United States Department of Agriculture

Marketing and Regulatory Programs

Agricultural Marketing Service

Fruit and Vegetable Program

Specialty Crops Inspection Division

Frozen Asparagus

Inspection Instructions

September 2015

These instructions contain information and guidelines to help personnel of the U.S. Department of Agriculture's (USDA) Specialty Crops Inspection (SCI) Division uniformly apply and interpret U.S. grade standards, other similar specifications, and special procedures.

These guidelines do not supersede the Federal Food, Drug, and Cosmetic Act or any other applicable Federal or State laws or regulations. Compliance with these statutes is mandatory. This publication supersedes any previously issued inspection instructions.

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Inspection instructions are issued by USDA after careful consideration of all data and views submitted. The Department welcomes suggestions for improving the inspection instructions in future revisions.

Comments may be submitted to:

Director, Specialty Crops Inspection Division
Fruit and Vegetable Program
USDA, Agricultural Marketing Service
1400 Independence Avenue, SW, STOP 0240
Washington, DC 20250

These instructions replace the Instructions for the Inspection of Frozen Asparagus dated June 1970, and include, but not limited to, all previous correspondence, memos, inspection instructions, or procedures.

INSPECTION INSTRUCTIONS FOR FROZEN ASPARAGUS

GENERAL

The United States Standards for Grades of Frozen Asparagus is an Attribute Type Standard that is based on a "go" or "no go" acceptance procedure. Deviations in the characteristics that denote quality are classified as minor, major, severe, or critical depending upon seriousness of the defect. The defects are then tallied, compared to acceptance numbers, and the sample is either Grade A, or it fails Grade A, with no score points to indicate the relative degree of excellence.

Variations from the quality requirements (color, sizing, damage, texture, harmless extraneous vegetable material (HEVM)) are individually classified as defects. These defects are described and categorized as minor, severe, or critical, depending upon the seriousness of the defect. The sampling plans in the standard are based upon the number of defects per hundred units (DHU) rather than percent defective. Under DHU, a unit may be scored more than once.

For example, a single spear may have a minor color defect; a minor length of unit defect; a major tough fiber defect; and a severe discoloration defect, for a total of four defects:

2 minor defects
1 major defect
1 severe defect
4 total defects – all on one spear

The allowance for the various defect classifications, which are given as cumulative acceptance numbers, are statistically geared to specific acceptable quality levels (AQL's) and sample unit size. Any change in AQLs or sample unit size will require a corresponding change in the sampling plans (acceptance numbers). Inspectors must follow the standard, and the procedures outlined in these instructions.

An exception is buyer specifications, in which AQLs are specified and/or defects are classified differently. Inspection and certification cannot be made on these buyers' specifications unless the specifications are available to the inspector and tables of acceptance numbers for specified, AQLs included with the specification.

As with any other product, it is acceptable to inspect and certify on the basis of these specifications provided that:

- A copy of the written specification is available to the inspector;
- The inspector is able to interpret the specification; and
- There is no conflict with SCI Division policy.

Many buyers' specifications include sizing requirements, length of spear or cut, limitations on white butts, and re-definitions of quality defects. If the specification uses AQLs other than those in the grade standards, the appropriate tables of acceptance numbers must be a part of the package given to the inspector. The same policy applies to any classification of defects that are different than those provided in the grade standards.

PRODUCT DESCRIPTION

Frozen asparagus consists of sound and succulent fresh shoots of the asparagus plant (Asparagus officianalis). The product is prepared by sorting, trimming, washing, and blanching as necessary to assure a clean and wholesome product. It is then frozen and stored at temperatures necessary for preservation.

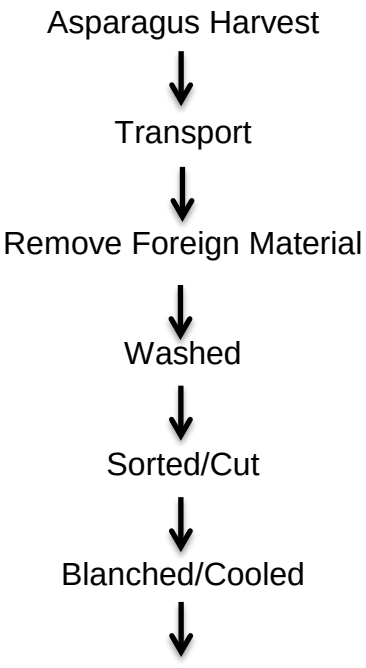
Asparagus varieties are classified in two groups based principally on color:

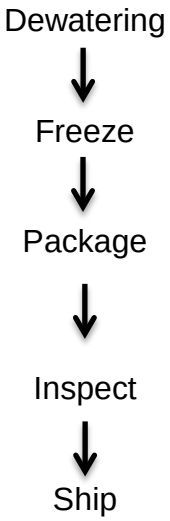
Dark green: color types such as those strains that date back to Mary Washington and Martha Washington.

Light green: color types are of limited availability and practically all are in the fresh market.

As with other vegetables, asparagus hybrids have been developed and it is questionable if the exact type can be identified. For freezing purposes, varieties with dark green spears are preferred. Often the tips are purplish green.

PRODUCTION FLOW





INSPECTION AND GRADING

EQUIPMENT, INSPECTION AIDS, AND INSTRUCTIONS

- U.S. Standards for Grades of Frozen Asparagus
- USDA Frozen Asparagus Size Gauge
- USDA Photographic Plates 1, 2, and 3, showing Stages of Development
- USDA photographs showing defects of workmanship, damage
- AIM Inspection Series Manuals
  - Foreign Material Manual
  - General Procedures Manual
  - Sampling Manual
  - Technical Procedures Manual
- FDA Defect Action Level Handbook
- FDA Macroanalytical Procedures Manual – Method V-93
- Defect Tally Sheet (FV-364-154E) and/or Control Charts (intranet link)

SAMPLE UNIT SIZE

Uniformity in the preparation and performance of sampling procedures are a fundamental part of Division services. The AIM Sampling Manual provides in depth guidance on the procedures and techniques used in sampling frozen asparagus.

Follow the random selection procedures outlined in the AIM Sampling Manual to get a proper sample unit in relation to styles:

- For spears and tips – 50 units

- For cut styles – 100 units

DEFECT TALLY SHEET FV-364-154E

Inspection data should be recorded on the Defect Tally Sheet FV-364-154E (intranet link) and control chart. The defect tally sheet records detailed information about the findings in a sample of frozen asparagus. The tally sheet is to be used for all lot inspections and may be used for in-plant inspections. The control chart helps production personnel with process control.

Control charts include a key of abbreviations for various types of defects. When a particular type of defect becomes prevalent, it may be desirable to set up a separate control chart with predetermined limits for that defect only.

After the sample unit has been selected, all defects are counted, properly classified, and tallied on the tally sheet. Additional instructions on completing tally sheets may be found in the AIM General Procedures Manual in the Score Sheet/Tally Sheet Completion section.

The following is a simple routine tallying procedure:

SIZE DESIGNATION

Sample Unit No. 1

1. For spears or tips, count the number of defects that may be present for size (diameter).

2. Record the number of each defect class in the appropriate space on the tally sheet opposite size (diameter).

3. Total the above values in the space immediately below opposite cumulative total (each class).

4. Add the total number of defects found for all classes and record opposite total (all classes).

5. Record the value found in step 4 above in the space opposite cumulative total.

Sample Unit No. 2

1. Repeats steps 1 and 2.

2. Add the number of minor defects found in sample unit No. 2 to the number of minor defects found in sample unit No. 1 and record in the minor box opposite cumulative total (each class) under sample unit No. 2. Do the same for major and severe.

3. Add the total number of defects found in sample unit No. 2 only and record opposite total (all classes) under sample unit No. 2.

4. Add the total of all classes recorded for sample unit No. 2 to the total of all classes recorded for sample unit No. 1 and record opposite cumulative total (all classes) under sample No. 2.

Subsequent Sample Units

Use the same procedure for subsequent sample units as for sample units.

As for sample unit No. 2 except that the total values of sample unit No. 3 are added to the cumulative total values of No. 2, those of No. 4 to No. 3 and so on.

CLASSIFIED QUALITY FACTORS

Defects in the quality factors category include color, length, damage, character, and HEVM. Such defects are classified as minor, major, severe, or critical by use of objective measurements, photographic illustrations, descriptive terminology, or other applicable tests. At the completion of the examination of each sample unit, the defects are recorded on the tally sheet in the appropriate boxes. The cumulative totals and totals need not be completed until the examination of all sample units is complete, except if the tally sheet is being used for in-line control, in which case the entries should be completed as the inspection progresses. Recording and adding up the totals and cumulative totals follow the same procedures as for size defects.

COMPLIANCE CRITERIA

Criteria for compliance with requirements for size designations and grade are specified in the frozen asparagus grade standards. Persons using these standards especially for process control purposes should be thoroughly familiar with the acceptance criteria.

The criterion for lot acceptance for a specified size and for quality is as follows:

- The number of defects of the various classes in the first sample unit does not exceed the acceptance number specified for total sample. The values for total apply to minor defects as well as the sum of minor, major, severe, and critical defects.

  The absolute limit (AL) is not applicable to the first sample unit.

- The number of defects of the various classes in the second and each subsequent sample unit does not exceed the AL value for the applicable class.

- The cumulative number of defects for each class does not exceed the cumulative

acceptance number for the total sample size for the applicable defect class.

- The cumulative total defects, minor plus major plus severe plus critical, does not exceed the cumulative acceptance number for the sample size.
- The amount of loose material does not exceed the allowance for the grade.
- The flavor and odor are normal.
- Varietal characteristics are similar.
- Sand, grit, and silt are within grade limits.
- The product is wholesome and does not contain foreign material.
- The overall appearance is satisfactory for the respective grade.

If any individual sample unit or the cumulative total fails to meet the acceptance criteria, the entire lot fails even though the subsequent sample units are satisfactory. The lot may be separated, at the option of the packer or applicant, into meeting and failing portions in accordance with segregation procedures outlined in the AIM Sampling Manual.

CONTROL CHART

The Control Chart is for use In-Plant for applicants interested in process control. The example control chart, appendix I, illustrates the control chart found on the reverse of Defect Tally sheet FV-364-154E on which numbers of defects are recorded and plotted. Some packers may choose to furnish their own control charts to suit their particular needs. Buyers of frozen asparagus may also wish to furnish their own control charts to fit their specifications. In any case, the basic design of the defect control chart is the same. The difference would be the amount of information desired on the chart or the use of different AQLs which would require different AL values.

On the example control chart, the top portion is devoted to size designation (single size only). In this case, there is no control chart involved since space would permit only the recording of numbers of defects. The procedures for recording the numbers of defects and carrying out the cumulative values are the same as those explained for the tally sheet except that no separate space is provided for minor defects. The number of minor defects is added to the numbers of major and severe defects and recorded as Total.

The lower portion of the control chart is devoted to the quality factors. Since the frequency of occurrence of critical and severe defects is expected to be rather low, these two classes are not set to a control chart. The numbers of defects for these two

classes and their cumulative values are recorded in a similar manner as explained for the tally sheet.

Plotting

The major and minor quality defects are counted, recorded, and plotted as follows:

- Record the number of major defects for each sample unit in the box opposite Ind. (Individual) for the appropriate sample unit number on the major chart;

- Plot this value on the corresponding horizontal line on the chart, placing an X directly on the line in the center portion of the sample unit column;

- Calculate the cumulative total after each sample unit and record in the box opposite Cum. (cumulative) under the appropriate sample unit;

- Do not plot cumulative values.

- Count the number of minor defects and add this value to the sample unit numbers of critical, severe, and major;

- Record the value obtained in the box opposite Ind. under the appropriate sample unit number on the total chart;

- Plot this value on the appropriate horizontal line for the sample unit as explained for major; and

- Calculate and record the cumulative values for each sample unit.

Interpretation of Plottings and Values

AL values and acceptance values for size and quality factors are listed on the control chart for each defect class.

The dash lines on the major and total control charts represent the AL values for the respective defect class. These are identified in the left-hand margin of the chart by AL-A and AL-B meaning the absolute limit for Grade A, and the absolute limit for Grade B respectively.

A lot may be accepted for a specific grade provided:

- The number of defects for any individual sample unit does not exceed the AL value for the defect class and grade. (In the case of major and total, this may be readily determined by checking to see that no plotted value X is above the AL line for the grade);

- The cumulative number of defects does not exceed the cumulative acceptance number for the defect class, sample sizes, and grades;

- The flavor and odor are normal; and

- The amount of loose material, where applicable, does not exceed the allowance for such material for the grade.

CODE SEGREGATION

In the case of in-plant inspection, if a lot fails at any time during a production, the entire production lot shall fail unless the offending portion can be segregated in accordance with current lot segregation procedures in the AIM Sampling Manual.

When a lot is segregated, all values for sample units applicable to the failed, segregated portion are removed from the tally sheet or control chart, the remaining portions combined, and all cumulative totals recalculated for the remaining portions only. The acceptance criterion is again applied to remaining portions.

WEIGHT

NET WEIGHT

Processed foods are commonly packed to meet a prescribed net weight or content, and are labeled accordingly. This net weight or content may be specified in a purchase specification or contract. In depth instructions on performing net weights may be found in the AIM Technical Procedures Manual.

TEMPERATURE AND CARE OF FROZEN PRODUCT

As a prerequisite to assigning the grade to frozen fruits and vegetables, the U.S. standards for frozen asparagus state: “frozen and stored at temperatures necessary for preservation."

Interpretive guidance on this statement is found in the Verification of Frozen Sample Units section of the AIM Technical Procedures Manual.

The inspector must make every effort to ensure that when sampling and handling, procedures do not contribute to broken or shattered units.

THAWING

The product may be thawed in the following ways:

- Air thaw the product in its container at room temperature.

- Water thaw the product in its container or on a screen of suitable size under a fine spray of water. The water temperature should not exceed 86° F.

Regardless of the thawing method used, determine the size as soon as the units are readily separable and the sample units have been selected for product evaluation.

Insects or extraneous material remaining in the water used for thawing should be recovered and evaluated as a part of the sample unit.

Detailed instructions on thawing procedures may be found in the AIM Technical Procedures Manual section on Thawing Procedures.

STYLES

Frozen asparagus styles:

- Spears,
- Cut Spears,
- Center Cuts, and
- Tips.

Record the style of the product on the tally sheet, FV-364-154E.

For cut spears determine the percent of head material on the basis of the 100-unit sample and record this information in the appropriate space. The amount of head material required in cut spears depends on the length of the cut, as follows:

TABLE II

Length of Cut	Sample Average (Minimum)	Individual Subsample (Minimum)
1¼ inches or less	18%	12%
Longer than 1¼ inches	25%	15%

In separating head material, keep in mind that a piece or unit of head material is:

- A tip end of a shoot that is 3/8 inch or more in length; or

- An upper portion of a shoot that contains a substantial amount of compact head material.

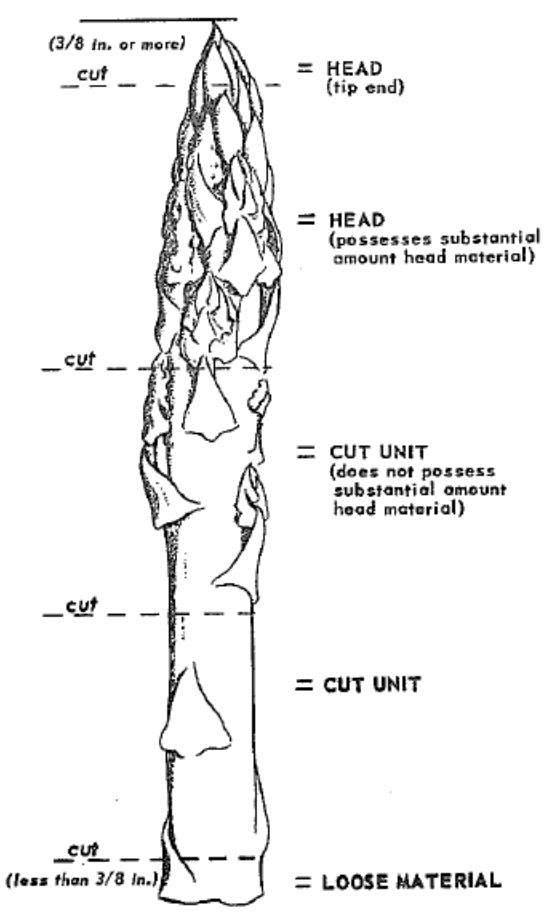
Substantial Amount means approximately 75 percent or more of the apparent original head portion of the shoot. A few bracts staggered down a portion of the cut do not

qualify the unit as head material. See visual illustrations 1 and 2 of heads or head material, cut and loose material below.

ILLUSTRATIONS 1 AND 2: FROZEN ASPARAGUS CUT SPEARS (GREEN OR GREEN-WHITE TYPE)

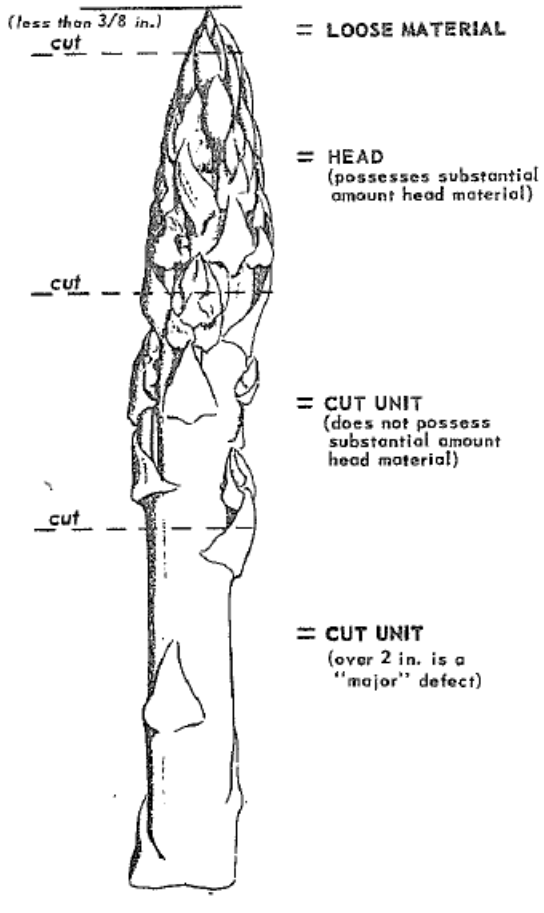
FROZEN ASPARAGUS CUT SPEARS (GREEN OR GREEN-WHITE TYPE)

Definition of Terms



1.

In determining the percent, by count, of heads, a tip end that is 3/8 inch, or more, in length is counted as one head.



2.

If a portion of a spear possesses a substantial amount of head material, it is counted as one head.

TYPES

The U.S. grade standards for frozen asparagus define two types – green or all green, and green-white.

Green or all green asparagus is green or yellowish green the entire length of the unit. Green asparagus generally has less fiber and heads are less compact than green-white.

Green-white units have a typical green color over most of the unit but are white in the lower portions of the stalk. This type is restricted to the styles of spears and tips.

Culturally – bleached (white) asparagus is not frozen.

Nearly all of the asparagus frozen is of the all green type. Inspectors rarely will decide whether or not the product complies with the criteria for green-white. Unless the product is actually labeled or offered as green-white, consider the product as all green type.

When asparagus is declared or offered as green-white type it should have a substantial number of spears or tips that meet the definition for this type. This means that the number of all green spears or tips present do not exceed the acceptance values for absolute limits (AL) or for the sample size in Table I of this Instruction as shown on the following page. If the product fails to meet these criteria, it should be considered as all green type and graded accordingly.

TABLE I: COMPLIANCE WITH GREEN-WHITE TYPE

Absolute Limit (AL) In any sample unit [1]		
Number of Sample Units	Number of Spears or Tips	Maximum No. All-Green permitted
1	50	12
2	100	21
3	150	30
4	200	39
5	250	47
6	300	55
7	350	63
8	400	72
9	450	80
10	500	90
11	550	96
12	600	104
13	650	112
14	700	121
15	750	129
16	800	140
17	850	145
18	900	153
19	950	161
20	1000	169
21	1050	177

[1] In any sample unit, except the first of 50 units.

SIZE DETERMINATION

The United Standards for Grades of Frozen Asparagus include size designations for spears and tips (as applicable), and state how size (diameter) is to be determined. Size determination of spears and tips should be made as soon as possible after the units are thawed and can be separated. Otherwise, the shoots may lose rigidity and are more difficult to restore to their original conformation for proper measurement.

USDA Inspection Aid 109, Canned and Frozen Asparagus Sizer is a white, opaque Plexiglas plate (3" x 8") with a V shaped notch extending lengthwise which is used to measure and classify the size (diameter) of asparagus. One side is marked for frozen asparagus sizing; the other side is marked for canned asparagus. The right edge of the V on each side of the plate includes the diameter dimensions for the respective size designations. The diameter dimensions imprinted on the sizer equal the width of the V at the point indicated by the dimension. One edge on each side is marked off in 1/4-inch graduations for measuring the length of the asparagus units.

Clean Inspection Aid 109, Canned and Frozen Asparagus Sizer by using mild soap and lukewarm water and dry with a soft cloth or towel. Do not use abrasive or strong cleaning agents on this inspection aid. Do not soak for extended periods of time.

HOW TO USE THE ASPARAGUS SIZER

It is not necessary to make actual measurements of each unit to ascertain the sizes present in any individual sample unit. Separate the units according to diameter, grouping those that appear to be of the same diameter. Measure two or three units from each size group to establish the sizes and percentages of each size group present. Check additional units if needed. The diameter measurements are made with the USDA sizer as follows:

- Use the same sample unit for quality determination unless separate in-line control is in effect for size only.
- Use the side applicable to the frozen product.
- Insert the asparagus unit into the V so that:
    - The asparagus unit length is approximately at right angles to the sizer.
    - The greatest diameter of the asparagus unit (after being restored to its original shape) is approximately parallel with the end of the sizer; and
    - The point of measurement of the asparagus unit is at the point of maximum diameter, regardless of the length of the shoot.

- Move the asparagus unit down the V until the unit barely makes contact with both sides of the V. Do not force the unit beyond this point.

- Classify the size designation of the unit, stated between the diameter divisions, with which the unit falls.

Example:

- If a frozen asparagus spear, when measured following the procedures above, falls between the 3/8-inch and 5/8-inch diameter divisions, the spear is classified as medium size.

- If the diameter falls on a dividing line between two size classifications, consider the unit as the larger size.

SIZE COMPLIANCE

Follow the requirements in the grade standards to determine compliance with one of the following sizes:

- A single size,

- Blends of two adjacent sizes,

- Blends of three adjacent sizes, or

- Mixed sizes.

Table I of the standards provides diameters for the respective single sizes according to word or number designation.

Table II of the standards specifies defects that may be applicable for a particular single size or a blend of specified sizes. Note that these deviations are classified as minor, major, or severe. For blends of sizes, a defect can only be minor.

Table III contains the acceptance criteria for single sizes and blends of sizes according to sample size and the number and type of defects present. Note that right hand column applies to blends only.

SINGLE SIZES

Acceptance criteria are illustrated by the following example:

Example 1 (Medium Size Declared)

Sample size - 300 spears.

Small	-	10 spears	-	Major defect
Large	-	11 spears	-	Minor defect
Extra Large	-	9 spears	-	Severe defect
	Total:	30 defects		

The sample as a whole meets the criteria for medium size since a sample size of 300 spears could contain 32 major, 12 severe, and 55 total defects.

Example 2 (Medium Size Declared)

Sample size - 300 spears.

Small	-	10 spears	-	Major defect
Large	-	11 spears	-	Minor defect
Extra Large	-	9 spears	-	Severe defect
	Total:	30 defects		

BLENDS OF SIZES

The standards define two combinations for blends of sizes. One combination is for a blend of two adjacent sizes; the second is for a blend of three adjacent sizes. Acceptance criteria are shown in Table III and §52.391 in the same manner as for single sizes.

If a sample is found to fail the criteria for either a blend of two or three sizes, the lot is considered as Mixture of Sizes.

Example 3 (Lot Declared as Medium-Large Blend)

Sample size - 400 spears

Small	-	24 spears	-	Minor defect
Extra Large	-	8 spears	-	Minor defect
	Total:	32 defects		

The sample as a whole meets the criteria for medium-large blend, as Table III permits 41 defects for a sample of 400 units.

MIXED SIZES

If the sample does not meet the criteria for either a single size or blends of sizes, it automatically falls into the category of mixture of sizes**.**

CLASSIFIED QUALITY FACTORS (DEFECTS)

Defects are classified by the degree of severity of the following quality factors: color, uniformity of length, character, damage, and harmless extraneous vegetable material (HEVM).

COLOR

The normal color of frozen asparagus after thawing is:

- Green or all-green – bright green or purplish green, with no tinges of gray or olive colors.

- Green-white – the same as green except that white or yellowish-white areas extend up the stalk from the cut end.

A grayish or olive coloration in frozen asparagus may be caused by over-blanching, improper cooling after blanching, holding too long prior to freezing, and other causes. Asparagus spears affected in this manner should be considered a major or severe color defect, depending upon whether the appearance of the unit is more than slightly but not materially affected, major, or materially affected or worse, severe. Other color defects are described and classified in the grade standards in Table IV. Color defects are either major or severe; there are no minor defects for color. For all-green spears and tips, disregard white color not exceeding $^{1}/_{4}$-inch.

UNIFORMITY OF LENGTH

Defects for this factor are described and classified in the grade standards in Table IV. In the case of spears or tips, the sample unit is laid in a single layer and single row. All of the heads or cut ends (i.e., preferable cut ends) should be even. This may be done quickly by placing the heads or cut ends against a straight edge of some type. An estimation of length is then made from the approximate average length of all of the spears or tips with the most uniform lengths. Spears or tips that vary more than 1½ inches from this approximate average length are considered a minor defect. Misshapen units should be straightened when determining the length.

In the case of cut styles, units shorter than 1/2 inch (excluding head material or loose material) or more than 2 inches are considered defects for these styles, and classified as minor and major respectively.

DAMAGE

Various types of damage are classified according to the degree to which the appearance or edibility of the unit is affected. Under this factor there are four sub-headings or sub-classifications of damage:

- Shattered heads
- Misshapen
- Poorly Cut
- Discoloration, mechanical injury, pathological injury, other.

Shattered heads – To be considered a defect the head should be shattered or broken to the extent that the appearance of the unit is materially affected.

Misshapen – Only spears or tips which are seriously affected in appearance by doubles or by crooked units, or other malformations should be scored as a defect.

Poorly cut – Consider as poorly cut units only those units which have very ragged, stringy, or frayed edges or a unit that is only partially cut or cut at an angle of less than approximately 45 degrees.

Other types of damage – Other types of damage listed in the grade standards include discoloration, mechanical injury, pathological injury, or damage by other means.

Although these types are listed and classified together, it is the intent to consider each a separate defect when they are non-related. If they are related defects, or if a clear distinction as to cause can't be made, consider the damage as one (1) defect.
For example, a unit may be gouged on the stalk and also have considerable insect damage on the head. In this case the damage is non-related and the unit is considered two defects. In another example, the stalk may have a discolored growth crack and in the same area have rust. In this case it is difficult to determine whether or not the two conditions are related, and consequently the unit should be scored as one (1) defect only. Inspectors should use discretion in scoring a unit more than once for the factor of other types of damage.

HARMLESS EXTRANEOUS VEGETABLE MATERIAL

Various types of harmless extraneous vegetable material most commonly encountered in frozen asparagus are classified for defects by length. If more than one type of harmless extraneous material occurs in one sample unit, they are treated as separate defects according to their length.

More than one piece of a single type should be treated as a single defect according to the aggregate lengths of the pieces.

WHOLESOMENESS (FOREIGN MATERIAL)

Be alert for foreign matter during the examination of frozen asparagus. This includes but is not limited to: wood splinters, paint flakes, weeds, and insects. Ordinarily, careful macroscopic or visual examination is sufficient to detect this type of material. However, when circumstances warrant (e.g., for insect recovery) extraction, filtration, and microscopic examination should be used to determine extent of contamination.

Detailed instructions on Foreign Material procedures may be found in the AIM Foreign Material Manual.

CHARACTER

The factor of character is a combination of development characteristics, tenderness, and fiber development.

Development

The grade standards show photographs of defects related to development for the factor of character. Plate 1 and 2 show the bottom limits for a well-developed head and are not considered defects. In these cases, growth has progressed to the point where seed development has just begun. The lower bracts are slightly elongated but the heads are still tight. Asparagus with growth that that has progressed beyond the spears illustrated in plate 1, but not beyond the spears illustrated in plates 2 and 3, are considered reasonably well developed. Plates 2 and 3 are considered the maximum limits for reasonably well developed. Note the seedy appearance of the heads. The bracts have elongated, giving the head a slightly loose appearance. The bracts at the tips, however, are still fairly compact. Note the slightly sparse appearance of the heads of spears 5, 6, and 8 of plates 2 and 3. Reasonably well developed asparagus is considered a defect in Grade A only. One-hundred percent of such units are permitted in Grade B. When the development of the asparagus has progressed beyond the point illustrated in plates 2 and 3, the heads may appear seedier and the bracts will be more elongated producing a rather loosely structured head. Asparagus in this condition is considered poorly developed and is a defect in both Grade A and Grade B.

Tenderness and Texture (Fiber Development)

The tenderness and texture of frozen asparagus is affected by the presence of tough, inedible fibers. The development of fiber in asparagus is to be anticipated when the raw product is held in the field or processors' storage for any appreciable period of time. Slow growing due to weather conditions may also affect the amount of fiber in the raw product.

The tenderness of frozen asparagus may be determined by manually feeling the ends of the units, the fork test, or chewing. The presence of fiber should be determined throughout the entire length of the unit.

- By rubbing the thumb or finger across the end of cut surface it is possible, with a bit of experience, to detect the presence of fibrous material or suspected fibrous material. A unit found or suspected to be fibrous should be further examined by the fork test and chewing.

- The fork test (after cooking) is accomplished by severing the unit by rocking a fork through the product with moderate pressure. The asparagus should cut through easily if no tough fiber is present.

- Chewing (after cooking) is the final determination of the presence of fiber in all cases. It is possible to find units that feel fibrous or are not completely severed in the fork test that do not have tough fibers. Units that chew without noticeable fiber are not considered a defect. Instructions and cook times for cooking frozen asparagus may be found in the AIM Technical Procedures Manual, Cooking Procedures section.

Follow the classification criteria in the grade standards, Table IV. Note that any noticeable fiber up to 1 inch is a minor defect; fibers more than 1 inch up to 2 inches is a major defect; fibers longer than 2 inches are a severe defect. Woody units of any length are severe defects.

A single unit can be scored twice for character defects. For example, a spear may be poorly developed and be a major development defect. The same spear may have 1/2 inch of tough fiber and be a minor fiber defect. In such an instance, the spear would be classified as one minor and one major defect under the character factor.

PREREQUISITES

The following product characteristics and extraneous materials are not readily measurable and are not included in the tables of classified defects, but are important in the assessment of overall quality:

- Flavor and odor,

- Grit, silt and earthy material,

- Similar varietal characteristics,

- Overall appearance, and

- Loose material that is measurable by weight.

Grades A and B both require that the product has a good flavor and odor; is free of grit, silt, or other earthy material; has similar varietal characteristics; and meets a 5% and 10% limit, respectively, for loose material. To meet Grade A requirements, the product must have an attractive appearance; for Grade B, it need be reasonably attractive.

Good flavor and odor means that the product has the flavor and odor of asparagus before and after cooking, and has been properly prepared from freshly harvested asparagus, including proper blanching, freezing, and handling in accordance with good commercial practice. The product must be free of off-flavors and odors of any kind, such as hay-like flavors or odors. If the product has an objectionable flavor or odor (e.g., a flavor or odor that would likely cause the consumer to discard the product), it should be considered Grade Not Certified (GNC). Instructions and cook times for cooking frozen asparagus may be found in the AIM Technical Procedures Manual, Cooking Procedures section.

Free from grit, silt, or earthy material means that the product does not contain any of this material that is readily visible or noticeable upon chewing. Asparagus is sometimes raised on peat soil and if not thoroughly washed, may carry over a little peat. Heavy wind may imbed particles of sand in the shoot and under the bracts that is difficult to remove. During examination of the sample, check carefully for visual extraneous matter. Check the cooked product for presence of grit or sand by chewing suspect portions of the product. If, upon visual observation and the chewing test, extraneous matter or sand is more than slightly noticeable, the product is classified, e.g., Substandard, account grit. If the material is present in extreme quantities and would be highly objectionable to the consumer, classify the product as GNC.

Similar varietal characteristics means that the asparagus must be of similar color types, although there may be variations within such color types. This requirement is seldom a problem. An extreme example of dissimilar varietal characteristics would be a mixture of all-green and culturally bleached units.

Overall appearance, which assesses whether the product is attractive or reasonably attractive, is a control that can be used to address any unusual characteristic that would affect the overall appearance, or make the product undesirable for the indicated grade even though the sample would meet all of the objective criteria for classified defects.

LOOSE MATERIAL

Loose material means any shattered material and cut or broken pieces that are less than 3/8 inch in length.

Loose material determinations are made on the basis of sample weight and not on a standard sample unit of 50 spears (or 100 cut spears). The most practical way to handle the requirement is to separate the shattered material and small pieces from each container and weigh the material on a gram scale.

An alternative is to collect all the loose material from all of the packages in the sample and make only one weighing. This may be done since the requirement is on the basis of sample average and not on individual sample units.

For in-line control, record loose material in order of production if this type of defect is a problem. For institutional size packages of cuts, or cuts and tips, take a well-mixed 10-ounce subsample from each package and base loose material on the total of those subsamples.

APPENDIX I STAGES OF DEVELOPMENT IN FROZEN ASPARAGUS

Plate 1

1. 2.

Spears show lower limit for Well Developed Heads

APPENDIX II STAGES OF DEVELOPMENT IN FROZEN ASPARAGUS

Plate 2

3. 4. 5. 6.

Spears show lower limit for Reasonably Well Developed Heads

APPENDIX III STAGES OF DEVELOPMENT IN FROZEN ASPARAGUS

Plate 3

7. 8. 9. 10.

Spears show lower limit for Reasonably Well Developed Heads

APPENDIX IV TABLE III

TOLERANCES FOR SIZE COMPLIANCE		SINGLE SIZES			BLENDS OF SIZES
		Maximum Defects Permitted			
In any Sample Unit (AL)[1]		5	10	15	10
Number of Sample Units	Number of Spears or Tips	Severe	Major	Total [2]	Minor or Total [3]
		In the Total Sample			In the Total Sample
1	50	3	7	12	7
2	100	5	13	21	13
3	150	7	18	30	18
4	200	9	22	39	22
5	250	10	27	47	27
6	300	12	32	55	32
7	350	14	36	63	36
8	400	15	41	72	41
9	450	17	45	80	45
10	500	18	50	90	50
11	550	20	54	96	54
12	600	21	59	104	59
13	650	23	63	112	63
14	700	24	68	121	68
15	750	26	72	129	72
16	800	27	76	140	76
17	850	29	81	145	81
18	900	30	85	153	85
19	950	32	90	161	90
20	1000	33	94	169	94
21	1050	35	98	177	98
22	1100	36	103	185	103
23	1150	37	107	192	107
24	1200	39	111	200	111
25	1250	41	116	208	116
26	1300	42	120	216	120
27	1350	43	124	224	124
28	1400	45	129	232	129

TABLE III Continued

TOLERANCES FOR SIZE COMPLIANCE		SINGLE SIZES		BLENDS OF SIZES	
		Maximum Defects Permitted			
In any Sample Unit (AL)[1]		5	10	15	10
Number of Sample Units	Number of Spears or Tips	Severe	Major	Total [2]	Minor or Total [3]
		In the Total Sample			In the Total Sample
29	1450	46	133	240	133
30	1500	47	137	248	137
31	1550	49	142	256	142
32	1600	50	146	264	146
33	1650	52	150	271	150
34	1700	53	154	279	154
35	1750	54	159	287	159
36	1800	56	163	295	163
37	1850	57	167	303	167
38	1900	59	171	311	171
39	1950	60	176	318	176
40	2000	62	180	326	180
41	2050	63	184	334	184
42	2100	64	188	342	188
43	2150	66	193	350	193
44	2200	67	197	358	197
45	2250	68	201	365	201
46	2300	70	205	373	205
47	2350	71	210	381	210
48	2400	72	214	389	214
49	2450	74	218	397	218
50	2500	75	222	404	222

[1] In any sample unit, except the first one of 50 Spears or Tips.
[2] "Total" – the sum "Severe", "Major", and "Minor" defects, as applicable.
[3] In "Blends of Sizes", "Minor" and "Total" defects are the same.

APPENDIX V TABLE IV

GRADE COMPLIANCE Spears; and Tips		U.S. Grade A					U.S. Grade B			
		Maximum Defects Permitted								
In any Sample Unit (AL)[1]		0	5	8	15		2	8	13	25
		Critical	Severe	Major	Total [2]		Critical	Severe	Major	Total [2]
1	50	0	3	6	12		1	6	10	20
2	100	0	5	11	21		2	11	18	37
3	150	0	7	15	30		3	15	25	53
4	200	0	9	19	39		3	19	33	68
5	250	0	10	23	47		4	23	40	84
6	300	0	12	27	55		4	27	47	99
7	350	0	14	30	63		5	30	54	114
8	400	0	15	34	72		5	34	61	130
9	450	0	17	38	80		6	38	68	145
10	500	0	18	42	90		6	42	76	159
11	550	0	20	45	96		7	45	81	175
12	600	0	21	49	104		7	49	88	190
13	650	0	23	53	112		8	53	95	204
14	700	0	24	56	121		8	56	102	219
15	750	0	26	60	129		9	60	108	234
16	800	0	27	64	140		9	64	117	249
17	850	0	29	67	145		9	67	122	264
18	900	0	30	71	153		10	71	129	278
19	950	0	32	74	161		10	74	136	293
20	1000	0	33	78	169		11	78	142	308
21	1050	0	35	81	177		11	81	149	322
22	1100	0	36	85	185		12	85	156	333
23	1150	0	37	88	192		12	88	162	347
24	1200	0	39	92	200		12	92	169	362
25	1250	0	41	95	208		13	95	176	376
26	1300	0	42	99	216		13	99	182	391
27	1350	0	43	102	224		14	102	189	405
28	1400	0	45	106	232		14	106	195	420
29	1450	0	46	109	240		15	109	202	434
30	1500	0	47	113	248		15	113	209	449
31	1550	0	49	117	256		15	117	215	463
32	1600	0	50	120	264		16	120	222	478
33	1650	0	52	124	271		16	124	228	492
34	1700	0	53	127	279		17	127	235	506

TABLE IV Continued

GRADE COMPLIANCE Spears; and Tips		U.S. Grade A					U.S. Grade B		
		Maximum Defects Permitted							
In any Sample Unit (AL)[1]		0	5	8	15	2	8	13	25
		Critical	Severe	Major	Total [2]	Critical	Severe	Major	Total [2]
35	1750	0	54	131	287	17	131	242	521
36	1800	0	56	134	295	17	134	248	535
37	1850	0	57	138	303	18	138	255	550
38	1900	0	59	141	311	18	141	261	564
39	1950	0	60	145	318	19	145	268	579
40	2000	0	62	148	326	19	148	274	593
41	2050	0	63	152	334	19	152	281	607
42	2100	0	64	155	342	20	155	287	622
43	2150	0	66	159	350	20	159	294	636
44	2200	0	67	162	358	21	162	301	651
45	2250	0	68	166	365	21	166	307	665
46	2300	0	70	169	373	21	169	314	679
47	2350	0	71	172	381	22	172	320	694
48	2400	0	72	176	389	22	176	327	708
49	2450	0	74	179	397	23	179	333	723
50	2500	0	75	183	404	23	183	340	737

[1] In any sample unit, except the first one of 50 Spears or Tips.
[2] "Total" – the sum "Critical", "Severe", "Major", and "Minor" defects, as applicable.

APPENDIX VI TABLE V

GRADE COMPLIANCE Cut Spears; and Cuts		U.S. Grade A					U.S. Grade B			
		Maximum Defects Permitted								
In any Sample Unit (AL)[1]		0	7	14	25		3	14	22	44
		Critical	Severe	Major	Total [2]		Critical	Severe	Major	Total [2]
1	100	0	5	11	21		2	11	18	37
2	200	0	9	19	39		3	19	33	68
3	300	0	12	27	55		4	27	47	99
4	400	0	15	34	72		5	34	61	130
5	500	0	18	42	90		6	42	76	160
6	600	0	21	49	104		7	49	88	190
7	700	0	24	56	121		8	56	102	219
8	800	0	27	64	140		9	64	117	249
9	900	0	30	71	153		10	71	129	278
10	1000	0	33	78	169		11	78	142	308
11	1100	0	36	85	185		12	85	156	337
12	1200	0	39	92	200		12	92	169	366
13	1300	0	42	99	216		13	99	182	396
14	1400	0	45	106	232		14	106	195	425
15	1500	0	47	113	248		15	113	209	454
16	1600	0	50	120	264		16	120	222	483
17	1700	0	53	127	279		17	127	235	512
18	1800	0	56	134	295		17	134	248	541
19	1900	0	59	141	311		18	141	261	570
20	2000	0	62	148	326		19	148	274	599
21	2100	0	64	155	342		20	155	287	628
22	2200	0	67	162	358		21	162	301	651
23	2300	0	70	169	373		21	169	314	679
24	2400	0	72	176	389		22	176	327	708
25	2500	0	75	183	404		23	183	340	737
26	2600	0	78	190	420		24	190	353	766
27	2700	0	81	197	436		24	197	366	794
28	2800	0	83	203	451		25	203	379	823
29	2900	0	86	210	467		26	210	392	852
30	3000	0	89	217	482		27	217	405	880
31	3100	0	92	224	498		28	224	418	909
32	3200	0	94	231	513		28	231	431	938
33	3300	0	97	238	529		29	238	444	966
34	3400	0	100	245	544		30	245	457	995

TABLE IV Continued

GRADE COMPLIANCE Cut Spears; and Cuts		U.S. Grade A					U.S. Grade B		
		Maximum Defects Permitted							
In any Sample Unit (AL)1		0	7	14	25	3	14	22	44
		Critical	Severe	Major	Total [2]	Critical	Severe	Major	Total [2]
35	3500	0	102	252	560	31	252	470	1024
36	3600	0	105	258	575	31	258	483	1052
37	3700	0	108	265	591	32	265	496	1081
38	3800	0	111	272	606	33	272	509	1110
39	3900	0	113	279	622	34	279	521	1138
40	4000	0	116	286	637	34	286	534	1167
41	4100	0	119	292	653	35	292	547	1195
42	4200	0	122	299	668	36	299	560	1224
43	4300	0	124	306	684	37	306	573	1252
44	4400	0	127	313	699	37	313	586	1281
45	4500	0	130	320	714	38	320	599	1310
46	4600	0	132	327	730	39	327	612	1338
47	4700	0	135	333	745	40	333	625	1367
48	4800	0	138	340	761	40	340	638	1395
49	4900	0	140	347	776	41	347	651	1424
50	5000	0	143	354	792	42	354	663	1452

[1] In any sample unit, except the first one of 100 cuts.
[2] "Total" – the sum "Critical", "Severe", "Major", and "Minor" defects, as applicable.

APPENDIX VIII – EXAMPLE TALLY SHEET AND CONTROL CHART

REPRODUCE LOCALLY. *Include form number and date on all reproductions.* SHEET OF SHEETS

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

DEFECT TALLY SHEET FOR FROZEN ASPARAGUS

NAME AND ADDRESS OF APPLICANT: Blandos Frozen Food Co. Buddington, U.S.A.

STYLE: ☐ SPEARS ☐ CUT SPEARS ☐ CENTER CUTS ☐ TIPS

CODE:

DATE: 3-26-70

INSPECTOR (Print and Sign): H.N.W.

GRADE: B

TYPE: Green

LENGTH OF CUT: 5"

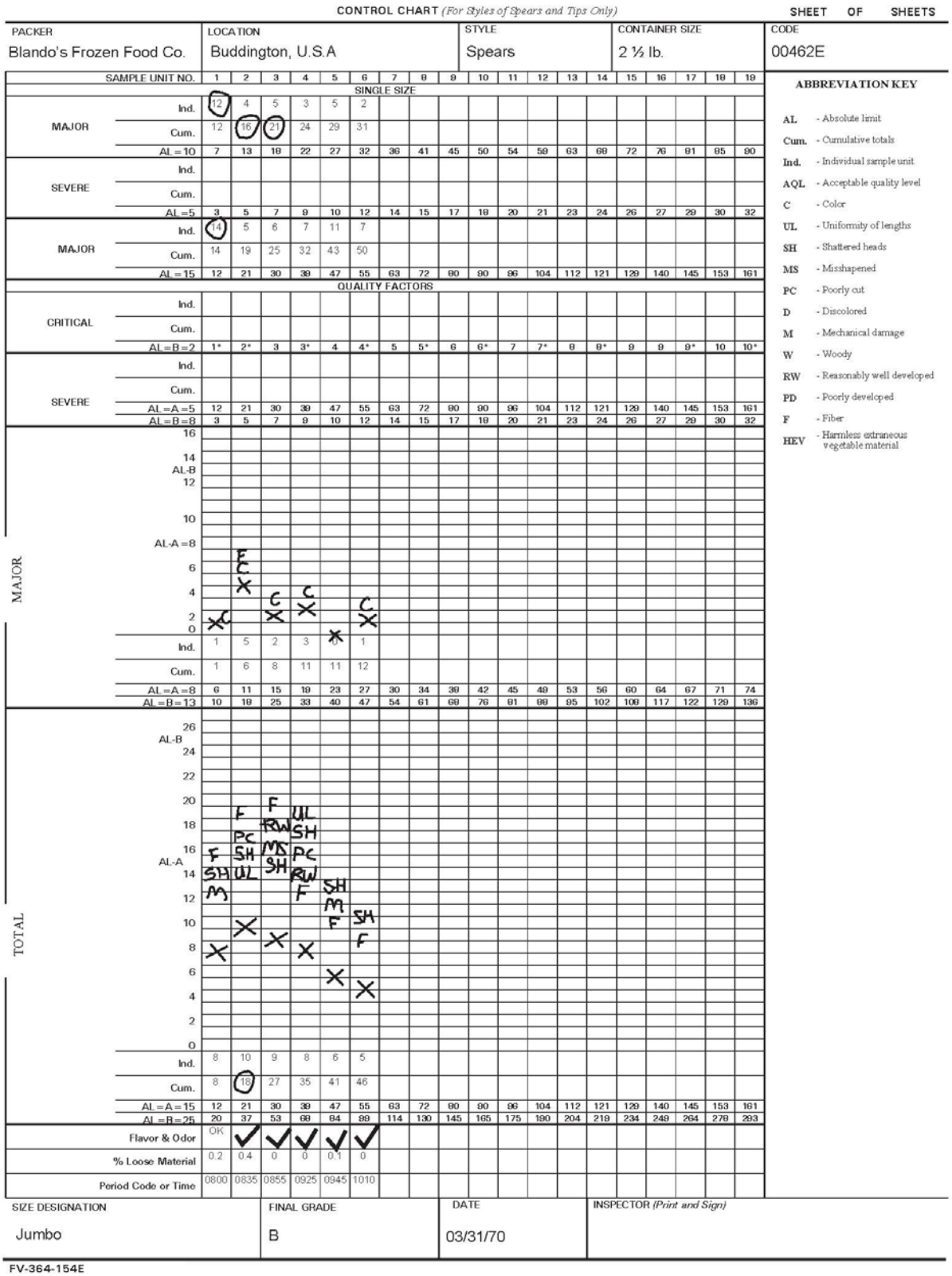
NO., SIZE AND KIND OF CONTAINER: 2 ½ lb. Carton

LABEL: Astro Brand Jumbo Asparagus Spears

CONTAINER MARK		10D6A 40.3				10D6B 40.2				10D6C 40.6				10D6D 40.7				10D6F 40.6				10D6G 40.4																			
NET WEIGHT																																								
Sample Unit No.		1				2				3				4				5				6				7				8				9							
DEFECT		Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.	Min.	Maj.	Se-vere	Crit.				
COLOR White or yellowish white			1				2				2				2								1																	
UNIFORMITY OF LENGTH	Varies> 1-1/2 in.					1								1																									
	Length <1/2"; >2"																																						
DAMAGE	Shattered heads	2				2				2				1				3				3																	
	Misshapened									1																													
	Poorly cut					1								1																									
	Discolored																																						
	Mechanical	1																2				2																	
	Pathological	3				1	2			3				1	1																								
	Other																																						
Harmless Extraneous Material																																								
CHARACTER	Reasonably well developed Poorly developed	1								1				1				1																					
	Fiber						1																																
TOTAL *(Each class)*		7	1			5	5			7	2			5	3			6				4	1																
CUMULATIVE TOTAL *(Each class)*		7	1			12	6			19	8			24	11			30	11			34	12																
TOTAL *(All classes)*		8				10				9				8				6				5																	
CUMULATIVE TOTAL *(All classes)*		8				18				27				35				41				46																	
SIZE *(Diameter)*		2	12			1	4	-		1	5	-		4	3	-		6	5	-		5	2	-															
CUMULATIVE TOTAL *(Each class)*		2	12			3	16	-		4	21	-		8	24	-		14	29	-		19	31	-															
TOTAL *(All classes)*		14				5				6				7				11				7																	
CUMULATIVE TOTAL *(All classes)*		14				19				25				32				43				50																	
% LOOSE MATERIAL		0.2				0.4				0				0				0.1				0																	
PERCENT HEAD MATERIAL																																							
FLAVOR AND ODOR		Good				-				-				-				-				-																	

REMARKS:

FV-364-154E



CONTROL CHART *(For Styles of Spears and Tips Only)*

SHEET OF SHEETS

PACKER	LOCATION	STYLE	CONTAINER SIZE	CODE
Blando's Frozen Food Co.	Buddington, U.S.A	Spears	2 ½ lb.	00462E

SAMPLE UNIT NO.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
SINGLE SIZE																				
MAJOR	Ind.	12	4	5	3	5	2													
	Cum.	12	16	21	24	29	31													
	AL=10	7	13	18	22	27	32	36	41	45	50	54	59	63	68	72	76	81	85	90
SEVERE	Ind.																			
	Cum.																			
	AL=5	3	5	7	9	10	12	14	15	17	18	20	21	23	24	26	27	29	30	32
MAJOR	Ind.	14	5	6	7	11	7													
	Cum.	14	19	25	32	43	50													
	AL=15	12	21	30	39	47	55	63	72	80	90	96	104	112	121	129	140	145	153	161
QUALITY FACTORS																				
CRITICAL	Ind.																			
	Cum.																			
	AL=B=2	1*	2*	3	3*	4	4*	5	5*	6	6*	7	7*	8	8*	9	9	9*	10	10*
SEVERE	Ind.																			
	Cum.																			
	AL=A=5	12	21	30	39	47	55	63	72	80	90	96	104	112	121	129	140	145	153	161
	AL=B=8	3	5	7	9	10	12	14	15	17	18	20	21	23	24	26	27	29	30	32
MAJOR	16																			
	14 AL-B																			
	12																			
	10																			
	AL-A=8																			
	6		F																	
	4		F		C	C														
	2	X			X	X														
	0	X					X													
	Ind.	1	5	2	3	0	1													
	Cum.	1	6	8	11	11	12													
	AL=A=8	6	11	15	19	23	27	30	34	39	42	45	49	53	56	60	64	67	71	74
	AL=B=13	10	18	25	33	40	47	54	61	69	76	81	89	95	102	109	117	122	129	136
TOTAL	26																			
	24 AL-B																			
	22																			
	20		F	F	UL															
	18		PC	RW	SH															
	16 AL-A	F	SH	MS	PC															
	14	SH	UL	SH	RW	SH														
	12	M			F	M														
	10		X	X		F	SH													
	8	X			X		F													
	6					X														
	4						X													
	2																			
	0																			
	Ind.	8	10	9	8	6	5													
	Cum.	8	18	27	35	41	46													
	AL=A=15	12	21	30	39	47	55	63	72	80	90	96	104	112	121	129	140	145	153	161
	AL=B=25	20	37	53	69	84	99	114	130	145	165	175	190	204	219	234	249	264	278	293
	Flavor & Odor	OK	✓	✓	✓	✓	✓													
	% Loose Material	0.2	0.4	0	0	0.1	0													
	Period Code or Time	0800	0835	0855	0925	0945	1010													

ABBREVIATION KEY

AL	- Absolute limit
Cum.	- Cumulative totals
Ind.	- Individual sample unit
AQL	- Acceptable quality level
C	- Color
UL	- Uniformity of lengths
SH	- Shattered heads
MS	- Misshapened
PC	- Poorly cut
D	- Discolored
M	- Mechanical damage
W	- Woody
RW	- Reasonably well developed
PD	- Poorly developed
F	- Fiber
HEV	- Harmless extraneous vegetable material

SIZE DESIGNATION	FINAL GRADE	DATE	INSPECTOR *(Print and Sign)*
Jumbo	B	03/31/70	

FV-364-154E