



United States
Department of
Agriculture

Carrots for Processing

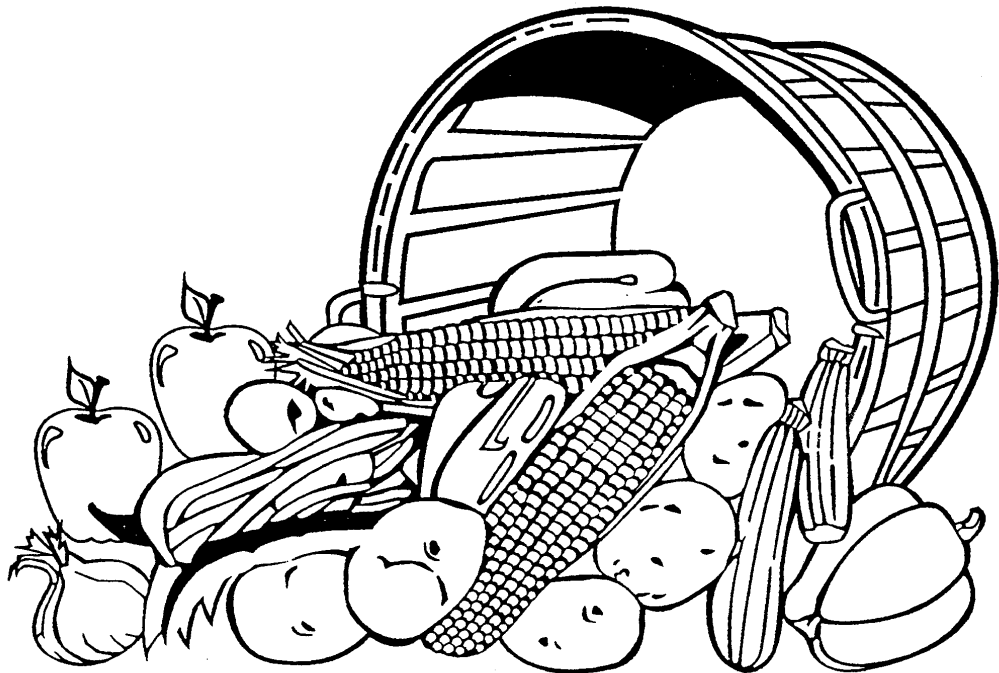
Agricultural
Marketing
Service

Inspection Instructions

Fruit and
Vegetable
Programs

Fresh Products
Branch

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C O N T E N T S

	<u>Page</u>
INTRODUCTION.	1
SAMPLING.	1
TOLERANCES.	1
 GRADE INTERPRETATIONS	
1. Variety.	1
2. Color.	1
3. Shape	
(a) Curvature.	2
(b) Second Growth.	2
(c) Forked Carrots	2
4. Smoothness	2
5. Woodiness.	2
Fig. 1.	3
Fig. 2.	4
Fig. 3.	6
6. Sunburn.	7
7. Air Cracks and Clean Cuts.	7
8. Growth Cracks.	7
9. Insects.	7
10. Freezing	7
11. Hollow	8
12. Broken Carrot Roots.	8
13. Decay.	8
(a) Soft Rot	8
(b) Crown Rot.	8
(c) Dry Rot.	8
Fig. 4	9
Fig. 5	10
14. Cull Material.	11
15. Size	11
 APPENDIX I.....U.S. STANDARDS	



INSPECTION INSTRUCTIONS

CARROTS FOR PROCESSING

Introduction. These instructions are intended to assist you in handling factors affecting grade. Your responsibility regarding company contracts, equipment, memoranda, appeal inspections, etc., may be given orally or in writing by the supervisor or is covered in other instructions. (See General Shipping Point Handbook)

Sampling. See Shipping Point Handbook, Part II, pages 176-192 for detailed information and general policy on this subject.

Representative samples must be secured whenever possible, and restricting the certificate to the upper portion of a bulk load, or in the case of bin boxes to the upper one foot or so of the box, should be avoided unless such procedure is absolutely necessary.

Tolerances. It is a common practice for growers to deliver carrots which have not been separated into specific lots of U. S. No. 1 or U. S. No. 2 grades, and consequently there is no need for tolerances. When any contract calls for the delivery of a specific grade, tolerances are provided in the standards. There is no limit to the percentage of defects allowed in individual containers, but the lot must average within the tolerances provided in the standards.

Grade Interpretations.

1. Variety. The U. S. No. 1 and U. S. No. 2 grades call for "similar varietal characteristics", which is defined as being of the "same general type". Therefore, in a load of predominately short-type carrots such as Oxheart, it will be necessary to classify as culls any long-type carrots such as Emperor that are found in the sample. Ordinarily, the contract between grower and processor will establish the variety to be grown and the seed, in many instances, will be supplied by the processor to insure his receiving the variety suitable for his purposes.

2. Color. The U. S. No. 1 and U. S. No. 2 grades both require that carrots be "fairly well colored". This is defined to mean that the outside and inside color of the carrot is orange, orange red, or orange scarlet but not pale orange or distinctly yellow in color. A color plate, illustrating the lower limit of "fairly well colored" has been issued and may be obtained from your supervisor.

- 2 -

3. Shape.

a. Curvature. See figure 1. The U. S. No. 1 grade requires that the carrot roots be "fairly well formed" which is defined to mean that the carrots are not so crooked or otherwise misshapen that a loss of over 5 percent by weight is incurred in the ordinary process of trimming. Both carrots shown in figure 1 are U. S. No. 1. The U. S. No. 2 grade requires that carrots be "not badly misshapen." "Badly misshapen" is defined to mean that the carrot root is forked or misshapen to the extent that, in the ordinary process of trimming, a loss of over 15 percent, by weight, of the root is incurred in excess of that which would occur if the root were perfect.

b. Second growth. See figure 2. All small forks and second growth on carrots should be broken or trimmed from the main root and scored as cull material. Figure 2 represents such carrots and the black lines on the illustrations show the approximate points at which such second growth should be removed. It is a common practice in some areas for growers to do some trimming and grading of their carrots in the field. The carrot shown in figure 2 and designated as "D" was trimmed by the grower in the field. This carrot should be trimmed further at the lines marked on the illustration and this second growth placed in cull material.

c. Forked carrots. See figure 3. Forked carrots, such as those illustrated in figure 3 are U. S. No. 1. These carrots can be separated approximately as designated by the lines drawn and are considered "fairly well formed" because there is practically no loss in the ordinary preparation for processing.

4. Smoothness. The U. S. No. 1 grade requires that carrots be "fairly smooth" and the U. S. No. 2 grade requires that carrots be "not excessively rough." This factor in both grades is to be considered from the waste standpoint and the method of trimming for determination of waste involved is important. It should be remembered that even a perfect carrot incurs peel waste, and it is only the waste in excess of this normal amount that is counted against the carrot under examination.

Nematode injury causes a rough appearing carrot with small to large nodules. The affected flesh extending toward the core may be lighter in color than the minimum grade requirement and should be handled on the basis of waste. With the nodules, fine hair-like rootlets are often encountered which are usually fairly thickly grouped at the point of injury. The rootlets may affect the appearance of the carrot, but their presence does not materially affect the processing quality and should be ignored.

5. Woodiness. This condition is usually the result of carrots remaining in the ground long after they have attained their maximum growth. The cores of woody carrots are very tough and fibrous and it is difficult to cut through them even with a sharp knife. In a woody carrot, the core separates very readily from the outer flesh. Since the texture and taste of the carrot is adversely affected, such carrots are not permitted in the U. S. No. 1 or U. S. No. 2 grades.



FIGURE 1

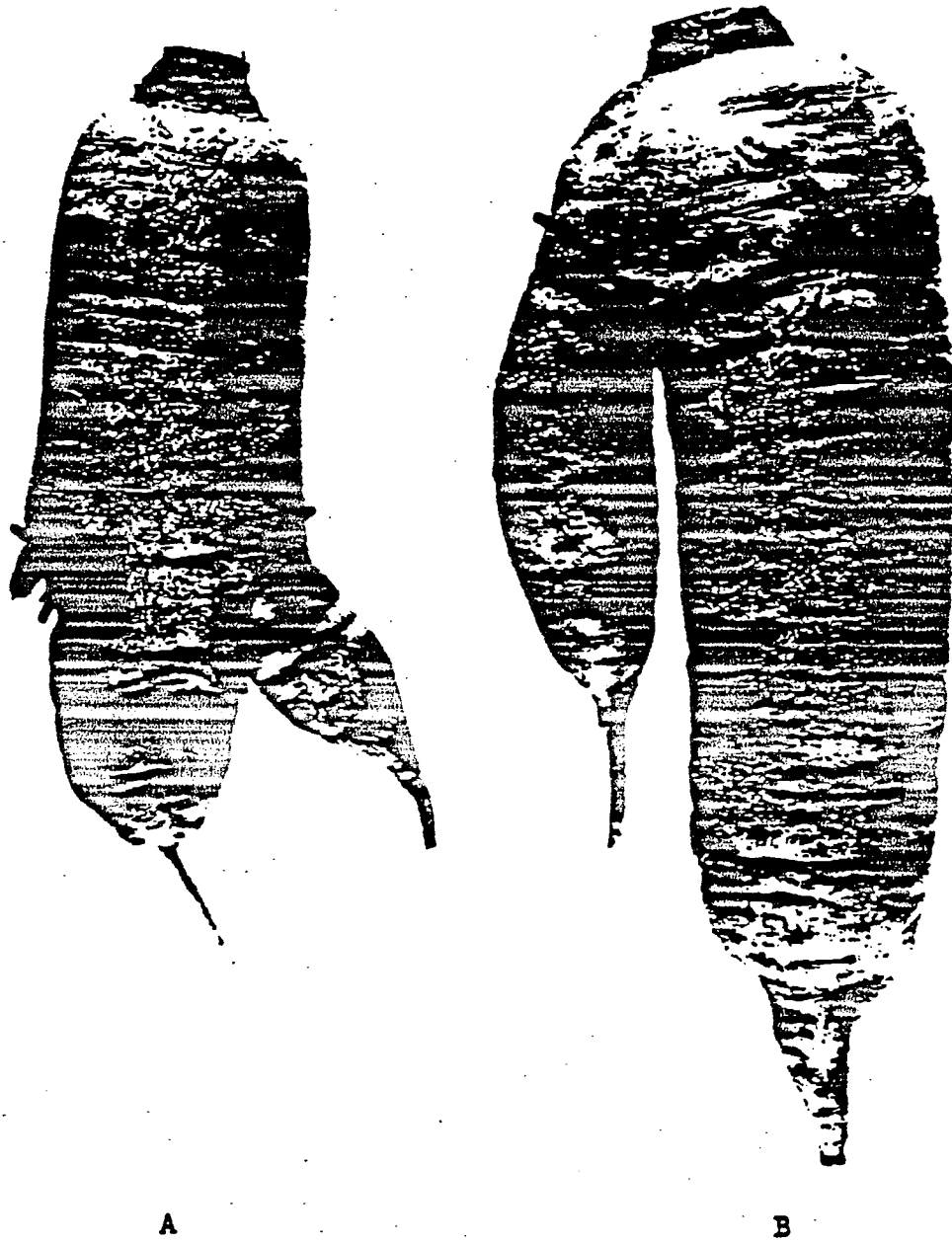


FIGURE 2



C



D

FIGURE 2



FIGURE 3

6. Sunburn (greening or green-top). In some cases the main difficulty encountered in connection with color will not be the basic interior and exterior color of the carrot but rather the effect of exposure to the sun; namely green color in the area at the top of the carrot and sometimes extending down through the vascular ring. When the carrot is affected by this type of defect, you must determine whether the green flesh or green vascular ring extends down into the carrot far enough to involve more than 5 percent waste (U. S. No. 1 grade) or 25 percent waste (U. S. No. 2 grade). In examining for sunburn, when a green or purple outer color is seen at the shoulders, a straight-across cut should be made at a point below the top which the inspector estimates to be the 5 percent or 25 percent point. If the flesh and vascular ring are found to be free from green color below this point and the carrot is of an acceptable orange color, then the carrot obviously meets the requirements of the U. S. No. 1 or U. S. No. 2 grade. However, regardless of flesh color, if the vascular ring or flesh shows greening below this cut, then it fails to meet the specified requirement.

7. Air Cracks and Clean Cuts. See figure 4. Carrots with one or two clean cracks about $1/16$ to $1/8$ inch wide extending the full length of the carrot should not be scored as damaged. Carrots designated as "A" and "B" are U. S. No. 1. The carrot designated as "C" is U. S. No. 2 since it is affected with an air crack which is more than $1/8$ inch wide.

8. Growth Cracks. Figure 5 illustrates a carrot affected by a typical growth crack. Defects of this type are handled on the basis of waste. The carrot illustrated in figure 5 is probably U. S. No. 1 grade since it appears that not more than 5 percent waste would be involved in the ordinary preparation for use.

9. Insects. Carrot roots may be affected by infestation of Rust-fly maggot or occasionally by other insect injury. The Rust-fly maggot itself is about $1/8$ inch long and about as wide as the lead of an ordinary lead pencil. The female fly punctures the skin and lays the eggs after which the larvae hatch and start feeding under the skin. The small larvae are very difficult to detect. All carrots with worms or maggots should be scored against the U. S. No. 1 and U. S. No. 2 grades. When worms are not present but the results of feeding and tunneling activity are present, the carrots should be scored on the basis of waste.

10. Freezing. All carrots which are frozen at time of inspection, obviously should be scored as culls. Carrots which have been frozen will be affected in a number of different ways depending upon the severity of freezing. The carrots must be judged on the basis of whether or not the processing quality is materially or seriously affected. Roots that have a watery, translucent appearance should be scored against the U. S. No. 1 grade since their keeping quality may be greatly impaired. Pithy carrots are also sometimes a result of freezing injury and carrots so affected should be scored on a waste basis.

11. Hollow. This condition generally occurs in the lower part of the root and the carrot should not be scored unless decayed or damaged by discoloration. You should be guided by the general definitions of damage and serious damage in the standards when hollowness is accompanied by discoloration.

12. Broken Carrot Roots. Broken carrot roots, or pieces of roots, that are otherwise perfect should be passed as U. S. No. 1 or U. S. No. 2 if they meet the specified minimum length requirements (see Size, Par 15) and in the ordinary process of trimming the broken end, a loss of not over 5 or 25 percent, respectively, is involved. In other words, if the tip end is broken off and the length of the broken tip meets the specified minimum length and the waste caused by proper trimming does not exceed 5 percent, the broken piece meets the U. S. No. 1 grade for processing. Naturally, the same interpretation applies to the crown end of the carrot. A broken piece or portion of a root should be scored as undersize if less than 3 inches in length, or less than any specified minimum length, except that any piece less than 2 inches in length shall be included in cull material. (See Size and Cull Material, Pars. 14 and 15).

13. Decay

a. Soft Rot. The U. S. No. 1 and U. S. No. 2 grades require that carrots be free from soft rot. Therefore, when any contract calls for field run carrots (no separation into definite grades), all carrots affected with soft rot must be placed in the cull category.

If the contract calls for delivery of U. S. No. 1 or U. S. No. 2 carrots, the standards provide for a tolerance of 10 percent for carrots failing to meet the grade. Included in the 10 percent is a tolerance of 3 percent for carrots affected by soft rot and included in the 3 percent is a tolerance of one percent for carrots which are seriously damaged by soft rot.

The word "affected" means any amount, however slight, while "seriously damaged" means that the area affected by soft rot constitutes more than 25 percent, by weight, of the carrot.

b. Crown Rot. All carrots affected by Crown Rot should be handled in the same manner as soft rot. This type decay is progressive in nature. (See Miscellaneous Publication No. 440).

c. Dry Rot. The U. S. No. 1 grade requires that carrots be free from damage by dry rot (cannot be removed in the ordinary process of trimming without a waste of more than 5 percent, by weight) and the U. S. No. 2 grade requires that carrots be free from serious damage by dry rot (cannot be removed without a waste of more than 25 percent, by weight).



FIGURE 4

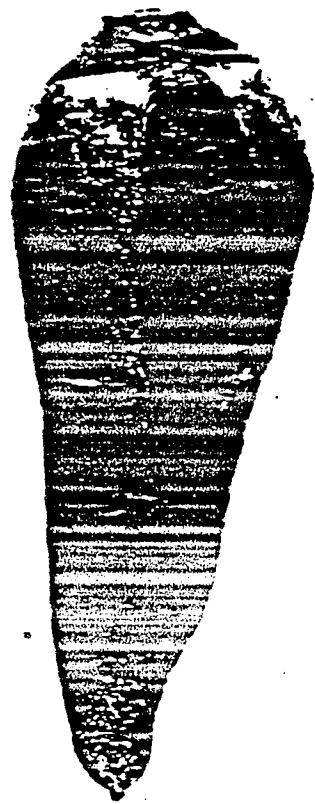


FIGURE 5

14. Cull Material. Cull material consists of pieces of roots smaller than the minimum length required or specified, loose tops and portions of attached tops in excess of the permitted length and second growth roots which are shorter than the minimum length required or specified, loose dirt, weeds or other foreign material. Such small second growth roots, tops and adhering caked dirt shall be removed from the carrot and placed in cull material. "Pieces of roots" may be defined as being pieces which have either the top or bottom or both the top and bottom missing and at the same time are undersize.

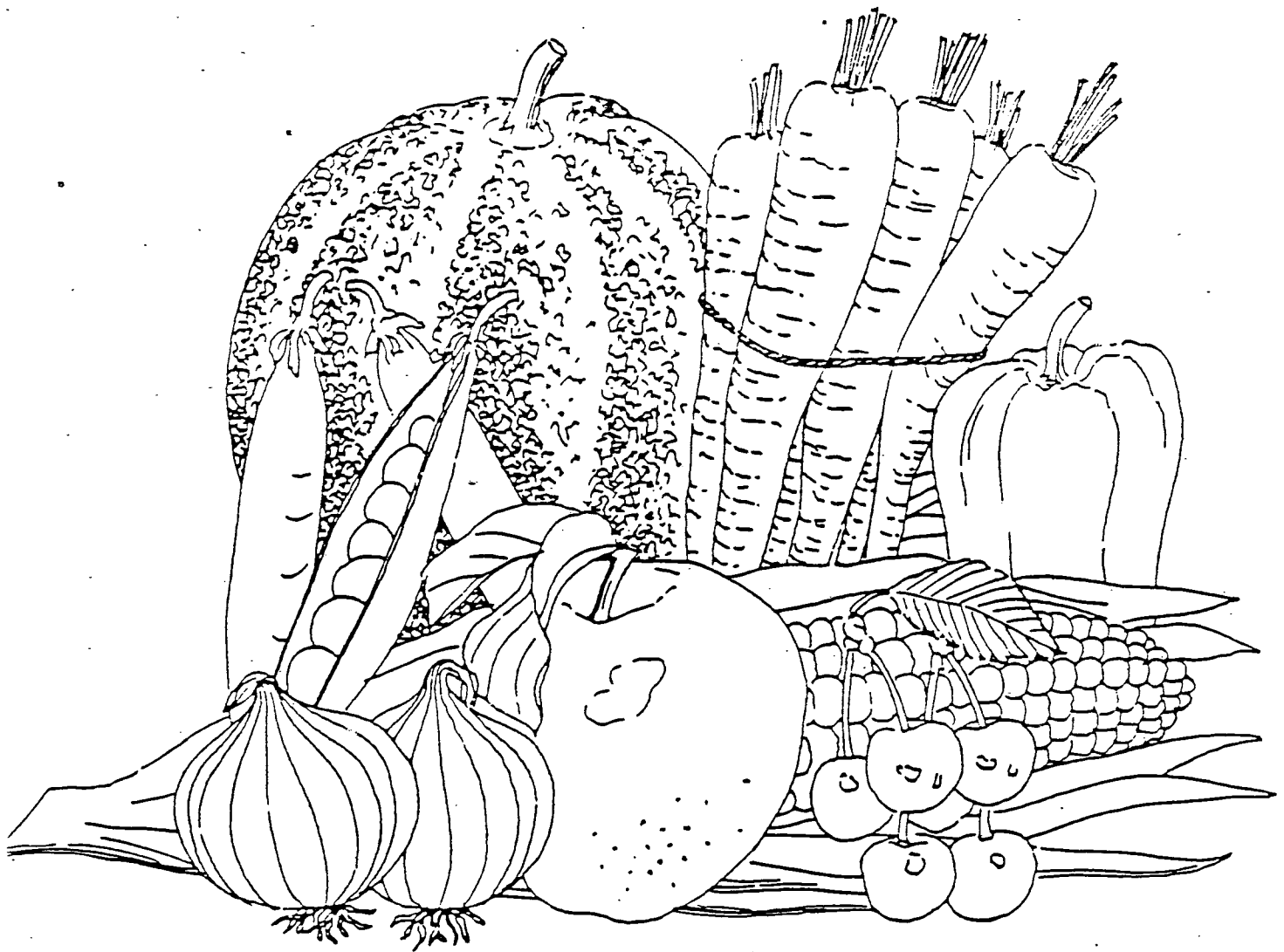
When inspection is on a contract basis by which the processor accepts the percentage of the lot which meets certain specifications (whether grade specifications or special specifications) there is no tolerance and anything below the specifications is "cull material", which is merely weighed and recorded as such. If the grower-processor contract calls for the delivery of lots meeting a specific U. S. Grade, then the tolerance of 2 percent for cull material applies. In any such lot, if the amount of cull material present exceeds 2 percent the lot fails to meet the grade regardless of the perfection of the carrots themselves.

15. Size. Both diameter and length are to be considered under this heading. If the grower-processor contract makes no mention of minimum length, the 3 inch minimum length required in the Standards will be used. If the contract specifies a minimum length other than 3 inches, then that figure is the basis for determining under-length, except that a piece of carrot root less than 2 inches in length is always classed as cull material.

Since there are no diameter requirements in the standards, the contract between the processor and grower will in all cases determine the permissible diameters. If the contract fails to mention a minimum or maximum diameter, the inspection will be made with no regard for these factors. In most cases, especially those in which the processor will dice carrots, a minimum diameter will be specified but no maximum diameter will be mentioned. If, in addition to one specified diameter requirement, the contract calls for delivery of a specific U. S. grade, the tolerance of 5 percent for undersize (including under-diameter and under-length) applies. If, however, the contract specifies both a minimum and maximum diameter and the delivery of a specific grade, the 10 percent tolerance for off-size will apply, but only one-half of this amount, or 5 percent will be allowed for undersize. If inspection is on a contract basis whereby the processor accepts only the percentage of the lot which meets certain size requirements, there is no tolerance for off-size.

Appendix I.

United States Standards





UNITED STATES STANDARDS FOR GRADES OF
CARROTS FOR PROCESSING

(49 F.R. 26706)

Effective July 30, 1984

Sec.	
51.4140	General.
51.4141	Grades.
51.4142	Crowning or topping requirements.
51.4143	Size.
51.4144	Tolerances.
51.4145	Definitions.

(Agricultural Marketing Act of 1946, secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended [7 U.S.C. 1622, 1624])

§ 51.4140 General.

(a) Compliance with the provisions of these standards shall not excuse failure to comply with provisions of applicable Federal or State laws.

(b) The accompanying grades for carrots are intended to facilitate transactions between growers and processors who may wish to use a purchasing system based upon the quality of carrots delivered.

(c) In the application of these standards it is assumed that in most instances sellers will not sort their carrots into lots of U.S. No. 1 and U.S. No. 2 grades before delivery to the buyer. Upon delivery, the inspector will select representative samples and determine the percentage of each grade. Under such a procedure, there is no need for tolerances.

§ 51.4141 Grades.

(a) "U.S. No. 1" consists of carrots which meet the following requirements:

- (1) Basic requirements:
 - (i) Similar varietal characteristics;
 - (ii) Firm;
 - (iii) Fairly well colored;
 - (iv) Fairly well tapered;
 - (v) Fairly smooth; and,
 - (vi) Not woody.
- (2) Free from: Unusable material.
- (3) Free from damage by:

- (i) Soft rot;
- (ii) Growth cracks;
- (iii) Sunburn;
- (iv) Green core;
- (v) Pithy core;
- (vi) Watercore;
- (vii) Internal discoloration;
- (viii) Oil spray;
- (ix) Freezing;
- (x) Dry rot;
- (xi) Other disease;
- (xii) Insects; and,
- (xiii) Mechanical or other means.

(4) Free from serious damage by: Soft rot.

(b) "U.S. No. 2" consists of carrots which meet the following requirements:

- (1) Basic requirements:
 - (i) Similar varietal characteristics;
 - (ii) Firm;
 - (iii) Fairly well colored;
 - (iv) Not badly misshapen;
 - (v) Not excessively rough; and,
 - (vi) Not woody.
- (2) Free from: Unusable material.
- (3) Free from damage by: Soft rot.
- (4) Free from serious damage by:
 - (i) Soft rot; and,
 - (ii) Any other cause.

(c) For crowning and topping requirements see § 51.4142.

(d) For size requirements see § 51.4143.

(e) For tolerances see § 51.4144.

§ 51.4142 Crowning or topping requirements.

(a) Carrots shall be specified as crowned or topped.

(1) Crowned carrots shall have the crowns cut off the root reasonably perpendicular to the longitudinal axis. All uncrowned carrots shall be separated from crowned carrots and the percentage of such carrots determined.

(2) Topped carrots shall have the tops or sprouts cut, snapped, or twisted off to within three-fourths inch of the crown of the root, or to any other specified length. All portions of leaf stems or sprouts over three-fourths inch long, or any other specified length, shall be considered as unusable material. (section 51.4145).

§ 51.4143 Size

(a) Unless otherwise specified, the minimum length shall be not less than 3 inches, provided that roots under 2 inches in length shall be considered unusable material.

(b) The minimum and maximum diameters for U.S. No. 1 and U.S. No. 2 grades may be specified by agreement between the buyer and the seller.

§ 51.4144 Tolerances.

In the application of these standards to determine the percentages of carrots in the lot which meet the requirements of the respective grades, no tolerances apply. However, for the purpose of determining compliance with one of the foregoing grades the following tolerances, by weight, are provided in order to allow for variations incident to proper grading and handling:

(a) For defects. Ten percent for carrots in any lot which fail to meet the requirements of the specified grade, including therein not more than 3 percent for carrots which are damaged by soft rot and included in this latter amount not more than 1 percent for carrots which are seriously damaged by soft rot.

(b) For unusable material. Two percent in any lot.

(c) For size. Ten percent for carrots in any lot which fail to meet the specified size requirements, included therein not more than 5 percent for carrots which fail to meet the specified minimum diameter or length.

§ 51.4145 Definitions.

(a) "Similar varietal characteristics" means that the carrots are of the same

(b) "Firm" means that the carrot is not soft, flabby or shriveled.

(c) "Fairly well colored" means that the outside and inside color of the carrot is orange, orange red, or orange scarlet but not a pale orange or distinct yellow color.

(d) "Fairly well formed" means that the carrot is not forked, or materially crooked, or otherwise misshapen to the extent that, in the process of trimming, a loss of over 5 percent, by weight, of the root is incurred in excess of that which would occur if the root were perfect.

(e) "Fairly smooth" means the carrot is not rough, ridged, or covered with secondary rootlets to the extent that, in the process of trimming, a loss of over 5 percent, by weight, of the root is incurred in excess of that which would occur if the root were perfect.

(f) "Woody" means that the flesh of the carrot is tough and fibrous.

(g) "Unusable material" means pieces of carrots under 2 inches in length, loose tops, loose dirt, adhering caked dirt, weeds or other foreign matter, portions of attached tops or sprouts in excess of the specified length or, loose crowns or portions of crowns. Carrots with adhering caked dirt, and tops or sprouts longer than the required or specified length shall not be scored against U.S. No. 1 or U.S. No. 2 grades, but such material shall be removed from the carrot and scored as unusable material.

(h) "Diameter" means the greatest dimension of the root taken at right angles to the longitudinal axis.

(i) "Badly misshapen" means that the carrot is forked or misshapen to the extent that, in the process of trimming, a loss of over 15 percent, by weight, of the root is incurred in excess of that which would occur if the root were perfect.

(j) "Excessively rough" means that the carrot is rough or ridged to the extent that in the process of trimming, a loss of over 15 percent, by weight, of the root is incurred in excess of that which would occur if the root were perfect.

(k) "Damage" means any specific defect defined in this section; or an equally objectionable variation of any one of these defects, any other defect, or any combination of defects, which materially detracts from the processing quality of the carrot, or which cannot be removed in the process of trimming without a loss of more than 5 percent, by weight, in excess of that which would occur if the root were perfect. The following specific defects shall be considered as damage:

(1) Watercore when moderately discolored.

(2) Oil spray when materially detracting from the processing quality of the carrot, or causing an oily flavor.

(3) Growth cracks when not smooth or not shallow, or when materially detracting from the processing quality of the carrot.

(4) Air cracks when excessively deep or wide, or when materially detracting from the processing quality of the carrot.

(5) Freezing when any amount affects the root.

(6) Soft rot when any amount affects the root.

(l) "Serious damage" means any specific defect defined in this section; or an equally objectionable variation of any one of these defects, any other defect, or any combination of defects, which seriously detracts from the processing quality of the carrot, or which cannot be removed in the process of trimming without a loss of more than 15 percent, by weight, in excess of that which would occur if the root were perfect. The following specific defects shall be considered as serious damage:

(1) Watercore when severely discolored.

(2) Oil spray when seriously detracting from the processing quality of the carrot, or causing an oily flavor.

(3) Freezing when any amount affects the root.

(4) Soft rot when affecting more than 15 percent of the total weight of the root.

Done in Washington, D.C. on June 26, 1944.

William T. Manley,

Deputy Administrator, Marketing Program Operations.

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