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Division

Processed
Products
Branch

Tomato Juice Grading Manual

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

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DESCRIPTION OF THE PRODUCT

Tomato Juice

Tomato juice, as defined by FDA, is the unfermented, unconcentrated liquid extracted from mature tomatoes of red or reddish varieties, with or without scalding followed by draining. In the extraction of such liquid, heat may be applied by any method which does not add water thereto. Such liquid is strained free from skins, seeds, and other coarse or hard substances but contains finely divided insoluble solids from the flesh of the tomatoes. Such liquid may be homogenized, may be seasoned with salt, and may be acidified with any safe and suitable organic acid. The juice is preserved by heat sterilization (canning or aseptic process), refrigeration, or freezing. When sealed in a container to be held at ambient temperatures, it is so processed by heat, before or after sealing, as to prevent spoilage.

Tomato Juice from Concentrate

FDA defines this juice as one that has been concentrated and later reconstituted with water and/or tomato juice to a tomato soluble solids content of not less than 5.0% by weight. The juice may be seasoned with salt, may be acidified with any safe and suitable organic acid. The juice is preserved by heat sterilization (canning or aseptic process), refrigeration, or freezing. When sealed in a container to be held at ambient temperatures, it is so processed by heat, before or after sealing, as to prevent spoilage.

Concentrated Tomato Juice: Identity and Grading

"Concentrated tomato juice" means the product prepared from clean, sound, whole tomatoes of the red or reddish varieties as such product is defined in the Standard of Identity for Tomato Concentrates issued under the Federal Food, Drug, and Cosmetic Act. The product contains not less than 20.0 percent but less than 24.0 percent of tomato soluble solids.

This product may be designated either as puree or concentrated tomato juice. However, if the product is primarily packed as concentrated tomato juice (other than no salt added) the percent of salt will probably be appreciably greater than that ordinarily present in tomato puree which is generally packed unsalted. In addition, the finisher screen size used to make concentrated tomato juice is generally smaller (.020" or .027") than for puree (.033" or .045").

The product is concentrated under vacuum, the remainder of the process being similar to that for ordinary tomato juice. For beverage use it is usually diluted with water in the ratio of three parts of water to one part of concentrate.

Except for the requirements as to the concentration, the product is graded after reconstitution. The standards for concentrated tomato juice, after reconstitution, are the same as tomato juice from concentrate.

Therefore, the instructions listed herein are applicable to the grading of all three products (tomato juice, tomato juice from concentrate, and concentrated tomato juice).

Solids Content

Note in the above definitions that water added to single strength tomato juice during processing in amounts other than would be expected using good commercial practice, is not permitted and that its inclusion -- by any means or at any stage -- is basis for regarding the product as being in violation of the Food and Drug Standard of Identity for Tomato Juice.

FDA has set the minimum tomato soluble solids (TSS) for "tomato juice from concentrate" at 5.0% by weight (excluding any added salt but including the naturally occurring salt). There is no minimum TSS for single strength tomato juice, set either by FDA or USDA. Because of proper "labeling" directives by FDA, under lot inspection, one would know whether a product offered for inspection is "tomato juice" (single strength) or "tomato juice from concentrate." Grade the product that it is offered for---either tomato juice or tomato juice from concentrate.

The methods referenced for sucrose and salt determination are contained in File Code 135-A-3, Brix Measurement, and File Code 135-A-19, Determination of Salt Content in Processed Foods. For sample preparation, follow the procedure in the tomato products handbook "Methods of Analyses for Tomato Products-- Solids Content Determinations."

For tomato juice from concentrate and concentrated tomato juice with added salt, an additional step is needed. Subtract the percentage of sodium chloride found from the percent of tomato soluble solids found (percent sucrose from the refractive index tables) and multiply the difference by 1.016. The resultant value is considered the percent of "Tomato Soluble Solids."

Seasoning

The only seasoning permitted in tomato juice and tomato juice from concentrate is salt. Any other ingredient which would be added as a flavoring or spicing agent would render the product in violation of the FDA Standard of Identity for Tomato Juice and Tomato Juice from Concentrate and would be so designated and reported. However, the juice may be acidified with any safe and suitable organic acid. Tomato concentrates (21 CFR §155.191) include tomato puree, tomato paste and concentrated tomato juice. Tomato juice from concentrate may be made from any of these 3 tomato products. However, be guided by the following chart as to end product status (whether grade-assignable or N.A.G.) when optional permissible ingredients under FDA are used.

TABLE I

STATUS	PRODUCT	SOLUBLE SOLIDS CONTENT	OPTIONAL INGREDIENTS
May be assigned a grade	Tomato juice (single strength)	N/A	Salt, Organic acid(s)
	Tomato juice from concentrate	5.0 percent by weight (minimum)	
No applicable grade (N.A.G.)	Tomato juice (single strength)	N/A	Lemon juice, Concentrated lemon juice, Sodium bicarbonate, Spices, Flavoring
	Tomato juice from concentrate	5.0 percent by weight (minimum)	
May be assigned a grade	Tomato concentrates:		Salt, Organic acid(s), Lemon juice, Concentrated lemon juice, Sodium bicarbonate, Water (to adjust final composition), Spices,* Flavoring*
	1. Puree	8.0 or more but less than 24.0 percent	
	2. Paste	24.0 percent minimum	
	3. Concentrated tomato juice	20.0 or more but less than 24.0 percent	

* Not permitted in concentrated tomato juice.

Homogenization

Under the Standard of Identity, homogenization is permitted. Pressures of 400 to 1,400 pounds per square inch are used. This tends to break up the suspended solids and retards or prevents settling or separation.

It also produces a heavier body and a smoother texture in the juice, so that homogenized juice gives a somewhat different taste sensation than unhomogenized juice.

PROCESSING PRACTICES

Preparation

Green or over-ripe fruit will adversely affect the color and/or flavor. Careful sorting or trimming of the raw product is essential to the production of high quality juice. Stems and other extraneous vegetable materials are eliminated as such materials impart a bitter flavor and may cause a brownish or grayish/brown coloring.

Care is exercised in the extraction of the juice from the tomatoes so that the pulp, seeds, and peel are not expressed to the point where the color and flavor of the juice are adversely affected. Elimination of seed particles is important since their presence in excessive amounts may cause the juice to have an inferior, somewhat bitter taste.

Washing and draining of the tomatoes should:

1. Clean the fruit of mud, sand, silt or similar material.

2. Remove residue of organic insecticides and/or pesticides.

3. Remove small surface insects and minimize contamination from fly egg and other related infestation.

4. Remove much of the loose extraneous material which may be present.

In a typical process for preparing tomatoes for juice extraction, the tomatoes are first dumped into soak tanks of running water to which chlorine and/or a detergent or wetting agent is continuously replenished. Regularly scheduled cleanup of mud buildup in the bottom of the soak tanks or water troughs will help minimize or eliminate objectionable odor from these tanks or troughs.

The tomatoes are then conveyed through several high pressure sprays and final rinsings to sizing belts (if running concurrently with canned tomatoes), sorting belts, and trimming belts. During the operation, agitation or use of some type of roller belts which continually turn the tomatoes to insure thorough washing of all surfaces of the raw product is encouraged. Once the tomatoes reach the sorting and trimming belts, special attention is given to:

1. Careful sorting and effective trimming which produces a better over-all raw product.

2. Elimination of rotted portions of tomatoes and reduction of defective portions of tomatoes.

3. Elimination of worm or insect-damaged tomatoes. (This decreases the possibility of finding insect fragments in routine light filth analyses).

4. Elimination of foreign materials and debris that could ruin the equipment (augers, choppers, etc.) or affect product safety/wholesomeness.

Crack-resistant varieties of tomatoes have been developed which reduce the extent of invasion by mold, bacteria, and insects into the flesh of the fruit, thus contributing to the control of these "undesirables." A greater degree of wholeness also improves yield by reducing losses during washing, trimming and sorting.

Mechanical harvesting has influenced the development of varieties which will ripen at approximately the same time and show good resistance to mechanical injury.

Extraction

Following these preliminary operations, the tomatoes are conveyed to a chopper and after chopping are usually preheated and extracted.

Industry experience has indicated that preheating of tomatoes before extraction is desirable from the standpoint of flavor, color, and "body." There is less tendency for the solids to separate on standing when the juice is extracted from preheated tomatoes.

The temperature to which the tomatoes are subjected in the hot-break generally range from about 160° F to 210° F. Temperatures in excess of 210° F have been noted.

Retention of Vitamin C may be obtained either with a hot-break or cold break (no preheat) but high retention is easier to obtain with the cold-break since Vitamin C is lost more rapidly at high temperatures when air is present; consequently, it is important to handle juice promptly if a hot-break is used. With the hot-break, a higher yield is obtained. Packers who recover seed for future planting obviously must use a cold-break.

Several models of extractors are used but preference is given to types which "press" the juice from the pulp rather than using a churning or agitating action which incorporates air into the juice.

Typical extractors have worm conveyors within a cylindrical or truncated conical screen. Extraction is frequently achieved in two stages; in the first stage, the chopped tomatoes are pressed through a screen having 0.040 to 0.060 inch openings, this being followed by pressing or screening through a second "finisher" having 0.020 to 0.027 inch openings.

The extractors can be adjusted to vary the yield of juice and can also be used as "regulators of quality." The average desired yield of tomato juice is about 70 percent (hot break) since higher yields tend to reduce the quality.

The residue, especially with low yield extraction, is rather moist and is often re-extracted for use in the manufacture of other tomato products such as puree, sauce, or catsup. If this is done, the product must be labeled to show the use of such residual material from partial extraction of juice as required under Food and Drug regulations.

Deaeration

Deaeration is the removal of occluded or dissolved air and is accomplished by subjecting the cold or slightly-warm tomatoes or tomato juice to a vacuum of 25 to 26 inches. Deaeration is instrumental in preventing oxidation of tomato constituents. With efficient and complete removal of air, tomatoes can be held at high temperatures with no substantial loss of Vitamin C. Color and flavor are also protected by deaeration, although this effect is not so marked. Deaeration should be done as soon as possible after the tomatoes are crushed.

For practical reasons, deaeration is usually effected immediately after extraction of the juice. Deaeration is frequently used after pasteurization or presterilization of the juice to prevent foaming at the filler, and, in the event of high-temperature presterilization, to cool the juice to filling temperature.

At this stage, since the juice is hot, a vacuum of 10 to 15 inches is briefly applied to the juice before it goes to the fillers. All delivery pipes to fillers or holding tanks should extend below the surface of the juice where possible to minimize reaeration.

Seasoning

Salt is usually added to the juice, either by the batch method in salting tanks, by continuous dry-salting, or to the individual cans by means of salt tablets or dry salt dispensers.

The quantity of salt usually added is from 4 to 6 pounds per 100 gallons of juice (0.5 to 0.7 percent) or an equivalent amount per can.

Filling

Filling machines are adjusted to give a practically full can. The label should state the contents in liquid measure, generally fluid ounces.

Good practical "fills" are necessary in order to meet the legal fill requirements and to prevent excessive headspace which would result in impairment of flavor and color. Excessive headspace would also increase the extent of attack on metal containers. Headspace is generally reported in units of 1/32 inch rather than 1/16 inch.

INSPECTION OF THE PRODUCT

General

Before assigning a United States grade to any processed food product every reasonable effort should be made to be sure that the food is clean and not in violation of any regulation of the Food and Drug Administration.

It is important to be familiar with the various microanalyses required for tomato products as well as their sampling rates.

The criteria for these examinations are explained in detail under the "Methods of Analyses for Tomato Products."

Inspection Equipment

The following list comprises minimum equipment and supplies needed for the inspection of tomato juice:

1) Scale --(graduated to 0.1 ounces)

2) Vacuum gauge

3) Headspace gauge

4) Can opener

5) Two flat white grading trays approximately 12 x 18 inches (See further instructions under the scoring of defects)

6) Approved grading light source. (See further instructions under Color)

7) Graduated glass cylinder (250 mL capacity with graduations of 2 mL)

8) Ruler

9) Beaker, Griffin, low form, 600mL, graduated

10) Certified volumetric flask(s) calibrated in fluid ounces at 20°C

11) Supplies, other than inspection equipment:

    a) A folder containing this grading manual and any supplemental instructions on the product or related subject; United States Standards for Grades of Tomato Juice.

b) Inspection papers, such as Application for Inspection, contract instructions, score sheets, and applicable work sheets for preparing certificates for typing.

In addition, the following equipment which is listed in detail in other instructions will be needed:

1) Refractometer, filter paper, etc. (See Methods of Analyses -- Solids Content Determinations)

2) Mold Counting equipment (See Methods of Analyses -- Mold Count). Also, see File Code 135-A-6 and 135-A-8.

3) Insect fragment counting equipment (See Methods of Analyses -- Light Filth). This analysis is done only per applicant's request.

4) Fly egg and maggot counting equipment. (See Methods of Analyses -- Fly Egg & Maggot Determination)

5) One liter beaker. Although not a common occurrence, inspectors are cautioned to be alert to the presence of sand or similar inorganic matter in tomato juice. (See Methods of Analyses -- Sand and Inorganic Residue)

Fill of Container
(See File Code 128-A-40)

Fill of container is not a factor of quality. Because different approaches are utilized in processing and sterilizing the juice and containers, the in-going temperature of the product may be quite variable. The degree of filling of containers is directly related to this in-going temperature.

It is recommended that each container of tomato juice be filled as full as practicable without impairment of quality, and that the product occupy not less than 90 percent of the water capacity of the container. Label volume for tomato juice is declared in fluid ounces net contents.

The formula for determining the volume (U.S. fluid ounces) of tomato juice at 20° C from the avoirdupois weight is as follows:

$$\text{U.S. fluid ounce} = \frac{\text{Avoirdupois ounces X 0.9614}}{\text{Specific gravity @ 20° C}}$$

Example:

One No. 3 cyl. can of tomato juice weighs 49.2 oz. avoir.

Refractive index = 1.3415 @ 20° C
(See "Methods of Analyses for Tomato Products, Solids Content Determinations")

Sp. gr. = 1.02309 @ 20° C
(See "Methods of Analyses for Tomato Products, Solids Content Determinations")

$$\frac{(49.2)\ (0.9614)}{1.02309} = 46.2333 \text{ or } 46.2 \text{ U.S. fl. oz. at } 20°C$$

In addition to this formula, conversion tables (avoirdupois ounces to fluid ounces) have been developed and can be found in the appendix section of this instruction. These tables cover the following more common can sizes:

Table	Can Size	
1	6Z (202 x 308)	5-1/4 to 5-1/2 U.S. fl. oz.
2	8Z (211 x 300)	7 U.S. fl. oz.
3	300 (300 x 407)	13.5 U.S. fl. oz.
4	303 (303 x 406)	15 U.S. fl. oz.
5	2 (307 x 409)	18 U.S. fl. oz.
6	3 cyl. (404 x 700)	46 U.S. fl. oz.
7	10 (603 x 700)	96 U.S. fl. oz.

These tables cover a refractive index range from 1.3392 to 1.3440. In calculating the individual value, .05 to .09 fluid ounces were increased to the nearest 0.1, values less than .05 were dropped.

These tables are intended to be used as guides in determining fill of containers on routine inspection matters.

In the event individual containers fall below the declared net contents it is advisable to verify these low fills by using a certified volumetric flask which is calibrated in fluid ounces and contains capacity tolerances conforming to specifications of the National Bureau of Standards. This measurement of capacity should be determined only when the contents of the containers have attained a temperature of 20° C.

Steps for using conversion tables:

(1) Record the can size and net weight of the sample unit (nearest 0.1 avdp. ounce).

(2) Determine the Refractive Index of the juice @ 20° C.

(See "Methods of Analyses - Solids Content Determinations." Normally tomato juice does not require filtering before taking a reading from refractometer; however, correct temperature is essential).

(3) Use the table for the appropriate can size.

(4) In the table, under the heading "Net Weight", find the weight of the sample unit. Also, under the heading "Refractive Index @ 20° C" find the reading for the sample unit.

(5) By reading across from left to right from the "Net Weight" of the sample unit and down from the "Refractive Index", determine where these two columns intersect.

(6) Blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value. See footnote in tables.

EXAMPLE 1

A 6 ounce can weighs 5.6 ounces (avoirdupois) with a refractive index of 1.3400 @ 20° C. The volume of the sample unit in U.S. fluid ounces is 5.3.

EXAMPLE 2

A 6 ounce can weighs 5.8 ounces (avoirdupois) with a refractive index of 1.3397 @ 20° C. The volume of the sample unit in U.S. fluid ounces is 5.5. (Note on the chart that the refractive index is not shown as it falls between 1.3396 and 1.3398. The vertical line between these two readings represents 1.3397 (intermediate refractive index)).

COLOR

General

Color is one of the most important factors in evaluating the quality of tomato juice.

Accurate color determination is dependent upon proper lighting, correct equipment, good technique and normal color perception.

Color of tomato juice is evaluated after the product has been stirred or mixed without incorporation of air and before it has had a chance to separate or settle out.

Red Tomato Juice Color

The amount of red in tomato juice is determined by comparing the color of the product with that produced by spinning a combination of the following Munsell color discs:

Disc 1 -- Red (5 R 2.6/13) (glossy finish)
Disc 2 -- Yellow (2.5 YR 5/12) (glossy finish)
Disc 3 -- Black (N 1) (glossy finish)
Disc 4 -- Grey (N 4) (mat finish)

Such comparison is made under a diffused light source approximately that of daylight under a moderately overcast sky, and a color temperature of 7500 degrees Kelvin $\pm$ 200 degrees.

With the light source over the disc and product, observation is made at an angle of 45 degrees from a distance of about 24 inches from the product.

The Macbeth-Munsell Disc Colorimeter has been developed for grading tomato products under artificial lighting conditions closely approximating the above specifications.

Grade A Color

Grade A color is typical of tomato juice made from wholesome, well-ripened red tomatoes and which has been properly prepared and processed.

Such color must contain as much or more red than that produced by spinning the specified Munsell color discs in the following combinations:

(1) 65 percent of Disc 1
(2) 21 percent of Disc 2
(3) Remaining 14 percent is made up of Disc 3 or Disc 4, or 1/2 (7%) Disc 3 and 1/2 (7%) Disc 4 - whichever most nearly matches the appearance of the product.

Color evaluation can be made against these discs or against approved plastic discs of equivalent color. The score range for Grade A tomato juice is 26 to 30 points.

Use of electronic color meters

Values that may be used for conversion to a numerical score point color evaluation of the product may be determined by any electronic color meter system approved by the United States Department of Agriculture.

The values derived with the approved electronic color meter system shall be resolvable into a calculated numerical score point by use of any appropriate conversion formula that has been approved by the USDA.

Grade B Color -- 25 Points

Under the current standards, it is possible to give tomato juice color a "special category" score of 25 points.

Tomato juice will be assigned 25 score points when the juice does not possess as much red as that specified for Grade A color but does contain as much red, or more red, than that produced when spinning Munsell color discs in the following combinations:

(1) 59 percent of Disc 1
(2) 24-1/2 percent of Disc 2
(3) (Remaining 16-1/2 percent is made up of Disc 3 or Disc 4), or 1/2 (8-1/4%) of Disc 3 and 1/2 (8-1/4%) of Disc 4 - whichever most nearly matches the appearance of the product.

Tomato juice assigned this score for the factor of color can be graded A, provided all other criteria are met and that the total score for the product is not less than 85 points. This is a partial limiting rule. Such a provision permits tomato juice of slightly inferior color, but with very few defects and good flavor, to be Grade A.

Grade B Color -- 23 or 24 Points

Tomato juice which possesses as much or more red than that produced when spinning Munsell color discs of the following combinations:

(1) 53 percent of Disc 1
(2) 28 percent of Disc 2
(3) (Remaining 19 percent is made up of Disc 3 or Disc 4), or 1/2 (9-1/2%) of Disc 3 or 1/2 (9-1/2%) of Disc 4 - whichever most nearly matches the appearance of the product.

It shall not be graded above Grade B regardless of the total score. It must be typical of tomato juice and possess a "reasonably good color."

Substandard Color

Any color which is definitely "off" or which possesses less red than that specified for Grade B above shall not be graded above Substandard regardless of the total score.

Any juice which has been improperly prepared or processed is subject to impaired color -- generally because of excessive or prolonged heating.

CONSISTENCY

General

Since the FDA Standard of Identity specifically refers to finely divided insoluble solids which may be present in tomato juice, we consider that such particles will be present in all tomato juice to a greater or lesser degree.

Since these particles are insoluble and generally slightly heavier than the liquid in which they are suspended, there is a tendency for them to separate out. Of value in preventing such separation is the process of homogenization which breaks down these solids into smaller particles, thereby providing better and easier suspension of the insoluble solids throughout the liquid.

The process used in the extraction of the juice (i.e., hot break or cold break) will cause a variation in the consistency. The "hot break" seems to be effective in producing tomato juice of more uniform consistency. The degree of consistency is the prime factor in controlling the "body" of the juice; "body" being of principal concern among packers, buyers, and distributors of tomato juice.

Since consistency has reference to the viscosity of the product and the tendency for insoluble solids to separate, both factors must be considered when evaluating this factor. Consistency is scored after stirring, shaking or mixing the contents and evaluating the appearance of the juice on a 12" x 18" grading tray.

At a temperature of approximately 20°C, note the degree of viscosity, amount of insoluble tomato solids in suspension, and any tendency towards separation. If more than a very slight separation is observed, pour a 150 mL sample of the juice into a graduated glass cylinder (250 mL capacity with graduation of 2 mL) and permit the product to settle.

The degree of separation is noted after the product has been allowed to settle for 15 minutes. The amount of separation is measured at the end of this time. If this amount of practically clear liquid at the top of the juice is 4 mL (2 divisions of the graduate) or less, the juice is considered as possessing little tendency for separation. If, at the end of 15 minutes, the height of clear liquid is greater than 4 mL but not greater than 10 mL, the juice will be considered as being in the Grade B range for consistency.

Tomato juice possessing only "reasonably good consistency" is permitted in Grade A, provided all other criteria are met and the product scores not less than 85 points (this is a partial limiting rule).

Tomato juice which fails the requirements for "reasonably good consistency" is classed as Substandard for this factor and shall not be graded above Substandard regardless of the total score for the product.

Many packers and/or buyers are greatly concerned with the viscosity or "rate of flow" of the juice. This viscosity (or "body") is dependent upon many factors and personal choice provides the basis by which either thin, medium, or heavy "bodied" juice is bought.

Buyer specifications often include a measurement of this "rate of flow" by means of some designated method. If packers and/or buyers request viscosity measurements and the necessary equipment is available, such requests will be honored and the results appropriately reported.

An example of a device used to measure the gross viscosity of products such as tomato juice (and fruit juices, drinks and nectars) is the Capillary Viscometer as described by Lamb and Lewis of the National Canners Association (now the National Food Processors Association).

A measurement of the viscosity by mechanical means such as the Lamb and Lewis Capillary Viscometer does not classify the quality of the juice. Such measurements may be considered, but are not the determining basis, for assigning the numerical score points for the factor of consistency in tomato juice.

Score Points for the Factor of Consistency

Grade A -- 13 to 15 Points

- -- Flows readily but is not "gummy" or "watery"
- -- has normal amount of suspended solids
- -- Has little tendency to separate -- not more than 4 mL of clear liquid when tested by the method described in this section.

Grade B -- 10 to 12 Points

- -- meets requirements of Grade A except may show as much as 10 mL of free liquid when tested by the method described in this section.

DEFECTS

General

This factor refers to the degree of freedom from such defects as dark specks or scale-like particles, seeds, particles of seed, peel, core material or other similar substances not specifically mentioned.

Since tomato juice is normally extracted from whole, clean, sound tomatoes of the red or reddish varieties, defects which might arise from the use of residual materials or trimmings from the canning of peeled tomatoes will not be present to any great degree. Also, the tomatoes are usually expressed for juice to only a limited degree. This partial extraction is helpful in preventing introduction of defects of peel, core material, seeds, seed particles or extraneous vegetable material.

Often times, broken finishing screens, unclean equipment (such as preheaters, sterilizers, fillers, pumps, pipes, etc.) or improper processing (burnt coil) are responsible for the presence of many defects such as dark specks, flakes, seeds, peel, or scale-like particles.

Sampling

In evaluating for absence of defects, it is important that the sample unit be representative and that it be thoroughly mixed just prior to examination.

The container lid should be completely removed so that the interior surface of the container may be examined for such defects as severe etching, oxidation or tin plate deterioration. This also permits observation of large scale-like flakes or other heavy particles which have gravitated to the bottom of the container that would possibly not be otherwise noted.

A sample unit of 500 mL is examined when scoring for absence of defects. It is desirable that two 12" x 18" white grading trays be used and that an aliquot of 250 mL be poured into each tray.

Afther extracting 500 mL for the sample unit, the entire contents should be emptied and the container bottom and walls examined for condition and large scale-like flakes.

Evaluation

When the sample has been poured onto the trays it is evaluated for defects in accordance with the following classifications and allowances:

This guide classes the various defects by color, size, type, and further indicates the number of each allowed in the various grades.

QUALITY FACTOR	COLOR, TYPE OR SIZE	Minor	Major	Severe
DEFECTS	Light brown specks, peel or seed particles			
	1/16 to 1/8th inch		X	
	Larger than 1/8th inch			X
	Dark brown or black specks			
	less than 1/32 inch	X		
	1/32 to 1/16th inch		X	
	Larger than 1/16th inch			X

Acceptance/Rejection Numbers for Various Defect Classifications

GRADE	DEFECT CLASSIFICATION			
	Severe	Major	Total	Whole Seed Tolerance
	AC RE	AC RE	AC RE	
A	1 2	4 5	8 9	Not more than 1 whole seed per 500 mL
B	2 3	8 9	16 17	Not more than 3 whole seeds per 500 mL

AC: Acceptance numbers
RE: Rejection numbers

NOTE: Whole seed tolerance stands on its own.

Evaluation -- continued

Following is a guide which may be used in regulating score points in relation to the number and type of defects found in the sample:

Severe	Major	Minor/Total	No. of Seeds/500 mL	Points	
0	0	2	0	15	
0	2	6	0	14	A
1	4	8	1	13	
1	4	10	1	12	
1	6	12	2	11	B
2	8	16	3	10	

The most severe defect(s) limits the score.

Example: 1 severe and 3 minor = 13 points

2 severe, 2 major, & 6 minor = 10 points

In the event a sample (500 mL) contains a sizeable amount of peel, seed particles, or light brown specks (less than 1/16th inch) it is permissible to lower the grade based on the overall appearance.

The purpose of these guides is to lend objectivity in evaluating for absence of defects. Compliance with the allowances, however, does not supplant the requirements in the U.S. Standards that:

- In Grade A: "Any combination of defects present do not more than slightly affect the appearance or drinking quality of the product."

- In Grade B: "Any defects present may not seriously affect the appearance or drinking quality of the product."

FLAVOR AND ODOR

Among the reasons for the differences in flavor of tomato juice are:

(1) Quality of raw product, variety, area of production, ripeness, efficiency of sorting, length of storage, leaf and stem material;

(2) Degree of extraction;

(3) Type of "break";

(4) Process and storage conditions.

Conditions which tend to degrade flavor are:

(1) Excessive cracks and other similar defects which are not removed;

(2) Excessive extraction which crushes seeds, cores, stems, etc.; overheating and stack burning.

Taste the juice and classify as follows:

Grade A Flavor -- 33 to 40 Points

-- Distinct and characteristic of good quality tomato juice.

Grade B Flavor -- 27 to 32 Points

-- Characteristic of tomato juice.

-- Adversely affected but not seriously so by the flavor imparted by stems, leaves, crushed seeds, cores, immature tomatoes, improper trimming or processing (Keeping the juice too long in holding/mixing tanks prior to canning could give a slight "sour" taste and odor).

APPENDIX

TABLE I
6 oz. (202 x 308) can

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

NET WEIGHT (AVDP. OZ.)	REFRACTIVE INDEX AT 20°C																								
	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
5.2	4.9																								
5.3	5.0																								X 4.9
5.4	5.1																					5.0			
5.5	5.2																			X 5.1					
5.6	5.3																5.2								
5.7	5.4														5.3										
5.8	5.5												5.4												
5.9	5.6										X 5.5														
6.0	5.7								5.6																
6.1	5.8						5.7																		
6.2	5.9					X 5.8																			

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 2
8 oz. (211 x 300) can

NET WEIGHT (AVDP. OZ.)	REFRACTIVE INDEX AT 20°C																								
	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
6.6	6.2																								
6.7	6.3																								
6.8	6.4																								X 6.3
6.9	6.5																						X 6.4		
7.0	6.6																				6.5				
7.1	6.7																		6.6						
7.2	6.8																6.7								
7.3	6.9															X 6.8									
7.4	7.0													X 6.9											
7.5	7.1											7.0													
7.6	7.2										X 7.1														
7.7	7.3								7.2																
7.8	7.4							X 7.3																	
7.9	7.5					7.4																			
8.0	7.6				7.5																				
8.1	7.7			X 7.6																					
8.2	7.8	7.7																							
8.3	7.8																								7.7
8.4	7.9																							X 7.8	
8.5	8.0																						7.9		

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 2A
No. 211 cyl. (211 x 414) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
11.8	11.2		X11.1																	X11.0					
11.9	11.3	X11.2																11.1							
12.0	11.3																11.2								
12.1	11.4																X11.3								
12.2	11.5														11.4										
12.3	11.6													11.5											
12.4	11.7													X11.6											
12.5	11.8											11.7													
12.6	11.9										11.8														
12.7	12.0										X11.9														
12.8	12.1								12.0																
12.9	12.2								X12.1															12.0	
13.0	12.3							X12.2															12.1		
13.1	12.4						X12.3															12.2			
13.2	12.5						X12.4														12.3				
13.3	12.6				12.5															12.4					
13.4	12.7			12.6															12.5						
13.5	12.8			X12.7														12.6							
13.6	12.9		X12.8														12.7								
13.7	13.0	X12.9															X12.8								
13.8	13.0															X12.9									
13.9	13.1														X13.0										
14.0	13.2													X13.1											

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 3
No. 300 (300 x 407) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
13.6	12.9		X 12.8														12.7								
13.7	13.0	X 12.9															X 12.8								
13.8	13.0															X 12.9									
13.9	13.1														X 13.0										
14.0	13.2													X 13.1											
14.1	13.3												X13.2												
14.2	13.4											13.3													
14.3	13.5										13.4														
14.4	13.6										X 13.5													13.4	
14.5	13.7								13.6															X 13.5	
14.6	13.8								X 13.7														X 13.6		
14.7	13.9							X 13.8														13.7			
14.8	14.0						13.9														13.8				
14.9	14.1					14.0														X 13.9					
15.0	14.2					X 14.1													14.0						
15.1	14.3				X 14.2													14.1							
15.2	14.4			14.3													14.2								
15.3	14.5		14.4														X 14.3								
15.4	14.6		X14.5													X14.4									

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 4
No. 303 (303 x 406) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
15.0	14.2					X 14.1													14.0						
15.1	14.3				14.2													14.1							
15.2	14.4			14.3													14.2								
15.3	14.5			X 14.4													X 14.3								
15.4	14.6		X 14.5													X 14.4									
15.5	14.7	14.6													14.5										
15.6	14.7													14.6											
15.7	14.8													X 14.7											
15.8	14.9												14.8												
15.9	15.0											14.9													X 14.8
16.0	15.1										15.0													X 14.9	
16.1	15.2										X 15.1												X 15.0		
16.2	15.3									X 15.2												15.1			
16.3	15.4								15.3												15.2				
16.4	15.5							15.4													X 15.3				
16.5	15.6							X 15.5												X 15.4					
16.6	15.7						X 15.6												15.5						
16.7	15.8					15.7												X 15.6							
16.8	15.9					X 15.8											15.7								
16.9	16.0				X 15.9												X 15.8								
17.0	16.1			16.0												15.9									

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 5 (Page 1 of 2)
No. 2 (307 x 409) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
18.1	17.1							17.0												16.9					
18.2	17.2							X 17.1											17.0						
18.3	17.3						17.2											17.1							
18.4	17.4					17.3											17.2								
18.5	17.5					X 17.4											X 17.3								
18.6	17.6					X 17.5										17.4									
18.7	17.7				X 17.6										17.5										
18.8	17.8			17.7											X 17.6										
18.9	17.9			X 17.8										X 17.7											X 17.6
19.0	18.0		X 17.9											X 17.8											X 17.7
19.1	18.1		X 18.0										X 17.9										17.8		
19.2	18.2	X 18.1										18.0											X 17.9		
19.3	18.2											X 18.1										18.0			
19.4	18.3										X 18.2										18.1				
19.5	18.4									18.3											X 18.2				
19.6	18.5									X 18.4										X 18.3					
19.7	18.6								18.5											X 18.4					
19.8	18.7								X 18.6										X 18.5						
19.9	18.8							X 18.7										18.6							

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 5 (Page 2 of 2)
No. 2 (307 x 409) can

NET WEIGHT (AVDP. OZ.)	REFRACTIVE INDEX AT 20°C																								
	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
20.0	18.9						18.8										18.7								
20.1	19.0						X 18.9										X 18.8								
20.2	19.1					19.0										18.9									
20.3	19.2					X 19.1									19.0										
20.4	19.3				19.2										19.1										X 19.0
20.5	19.4				X 19.3									19.2										19.1	
20.6	19.5			X 19.4										X 19.3										X 19.2	
20.7	19.6			X 19.5								19.4											X 19.3		
20.8	19.7		X 19.6									19.5										19.4			
20.9	19.8		X 19.7									19.6										X 19.5			
21.0	19.9		X 19.8								19.7										19.6				
21.1	19.9										X 19.8									19.7					
21.2	20.0									19.9										X 19.8					

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value unitl a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 6 (Page 1 of 3)
No. 3 cyl. (404 x 700) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
48.0	45.4		X 45.3				X 45.2				45.1				45.0					X 44.9				X 44.8	
48.1	45.5		X 45.4				X 45.3				X 45.2				45.1				45.0					X 44.9	
48.2	45.6		X 45.5			45.4					X 45.3				X 45.2				45.1				45.0		
48.3	45.7	45.6				45.5					X 45.4				X 45.3				X 45.2				X 45.1		
48.4	45.8	45.7				45.6				45.5				45.4				45.3					X 45.2		
48.5	45.9	X45.8				X 45.7				X 45.6				X 45.5				45.4					X 45.3		
48.6	45.9					X 45.8				X 45.7				X 45.6				45.5				45.4			
48.7	46.0					X 45.9			45.8					X 45.7				X 45.6				X 45.5			
48.8	46.1				46.0				45.9				45.8				45.7					X 45.6			
48.9	46.2				46.1				46.0				45.9				45.8				45.7				
49.0	46.3				X 46.2				X 46.1				X 46.0				X 45.9				45.8				45.7
49.1	46.4			46.3				46.2				46.1					X 46.0				X 45.9				X 45.8
49.2	46.5			46.4				46.3				46.2					X 46.1				X 46.0				X 45.9
49.3	46.6			46.5				X 46.4				46.3				46.2				46.1				46.0	
49.4	46.7			X46.6				X 46.5				X 46.4				X 46.3				X 46.2				46.1	
49.5	46.8			X46.7				X 46.6				X 46.5				X 46.4				X 46.3				46.2	
49.6	46.9		46.8				X 46.7				46.6				46.5					X 46.4				X 46.3	
49.7	47.0		46.9				46.8				46.7				46.6				46.5				46.4		
49.8	47.1		X47.0				X 46.9				X 46.8				46.7				46.6				X 46.5		
49.9	47.2		X47.1			47.0					X 46.9				X 46.8				X 46.7				X 46.6		

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 6 (Page 2 of 3)
No. 3 cyl. (404 x 700) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																							
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
50.0	47.3		X 47.2				47.1			47.0				46.9				46.8					X 46.7		
50.1	47.4	47.3				47.2				47.1				47.0				46.9				46.8			
50.2	47.5	47.4				X 47.3				X 47.2				X 47.1				47.0				46.9			
50.3	47.6	X 47.5				X 47.4				X 47.3				X 47.2				X 47.1				X 47.0			
50.4	47.7	X 47.6				X 47.5			47.4					X 47.3			47.2				47.1				
50.5	47.7					X 47.6			47.5				47.4				47.3				47.2				47.1
50.6	47.8				47.7				47.6				X 47.5				X 47.4				47.3				47.2
50.7	47.9				X 47.8				X 47.7				X 47.6				X 47.5				X 47.4				X 47.3
50.8	48.0				X 47.9			47.8				47.7					X 47.6			47.5				47.4	
50.9	48.1			48.0				47.9				47.8				47.7				47.6				47.5	
51.0	48.2			48.1				X 48.0				47.9				X 47.8				X 47.7				47.6	
51.1	48.3			48.2				X 48.1				X 48.0				X 47.9				X 47.8				X 47.7	
51.2	48.4			X 48.3				X 48.2				X 48.1			48.0					X 47.9			47.8		
51.3	48.5			X 48.4			48.3				48.2				48.1					X 48.0			47.9		
51.4	48.6		48.5				48.4				X 48.3				48.2				X 48.1				X 48.0		
51.5	48.7		48.6				X 48.5				X 48.4				X 48.3				X 48.2				X 48.1		
51.6	48.8		X 48.7				X 48.6				X 48.5				X 48.4			48.3					X 48.2		
51.7	48.9		X 48.8			48.7				48.6				48.5				48.4				48.3			
51.8	49.0		X 48.9			48.8				48.7				X 48.6				48.5				X 48.4			
51.9	49.1	49.0				48.9				X 48.8				X 48.7				X 48.6				X 48.5			

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 6 (Page 3 of 3)
No. 3 cyl. (404 x 700) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
52.0	49.2	49.1				X 49.0				X 48.9				X 48.8			48.7				48.6				48.5
52.1	49.3	X 49.2				X 49.1			49.0				48.9				48.8				48.7				48.6
52.2	49.4	X 49.3				X 49.2			49.1				49.0				X 48.9				48.8				X 48.7
52.3	49.4				49.3				49.2				X 49.1				X 49.0				X 48.9			48.8	
52.4	49.5				49.4				X 49.3				X 49.2				49.1			49.0				48.9	
52.5	49.6				X 49.5				X 49.4			49.3				49.2				49.1				49.0	
52.6	49.7				X 49.6			49.5				49.4				49.3				X 49.2				X 49.1	
52.7	49.8			49.7				X 49.6				49.5				X 49.4				X 49.3				X 49.2	
52.8	50.9			49.8				X 49.7				X 49.6			49.5					X 49.4			49.3		
52.9	50.0			49.9				X 49.8			49.7				49.6				49.5				X 49.4		
53.0	50.1			X 50.0				X 49.9			49.8				49.7				X 49.6				X 49.5		
53.1	50.2			X 50.1			50.0				X 49.9				X 49.8				X 49.7				X 49.6		
53.2	50.3		50.2				X 50.1				X 50.0				X 49.9			49.8				49.7			
53.3	50.4		50.3				X 50.2				X 50.1			50.0				49.9				49.8			
53.4	50.5		X 50.4			50.3				50.2				50.1				50.0				X 49.9			
53.5	50.6		X 50.5			50.4				50.3				X 50.2				X 50.1			50.0				49.9

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 7 (Page 1 of 3)
No. 10 (603 x 700) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
100.0	94.5			X 94.4		X 94.3	94.2		94.1		94.0			X 93.9	93.8		93.7			X 93.6	93.5			X 93.4	
100.1	94.6		94.5			X 94.4	94.3		94.2		94.1		94.0		93.9		93.8		93.7		93.6		93.5		
100.2	94.7		94.6		94.5		94.4		94.3		94.2		94.1		94.0		93.9		93.8		93.7		93.6		93.5
100.3	94.8		94.7		94.6		X 94.5		94.4		X 94.3		94.2		94.1		X 94.0		93.9		93.8		93.7		93.6
100.4	94.9		94.8		94.7		X 94.6		94.5		X 94.4		X 94.3		94.2		X 94.1		94.0		93.9		X 93.8		93.7
100.5	95.0		X 94.9		X 94.8		X 94.7		X 94.6		X 94.5		X 94.4		X 94.3		X 94.2		X 94.1		94.0		X 93.9		X 93.8
100.6	95.1		X 95.0		X 94.9		X 94.8		X 94.7		X 94.6		X 94.5		X 94.4		X 94.3		X 94.2		X 94.1		X 94.0		X 93.9
100.7	95.2		X 95.1		X 95.0		X 94.9		X 94.8		X 94.7		X 94.6		X 94.5		X 94.4		X 94.3		X 94.2		X 94.1		X 94.0
100.8	95.3		X 95.2		X 95.1		X 95.0		X 94.9		X 94.8		X 94.7		X 94.6		X 94.5		X 94.4		X 94.3		X 94.2		X 94.1
100.9	95.4		X 95.3		X 95.2		X 95.1	95.0		94.9		94.8		94.7		94.6		94.5		94.4			X 94.3		X 94.2
101.0	95.5		X 95.4		X 95.3		X 95.2		95.1	95.0		94.9		94.8		94.7		94.6		94.5		94.4		94.3	
101.1	95.6	95.5		95.4		95.3		X 95.2		95.1		95.0		X 94.9		94.8		94.7		X 94.6		94.5		94.4	
101.2	95.7	95.6		95.5		95.4		X 95.3		X 95.2		95.1		X 95.0		X 94.9		94.8		X 94.7		94.6		94.5	
101.3	95.8	95.7		95.6		X 95.5		X 95.4		X 95.3		X 95.2		X 95.1		X 95.0		X 94.9		X 94.8		X 94.7		X 94.6	
101.4	95.9	X 95.8		95.7		X 95.6		X 95.5		X 95.4		X 95.3		X 95.2		X 95.1		X 95.0		X 94.9		X 94.8		X 94.7	
101.5	96.0	X 95.9		X 95.8		X 95.7		X 95.6	95.5			X 95.4		X 95.3	95.2			X 95.1		X 95.0	94.9			X 94.8	
101.6	96.1	X 96.0		X 95.9		X 95.8		X 95.7	95.6		95.5			X 95.4	95.3		95.2			X 95.1	95.0		94.9		
101.7	96.2	X 96.1		X 96.0		X 95.9	95.8		95.7		95.6				95.4		95.3		X 95.2		95.1		95.0		94.9
101.8	96.2			X 96.1		X 96.0	95.9		95.8		95.7		95.6		95.5		95.4		95.3		95.2		95.1		95.0
101.9	96.3		96.2			X 96.1	96.0		95.9		95.8		95.7		95.6		X 95.5		95.4		95.3		X 95.2		95.1
102.0	96.4		96.3				96.1		96.0		95.9		X 95.8		95.7		X 95.6		X 95.5		95.4		X 95.3		X 95.2

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 7 (Page 2 of 3)
No. 10 (603 x 700) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
102.1	96.5		96.4		96.3		X 96.2		96.1		X 96.0		X 95.9		X 95.8		X 95.7		X 95.6		X 95.5		X 95.4		X 95.3
102.2	96.6		X 96.5		96.4		X 96.3		X 96.2		X 96.1		X 96.0		X 95.9		X 95.8		X 95.7		X 95.6		X 95.5		X 95.4
102.3	96.7		X 96.6		X 96.5		X 96.4		X 96.3		X 96.2		X 96.1		X 96.0		X 95.9	95.8			X 95.7		X 95.6	95.5	
102.4	96.8		X 96.7		X 96.6	96.5			X 96.4		X 96.3	96.2			X 96.1		X 96.0	95.9		95.8			X 95.7	95.6	
102.5	96.9		X 96.8		X 96.7	96.6		96.5			X 96.4	96.3		96.2		96.1		96.0		95.9		95.8		95.7	
102.6	97.0		X 96.9	96.8		96.7		96.6		96.5		96.4		96.3		96.2		96.1		96.0		95.9		95.8	
102.7	97.1		X 97.0	96.9		96.8		96.7		96.6		96.5		96.4		96.3		96.2		X 96.1		96.0		95.9	
102.8	97.2		X 97.1	97.0		96.9		X 96.8		96.7		96.6		X 96.5		X 96.4		96.3		X 96.2		X 96.1		96.0	
102.9	97.3	97.2		97.1		97.0		X 96.9		X 96.8		96.7		X 96.6		X 96.5		X 96.4		X 96.3		X 96.2		X 96.1	
103.0	97.4	97.3		97.2		97.1		X 97.0		X 96.9		X 96.8		X 96.7		X 96.6		X 96.5		X 96.4		X 96.3		X 96.2	
103.1	97.5	97.4		97.3		97.2		X 97.1		X 97.0		X 96.9		X 96.8	96.7			X 96.6		X 96.5	96.4			X 96.3	
103.2	97.6	97.5		97.4		X 97.3		X 97.2	97.1			X 97.0		X 96.9	96.8		96.7			X 96.6	96.5		96.4		96.3
103.3	97.7	X 97.6		X 97.5		X 97.4		X 97.3	97.2		X 97.1		97.0		96.9		96.8			X 96.7	96.6		96.5		96.4
103.4	97.8	X 97.7		X 97.6		X 97.5		X 97.4	97.3		97.2		97.1		97.0		96.9		96.8		96.7		96.6		96.5
103.5	97.9	X 97.8		X 97.7		X 97.6	97.5		97.4		97.3		97.2		97.1		97.0		96.9		96.8		X 96.7		X 96.6
103.6	97.9			X 97.8	97.7		97.6		97.5		X 97.4		97.3		97.2		X 97.1		97.0		96.9		X 96.8		X 96.7
103.7	98.0		97.9		97.8		97.7		97.6		X 97.5		X 97.4		97.3		X 97.2		X 97.1		X 97.0		X 96.9		X 96.8
103.8	98.1		98.0		97.9		X 97.8			97.7	X 97.6		X 97.5		X 97.4		X 97.3		X 97.2		X 97.1		X 97.0	96.9	
103.9	98.2		98.1		98.0		X 97.9		97.8		X 97.7		X 97.6		X 97.5		X 97.4		X 97.3		X 97.2		X 97.1	97.0	
104.0	98.3		X 98.2		98.1		X 98.0		97.9		X 97.8	97.7			X 97.6		X 97.5	97.4		97.3			X 97.2	97.1	

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.

APPENDIX

U.S. FLUID OUNCE CHART - TOMATO JUICE
CONVERSION OF NET WEIGHTS (AVOIRDUPOIS OUNCES) TO FLUID OUNCES

TABLE 7 (Page 3 of 3)
No. 10 (603 x 700) can

NET WEIGHT	REFRACTIVE INDEX AT 20°C																								
(AVDP. OZ.)	1.3392	1.3394	1.3396	1.3398	1.3400	1.3402	1.3404	1.3406	1.3408	1.3410	1.3412	1.3414	1.3416	1.3418	1.3420	1.3422	1.3424	1.3426	1.3428	1.3430	1.3432	1.3434	1.3436	1.3438	1.3440
104.1	98.4		98.3		X 98.2		X 98.1		X 98.0		X 97.9	X 97.8		97.7				97.5		97.4		97.3		97.2	
104.2	98.5		X 98.4		X 98.3	98.2		98.1			X 98.0	97.9		97.8		97.7		97.6		97.5		97.4		97.3	
104.3	98.6		X 98.5		X 98.4	98.3		98.2		98.1		98.0		97.9		97.8		97.7		X 97.6		97.5		97.4	
104.4	98.7		X 98.6	98.5		98.4		98.3		98.2		98.1		X 98.0		97.9		97.8		X 97.7		X 97.6		X 97.5	
104.5	98.8		X 98.7	98.6		98.5		98.4		98.3		98.2		X 98.1		X 98.0		97.9		X 97.8		X 97.7		X 97.6	
104.6	98.9		X 98.8	98.7		98.6		X 98.5		X 98.4		98.3		X 98.2		X 98.1		X 98.0		X 97.9		X 97.8		X 97.7	
104.7	99.0	98.9		98.8		98.7		X 98.6		X 98.5		X 98.4		X 98.3		X 98.2		X 98.1		X 98.0	97.9		97.8		
104.8	99.1	99.0		98.9		X 98.8		X 98.7		X 98.6		X 98.5		X 98.4	98.3			X 98.2		X 98.1	98.0		97.9		97.8
104.9	99.2	99.1		99.0		X 98.9		X 98.8	98.7			X 98.6		X 98.5	98.4		98.3		98.2		98.1		98.0		97.9
105.0	99.3	99.2		99.1		X 99.0		X 98.9	98.8		98.7			X 98.6	98.5		98.4		98.3		98.2		X 98.1		98.0
105.1	99.4	X 99.3		X 99.2		X 99.1		X 99.0	98.9		98.8		98.7		98.6		98.5		98.4		98.3		X 98.2		X 98.1
105.2	99.5	X 99.4		X 99.3	99.2		99.1		99.0		98.9		98.8		98.7		X 98.6		X 98.5		98.4		X 98.3		X 98.2
105.3	99.6	X 99.5		X 99.4	99.3		99.2		99.1		X 99.0			98.9	98.8		X 98.7		X 98.6		X 98.5		X 98.4	98.3	
105.4	99.6			X 99.5	99.4		99.3		99.2		X 99.1		X 99.0		X 98.9		X 98.8		X 98.7		X 98.6		X 98.5	98.4	
105.5	99.7		99.6		99.5		99.4		99.3		X 99.2		X 99.1		X 99.0		X 98.9	98.8			X 98.7		X 98.6	98.5	
105.6	99.8		99.7		99.6		X 99.5		X 99.4		X 99.3		X 99.2		X 99.1		X 99.0	98.9		98.8		98.7		98.6	
105.7	99.9		99.8		99.7		X 99.6		X 99.5		X 99.4	99.3		99.2			X 99.1	99.0		98.9		98.8		98.7	
105.8	100.0		99.9		99.8		X 99.7		X 99.6		X 99.5	99.4		99.3		99.2		99.1		99.0		98.9		98.8	
105.9	100.1		X100.0		X 99.9	99.8		99.7			X 99.6	99.5		99.4		99.3		99.2		X 99.1		99.0		X 98.9	
106.0	100.2		X100.1		X100.0	99.9		99.8		99.7		99.6		99.5		99.4		99.3		X 99.2		X 99.1		X 99.0	

"X" indicates that the volume at the intermediate refractive index is the same as the volume figure to the right of the "X" mark. Reading across from left to right, blank spaces following a fluid ounce value have the same value until a space contains a new fluid ounce value.