



United States
Department of
Agriculture

Agricultural
Marketing
Service

Fruit and
Vegetable
Programs

Fresh Products
Branch

July 1983

Tomatoes for Processing

Inspection Instructions

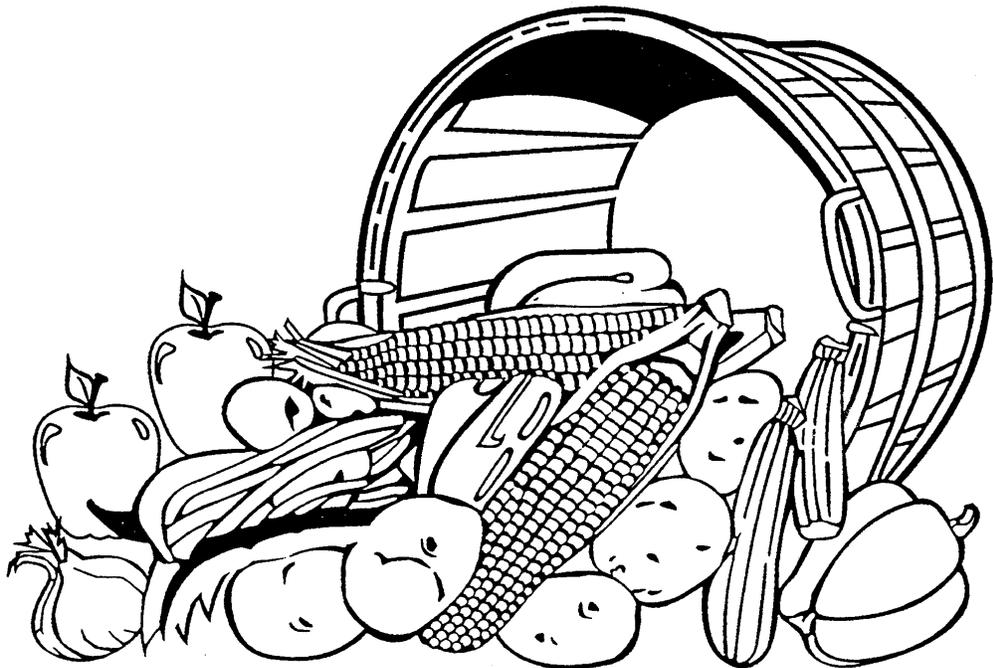


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UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
FRESH PRODUCTS BRANCH

INSPECTION INSTRUCTIONS
FOR
TOMATOES FOR PROCESSING

GENERAL

These inspection instructions are specifically developed and designed (1)
by the Fresh Products Branch to assist officially licensed inspectors
in the interpretation and application of the U.S. Standards for Grades
of Tomatoes for Processing CFR - Sections 51.3310 - 3327. They do not
establish any substantial rule not legally authorized by the official
grade standards. Tomatoes are grown in practically all states but
only few have major processing operations. California is the leading
processor of tomatoes followed by Ohio, Michigan, New Jersey, Indiana
and Pennsylvania. Several other states process tomatoes, but on a
much smaller scale.

INSPECTOR'S RESPONSIBILITY

These instructions are intended to assist the inspector. The (2)
inspector's responsibility regarding company contracts, equipment,
memoranda, appeal inspections, etc. may be given orally or in writing
by the supervisor or covered in other instructions (General Inspection
Instructions for Raw Products for Processing). When problems are
encountered which are not fully covered by these instructions, the
inspector shall contact the supervisor for further instructions. If
it is necessary to take immediate action, use good judgment and advise
the supervisor promptly of the action taken.

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SAMPLING

- (3) Representative sampling is as important as grade interpretation. It is essential that an inspector obtain representative samples, if not, the results of the inspection and color reading may be incorrect. An inspector must remember that the percentage of each category and the color reading reported on the certificate determine the amount of money the grower will receive. Therefore, if the sample taken is not representative, the settlement cannot be equitable.
- (4) Whenever possible, an inspector should draw the sample. Where the volume of work is heavy, some states certify sample helpers for that purpose only. In those that do not certify sample helpers, the processor usually assigns a company employee to pull samples. In either case the inspector is responsible for the accuracy of sampling and should supervise helpers to insure accuracy.
- (5) Tomatoes are generally shipped to the processing plant in bulk trailers or in bulk bins loaded on trailers or trucks. Regardless of the way, the following sampling plans were developed to insure that the load is properly sampled.

A. Sampling Bulk Trailers.

- (6) This sampling plan uses a rotating card system designed to eliminate any possible bias in sampling bulk trailer loads by mechanical samplers. The card system consists of 24 cards. Each card represents a load of tomatoes. The cards are divided into squares with circles in three or four of the squares. The circles represent where the probe sample is to be taken. The first 12 cards are for single loads, the second 12 for semi or double trailer loads. Generally, the three or four probes will supply enough tomatoes for a representative sample. However there may be an instance on single loads where three probes will be too much. In these cases the sampler is to probe the load twice, using the first and third probe pattern as guides.

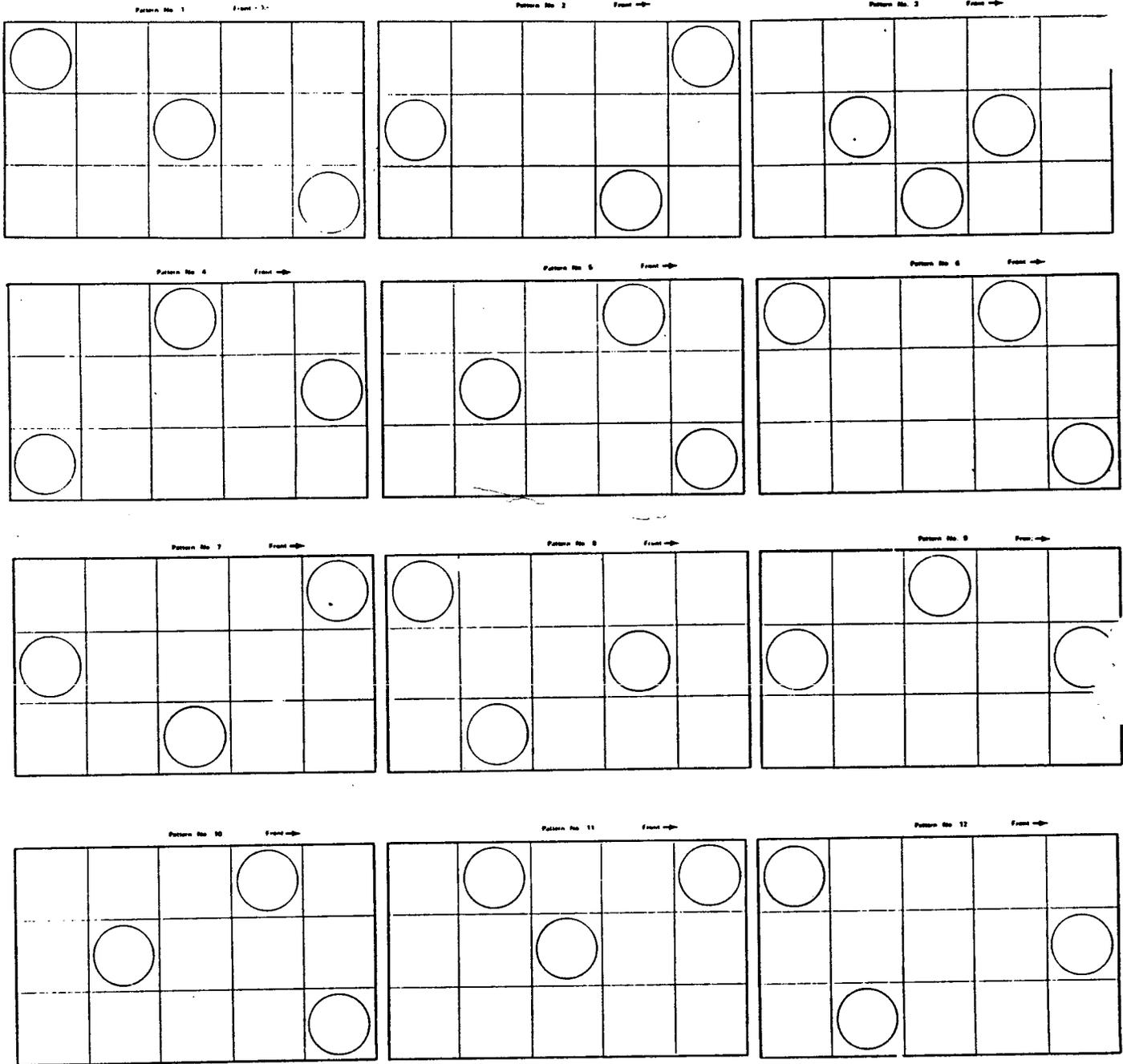
1. Rotating the Cards.

The cards should be handled in the following manner:

(7)

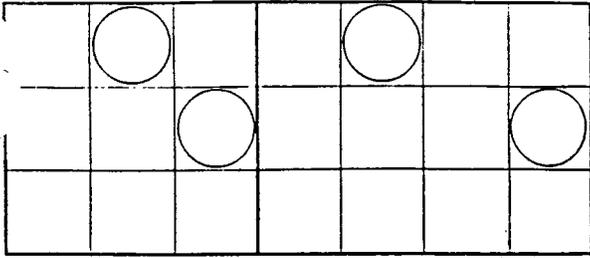
- a. At the beginning of each day or shift, count the cards to make sure the set is complete (24 cards).
- b. Divide the set into single or double loads and turn the cards face down.
- c. Draw the top card for each load (single or double), placing this card at the bottom of the deck after sample has been taken. Continue with this rotation system.

PROBE PATTERN SINGLE LOAD

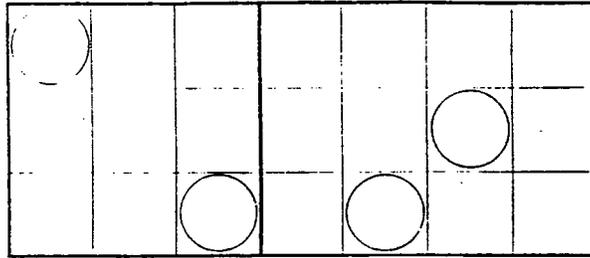


PROBE PATTERN
SEMI OR
DOUBLE LOADS

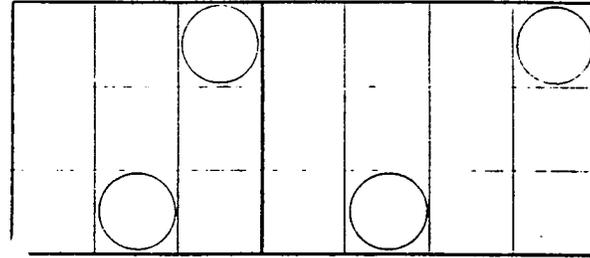
Pattern No. 1 Front view



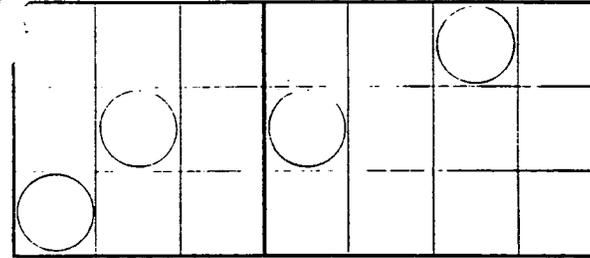
Pattern No. 2 Front view



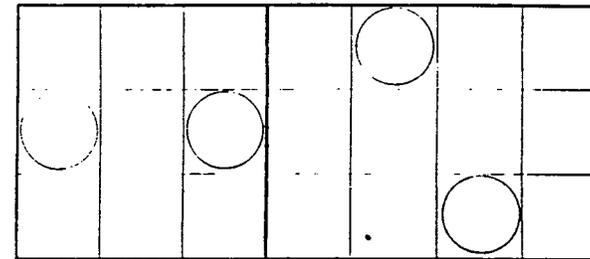
Pattern No. 3 Front view



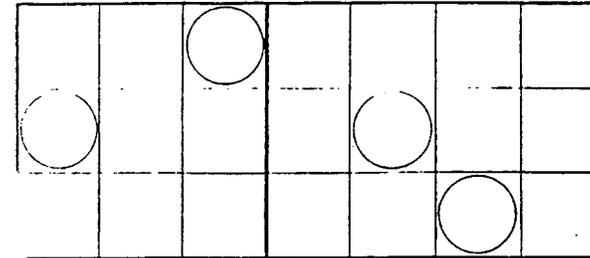
Pattern No. 4 Front view



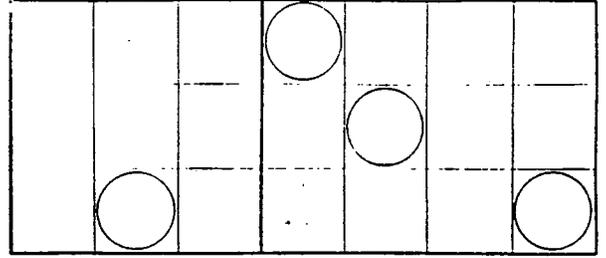
Pattern No. 5 Front view



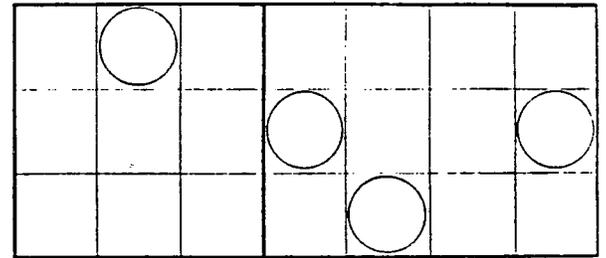
Pattern No. 6 Front view



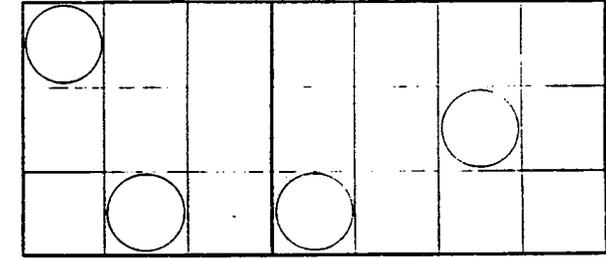
Pattern No. 7 Front view



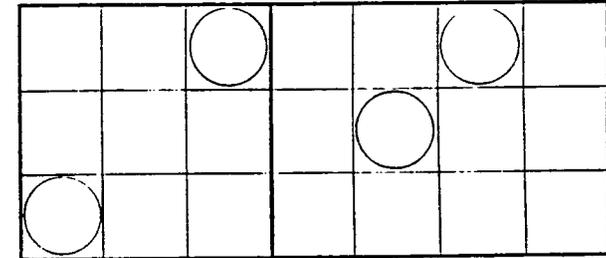
Pattern No. 8 Front view



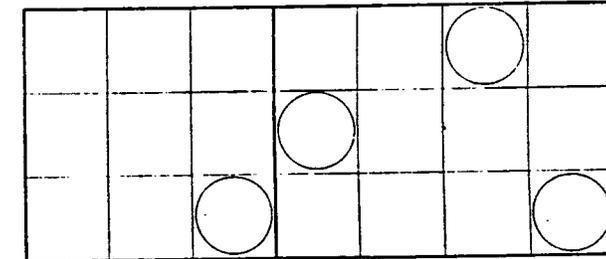
Pattern No. 9 Front view



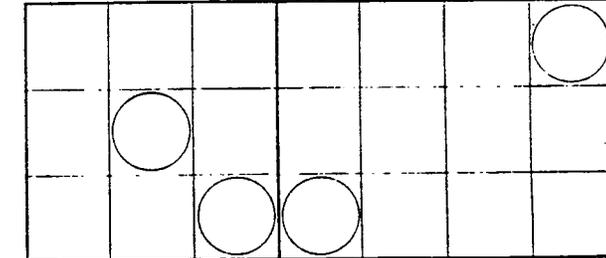
Pattern No. 10 Front view



Pattern No. 11 Front view



Pattern No. 12 Front view



B. Sampling Bulk Bins.

(8) This sampling plan, which may be applied to either restricted or unrestricted inspections, also features a rotating card system that is designed to eliminate any possible bias in sample or bin selection. For grading stations using hand sampling (as opposed to mechanical sampling devices), the card system not only indicates the quarter of the bin from which the sample is to be taken, but also the top or bottom of that quarter. For grading stations equipped with mechanical samplers, information on the cards pertaining to quarters or the top or bottom of quarters of bins would not apply.

1. Rotating the Cards.

(9) Each inspection station will be furnished a "deck" of 40 sampling cards. For stations with more than 1 grading table, a sufficient number of "decks" will be provided to correspond with the number of grading tables. The cards should be handled in the following manner:

- (a) At the beginning of each day count the cards to make sure the set is complete (40 cards).
- (b) Turn cards face down.
- (c) Draw top card for each grower's load, placing this card at bottom of the deck after sampling information is obtained. Continue with this rotation system.

2. Sampling Information.

(10) Each card provides information on sampling loads containing as many as 60 bins. No two cards are alike due to the random selection of numbers. Based on the total number of bins in a grower's load or on the number of accessible bins (for restricted inspections), the card will:

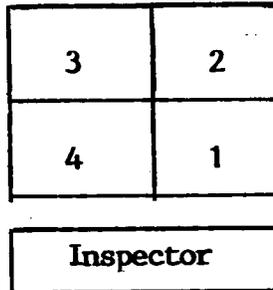
- (a) Determine the number of bins to be sampled;
- (b) Designate specific bins by use of simple numbering system;
- (c) Specify the quarter section of the bin from which the 50 lb. sample is to be taken; and,
- (d) Whether the 50 lb. sample is to be taken from the top or bottom of that quarter.

3. Bin Numbering Systems.

- (a) For Unrestricted Inspections. See the Illustration on page 12. Always start with the bottom bin in the tier nearest the cab (right side), counting upward as shown in the illustration. (11)
- (b) For Restricted Inspections. See the illustration on page 13. Note that the numbering system involves counting only the top layer of bins, starting with the tier nearest the cab (right side) and counting back to the rear of the truck.

4. Quarter Section.

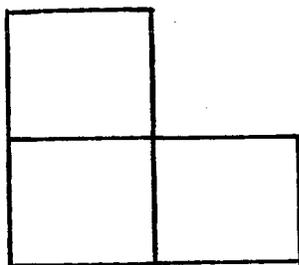
The quarter sections of bins are numbered as follows: (12)



Note that the quarter to the sampler's right is always no. 1; no. 2 is immediately behind no. 1, etc. The sampler should always be facing in the same direction when drawing samples. Usually he should approach the bin in the same direction that the truck is headed. If this is inconvenient it is permissible to change this procedure, but still approach each bin from the same direction.

- (13) To limit the sampler to the quarter section designated for sampling, a square covering (48"x48") with one quarter section removed will be placed on top of the bin with the opening directly over the quarter section to be sampled. Then the sampler will remove the 50 lb. sample from the top or bottom of that section.

Illustration:



5. Sample.

- (14) It is recommended that approximately 50 lbs. of tomatoes be taken from each bin sampled. It is not intended that each sample be weighed to obtain exactly 50 lbs. However, care should be taken to draw about the same amount from each bin sampled. It would not be correct to draw 30 lbs. from one bin and 70 lbs. from another. Use the same method of measurement (such as a bushel basket, plastic container, etc.) so that the amount of tomatoes taken from each bin remains fairly constant.

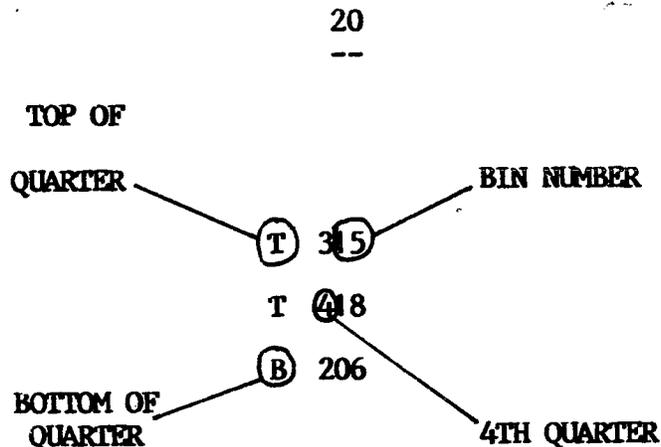
6. Examples.

(a) Unrestricted Inspections.

A load of 20 bulk bins is delivered to the processor. (15)
Inspections at your station are made on an
unrestricted basis. In other words, the processor
has agreed to make the entire load accessible for
inspection. Draw the top card of the "deck." The
card selected may be as follows:

1	2	3	4	5	6	7	8	9	10
B 101	B 402 B 201	T 203 T 301	B 203 T 201	B 105 T 403	B 206 T 102	B 205 R 407	T 406 B 204	B 203 B 302	B 204 T 106
11	12	13	14	15	16	17	18	19	20
B 202 T 103	B 212 T 106	B 306 B 209	T 111 B 302	T 415 B 308	B 407 B 216 B 408	B 316 B 409 B 417	B 207 B 109 B 412	T 417 B 405 T 203	T 315 T 418 B 206
21	22	23	24	25	26	27	28	29	30
T 311 B 317 B 313	T 222 T 417 B 110	T 413 T 408 T 215	B 305 T 115 T 316	T 325 T 423 T 109	T 324 T 414 B 320	B 102 B 312 B 103	B 307 B 115 B 209	T 123 T 101 B 429	B 406 B 228 T 413
31	32	33	34	35	36	37	38	39	40
B 131 T 417 B 322	T 113 B 218 T 214	T 302 T 233 B 121	B 202 T 403 B 330	T 414 B 331 B 409	T 134 T 306 B 230 B 404	B 221 B 208 T 125 T 313	T 328 B 418 T 126 B 107	B 137 T 336 T 234 T 418	B 122 T 327 B 240 T 115
41	42	43	44	45	46	47	48	49	50
B 212 B 236 T 219 T 204	B 133 T 211 T 418 T 323	T 404 B 410 B 315 B 320	T 138 B 443 T 219 B 108	B 240 B 312 T 133 T 139	T 120 B 337 B 308 T 240	B 323 B 319 B 427 T 241	B 239 B 342 T 213 T 205	T 422 T 432 B 325 T 221	T 242 B 149 T 131 T 208
51	52	53	54	55	56	57	58	59	60
T 337 T 111 T 418 T 250	B 203 T 415 B 206 B 246	T 437 T 342 T 325 B 129	T 209 T 123 T 450 B 337	B 249 B 130 B 131 T 205	T 417 B 120 T 234 T 336	T 126 B 219 T 105 B 348	T 312 B 441 T 215 T 428	T 354 T 129 B 432 T 234	B 234 T 436 T 438 B 153

- (16) The sampling information for this load is found under 20 (since this is the number of bins on the load) and is enlarged below (and circled on the card shown on the preceding page).

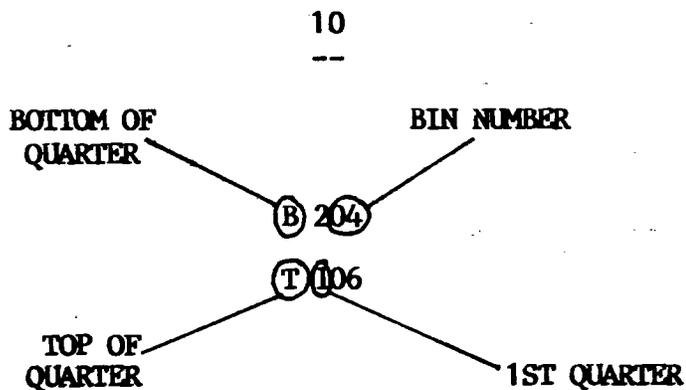


- (17) The letters T or B mean top or bottom of a quarter section of the bin. Following the letter the first digit indicates the quarter section from which the 50 lb. sample is to be taken. The last 2 digits indicate the bin number. The fact that there are 3 rows of numbers (each preceded by a letter) means that 3 bins are to be sampled.
- (18) Still using the preceding sampling information, the first 50 lb. sample is taken from the top of quarter no. 3 of bin no. 15 (T 315). Another 50 lbs. from the top of quarter number 4 of bin no. 18 (T 418). Still another 50 lb. sample is taken from the bottom off quarter no. 2 of bin no. 6 (B 206). Thus the grade for this load is determined from approximately 150 lbs. of tomatoes.

(b) Restricted Inspections.

It is possible that the processor may not desire to make loads fully accessible. In such cases the certificate is restricted to the top layer of bins. Still using the 20 bin load as an example (and the same card), the procedure now is to count the bins in the top layer of the load. There are only 10 accessible bins (See illustration on page 13). Therefore, the sampling information will be found on the card under 10. It is as follows:

(19)



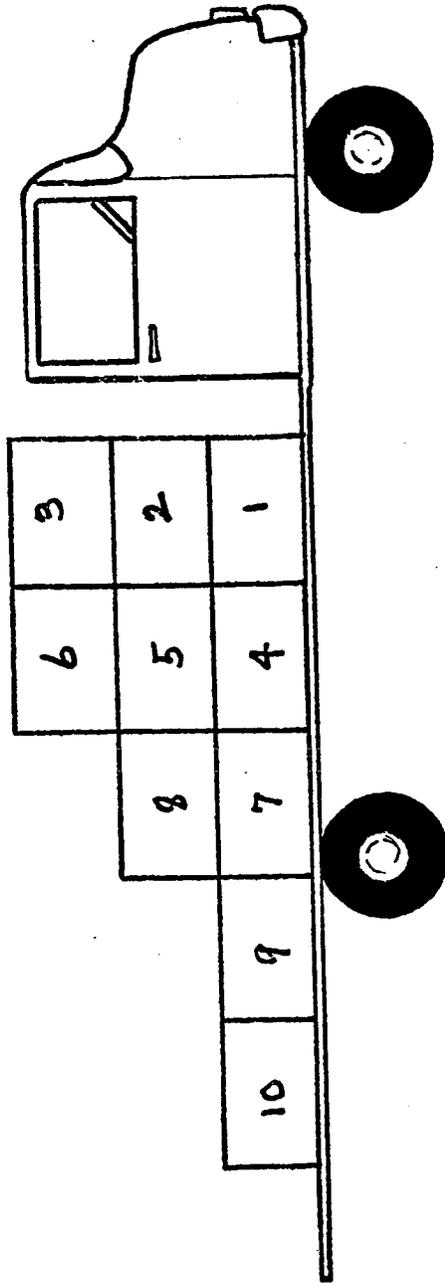
Thus, only two bins are sampled with 50 lbs. of tomatoes removed from the bottom of quarter section 2 of bin no. 4 and 50 lbs. from the top of quarter section no. 1 of bin no. 6.

(20)

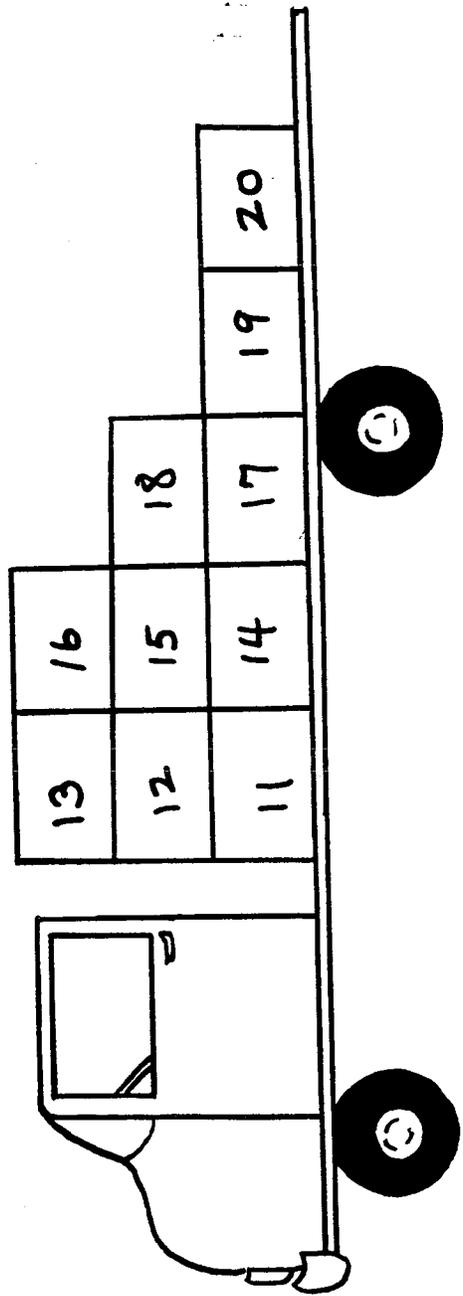
If the truck had been loaded differently and only 8 bins were accessible for inspection, then the sampling information to be used would be found on the card under 8.

(21)

NUMBERING SYSTEM FOR BULK BINS (UNRESTRICTED INSPECTIONS)

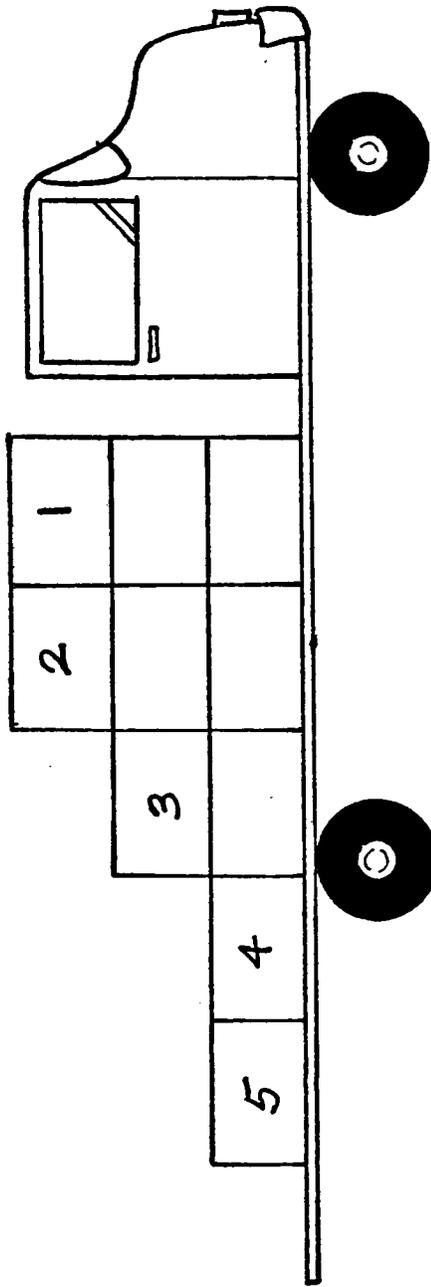


RIGHT SIDE OF TRUCK

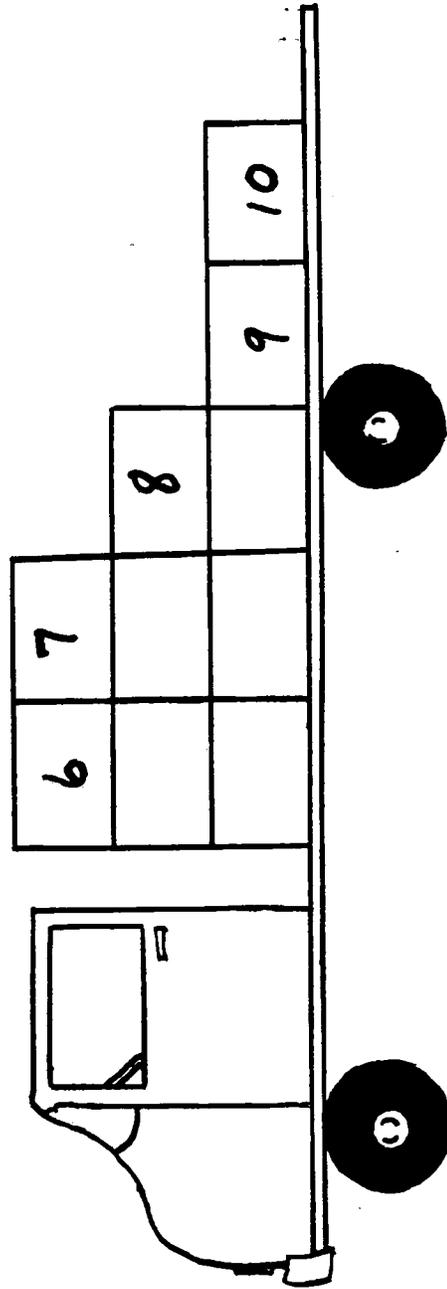


LEFT SIDE OF TRUCK

NUMBERING SYSTEM FOR BULK BINS (RESTRICTED INSPECTIONS)



RIGHT SIDE OF TRUCK



LEFT SIDE OF TRUCK

(c) Sampling Field Boxes, Baskets or Hampers.

- (22) The minimum number of samples (boxes, baskets or hampers) to be taken is determined by the total number of containers in the load.

<u>Lot Size Number of Containers</u>	<u>Number of Sample Containers to be Taken</u>
1 to 400	4
401 to 600	6
over 600	8

Dividing of Sample.

- (23) The sample is divided into three separate parts through the use of mechanical conveyor-separators. These dividers are of two general types.
- (24) (a) Belt-Conveyor Type. This unit is the simpler of the two and is approximately two feet wide and six feet in length. There are adjustable baffles mounted on the unit which permit only part of the original sample to be conveyed through to the compartmented tilt-type grading table.
- (25) (b) Conveyor-Grader Type. This is the larger, more complex unit. The principle of baffle separation is the same with each unit except that the inspector (or inspectors) actually does the grading for defect classification as the fruit is moving toward the scales.
- (26) The smaller unit is used for one or two grading stations, while the larger unit is designed for heavy volume central grading stations. The belt speed on each unit is approximately 32 feet per minute with a stop-start switch located near the inspector's grading position.

The containers which comprise the sample are dumped onto the conveyor continuously to provide a steady flow of tomatoes one layer deep spread uniformly over the width of the conveyor. (27)

On each type conveyor there are adjustable baffles to direct the flow of fruit so that three approximate separations are made of the original sample as follows: (28)

- (a) 1/8 for color evaluation.
- (b) 1/4 for defect evaluation.
- (c) 5/8 is returned to the grower's load. (29)

It is important that the inspector check the setting of the baffles frequently to make sure that the separation is approximately as shown above.

At some grading stations where mechanical samplers are used, a bucket is attached to the frame of the probe to catch the color evaluation sample. When this is the situation, the baffles should be reset for the 1/4 portion for defect evaluation and the remainder returned to the grower's load. (30)

ANALYSIS OF SAMPLE

Defect Evaluation. The 1/4 portion of the original sample which was separated for defect evaluation is classified into four groups as follows: (31)

1. Category A. "Category A" consists of tomatoes free from any worm attached, worm injury, freezing, stems over 1 inch in length, mechanical damage, mold or decay and requiring 10 percent or less trim for other defects. (32)

- (33) 2. Category B. "Category B," those tomatoes free from any worm attached, worm injury, freezing, stems over three inches in length, mechanical damage, mold or decay and requiring more than an estimated 10 percent but not more than 20 percent waste for other defects.
- (34) 3. Category C. "Category C," those tomatoes free from any worm attached, worm injury, freezing, stems over three inches in length, but affected by mold or decay, Anthracnose when more than 2 spots or aggregating more than 3/8 inches in diameter, which combined with any other defects, if present would not waste more than 20 percent, including not more than 10 percent resulting from mold or decay.
- (35) 4. Culls. "Culls" are those tomatoes which fail to meet the requirements of category "C," and when the color evaluation is determined by means of an electronic instrument, includes tomatoes which are completely green.
- (36) After all tomatoes in the defect sample are segregated into the above categories, total weights of tomatoes in the four categories are recorded separately on the certificate. The inspector will not physically trim tomatoes placed in the various defect categories.

COLOR EVALUATION

- (37) The standards provide for optional color determination by use of an electronic colorimeter instrument or subjective visual color evaluation of individual fruit. Any equipment used in such evaluations must be properly calibrated and the type of device and procedures utilized shall be specified in the grower-processor contracts. Unless otherwise specified, the tomato color reading cutoff number shall be specified in the grower-processor contracts.

- 17 -

COLOR EVALUATION BY THE AGTRON COLORIMETER

- * Divide the 1/8 portion until an 8 pound sample is obtained. The 8 * (38)
- * pound sample shall consist of tomatoes representative of the lot: *
- * Provided, that each tomato from which juice is extracted must show a *
- * definite change in surface color from green to tannish yellow, pink, *
- * red, or a combination thereof. *

Wash the sample and remove any attached stems.

Place the sample in the blender; cover with the blender lid connected to the vacuum hose. Start the vacuum pump. When the gauge reads 27, run the blender for 5 seconds only. When the blender stops, remove the container from the blender base (do not break vacuum). Turn the container upside down and shake it once or twice. Return the container to the base and start the blender. When you are reasonably sure that all the tomatoes are being blended, set blending time for one minute only.

After one minute, stop the blender, but leave the vacuum pump on for an additional 10 seconds, then turn the pump off.

Remove the lid and insert the 14 mesh wire screen into the blender being careful not to force any air bubbles to the surface. (Air bubbles will distort the reading).

Open the Agrton drawer until fully extended. Place the petre dish juice tray with the highest lip up and towards the back of the Agtron, making sure the corners of the tray fit into the guides or corner notches.

Using the ladle provided, extract one full ladle (175 ml.) of the strained sample from the blender and place it in the petre dish (each petre dish is marked for 175 ml).

Place the filled petre dish on the tray.

Before closing the drawer of the Agtron, check the needle position and calibrate if needed, then gently insert the drawer and read the meter setting.

COLOR EVALUATION BY THE HUNTER COLORIMETER

- (39) The color sample (1/8 of the original sample taken) shall be prepared for extraction in the following manner:

Wash in a running water spray;

Remove all attached stems;

Tomatoes with any degree of infection by mold or decay including Anthracnose shall be trimmed to remove defective portions; Any tomatoes which are classified as "Culls" for defects shall be removed; and

Completely green tomatoes shall be removed. Each tomato must show a definite break in surface color from green to tannish-yellow, pink, red or a combination thereof.

- (40) Extraction. The raw juice shall be extracted from the representative sample by means of an extractor (fitted with a 0.034 inch mesh screen juice attachment) or a commercial blender. The raw juice is thoroughly mixed and a portion placed in a plastic viewing cell for color measurement.

Instrument Measurement.

- (41) a. Insert viewing cup filled with juice (to within 1/4" of top) into the specimen port.
- b. Bottom of the viewing cup must be clean. (Do not allow fingers to come in contact with the glass bottom. Fingerprints will cause erroneous readings).
- c. Depress the TC button.
-

- d. Immediately record the value displayed on the digital readout.
- e. Record on the inspection certificate the Tomato Color Reading value to the nearest tenth of a point
- f. Remove viewing cup; empty and clean.

Visual Evaluation of Color. The standards provide for determining color visually under the definition of "fairly well colored." Basic requirements in Categories "A," "B" and "C" state that each tomato shall be "fairly well colored" (See plexiglas color comparator PL-2), which means that at least two-thirds of the flesh of the tomato has good red color. Although the requirements are based on flesh color, it is impracticable to cut all tomatoes before determining their correct classification. The inspector must do most of the sorting on the basis of external color. External color is usually a correct indication of the color of the flesh but this is not always true. The flesh of some varieties may be lighter and others darker than indicated externally. Growing conditions may cause the internal color to be poorer or better than external color indicated. It is permissible to cut cross sections of tomatoes that may be close to borderline for color. However, all tomatoes classified as "Culls" should be cut to verify the scoring. (42)

Inspectors should be aware that when inspecting tomatoes constantly temporary color blindness may result. Therefore, inspectors should take advantage of every opportunity to rest their eyes by looking at some dark-colored object for a minute or two. (43)

INTERPRETATION OF DEFECTS

Firmness. Firmness is handled as a waste factor. Category "A" requires a tomato to be "firm," which is defined to mean that the tomato, after peeling, is not so soft, puffy or shriveled that it will lose more than 10 percent of its weight. Both categories "B" (44)

and "C" require tomatoes to be "fairly firm," which means that the tomato, after peeling, is not so soft, puffy or shriveled that it will lose more than 20 percent of its weight. If a tomato is shriveled to the extent that it has become tough or rubbery, it shall be classed as a "Cull."

(45) **Sunburn-Sunscald.** In determining percentages of waste caused by green top, sunburn or sunscald, consideration shall be given to the character and depth of the injury.

(46) **Sunburn.** The term "sunburn" is applied to yellowish or greenish-yellow areas usually found on the shoulders of tomatoes. Generally, sunburn will affect tomatoes in one of two ways, thin and superficial or penetrating the outer wall. The following shall be used as a guide for scoring each type of sunburn.

Thin Superficial Type: Score against Category "A" when extending more than 3/4 inch from stem scar, and more than 3/4 of the circumference of a 2 1/2 inch tomato. Score against Category "B" when extending more than 1 inch from stem scar, and around the circumference of a 2 1/2 inch tomato.

Type which Penetrates Outer Wall: Score against Category "A" when extending more than 3/4 inch from stem scar and more than 1/2 of the circumference of a 2 1/2 inch tomato. Score against Category "B" when extending more than 3/4 inch from stem scar and around the circumference of a 2 1/2 inch tomato.

(47) In either type, correspondingly lesser or greater area on sunburn on smaller or larger tomatoes may be permitted, provided that such sunburn does not cause greater waste than that caused by sunburn permitted on a 2 1/2 inch tomato.

Sunscald. Usually affects the shoulder or the cheek of the tomato and (48)
removal of affected portion generally requires more than 10 percent
waste. Thus the inspector usually has the problem of determining
whether a tomato is to be placed in category "B" or the "Cull"
classification. If the injury occurs after the tomato has ripened,
the affected areas will show a darkened, soft, watery condition where
the flesh has broken down and contents easily leak out if the skin is
broken. Earlier injury may cause the affected area of the ripe tomato
to become slightly sunken with a tough outer wall which is
whitish-yellow in color. In scoring both types the percent of waste
necessary to remove the injury must be estimated.

**Gray Wall, Virus Mottling, Cloudy Spot, Ghost Spot, Internal Browning
and Irregular Ripening.** In some localities and seasons, a noticeable (49)
proportion of the tomatoes show one or a combination of the above
mentioned conditions. Fruit affected by such factors should be
disregarded from the standpoint of any defect classification and
should not be handled on a waste basis. Presence of such factors is
expressed in the color index or by visual evaluation of color. Such
fruit is classified as category "A" if there is no other defect.

Worms and Worm Injury. All tomatoes with worms attached or with (50)
injury that has penetrated through the outer wall, or attached cocoons
shall be scored as "Culls." Worms on the fruit but not attached, and
loose worms, should be ignored.

Insects. Grasshoppers, crickets, spiders or other insects on the (51)
tomatoes should be disregarded but tomatoes injured by such insects
should be scored on a waste basis.

- (52) **Mechanical Damage.** "Mechanical Damage" means that the tomato is bruised, crushed or ruptured. In determining percent of waste caused by leaky tomatoes, consideration shall be given to the wide variation of locule size in different varieties. When a tomato is cracked, crushed or split to the extent that one locule is exposed, with part or all of its contents missing, or when causing a loss of not more than 10 percent waste, by weight, it will pass category "A" requirement. If a tomato has two locules exposed, it will not lose more than 20 percent, by weight, and shall be classified as category "B," unless additional defects make it "C" or "Cull." All tomatoes having more than 20 percent waste caused by mechanical damage shall be classed as "Culls."
- (53) **Freezing.** "Freezing" means that the tomato is frozen or shows evidence of having been frozen. Fruit affected by freezing injury develop a wide range of symptoms. Indication of freezing injury is a glassy or water-soaked appearance of the fruit. Tomatoes affected by any amount of freezing injury shall be classed as "Culls."
- (54) **Discolored Growth Cracks.** Badly discolored cracks which are not affected by mold or decay should be scored on a waste basis only. However, growth cracks affected by mold or decay which has penetrated the fleshy wall of the tomato, the removal of which in trimming would cause a loss of not more than 10 percent, shall be placed in category "C." Additional defects would cause the tomato to be classed as a "Cull."
- (55) **Decay.** Tomatoes affected by mold or decay, the removal of which in trimming would cause a loss of not more than 10 percent, shall be classified as category "C." Other additional defects would make them Culls.

Anthracose Spots. Anthracnose Spots shall be permitted in category "C" when not more than two spots or spots aggregate not more than a circle 3/8 inch in diameter **unless** additional defects are present causing the tomato to be classed as a "Cull." (56)

Blossom End Rot. In the initial stage of development Blossom End Rot is evidenced by a brown or silver discoloration of the skin. This is not considered as decay. However, if the flesh of the tomato wall is affected this shall be considered as decay and classified as either category "C" or "Culls" depending upon the percentage of waste. (57)

Green Tomatoes. Any tomato completely green in color shall be classified as a "Cull." However, tomatoes showing any degree of a break in color from green shall be classified in any one of the three categories "A," "B" or "C" depending upon the defects present. (58)

Stems. Tomatoes with stems over 1 inch in length are not permitted in category "A." Stems over 1 inch to 3 inches in length meet the category "B" or "C" requirements. All tomatoes with stems over 3 inches in length shall be classed as "Culls." (59)

CERTIFICATE

The following form shows part of the memorandum on which the inspector records weights, percentages, calculation of percent usable and percent waste and tomato color reading. After the tomatoes have been weighed, the results shall be recorded on the inspection certificate as illustrated. (60)

Category	Pounds	Percent	Percent Usable	Percent Waste
A	42	58	58	-
B	5	7	6	1
C	23	32	24	8
Culls	2	3	-	3

Total	72	100	88	12
-------	----	-----	----	----

Color Reading: _____

- (61) **Recording Weights.** Recording weights on the inspection certificate shall be made in whole pounds. The nearest whole pound shall be used, except when the total amount of "Culls" is 1/2 to 1 pound, it shall be reported as 1 pound. When the total amount of "Culls" is less than 1/2 pound it shall be ignored and recorded as zero on the certificate.
- (62) **Computing Percentages.** In computing percentages from the slide rule always add fractions to or subtract them from category "C" in order to make the percentage total exactly 100.
- (63) **Computing "Percent Usable" and "Percent Waste."** The total percent of category "A" plus 85 percent of category "B" plus 75 percent of category "C" are added to comprise the "percent usable." The total percent of "Culls" plus 15 percent of category "B" plus 25 percent of category "C" are added to comprise the "percent waste."
- (64) **Tomato Color Reading.** The standards no longer specify a tomato color value. The standards do specify that the equipment used for determining the color reading shall be properly calibrated and that the procedure used shall be specified in the grower-processor

contracts. If a load of tomatoes fails to meet the tomato color value specified in the contract, it shall be recorded on the inspection certificate as follows:

Color Reading: _____ - Fails to meet tomato color value as specified in grower-processor contract.

Care of Certificate. Inspectors should take necessary precautions to prevent blank certificates from falling into hands of persons who have no right to use them. Each inspector shall be held responsible for the return of all unused certificates to the Supervising Inspector or inspection office at the close of the season or deal. (65)

Inspectors will receive specific instructions from the Supervising Inspector with reference to mailing the inspection copy of the certificate. Some states desire these mailed daily, while others may make other arrangements. (66)

Care in Recording. The certificate must be easily legible. All data set down during the process of inspection should be complete, neat in appearance and clear. All computations should be checked carefully for errors. Inspectors will be held responsible for figures being legible on all copies of the certificate. Remember that the original certificate is sometimes lost, and then it becomes necessary to use the carbon copies. (67)

Correct Numbers and Names. Most of the processors furnish the growers with a book of forms which are to be filled in by the grower on each load delivered. These forms give the name of grower, date and contents of the load. The inspector will transpose this information from this form to the certificate. No excuse will be accepted for failure to record this information correctly on the certificate. (68)

- (69) Name of Place, Processor, Grower and Date. The name of the place where the inspection is made, name of processor and grower, time of inspection and date should be filled in on the certificate just before starting the inspection, or immediately after the inspection is made. Where the processor has obtained authority from Washington to print a supply of inspection certificates to be used in their inspections, it will not be necessary to write in the name of the processor as it appears on the face of the certificate.
- (70) Signing of the Certificate. Inspectors shall sign the certificate using their full name, or initials of the given name and last name in full. This warning is given because some new inspectors have been found to either initial or simply sign the last name to the certificate. Legally either of these signatures would be worthless.
- (71) Issuing Restricted Certificates on Large Loads at Receiving Stations Where it is not Possible to Obtain Samples on All Parts of Loads.
In the case of large loads where the processor refuses, or is unwilling to make the load accessible, certificates restricting the inspection to certain portions of loads **MAY BE** issued at receiving stations located considerable distances from the processing plant.
- (72) In such instances, issue certificates restricting the inspection to the accessible portion of the load, with a description similar to the following: "Inspection and certificate restricted to the upper 2 layers of load" or "to the upper 12 inches," etc.
- (73) Correcting Inspection Certificate. If the corrections are not too conspicuous, minor mistakes which would not affect the credibility of the certificate if presented in court may be changed by crossing out the part in error and inserting the correct information. No correction should be made on any certificate unless the inspector has

all copies so that all may be corrected at the same time. Whenever an error has been discovered and the inspector does not have all copies of the certificate, a new certificate should be issued upon which the following statement should be made: "This certificate supersedes certificate no. which is in error."

No attempt should be made to erase errors on certificates. All corrections should be initialed to show the authority for the correction. (74)

Printing of Inspection Certificates by Processors. Copies of such certificates must be submitted to Washington, D.C. for approval before printing. The following procedure should be followed where processors have these forms printed. (75)

In order to reduce the number of forms, simplify records and hold costs to a minimum, many processors desire to show weights and the calculations of value of loads as well as other information on the inspection certificate. Under such conditions, processors may be authorized to have their own certificates printed. The inspection report, including the line for the inspector's signature, should be placed at the upper part of the form. Other information, such as spaces for gross, tare and net weights, calculation of the value of a load and other information should be placed on the lower part of the form headed by a statement to the effect that the information given below is not vouched for by the inspector. (76)

Processors should also be advised that before any certificates are printed, a draft must be submitted to the Washington office for approval. After the certificate has been approved and printed, it will also be necessary for the processor to furnish the Washington office with an affidavit from the printer showing the number of sets printed and the serial numbers. The affidavit written on the printer's letterhead and sworn to by a notary public will be satisfactory: (77)

New York, NY
May 25, 19__

John Doe Canning Co.
1425 New York Street
New York, NY

Dear Sir:

We hereby certify and affirm we have printed on order C 301,
April 1, 19__, for the John Doe Canning Co., New York, NY, 50,000 sets
of form FV-27, Inspection Certificate, Products Tomatoes, the first
serial number for 50,000 sets being A-13041, inclusive and continued
consecutively throughout 50,000 sets, the last number being A-63040.

We further certify that the above statement is true and correct within
our knowledge, and that we have not printed any other sets of the form
FV-27 bearing any other number, serial or otherwise for this company.

Very truly yours,

Jones Printing Co.
Samuel Jones
General Manager

Subscribed and sworn to me this May 25, 19__.

SEAL
Henry Smith
Notary Public

My Commission Expires
February 10, 19__

Some processors in the past have had one certificate form printed with the name of a certain State in the heading and then used it in all States in which they operate. Use of such memoranda with an out-of-state heading will not be approved. (78)

Processors who have their own certificates printed should be instructed to have the printer deliver them to the State headquarters of the Inspection Service or to such other offices as those in charge might designate. It is the responsibility of the Inspection Service to distribute inspection certificates to inspectors on location who must account for the use of each certificate. Therefore, every precaution should be exercised by both supervisors and inspectors to see that blank copies of certificates do not fall into hands of anyone outside the Inspection Service. (79)

REGRADES

A "regrade" is routinely requested by the processor or grower when a load fails to meet one or more contract specifications. (80)

When the processor or grower requests a regrade they are questioning the accuracy of the inspection report due to the irregularity of quality in the various containers or location in the load. It is the sampling that is in question, not the grade interpretation. (81)

Regardless of how careful the inspector is in sampling there will always be an occasional load in which the samples will not accurately represent the quality. From this standpoint it is necessary to understand the possibility of error in sampling irregular quality. (82)

- (83) When the grower or processor requests a regrade and does not question the inspector's interpretation of color or grade, it will be permissible for the same inspector to select additional samples for analysis. These samples should be inspected and the results of the two inspections combined into a weighted average and a new certificate issued. The first certificate, if issued, should be voided.

APPEAL INSPECTIONS

- (84) If the processor or grower questions the accuracy of the inspection report because of the inspector's interpretation of grade or color index reading, they may request an appeal inspection to verify the contention. Such a request usually cannot be granted at outlying plants or receiving stations where only one inspector is located unless a Keyman or Supervising Inspector happens to be in the immediate vicinity. If neither is available, the inspector should try to adjust the difficulty, perhaps by taking additional samples. If a processor or grower is still not satisfied with the inspector's interpretation of a grade factor it is, of course, their privilege to notify the Supervising Inspector. It then becomes the duty of the Supervisor to take steps necessary to correct the situation. The supervisor should be notified when an inspector is in doubt whether some of the grade interpretations are correct. An early checkup of grade interpretations may be requested.
- (85) At plants or receiving stations where a number of inspectors are working under the direction of a Supervisor or Keyman it is usually feasible to grant the request for an appeal inspection if the request is made within a reasonable time after the first inspection was made, and provided the load has not been out of the inspection yard. The

Supervisor, Keyman or a designated inspector should make the inspection and issue a certificate showing the results with this statement written across the face: **"Appeal Inspection. This certificate supersedes certificate No. _____."** (86)

The certificate issued on an appeal inspection should include only the results of the second examination. Results of the appeal inspection should never be averaged with those on the first certificate. (87)

When Second Inspection Not an Appeal. If much time has elapsed since the first inspection, or the load has been out of the inspection yard, a second inspection should be treated as a new inspection and no reference should be made to the first certificate. This procedure is necessary in the inspection of tomatoes for processing, as they ripen very rapidly during the season, particularly during hot weather. Very frequently growers will hold a load of tomatoes that shows poor color outside of the inspection yard for a few hours in order to increase the degree of color. Growers often regrade their load, either in the yard or outside, or they may take it home and regrade it there. All such inspections must be treated as new and the results cannot be considered as having any bearing on the credibility of the results reported on the first certificate. (38)

Number of Samples to be Examined on Appeal or Second Inspection. The number of samples to be examined in the case of appeal or second inspection will depend upon the uniformity of the lot in question and the character of the defects. If the load shows considerable irregularity, the usual number of samples taken should be doubled. (89)

- (90) If the quality is relatively uniform in the different containers or parts of the load, and it is only a question of whether there is a difference in interpretation between the two inspections, it may be sufficient to examine the tomatoes in the same samples as in the first inspection.
- (91) An appeal or second inspection should never be made of the tomatoes in the same samples, as many tomatoes are cut, bruised or lose weight, particularly when considerable decay is present.
- (92) Grading Samples Selected by Other Parties. In some cases, growers bring in loads after the inspection platform has closed for the day, and one of the processor's employees draws the sample to be graded the following day. It is obvious that the inspector should not grade and certify to the quality of such samples as being "sample of the lot herein described" when the lot was never seen and the quality may have materially changed during the night. However, the inspector may inspect and certify to the grade of samples selected by other parties and it is up to the processor and grower whether settlement for the load will be made on the basis of inspection of the samples.
- (93) Samples which are not selected by the inspector or by the "sample helper" working under the direct supervision of the inspector must be considered as "submitted samples." The certificate should show under "Number of Containers" only the number of packages in the sample. Do not show the total number of packages the submitted sample is supposed to represent. Under "Remarks" the identity of the individual responsible for the information regarding the sample shall be shown and the remarks so worded to show that such individual, and not the inspector, is responsible for all the information.

Write or stamp on the face of the certificate in red letters (94)
- **SUBMITTED SAMPLE** and write "over" at the bottom of the certificate.
On the back of the certificate show information such as the following
under "Remarks:" "Richard Roe, Fieldman, Heinz & Co. states this
sample is from truck license # _____; grower John Doe; samples
submitted by John Jones."

In some instances it will not be feasible to separate copies of the (95)
certificate in order to write on the back. When it is not possible to
do this, it will be permissible to show the information on a
mimeographed form attached to the certificate and cross referenced so
as to be identified with the sample.

INTERFERENCE WITH INSPECTOR'S WORK AND ABUSE OF INSPECTORS

Occasionally there are attempts to intimidate or influence the (96)
inspector by abusive language. In some cases they may even go so far
as to transfer tomatoes from one compartment to another of higher
grade. It should be clearly understood that the Inspection Service
under its official Regulations Governing Inspection, Certification and
Standards for Fresh Fruits, Vegetables, and Other Products (Sec.
51.46) has authority to suspend the service under such conditions.
Whenever any grower or processor becomes abusive or interferes with
the work of the inspector and will not listen to reason, the inspector
should refuse to grade the load and so advise the grower and
processor. It will then be up to the processor and the grower to
adjust payment of the load without inspection or properly assure the
inspector that future conduct will be satisfactory. When such
instances occur, the inspector should immediately prepare a written
report for the Supervisor setting forth all particulars.

CARE AND USE OF EQUIPMENT

- (97) Agtron Tomato Colorimeter. This instrument is an electronic color grading instrument. It assigns a dial reading by establishing a ratio between the red reflectance and the green reflectance. There are several things that should be done to insure proper results when using the Agtron:

The instrument must be free from dust and dirt to insure a proper reading of the tomatoe juice;

It must be level while being used;

Keep the instrument out of direct sunlight; and,

Moving or handling must be done with care.

- (98) Cleaning. Remove the drawer by pressing drawer stops on each side of the drawer. Clean the drawer bottom with a clean damp sponge, removing all dust and juice.

- (99) Operation Instructions. Plug in the instrument, turn power switch to ON. (Red Button-Red Light will light indicating power is on. See FIG. I).

Let the instrument warm up (15 to 20 minutes).

Open drawer. Turn on meter switch.

Calibrate needle to calibration line on meter.

Keep drawer closed and meter switch off when not using.

Red Light and Main Power Switch must remain on.

Hunter Tomato Colorimeter.

LIST OF EQUIPMENT

- (100) a. Basic Instrument (D25 D2A/D6D).
- (1) Measurement unit.
 - (2) Optical unit (TC attachment).

- d. Standard tiles.
 - (1) Tomato color standard.
 - (2) Black Glass.
- c. Standard box.
- d. Brush for lens and filters.
- e. Calibrated quartzline lamp.
- f. Fuse.
- g. Plastic viewing cup.
- h. Allen wrenches.

PREPARATION FOR OPERATION

Location.

- a. Bench space where there is subdued illumination. (101)
- b. No drafts.
- c. Relatively dry air.
- d. Constant temperature (less than 90° F).

Connections to be made.

- a. The instrument is equipped with a three-pronged plug and will not operate properly unless it is plugged into a 3-hole receptacle for proper grounding. (102)
- b. Plug instrument into electric circuit (AC) for about 24 hours before using (See Fig. II).
- c. AC voltage must not be less than 100 volts with ground.
- d. Once the instrument has been plugged in, it shall be left on for the entire season.

- e. Optical unit (TC attachment) is connected to the measuring unit by two cables. Each cable has a distinctive plug and can be connected in only one way. (No chance of making an error).

INSPECTOR'S OPERATING INSTRUCTIONS

To Standardize Instrument.

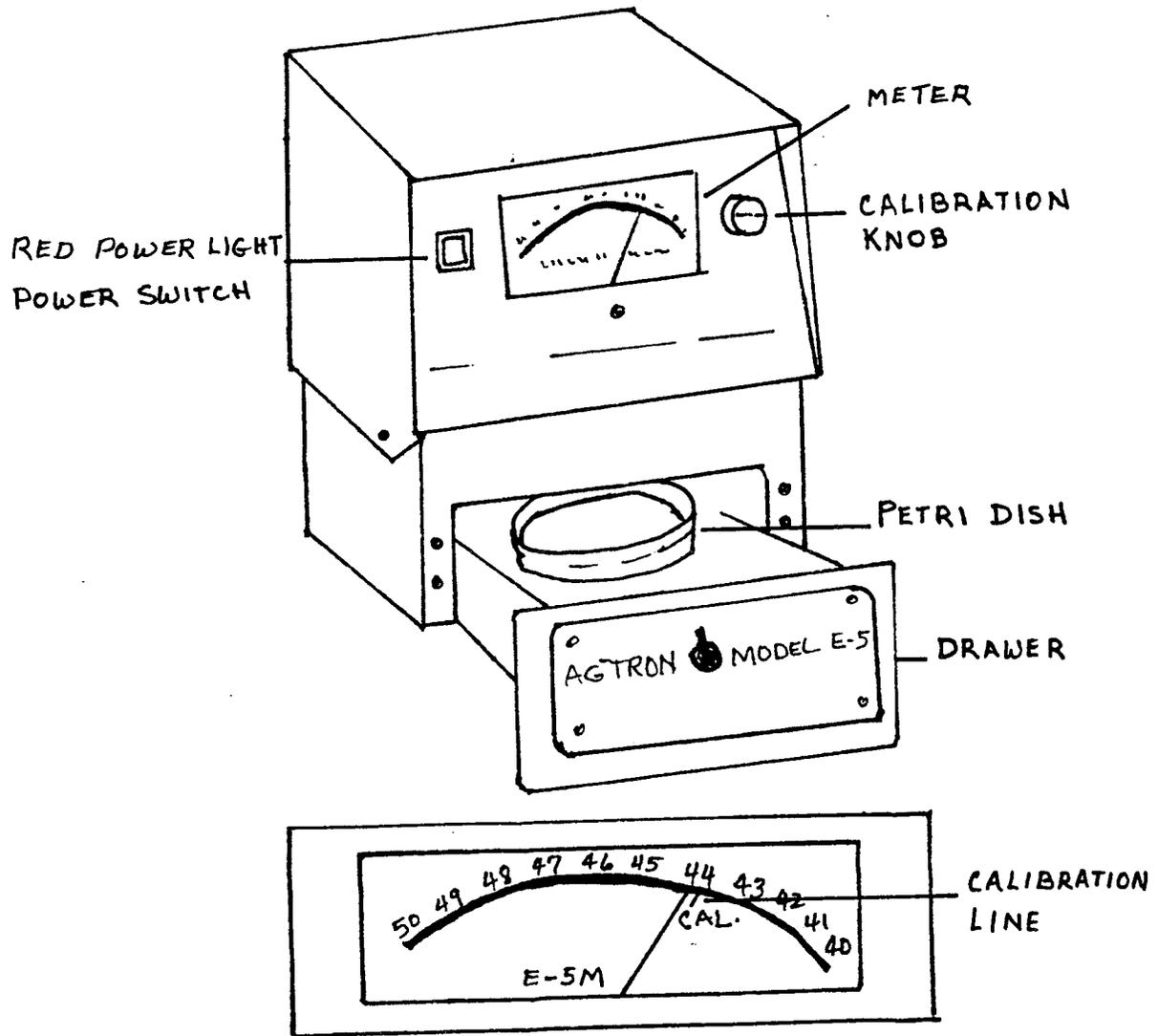
- (102) a. Place Tomato Color Standard tile in specimen port.
 - (1) Be sure standard tile is clean. If necessary, wash it with a mild soap or detergent and rinse with hot water.
- b. Place a piece of white paper over specimen viewing port during standby periods.
- c. Depress the (Y) push button.
- d. Turn the (Y) standardizing control knob until the calibrated (Y) value of the tile is displayed on digital readout.
- e. Depress the (X) button.
- f. Turn the (X) standardization control knob until the calibrated (X) value of the tile is displayed on digital readout.
- g. Depress the (Z) push button.
- h. Turn the (Z) standardization control knob until the calibrated (Z) value of the tile is displayed on digital readout. (**Note: Clockwise rotation lowers the displayed value**).
- i. After standardizing on the X, Y, and Z values, push the TC button.
- j. If the TC value displayed is not as assigned for the Tomato Color tile, use the (Y) standardization knob to adjust the displayed value to the assigned TC value.
- k. Check values on Tomato Color Standard tile at least every 1/2 hour.

Zero Adjustment (Black Tile).

(104)

- a. Make this check daily.
- b. Be sure that lenses, mirrors and filters are clean before making this adjustment.
- c. Check is made on (Y), (X) and (Z) scale only. (Note: It cannot be made on the L, A, B, scale).
- d. Place Tomato tile in specimen port and standardize on (Y), (X) and (Z) scale as described under the heading "To Standardize Instrument."
- e. Place black glass in specimen port.
- f. Depress (Y) push button.
- g. Using screwdriver adjust screw assessible through the (Y) zero reference adjustment hole until the digital readout shows +00.0.
- h. Repeat the same check for (X) and (Z) scale.

AGTRON TOMATO COLORIMETER



ENLARGED DRAWING OF METER

FIG. I

HUNTER TOMATO COLORIMETER (DIGITAL)

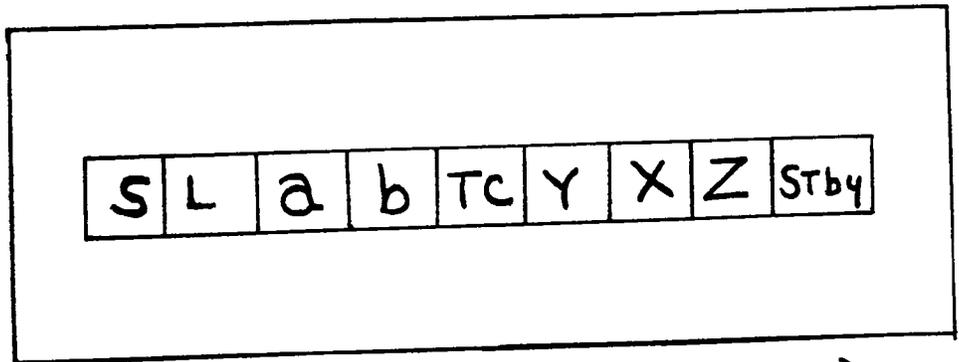
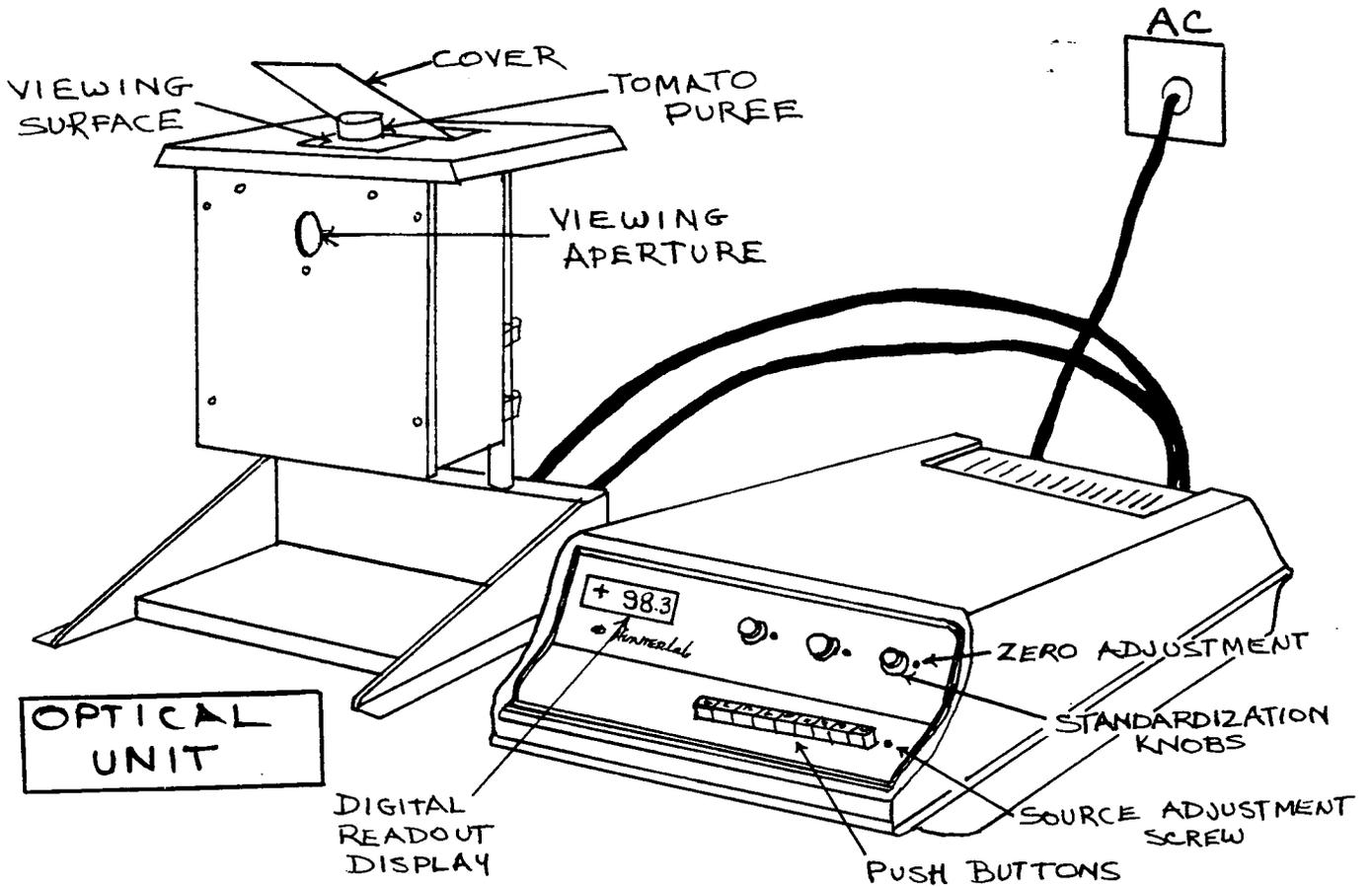
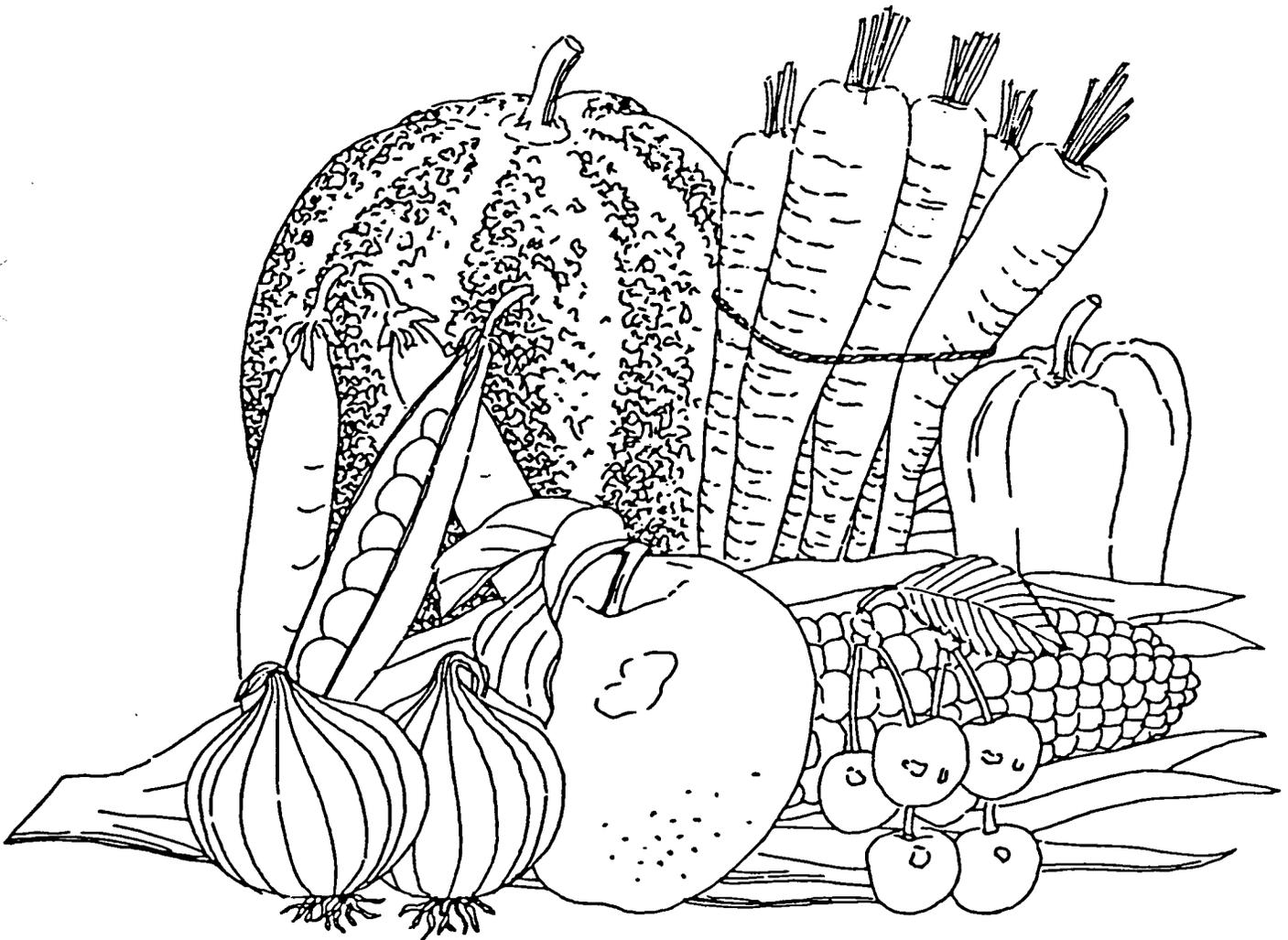


FIG II

(ENLARGED DRAWING OF KEYBOARD)

Appendix I

United States Standards



UNITED STATES STANDARDS FOR GRADES OF TOMATOES FOR PROCESSING¹

Effective July 11, 1983

(48 F.R. 26751)

GENERAL	
Sec.	
51.3310	General.
CATEGORIES	
51.3311	Category A.
51.3312	Category B.
51.3313	Category C.
CULLS	
51.3314	Culls.
PERCENT USABLE	
51.3315	Percent usable.
PERCENT WASTE	
51.3316	Percent waste.
COLOR EVALUATION	
51.3317	Color evaluation.
EXTRANEOUS MATERIAL	
51.3318	Extraneous material.
DEFINITIONS	
51.3319	Firm.
51.3320	Fairly firm.
51.3321	Worm injury.
51.3322	Mold or decay.
51.3323	Freezing.
51.3324	Green.
51.3325	Mechanical damage.
51.3326	Defect classification guide.
METRIC CONVERSION TABLE	
51.3327	Metric conversion table.

AUTHORITY: Secs. 203, 205, 60 Stat. 1087, as amended, 1090 as amended; 7 U.S.C. 1622, 1624.

GENERAL

§ 51.3310 General.

(a) The standards contained in this subpart apply to an inspection procedure for determining the quality of tomatoes for processing based on two factors:

(1) Color measurement by use of an electronic colorimeter instrument or subjective visual color evaluation of individual fruit; and,

¹ Packing of the product in conformity with the requirements of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act or with applicable State laws and regulations.

(2) classification of defects. Calculation of percentages shall be on the basis of weight.

CATEGORIES

§ 51.3311 Category A.

"Category A" consists of tomatoes which meet the following requirements:

(a) Basic requirements:

- (1) Firm; and,
- (2) Color:

(i) Electronic color determination shall be as specified in § 51.3317; or

(ii) Visual color analysis shall be as specified in § 51.3317.

(b) Free from:

- (1) Any worm attached;
- (2) Worm injury;
- (3) Freezing;
- (4) Stems over 1 inch in length;
- (5) Mechanical damage when more than one locule is exposed or when causing a loss of more than 10 percent by weight, of the tomato;
- (6) Mold or decay; and,
- (7) Any other defect or combination of defects, the removal of which in the preparation for processing causes a loss of more than 10 percent, by weight, of the tomato.

§ 51.3312 Category B.

"Category B" consists of tomatoes which meet the following requirements:

(a) Basic requirements:

- (1) Fairly firm; and,
- (2) Color;

(i) Electronic color determination shall be as specified in § 51.3317; or

(ii) Visual color analysis shall be as specified in § 51.3317.

(b) Free from:

- (1) Any worm attached;
- (2) Worm injury;
- (3) Freezing;
- (4) Stems over 3 inches in length;
- (5) Mechanical damage when more than two locules are exposed or when causing a loss of more than 20 percent by weight, of the tomato;

- (6) Mold or decay; and.
 (7) Any other defect or combination of defects, the removal of which in the preparation for processing causes a loss of more than 20 percent, by weight, of the tomato.

§ 51.3313 Category C.

"Category C" consists of tomatoes which meet the following requirements:

- (a) Basic requirements:
 (1) Fairly firm; and,
 (2) Color:
 (i) Electronic color determination shall be as specified in § 51.3317; or
 (ii) Visual color analysis shall be as specified in § 51.3317.
 (b) Free from:
 (1) Any worm attached;
 (2) Worm injury;
 (3) Freezing;
 (4) Stems over 3 inches in length;
 (5) Anthracnose when more than two spots or aggregating more than a circle three-eighths inch in diameter; and,
 (6) Other mold or decay, or a combination of other defects including mold or decay, the removal of which in the preparation for processing causes a loss of more than 20 percent, by weight, of the individual tomato; including therein not more than 10 percent resulting from mold or decay.

§ 51.3314 Culls.

"Culls" are tomatoes which fail to meet the requirements of Category C and, when color evaluation is determined by means of an electronic instrument, includes tomatoes which are completely green.

PERCENT USABLE

§ 51.3315 Percent usable.

"Percent usable" is a calculation of total weight of tomatoes in Category A, plus 85 percent of the weight of tomatoes in Category B, plus 75 percent of the weight of tomatoes in Category C.

PERCENT WASTE

§ 51.3316 Percent waste.

"Percent waste" is a calculation of total weight of Culls, plus 15 percent of the weight of tomatoes in Category B, plus 25 percent of the weight of tomatoes in Category C.

§ 51.3317 Color evaluation.

Color may be determined either by an electronic colorimeter or visually.

(a) Electronic color evaluation shall be the color value of a composite raw juice sample. The equipment used in such evaluation shall be properly calibrated, and the type of device and procedures utilized shall be specified in grower-processor contracts. The composite raw juice sample shall be extracted from tomatoes representative of the lot: Provided, that each tomato from which juice is extracted must show a definite change in surface color from green to tannish-yellow, pink, red, or a combination thereof.

(b) Visual analysis requires that each tomato be "fairly well colored" which means that at least two-thirds of the flesh of the tomato has good red color: Provided, that a tomato having flesh of a lighter shade of red shall be considered as "fairly well colored" if a sufficient amount of the flesh has a red color equivalent to that of a tomato with two-thirds good red color.

EXTRANEOUS MATERIAL

§ 51.3318 Extraneous material.

(a) Extraneous material is loose stems, vines, and dirt, adhering dirt, stones, trash, and other foreign material.

(b) The amount of extraneous material in any lot may be specified in connection with these standards.

DEFINITIONS

§ 51.3319 Firm.

"Firm" means that the tomato is not water-soaked to the extent that it is so soft, shriveled or puffy that it will lose more than 10 percent of its weight during the peeling or washing process.

§ 51.3320 Fairly firm.

"Fairly firm" means that the tomato is not water-soaked to the extent that it is so soft, shriveled or puffy that it will lose more than 20 percent of its weight during the peeling or washing process.

§ 51.3321 Worm injury.

"Worm injury" means any worm injury that has penetrated through the outer wall of the tomato.

§ 51.3322 Mold or decay.

"Mold or decay" means breakdown, disintegration or fermentation of the flesh of the tomato caused by bacteria or fungi.

§ 51.3323 Freezing.

"Freezing" means that the tomato is frozen or shows evidence of having been frozen.

§ 51.3324 Green.

"Green" means that the surface of the tomato is completely green in color. The shade of green color may vary from light to dark.

§ 51.3325 Mechanical damage.

"Mechanical damage" means that the tomato is bruised, crushed or ruptured.

§ 51.3326 Defect classification guide.

Defect	Waste	
	More than 10 percent	More than 20 percent
Sunburn (thin superficial type).....	When extending more than ¼ inch from stem scar, and more than ¼ of the circumference of a 2½-inch tomato.	When extending more than 1 inch from stem scar, and around the circumference of a 2½-inch tomato.
(Type which penetrates outer wall)....	When extending more than ¼ inch from stem scar, and more than ½ of the circumference of a 2½-inch tomato.	When extending more than ¾ inch from stem scar, and around the circumference of a 2½-inch tomato.
Worms and worm injury.....	Tomatoes with worms attached or with worm injury that has penetrated through the outer wall, or attached cocoons, shall be classed as "Culls". Worms on the fruit but not attached, and loose worms shall be ignored.	
Insects.....	Grasshoppers, crickets, spiders, or other insects on the tomatoes shall be disregarded, but tomatoes injured by such insects shall be evaluated on a waste basis.	
Growth cracks.....	Badly discolored cracks which are not affected by mold or decay shall be evaluated on a waste basis. Cracks affected by mold or decay which has penetrated the fleshy wall of the tomato shall be classed as "Category C", unless additional defects make them "Culls".	
Gray wall, virus mottling, cloudy spot, ghost spot, internal browning and irregular ripening.	Fruit affected by such conditions shall not be handled on a waste basis. Presence of such factors shall be evaluated from the standpoint of their effect on color (See § 51.3317.)	
Blossom end rot.....	The initial stage of development, occurring as brown or silver discoloration of the skin, shall not be considered as decay. However, if the fleshy wall of the tomato is affected it shall be classed as decay.	
Sunscald.....	Affected areas showing a darkened, soft watery condition of the flesh or areas slightly sunken with a tough outer wall which has a whitish yellow appearance, shall be evaluated on a waste basis.	
Freezing.....	Fruit affected by freezing injury develop a wide range of symptoms. Chief symptom of freezing injury is a glassy or water-soaked appearance of the fruit. Tomatoes affected by any amount of freezing injury shall be classed as "Culls".	
Mold or decay.....	Tomatoes affected by mold or decay which has penetrated the flesh shall be classed as "Category C" or "Culls" depending upon the amount of waste.	

METRIC CONVERSION TABLE

§ 51.3327 Metric conversion table.

Inches:	Millimeters (mm)
1/8 equals	3.2
1/4 equals	6.4
3/8 equals	9.5
1/2 equals	12.7
5/8 equals	15.9
3/4 equals	19.1
7/8 equals	22.2
1 equals	25.4
1 1/2 equals	38.1
2 equals	50.8
2 1/2 equals	63.5

Done at Washington, D.C. on June 6, 1983.
 William T. Manley,
 Deputy Administrator, Marketing Program
 Operations.

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