



United States
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Fruit and
Vegetable
Division

Processed
Products
Branch

United States Standards for Grades of Dehydrated (Low Moisture) Apples

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This is the second issue of the United States Standards for Grades of Dehydrated (Low Moisture) Apples, published in the **FEDERAL REGISTER** of June 30, 1977 (42 FR 33259) to become effective July 31, 1977.

Voluntary U.S. grade standards are issued under the authority of the Agricultural Marketing Act of 1946, which provides for the development of official U.S. grades to designate different levels of quality. These grade standards are available for use by producers, suppliers, buyers, and consumers. As in the case of other standards for grades of processed fruits and vegetables, these standards are designed to facilitate orderly marketing by providing a convenient basis for buying and selling, for establishing quality control programs, and for determining loan values.

The standards also serve as a basis for the inspection and grading of commodities by the Federal inspection service, the only activity authorized to approve the designation of U.S. grades as referenced in the standards, as provided under the Agricultural Marketing Act of 1946. This service available as on-line (in-plant) or lot inspection and grading of all processed fruit and vegetable products, is offered to interested parties, upon application, on a fee-for-service basis. The verification of some specific recommendations, requirements or tolerances contained in the standards can be accomplished only by the use of on-line inspection procedures. In all instances, a grade can be assigned based on final product factors or characteristics.

In addition to the U.S. grade standards, grading manuals or instructions for inspection of several processed fruits and vegetables are available upon request for a nominal fee. These manuals or instructions contain detailed interpretations of the grade standards and provide step-by-step procedures for grading the product.

Grade standards are issued by the Department after careful consideration of all data and views submitted, and the Department welcomes suggestions which might aid in improving the standards in future revisions. Comments may be submitted to, and copies of standards and grading manuals obtained from:

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United States Standards for Grades of Dehydrated, Low-Moisture, Apples

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Authority: §52.2341 to §52.2352 issued under the Agricultural Marketing Act of 1946, Sec. 205, 60 Stat. 1090, as amended (7 U.S.C. 1624).

Note: Compliance with the provisions 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.

§52.2341 Product Description.

Dehydrated (low-moisture) apples, hereinafter referred to as **dehydrated apples**, are prepared from clean and sound fresh or previously dried (or evaporated) apples from which the peels and cores have been removed and which have been cut into segments. The dried (or evaporated) apple segments may be cut further into smaller segments in preparation for dehydration whereby practically all of the moisture is removed to produce a very dry texture and are prepared to assure a clean, sound, wholesome product. The sulfur dioxide content of the finished product may not exceed 1,000 parts per million. No other additives may be present.

§52.2342 Styles.

- (a) **Pie pieces.** Pie pieces consist predominantly of parallel-cut, irregularly shaped pieces, approximating 3/16 inch (5 mm) or less in thickness and 3/4 inch (19 mm) or longer in their longest dimension.
- (b) **Flakes.** Flakes consist predominantly of parallel-cut, irregularly shaped pieces, approximating 3/16 inch (5 mm) or less in thickness and less than 3/4 inch (19 mm) in their longest dimension.
- (c) **Wedges.** Wedges are fairly thick sectors, approximating no more than 5/8 inch (16 mm) at their greatest thickness.
- (d) **Sauce pieces.** Sauce pieces are small popcorn-like units of varying shapes and sizes, not otherwise conforming to the style of flakes, and in which practically all of the units when free-flowing will pass through 0.446 inch (11.3 mm) square openings. Sauce pieces of this style are considered **finely-cut** when practically all of the units will pass through 3/8 inch (9.5 mm) square openings.

§52.2343 Grades.

- (a) **U.S. Grade A** is the quality of dehydrated apples in which the moisture content of the finished product is not more than 3.0 percent, by weight; that have a normal flavor and odor, that have a good color, that are reasonably uniform in size, that are practically free from defects, that have a good texture, and that for those factors which are scored in accordance with the scoring system outlined in this subpart the total score is not less than 85 points.

- (b) **U.S. Grade B** is the quality of dehydrated apples in which the moisture content of the finished product is not more than 3.5 percent, by weight; that have a normal flavor and odor, that have a reasonably good color, that are fairly uniform in size, that are reasonably free from defects, that have a reasonably good texture, and that for those factors which are scored in accordance with the scoring system outlined in this subpart the total score is not less than 70 points.
- (c) **Substandard** is the quality of dehydrated apples that fail to meet the requirements of U.S. Grade B.

§52.2344 Determining the Grade.

In addition to considering other requirements outlined in the standards, the following quality factors are evaluated:

- (a) **Factors not rated by score points:**
 - (1) Moisture content.
 - (2) Flavor and odor.
- (b) **Factors rated by score points.** The relative importance of each factor which is scored is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

Factors:	Score Points
Color	20
Uniformity of Size	20
Defects	40
Texture	20
Total Score	100

- (c) The factors of flavor and odor, color, and texture are determined both upon the dehydrated apples and the cooked product as outlined in this subpart.
- (d) **Normal flavor and odor** means that the dehydrated apples and the cooked product have a characteristic flavor and odor that is free from objectionable flavors or objectionable odors of any kind. A flavor and odor in the dehydrated apples indicative of proper sulfur treatment is not considered objectionable.

§52.2345 Determining the Rating for the Factors Which Are Scored.

The essential variations within each factor which is scored are so described that the value may be determined for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive (for example, **17 to 20 points** means 17, 18, 19, or 20 points).

§52.2346 Color.

- (a) **"A" classification.** Dehydrated apples that have a good color may be given a score of 17 to 20 points. **Good color** means that the dehydrated apples have a reasonably uniform, reasonably bright, light yellow to yellow-white characteristic color which upon cooking, is a reasonably bright color typical of cooked dehydrated apples that have been properly prepared and processed.
- (b) **"B" classification.** If the dehydrated apples have a reasonably good color, a score of 14 to 16 points may be given. Dehydrated apples that fall into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). **Reasonably good color** means that the dehydrated apples have a fairly uniform, fairly bright, light yellow-amber or light yellow to yellow white characteristic color and which, upon cooking, may be variable in color but is typical of cooked dehydrated apples that have been properly prepared and processed.
- (c) **"SStd" classification.** Dehydrated apples that fail to meet the requirements of paragraph (b) of this section may be given a score of 0 to 13 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.2347 Uniformity of Size.

- (a) **"A" classification.** Dehydrated apples that are reasonably uniform in size may be given a score of 17 to 20 points. **Reasonably uniform in size** means that the dehydrated apples comply with the requirements of Table I of this paragraph.

**Table I - Uniformity of Size - U.S. Grade A
(Percentage by Weight)**

Sizes	Pie Pieces	Flakes	Wedges	Sauce
Pieces less than 3/4 inch (19 mm) in longest dimension	---	95% or more	---	---
Pieces 3/4 inch (19 mm) or more in longest dimension	75% or more		---	---
Pieces 1 inch (25.4 mm) or more in longest dimension	35% or more	---	95% or more	---
Pieces 3/16 inch (5 mm) or less at greatest thickness	98% or more	98% or more	---	---
Pieces 5/8 inch (16 mm) or less at greatest thickness	---	---	98% or more	---
Pass through No. 4 sieve	10% or less	---	---	---
Pass through No. 8 sieve	5% or less	10% or less	---	10% or less
Pass through No. 16 sieve	---	2% or less	---	2% or less
Pass through 0.446 inch sieve	---	---	---	95% or more

- (b) **"B" classification.** If the dehydrated apples are fairly uniform in size a score of 14 to 16 points may be given. Dehydrated apples that fall into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). **Fairly uniform in size** means that the dehydrated apples comply with the requirements of Table II of this paragraph.

**Table II - Uniformity of Size - U.S. Grade B
(Percentage by Weight)**

Sizes	Pie Pieces	Flakes	Wedges	Sauce
Pieces less than 3/4 inch (19 mm) in longest dimension	---	85% or more	---	---
Pieces 3/4 inch (19 mm) or more in longest dimension	60% or more	---	---	---
Pieces 1 inch (25.4 mm) or more in longest dimension	25% or more	---	85% or more	---
Pieces 3/16 inch (5 mm) or less at greatest thickness	98% or more	98% or more	---	---
Pieces 5/8 inch (16 mm) or less at greatest thickness	---	---	98% or more	---
Pass through No. 4 sieve	15% or less	---	---	---
Pass through No. 8 sieve	5% or less	---	---	---
Pass through No. 16 sieve	---	5% or less	---	5% or less
Pass through 0.446 inch sieve	---	---	---	85% or more

- (c) **"SStd" classification.** Dehydrated apples that fail to meet the requirements of paragraph (b) of this section may be given a score of 0 to 13 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.2348 Defects.

- (a) **Definitions of defects.** The factor of defects refers to the degree of freedom from carpel tissue; from units damaged by pieces of peel, bruises or other discoloration, bitter pit or corky tissue, water core, or damaged by other means; from units damaged by calyxes and stems; and from defects not specifically mentioned as defined in this paragraph.
- (1) **Practically free from carpel tissue.** **Practically free from carpel tissue** means that for each 1-3/4 ounces (49.6 g) of dehydrated apples any carpel tissue that may be present does not exceed in the aggregate an area equal to 1/2 square inch (3.25 cm²).

- (2) **Reasonably free from carpel tissue.** **Reasonably free from carpel tissue** means that for each 1-3/4 ounces (49.6 g) of dehydrated apples any carpel tissue that may be present in the aggregate exceeds an area equal to 1/2 square inch (3.25 cm²) but does not exceed an area equal to 1 square inch (6.5 cm²).
 - (3) **Damaged by pieces of peel.** **Damaged by pieces of peel** means pieces of peel, regardless of color, which in their greatest dimension exceed 1/4 inch (6.35 mm).
 - (4) **Damaged by bruises or other discoloration; bitter pit or corky tissue, water core, and other similar defects.** **Damaged by bruises or other discoloration, bitter pit or corky tissue, water core, and other similar defects** means the appearance or eating quality of the unit is materially affected by such defects.
 - (5) **Damaged by other means.** **Damaged by other means** defects not specifically mentioned which materially affect the appearance or edibility of the piece so damaged.
 - (6) **Damaged by calyxes and stems.** **Damaged by calyxes and stems** means the appearance or eating quality of the unit is materially affected by such defects including portions thereof.
 - (7) **Defects not specifically mentioned.** **Defects not specifically mentioned** include but are not limited to such apple materials as excessive loose seeds or loose stems which are not considered as damaged units and which singly or collectively materially affect the appearance or edibility of the product.
- (b) **"A" classification.** Dehydrated apples that are practically free from defects may be given a score of 34 to 40 points. **Practically free from defects** means that dehydrated apples of any style are practically free from carpel tissue and defects not specifically mentioned and, in addition, the defects present do not exceed the allowances set forth in Table III.
- (c) **"B" classification.** If the dehydrated apples are reasonably free from defects, a score of 28 to 33 points may be given. Dehydrated apples that fall into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). **Reasonably free from defects** means that the dehydrated apples of any style are reasonably free from carpel tissue and defects not specifically mentioned and, in addition, the defects present do not exceed the allowances set forth in Table III.

Table III - Defects

	U.S. Grade A		U.S. Grade B	
Defects:	Pie Pieces Wedges Percent by weight	Flakes Sauce Pieces Percent by weight	Pie Pieces Wedges Percent by weight	Flakes Sauce Pieces Percent by weight
Pieces of Peel Bruises or other discolorations Bitter pit or corky tissue Water core Other similar defects Damaged by other means Calyxes and stems	10%	5%	15%	8%
Provided this maximum is not exceeded: Calyxes and stems	1%	1/2%	2%	1%

- (d) **"SStd" classification.** Dehydrated apples that fail to meet the requirements of paragraph (c) of this section may be given a score of 0 to 27 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.2349 Texture.

- (a) **"A" classification.** Dehydrated apples that have a good texture may be given a score of 17 to 20 points. **Good texture** means with respect to the dehydrated product that the units are brittle; and, upon cooking in accordance with the methods outlined in this subpart, the textures of the respective styles are as follows:
- (1) **Pie pieces; wedges.** The units are reasonably uniform in tenderness and texture; are practically free from any tough (or **leathery**) units; and there is no more than moderate disintegration except for small pieces that may have been present.

- (2) **Flakes.** The units are reasonably uniform in tenderness and texture; are practically free from any tough (or **leathery**) units; and there may be considerable disintegration of the pieces but not to the degree of a grainy applesauce consistency.
 - (3) **Sauce pieces.** The mass has a reasonably uniform texture and finish ranging from that of a coarse, grainy applesauce to a fine, grainy applesauce, practically without any hard particles.
- (b) **"B" classification.** If the dehydrated apples have a reasonably good texture, a score of 14 to 16 points may be given. Dehydrated apples that fall into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). **Reasonably good texture** means with respect to the dehydrated product that the units are brittle; and, upon cooking in accordance with the methods outlined in this subpart, the textures of the respective styles are as follows:
- (1) **Pie pieces; wedges.** The units are fairly uniform in tenderness and texture but moderately free from any tough (or **leathery**) units; and there may be no more than moderate disintegration except for small pieces that may have been present.
 - (2) **Flakes.** The units are fairly uniform in tenderness and texture but moderately free from any tough (or **leathery**) units; and the pieces may have become disintegrated to the degree of a grainy applesauce consistency.
 - (3) **Sauce pieces.** The mass has a fairly uniform texture and finish ranging from that of a coarse, grainy applesauce to a fine, grainy applesauce; and hard particles may be noticeable but not objectionable.
- (c) **"SStd" classification.** Dehydrated apples that fail to meet the requirements of paragraph (b) of this section may be given a score of 0 to 13 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.2350 Explanations of Methods and Analyses.

- (a) **Moisture method.** **Moisture** in dehydrated apples is determined in accordance with the official method applicable to dried fruits as outlined in the **Official Methods of Analysis of the Association of Official Analytical Chemists**.

(b) **Cooking procedures.** A representative sample of not less than 2 ounces avoirdupois (about 55 g) to approximately 4 ounces avoirdupois (about 110 g) is recommended for purposes of the cooking procedures in this paragraph. The procedures for cooking to determine compliance with requirements for color and texture are as follows for the respective styles:

- (1) **Pie pieces.** Add 1 part, by weight, of pie pieces to 6 parts, by weight, of water just below the boiling point; cover, bring to a boil, and simmer for 20 minutes.
- (2) **Flakes.** Add 1 part, by weight, of the flakes to 5 parts, by weight, of water just below the boiling point; cover, bring to a boil, and simmer for 15 minutes.
- (3) **Wedges.** Add 1 part, by weight, of the wedges to 6 parts, by weight, of water just below the boiling point; cover, bring to a boil, and simmer for 30 minutes.
- (4) **Sauce pieces.** Add 1 part, by weight, of the sauce pieces to 8 parts, by weight, of water just below the boiling point; cover, bring to a boil, and simmer for 15 minutes.

(c) **Sifting methods.** The technique for determining compliance with the requirements for pieces that pass through U.S. Standard No. 4, No. 8, and No. 16 sieves is as follows:

- (1) **Pie pieces.**
 - (i) From a 4 ounce (about 110 g) representative sample of dehydrated apple **pie pieces**, remove all pieces which are 3/4 inch (19 mm) or more in their longest dimension;
 - (ii) Place the remainder of the sample on a U.S. Standard No. 4, 8 inch (20.3 cm) diameter, full-height sieve nested on top of a U.S. Standard No. 8, 8 inch (20.3 cm) diameter, full-height sieve to which a bottom pan has been attached;
 - (iii) Place the assembly on a smooth level surface and with a steady, fairly rapid sieving motion, move the assembly approximately 20 inches (50 cm) in a straight line and return to its original position, repeating the movement 20 times;

- (iv) Weigh the fine material sifted through to the bottom pan and calculate on the basis of the original sample (under subdivision (i) of this subparagraph) as the percentage which passed through the No. 8 sieve; and
- (v) Weigh the material sifted through the No. 4 sieve and remaining on the No. 8 sieve; calculate on the basis of the original sample (under subdivision (i) of this subparagraph) and add the percentage which remained on the No. 8 sieve to the percentage which passed through the No. 8 sieve (under subdivision (iv) of this subparagraph) as the total percentage which passed through the No. 4 sieve.

(2) Flakes.

- (i) From a 4 ounce (about 110 g) representative sample of dehydrated apple **flakes** remove all pieces which are 3/4 inch (19 mm) or more in their longest dimension;
- (ii) Place the remainder of the sample on a U.S. Standard No. 8, 8 inch (20.3 cm) diameter, full-height sieve nested on top of a U.S. Standard No. 16, 8 inch (20.3 cm) diameter, full-height sieve to which a bottom pan has been attached;
- (iii) Place the assembly on a smooth level surface and with a steady, fairly rapid sieving motion, move the assembly approximately 20 inches (50 cm) in a straight line and return to its original position, repeating the movement 20 times;
- (iv) Weigh the fine material sifted through to the bottom pan and calculate on the basis of the original sample (under subdivision (i) of this subparagraph) as the percentage which passed through the No. 16 sieve; and
- (v) Weigh the material sifted through the No. 8 sieve and remaining on the No. 16 sieve; calculate on the basis of the original sample (under subdivision (i) of this subparagraph) and add the percentage which remained on the No. 16 sieve to the percentage which passed through the No. 16 sieve (under subdivision (iv) of this subparagraph) as the total percentage which passed through the No. 8 sieve.

(3) Sauce pieces.

- (i) From a 4 ounce (about 110 g) representative sample of dehydrated apple **sauce pieces** remove all pieces which in their smallest dimensions will not pass readily through 0.446 inch (11.3 mm) square openings by gentle hand pressing;
- (ii) Place the remainder of the sample on a U.S. Standard No. 8, 8 inch (20.3 cm) diameter, full-height sieve nested on top of a U.S. Standard No. 16, 8 inch (20.3 cm) diameter, full-height sieve to which a bottom pan has been attached;
- (iii) Place the assembly on a smooth level surface and with a steady, fairly rapid sieving motion, move the assembly approximately 20 inches (50 cm) in a straight line and return to its original position, repeating the movement 20 times;
- (iv) Weigh the fine material sifted through to the bottom pan and calculate on the basis of the original sample (under subdivision (i) of this subparagraph) as the percentage which passed through the No. 16 sieve; and
- (v) Weigh the material sifted through the No. 8 sieve and remaining on the No. 16 sieve; calculate on the basis of the original sample (under subdivision (i) of this subparagraph) and add the percentage which remained on the No. 16 sieve to the percentage which passed through the No. 16 sieve (under subdivision (iv) of this subparagraph) as the total percentage which passed through the No. 8 sieve.

§52.2351 Determining the Grade of a Lot.

The grade of a lot of dehydrated apples covered by these standards is determined by the procedures set forth in the Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products (§§ 52.1 through 52.83).

§52.2352 Score Sheet.

Size and kind of container			
Container mark or identification			
Label (including SO ₂ content, if any)			
Net weight			
Moisture content (percent)			
Style			
Factors		Score points	
Color	20	"A"	17-20
		"B"	14-16 <u>1/</u>
		"SStd"	0-13 <u>1/</u>
Uniformity of Size	20	"A"	17-20
		"B"	14-16 <u>1/</u>
		"SStd"	0-13 <u>1/</u>
Defects	40	"A"	34-40
		"B"	28-33 <u>1/</u>
		"SStd"	0-27 <u>1/</u>
Texture	<u>20</u>	"A"	17-20
		"B"	14-16 <u>1/</u>
		"SStd"	0-13 <u>1/</u>
Total Score		100	
Normal flavor and odor			
Grade			

1/ Limiting rule.

Dated: June 23, 1977

Irving W. Thomas _____
Acting Deputy Administrator
Commodity Services, FSQS