1
Injured-by-Frost kernels	Not more than 1.9%	0.1
Injured-by-Heat Kernels	Not more than 0.2%	0.04
Frost-damaged kernels	Not more than 0.4%	0.05
Heat-damaged Kernels	Not more than 0.1%	0.1
Other Grains	Not more than 25.0%	2.4
Moisture	As specified by contract or load order grade	0.5
Protein	As specified by contract or load order grade	N/A <u>2/</u>

1/ Use 10.4 as the grade limit due to reporting requirements.

2/ Breakpoints are not established for protein. Certify the average results of the sublots loaded. Material portions occur only when the contract or load order specifies a limit per subplot and that limit is exceeded.

TABLE 5 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR CORN

Grade	Minimum limits of-		Maximum limits of-					
			Damaged kernels				Broken corn and foreign material (percent)	
	Testweight per bushel (pounds)		Heat-damaged kernels (percent)		Total (percent)			
	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	56.0	-0.4	0.1	0.1	3.0	1.0	2.0	0.2
U.S. No. 2	54.0	-0.4	0.2	0.2	5.0	1.3	3.0	0.3
U.S. No. 3	52.0	-0.4	0.5	0.3	7.0	1.5	4.0	0.3
U.S. No. 4	49.0	-0.4	1.0	0.5	10.0	1.8	5.0	0.4
U.S. No. 5	46.0	-0.4	3.0	0.9	15.0	2.1	7.0	0.4

TABLE 6 - BREAKPOINTS FOR CORN SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Flint	95% or more of flint corn <u>1/</u>	-1.0
Flint and Dent	More than 5%, but less than 95% of flint corn. <u>2/</u>	1.0 or -1.0
Infested	Same as standards	0
Corn of other colors:		
White	Not more than 2.0%	0.8
Yellow	Not more than 5.0%	1.0
Waxy	95% or more	-3.0
High BCFM	As specified by contract or load order grade	10% of the load order grade
Moisture	As specified by contract or load order grade	0.4
Protein, Oil, Starch	As specified by contract or load order grade	N/A <u>3/</u>

1/ Use 94.5 as the grade limit due to reporting requirements.

2/ Use 5.4 and 94.4 as the grade limit due to reporting requirements.

3/ Breakpoints are not established for protein, oil, or starch. Certify the average results of the sublots loaded. Material portions occur only when the contract or load order specifies a limit per subplot and that limit is exceeded.

TABLE 7 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR FLAXSEED

Grade	Minimum limits of-		Maximum limits of- Damaged kernels			
	Testweight per bushel (pounds)		Heat-damaged kernels (percent)		Total (percent)	
	GL	BP	GL	BP	GL	BP
U.S. No. 1	49.0	- 0.1	0.2	0.1	10.0	0.9
U.S. No. 2	47.0	- 0.1	0.5	0.1	15.0	1.1

TABLE 8 - BREAKPOINTS FOR FLAXSEED SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Moisture	As specified by contract or load order grade	0.4
Dockage	0.99% or above	0.32

TABLE 9 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR MIXED GRAIN

Grade	Maximum limits of-				
	Moisture	Total (percent)		Heat-damaged kernels (percent)	
	GL	GL	BP	GL	BP
U.S. Mixed Grain	16.0	15.0	0.6	3.0	4.0

Note: There is no tolerance for U.S. Sample Grade Mixed Grain

TABLE 10 - BREAKPOINTS FOR MIXED GRAIN SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Smutty	15 or more in 250 grams (wheat, rye, or triticale predominate)	6
	More than 0.2% (all other mixtures)	0.05
Ergoty	More than 0.30% (rye or wheat predominate)	0.13
	More than 0.10% (all other mixtures)	
Garlicky	2 or more per 1,000 grams (wheat, rye, or triticale predominate)	1
	4 or more per 500 grams (all other mixtures)	2
Infested	Same as standards	0
Blighted	More than 4.0% (barley predominates)	1.1
Treated	Same as standards	0
Moisture	As specified by contract or load order grade	0.5

TABLE 11 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR OATS

Grade	Minimum limits of-				Maximum limits of-					
	Testweight per bushel (pounds)		Sound Oats (Percent)		Heat-damaged Kernels (percent)		Foreign Material (percent)		Wild Oats (percent)	
	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	36.0	- 0.5	97.0	- 0.8	0.1	0.1	2.0	0.4	2.0	0.6
U.S. No. 2	33.0	- 0.5	94.0	- 1.2	0.3	0.4	3.0	0.4	3.0	0.8
U.S. No. 3 <u>1/</u>	30.0	- 0.5	90.0	- 1.4	1.0	0.5	4.0	0.5	5.0	1.1
U.S. No. 4 <u>2/</u>	27.0	- 0.5	80.0	- 1.9	3.0	0.8	5.0	0.5	10.0	1.4

1/ Oats that are Slightly Weathered shall be graded not higher than U.S. No. 3.

2/ Oats that are Badly Stained or Materially Weathered shall be graded not higher than U.S. No. 4.

TABLE 12 - BREAKPOINTS FOR OATS SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Heavy	38 pounds or more	- 0.5
Extra Heavy	40 pounds or more	- 0.5
Moisture	As specified by contract or load order grade	0.5
Thin	More than 20.0%	0.5
Smutty	More than 0.2%	0.05
Ergoty	More than 0.10%	0.10
Garlicky	4 or more in 500 grams	2.33
Infested	Same as standards	0
Bleached	Same as standards	0

TABLE 13 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR RYE

Grade	Minimum limits of-		Maximum limits of-									
	Test weight per bushel (pounds)		Foreign Material				Damaged Kernels				Thin Rye (percent)	
			Foreign matter other than wheat (percent)		Total (percent)		Heat-damaged (percent)		Total (percent)			
GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	
U.S. No. 1	56.0	- 0.5	1.0	0.4	3.0	0.8	0.2	0.1	2.0	0.8	10.0	0.6
U.S. No. 2	54.0	- 0.5	2.0	0.5	6.0	1.1	0.2	0.1	4.0	1.1	15.0	0.8
U.S. No. 3	52.0	- 0.5	4.0	0.8	10.0	1.4	0.5	0.4	7.0	1.4	25.0	0.9
U.S. No. 4	49.0	- 0.5	6.0	0.8	10.0	1.4	3.0	0.8	15.0	2.0	---	---

TABLE 14 - BREAKPOINTS FOR RYE SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Moisture	As specified by contract or load order grade	0.3
Light Garlicky	2 or more per 1,000 grams <u>1/</u>	1.33
Garlicky	More than 6 per 1,000 grams	7.33
Ergoty	More than 0.30%	0.10
Plump	Not more than 5.0% through 0.064 x 3/8 inch sieve	0.5
Light Smutty	More than 14 per 250 grams	6
Smutty	More than 30 per 250 grams	10
Infested	Same as standards	0
Dockage	As specified by contract or load order grade	0.2

1/ Use 1 2/3 as the grade limit.

TABLE 15 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR SORGHUM

Grade	Minimum limits of-		Maximum limits of-							
	Test weight per bushel (pounds)		Damaged Kernels				Broken kernels and foreign material			
			Heat-damaged (percent)		Total (percent)		Total (percent)		Foreign material (percent)	
	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	57.0	- 0.4	0.2	0.1	2.0	1.1	3.0	0.5	1.0	0.4
U.S. No. 2	55.0	- 0.4	0.5	0.4	5.0	1.8	6.0	0.6	2.0	0.5
U.S. No. 3 <u>1/</u>	53.0	- 0.4	1.0	0.5	10.0	2.3	8.0	0.7	3.0	0.6
U.S. No. 4	51.0	- 0.4	3.0	0.8	15.0	2.8	10.0	0.8	4.0	0.7

1/ Sorghum which is distinctly discolored shall be graded not higher than U.S. No. 3.

TABLE 16 - BREAKPOINTS FOR SORGHUM SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Class:		
Tannin	Not less than 90.0%	-1.9
Sorghum	Not less than 97%	-1.0
White	Not less than 98%	-0.9
Smutty	20 or more in 100 grams <u>1/</u>	8
Infested	Same as standards	0
Dockage	0.99% and above	0.32
Moisture	As specified by contract or load order grade	0.5

1/ Use 19 as the grade limit.

TABLE 17 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR SOYBEANS

Grade	Maximum limits of-									
	Damaged kernels				Foreign Material (percent)	Splits (percent)		Soybeans of other colors (percent)		
	Heat-damaged Kernels (percent)		Total (percent)							
	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	0.2	0.2	2.0	0.8	1.0	0.2	10.0	1.6	1.0	0.7
U.S. No. 2	0.5	0.3	3.0	0.9	2.0	0.3	20.0	2.2	2.0	1.0
U.S. No. 3	1.0	0.5	5.0	1.2	3.0	0.4	30.0	2.5	5.0	1.6
U.S. No. 4	3.0	0.9	8.0	1.5	5.0	0.5	40.0	2.7	10.0	2.3

TABLE 18 - BREAKPOINTS FOR SOYBEAN SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Garlicky	5 or more per 1,000 grams <u>1/</u>	2
Infested	Same as standards	0
Soybeans of other colors	Not more than 10.0%	2.3
Moisture	As specified by contract or load order grade	0.3
Oil	As specified by contract or load order grade	N/A <u>2/</u>
Protein	As specified by contract or load order grade	N/A <u>2/</u>
Test Weight per bushel	As specified by contract or load order grade	0.4

1/ Use 4.67 as the grade limit.

2/ Breakpoints are not established for oil and protein. Certify the average results of the sublots loaded. Material portions occur only when the contract or load order specifies a limit per subplot and that limit is exceeded.

TABLE 19 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR SUNFLOWER SEED

Grade	Minimum limits of-		Maximum limits of-					
	Testweight per bushel (pounds)		Damaged Sunflower Seed				Dehulled Seed (percent)	
			Heat-damaged (percent)		Total (percent)			
	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	25.0	- 0.5	0.5	0.4	5.0	1.3	5.0	1.3
U.S. No. 2	25.0	-0.5	1.0	0.6	10.0	1.8	5.0	1.3

TABLE 20 - BREAKPOINTS (BP) FOR SUNFLOWER SEED SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Moisture	As specified by contract or load order grade	0.5
Foreign material	1.25% and less	0.27
	1.26% and above	0.39
Admixture	As specified by contract or load order grade	0.6

TABLE 21 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR TRITICALE

Grade	Minimum limits of-		Maximum limits of-											
	Test weight per bushel (pounds)		Damaged kernels				Foreign material							
			Heat-damaged (percent)		Total (percent)		Material other than wheat or rye (percent)		Total <u>2/</u> (percent)		Shrunken and broken kernels (percent)		Defects <u>3/</u> (percent)	
GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	
U.S. No. 1	48.0	-0.5	0.2	0.1	2.0	0.8	1.0	0.4	2.0	0.6	5.0	0.8	5.0	1.3
U.S. No. 2	45.0	-0.5	0.2	0.1	4.0	1.1	2.0	0.5	4.0	0.9	8.0	0.8	8.0	1.3
U.S. No. 3	43.0	-0.5	0.5	0.4	8.0	1.5	3.0	0.6	7.0	1.2	12.0	1.6	12.0	2.3
U.S. No. 4	41.0	-0.5	3.0	0.8	15.0	2.0	4.0	0.8	10.0	1.4	20.0	2.3	20.0	2.3

1/ Include heat-damaged kernels.

2/ Includes material other than wheat or rye.

3/ Defects include damaged kernels (total), foreign material (total), and shrunken and broken kernels. The sum of these three factors may not exceed the limit for defects for each numerical grade.

TABLE 22 - BREAKPOINTS FOR TRITICALE SPECIAL GRADES AND FACTORS

Special Grade or Factor	Grade Limit	Breakpoint
Light Garlicky	2 or more per 1,000 grams <u>1/</u>	0
Garlicky	More than 6 per 1,000 grams	1.33
Ergoty	More than 0.10%	0.1
Smutty	More than 14 per 250 grams	6
Infested	Same as standards	0
Dockage	0.99% or above	0.32
Moisture	As specified by contract or load order grade	0.5

1/ Use 1 2/3 as the grade limit.

TABLE 23 - GRADE LIMITS (GL) AND BREAKPOINTS (BP) FOR WHEAT

Grade	Minimum limits of -				Maximum limits of-													
	Test weight per bushel				Damaged kernels								Wheat of other classes <u>5/</u>					
	Hard Red Spring or White Club <u>1/</u> (pounds)		All other classes and subclasses (pounds)		Heat-damaged kernels <u>2/</u> (percent)		Total <u>3/</u> (percent)		Foreign material (percent)		Shrunken and broken kernels (percent)		Defects <u>4/</u> (percent)		Contrasting Classes (percent)		Total <u>6/</u> (percent)	
U.S. No.	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP	GL	BP
U.S. No. 1	58.0	-0.3	60.0	-0.3	0.2	0.2	2.0	1.0	0.4	0.2	3.0	0.3	3.0	0.7	1.0	0.7	3.0	1.6
U.S. No. 2	57.0	-0.3	58.0	-0.3	0.2	0.2	4.0	1.5	0.7	0.3	5.0	0.4	5.0	0.9	2.0	1.0	5.0	2.1
U.S. No. 3	55.0	-0.3	56.0	-0.3	0.5	0.3	7.0	1.9	1.3	0.4	8.0	0.5	8.0	1.2	3.0	1.3	10.4	2.9
U.S. No. 4	53.0	-0.3	54.0	-0.3	1.0	0.4	10.0	2.3	3.0	0.6	12.0	0.6	12.0	1.4	10.4	2.3	10.4	2.9
U.S. No. 5	50.0	-0.3	51.0	-0.3	3.0	0.7	15.0	2.7	5.0	0.7	20.0	0.7	20.0	1.5	10.4	2.3	10.4	2.9

1/ Use when HRS or WHCB predominate in Mixed wheat.

2/ Use an analytical portion of approximately 66 grams for Durum wheat.

3/ Use an analytical portion of approximately 20 grams for Durum wheat. Includes heat-damaged kernels.

4/ Defects include DKT, FM, and SHBN. The sum of these three factors may not exceed the limit for defects for each numerical grade.

5/ Use an analytical portion of approximately 20 grams for Durum wheat. Unclassed wheat may contain not more than 10.4 percent WOCL.

6/ Includes contrasting classes.

TABLE 24 - BREAKPOINTS FOR WHEAT SPECIAL GRADES AND FACTORS

Special Grade or Factor		Grade Limit	Breakpoint
Moisture		As specified by contract or load order	0.3
Garlicky		More than 2 per 1,000 grams	1.33
Light Smutty		More than 5 smut balls per 250 grams	3
Smutty		More than 30 smut balls per 250 grams	10
Infested		Same as standards	0
Ergoty		More than 0.05%	0.03
Treated		Same as standards	0
Dockage		As specified by contract or load order	0.2
Protein		As specified by contract or load order	0.5
<u>Class</u>	<u>Subclass</u>		
Hard Red Spring	DNS	75% or more DHV <u>1/</u>	-5.0
	NS	25% or more DHV but less than 75% of DHV <u>2/</u>	-5.0
Durum	HADU	75% or more HVAC <u>1/</u>	-5.0
	ADU	60% or more HVAC but less than 75% of HVAC <u>3/</u>	-5.0
Soft White	WH	Not more than 10% White Club wheat <u>4/</u>	2.0
	WHCB	Not more than 10% of other Soft White wheat <u>4/</u>	2.0
	WWH	More than 10% WHCB and more than 10% of other Soft White wheat <u>5/</u>	-3.0

1/ Use 74.5 as the grade limit due to reporting requirements.

2/ Use 24.5 and 74.4 as the grade limits due to reporting requirements.

3/ Use 59.5 and 74.4 as the grade limits due to reporting requirements.

4/ Use 10.4 as the grade limit due to reporting requirements.

5/ Use 10.5 as the grade limit due to reporting requirements.

**TABLE 25 - BREAKPOINTS FOR DOUBLE PORTION SIZES AND COMPONENT
SAMPLE INSPECTIONS FOR FACTORS EXPRESSED IN TENTHS 1/**

Normal Breakpoint	Double Portion or 2 Components	Number of Components per Sublot			
		<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
0.1	0.1	0.1	0.1	0.0	0.0
0.2	0.1	0.1	0.1	0.1	0.1
0.3	0.2	0.2	0.2	0.1	0.1
0.4	0.3	0.2	0.2	0.2	0.2
0.5	0.4	0.3	0.2	0.2	0.2
0.6	0.4	0.3	0.3	0.3	0.2
0.7	0.5	0.4	0.3	0.3	0.3
0.8	0.6	0.5	0.4	0.4	0.3
0.9	0.6	0.5	0.4	0.4	0.4
1.0	0.7	0.6	0.5	0.4	0.4
1.1	0.8	0.6	0.5	0.5	0.4
1.2	0.8	0.7	0.6	0.5	0.5
1.3	0.9	0.8	0.7	0.6	0.5
1.4	1.0	0.8	0.7	0.6	0.6
1.5	1.1	0.9	0.8	0.7	0.6
1.6	1.1	0.9	0.8	0.7	0.7
1.7	1.2	1.0	0.9	0.8	0.7
1.8	1.3	1.0	0.9	0.8	0.7
1.9	1.3	1.1	1.0	0.8	0.8
2.0	1.4	1.2	1.0	0.9	0.8
2.1	1.5	1.2	1.1	0.9	0.9
2.2	1.6	1.3	1.1	1.0	0.9
2.3	1.6	1.3	1.2	1.0	0.9
2.4	1.7	1.4	1.2	1.1	1.0
2.5	1.8	1.4	1.3	1.1	1.0
2.6	1.8	1.5	1.3	1.2	1.1
2.7	1.9	1.6	1.4	1.2	1.1
2.8	2.0	1.6	1.4	1.3	1.1
2.9	2.1	1.7	1.5	1.3	1.2
3.0	2.1	1.7	1.5	1.3	1.2
5.0	3.5	2.9	2.5	2.2	2.0

1/ Using Tables 1 – 24, find the normal breakpoint value for the factor which is determined on a larger portion size or on a component sample basis. Find the adjusted (reduced) breakpoint value based on the normal breakpoint value.

TABLE 26 - BREAKPOINTS FOR DOUBLE PORTION SIZES AND COMPONENT SAMPLE INSPECTIONS FOR FACTORS EXPRESSED IN HUNDREDTHS
1/

Normal Breakpoint	Double Portion or 2 Components	Number of Components per Sublot			
		<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
0.03	0.02	0.02	0.02	0.01	0.01
0.04	0.03	0.02	0.02	0.02	0.02
0.05	0.04	0.03	0.03	0.03	0.02
0.06	0.04	0.03	0.03	0.03	0.02
0.10	0.07	0.06	0.05	0.04	0.04
0.13	0.09	0.08	0.07	0.06	0.05
0.19	0.13	0.11	0.10	0.08	0.08
0.20	0.14	0.12	0.10	0.09	0.08
0.23	0.16	0.13	0.12	0.10	0.09
0.27	0.19	0.16	0.14	0.12	0.11
0.32	0.23	0.18	0.16	0.14	0.13
0.39	0.28	0.23	0.20	0.17	0.16
0.47	0.33	0.27	0.24	0.21	0.19

TABLE 27 - BREAKPOINTS FOR DOUBLE PORTION SIZES AND COMPONENT SAMPLE INSPECTIONS FOR FACTORS EXPRESSED AS COUNTS 1/

Normal Breakpoint	Double Portion or 2 Components	Number of Components per Sublot			
		<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>
1.33	1	1	1	0.67	0.67
2	1	1	1	1	1
2.33	1.67	1.33	1.33	1	1
6	4	4	3	3	2
7.33	5.33	4.33	3.67	3.33	3
8	6	5	4	4	3
10	7	6	5	5	4

1/ Using Tables 1 – 24, find the normal breakpoint value for the factor which is determined on a larger portion size or on a component sample basis. Find the adjusted (reduced) breakpoint value based on the normal breakpoint value.

TABLE 28 – STARTING VALUES (SV) ^{1/}

Expressed in Hundredths		Expressed in Tenths		Expressed as Counts	
Breakpoint	SV	Breakpoint	SV	Breakpoint	SV
0.01	0	0.1	0	1 – 1 1/3	0
.02 - .04	.01	0.2 – 0.4	0.1	1 2/3 - 4	1
.05 - .07	.02	0.5 – 0.7	0.2	5 - 7	2
.08 - .10	.03	0.8 – 1.0	0.3	8 - 10	3
.11 - .13	.04	1.1 – 1.3	0.4	0.2	
.14 - .16	.05	1.4 – 1.6	0.5	0.3	
.17 - .19	.06	1.7 – 1.9	0.6	0.3	
.20 - .22	.07	2.0 – 2.2	0.7	0.4	
.23 - .25	.08	2.3 – 2.5	0.8	0.4	
.26 - .28	.09	2.6 – 2.8	0.9	0.4	
.29 - .31	.10	2.9 – 3.1	1.0	0.5	
.32 - .34	.11	3.2 – 3.4	1.1	0.5	
.35 - .37	.12	3.5 – 3.7	1.2	0.6	
.38 - .40	.13	3.8 – 4.0	1.3	0.6	
.41 - .43	.14	4.1 – 4.3	1.4	0.7	
.44 - .46	.15	4.4 – 4.6	1.5	0.7	
.47 - .49	.16	4.7 – 4.9	1.6	0.8	
		5.0 – 5.2	1.7	0.8	

^{1/} A starting value is needed for each grading factor examined during loading. Starting values are based on the breakpoint value. To find the starting value for a given factor, first determine the breakpoint value for that factor in Tables 1-27. Then find its corresponding starting value in the table below. If the breakpoint value is negative, the starting value is also negative. There is no starting value when the breakpoint value is “0” or when the factor does not have a breakpoint value.

TABLE 29 – MATERIAL ERROR TABLE FOR FACTORS WITH BREAKPOINTS ^{1/}

Expressed in Hundredths		Expressed in Tenths		Expressed as Counts	
Breakpoint	Acceptable Average Range	Breakpoint	Acceptable Average	Breakpoint	Acceptable Average
.02	+/- 0.02	0.1	+/- 0.1	0.67	1
.03	+/- 0.04	0.2	+/- 0.2	1	1.33
.04	+/- 0.05	0.3	+/- 0.4	1.33	2
.05	+/- 0.07	0.4	+/- 0.5	1.67	2.33
.06	+/- 0.08	0.5	+/- 0.7	2	3
.07	+/- 0.09	0.6	+/- 0.8	2.33	3.33
.08	+/- 0.11	0.7	+/- 0.9	2.67	3.67
.09	+/- 0.12	0.8	+/- 1.1	3	4.13
.10	+/- 0.14	0.9	+/- 1.2	3.33	4.67
.11	+/- 0.15	1.0	+/- 1.4	3.67	5
.12	+/- 0.16	1.1	+/- 1.5	4	5.67
.13	+/- 0.18	1.2	+/- 1.6	4.33	6
.14	+/- 0.19	1.3	+/- 1.8	4.67	6.67
.15	+/- 0.21	1.4	+/- 1.9	5	7
.16	+/- 0.22	1.5	+/- 2.1	5.33	7.67
.17	+/- 0.24	1.6	+/- 2.2	5.67	8
.18	+/- 0.25	1.7	+/- 2.4	6	8.67
.19	+/- 0.26	1.8	+/- 2.5	6.33	9
.20	+/- 0.28	1.9	+/- 2.6	6.67	9.33
.21	+/- 0.29	2.0	+/- 2.8	7	10
.22	+/- 0.31	2.1	+/- 2.9	7.33	10.33
.23	+/- 0.32	2.2	+/- 3.1	7.67	11
.24	+/- 0.33	2.3	+/- 3.2	8	11.33
.25	+/- 0.35	2.4	+/- 3.3	9	12.67
.26	+/- 0.36	2.5	+/- 3.5	10	14
.27	+/- 0.38	2.6	+/- 3.6		
.28	+/- 0.39	2.7	+/- 3.8		
.29	+/- 0.41	2.8	+/- 3.9		
.32	+/- 0.45	2.9	+/- 4.1		
.33	+/- 0.47	3.0	+/- 4.2		
.39	+/- 0.55	3.5	+/- 4.9		
.47	+/- 0.66	5.0	+/- 7.1		

^{1/} Using the factor breakpoint value, find the acceptable deviation range for averaging. If the difference between inspection results is within the acceptable range limit, the review inspection result is averaged with the preceding result. If the difference between inspection results is larger than the acceptable range limit, the review inspection result replaces the previous result.

TABLE 30 – MATERIAL ERROR TABLE FOR FACTORS WITHOUT BREAKPOINTS

DAMAGED KERNELS <u>1/</u>					
Contract Limit (%)	Wheat Sorghum Triticale	Corn Barley	Soybeans Oats Flaxseed	Sunflower Rye	SAMPLE GRADE FACTORS <u>2/</u>
(Acceptable Average Range)					
0.0	+/- 0.3	+/- 0.2	+/- 0.2	+/- 0.3	Sample Grade factors (i.e., FSUB, stones, etc.) are always averaged
0.1	+/- 0.4	+/- 0.2	+/- 0.2	+/- 0.3	
0.2	+/- 0.4	+/- 0.3	+/- 0.3	+/- 0.5	
0.3	+/- 0.6	+/- 0.5	+/- 0.4	+/- 0.5	
0.4	+/- 0.6	+/- 0.5	+/- 0.4	+/- 0.7	
0.5	+/- 0.8	+/- 0.6	+/- 0.5	+/- 0.7	
0.6	+/- 0.8	+/- 0.6	+/- 0.5	+/- 0.7	
0.7	+/- 0.8	+/- 0.7	+/- 0.6	+/- 0.8	
0.8	+/- 1.0	+/- 0.7	+/- 0.6	+/- 0.8	
0.9	+/- 1.0	+/- 0.7	+/- 0.7	+/- 0.8	
1.0	+/- 1.0	+/- 0.8	+/- 0.7	+/- 1.0	

1/ Using the contracted limit for special damage factors that do not have breakpoints (i.e., scab damage, mold damage, sprout damage, etc.), find the acceptable deviation range for averaging. If the difference between in inspection results is within the acceptable range limit, the review inspection result is averaged with the preceding result. If the difference between inspection results is larger than the acceptable range limit, the review inspection result replaces the previous result.

2/ Sample grade factors do not have breakpoints and are always averaged with the preceding result.

**TABLE 31 – MATERIAL ERROR TABLE FOR FACTORS WITHOUT BREAKPOINTS
DOUBLE PORTION ANALYSIS**

DAMAGED KERNELS <u>1/</u>					SAMPLE GRADE FACTORS <u>2/</u>
Contract Limit (%)	Wheat Sorghum Triticale	Corn Barley	Soybeans Oats Flaxseed	Sunflower Rye	
(Acceptable Average Range)					
0.0	+/- 0.1	+/- 0.1	+/- 0.1	+/- 0.2	Sample Grade factors (i.e., FSUB, stones, etc.) are always averaged
0.1	+/- 0.2	+/- 0.2	+/- 0.2	+/- 0.2	
0.2	+/- 0.3	+/- 0.2	+/- 0.2	+/- 0.3	
0.3	+/- 0.4	+/- 0.3	+/- 0.3	+/- 0.3	
0.4	+/- 0.4	+/- 0.3	+/- 0.3	+/- 0.4	
0.5	+/- 0.5	+/- 0.4	+/- 0.3	+/- 0.4	
0.6	+/- 0.5	+/- 0.4	+/- 0.4	+/- 0.5	
0.7	+/- 0.6	+/- 0.4	+/- 0.4	+/- 0.5	
0.8	+/- 0.6	+/- 0.5	+/- 0.4	+/- 0.5	
0.9	+/- 0.6	+/- 0.5	+/- 0.5	+/- 0.6	
1.0	+/- 0.7	+/- 0.5	+/- 0.5	+/- 0.6	

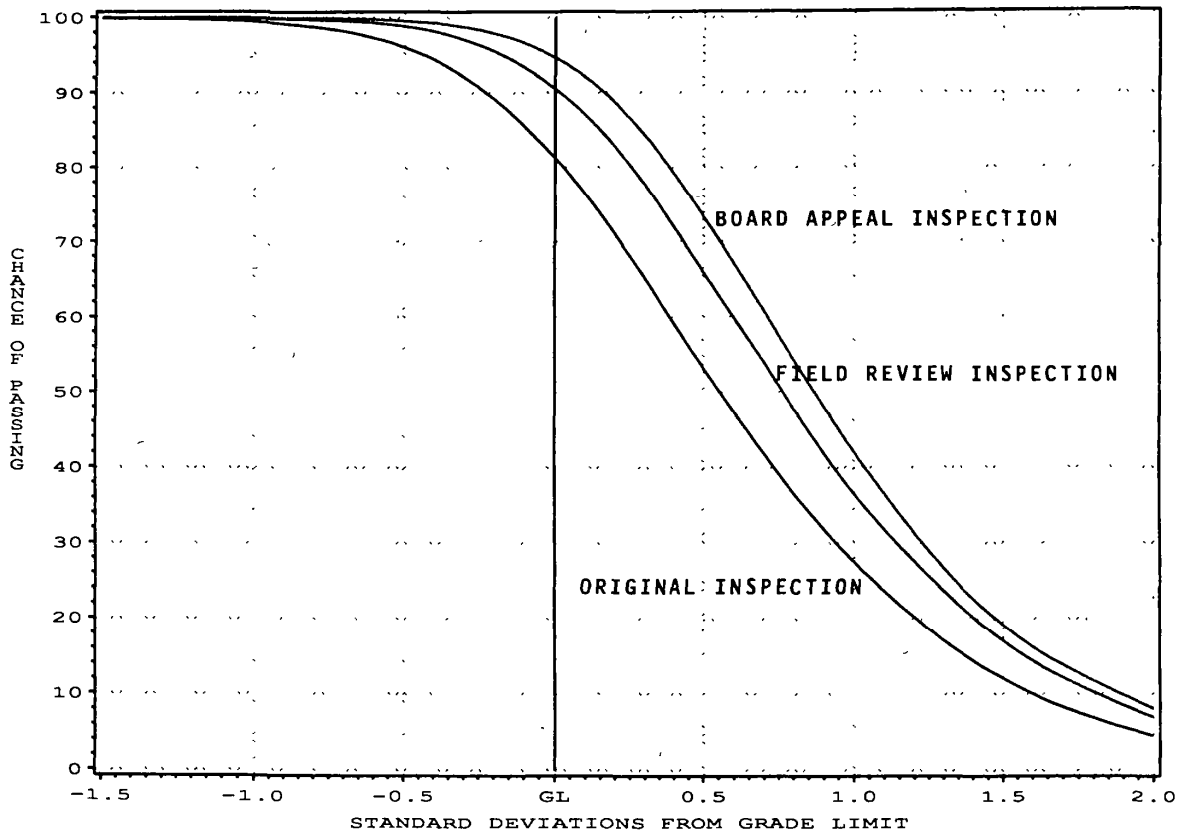
1/ Using the contracted limit for special damage factors that do not have breakpoints (i.e., scab damage, mold damage, sprout damage, etc.), find the acceptable deviation range for averaging. If the difference between in inspection results is within the acceptable range limit, the review inspection result is averaged with the preceding result. If the difference between inspection results is larger than the acceptable range limit, the review inspection result replaces the previous result.

2/ Sample grade factors do not have breakpoints and are always averaged with the preceding result.

EXAMPLE – INSPECTION LOG

SUBLOT NUMBER	TW		DKT		FM		Remarks
		-0.4 / .1		0.9 / .3		0.3 / .1	
	54.0		3.0		2.0		
1	55.1	0	2.9	.2	2.0	.1	
2	53.8	-2	2.7	0	2.2	.3	
3 MP - 1	54.7	0	3.7	.7	2.2	.5 / .3	Applicant requests Field Review (REX) of MP – 1 (DKT and FM only)
Field Review MP - 1			2.4		2.0		
Rex MP - 1	54.7	0	2.4	0	2.1	.4 / .3	Field Review does not eliminate MP. Applicant elects to discharge MP – 1.
3	53.9	-1	2.2	0	1.8	.1	
4 MP - 2	53.8	-.3	3.2	.2	2.4	.5 / .3	Applicant requests Field Review (REX) of MP – 2 (TW, DKT and FM)
Field Review MP - 2	54.2		3.0		2.3		
Rex MP - 2	54.0	-.1	3.1	.1	2.4	.5 / .3	Field Review does not eliminate MP. Applicant requests Board Appeal.
BAR Review MP - 2	54.1		3.5		2.0		
MP - 2 BAR 4	54.0	-1	3.3	.3	2.2	.3	BAR Review eliminates MP

GENERAL OPERATING CHARACTERISTIC CURVE
 FOR THE SHIPLLOT INSPECTION PLAN



The general operating characteristic (OC) curve describes what the inspection plan will do for a given target at which an elevator operates. The use of standard deviation values on the horizontal axis makes the curve applicable to all grains, factors, and grades.

To read the OC curve, determine the “proper” standard deviation and read the process target value on the horizontal scale. Go up to the curve and then over to the vertical axis. The numbers on the vertical axis give the chance of a subplot being accepted for the target value and factor under consideration. Alternately, the numbers of the vertical axis can be interpreted as the percentage of sublots that would be accepted as meeting the grade for the specific factor and process target value.

As an example, an elevator is loading U.S. No. 2 soybeans and is targeting foreign material around 1.9%. What percent of sublots loaded will be accepted as U.S. No. 2 soybeans? (Assume the proper standard deviation for foreign material is 0.2% for U.S. No. 2 soybeans.)

- a. Determine how many standard deviations 1.9% is from the grade limit (2.0%).
- (1) $1.9\% - 2.0\% = 0.1\%$ difference from grade limit
 - (2) $\frac{-0.1\% \text{ difference}}{0.2\% \text{ standard deviation}} = -0.5$ standard deviations
 - (3) Therefore, 1.9% is -0.5 standard deviation from the 2.0% grade limit.
- b. Find where the OC curve crosses -0.5 standard deviations.
- c. From this point, read across to the vertical axis to determine the chance of passing.

If a shipper is targeting at 1.9% foreign material, approximately 96% of the sublots offered for inspection will be accepted on the original inspection. Approximately 99% will be accepted on the field review if a material portion occurs.

Regardless of grain, factor, or grade, if a shipper targets at the grade limit, approximately 81% of the sublots offered for inspection will be accepted for that factor on the original inspection. Approximately 90% are accepted after the field review of a material portion.