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(4) *Defect*. Any nonconformance of a unit of product from specified requirements of a single quality characteristic. Defects are classed as "minor," "major," "severe" or "critical" depending upon the severity and undesirability of the defect.

(5) *Defective*. A unit of product that has one or more defects.

(6) *Inspection by attributes*. Inspection whereby a unit of product is classified as defective or nondefective or the number or defects in the unit of product is counted.

(7) *Standard sample unit size*. A specified amount of product to be used for inspection.

(b) Terms applicable to on-line inspection only.

(1) *Basic inspection period*. A specified period of consecutive production designated for on-line inspection.

(2) *Cumulative Sum Sampling (CuSum) Plan*. An on-line sampling plan that accumulates the number of defects (or defectives), which exceed the sample unit tolerance ("T"), in a series of consecutive samples. Terms specific to the CuSum sampling plan are:

(i) *Acceptance limit ("L")*. The maximum accumulation of defects (or defectives) allowed to exceed the sample unit tolerance ("T") in any sample unit or consecutive group of sample units.

(ii) *CuSum value*. The accumulated number of defects (or defectives) that exceed the sample unit tolerance ("T").

(iii) *Sample unit tolerance ("T")*. The allowable number of defects (or defectives) in any sample unit.

(iv) *Starting value ("S")*. The initial CuSum value used to begin a CuSum sampling plan.

(3) *On-line sampling inspection*. The random selection and subsequent inspection of sample units from a production line.

(4) *Probability of acceptance ("Pa")*. The probability that a portion of production, with a given level of quality, will be accepted. In on-line sampling inspection, the probability of acceptance of any portion of production depends on the sample results obtained from the preceding portions. The probability of acceptance values associated with these procedures are the values which would be expected if a large number of sample units are to be inspected. For the CuSum plans referenced in these procedures, the probability of acceptance at the Acceptable Quality Level (AQL) is approximately 95 percent. The starting value ("S") associated with each CuSum plan helps to make the probability of acceptance of the first portions of production of a basic inspection period as close as possible to 95 percent.

(c) Terms applicable to lot inspection only.

(1) *Acceptance number*. The largest number of defects (or defectives) in the sample that will permit acceptance of the inspection lot.

(2) *Inspection lot*. Any number of containers of the same size and type which contain a processed product of the same type and style, manufactured or processed under essentially the same conditions, offered for inspection and acceptance at one time.

(3) *Probability of acceptance* ("*Pa*"). The probability that an inspection lot, with a given level of quality, will be accepted.

[43 FR 10540, Mar. 14, 1978. Redesignated at 46 FR 63203, Dec. 31, 1981]

§ 52.38b Statistical sampling procedures for on-line inspection by attributes of processed fruits and vegetables.

(a) *General*. The Cumulative Sum Sampling Plan, hereinafter referred to as "CuSum," shall be used as the on-line sampling plan for attributes standards under the following conditions.

(1) The producer has designated the intended grade for the basic inspection period prior to the start of production.

(2) Inspection of the product shall be made during the basic inspection period at a point after which all product characteristics, subject to inspection, are fixed and will not be subject to change during final packaging.

(3) A shift to CuSum sampling plans from lot sampling plans during a basic inspection period is not permitted (or vice versa).

(b) *Sampling rate/frequency*. The minimum number of standard sample units to be drawn at random shall be determined by the applicable sampling procedure as approved by the Administrator.

(c) *Determining CuSum values.* At the beginning of the basic inspection period, the CuSum value is set equal to the starting value ("S") for the specified CuSum plan. The CuSum value is then determined for each consecutive sample unit as follows:

(1) Add the number of defects (or defectives) for the present sample unit to the CuSum value of the previous sample unit.

(2) Subtract the sample unit tolerance ("T").

(3) The CuSum value is reset in the following situations. However, determine compliance with the designated grade (see paragraph (d) of this section) prior to resetting the CuSum value:

(i) Reset the CuSum value to zero (0) if the CuSum value is less than zero (0).

(ii) Reset the CuSum value to the acceptance limit ("L") if the CuSum value exceeds the acceptance limit ("L").

(d) *Determining compliance for a designated grade.* (1) A portion of production meets the designated grade if the CuSum value, calculated from the sample unit representing that portion, is equal to or less than the acceptance limit ("L") for all classes of defects.

(2) A portion of production fails the designated grade if the CuSum value, calculated from the sample unit representing that portion, exceeds the acceptance limit ("L") for one or more classes of defects.

(e) *Evaluation of production failing a designated grade.* Production failing a designated grade shall be reevaluated by procedures approved by the USDA.

(f) *Assigning a grade.* (1) All similarly identified (e.g., codes, subcodes, etc.) production will be assigned the same grade.

(2) The grade assigned to similarly identified production will be the lowest grade assigned to any portion of that similarly identified production.

(g) *Redesignation of producer's intended grade.* If the intended grade is redesignated during a basic inspection period, a new CuSum sampling plan shall be instituted for each class of defects (or defectives).

(h) *Cumulative Sum Sampling (CuSum) Plans for processed fruits and vegetables.* (1) Tables VI through X contain the CuSum sampling plans for each of five different standard sample unit sizes. The plans within each table are listed according to increasing values of Acceptable Quality Levels (AQL's).

(2) AQL values of 10.0 or less may be expressed either in "defects per hundred units" or in "percent defective units." The same sampling plans are used for both. Separate sampling plans must be used for AQL values greater than 10.0.

(3) These tables also provide the quality levels associated with 50 percent and 10 percent probabilities of acceptance for each of the plans. These quality levels are expressed in the same units as the corresponding AQL values.

(4) A separate CuSum sampling plan is chosen for each class of defects (or defectives) by first specifying the desired AQL and then selecting the appropriate standard sample unit size. The quality levels associated with 50 percent and 10 percent probabilities of acceptance may be used as guides to help determine a suitable standard sample unit size.

TABLE VI—CUSUM SAMPLING PLANS

[Standard sample unit size=13]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
Quality levels expressed as defects per 100 units or percent defective					
0.65	0.3	0.1	0.9	5.3	17.7
1.0	.2	.2	.8	5.6	17.7
1.5	0	.5	0.5	7.7	19.2
2.2	.5	.5	1.5	8.2	19.2
4.0	.8	.8	2	9.7	19.6
5.0	0	1	1	14.4	30.2
6.5	1	1	2	14.7	30.2
8.5	1	1.5	2.5	17.4	31.3
10.0	1	1.8	2.6	18.8	32.0
Quality levels expressed as defects per 100 units only					
12.5	1	2	3	23.5	41.4
15.0	1	2.5	3	26.1	42.8
20.0	2	3	4	32.2	52.1
25.0	1	4	3	40.3	62.3
33.0	1	5	4	48.9	72.3
40.0	2	6	5	57.1	82.1
50.0	1	8	4	73.3	101.2
65.0	2	10	5	89.9	120.0
85.0	1	13	5	113.9	147.6
100.0	2	15	6	130.4	165.7
150.0	2	22	7	186.5	227.9
250.0	4	35	11	291.2	340.6
Quality levels expressed as percent defective only					
12.5	1	2	2	22.4	36.4
15.0	1	2.5	2.5	25.0	37.4
20.0	1	3	3	30.7	44.5
25.0	1	4	2	38.1	52.8

TABLE VI—CUSUM SAMPLING PLANS—Continued

[Standard sample unit size=13]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
33.0	1	5	3	46.2	60.3
40.0	1	6	3	53.8	67.4
50.0	2	7	4	61.5	74.1

TABLE VII—CUSUM SAMPLING PLANS

[Standard sample unit size=25]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
Quality levels expressed as defects per 100 units or percent defective					
0.4	0.3	0.1	0.9	2.8	9.2
0.65	.2	.2	.8	3.4	9.2
1.0	0	.5	.5	4.0	10.0
1.5	1	.5	2	4.3	10.0
2.5	0	1	1	7.5	15.7
4.0	.5	1.5	2	9.0	16.3
5.0	1.5	1.5	3	9.1	16.3
6.5	1	2	3	12.2	21.5
8.5	0	3	2	16.4	27.1
10.0	1	3	3	16.7	27.1
Quality levels expressed as defects per 100 units only					
12.5	1	4	3	21.0	32.4
15.0	1	5	3	25.2	37.6
20.0	1	6	4	29.7	42.7
25.0	1	8	3	37.7	52.7
33.0	1	10	4	46.5	62.4
40.0	2	12	5	55.1	72.0
50.0	2	14	7	63.9	81.5
65.0	3	18	8	80.7	100.1
85.0	4	23	10	101.8	123.1
100.0	4	27	10	118.3	141.2
Quality levels expressed as percent defective only					
12.5	1	4	3	20.5	29.8
15.0	0	5	2	24.3	34.3
20.0	1	6	3	28.7	38.7
25.0	2	7	4	33.0	43.0
33.0	2	9	5	41.2	51.2
40.0	2	11	5	49.2	59.1
50.0	1	14	3	60.6	70.3

TABLE VIII—CUSUM SAMPLING PLANS

[Standard sample unit size=50]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
Quality levels expressed as defects per 100 units or percent defective					
0.15	0.3	0.1	0.9	1.4	4.6
0.25	.2	.2	.8	1.5	4.6
0.4	0	.5	.5	2.0	5.0
0.65	.5	.5	1.5	2.1	5.0
1.0	.4	.8	1.6	2.5	5.1
1.5	1	1	2	3.8	7.9

TABLE VIII—CUSUM SAMPLING PLANS—Continued

[Standard sample unit size=50]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
2.5	1.5	1.5	3	4.6	8.1
4.0	1	2.5	3	6.8	11.1
5.0	1	3	3	9.3	13.6
6.5	1	4	3	10.5	16.2
8.5	1	5	4	12.7	18.8
10.0	1	6	4	14.9	21.4
Quality levels expressed as defects per 100 units only					
12.5	1	8	3	18.9	26.3
15.0	1	9	4	21.1	28.8
20.0	2	12	5	27.5	36.0
25.0	2	14	7	31.9	40.7
33.0	3	18	9	40.4	50.0
40.0	3	22	9	48.7	59.3
50.0	4	27	10	59.1	70.6
65.0	4	35	11	75.7	88.5
85.0	5	45	14	96.5	110.7
Quality levels expressed as percent defective only					
12.5	2	7	5	16.8	22.3
15.0	1	9	4	20.9	27.2
20.0	2	11	6	25.2	31.6
25.0	2	14	5	31.2	38.1
33.0	2	18	6	39.4	46.4
40.0	1	22	5	47.3	54.4
50.0	1	27	5	57.2	64.1

TABLE IX—CUSUM SAMPLING PLANS

[Standard sample unit size=100]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
Quality levels expressed as defects per 100 units or percent defective					
0.1	0.3	0.1	0.9	0.7	2.3
0.15	.2	.2	.8	0.8	2.3
0.25	0	.5	.5	1.0	2.5
0.4	1	.5	2	1.1	2.5
0.65	0	1	1	1.9	3.9
1.0	.5	1.5	2	2.2	4.1
1.5	1	2	2	3.0	5.4
2.5	1	3	3	4.2	6.8
4.0	1	5	3	6.3	9.4
5.0	1	6	4	7.4	10.7
6.5	1	8	4	9.5	13.2
8.5	2	1.0	5	11.7	15.6
10.0	2	1.2	5	13.8	18.0
Quality levels expressed as defects per 100 units only					
12.5	2	14	7	16.0	20.4
15.0	2	17	7	19.1	23.9
20.0	3	22	9	24.4	29.6
25.0	4	27	10	29.6	35.3
33.0	3	36	10	38.8	45.4
40.0	4	43	12	46.1	53.1
50.0	5	53	14	56.4	64.1
Quality levels expressed as percent defective only					
12.5	2	14	6	15.8	19.7

TABLE IX—CUSUM SAMPLING PLANS—Continued

[Standard sample unit size=100]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
15.0	2	17	6	18.9	23.0
20.0	2	22	7	24.0	28.5
25.0	3	27	8	29.2	33.8
33.0	3	35	9	37.3	42.1
40.0	4	42	10	44.4	49.2
50.0	4	52	10	54.3	59.1

TABLE X—CUSUM SAMPLING PLANS

[Standard sample unit size=200]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
Quality levels expressed as defects per 100 units or percent defective					
0.04	0.3	0.1	0.9	0.3	1.2
0.065	0.2	0.2	0.8	0.4	1.2
0.1	0	0.5	0.5	0.5	1.3
0.15	0.4	0.8	0.8	0.6	1.3
0.25	0.4	0.8	1.6	0.6	1.3
0.4	1	1	2	1.0	2.0
0.65	1	1.8	2.6	1.2	2.1
1.0	1	2.5	3	1.7	2.8
1.5	1	4	3	2.6	4.1
2.5	1	6	4	3.7	5.3
4.0	1	10	4	5.8	7.8
5.0	2	12	5	6.9	9.0
6.5	2	15	6	8.5	10.8
8.5	3	19	8	10.6	13.1
10.0	3	22	9	12.2	14.8
Quality levels expressed as defects per 100 units only					
12.5	4	27	10	14.8	17.7
15.0	3	33	9	17.8	21.0
20.0	4	43	12	23.1	26.6
25.0	5	53	14	28.2	32.1
33.0	5	70	15	36.9	41.3
40.0	6	84	18	44.1	48.8
50.0	6	105	18	54.8	60.1

TABLE X—CUSUM SAMPLING PLANS—Continued

[Standard sample unit size=200]

AQL	S	T	L	Quality levels	
				Pa= 50%	Pa= 10%
Quality levels expressed as percent defective only					
12.5	3	27	9	14.7	17.3
15.0	4	32	10	17.3	20.0
20.0	3	43	9	22.8	25.9
25.0	4	53	11	27.9	31.1
33.0	5	69	13	36.1	39.4
40.0	5	83	14	43.1	46.5
50.0	5	103	14	53.1	56.5

[43 FR 10540, Mar. 14, 1978. Redesignated at 46 FR 63203, Dec. 31, 1981]

§ 52.38c Statistical sampling procedures for lot inspection of processed fruits and vegetables by attributes.

(a) *General.* Single sampling plans shall be used as the lot sampling plan for attributes standards under either of the following conditions:

(1) Sampling of the product shall be made during the production period. No grade will be assigned to individual sample units. One grade determination only will be made at the end of the production period for the inspection lot.

(2) Sampling of the product shall be made when the inspection lot is located in a warehouse, truck, railroad car, or other similar conveyance.

(b) *Sample size.* Samples shall be randomly selected from each inspection lot in the exact number of sample units indicated for the lot size in tables XI through XIV as applicable for canned, frozen, dried, or dehydrated fruits and vegetables.

TABLE XI—CANNED OR SIMILARLY PROCESSED FRUITS, VEGETABLES, AND PRODUCTS CONTAINING UNITS OF SUCH SIZE AND CHARACTER AS TO BE READILY SEPARABLE

[Lot sample size]

Container size group	Lot size (number of containers)			
Group 1: Any type container of a volume not exceeding that of a No. 303 size can.	12,000 or less	12,001–39,000	39,001–84,000	84,001–145,000
Group 2: Any type of container of a volume exceeding that of a No. 303 size can but not exceeding that of a No. 3 cylinder size can.	6,000 or less	6,001–19,500	19,501–42,000	42,001–72,500