United States Department of Agriculture

Agricultural Marketing Service

Fruit and Vegetable Programs

Processed Products Division

Grading Manual for Frozen Okra

Effective November 16, 2011

This manual is designed for Processed Products Division Personnel of the U.S. Department of Agriculture. Its purpose is to give background information and guidelines to assist in the uniform application and interpretation of U.S. grade standards, other similar specifications, and special procedures.

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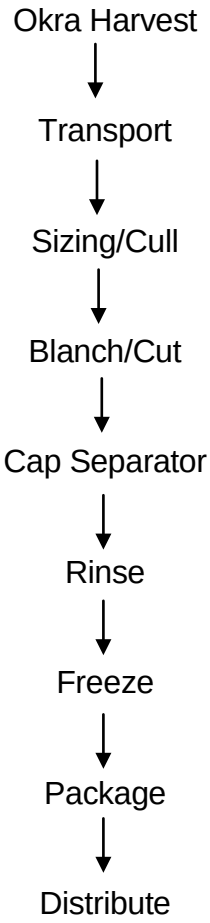
PURPOSE AND SCOPE

The instructions contained in this manual furnish technical information that will be a guide in the inspection of frozen okra, and provide technical interpretation of the U.S. Standards for Grades of Frozen Okra.

PRODUCT DESCRIPTION

Frozen okra is the product prepared from the clean, sound, succulent, and edible fresh pods of the okra plant (*Hibiscus esculentus*) of the green variety. The product may or may not be trimmed, is properly prepared, properly processed, and is then frozen and stored at temperatures necessary for preservation.

PRODUCTION



SAMPLING PROCEDURES

Follow the general procedures and instructions as outlined in the U.S. Standards for Grades of Frozen Okra, and the AIM Inspection Series of manuals as applicable:

- Certification Manual
- Condition of Food Containers (COC) Manual
- Foreign Material Manual
- General Procedures Manual
- Sampling Manual
- Technical Procedures Manual

SUGGESTED ORDER OF GRADING

A. Non-quality Factors.

1. Record the following applicable information on tally sheet (FV-364-104):

a. Name and address of applicant.

b. Contract Number or Purchase Order (P.O.) Number.

c. Size and kind of container.

d. No. of cases in lot (page 1 only).

e. Total pounds for lot (page 1 only).

f. Label, and/or attach a copy (page 1 only).

2. Select the containers to be used for non-quality and prerequisite evaluation.

3. Arrange the containers on the grading table in chronological order by code.

4. Record the codes on the tally sheet, including case codes if available.
NOTE: THE SUMMARY COLUMN (COLUMN 8) ON THE TALLY SHEET SHALL BE USED FOR THE SUMMATION OF THE GRADING RESULTS OF THE LOT.

5. Determine and record the net weight of each container using Division procedures for determination of tares and reading of scales. Enter the sum and average of all the net weights on the tally sheet.

6. Empty the product into the individual grading trays.

7. Record the style in the applicable box on the tally sheet.

B. Prerequisite Quality Factors.

1. First, thaw the sample units in water. Prepare a pot of boiling water to cook the samples used to evaluate flavor and odor, sand, grit, or silt, and tough fiber in defects. Evaluate on a container-by-container basis, the following prerequisites (Sections a - d). Record the results, as applicable, for each prerequisite in the appropriate place on the tally sheet.

a. Varietal characteristics It is unlikely that any color of okra, other than green, will be encountered in commercial operations. Other colors of okra do exist, mainly ornamental varieties, such as white and red. Only green okra meets the product description in the U.S. Standards.

Varieties of okra grown for processing are principally one of the following:

Clemson The pods are green, ridged, and angular.

Emerald The pods are deep green, smooth, and round. Emerald is often fibrous.

(1) "Similar" should be assigned to those sample units containing okra of similar varietal characteristics.

(2) "Substandard" should be assigned to those sample units containing okra of dissimilar varietal characteristics.

b. Flavor and Odor The U.S. grade standards require that flavor and odor is determined before and after cooking. All frozen sample units must be cooked for flavor and odor evaluation. Follow directions in the AIM Inspection Series, Technical Procedures Manual (Cooking procedures) and cook a representative sample. Include any "suspect" units for flavor evaluation. Definite "off-flavor or off-odor" is substandard.

(1) "Good" should be assigned to okra that before and after cooking has a good distinctive flavor and odor, characteristic of young, tender okra, and is free from objectionable flavors or odors.

(2) "Reasonably Good" should be assigned to okra that before and after cooking has a reasonably good flavor and odor, characteristic of properly prepared and processed okra, and is free from objectionable flavors or odors.

(3) "Substandard" (Sstd) should be assigned to okra that does not meet the requirements for "reasonably good" flavor and odor, or before or after cooking has a definite "off flavor or off odor".

c. Appearance Use the following guidelines in assigning a grade for appearance. The appearance should be evaluated immediately upon thawing.

(1) Evaluate the units for insignificant blemishes. Insignificant blemish means any unit that is so affected by slight abnormalities, scars, discolorations or other imperfections that it may affect the appearance slightly but does not affect the edibility of the unit.

(a) Good appearance "Grade A" means the okra is bright and practically free of insignificant blemishes.

(b) Reasonably good appearance "Grade B" means the okra may be slightly dull and is reasonably free of insignificant blemishes.

(c) Substandard appearance "Sstd" means the okra does not meet the requirements for reasonably good appearance.

d. Sand, Grit, or Silt Evaluate the units for sand, grit, or silt in the thawed state by observing for readily visible sand, grit, or silt. After cooking, in addition to evaluating for tough fiber and flavor, examine for the presence of sand, grit, or silt that is readily noticeable upon chewing. Observe the water in the pan used for cooking the sample; any sand, grit, or silt observed in the pan or water will be included with the sand, grit, or silt observed during the organoleptic portion of the evaluation.

(1) None "Grade A" means no sand, grit, or silt is allowed.

(2) Trace "Grade B" means a trace amount of sand, grit, or silt is allowed. A trace amount would be an amount so small as to be immeasurable, yet detectable visually or organoleptically.

(3) Substandard "Sstd" for sand, grit, and silt means the okra has more than a trace amount of sand, grit, or silt and does not meet the requirements for **Trace "Grade B"**.

C. Grading of Specified Defects.

1. Determine the total units of product available in the nonquality/ prerequisite samples.

2. Refer to the applicable acceptance numbers table in the standards, and select the Units of Product column as applicable for the style.

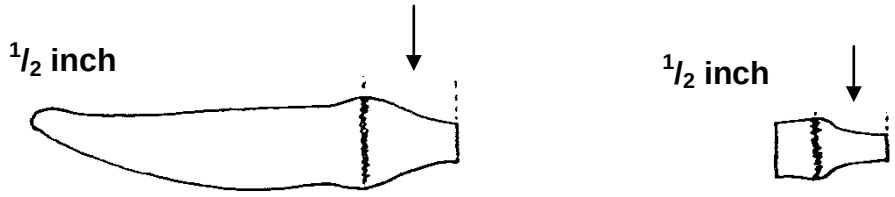
3. Record the Units of Product selected in the "Specified count or weight of product used" space on page 1 of the tally sheet.

4. Count out a uniform amount of product from each grading tray to arrive at the sample size selected for the lot as a whole.

NOTE: WHEN USING ONE HALF OR MORE OF THE PRODUCT FROM ANY CONTAINER, ALL OF THE EXTRANEOUS VEGETABLE MATERIAL (EVM) IN THE CONTAINER IS TO BE RECORDED.

NOTE: BY SEPARATING EACH CATEGORY OF DEFECTS INTO SEPARATE AREAS, THE FOLLOWING STEPS NUMBERED 5 THRU 15 MAY BE DONE SIMULTANEOUSLY AS YOU EXAMINE THE PRODUCT IN EACH GRADING TRAY. IF THERE IS MORE THAN ONE (1) CATEGORY OF DEFECT ON A SINGLE UNIT, PLACE THE UNIT IN THE FIRST APPLICABLE CATEGORY, THEN IN THE FOLLOWING CATEGORIES ACCORDING TO THE SEQUENCE OF GRADING.

5. Evaluate the units for **EVM** and record the number of pieces of EVM on the tally sheet. EVM consists of leaves, similar harmless plant material, stem extending greater than $^1/_2$ inch beyond the cap scar, and detached stem of any length. On whole or cut style okra, stem measurement for EVM means any stem extending **beyond** $^1/_2$ inch measured from the cap scar as illustrated below.



6. Evaluate the units for **serious blemishes**. Count and record on the tally sheet the number of units found. Seriously blemished means any unit which is affected by discoloration or abnormalities to the extent that it seriously affects the appearance or eating quality of the unit; this includes damage from trimmed or cut surfaces and pathological or insect injury.

7. Evaluate the units for **minor blemishes**, tally with seriously blemished and record as **"Total Blemish"**. Minor blemish means any unit which is affected by discoloration or abnormalities to the extent that it materially affects the appearance or edibility of the unit; this includes damage from trimmed or cut surfaces and pathological or insect injury.
Total blemish means the total of minor blemish and serious blemish.
NOTE: EVEN THOUGH A UNIT HAS MORE THAN ONE MINOR OR SERIOUSLY BLEMISHED AREA ON IT, ONLY ONE MINOR AND ONE SERIOUSLY BLEMISHED DEFECT SHOULD BE COUNTED AGAINST IT.

8. Evaluate the units for **noticeable yellow or brown**. Count and record on the tally sheet the number of units found. Noticeable yellow or brown units

possess a noticeable yellow or brown color that materially affects the appearance or eating quality of the unit. These units do not qualify as being "off" color.

9. Evaluate the units for **minor color defects**. A minor color defect means the unit possesses a slightly dull color or slight yellowish green to brownish cast or varies markedly from the overall color. Minor color defects do not more than slightly affect the appearance or eating quality of the units. **Total color defect** means the total of the noticeable yellow or brown, and minor color defects.

10. Evaluate the units for **mechanical damage**. Mechanical damage means pods or portions thereof that have been broken, mashed, split, shattered, or excessively trimmed such that the appearance or eating quality of the unit is noticeably affected. Pods or portions thereof that possess a portion of the stem extending from $^{3}/_{8}$ inch to $^{1}/_{2}$ inch beyond the cap scar are classified as a defect under mechanical damage.

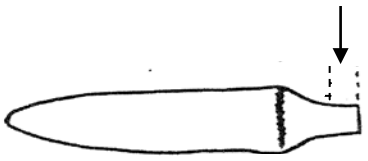
a. Attached stem

(1) Attached stem that is **less** than $^{3}/_{8}$ inch from the cap scar is considered insignificant for mechanical damage.

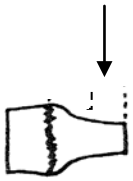
(2) Attached stem that is **between** $^{3}/_{8}$ inch and $^{1}/_{2}$ inch from the cap scar is scored as mechanical damage.

See illustrations below.

Area between $^{3}/_{8}$ inch and $^{1}/_{2}$ inch from cap scar

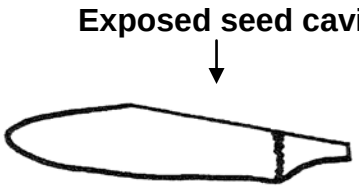


Area between $^{3}/_{8}$ inch and $^{1}/_{2}$ inch from cap scar



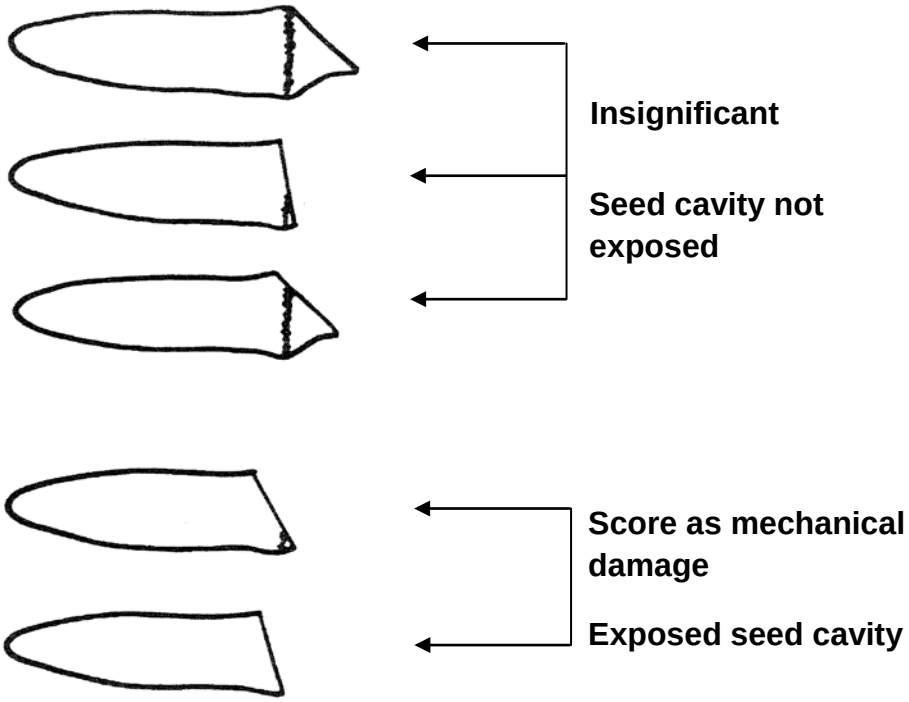
b. Excessively trimmed (whole style)

(1) Units that have been excessively trimmed so as to expose the longitudinal plane of the seed cavity as illustrated below.



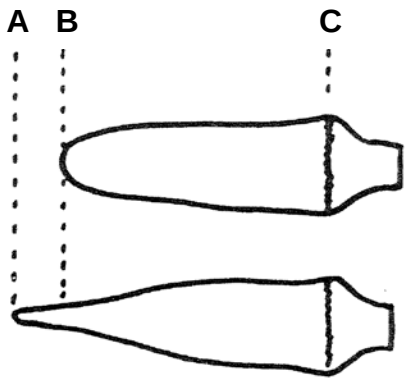
(2) Units that have been bias-cut, angle cut, or slant cut so as to expose the seed cavity.

See illustration below.



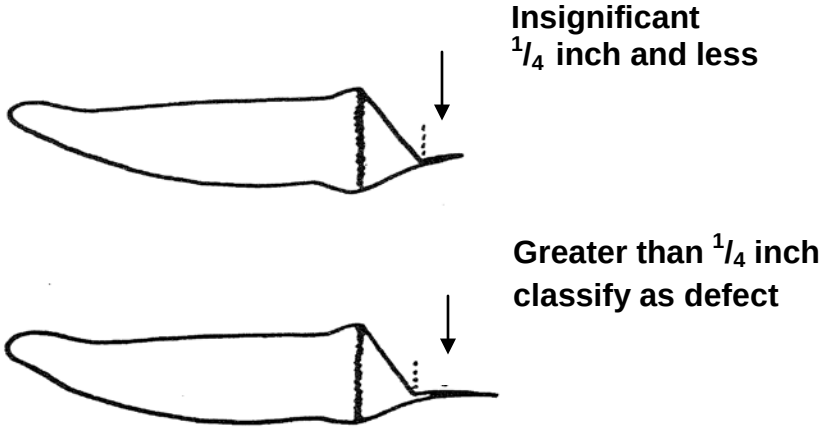
(3) Units that have been trimmed on both ends with pod tip removal affecting the overall appearance of the pod. Pod tips trimmed between point **A** and **B** that do not have a shattered or ragged appearance are considered insignificant. Pod tips trimmed between points **A** and **B** that have a shattered or ragged appearance are classified as excessively trimmed. Pod tips trimmed between points **B** and **C** are considered excessively trimmed.

See illustration below.

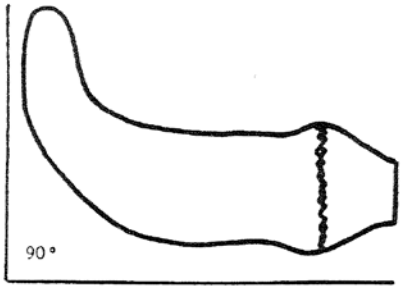


c. Mechanical damage stem end

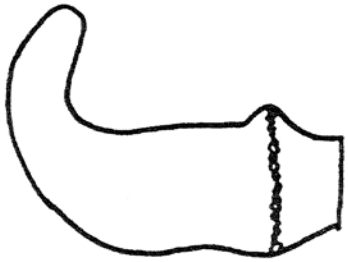
Units with a broken or torn appearance resulting from a poorly or improperly cut stem end. Units with $^1/_4$ inch or less of remnant material are considered insignificant for mechanical damage. Any unit with remnant material extending beyond $^1/_4$ inch is classified as a defect under mechanical damage.



11. Evaluate the sample for **misshapen units (whole style)**. Misshapen units are whole pods which are seriously deformed. The illustration below shows the minimum acceptable limits when scoring as misshapen.



Insignificant



Score as misshapen

12. Evaluate the sample for **small pieces**.

a. **(whole style)** small pieces mean a piece of pod that is $^{1}/_{4}$ or less of the weight of the smallest whole pod in the sample unit.

b. **(cut style)** small pieces mean a piece of pod measured on the longitudinal axis of the unit that is $^{1}/_{4}$ inch or less in length. The small pieces are aggregated to form a unit equal to the designated size of cut, or the average sized unit from the sample if no size is provided. Each aggregated unit is scored as a defect. This procedure may be performed by weighing an average unit, and then assembling enough pieces that collectively equal the weight of the average unit.

13. Evaluate the units for **tough fiber**. Tough fiber is evaluated on the unit after cooking. See the AIM Inspection Series, Technical Procedures Manual (Cooking procedure for frozen products) for instructions on cooking frozen okra. Tough fiber is tough and objectionable but can be chewed

and swallowed without difficulty. **Edible** cap and stem material is not objectionable upon eating. This material does not have the same texture as pod material because the caps and stems are solid (have no open space for seed in the center). The flavor is not the same, as cap and stem have no seeds which have a flavor of their own. **Inedible** cap and stem are classified under tough fiber. Inedible cap and stem material is objectionable but can be chewed and swallowed without hazard.

Note: The evaluation for tough fiber; hard, woody okra material; and character are performed on each unit after cooking. The individual units may be evaluated for these defects concurrently.

14. Evaluate the units for **hard, woody okra material**. The evaluation for hard, woody okra material is performed after cooking. Hard, woody okra material is any piece of pod, stem, or cap that is brittle, hard, or woody. It is highly objectionable and seriously affects the eating quality of the unit.

15. Evaluate the units for **character**. The evaluation for character is performed after cooking.

a. Good character (Grade A) means the units are fleshy and tender and that the seeds are in the early stages of maturity.

b. Reasonably good character (Grade B) means the units may have lost their fleshy texture to a considerable extent, the units are reasonably tender, and the seeds may have developed beyond the early stages of maturity. As the seeds develop beyond the early stages of maturity they begin to become hard, chewy, mealy, and develop a darker colored seed coat.

c. Substandard character (Sstd) means the units fail to meet the requirements for reasonably good character.

TIME SAMPLING

The use of time sampling procedures may only be approved by the Officer-in-Charge or area supervisor. Please follow all applicable instructions in the AIM instructional series of manuals. Refer to the acceptance numbers tables (Tables I, II, III, IV) for time sampling in this manual.

TABLE I

Time Sampling Acceptance Numbers for Whole Style US Grade A (50 Plan)

Units of Product	EVM	Serious Blemish	Total Blemish	Noticeable Yellow or Brown	Total Color defects	Mechanical Damage	Small Pieces and Misshapen	Tough Fiber	"B" Character
TOL.	4.0	2.0	6.0	1.0	10.0	10.0	5.0	4.0	10.0
(AQLs)[1/]	2.9	1.3	4.6	0.612	8.2	8.2	5.0	2.9	8.2
1x50	3	2	5	1	7	7	5	3	7
2x50	6	3	8	2	13	13	8	6	13
3x50	8	4	11	2	18	18	12	8	18
4x50	10	5	14	3	23	23	15	10	23
5x50	11	6	17	3	28	28	18	11	28
6x50	13	7	20	4	33	33	21	13	33
7x50	15	8	23	4	37	37	24	15	37
8x50	17	9	25	5	42	42	27	17	42
9x50	19	10	28	5	47	47	30	19	47
10x50	21	11	31	6	51	51	33	21	51
11x50	22	11	33	6	56	56	36	22	56
12x50	24	12	36	7	61	61	39	24	61
13x50	26	13	39	7	65	65	42	26	65
14x50	28	14	41	8	70	70	45	28	70
15x50	29	15	44	8	74	74	47	29	74
16x50	31	16	47	8	79	79	50	31	79
17x50	33	16	49	9	83	83	53	33	83
18x50	34	17	52	9	88	88	56	34	88
19x50	36	18	54	10	92	92	59	36	92
20x50	38	19	57	10	97	97	61	38	97
21x50	39	20	60	10	101	101	64	39	101
22x50	41	20	62	11	106	106	67	41	106
23x50	43	21	65	11	110	110	70	43	110
24x50	44	22	67	12	115	115	73	44	115
25x50	46	23	70	12	119	119	75	46	119
26x50	48	23	72	12	123	123	78	48	123
27x50	49	24	75	13	128	128	81	49	128
28x50	51	25	77	13	132	132	84	51	132
29x50	53	26	80	14	137	137	86	53	137

1/ AQL calculated from tolerance (TOL) at 650 units

TABLE II

Time Sampling Acceptance Numbers for Whole Style US Grade B (50 Plan)

Units of Product	EVM	Serious Blemish	Total Blemish	Noticeable Yellow or Brown	Total Color defects	Mechanical Damage	Small Pieces and Misshapen	Tough Fiber	Hard Woody Okra material	"Sstd" Character
TOL.	6.0	4.0	12.0	6.0	20.0	20.0	10.0	8.0	1.0	10.0
(AQLs)1/	4.6	2.9	10.1	4.6	17.6	17.6	8.2	6.4	0.612	8.2
1x50	5	3	8	5	13	13	7	6	1	7
2x50	8	6	15	8	24	24	13	10	2	13
3x50	11	8	21	11	34	34	18	15	2	18
4x50	14	10	27	14	44	44	23	18	3	23
5x50	17	11	33	17	54	54	28	22	3	28
6x50	20	13	39	20	63	63	33	26	4	33
7x50	23	15	45	23	73	73	37	30	4	37
8x50	25	17	50	25	83	83	42	34	5	42
9x50	28	19	56	28	92	92	47	38	5	47
10x50	31	21	61	31	102	102	51	41	6	51
11x50	33	22	67	33	111	111	56	45	6	56
12x50	36	24	72	36	121	121	61	48	7	61
13x50	39	26	78	39	130	130	65	52	7	65
14x50	41	28	84	41	139	139	70	56	8	70
15x50	44	29	89	44	149	149	74	59	8	74
16x50	47	31	95	47	158	158	79	63	8	79
17x50	49	33	100	49	168	168	83	66	9	83
18x50	52	34	106	52	177	177	88	70	9	88
19x50	54	36	111	54	186	186	92	73	10	92
20x50	57	38	116	57	196	196	97	77	10	97
21x50	60	39	122	60	205	205	101	80	10	101
22x50	62	41	127	62	214	214	106	84	11	106
23x50	65	43	133	65	223	223	110	88	11	110
24x50	67	44	138	67	233	233	115	91	12	115
25x50	70	46	144	70	242	242	119	95	12	119
26x50	72	48	149	72	251	251	123	98	12	123
27x50	75	49	154	75	260	260	128	101	13	128
28x50	77	51	160	77	270	270	132	105	13	132
29x50	80	53	165	80	279	279	137	108	14	137

1/ AQL calculated from tolerance (TOL) at 650 units

TABLE III

Time Sampling Acceptance Numbers for Cut Style US Grade A (100 Plan)

Units of Product	EVM	Serious Blemish	Total Blemish	Noticeable Yellow or Brown	Total Color defects	Small Pieces and Mechanical Damage	Tough Fiber	"B" Character
TOL.	1.0	2.0	6.0	1.0	10.0	12.0	4.0	10.0
(AQLs)1/	0.651	1.47	5.0	0.651	8.7	10.6	3.2	8.7
1x100	2	3	8	2	13	15	6	13
2x100	3	6	15	3	24	28	10	24
3x100	4	8	21	4	34	40	15	34
4x100	5	10	27	5	44	52	18	44
5x100	6	12	33	6	54	64	22	54
6x100	7	14	39	7	64	76	26	64
7x100	8	15	45	8	74	87	30	74
8x100	9	17	50	9	83	99	34	83
9x100	10	19	56	10	93	110	38	93
10x100	11	21	61	11	102	122	41	102
11x100	11	23	67	11	112	133	45	112
12x100	12	24	73	12	121	144	48	121
13x100	13	26	78	13	130	156	52	130
14x100	14	28	84	14	140	167	56	140
15x100	15	30	89	15	149	178	59	149
16x100	16	31	95	16	158	190	63	158
17x100	16	33	100	16	168	201	66	168
18x100	17	35	105	17	177	212	70	177
19x100	18	37	111	18	186	223	73	186
20x100	19	38	116	19	195	234	77	195
21x100	20	40	122	20	205	246	80	205
22x100	20	42	127	20	214	257	84	214
23x100	21	43	132	21	223	268	88	223
24x100	22	45	138	22	232	279	91	232
25x100	23	47	143	23	242	290	95	242
26x100	23	48	149	23	251	301	98	251
27x100	24	50	154	24	260	312	101	260
28x100	25	52	159	25	269	323	105	269
29x100	26	53	165	26	278	334	108	278

1/ AQL calculated from tolerance (TOL) at 1300 units

TABLE IV

Time Sampling Acceptance Numbers for Cut Style US Grade B (100 Plan)

Units of Product	EVM	Serious Blemish	Total Blemish	Noticeable Yellow or Brown	Total Color defects	Small Pieces and Mechanical Damage	Tough Fiber	Hard Woody Okra Material	"Sstd" Character
TOL.	2.0	4.0	12.0	6.0	20.0	20.0	8.0	1.0	10.0
(AQLs)[1/]	1.47	3.2	10.6	5.0	18.3	18.3	6.8	0.651	8.7
1x100	3	6	15	8	24	24	11	2	13
2x100	6	10	28	15	45	45	19	3	24
3x100	8	15	40	21	66	66	28	4	34
4x100	10	18	52	27	86	86	36	5	44
5x100	12	22	64	33	105	105	44	6	54
6x100	14	26	76	39	125	125	51	7	64
7x100	15	30	87	45	145	145	59	8	74
8x100	17	34	99	50	164	164	66	9	83
9x100	19	38	110	56	183	183	74	10	93
10x100	21	41	122	61	203	203	81	11	102
11x100	23	45	133	67	222	222	89	11	112
12x100	24	48	144	73	241	241	96	12	121
13x100	26	52	156	78	261	261	104	13	130
14x100	28	56	167	84	280	280	111	14	140
15x100	30	59	178	89	299	299	118	15	149
16x100	31	63	190	95	318	318	126	16	158
17x100	33	66	201	100	337	337	133	16	168
18x100	35	70	212	105	356	356	140	17	177
19x100	37	73	223	111	375	375	148	18	186
20x100	38	77	234	116	395	395	155	19	195
21x100	40	80	246	122	414	414	162	20	205
22x100	42	84	257	127	433	433	170	20	214
23x100	43	88	268	132	451	451	177	21	223
24x100	45	91	279	138	470	470	184	22	232
25x100	47	95	290	143	489	489	191	23	242
26x100	48	98	301	149	508	508	198	23	251
27x100	50	101	312	154	527	527	206	24	260
28x100	52	105	323	159	546	546	213	25	269
29x100	53	108	334	165	565	565	220	26	278

1/ AQL calculated from tolerance (TOL) at 1300 units