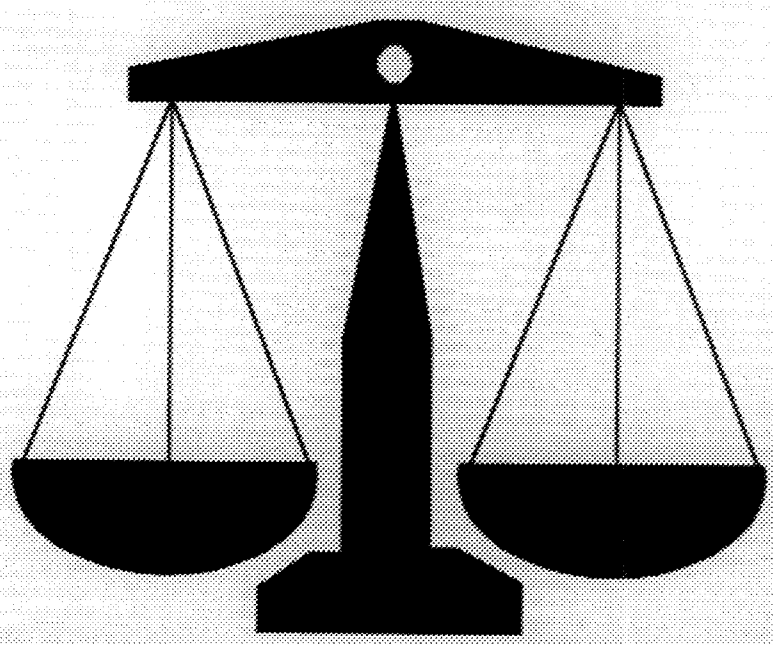
PN-ADC-847

QUALITY OF FRUITS AND VEGETABLES: GRADING & UNDERSTANDING QUALITY ISSUES



Presented by Agricultural-Led Export Businesses (ALEB)
November 9, 2000
Cairo Marriott
by
Mr. Dennis Spink

USAID Project No. 263-0264

Abt

DENNIS SPINK

3466 BROKEN ARROW LOOP
SALEM, OREGON 97304
TEL (503) 371-1365
EMAIL Osuspink@cs.com

EDUCATION:

	BS	BUSINESS AND TECHNOLOGY
	MINOR	FOOD SCIENCE,1956

EMPLOYMENT:

1991	1994	Vice President and Chief Quality officer for Agripac,Inc. Salem,Oregon .
1984	1991	Vice President of Quality Asssurance and research for Agripac Inc., Salem, Oregon.
1980	1984	Director of Quality Assurance for Agripac, Inc. Salem, Oregon.
1974	1980	Director of Quality Assurance, Frozen Food Division, for Stokely Van Camp, Inc., a National Food Processing Company. Frozen Food Plants in Washington , Oregon , California and Minnesota Stokely Van Camp , Inc.
1973	1974	Regional Quality Assurance Manager of frozen foods for the West Coast Region , Stokely Van Camp, Inc.
1969	1973	District Quality Assurance Manager of Northwest Frozen Food Plants for Stokely Van Camp , Inc.
1962	1969	Area Manager of Quality Assurance for Oregon and Southern Washington Frozen Food Plants of Stokely Van Camp , Inc.
1956	1962	Plant quality Manager , Frozen Food plant,Stokely Van Camp , Oxford, California.

ORGANIZATIONS RELATED TO FOOD PROCESS

INSTITUTE OF FOOD TECHNOLOGISTS

1962	1994	Member of Institute of Food Technologists, National.
1962	1979	Member of IFT , Puget Sound Section.
1964	1967	Member, Board of Directors, Puget Sound Section.
1967	1968	Vice President of Puget Sound IFT Section.
1968	1969	President , Puget Sound Section.
1969	1994	Member of Oregon Section.
1982	1983	Member of National Education Committee.
1992		Guest Speaker , National Convention.

UNIVERSITY ACTIVITIES

1966 & 1988	1969 1991	Washington State School of food Science, Industrial Advisory Committee.
1988	1994	Oregon State University School of Food Science , Industrial Advisory Committee.
1972	1994	University of California at Davis School of food Science , Industrial Advisory Committee.
1972	1997	Instructor at University of California School of Food Science: Short Course –Frozen Food Technology.
1968	1969	Instructor at Oregon State University , Short Course on Frozen Food Technology.
1968	1969	Guest Lecturer on Frozen Vegetables , Washington State University.

AMERICAN FROZEN FOOD INSTITUTE-National Frozen Food Association

1956	1994	Member , American Frozen Food Institute.
1967	1994	Member Western Technical Advisory Committee.
1972		Chairman of Research and Technology Council.
1972	1994	Member, Research and Technology Council.
1986	1994	Chairman of Frozen Food Research Foundation.
1962	1969	Chairman Frozen Food Temperature Abuse Committee, 7Yr. Study of Temperature abuse in Frozen Food Chain.
1964	1967	Board of Directors of the Institute.
1987	1990	Board of Directors of the Institute.
1982	1991	Chairman Advisory Committee to USDA on Frozen Grade Food Standards.

NATIONAL FOOD PROCESSORS ASSOCIATION

1983	1984	Chairman Grade Standard Advisory Committee For Canned and Frozen Grade Standard of USDA.

NORTHWEST FOOD PROCESSORS ASSOCIATION

1962	1975	Food Standards Committee.
1968	1972	Chairman of Food Standards Committee.
1990	1993	Chairman Operation Committee.

1964	Instructor , Food Micro, Short Course Several convention Guest Speaker Positions.

GENERAL AGRICULTURE ACTIVITIES

1980 1993	Guest Speaker Secondary Teachers Summer School for Agriculture.
1984	Guest Speaker, Northwest Horticulture Convention.
1972	Guest Speaker, Northwest Horticulture Convention.

OREGON STATE UNIVERSITY

School of Food Science Search Committee Member For the position of Food Extension Professor.

AWARDS

1979	Northwest Food Processors Key Award for "Outstanding Service to the Industry".

INTERNATIONAL

1974	Training and establishing Grade Standard And Process in Mexico.
1975	Training and Establish Sanitation and Bacteria Standard in Mexico.
1976	Plant Inspection of Mexico.
1993	Training new Sales People in Mexico for Mexican Company , Canned and Frozen.
1994	Agriculture Cooperative Development International (ACDI) Mission for Peru on Asparagus Processing.
1995	Chemonics Project to Guatemala.
1996	Chemonics with a touring African Project.
1997	Chili Project.

CONSULTING

1996	Consulting For Rainsweet Frozen Foods.
1996 & 1997	Expert Witness Food lawsuits.
1997	Consulting with Agripac , Inc.

REGISTRATION FORM

QUALITY & GRADING

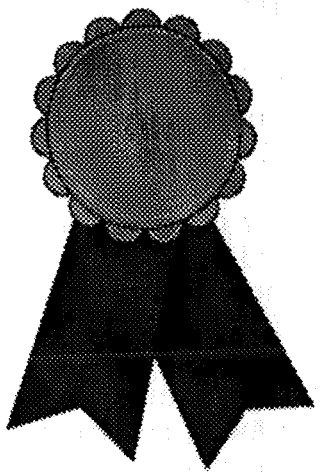
NAME
COMPANY
ADDRESS
TEL
FAX
EMAIL

REGISTRATION INFORMATION: There will be a **100 LE** fee for this program. Attendees will receive instruction, a course binder, coffee breaks, and lunches each day. They will also receive a Certificate of Attendance.

FOR FURTHER DETAILS:

AGRICULTURAL LED EXPORT BUSINESSES
12 DOKKI STREET, 6TH FLOOR
DOKKI, CAIRO
TEL 338-1445 (8 LINES)
FAX 348-0729

QUALITY OF FRUITS & VEGETABLES: GRADING & UNDERSTANDING QUALITY ISSUES



A WORKSHOP SPONSORED
BY
AGRICULTURAL LED EXPORT BUSINESSES
&
THE CENTER OF ADVANCED FOOD TECHNOLOGY

NOVEMBER 9, 2000 @ 9:30 AT THE CAIRO MARRIOTT, ZAMALEK, CAIRO

USAID PROJECT NO. 263-0264

QUALITY OF FRUITS & VEGETABLES: GRADING & UNDERSTANDING QUALITY ISSUES

INTRODUCTION

Assuring the quality of processed foods is no accident. It requires commitment from management and attention to all phases of the production chain; literally from field to fork. Product quality may be affected by poor harvesting and handling practices, insanitation, improper processing and handling, or abuse in transit.

This program will address quality issues in canned and frozen foods, and those parts of the process that affect food quality. Participants will learn how to upgrade and improve their processes and food handling practices to enhance quality of their finished products. The program will also include a hands-on grading session, which will allow attendees to evaluate and grade products according to United States and European standards.

THE PROGRAM

I. Importance of Quality and Safety in Doing Business

II. History of Fruit & vegetable Processing

III. Terminology

IV. Sanitation & GMP Compliance: Effects on Quality

V. What The Buyer Wants to Know About Suppliers

VI. Quality Standards for Fruits & Vegetables

- A. Understanding Grading
- B. Why Grade Standards Were Developed
- C. Defects & Other Quality Issues – Examination of A Range of Products
- D. Hands-On Grading

VII. Government Imposed vs. Industry Standards

INSTRUCTOR

Mr. Dennis Spink is an independent consultant who is currently working in the area of frozen food quality and safety. Prior to setting up his own business, he was the Vice President and Chief Quality Officer for Agripac, Inc. in Salem, Oregon. Agripac was one of the largest fruit and vegetable processors in the United States. While with Agripac, Spink helped develop grading systems for frozen foods that were eventually adopted by the United States Department of Agriculture.

MORE INFORMATION

Mr. Richard F. Stier
Mr. Morad S. Ahmed
ALEB
12 Dokki Street
Giza, Cairo
TEL 338-1445 (6 Lines)
FAX 348-0729
EGYPT
EMAIL rfstier4@egyptonline.com
EMAIL morad@egyptonline.com

November 9, 2000
9:30 – 17:00

CAIRO MARRIOTT
ZAMALEK, CAIRO

FOOD SAFETY & QUALITY: KEYS TO COMPETITIVENESS

AGENDA
NOVEMBER, 2000
CAIRO, EGYPT

I. BRIEF HISTORY OF THE FRUIT AND VEGETABLE PROCESSING INDUSTRY

II. IMPORTANCE OF QUALITY AND SAFETY IN DOING BUSINESS

- A. Why so many companies miss it
- B. Correction of the missing policy
- C. Blending of costs, quality and safety to equal profits

III. TERMINOLOGY OF THE INDUSTRY

IV. SANITATION AND GMP COMPLIANCE: EFFECTS ON QUALITY

V. WHAT THE BUYER WANTS TO KNOW ABOUT SUPPLIERS

VI. DEFINITION OF QUALITY

VII. WHY DO WE NEED STANDARDS ON FRUITS AND VEGETABLES?

- A. Understanding Standards
  1. Tips and facts about sampling, standards and specifications
- B. Defects and other quality issues
  1. Examination of a range of products
  2. Hands on grading
- C. Single Attribute System

VIII. STANDARDS AND SYSTEMS

- A. Writing Standards and Specifications

IX. HOW TO USE QUALITY DATA, SYSTEMS AND STANDARDS TO INCREASE PROFITS

X. GOVERNMENT IMPOSED VS. INDUSTRY STANDARDS

XI. PACK REPORTING 1999

'rozen 'ood 'imeline

500 B.C. - 1800 A.D. Cooling achieved by use of snow, natural ice, air in cold climates (weather freezing), evaporative cooling of water, and radiative cooling. The use of chemicals to lower the freezing point of water was known at least as early as 1550.

1820 - By this time, natural ice had come into general use as an article of commerce and was used on large scale for food preservation.

1842 - H. Benjamin was granted a British patent for a rapid freezing technique involving immersion of the article in a freezant.

1851 - Jacob Fussell of Baltimore, Maryland, first sold ice cream on a serious commercial scale in the U.S.

1853-54 - Captain H.O. Smith sailed to Newfoundland and conducted the first commercial "weather freezing" of fish.

1861 - Thomas S. More established what is believed to be the world's first cold storage plant in Darling Harbor, Australia. This facility was used primarily for freezing meat.

1861 - Enoch Piper of Camden, Maine, was granted a U.S. patent for the first practical method for artificially freezing fish and storing them in the frozen state. Freezing was accomplished in an insulated room by positioning pans of ice and salt over the fish. Glazing of the fish was also incorporated.

About 1863 - Artificial freezing of fish on a commercial basis began in the U.S., particularly in the Great Lakes region (salt and ice method).

1864 - Ferdinand Carre patented an ammonia compression machine in France.

1865 - A. & E. Robbins, Co. of New York City, using ice and salt, was the first company to freeze poultry in the U.S.

1867 - Dr. Peyton Howard made the first successful shipment of frozen beef in the U.S.

1868 - William Davis developed a freezing system for fish that involved packing fish tightly in metal pans, attaching a metal lid, and surrounding the pans with an ice-salt freezing mixture. This system was later used extensively on a commercial basis.

1869 - Pigeons were first frozen commercially in the U.S.

1870 - Ammonia compression machines were brought to a level of practicality almost simultaneously by Dr. Carl Linde in Germany and David Boyle in the U.S. Until this development, frozen foods were relatively unimportant.

1876 - Frozen meat was first shipped from the U.S. to England using the ice-salt method.

About 1880 - Ammonia compression machines and insulated rooms began to be used in the U.S.

About 1880 - Frozen meat was shipped from Australia to England using mechanical refrigeration. This was believed to be the first major use of mechanical refrigeration for preserving perishable food. About 30 tons of meat were transported on the Scottish steamer "Strathlaven," and the shipment arrived in good condition. Part of this meat was subsequently eaten by the royal family.

About 1880 - Commercial freezing of fish, poultry and meat became common in the U.S.

1889 - Liquid eggs were first frozen commercially in the U.S.

1891 - By this time 1,153,000 frozen mutton carcasses had been exported from New Zealand.

1892 - In Sandusky, Ohio, an ammonia compressor was first used in the U.S. for freezing fish.

1900 - By this time, fish freezing had become an important industry in the U.S.

1905 - Fruit was first frozen commercially in the U.S.

1907 - By this time, the importance of proper packaging of frozen fruit was recognized.

1907 - A histological technique was developed that enabled detection of the comparative physical effects of slow and quick freezing.

About 1910 - Fruit was frozen commercially in the Northwestern U.S. Some problems were encountered with fermentation of berries during slow freezing in large barrels.

About 1916 - Scientific work on the methodology of freezing foods began in earnest.

American Frozen Food Institute
1764 Old Meadow Lane • Suite 350 • McLean, Virginia 22102 • (703) 821-0770 • FAX (703) 821-1350

HISTORY OF FRUIT AND VEGETABLE PROCESSING

1. After World War II
2. 1958 Bacteria Standards
3. GMP's
4. 1972 Food Industrial Revolution
5. New centers for world food supply.

IMPORTANCE OF QUALITY AND SAFETY IN DOING BUSINESS.

A. Quality and safety is your business.
   1. These two factors determine:
      a. Time in business
      b. Position in industry
      c. Position in the market
      d. Profits.

B. Why so many Companies miss it?
   1. Pursuit of profit
   2. Not understanding the market.
   3. Not realizing obligation to the Customer.
   4. Not being able to measure their value.

C. Correction of missing policy
   1. Rethink Company goals by adding quality and safety.
   2. Study your market
      a. What sells
   3. Update company systems

D. Blending costs, quality and safety to equal profits.
   1. Lower costs
   2. Increase sales

TERMS USED IN THE INDUSTRY

1. **Block Frozen** – Items frozen in a block of ice.

2. **Wet pack** – Items frozen in a retail or wholesale carton.

3. **Blast Tunnel** – a dead-end hallway where buggies loaded with trays of wet-pack cartons are placed to allow cold air to blow between the packages to speed up the freezing process.

4. **I.Q.F.** – Individual Quick Frozen. This was accomplished in the 1960's by new freezing belts.

5. **I.P.M.** – Integrated Pest Management – a system of using chemical only when necessary and in the lowest possible amount and still accomplish disease or insect control.

6. **G.M.P.** – Good Manufacturing Practices. A set of manufacturing rules that are to be used as guidelines in providing clean and wholesome food.

7. **Low Acid G.M.P.** – A set of Good Manufacturing Rules that are required in manufacturing of canned vegetables.

8. **Recall System** – A code system that allows for a tracing and removal of product from the market place.

9. **Blanching** – a subjecting of vegetables to high heat (200°F) for short periods of time to maintain flavor and color of the product.

10. **Enzyme** – A group of complex proteins that can cause a loss of color and flavor in most vegetables after freezing. Blanching will inactivate them.

11. **Glassy Point** – A temperature at which all liquid within a cell become ice.

12. **Freezer Burn** – A quality condition caused by the migration of the moisture from the surface tissue of the product causing it to turn white in color and to become tough in texture.

13. **Moisture Migration** – The movement of water within or away from the vegetable units while in a frozen state.

SANITATION AND GMP COMPLIANCE: EFFECTS ON QUALITY

A. Sanitation
   1. Define
   2. Organization
   3. Tools
   4. Inspection
   5. Use of Information

B. GMP's
   1. Define
   2. Special: personal hygiene
   3. Value and connection to profits and quality improvement

C. Relate effects on quality
   1. Appearance
   2. Food Safety
   3. Selling tool

CURRENT GOOD MANUFACTURING PRACTICE IN MANUFACTURING, PROCESSING, PACKING, OR HOLDING HUMAN FOOD

PART 110 — SANITATION*

Promulgated as Part 128 4/26/69, effective 5/26/69, recodified as Part 110 3/15/77. Revised 51 FR 22458, 6/19/86, Effective 12/16/86. (Minor corrections may be published in the Federal Register at a later date).

TITLE 21—FOOD AND DRUGS

PART 110 CURRENT FOOD MANUFACTURING PRACTICE (SANITATION) IN MANUFACTURING, PROCESSING, PACKING, OR HOLDING HUMAN FOOD.

SUBPART A—GENERAL PROVISIONS

110.3 Definitions.
110.5 Current good manufacturing practice.
110.10 Personnel.
110.19 Exclusions.

SUBPART B—BUILDINGS AND FACILITIES

110.20 Plant and grounds.
110.35 Sanitary operations.
110.37 Sanitary facilities and controls.

SUBPART C—EQUIPMENT

110.40 Equipment and utensils.

SUBPART D—[Reserved]

SUBPART E—PRODUCTION AND PROCESS CONTROLS

110.80 Processes and controls.
110.93 Warehousing and distribution.

SUBPART F—[Reserved]

SUBPART G—DEFECT ACTION LEVELS

110.110 Natural or unavoidable defects in food for human use that present no health hazard.

Subpart A—General Provisions

§110.3 DEFINITIONS.

The definitions and interpretations of terms in section 201 of the Federal Food, Drug, and Cosmetic Act (the act) are applicable to such terms when used in this part. The following definitions shall also apply:

(a) "Acid foods or acidified foods" means foods that have an equilibrium pH of 4.6 or below.

(b) "Adequate" means that which is needed to accomplish the intended purpose in keeping with good public health practice.

(c) "Batter" means a semifluid substance, usually composed of flour and other ingredients, into which principal components of food are dipped or with which they are coated, or which may be used directly to form bakery foods.

(d) "Blanching", except for tree nuts and peanuts, means a prepackaging heat treatment of foodstuffs for a sufficient time and at a sufficient temperature to partially or completely inactivate the naturally occuring enzymes and to effect other physical or biochemical changes in the food.

(e) "Critical control point" means a point in a food process where there is a high probability that improper control may cause, allow, or contribute to a hazard or to filth in the final food or decomposition of the final food.

(f) "Food" means food as defined in section 201(f) of the act and includes raw materials and ingredients.

(g) "Food contact surfaces" are those surfaces that contact human food and those surfaces from which drainage onto the food or onto surfaces that contact the food ordinarily occurs during the normal course of operations. "Food-contact surfaces" includes utensils and food-contact surfaces of equipment.

(h) "Lot" means the food produced during a period of time indicated by a specific code.

(i) "Microorganisms" means yeasts, molds, bacteria, and viruses and includes, but is not limited to, species having public health significance. The term "undesirable microorganisms" includes those microorganisms that are of public health significance, that subject food to decomposition, that indicate that food is contaminated with filth, or that otherwise may cause food to be adulterated within the meaning of the act. Occasionally in these regulations, FDA used the adjective "microbial" instead of using an adjectival phrase containing the word microorganism.

(j) "Pest" refers to any objectionable animals or insects including, but not limited to, birds, rodents, flies, and larvae.

(k) "Plant" means the building or facility or parts thereof, used for or in connection with the manufacturing, packaging, labeling, or holding of human food.

(l) "Quality control operation" means a planned and systematic procedure for taking all actions necessary to prevent food from being adulterated within the meaning of the act.

(m) "Rework" means clean, unadulterated food that has been removed from processing for reasons other than insanitary conditions or that has been successfully reconditioned by reprocessing and that is suitable for use as food.

(n) "Safe-moisture level" is a level of moisture

*These requirements apply also to U.S.D.A. inspection and purchase contract (39 FR 786 - 1/3/74).

15

low enough to prevent the growth of undesirable microorganisms in the finished product under the intended conditions of manufacturing, storage, and distribution. The maximum safe moisture level for a food is based on its water activity (a_w). An a_w will be considered safe for a food if adequate data are available that demonstrate that the food at or below the given a_w will not support the growth of undesirable microorganisms.

(o) "Sanitize" means to adequately treat food-contact surfaces by a process that is effective in destroying vegetative cells of microorganisms of public health significance, and in substantially reducing numbers of other undesirable microorganisms, but without adversely affecting the product or its safety for the consumer.

(p) "Shall" is used to state mandatory requirements.

(q) "Should" is used to state recommended or advisory procedures or identify recommended equipment.

(r) "Water activity" (a_w) is a measure of the free moisture in a food and is the quotient of the water vapor pressure of the substance divided by the vapor pressure of pure water at the same temperature.

§110.5 CURRENT GOOD MANUFACTURING PRACTICE.

(a) The criteria and definitions in this part shall apply in determining whether a food is adulterated (1) within the meaning of section 402(a)(3) of the act in that the food has been manufactured under such conditions that it is unfit for food; or (2) within the meaning of section 402(a)(4) of the act in that the food has been prepared, packed, or held under insanitary conditions whereby it may have become contaminated with filth, or whereby it may have been rendered injurious to health. The criteria and definitions in this part also apply in determining whether a food is in violation of section 361 of the Public Health Service Act (42 U.S.C. 264).

(b) Food covered by specific current good manufacturing practice regulations also is subject to the requirements of those regulations.

§110.10 PERSONNEL.

The plant management shall take all reasonable measures and precautions to ensure the following:

(a) *Disease control.* Any person who, by medical examination or supervisory observation, is shown to have, or appears to have, an illness, open lesion, including boils, sores, or infected wounds, or any other abnormal source of microbial contamination by which there is a reasonable possibility of food, food-contact surfaces, or food-packaging materials becoming contaminated, shall be excluded from any operations which may be expected to result in such contamination until the condition is corrected. Personnel shall be instructed to report such health conditions to their supervisors.

(b) *Cleanliness.* All persons working in direct contact with food, food-contact surfaces, and food-packaging materials shall conform to hygienic practices while on duty to the extent necessary to protect against contamination of food. The methods for maintaining cleanliness include, but are not limited to:

(1) Wearing outer garments suitable to the operation in a manner that protects against the contamination of food, food-contact surfaces, or food-packaging materials.

(2) Maintaining adequate personal cleanliness.

(3) Washing hands thoroughly (and sanitizing if necessary to protect against contamination with undesirable microorganisms) in an adequate hand-washing facility before starting work, after each absence from the work station, and at any other time when the hands may have become soiled or contaminated.

(4) Removing all insecure jewelry and other objects that might fall into food, equipment, or containers, and removing hand jewelry that cannot be adequately sanitized during periods in which food is manipulated by hand. If such hand jewelry cannot be removed, it may be covered by material which can be maintained in an intact, clean, and sanitary condition and which effectively protects against the contamination by these objects of the food, food-contact surfaces, or food-packaging materials.

(5) Maintaining gloves, if they are used in food handling, in an intact, clean, and sanitary condition. The gloves should be of an impermeable material.

(6) Wearing, where appropriate, in an effective manner, hair nets, headbands, caps, beard covers, or other effective hair restraints.

(7) Storing clothing or other personal belongings in areas other than where food is exposed or where equipment or utensils are washed.

(8) Confining the following to areas other than where food may be exposed or where equipment or utensils are washed: eating food, chewing gum, drinking beverages, or using tobacco.

(9) Taking any other necessary precautions to protect against contamination of food, food-contact surfaces, or food-packaging materials with microorganisms or foreign substances including, but not limited to, perspiration, hair, cosmetics, tobacco, chemicals, and medicines applied to the skin.

(c) *Education and training.* Personnel responsible for identifying sanitation failures or food contamination should have a background of education or experience, or a combination thereof, to provide a level of competency necessary for production of clean and safe food. Food handlers and supervisors should receive appropriate training in proper food handling techniques and food-protection principles and should be informed of the danger of poor personal hygiene and insanitary practices.

(d) *Supervision.* Responsibility for assuring compliance by all personnel with all requirements

16

of this part shall be clearly assigned to competent supervisory personnel.

§110.19 EXCLUSIONS.

(a) The following operations are not subject to this part: Establishments engaged solely in the harvesting, storage, or distribution of one or more "raw agricultural commodities," as defined in section 201(r) of the act, which are ordinarily cleaned, prepared, treated, or otherwise processed before being marketed to the consuming public.

(b) FDA, however, will issue special regulations if it is necessary to cover these excluded operations.

Subpart B—Buildings and Facilities

§110.20 PLANTS AND GROUNDS.

(a) *Grounds.* The grounds about a food plant under the control of the operator shall be kept in a condition that will protect against the contamination of food. The methods for adequate maintenance of grounds include, but are not limited to:

(1) Properly storing equipment, removing litter and waste, and cutting weeds or grass within the immediate vicinity of the plant buildings or structures that may constitute an attractant, breeding place, or harborage for pests.

(2) Maintaining roads, yards, and parking lots so that they do not constitute a source of contamination in areas where food is exposed.

(3) Adequately draining areas that may contribute contamination to food by seepage, foot-borne filth, or providing a breeding place for pests.

(4) Operating systems for waste treatment and disposal in an adequate manner so that they do not constitute a source of contamination in areas where food is exposed.

If the plant grounds are bordered by grounds not under the operator's control and not maintained in the manner described in paragraph (a)(1) through (3) of this section, care shall be exercised in the plant by inspection, extermination, or other means to exclude pests, dirt, and filth that may be a source of food contamination.

(b) *Plant construction and design.* Plant buildings and structures shall be suitable in size, construction, and design to facilitate maintenance and sanitary operations for food-manufacturing purposes. The plant and facilities shall:

(1) Provide sufficient space for such placement of equipment and storage of materials as is necessary for the maintenance of sanitary operations and the production of safe food.

(2) Permit the taking of proper precautions to reduce the potential for contamination of food, food-contact surfaces, or food-packaging materials with microorganisms, chemicals, filth, or other extraneous material. The potential for contamination may be reduced by adequate food safety controls and operating practices or effective design, including the separation of operations in which contamination is likely to occur, by one or more of the following means: location, time, partition, air flow, enclosed systems, or other effective means.

(3) Permit the taking of proper precautions to protect food in outdoor bulk fermentation vessels by any effective means, including:

(i) Using protective coverings.

(ii) Controlling areas over and around the vessels to eliminate harborages for pests.

(iii) Checking on a regular basis for pests and pest infestation.

(iv) Skimming the fermentation vessels, as necessary.

(4) Be constructed in such a manner that floors, walls, and ceilings may be adequately cleaned and kept clean and kept in good repair; that drip or condensate from fixtures, ducts and pipes does not contaminate food, food-contact surfaces, or food-packaging materials; and that aisles or working spaces are provided between equipment and walls and are adequately unobstructed and of adequate width to permit employees to perform their duties and to protect against contaminating food or food-contact surfaces with clothing or personal contact.

(5) Provide adequate lighting in hand-washing areas, dressing and locker rooms, and toilet rooms and in all areas where food is examined, processed, or stored and where equipment or utensils are cleaned; and provide safety-type light bulbs, fixtures, skylights, or other glass suspended over exposed food in any step of preparation or otherwise protect against food contamination in case of glass breakage.

(6) Provide adequate ventilation or control equipment to minimize odors and vapors (including steam and noxious fumes) in areas where they may contaminate food; and locate and operate fans and other air-blowing equipment in a manner that minimizes the potential for contaminating food, food-packaging materials, and food-contact surfaces.

(7) Provide, where necessary, adequate screening or other protection against pests.

§110.35 SANITARY OPERATIONS.

(a) *General maintenance.* Buildings, fixtures, and other physical facilities of the plant shall be maintained in a sanitary condition and shall be kept in repair sufficient to prevent food from becoming adulterated within the meaning of the act. Cleaning and sanitizing of utensils and equipment shall be conducted in a manner that protects against contamination of food, food-contact surfaces, or food-packaging materials.

(b) *Substances used in cleaning and sanitizing; storage of toxic materials.* (1) Cleaning compounds and sanitizing agents used in cleaning and sanitizing procedures shall be free from undesirable microorganisms and shall be safe and adequate under the conditions of use. Compliance with this requirement may be verified by any

17

effective means including purchase of these substances under a supplier's guarantee or certification, or examination of these substances for contamination. Only the following toxic materials that are required to maintain sanitary conditions may be used or stored in a plant where food is processed or exposed: (i) Those required to maintain clean and sanitary conditions; (ii) Those necessary for use in laboratory testing procedures; (iii) Those necessary for plant and equipment maintenance and operation; and (iv) Those necessary for use in the plant's operations.

(2) Toxic cleaning compounds, sanitizing agents, and pesticide chemicals shall be identified, held, and stored in a manner that protects against contamination of food, food-contact surfaces, or food-packaging materials. All relevant regulations promulgated by other Federal, State, and local government agencies for the application, use, or holding of these products should be followed.

(c) *Pest control.* No pests shall be allowed in any area of a food plant. Guard or guide dogs may be allowed in some areas of a plant if the presence of the dogs in unlikely to result in contamination of food, food-contact surfaces, or food-packaging materials. Effective measures shall be taken to exclude pests from the processing areas and to protect against the contamination of food on the premises by pests. The use of insecticides or rodenticides is permitted only under precautions and restrictions that will protect against the contamination of food, food-contact surfaces, and food-packaging materials.

(d) *Sanitation of food-contact surfaces.* All food-contact surfaces, including utensils and food-contact surfaces of equipment, shall be cleaned as frequently as necessary to protect against contamination of food.

(1) Food-contact surfaces used for manufacturing or holding low-moisture food shall be in a dry, sanitary condition at the time of use. When the surfaces are wet-cleaned, they shall, when necessary, be sanitized and thoroughly dried before subsequent use.

(2) In wet processing, when cleaning is necessary to protect against the introduction of microorganisms into food, all food-contact surfaces shall be cleaned and sanitized before use and after any interruption during which the food-contact surfaces may have become contaminated. Where equipment and utensils are used in a continuous production operation, the utensils and food-contact surfaces of the equipment shall be cleaned and sanitized as necessary.

(3) Non-food-contact surfaces of equipment used in the operation of food plants should be cleaned as frequently as necessary to protect against contamination of food.

(4) Single-service articles (such as utensils intended for one-time use, paper cups, and paper towels) should be stored in appropriate containers and shall be handled, dispensed, used, and disposed of in a manner that protects against contamination of food or food-contact surfaces.

(5) Sanitizing agents shall be adequate and safe under conditions of use. Any facility, procedure, or machine is acceptable for cleaning and sanitizing equipment and utensils if it is established that the facility, procedure, or machine will routinely render equipment and utensils clean and provide adequate cleaning and sanitizing treatment.

(e) *Storage and handling of cleaned portable equipment and utensils.* Cleaned and sanitized portable equipment with food-contact surfaces and utensils should be stored in a location and manner that protects food-contact surfaces from contamination.

§110.37 SANITARY FACILITIES AND CONTROLS.

Each plant shall be equipped with adequate sanitary facilities and accommodations including, but not limited to:

(a) *Water supply.* The water supply shall be sufficient for the operations intended and shall be derived from an adequate source. Any water that contacts food or food-contact surfaces shall be safe and of adequate sanitary quality. Running water at a suitable temperature, and under pressure as needed, shall be provided in all areas where required for the processing of food, for the cleaning of equipment, utensils, and food-packaging materials, or for employee sanitary facilities.

(b) *Plumbing.* Plumbing shall be of adequate size and design and adequately installed and maintained to:

(1) Carry sufficient quantities of water to required locations throughout the plant.

(2) Properly convey sewage and liquid disposable waste from the plant.

(3) Avoid constituting a source of contamination to food, water supplies, equipment, or utensils or creating an unsanitary condition.

(4) Provide adequate floor drainage in all areas where floors are subject to flooding-type cleaning or where normal operations release or discharge water or other liquid waste on the floor.

(5) Provide that there is not backflow from, or cross-connection between, piping systems that discharge waste water or sewage and piping systems that carry water for food or food manufacturing.

(c) *Sewage disposal.* Sewage disposal shall be made into an adequate sewerage system or disposed of through other adequate means.

(d) *Toilet facilities.* Each plant shall provide its employees with adequate, readily accessible toilet facilities. Compliance with this requirement may be accomplished by:

(1) Maintaining the facilities in a sanitary condition.

(2) Keeping the facilities in good repair at all times.

(3) Providing self-closing doors.

(4) Providing doors that do not open into areas where food is exposed to airborne con-

tamination, except where alternate means have been taken to protect against such contamination (such as double doors or positive airflow systems).

(e) *Hand-washing facilities.* Hand-washing facilities shall be adequate and convenient and be furnished with running water at a suitable temperature. Compliance with this requirement may be accomplished by providing:

(1) Hand-washing and, where appropriate, hand-sanitizing facilities at each location in the plant where good sanitary practices require employees to wash and/or sanitize their hands.

(2) Effective hand-cleaning and sanitizing preparations.

(3) Sanitary towel service or suitable drying devices.

(4) Devices or fixtures, such as water control valves, so designed and constructed to protect against recontamination of clean, sanitized hands.

(5) Readily understandable signs directing employees handling unprotected food, unprotected food-packaging materials, or food-contact surfaces to wash and, where appropriate, sanitize their hands before they start work, after each absence from post of duty, and when their hands may have become soiled or contaminated. These signs may be posted in the processing room(s) and in all other areas where employees may handle such food, materials, or surfaces.

(6) Refuse receptacles that are constructed and maintained in a manner that protects against contamination of food.

(f) *Rubbish and offal disposal.* Rubbish and any offal shall be so conveyed, stored, and disposed of as to minimize the development of odor, minimize the potential for the waste becoming an attractant and harborage or breeding place for pests, and protect against contamination of food, food-contact surfaces, water supplies, and ground surfaces.

Subpart C—Equipment

§110.40 EQUIPMENT AND UTENSILS.

(a) All plant equipment and utensils shall be so designed and of such material and workmanship as to be adequately cleanable, and shall be properly maintained. The design, construction, and use of equipment and utensils shall preclude the adulteration of food with lubricants, fuel, metal fragments, contaminated water, or any other contaminants. All equipment should be so installed and maintained as to facilitate the cleaning of the equipment and of all adjacent spaces. Food-contact surfaces shall be corrosion-resistant when in contact with food. They shall be made of nontoxic materials and designed to withstand the environment of their intended use and the action of food, and, if applicable, cleaning compounds and sanitizing agents. Food-contact surfaces shall be maintained to protect food from being contaminated by any source, including unlawful indirect food additives.

(b) Seams on food-contact surfaces shall be smoothly bonded or maintained so as to minimize accumulation of food particles, dirt, and organic matter and thus minimize the opportunity for growth of microorganisms.

(c) Equipment that is in the manufacturing or food-handling area and that does not come into contact with food shall be so constructed that it can be kept in a clean condition.

(d) Holding, conveying, and manufacturing systems, including gravimetric, pneumatic, closed, and automated systems, shall be of a design and construction that enables them to be maintained in an appropriate sanitary condition.

(e) Each freezer and cold storage compartment used to store and hold food capable of supporting growth of microorganisms shall be fitted with an indicating thermometer, temperature-measuring device, or temperature-recording device so installed as to show the temperature accurately within the compartment, and should be fitted with an automatic control for regulating temperature or with an automatic alarm system to indicate a significant temperature change in a manual operation.

(f) Instruments and controls used for measuring, regulating, or recording temperatures, pH, acidity, water activity, or other conditions that control or prevent the growth of undesirable microorganisms in food shall be accurate and adequately maintained, and adequate in number for their designated uses.

(g) Compressed air or other gases mechanically introduced into food or used to clean food-contact surfaces or equipment shall be treated in such a way that food is not contaminated with unlawful indirect food additives.

Subpart D—[Reserved]

Subpart E—Production and Process Controls

§110.80 PROCESSES AND CONTROLS.

All operations in the receiving, inspecting, transporting, segregating, preparing, manufacturing, packaging, and storing of food shall be conducted in accordance with adequate sanitation principles. Appropriate quality control operations shall be employed to ensure that food is suitable for human consumption and that food-packaging materials are safe and suitable. Overall sanitation of the plant shall be under the supervision of one or more competent individuals assigned responsibility for this function. All reasonable precautions shall be taken to ensure that production procedures do not contribute contamination from any source. Chemical, microbial, or extraneous-material testing procedures shall be used where necessary to identify sanitation failures or possible food contamination. All food that has become contaminated to the extent that it is adulterated within the meaning of the act shall be rejected, or if permissible, treated or processed to eliminate the contamination.

(a) *Raw materials and other ingredients.* (1) Raw materials and other ingredients shall be inspected and segregated or otherwise handled as necessary to ascertain that they are clean and suitable for processing into food and shall be stored under conditions that will protect against contamination and minimize deterioration. Raw materials shall be washed or cleaned as necessary to remove soil or other contamination. Water used for washing, rinsing, or conveying food shall be safe and of adequate sanitary quality. Water may be reused for washing, rinsing, or conveying food if it does not increase the level of contamination of the food. Containers and carriers of raw materials should be inspected on receipt to ensure that their condition has not contributed to the contamination or deterioration of food.

(2) Raw materials and other ingredients shall either not contain levels of microorganisms thay may produce food poisoning or other disease in humans, or they shall be pasteurized or otherwise treated during manufacturing operations so that they no longer contain levels that would cause the product to be adulterated within the meaning of the act. Compliance with this requirement may be verified by any effective means, including purchasing raw materials and other ingredients under a supplier's guarantee or certification.

(3) Raw materials and other ingredients susceptible to contamination with aflatoxin or other natural toxins shall comply with current Food and Drug Administration regulations, guidelines, and action levels for poisonous or deleterious substances before these materials or ingredients are incorporated into finished food. Compliance with this requirement may be accomplished by purchasing raw materials and other ingredients under a supplier's guarantee or certification, or may be verified by analyzing these materials and ingredients for aflatoxins and other natural toxins.

(4) Raw materials, other ingredients, and rework susceptible to contamination with pests, undesirable microorganisms, or extraneous material shall comply with applicable Food and Drug Administration regulations, guidelines, and defect action levels for natural or unavoidable defects if a manufacturer wishes to use the materials in manufacturing food. Compliance with this requirement may be verified by any effective means, including purchasing the materials under a supplier's guarantee or certification, or examination of these materials for contamination.

(5) Raw materials, other ingredients, and rework shall be held in bulk, or in containers designed and constructed so as to protect against contamination and shall be held at such temperature and relative humidity and in such a manner as to prevent the food from becoming adulterated within the meaning of the act. Material scheduled for rework shall be identified as such.

(6) Frozen raw materials and other ingredients shall be kept frozen. If thawing is required prior to use, it shall be done in a manner that prevents the raw materials and other ingredients from becoming adulterated within the meaning of the act.

(7) Liquid or dry raw materials and other ingredients received and stored in bulk form shall be held in a manner that protects against contamination.

(b) *Manufacturing operations.* (1) Equipment and utensils and finished food containers shall be maintained in an acceptable condition through appropriate cleaning and sanitizing, as necessary. Insofar as necessary, equipment shall be taken apart for thorough cleaning.

(2) All food manufacturing, including packaging and storage, shall be conducted under such conditions and controls as are necessary to minimize the potential for the growth of microorganisms, or for the contamination of food. One way to comply with this requirement is careful monitoring of physical factors such as time, temperature, humidity, a_w, pH, pressure, flow rate, and manufacturing operations such as freezing, dehydration, heat processing, acidification, and refrigeration to ensure that mechanical breakdowns, time delays, temperature fluctuations, and other factors do not contribute to the decomposition or contamination of food.

(3) Food that can support the rapid growth of undesirable microorganisms, particularly those of public health significance, shall be held in a manner that prevents the food from becoming adulterated within the meaning of the act. Compliance with this requirement may be accomplished by any effective means, including:

(i) Maintaining refrigerated foods at 45°F (7.2°C) or below as appropriate for the particular food involved.

(ii) Maintaining frozen foods in a frozen state.

(iii) Maintaining hot foods at 140°F (60°C) or above.

(iv) Heat treating acid or acidified foods to destroy mesophilic microorganisms when those foods are to be held in hermetically sealed containers at ambient temperatures.

(4) Measures such as sterilizing, irradiating, pasteurizing, freezing, refrigerating, controlling pH or controlling a_w that are taken to destroy or prevent the growth of undesirable microorganisms, particularly those of public health significance, shall be adequate under the conditions of manufacture, handling, and distribution to prevent food from being adulterated within the meaning of the act.

(5) Work-in-process shall be handled in a manner that protects against contamination.

(6) Effective measures shall be taken to protect finished food from contamination by raw materials, other ingredients, or refuse. When raw materials, other ingredients, or refuse are unprotected, they shall not be handled simultaneously in a receiving, loading, or shipping area if that handling could result in contaminated food. Food transported by conveyor shall be protected against contamination as necessary.

(7) Equipment, containers, and utensils used to convey, hold, or store raw materials, work-in process, rework, or food shall be constructed, handled, and maintained during manufacturing

or storage in a manner that protects against contamination.

(8) Effective measures shall be taken to protect against the inclusion of metal or other extraneous material in food. Compliance with this requirement may be accomplished by using sieves, traps, magnets, electronic metal detectors, or other suitable effective means.

(9) Food, raw materials, and other ingredients that are adulterated within the meaning of the act shall be disposed of in a manner that protects against the contamination of other food. If the adulterated food is capable of being reconditioned, it shall be reconditioned using a method that has been proven to be effective or it shall be reexamined and found not to be adulterated within the meaning of the act before being incorporated into other food.

(10) Mechanical manufacturing steps such as washing, peeling, trimming, cutting, sorting and inspecting, mashing, dewatering, cooling, shredding, extruding, drying, whipping, defatting, and forming shall be performed so as to protect food against contamination. Compliance with this requirement may be accomplished by providing adequate physical protection of food from contaminants that may drip, drain, or be drawn into the food. Protection may be provided by adequate cleaning and sanitizing of all food-contact surfaces, and by using time and temperature controls at and between each manufacturing step.

(11) Heat blanching, when required in the preparation of food, should be effected by heating the food to the required temperature, holding it at this temperature for the required time, and then either rapidly cooling the food or passing it to subsequent manufacturing without delay. Thermophilic growth and contamination in blanchers should be minimized by the use of adequate operating temperatures and by periodic cleaning. Where the blanched food is washed prior to filling, water used shall be safe and of adequate sanitary quality.

(12) Batters, breading, sauces, gravies, dressings, and other similar preparations shall be treated or maintained in such a manner that they are protected against contamination. Compliance with this requirement may be accomplished by any effective means, including one or more of the following:

(i) Using ingredients free of contamination.

(ii) Employing adequate heat processes where applicable.

(iii) Using adequate time and temperature controls.

(iv) Providing adequate physical protection of components from contaminants that may drip, drain, or be drawn into them.

(v) Cooling to an adequate temperature during manufacturing.

(vi) Disposing of batters at appropriate intervals to protect against the growth of microorganisms.

(13) Filling, assembling, packaging, and other operations shall be performed in such a way that the food is protected against contamination. Compliance with this requirement may be accomplished by any effective means, including:

(i) Use of a quality control operation in which the critical control points are identified and controlled during manufacturing.

(ii) Adequate cleaning and sanitizing of all food-contact surfaces and food containers.

(iii) Using materials for food containers and food-packaging materials that are safe and suitable, as defined in § 130.3(d) of this chapter.

(iv) Providing physical protection from contamination, particularly airborne contamination.

(v) Using sanitary handling procedures.

(14) Food such as, but not limited to, dry mixes, nuts, intermediate moisture food, and dehydrated food, that relies on the control of a_w for preventing the growth of undesirable microorganisms shall be processed to and maintained at a safe moisture level. Compliance with this requirement may be accomplished by any effective means, including employment of one or more of the following practices:

(i) Monitoring the a_w of food.

(ii) Controlling the soluble solids-water ratio in finished food.

(iii) Protecting finished food from moisture pickup, by use of a moisture barrier or by other means, so that the a_w of the food does not increase to an unsafe level.

(15) Food such as, but not limited to, acid and acidified food, that relies principally on the control of pH for preventing the growth of undesirable microorganisms shall be monitored and maintained at a pH of 4.6 or below. Compliance with this requirement may be accomplished by any effective means, including employment of one or more of the following practices:

(i) Monitoring the pH of raw materials, food in process, and finished food.

(ii) Controlling the amount of acid or acidified food added to low-acid food.

(16) When ice is used in contact with food, it shall be made from water that is safe and of adequate sanitary quality, and shall be used only if it has been manufactured in accordance with current good manufacturing practice as outlined in this part.

(17) Food-manufacturing areas and equipment used for manufacturing human food should not be used to manufacture nonhuman food-grade animal feed or inedible products, unless there is no reasonable possibility for the contamination of the human food.

§ 110.93 WAREHOUSING AND DISTRIBUTION

Storage and transportation of finished food shall be under conditions that will protect food against physical, chemical, and microbial contamination as well as against deterioration of the food and the container.

Subpart F—[Reserved]

Subpart G—Defect Action Levels

§110.110 NATURAL OR UNAVOIDABLE DEFECTS IN FOOD FOR HUMAN USE THAT PRESENT NO HEALTH HAZARD.

(a) Some foods, even when produced under current good manufacturing practice, contain natural or unavoidable defects that at low levels are not hazardous to health. The Food and Drug Administration establishes maximum levels for these defects in foods produced under current good manufacturing practice and uses these levels in deciding whether to recommend regulatory action.

(b) Defect action levels are established for foods whenever it is necessary and feasible to do so. These levels are subject to change upon the development of new technology or the availability of new information.

(c) Compliance with defect action levels does not excuse violation of the requirement in section 402(a)(4) of the act that food not be prepared, packed, or held under unsanitary conditions or the requirements in this part that food manufacturers, distributors, and holders shall observe current good manufacturing practice. Evidence indicating that such a violation exists causes the food to be adulterated within the meaning of the act, even though the amounts of natural or unavoidable defects are lower than the currently established defect action levels. The manufacturer, distributor, and holder of food shall at all times utilize quality control operations that reduce natural or unavoidable defects to the lowest level currently feasible.

(d) The mixing of a food containing defects above the current defect action level with another lot of food is not permitted and renders the final food adulterated within the meaning of the act, regardless of the defect level of the final food.

(e) A compilation of the current defect action levels for natural or unavoidable defects in food for human use that present no health hazard may be obtained upon request from the Industry Programs Branch (HFF-326), Center for Food Safety and Applied Nutrition, Food and Drug Administration, 200 C St. S.W., Washington, DC 20204.

INFORMATION A BUYER WANTS TO KNOW

1. Organizational chart with names of Department Heads.

2. Recall Committee with names and phone numbers for offices and home.

3. Company contact person (usually the Salesperson).

4. Source of water for manufacturing.

5. FDA Inspection (including State)
   a. Are records available to customer?
   b. Who handles relations?

6. Quality Control System
   a. Is the A Grade USDA Grade A, House Grade or other (explain).
   b. Fill weight standards
   c. Probability of accuracy

7. Who determines grade standards?

8. Who has final say on all quality matters?

9. What happens to waste material?

10. How is waste water treated?

11. Recall Audit information

WHAT A SUPPLIER SHOULD DO FOR YOU

I. General
   A. Guarantee compliance with all Federal, State and Local food safety laws.
   B. Guarantee of meeting a 95% level on product quality.
   C. Guarantee of protection of quality to the point of change of ownership.
   D. Fair pricing.
   E. Market trends and general news.

II. Issue related to Quality

   A. A Quality Control System that has a mathematical probability of 90% or better. Also the guarantee of a consistent level of quality, is required.

   B. Store audit done on a regular schedule and reported to the Buyer.

   C. Assistance in procurement of vegetables of fruits not grown or processed by the Supplier and to guarantee its quality.

   D. Assistance in label development.

   E. Guarantee of temperature from the freezing belt to the buyer's warehouse.

   F. Cold storage and transportation audits covering all areas of product protection.

III. Shipping and Distribution

   A. Provide warehouses with temperature control on all loading docks.

   B. Recording of temperature during loading and unloading of purchased product.

   C. G.M.P. Inspection and records of cold storage warehouse temperatures. The inspections should be done on schedule.

IV. Extra Mile

A. Product training for Quality Control and Purchasing

B. Customer Workshops (Annually) Purchasing and Management

C. Product Development
1. Same item
2. Stir fry item
3. Prepared dinner items
4. Any other requests

DEFINITION OF QUALITY

Quality is a degree of excellence. It is a composite of those characteristics that differentiate individual units of a product, and have significance in determining the degree of acceptability of that unit by the Buyer.

Quality may be considered as a specification or set of requirements which are to be met within given limits (tolerances).

DEFINING GRADES

Many terms are used in defining grades for sales and general conversation. Agreement on terms should be reached on a national level to avoid confusion in sales agreements. It is the responsibility of a company to define its grades with its customers to build trust and good will.

In defining the grade you must use the characteristics of a product that can effect the desire of the customer to eat the product. Examples of this are the presence of disease, physical damage, a color that is not normal and a tender texture.

To gain the information necessary in making this determination you must know your targeted market. You must know the factors or attributes that your customers will be using to judge the quality. You must determine the range or variation accepted in the grade requirements.

The use of words, pictures and drawing may be used to convey the message of quality grades.

WHY DO WE NEED STANDARDS?

To reach any destination, goal or other point, a map is needed. Standards may be called a map, they define all that is required to accomplish your journey, or in this case, condition.

The two most important factors of quality are that of : 1). Meeting the Customer's needs and 2). Consistency within the lot.

TECHNICAL SERVICE BULLETIN NO. 21

AMERICAN FROZEN FOOD INSTITUTE • 1700 OLD MEADOW ROAD, SUITE 100 • McLEAN, VA 22102

TIPS & FACTS ABOUT SAMPLING, STANDARDS AND SPECIFICATIONS

TIPS & FACTS ABOUT SAMPLING, STANDARDS AND SPECIFICATIONS

INTRODUCTION

It has been said that in order to be able to design a house an architect must first know how to build one. This same analogy applies to Quality Control. Since one of the basic responsibilities of the quality control department is to effect mechanisms for process control the quality control manager (architect) among other things must have:

1. Knowledge of the process;
2. Knowledge of the product;
3. A thorough understanding of the mechanisms of sampling;
4. A thorough understanding of how tolerances in standards and specifications he must work with are interpreted.

Only if all four of these requirements are met can a process control program be effective and efficient. Effective in that the process plan will discriminate between good and bad production rapidly and accurately. Efficient in that the cost of the plans execution justifies the end and will permit quality separation without interruption of production. Assuming that the first two requirements stated above are met, this Technical Service Bulletin is aimed at the last two requirements.

The responsibility of decision making with respect to accepting or rejecting production has, since the very first time a food processing plant decided to incorporate quality control into its operation, generated some very frustrating times for the quality control department. When production was very good or very bad it was easily classified. But when the production was borderline, frustrations were borne with respect to the correct decision as to how the production should be treated. Often as not a verbal push and shove contest between production and quality control ensued if the two

disagreed. A properly designed process control mechanism easily understood by all concerned can readily overcome such frustrations and in so doing eliminate the deterioration of the sanity of the quality control department and maintain friendly relations with production.

Early standards and specifications promulgated by the U.S. Department of Agriculture contained sampling plans for allowances (tolerances) for defects that are not related to a specific acceptable quality level (AQL). This was not by design but just the way it happened to work out. USDA inspectors and others using these standards were not aware of the accuracy of their decisions in assigning a grade classification to a given lot, especially in borderline cases. The sample unit size (amount of product) more often than not may vary with the size of container with allowances for defects of various types expressed in terms of percent, by count, or percent by weight. Such decisions were based solely on the content of the sample unit without regard to its relation to the entire lot or total population.

Score points were, and still are, assigned to the various quality factors in these early standards on the erroneous assumption that such score points reflected the true quality level of the lot. The higher the score points, supposedly the better quality. This falacy is still firmly believed by many, not only in the purchasing field, but by production and quality control people as well.

To add to the dilema the sample unit size (amount of product) more often than not may vary with the size of container with allowances for defects of various types expressed in terms of percent, by count, or percent, by weight.

FREQUENCY DISTRIBUTION

Figures 1, 2 and 3 illustrate what can happen over a long period of time when lots containing exactly the percent defectives allowed for a given grade classification are offered for examination under the procedures prescribed in USDA's early standards. An artificial sampling device was used in each of these examples consisting of a box containing a lot with a total population of exactly one thousand units (beads) with known percentages of "defectives" represented by different colored beads.

A sample of 25, 50, and 100 units (beads) was taken 100 times each. The number of defectives was counted each time and recorded on the appropriate bar chart for the sample size (figures 1,2, and 3). In each case the samples were taken from a lot containing exactly five percent defective. It can readily be seen in these examples that when samples taken from a lot containing exactly the maximum number of defects permitted in Grade A and applying the sampling plans in the early USDA Standards, the lot could be classified from Top Grade A to substandard.

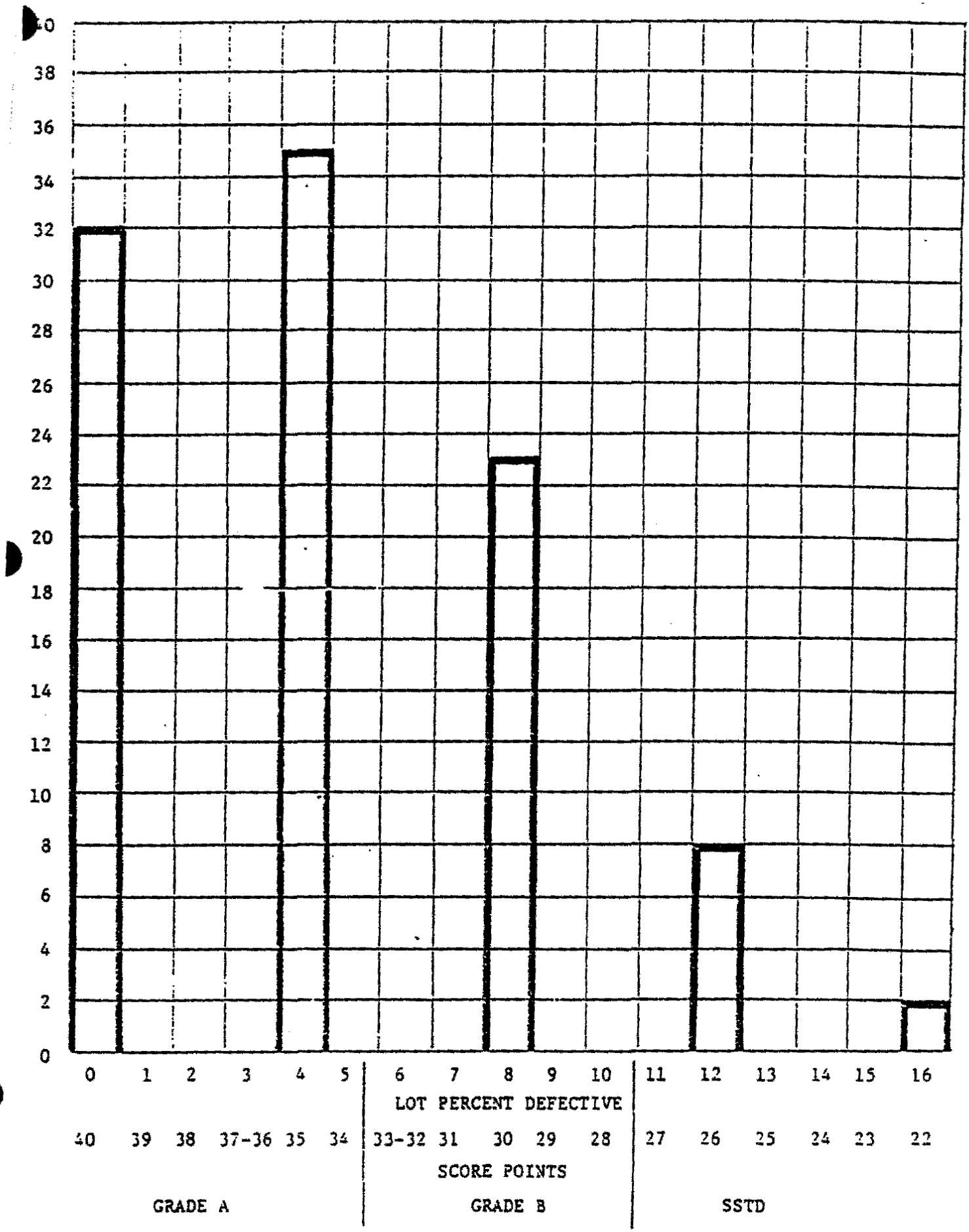
It is also shown that the score points based on such sampling plans do not necessarily reflect the true lot quality level.

Since the 1960's, however, the USDA has changed its policy toward sampling plans in its standards and specifications. That policy reflects sampling plans based on sound, scientific, statistical principals that provide the producer with the proper protection with respect to properly classifying his product as to grade.

FIGURE 1

SAMPLE SIZE - 25 LOT 5% DEFECTIVE

FREQUENCY DISTRIBUTION



SAMPLE SIZE - 50 LOT 5% DEFECTIVE

FREQUENCY DISTRIBUTION

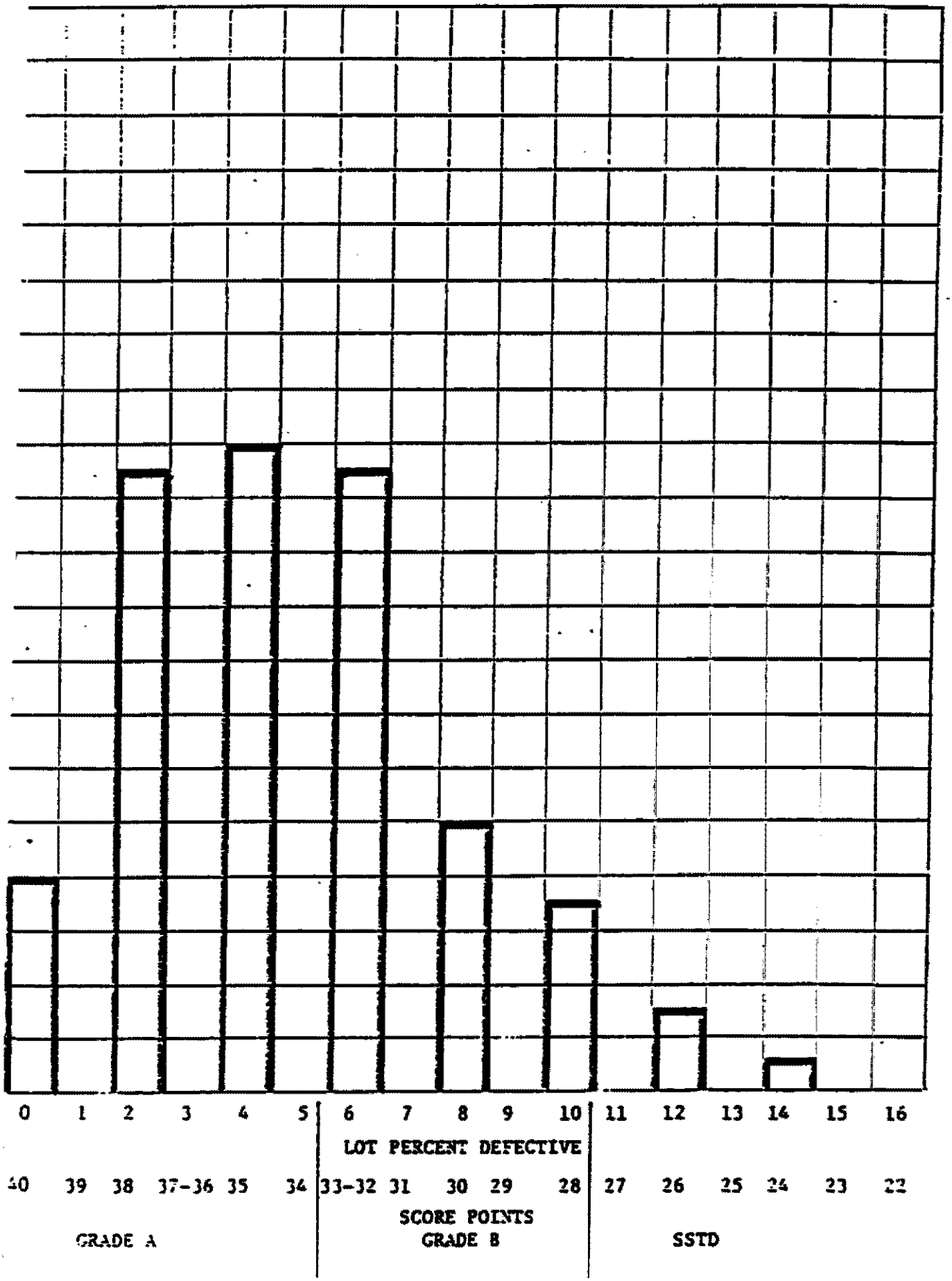
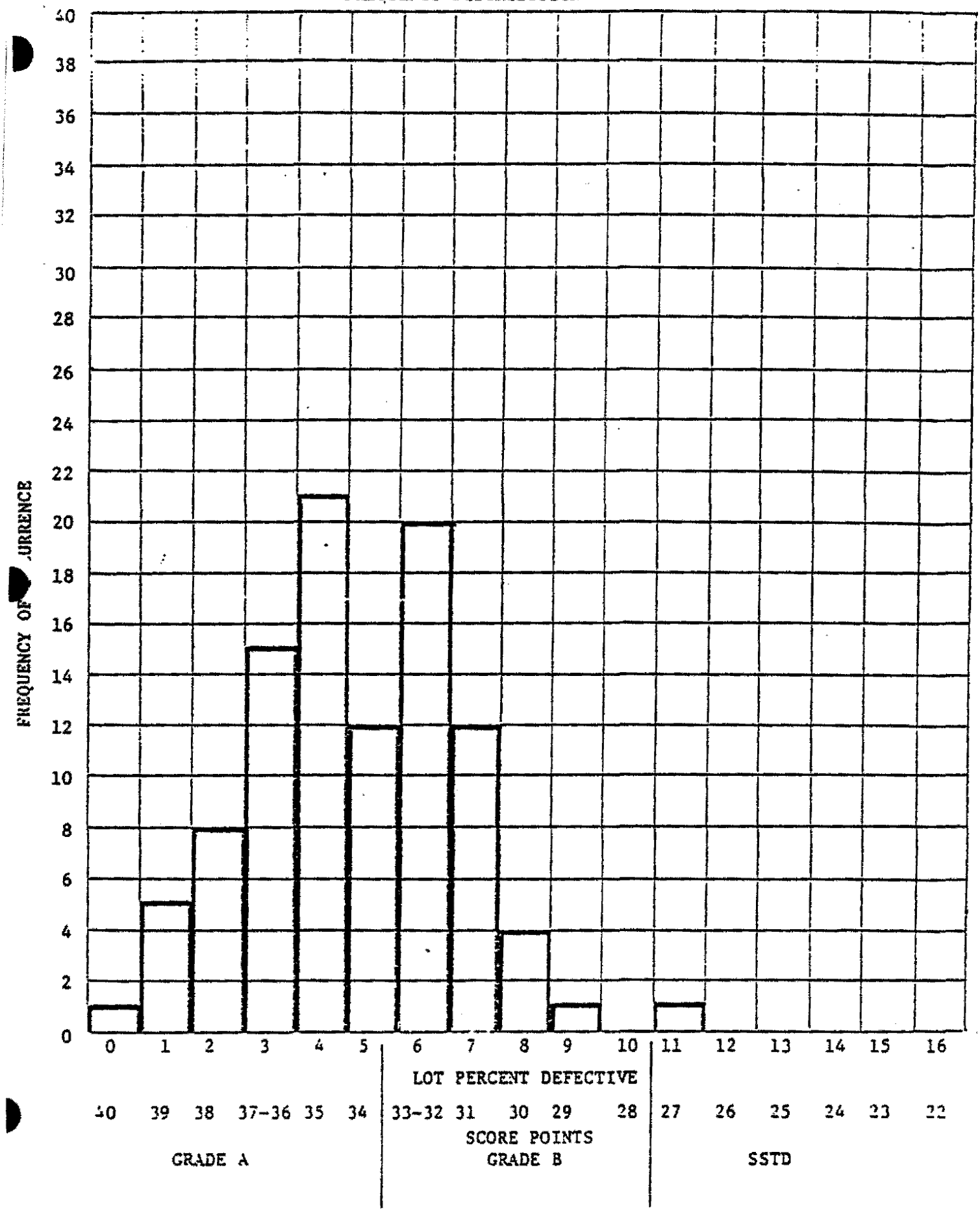


FIGURE 3

SAMPLE SIZE - 100 LOT 5% DEFECTIVE

FREQUENCY DISTRIBUTION



SAMPLING AND INSPECTION

Everything produced has a quality level. If the total number of pieces produced of a given product is relatively small it may be possible to determine what the actual quality level is by inspecting every piece (100% inspection). However, as is the case with most food products, the individual pieces are small and the large number of such pieces in any given process makes 100% inspection impossible.

The least that can be done in this case is to either estimate the quality level or estimate compliance of the production with a specified quality level. This is done by looking at only a small portion of the production (sample) and basing a decision about the entire lot on the results of that sample.

SAMPLING DEFINED

Sampling - is the process of drawing or selecting containers or sample units from a lot or production. As a result of sampling, information is obtained by which an estimate can be made of the quality of the lot under consideration and a decision made to accept, reject, or negotiate the merchandise in question. (See "Inspection Defined" below).

INSPECTION DEFINED

Inspection - is the act of: (1) interpreting specifications, (2) making and recording measurements of the product under inspection, (3) comparing the measurements with requirements of specification; and (4) disposition of the product.

Since inspection of most food products cannot be performed on the basis of 100% inspection it must for reasons previously stated be performed on the basis of "Sampling ". Therefore, hereinafter, reference to the term "Sampling" implies "Inspection Sampling"

"TYPES OF SAMPLING"

Acceptance Sampling - is the process in which decisions to accept or reject lots or production units are based on the examination of samples. Acceptance sampling determines a course of action and prescribes a procedure that, if applied to a series of lots, will give a specified degree of quality assurance subject to controlled risks of making the wrong decision.

Estimation Sampling - is the process of accumulating data from samples taken from a lot and by the use of statistically calculations estimating the actual quality level of the lot in question. Estimation sampling requires a larger sample from a lot for purposes of estimating the lot percent defective (quality level), than is necessary for purposes of merely accepting or rejecting the lot, provided a similar degree of confidence is desired.

Generally, acceptance sampling is preferred to estimation sampling in quality control programs for the following reasons:

1. Acceptance sampling requires a smaller sample size;
2. Acceptance sampling permits "on-the-spot" decisions regarding the acceptability of the production;
3. Acceptance sampling is simpler to apply since it only requires the matching of the number of defects found in the sample to a specified maximum number permitted as oppossed to having to make complicated calculations with the data obtained.

In summary acceptance sampling is more economical since it requires fewer inspectors (see 1 above) and permits immediate production segregation (good from bad) without process interruption.

METHODS OF SAMPLING - Both acceptance sampling and estimation sampling may be done in one of two ways - by "attributes"; or by "variables".

Sampling by Attributes - is when a record shows the number of articles conforming and the number of articles failing to conform to any specified requirement.

Sampling by Variables - is when a record is made of an actual measured quality characteristic, such as a weight or dimension. We are concerned in this writing only with inspection by attributes.

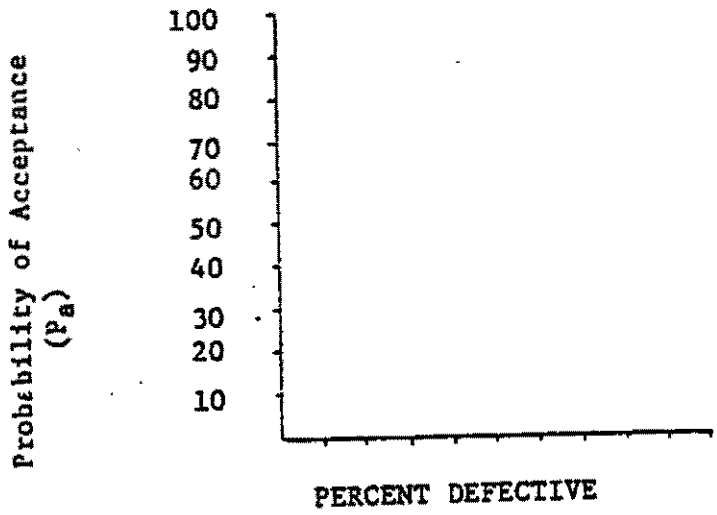
INFORMATION OBTAINED FROM SAMPLING - It is generally accepted that inspection of a sample gives information at the time about the goodness or badness of the pieces in the sample. Such information makes available a huge area of knowledge because the product in the sample tells on the process from which it was taken. It is thereby possible to draw conclusions as to whether the process was doing good work or bad at the time it produced the samples.

From the conclusions about the process, it is then possible to reverse the reasoning, so that the condition of the process gives information about the uninspected pieces. In this way acceptance sampling provides a basis for drawing conclusions about the process not because the uninspected pieces are neighbors of the inspected pieces but because the uninspected pieces are derived from the same process from which the inspected pieces have been taken. This same reasoning may be applied to on-line sampling whereby the lot becomes the on-going process.

OPERATING CHARACTERISTIC CURVE

The operating characteristic (OC) curve states the risks explained above in numberial terms. The OC Curve for attributes sampling plans is a graph of the fraction defective in a lot against the probability that the sampling plan will accept a lot with the specified percent defective. Normally, the percent defective is represented along the horizontal axis and the probability of acceptance along the vertical axis as illustrated in Figure 4.

FIGURE 4
OC CURVE



READING THE OC CURVE

The following is an exercise for thos not familiar with reading and interpreting OC Curves. To make the OC Curve meaningful the reader must be familiar with the terms used.

The following are helpful hints to aid in successfully completing the OC Curve Exercise Figure 6 contains three OC Curves, numbered 1,2, and 3 with sampling plans.

1. Given a percent defective - to find the probability of acceptance, locate the percent defective on the horizontal axis. Draw an imaginary line from this point vertically up to where it intersects with the specified sampling plan (curve). From this point on the curve draw an imaginary line horizontally to where it intersects the vertical axis (probability of acceptance P_a). This point of intersect on the vertical axis is the probability of acceptance expressed as percent.

2. Given the probability of acceptance - to find the percent defective, first locate the probability of acceptance on the vertical axis. From this point draw an imaginary line across to where it intersects with the specified sampling plan (curve). From this point on the curve draw an imaginary line vertically down until it intersects with the horizontal axis. This point of intersect on the horizontal axis is the percent defective.

3. The sample size (N) in Figure 6 is the total number of units of product used for inspection.

4. The acceptance number (C) in Figure 6 is the maximum number of non-conforming units of product (defects or defectives) that may be in sample size (N) and still be acceptable.

The correct answers to the exercise are given on page . The reader should attempt to complete the exercise before refering to the answers.

OC CURVE EXERCISE

- REFER TO FIGURE 5 -

1. Using sampling plan 2, what chance does a lot with 16% defective have of being accepted?

2. What is the AQL (Acceptable Quality Level) for all 3 sampling plans?

3. Which plan gives the best protection against poor quality lots?

4. What is the LQ (Limiting Quality Level) for a consumer's risk of 10% for sampling plan 2?

5. Using sampling plan 1, what chance does a lot with 12% defective have of being accepted?

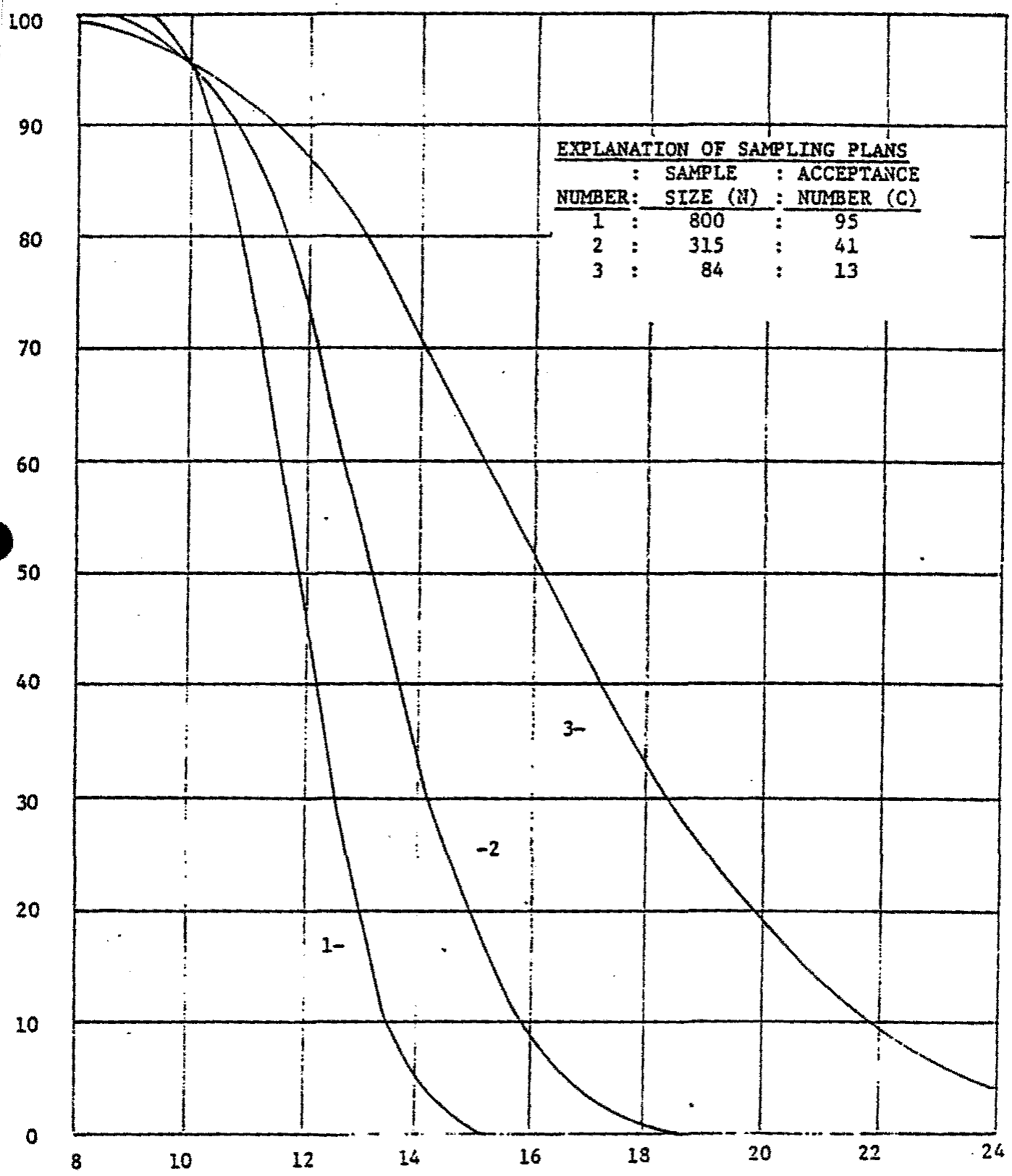
6. If a producer had a lot with 14% defective, which sampling plan would he prefer to use?

7. What do these 3 sampling plans say about the effect of sample size?

8. Using sampling plan 3, what chance does a lot with 18% defective have of being accepted?

9. As a producer, I want to be sure at least [illegible] of my lots are accepted by an inspector using sampling plan 3. At what percent defective can I target my operation?

FIGURE 5
OC CURVES

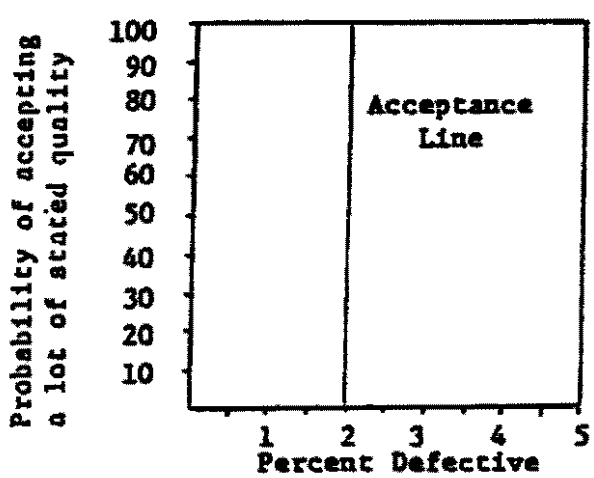


ANSWERS TO OC CURVE EXERCISE

1. Approximately 8%
2. 10% defective
3. Plan #1
4. Approximately 15.8%
5. Approximately 46%
6. Plan #3 would pass a 14% defective lot a greater percentage of the time.
7. The larger the sample size, the steeper the curve, hence the greater protection against passing bad lots.
8. Approximately 33%
9. 13%

The ideal sampling plan is one that will accept all lots with a specified percent defective or less and reject all lots with more than the specified percent defective. This is illustrated in Figure 5 which shows an OC Curve where it is desired to accept all lots with 2% defective or less and reject all lots with more than 2% defective. However, no sampling plan exists that can discriminate perfectly; there will always be the risk that a good lot will be rejected or a bad lot will be accepted.

FIGURE 6



SAMPLING RISKS

Two types of errors can be made when using Sampling Plans:

1) The risk that good lots can be rejected. This risk is often referred to as the type 1 risk, alpha (cc) risk, or producers risk.

2) The risk that bad lots can be accepted. This risk is often referred to as type 2 risk, BETA (B) risk, or consumers risk.

Recognizing that these two conditions exist in any sampling situation, the ultimate to be achieved in actual practice is to make the acceptance of good lots more likely than the acceptance of bad lots. This assurance is best achieved through the use of a well designed statistical sampling plan.

Consumers Risk - The risk a consumer takes that a lot containing a given percent defective or number of defects per hundred units will be accepted by a sampling plan. It is usually expressed as the probability of acceptance and depends on the percent defective (p) as well as the sampling plan itself. The consumers risk generally is probability of acceptance of 10% (80% probability of rejection).

Limiting Quality (LQ) - The percent of defective units or number of defects per hundred units of product for which, for purposes of acceptance sampling, the consumer wishes the probability of acceptance to be restructed to a specified value.

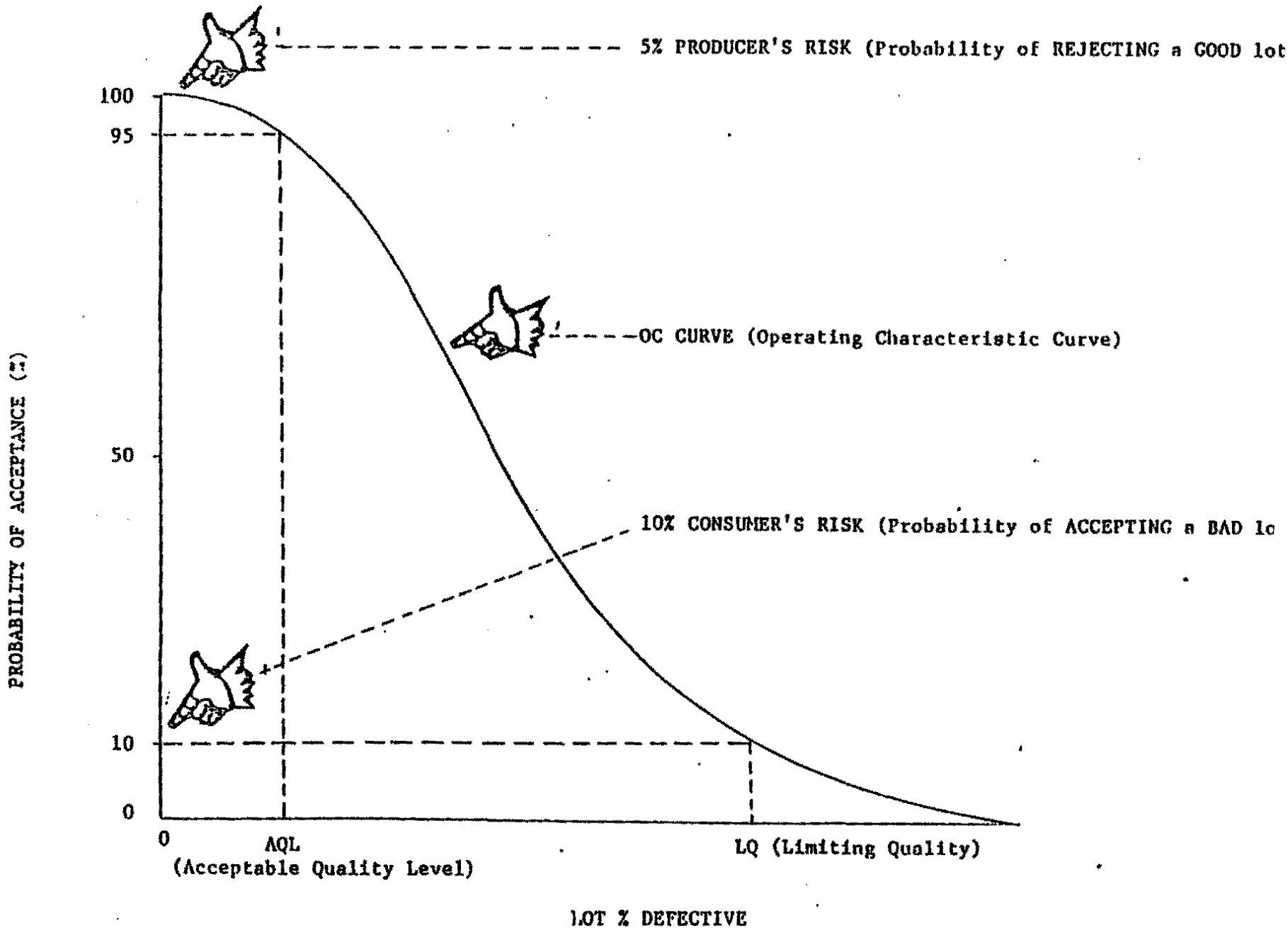
Probability of acceptance - For a given sampling plan and quality of inspection lots, is that percentage of inspection lots expected to be accepted.

Producers Risk - The risk a producer takes that a lot will be rejected by a sampling plan even though it conforms to requirements. The producers risk generally has a 95% probability of acceptance (5% chance of rejection).

Figure 7 illustrates a typical OC Curve for an Attribetes Sampling Plan. Note the points of intersect for AQL and Producers Risk, and LQ and Consumers Risk. For a properly designed attributes Sampling Plan the AQL (acceptable quality level) should intersect the curve at or very near the 95% probability of acceptance (5% probability of rejecting a good lot - producers risk). Also, the LQ (Limiting Quality) will be where ever the curve intersects with 10% probability of acceptance (consumers risk - probability of accepting a bad lot).

ATTRIBUTES SAMPLING

FIGURE 7



SAMPLING FACTS

Knowledge of some basic sampling facts is essential to having an understanding of the relationship between the sample and the production from which it came. The following simple, basic facts will aid to gaining that understanding.

FACT NO. 1 - Sampling acceptance plans with the same percent sample size give different quality protection (see Figure 8).

It has been and by some still is the erroneous belief that the protection given by sampling plans is constant if the ratio of the sample size (N) is constant.

Note in Figure 8 that the sample size for each of the sampling plans is 10% of the lot size (constant ratio). The differences in protection offered by these sampling plans is quite obvious. The curves illustrate that lots which are 4% defective will be accepted about 81% of the time using a sample size of 10% from a lot size of 50; about 65% of the time using a 10% sample size from a lot of 100; about 43% of the time using a 10% sample size from a lot of 200; and about 2% of the time using a 10% sample size from a lot of 1000. This assumes an acceptance number of 0 (zero) was used in each case.

FACT NO. 2 - A perfect sample does not ensure a perfect lot. This is illustrated in Figure 8 where each of the sampling plans have an acceptance number of 0 (zero) % defective will be accepted 100% of the time. A lot that is 2% defective will be accepted about 90% of the time when N=50, n=5, and c=0; about 81% of the time when N=100, n=10, and c=0; about 67% of the time when N=200, n=20, and c=0; and about 12% of the time when N=1000, n=100, and c=0. This is also projected to lots that are a higher percent defective even though the sample acceptance number is 0 (zero).

FACT NO. 3 - When a constant acceptance number is used, increasing the sample size will give better protection against passing bad lots. This is illustrated in Figure 8 where a constant acceptance number of 0 (zero) is used. As the sample size (n) increases the slope of the OC Curve becomes steeper. A lot of 2% defective would be passed about 90% of the time when the sample size n is 5, but only about 12% of the time when the sample size n is 100.

NOTE: For a constant acceptance number, increasing the sample size will also reduce the chance of passing good lots.

FACT NO. 4 - When a constant sample size is used, increasing the acceptancce number will permit lots with more defectives to be passed a greater percentage of the time. Stated another way, for a constant sample size, when the acceptance number is increased the slope of the OC curve becomes less steep. This is illustrated in Figure 9. The sample size is constant (n=27) but the acceptance number (c) is increased from 1 to 3. A lot that is 5% defective will be accepted about 60% of the time when n=27 and c=1; about 87% of the time when n=27 and c=2; and about 96% of the time when n=27 and c=3. A lot that is 15% defective will be accepted only about 8% of the time when n=27 and c=1, but about 41% of the time when n=27 and c=3.

FACT NO. 5 - A fixed sample size will tend toward a constant quality protection. Qualifying this somewhat, it should be stated that a fixed sample size, regardless of lot size is greater than 10% of the lot size.

The absolute size of a random sample is much more important than its relative size compared to the size of the lot. This is illustrated in Figure 10 showing OC Curves of five different sampling plans for lot sizes of 50, 100, 200, 1,000 and infinite respectively each using a sample size of 20. The top four curves show close agreement.

It is shown by the curves that unless the sample size is a large proportion of the lot size, as in the lower three curves where the sample for all practical purposes it will be good enough to compute the OC curves as if the lots were infinite.

FIGURE 8

FACT NO. 1:

Sampling acceptance plans with the SAME percent samples give DIFFERENT quality protection.

FACT NO. 2:

A perfect sample does not ensure a perfect lot.

FACT NO. 3:

For a constant acceptance Number when the sample size is INCREASED, the slope of the OC CURVE becomes STEEPER.

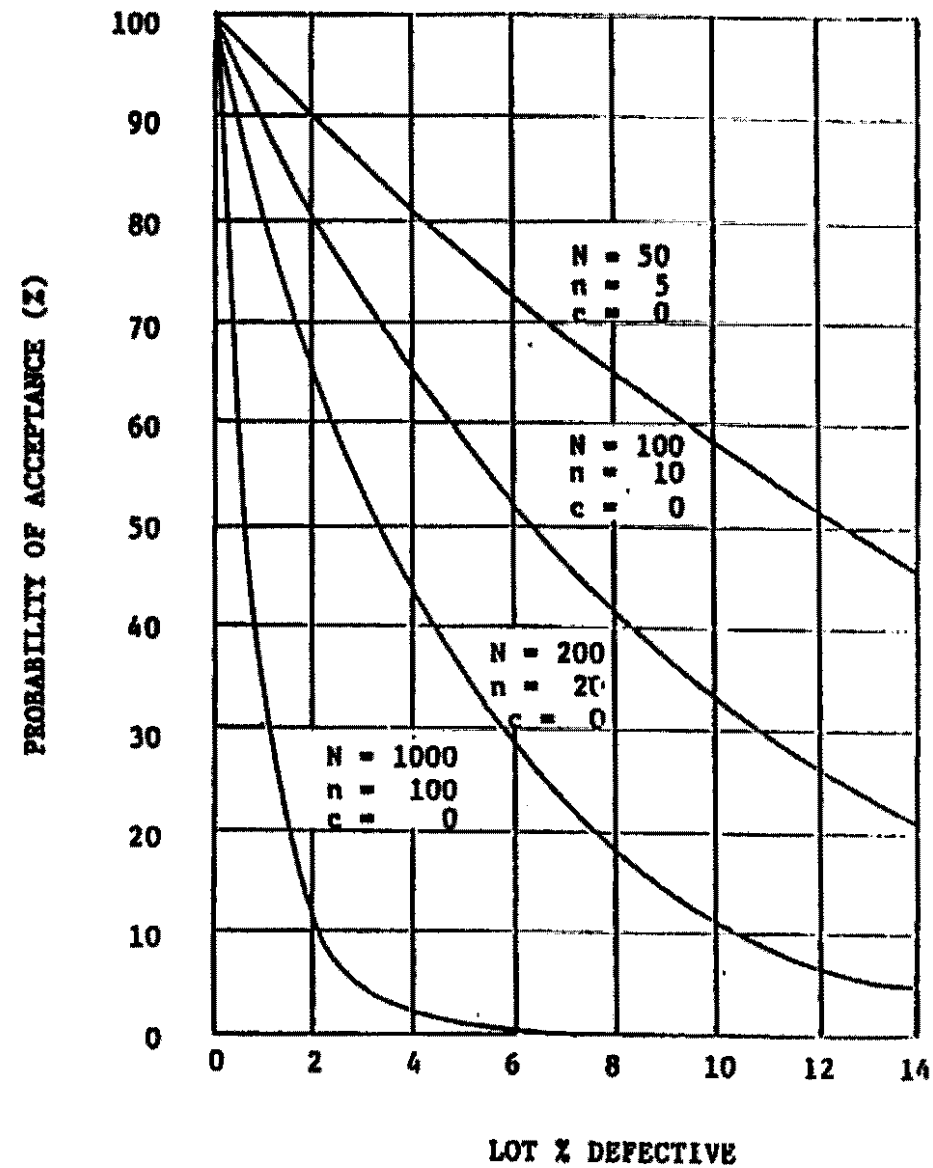
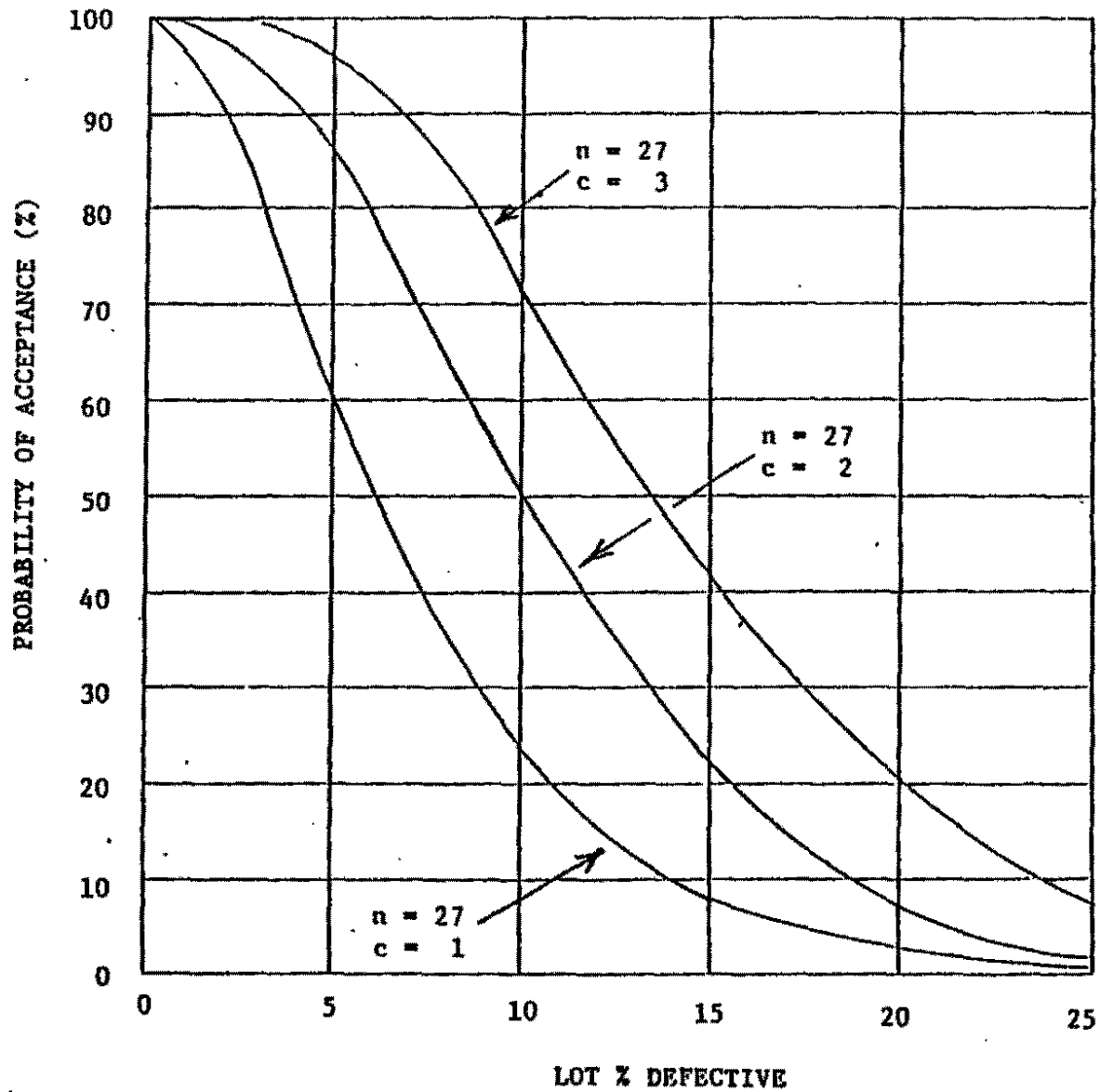


FIGURE 9

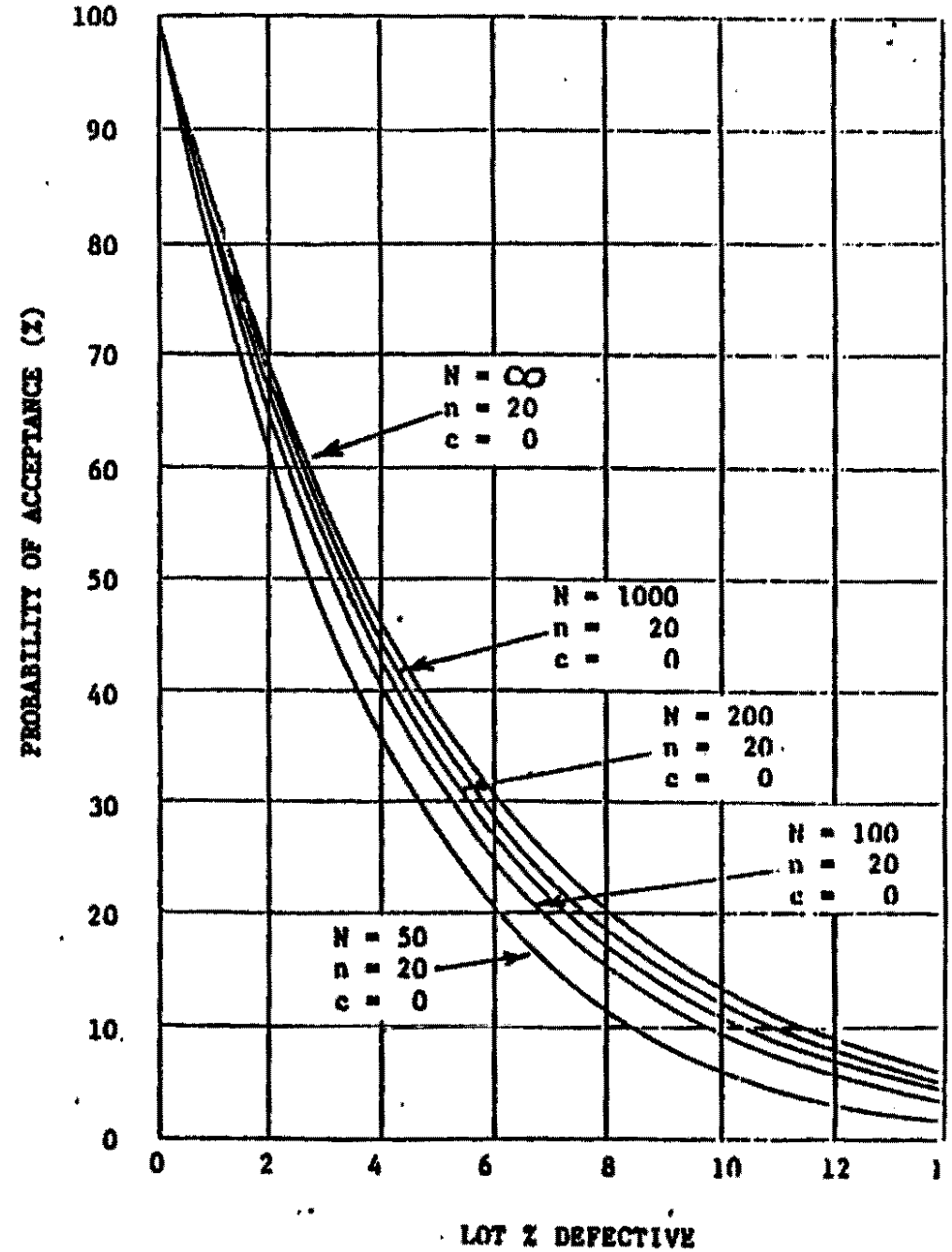
FACT NO. 4

For a constant sample size, when the acceptance number is INCREASED, the slope of the OC Curve becomes LESS STEEP.



FACT NO. 5

A FIXED sample size, regardless of lot size, tends toward CONSTANT quality protection . . . UNLESS the sample size is greater than 10% of the lot size.



FACT NO. 6 - Figure 11 shows that sampling plans with the same consumers risk or LQ (Limiting Quality of 10 percent) do not necessarily have the same AQL. It can be seen that all three curves merge at the 10 percent probability level with a LQ of 2.2 percent defective. The AQL's for the three sampling plans are 0.1 for n=100, c=0; 0.25 for 17=170, c=1; and 0.45 for n=24, c=2.

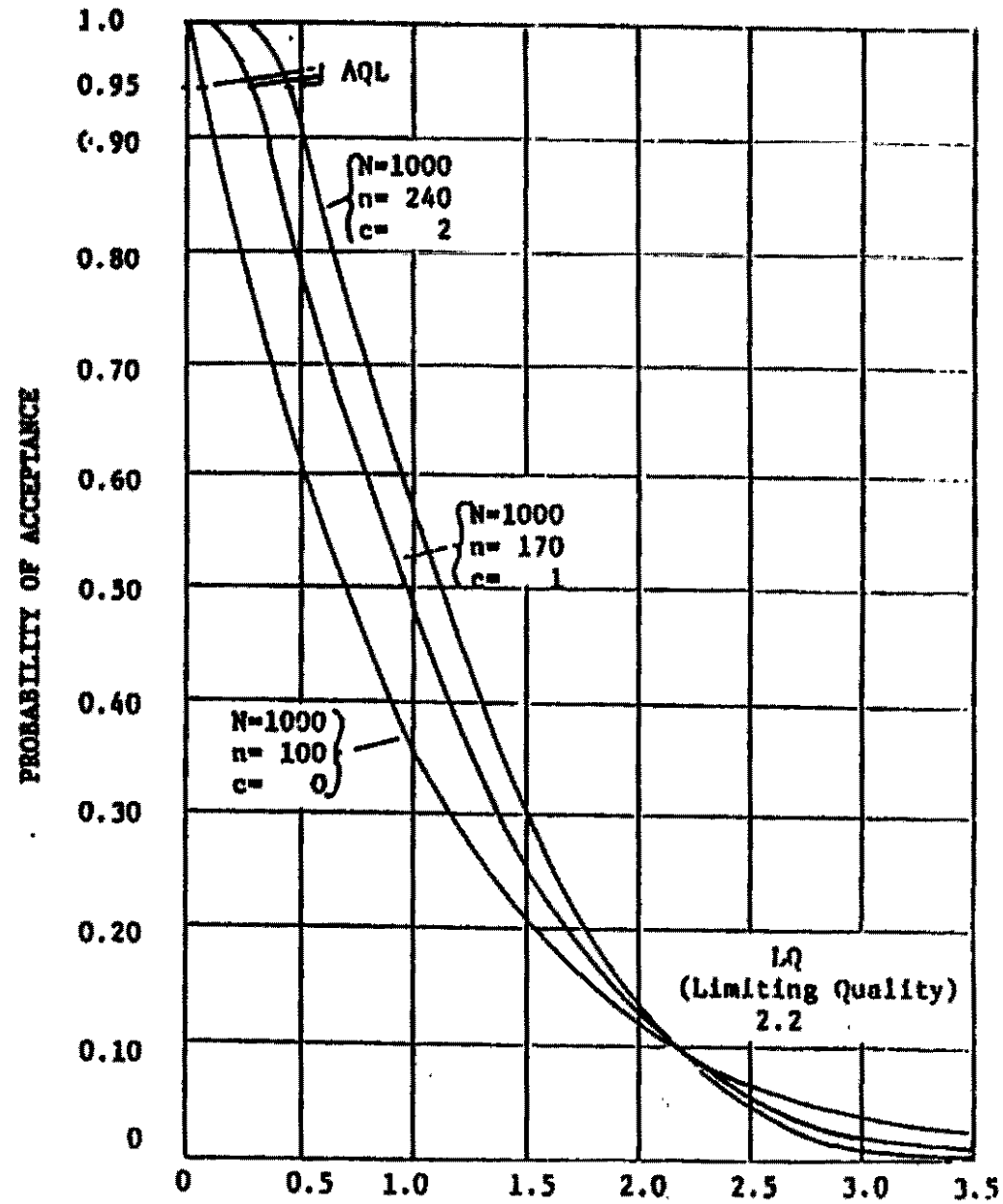
FACT NO. 7 - Figure 12 illustrates the opposite of Figure 11 whereby sampling plans with the same AQL (Producers risk of 5%) do not necessarily have the same LQ (Limiting Quality). In this case all three curves merge at the 95% probability of acceptance at 6.5% defective while the LQ is 13.0 percent defective for n=200, C=19; 15.7 percent defective for n=126, c=13; and 17.2 percent defective for n=84, c=9.

FACT NO. 8 - The number of defects permitted in the sample is greater than the AQL, except when plans with zero acceptance numbers are used.

FACT NO. 6

Sampling plans with the SAME LQ, Limiting Quality, (they usually have the SAME Consumer's Risk of 10%) DO NOT NECESSARILY have the same AQL.

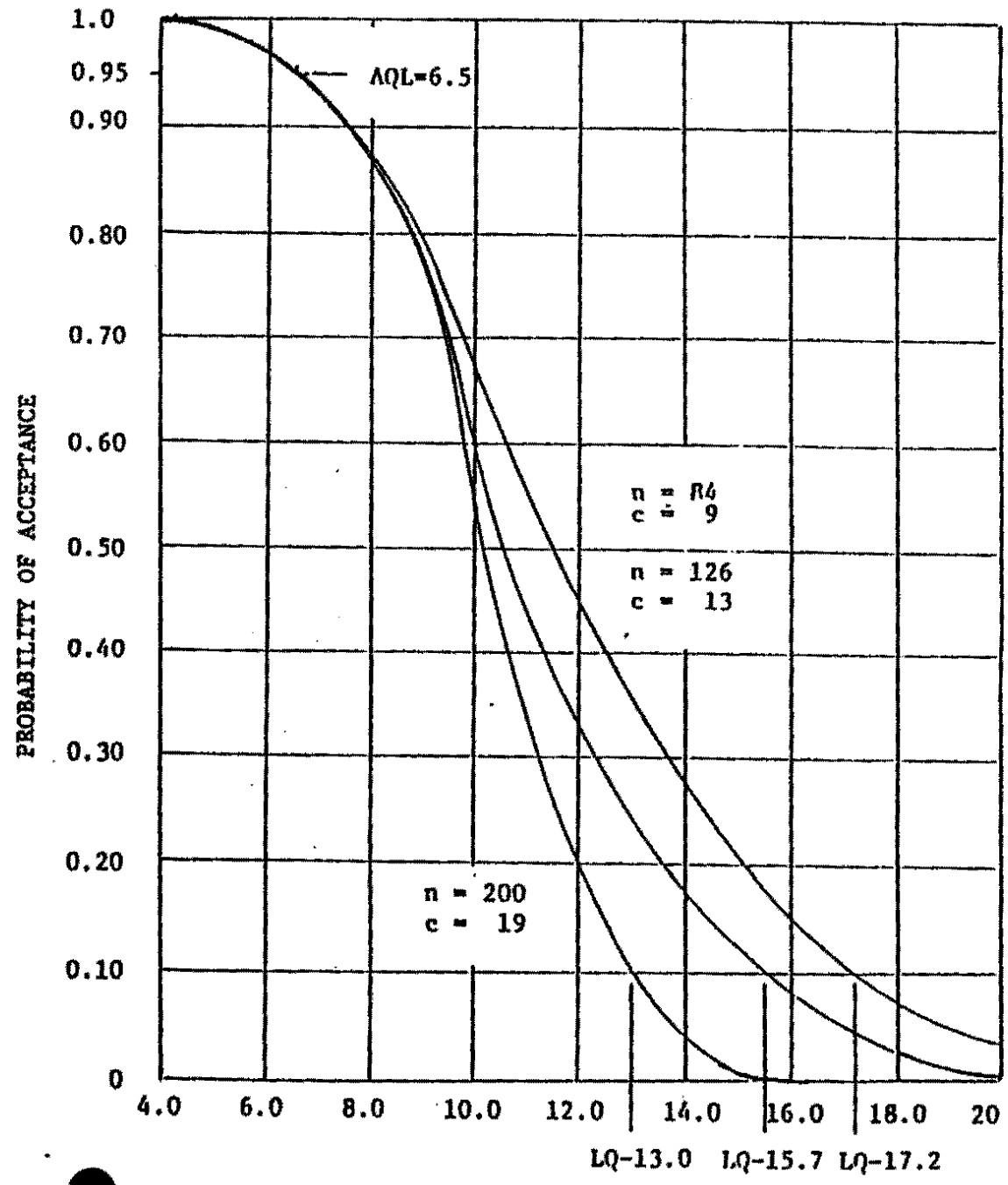
FIGURE 11



FACT NO. 7

Sampling plans with the same AQL (they usually have approximately the same Producer's Risk of 5%) DO NOT NECESSARILY have the same LQ.

FIGURE 12



IMPORTANCE OF RANDOM SAMPLING -

Random Sampling may be defined as a process of selecting a sample from a lot whereby each unit in the lot has an equal chance of being chosen. Ordinary haphazard or seemingly purposeless choice is insufficient to guarantee randomnees when carried out by human beings. Devices such as tables of random numbers are used to remove subjective biases inherent in personal choice.

All statistical sampling plans require that selection of the sample is at random. The most well designed sampling plans are utterly worthless when random sampling is ignored since the reliabilities of such plans become unpredictable.

Random sampling from production in-process does not present the seemingly difficult problems as does random sampling from a stationary lot. In the case of production in-process sampling is generally done on a time basis, i.e., every twnety, thirty, forty, etc. minutes. The "sin" that is so easy to fall pray to here is that samplers tend to time the sampling interval to exactly that time interval prescribed in the sampling program. For example, if the sampling plan prescribes a sampling interval of every thirty minutes, the tendency would be to start on the hour (since this is convenient to remember) and take a sample from the production at intervals of exactly each thirty minutes thereafter throughout the production. By the same token, the tendency also exists to catch the first sample of the production each time it starts up These practices negate random sampling principles. Random sampling was earlier defined as the process of

selecting a sample unit in the lot whereby each unit in the lot has an equal chance of being selected. In this case, "lot" is synonymous with "production". In order to accomplish this a sampling system must be used whereby random sampling times for given sampling frequency are prescribed. Only in this manner can every point in the production be made vulnerable to sampling during the life of that production period. Such random times must be varied from shift to shift or day to day.

Decks of cards with random sampling times are available that will make selecting random times for sampling purposes easier. There are other methods to accomplish this, but the deck of cards of random times is probably the easiest to use.

Random sampling from a stationary lot presents a much more complicated situation. A stationary lot is finished production in containers of a given size which may be packed several to a case. When cased, the cases are stacked in a specified location in a warehouse for storage. Such lots may be surrounded on one or more sides by other cases of merchandise or wall, making easy access to all parts of the stack impossible. In such case, the tendency for samplers is to sample only across the top and down the front if both sides and rear are restricted; across the, front, one side, and across the top if one side and rear restricted; or across both sides, front and top, if only the rear is restricted. None of these instances even vaguely resembles random sampling.

In order to effect random sampling in a stationary lot one must have knowledge of the stacking pattern. The number of pallets in the lot, and the number of cases on each pallet must be known. Each case on each pallet is assigned a number. (No two cases in the entire stack should have the same number). With the use of a table of random numbers or deck of cards of random numbers a sampling system can be predetermined before sampling.

The stack must then be torn down and the pallets placed in an area where access to each pallet is readily accessible. The random numbers previously selected will dictate the particular case (which may be located anywhere on a pallet) to be exposed for sampling.

In addition to constantly being readily accessible for sampling, in-process sampling has the added advantage of providing valuable information from the order of production. Past history of a production cannot be ignored in evaluating data from in-process sampling. The order of production is frequently lost in stationary lot sampling, therefore has no meaning.

HOW ARE TOLERANCES IN STANDARDS AND SPECIFICATIONS INTERPRETED?

Tolerances in standards and specifications may be interpreted in a number of different ways, each affecting how a producer must target his production in order to comply with the requirements. This creates confusion among those who must deal with the tolerances.

For the purpose of this discussion a tolerance is considered as a limit or allowance, minimum or maximum set for a particular quality factor or factors to establish a specified quality level of a product. This may be net weight, minim or maximum acidity, minimum or maximum Brix (percent sugar) maximum fiber, maximum number of sinkers in a particular brine for frozen peas, maximum number of blemished or otherwise damaged units, etc.

The producer may view tolerances as applying to his lot of finished product or to his production during processing. The analogy in this case is that the producer feels that if the average number of defects per hundred units or the percent defective in the lot is equal to or less than the tolerance of the standard or specification the lot should pass most of the time. The producer in this case is interpreting the tolerance as an AQL (acceptable quality level) whereby any lot in which the average number of defects per hundred units or percent defective is equal to or less than the tolerance the lot is considered good and will be accepted 95 percent of the time.

The opposite of the producers view may be that of the buyer who may consider any lot containing an average number of defects per hundred units or percent defective in excess of the tolerance should be rejected most of the time. In this case the buyer is viewing the tolerance as a LQ (limiting quality) whereby the protection of the sampling plan assures him that lots containing

in average number of defects per hundred units or percent defective in excess of the tolerance will be rejected 90 percent of the time.

Still another view contrary to either of the above may be that of a third party inspector called upon to certify a lot with respect to grade. Assuming his sample is representative of the lot, he applies the tolerance to the sample. In this case the inspectors interpretation is that the sample average must not exceed the tolerance of the specification or standard. If it does the lot is rejected.

The sampling plans in many USDA variable score point standards provide tolerances applicable to the individual container or sample unit. This is a fourth interpretation which differs from the three related to above. In this case an inspector may interprete the tolerance as meaning if an individual container or sample unit in the sample exceeds the tolerance the lot is rejected.

A fifth interpretation of a tolerance that is applied to the individual container but in a different way than that related to above is that of the consumer. The consumer is interested only in the particular container he/she purchases at the time. It would therefore be the consumers concern that no individual container in the lot may exceed the specified tolerance.

Five distinctly different ways in which a tolerance in a specification or standard may be interpreted have been mentioned. To briefly review these they are:

1. As a lot AQL (lot average)
2. As a lot LQ (limiting quality)
3. As a sample average
4. As a minimum for individual containers in the sample.
5. As a minimum for individual containers in the lot.

Each of these interpretations have a different effect on the confidence level under which the producer must operate. The interpretations listed in 2 through 5 above

will cause good lots, those in which the average number of defects or percent defectives do not exceed the tolerances, to be rejected an appreciably greater number of times than they would be in the case of the AQL interpretation.

AN INTRODUCTION TO SINGLE ATTRIBUTE INSPECTION

Single attribute inspection has been around for a long time but is relatively new to the canned and frozen fruit and vegetable processing industry. Agripac, Inc. has been using the single attribute inspection system since 1980.

This paper will discuss single attribute inspection (or grading) as used by Agripac, Inc. The following topics are covered to both familiarize those with little or no knowledge of quality control inspection with the overall inspection process, as well as provide some of the specific statistical computations and production run rules for those already acquainted with various inspection systems:

I. Basic Introduction
II. Statistics
III. Defect Tolerances
IV. Production Parameters
V. Sample Charting of Single Attributes
VI. Sample Sizes
VII. Variation
VIII. Multiple Grade Specifications
IX. Appendix - Mathematical Calculations of Process Standards

I. BASIC INTRODUCTION

In the inspection or grading of vegetables and fruits there are different quality factors (or attributes) that are examined for each product. Some products have only a few attributes. Frozen diced carrots for example have only 5; serious blemish, total blemish, scrap/irregular, off color and texture. Other products like frozen cut green beans can have as many as 15 attributes, all of which will not be listed at this point.

In single attribute grading each factor (or attribute) to be graded is considered to pass or fail the desired grade specifications independent of the defect levels of any other factors (hereafter called attributes). For example, in frozen cut green beans, whether a lot is within the specifications or not for major blemishes is not affected by other defect levels such as minor blemishes, short units, mechanical damage, etc. Each of the approximately 5-15 attributes stand on their own.

Those who have been involved with the food processing industry for some time should note that single attribute grading is markedly different from the traditional variable inspection systems employed by USDA and their following over the past 40-50 years. Variable inspection systems assign a variable score to each quality <u>category</u> such as color, size, character and defects.

60

A category such as color is given a subjective score of say 9 points out of a possible total of 10 (for a perfectly colored unit) for the "degree" of conformity as compared to the ideal. Unlike variable grading, in single attribute grading all attributes, including those like color, blemish, maturity, texture, etc. are indicated as being OK or not OK. Each unit is either in grade or not in grade.

Each unit within a sample is evaluated individually for each grade attribute. If a solitary unit is affected by more than one type of defect it is graded for each. For example, if a one inch unit of green bean has a major blemish, a stem, and is off color, it is scored for all three factors (though each attribute is evaluated independently).

When a buyers' specification states the tolerance for a given defect in their product, how should this be interpreted? For example, if the specification states that the limit for off color frozen cut green beans is 5%, does this mean:

a) The lot average is to be 5% or less off color?
b) Samples drawn from the lot should average 5% or less?
c) No samples drawn from the lot shall contain over 5% off color?
d) No samples drawn from the lot shall contain 5% or less off color?
e) 90% of the samples drawn from the lot shall contain 5% or less off color?
f) ????

By the end of this paper the reader should be able to easily answer this question.

Unlike many other grading systems, the single attribute system uses a solid foundation of statistics to set production operating limits from customer specifications. In order to fully comprehend the foundational concepts of single attribute grading an elementary knowledge of statistics is required. The majority of this paper is written to familiarize the reader with the basics of statistics and how it relates to single attribute grading.

II. STATISTICS

Since evaluation of product under the single attribute system is an either/or (OK or not OK) situation, this enables one to make use of mathematical formulas from the binomial distribution* to calculate process limits. In this application the distribution will also be normal. The following example will demonstrate what a normal distribution is, also noting some of its' mathematical properties.

* a study of binomial distributions is beyond the scope of this paper, but can be reviewed in most standard statistics textbooks.

Example 1: 19,000 dry white beans are placed into a container with 1000 dry red beans and thoroughly mixed. The red beans could be used to simulate a particular defect, like the off color frozen cut green beans noted in the buyer specification question previously asked.

If someone wanted to know the percentage of red beans in the container the most accurate method to determine this would be to separate and count all 20,000 beans. If one did not have the time (nor the patience) for such a method the next best method would be to sample the container using smaller groups of beans and then estimate the actual percent red beans from the samples.

If several samples of 200 beans were taken it would be noted that there would <u>not</u> be exactly 10 (or 5%) red beans in each sample! After taking a large number of samples it would be noted that the number of red beans varied anywhere from around 4 to 16 units, with the highest numbers of samples clustered near the 5% (10) level and the frequency diminishing as the quantities get further from the actual average. To show how this would appear in visual form, imagine the first four samples taken contained 9,10,12 and 9 red beans respectively. Each sample is plotted as a square box (with it's sequence in the sampling numerically marked in the middle of the box) on the line where its' sample quantity is indicated (Fig.1).

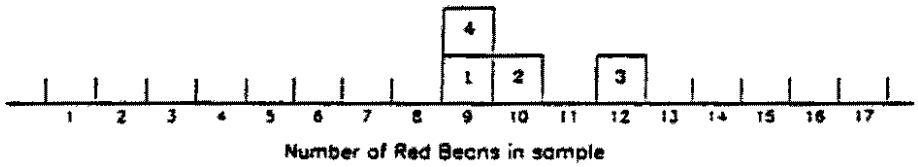


Fig. 1

If sampling was continued for many more samples, and each sample continued to be plotted as previously noted, it would evolve into something similar to the next diagram (Fig. 2). Note that the four boxes plotted in Fig. 1 are noted as filled in boxes. They would not normally be visibly distinct as such.

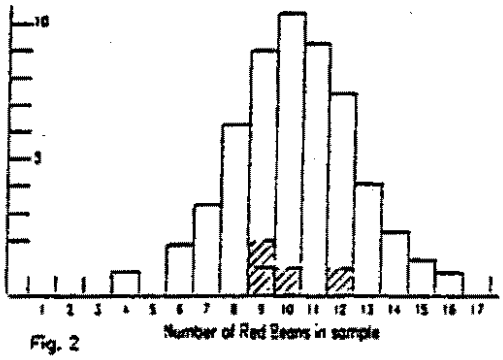


Fig. 2

In graphing samples such as this it is common to take out the horizontal lines of the boxes and note their location along the vertical (or Y) axis of the chart. This "cleans" up the overall affect of the chart and makes it more readable. This type of chart is called a histogram. Bars in the graph are of equal width, each corresponding to the numerical sequence listed.

62

The height of each bar corresponds to the frequency of the number it represents. Thus the area of the bar above each count is proportional to the frequencies of that sample count.

Histograms of uniform sample sizes taken from a static non changing lot will exhibit this type of typical bell shape when sampling attribute data. A "lot" refers to any given or selected segment of product of defined size which can be physically segregated. It can be as small as one tote to hundreds of thousands of pounds segregated from several days' production.

Note that in the example used there is between 4 to 16 red beans per sample. Based on any one sample or small group of samples it would be impossible to estimate the actual number of red beans in the total population. But, if enough samples were taken it would become evident that the peak of the "bell" is approximately 10, or 5% red beans, which is in fact the average number of red beans in the total sample.

If each sample was added back to the original lot (enabling an infinite number of potential samples), blended back into the original sample, and then the total resampled thousands of times the histogram noted in figure 2 would even out and become symmetrical. If a smooth line were drawn along the top of the histogram it would form what is referred to as a normal curve.

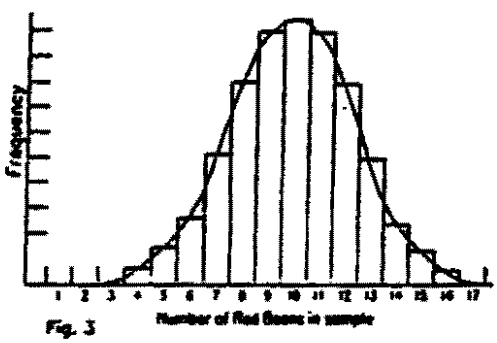


Fig. 3

The normal curve is the mathematical model that is used to make predictions concerning sampling of fixed populations. For any given population the normal curve may be described by two factors:

<u>Average</u> - the center of the curve (10 or 5% in the example used). The arithmetic mean calculated by dividing the sum of the individual samples by the number of samples.

<u>Standard deviation</u> - the extent to which the samples are scattered about the average, variability or spread. Together with the average it may be used to indicate the populations of the samples in the distribution that fall within specified distances from the average.

In every normal distribution there are approximately three standard deviations on each side of the average. Standard deviation is represented by the symbol sigma (o). By definition one standard deviation equals 68.3% of the total population, two standard deviations equal 95.4% and three standard deviations equal 99.7%. Regardless of the actual size of the normal curve it will always have the same number of standard deviations, which along with the average will enable one to make statistical calculations from its' associated population.

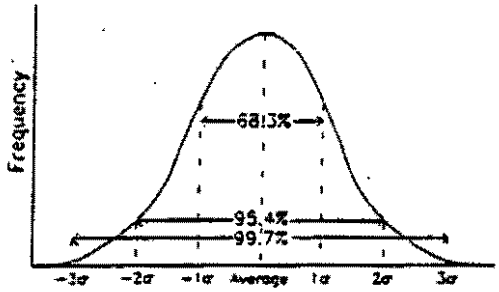


Fig.4 Number of "defects" in sample

Each of the curves displayed in Fig. 5 are different sized replicas of what is seen in Fig. 4, except for the fact that they are each successively moved up to higher averages. They also have associated higher standard deviations.

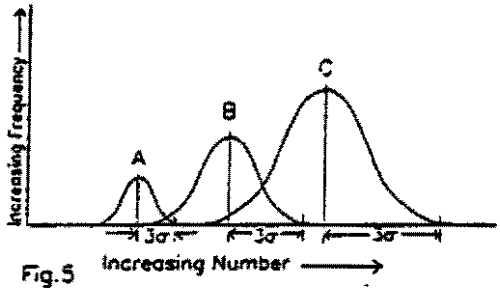


Fig.5

In the application of these principles to the grading of fruits and/or vegetables it is important to note that each normal curve, with its' associated standard deviation and average corresponds to a lot of uniform population (the same amount of defects spread throughout). As long as a lot stays uniform we can make very accurate predictions about actual lot quality based on the information derived from sampling. It is the job of the Quality Control technician to determine which normal curve the lot sampled comes from by comparing the data from the samples with the process standards provided.

Unfortunately, during a production run it is quite common for lot qualities to vary regularly due to any number of reasons. Raw product quality and/or the process may vary at any time. It is important that quality control technicians note these quality changes and get enough samples within each lot to properly identify the samples' corresponding curve. Note that in figure 5 there are a number of sample possibilities in curve "B" that are also common to both curves "A" and "C". In a real life scenario a sample could potentially come from any one of a large number of curves. Unless numerous samples are taken there is no way to be certain which lot curve is actually being sampled. It is possible however, to make some pretty good projections as to what the probability of a particular sample coming from a specific curve is, based on the statistical formulas from the normal curve (see appendix for details).

III. DEFECT TOLERANCES

Most buyer specifications give a tolerance for each specific defect. From buyer to buyer and grade to grade there are a wide range of potential acceptable tolerances. They vary depending on the type of defect, the product it is applied to and subjective evaluation as to its' affect on the sample as a whole. For example, the tolerance for EVM (extraneous vegetable material) in frozen cut green beans may be as low as 0.2% while the percent of "B" maturity units in "A" grade frozen cut green beans may be as high as 10.0%. Other tolerances may be lower or higher as directed by any particular buyer. By using the calculations as provided by the single attribute system we can provide some degree of assurance that product packed for any buyer makes the required specifications.

It is easy to see, from the example and illustrations provided at the beginning of this paper, that if a production plant were to manufacture a lot of product which <u>averaged</u> right at a buyers specification of 5% off color units, that 50% of the time the buyer might expect to draw samples from the lot which contained over the allowed tolerance. In figure 3, with an average of 10 red beans (representing any potential defect), one would expect half the samples to contain less than 10 and half over 10. This high pass/fail sample rate is generally not acceptable.

The question then arises, "at what level of defects can a plant then average and expect to pass the buyers' specification an acceptable percentage of the time?" In order to answer this question another must be answered, "What level of confidence (or degree of reliability) is required by the buyer?" If a buyer looked at 10 packages from a lot and only 1 failed to meet the specifications would the lot pass or fail?

One might ask, "why not expect to always have 10 packages out of 10 pass the required specifications?" As the reliability of not accepting unacceptable product goes up the potential for rejecting acceptable product goes up as well. At Agripac, Inc. it has been found that the buyer 90% confidence level is the most reasonable target to both satisfy the buyer and keep plant production at an acceptable level.

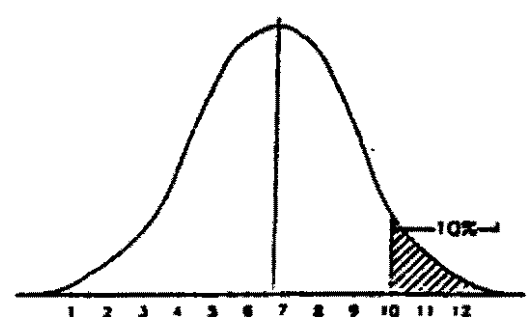


Fig.6

The normal curve in figure 6 can be used to show a lot of product in which exactly 10% of the samples pulled from the lot would expect to be rejected by a buyer. The area shaded under the curve represents 10% of the total area under the curve and represents the samples exceeding the 5% (10) tolerance.

15

This curve, representing a sample size of 200 units, drawn from a lot of 5% defective, would have an average of 6.7 units at the 90% confidence level. This average is referred to as the AQL or Acceptable Quality Level in Agripac Quality Control specifications. Any sample that has numbers of defects exceeding the AQL marks its corresponding lot as potentially exceeding a buyers' specification.

This is the maximum average that can be achieved on a production run which will meet the buyers' specifications a minimum of 90% of the time. Anytime that the production level is better than the AQL the reliability of meeting the buyers' specifications also increases. The AQL is calculated using the mathematical model of the normal curve. See pages 17-19 for specific information on formulas and calculations.

It is possible to adjust AQL's up or down based on any desired confidence level. Figure 7 illustrates a normal curve which shows the shaded area, which is the area of buyer rejection, at approximately 20% of the total. Note that as the rejection percentage increases the average of the normal curve increases as well. You would also expect to see the standard deviation increasing. Also note that a 20% rejection level normal curve still has 80% of the samples within the buyers specifications, but this lot would be rejected. Examples of several different reliability AQL values can be found on page 18.

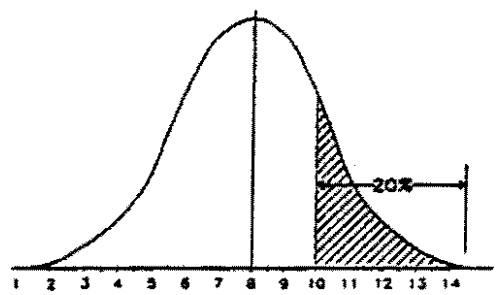


Fig.7

With the AQL calculated from the buyers specifications (tolerance), the next section of this paper will deal with the rationale behind setting up production parameters. These will enable a facility to process product within the given tolerances.

IV. PRODUCTION PARAMETERS

There are countless factors that influence the quality of any given lot. Environmental factors such as irrigation or rainfall, cultivation practices, soil conditions, pesticides etc. affect the quality from grower to grower and even within the same grower or field. Production changes, both intended and unintended, such as plugged screens, increased/decreased inspection levels, equipment speed changes, etc., affect the product as its being prepared for eventual consumption. An attribute which has a level of defects symbolized by curve "B" in figure 8 could change to curve "A" if improvement is made or change to curve "C" or "D" if the level of defects increases.

66

As a point of interest note that a sample of 7 defects could be found in any of the four curves. Of course the probability of a sample of 7 actually occurring in any of the four curves is NOT the same. In the process of determining product quality we are not so much interested in what the probability of getting 7 defects is as much as what is the probability of getting 7 or less defects. This is readily calculated from the area under a normal curve using tables provided in most standard statistics books. The approximate probability of finding 7 defects or less from the four lots represented by the curves in figure 8 are 90% for "A", 80% for "B",40% for "C" and 8% for "D".

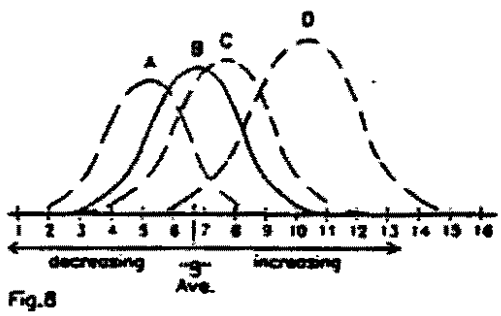


Fig.8

So how should a production line be targeted to assure that it can maintain a lot which is represented by figure 8"A"? If the production facility were to target for the 90% confidence level of curve "A", that would mean that 50% of the time we would have product unacceptable, since by definition "target" generally means the average. This then would mean that a process target (or average) must be calculated at something less than the curve which gives us our maximum level of 90% reliability (or 10% failures).

An arbitrary figure of two standard deviations to the left of the package AQL is selected as the target for the process standard. This will give adequate room for the production process to fluctuate and still meet the buyers' specifications. Figure 9 shows an example of the AQL curve and the process standard curve together.

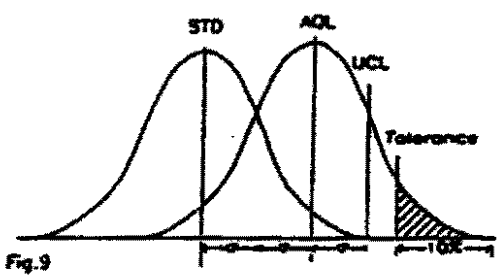


Fig.9

As review, note that the curve to the right (AQL) is the curve that represents what the maximum defective level can be and still maintain the buyers approval (90% of samples in grade), while the curve at left (STD) is the curve representing the defective level that the processing plant needs to target for in order to maintain all production within the AQL curve.

With the standard and AQL calculated, there remains but one more processing parameter to calculate in order to effectively isolate lots suitable to make any particular buyers' specifications. The UCL, or upper control limit is calculated at three standard deviations from the process standard.

As can be seen in figure 9, a sample over the UCL is not found within the process standard curve.

It also has a less than desirable probability of coming from the AQL curve which gives 90% buyer acceptance reliability. Samples exceeding the UCL, though still less than the buyers' tolerance level, are strong indications that the corresponding lot is not within the desired defect levels.

Once the STD, AQL and UCL are determined the quality control technician can easily determine if any lot of production is within the buyers specifications. The next section of this paper will demonstrate how this is done.

V. CHARTING OF SINGLE ATTRIBUTE GRADING

If the process specifications, the vertical lines noted in figure 9, were to be graphed on a piece of paper horizontally they would appear as in figure 10.

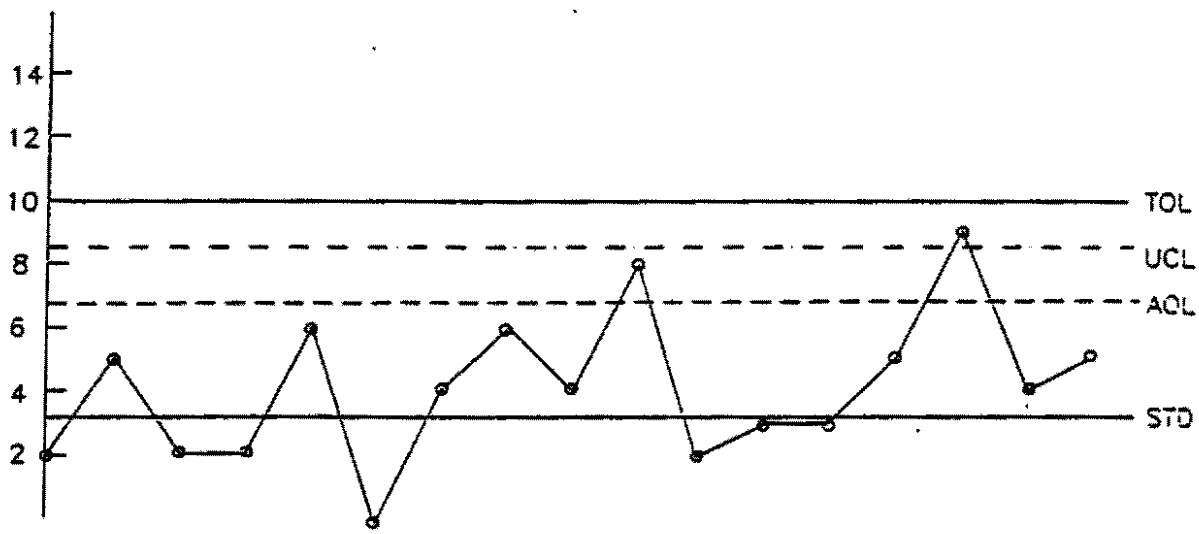


Fig.10

The processing standards for a sample size of 200 units at 5% defective are as follows:

Processing Standard	STD - 3.2
Acceptable Quality Limit	AQL - 6.7
Upper Control Limit	UCL - 8.5

Seventeen consecutive samples are plotted in figure 10, with connecting lines to emphasize their position. The samples in the order graphed would represent 2,5,2,2,6,0,4,6,4,8,2,3,3,5,9,4 and 5 defects. Most of the time defect attributes are recorded in numerical form in vertical columns corresponding to each sample.

68

If the number of defects exceeds the process standards they are circled in a particular color corresponding to the level exceeded. This gives added visual impact for quick review by supervisory staff and production personnel.

Occasionally for added visual emphasis a chart will be requested by production or quality control management. Though the tenth sample is over the AQL and the fifteenth sample is over the UCL, figure 10 is an example of a short run which would be considered entirely in grade.

As a point of reviewing the earlier discussion of statistics, note that the average of this succession of samples is 4.11 with a standard deviation of 2.33. Two standard deviations is 95.4% of the area under the curve, but when using the normal curve for quality control purposes we are normally only interested one side, hence two standard deviations or 97.7% of the samples would be at 8.77 defects or less. This is significantly better than the AQL curve, which would give 90% reliability, with an average of 6.7.

The quality control standards, as explained are integrated into the plant run rules to determine the segregation of lots into their appropriate grade as follows:

1. It takes two indications out of grade to change the grade.

2. A sample on or over the upper control limit is considered to be one indication out of grade.

3. A sample on or over the AQL is considered to be one-half indication out of grade.

4. Indications out of grade are added together unless

   a) a sample goes below the standard
   b) two samples in a row go below the AQL

   Product that has been running out of grade can be considered as "back in grade" once either of these two conditions are met as well.

In order to follow how the process standard run rules are utilized follow the progression of samples represented by figure 11 in the graphing of a single attribute.

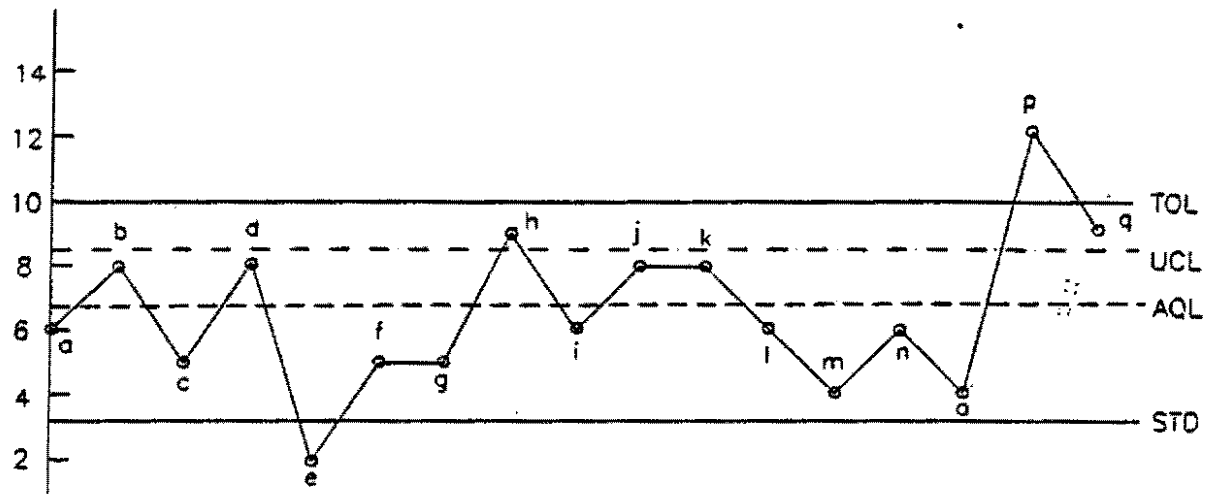


Fig.11

a) sample OK - no indications of grade problem.
b) sample over AQL - 1/2 indication out of grade.
c) sample OK - carry over 1/2 indication out of grade from "b".
d) sample over AQL - 1/2 indication out of grade
add 1/2 indication from "b" - 1 indication total.
e) sample under standard - start counting indications out of grade over again. 0 indications out of grade at this point.
f) sample OK - no indications of grade problem.
g) sample OK - no indications of grade problem.
h) sample over UCL - one indication out of grade.
i) sample OK - carry over 1 indication out of grade from "h".
j) sample over AQL - 1/2 indication out of grade
add to 1 indication from "h" - 1 1/2 indications total.
k) sample over AQL - 1/2 indication out of grade
add to 1 1/2 indications from "j" - 2 indications total
Change grade - point of lot change halfway between "g" and "h".
l) sample OK - no indications of grade problem.
m) sample OK - no indications of grade problem.
2nd sample in a row under the AQL - back in grade
point of lot change halfway between "k" and "l".
n) sample OK - no indications of grade problem.
o) sample OK - no indications of grade problem.
p) sample over UCL - one indication out of grade.
q) sample over UCL - one indication out of grade
add to 1 indication from "h" - 2 indications total
Change grade - point of change halfway between "o" and "p".

70

Of course figure 11 demonstrates the movement of but one attribute. There will typically be anywhere from 5-15 attributes monitored simultaneously , any number of which may be at different stages of "out of grade".

VI. SAMPLE SIZES

Samples are most commonly taken in package sizes, or multiples thereof, corresponding to the package size in which the product will be sold in its final manufactured state. It is necessary that the average number of units within a sample be determined so that the tolerance can be determined as a percentage. This is usually done by sampling a large number of samples and calculating from this an average. The count per unit weight is usually monitored throughout production runs to assure the quality control technician that the correct number of units are being graded. Significant size fluctuations will not only alter the number of units in a given weight but also correspondingly raise the defective level percentage, i.e. 1 defect in 200 units is a higher defective percentage than 1 defect in 250 units.

Sample size is a critical factor when determining process standards. A sample too small will give unreliable results and a sample too large will make grading too slow and cumbersome for efficient lot separations. To illustrate this point note the following calculations :

Example 2: The buyer specification is 1 EVM (extraneous vegetable material) in three 9oz. packages of frozen cut green beans. If there are 200 units in a 9 oz. package this equates to 0.17%.

Note the statistical calculations from the different listed sample sizes (assume 200 units per 9 oz. package):

Sample Size	Units	STD	AQL	UCL
3 packages	600	0.0	0.05	0.08
10 packages	1500	0.2	1.2	1.6
25 packages	5000	2.4	5.4	7.0

Sample sizes of 600 and 1500 units end up with process standards that are not workable in a production environment. They are so small that there is no room for any fluctuation. A sample size of 600 would give you limits of 0 for all parameters. Anytime a defect was found the lot would be out of grade. A sample of 1500 units, while slightly more acceptable, would still leave limits too close to one another to be useful. Two units of EVM would be both beyond the AQL and UCL at the same time. The AQL should be equal to or exceed 4 units to be acceptable for control purposes and also maintain the statistical reliability from which the limits are calculated. A sample of 5000 units would normally be taken from the prepackaged product flow in easily workable subsamples.

71

Example 3: The buyer specification is 10 off color units per 9oz. package of frozen cut green beans. If there are 200 units in a 9 oz. package this equates to 5.0%

Note again the statistical calculations from the different listed sample sizes (assume 200 units per 9 oz. package):

Sample Size	Units	STD	AQL	UCL
1 packages	200	3.2	6.7	8.5
2 packages	400	9.1	15.1	18.0
5 packages	1000	30.8	41.8	47.2

In most cases the smallest sample size should be used since it would meet the criteria of having an AQL of four or more. Checking a larger sample would cause additional work for the QC technician and would not give significantly better information.

VII. VARIATION

The single attribute system is based upon a stable normal distribution. If the lot quality is fluctuating, the only option available is to grade the entire lot down to the level of the worst samples that are being graded. Note the following control chart in figure 12. All or part of production runs similar to

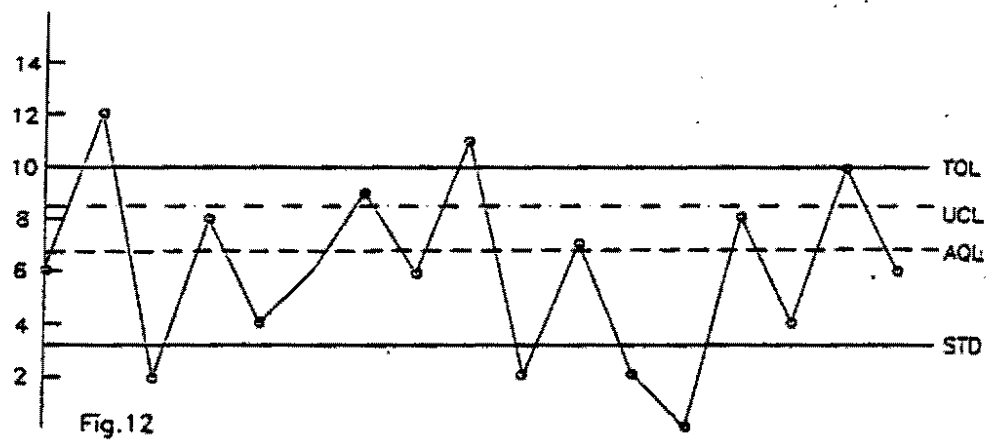


Fig.12

this usually result in averages over the AQL, which will likewise result in an excessive percentage of samples exceeding buyer specifications.

During periods of unstable quality, too large of sample size may cause points of quality change to be missed.

Extended time periods involved in grading very large samples can make it difficult to obtain sufficient numbers of samples. If the production lot quality is fluctuating or suspected to be fluctuating it is important that samples be taken as rapidly as possible.

72

Too large of samples could result in lots that get segregated at improper places or not at all. One might end up with either some good product in an unacceptable lot or vice versa.
An example of this is seen in figure 13. The doted line is an

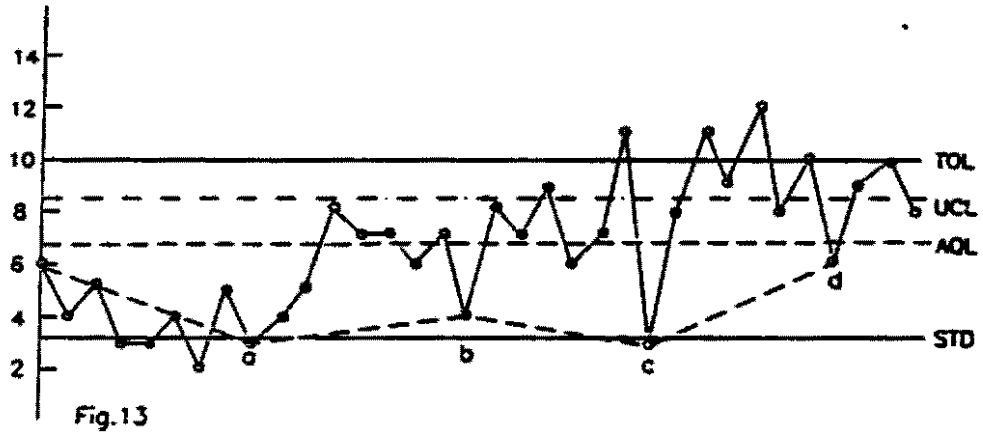


Fig.13

example of a sequence of samples taken by a QC technician who was getting samples at a rather slow frequency. Note that even though the overall lot quality was gradually getting worse, as noted by the solid line test data done by a QC technician taking more frequent samples, it was not picked up due to sample error and too infrequent sampling. It is also possible that the converse of this example could occur. The lot quality could start out poor, improve or be improving, and yet be missed for an extended period of time.

The majority of frozen product is run on a freezing belt into bulk totes. When product quality is changing it is important to have the frequency of grading as close as possible so as to make clean lot changes between totes. If more than one lot quality grade ends up in one tote the tote is tagged at the lower quality lot. If several totes are filled between lot quality changes the change is made at the approximate midpoint between the last grade of a different quality and the next grade. Of course the more totes filled between grades the more potential for error in lot separations.

VIII. MULTIPLE GRADE SPECIFICATIONS

Most buyers will have several grade levels corresponding to certain labels.

Production plants will also have numerous buyers for which to set aside product, each of which may have slightly different specifications which must be met. Figure 14 shows an example of the processing standard curve and AQL curve for two different sets of specifications, an "A" grade lot and a "B" grade lot.

In actual practice these curves may be further apart or they more often than not are intertwined more closely. Different buyer specifications for the same grade would also generally be intertwined quite closely. When quality control grading is being done there are usually at least 4-5 possible grade specifications that are possibilities. The data that is generated from the samples are compared with the process standards and then using the run rules noted the grade is determined. An expanded control chart showing several different grades at once might look like figure 15.

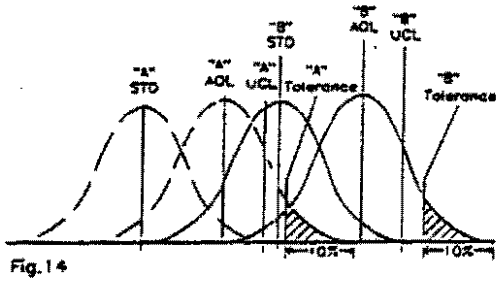


Fig.14

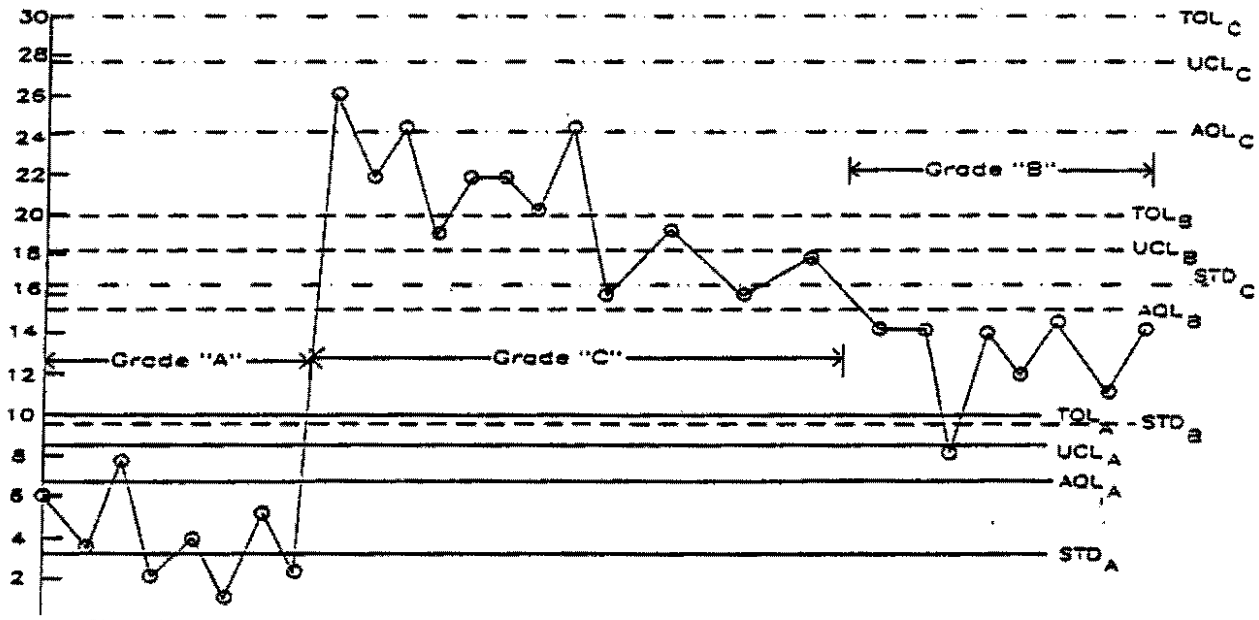


Fig.15

The first eight samples in figure 15 are running in the "A" grade specifications, the second eight samples are a solid "C" grade, the next four samples show some improvement though still in "C" grade and the last eight samples are in "B" grade.

Keep in mind that this graph shows a potential data output for only one attribute. In actual practice it may be necessary to keep an eye on up to fifteen at a time, with any number of those changing grades at once. The final grade is always equal to the grade of the attribute with the lowest grade. For example if fourteen attributes are within the "A" grade specifications and only one attribute is "B" grade the lot goes out "B" grade.

SUMMARY

The single attribute quality control inspection system used by Agripac, Inc. is the most accurate system available to segregate product in lots that will be acceptable for any given buyer. It is based on sound statistical principles that have been tried and tested for most fruits and vegetables processed for commercial use.

There are of course many other factors that go along with this system to make the overall program work. For example, proper sorting out of defects and identification of defects must be made for the system to properly identify lot quality. Intensive quality control supervision and training must be done on a continuous basis to assure that the system is functioning as it should.

IX. APPENDIX 1 - MATHEMATICAL CALCULATIONS OF PROCESS STANDARDS

The process of calculating process standards for continuous or finished lot inspection is as follows:

1. Determine fraction defective - USDA and buyer specifications are typically listed as a number of defects allowed per specified sample size. The number of defects allowed divided by the number of units in the sample is the fraction defective. Example: There are 10 off color units allowed in a 9 oz. package of frozen cut green beans containing 200 units. The number of units in a package will not be constant, but an average that is fairly close to the norm is usually satisfactory. 10 divided by 200 equals 5% defective.

2. Determine sample size - the sample size to be used in plant production must be adjusted to a size that will yield operating specifications in a workable range. The AQL of less than 4 units is not statistically reliable, as well as it will cause the operating specifications to be too closely bunched to be useful. Note the following example:

Sample Size	Percent Defective	STD	AQL	UCL
200 units	0.5	0.0	0.3	0.4

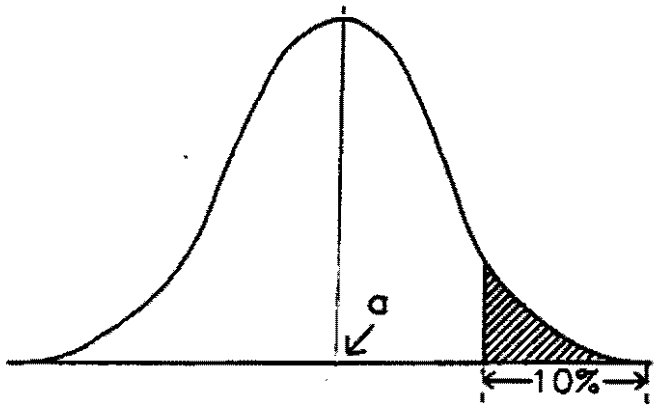
It is not necessary that every package contain exactly the same number of units, as small variations will result in process standards with differences of only a few tenths. A fraction of a defect has no practical significance. Note the following specifications that were calculated from similar sample sizes:

Sample Size	Percent Defective	STD	AQL	UCL
185 units	5.0	2.8	6.1	7.8
200 units	5.0	3.2	6.7	8.5
215 units	5.0	3.6	7.3	9.2

The effect of varying sample sizes on finished specifications is even less significant with a larger sample size and/or a smaller percent defective. Note the following example using EVM in frozen green beans:

Sample Size	Percent Defective	STD	AQL	UCL
5100 units	0.2	3.2	6.8	8.6
5000 units	0.2	3.1	6.6	8.4
4900 units	0.2	3.0	6.5	8.2

2. Calculate AQL (Acceptable Quality Limit) - the first decision to make is to determine what percent reliability is going to be used. As noted in the preceding section of this paper, Agripac, Inc. uses an approximately 10% buyers' risk. The formula for calculating the AQL is as follows:



$$a = \frac{nt + \frac{y^2}{2} - \sqrt{y^2nt + \frac{y^4}{4} - y^2nt^2}}{n + y^2}$$

$$a = \frac{nt + 0.845 - \sqrt{1.69nt + 0.714 - 1.69nt^2}}{n + 1.69}$$

AQL = a x n, where a = the formula for the package AQL from the normal curve as noted in the diagram at left and n = the sample size. The only other unknown in the formula is "y". This is the "Z" value taken from the area under the normal curve. It can be found in any standard statistics textbook. Agripac has used 1.3 (a rounded figure for the actual 1.28 associated with 90%).

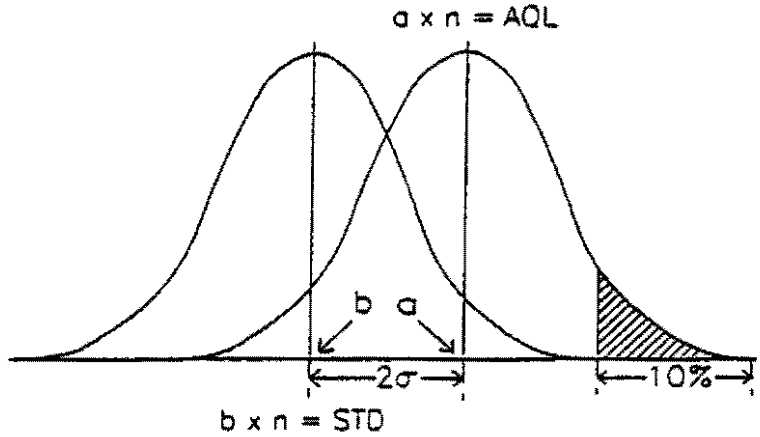
In solving for the equation where n = 200, y = 1.3 and t = .05; a = .0335.

Since the AQL = n x a = 200 x .0335 = 6.6951 = 6.7.

Other reliabilities will affect the AQL as noted in the following table (using the same n and t values just noted):

Reliability	Z	AQL
80%	0.84	7.7
85%	1.04	7.3
90%	1.28	6.7
95%	1.65	6.0
98%	2.05	5.3
99%	2.34	4.9

3. Calculate STD (Processing Standard) - Using the information from calculating the AQL the standard is calculated from the normal curve which is two standard deviations from the AQL curve.

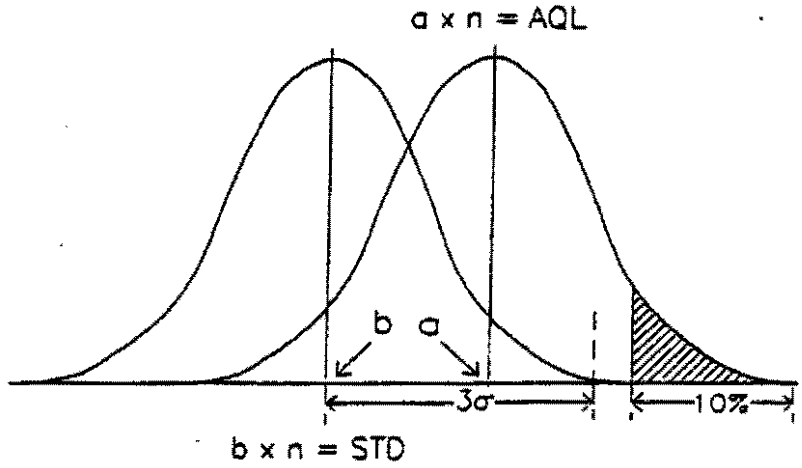


$$b = \frac{na + 2 - 2\sqrt{na + 1 - na}^{\,2}}{n + 4}$$

STD = b x n, where "b" is calculated from the formula above (a is the value calculated for "a" when determining the AQL) and n is the sample size of 200 as noted when calculating the AQL.

STD =.0158 x 200 = 3.1652 = 3.2.

4. Calculate UCL (Upper Control Limit) - Using the information from calculating the AQL and STD the upper control limit is calculated.



$$UCL = 3\left(\frac{AQL - STD}{2}\right) + STD$$

UCL = 3 x (6.7 - 3.2)/2 + 3.2 = 8.4601 = 5.5

STANDARDS

The standards cover the rules in processing a given product, items included.

1. The laws, rules and company requirements for the grade being assigned.

2 Product Description:
   A. Varieties
   B. Planting requirements
   C. Conditions of product being harvested
   D. Grades that are available
   E. Styles

3 Factors of Quality:
   A. Grade
   B. System
   C. Defect descriptions
   D. Special requirements

4. Samples required

5. Temperatures
   A. Processing
   B. Storage
   C. Transportation

SPECIFICATIONS

SPECIFICATIONS WILL LIST THE FOLLOWING

1. Product
2. Date
3. Signature of Approval
4. Quality Factors to Grade
   - A. EVM
   - B. Underdeveloped
   - C. Minor Defects
   - D. Major Defects
   - E. Crushed/Damaged Defects
   - F. Color
   - G. Character
5. Sample Size
   - A. Units
   - B. Weight
6. Tolerances In Percentage
7. Target, Limits for Each Grade
8. Flavor
9. Time
10. Grader's Name
11. Blanch Test Results
12. Product Temperatures

SYSTEM

Choosing the system to use in measurement of quality is very important in food processing. The most accurate measurement of quality of finished product will not change its quality to the desired grade. The food processor cannot afford to find out what he has manufactured, he must know step by step during the entire process how closely he is meeting the requirements of the grade set by his Sales staff.

I will provide you with material on a system that provides the step by step requirements for the two most important requirements in a processing center, those points are: 1). Consistency and 2). Probability of accuracy. You must have accuracy and you must be consistent . To gain this you must have a sample large enough to supply the information and you must draw enough samples to cover the range of time during processing.

I am providing two (2) articles to help you in your efforts to set up such a system. First is a Technical Service Bulletin supplied by the American Frozen Food Institute, and the second article is one that I put together for use in my old Company. Please read them and take advantage of the information.

HOW WILL WE USE QUALITY SYSTEMS?

MANAGEMENT

Quality Systems are a tool for:

1. Delegating authority and responsibility for product quality.
2. Making decisions on inventory, pricing and budget policies.
3. Measuring production.
4. Performance of Sales and office personnel.
5. Customers assurance of consistency in quality.

SALES

Quality Systems are a tool for:

1. Educating Sales Personnel
2. Gaining Customers/sales
3. Growing new products.
4. Product utilization

PURCHASING

Quality Systems are a tool for:

1. Providing assurance of product quality
2. Cost control

PRODUCTION PLANT

Quality Systems are a tool for:

1. Purchasing raw product from the farm
2. Cost control
3. Control of product quality
4. Machine efficiency
5. Freezing efficiency
6. Food safety
7. Weight control
8. Justificaion for decision making
9. Capability of machinery

DENNIS SPINK
VICE PRESIDENT OF QUALITY ASSURANCE
RESEARCH & NEW PRODUCT DEVELOPMENT
AGRIPAC, INC.

QUALITY ASSURANCE
ITS MEANING AND HOW TO USE IT

I. Define Quality Assurance and Quality Control

It is important that the meaning for the two titles be defined. In my presentation today they will mean the same. For some people Quality Control means the control of the quality during the processing operation. Quality Assurance is defined as an auditing function of the plant's quality control systems and procedures.

II. Quality Defined

Dr. Kramer defines quality as the composite of those characteristics that differentiate individual units of a product and have significance in determining the degree of acceptability of that unit by the buyer.

Quality is commonly thought of as a degree of excellence. Thus, the level or the excellence of the product may be thought of as the level of quality required in the market place. Another, and more common, thought is the relationship to what the government describes as quality.

III. Organization

The Quality Assurance Department's place on the organizational chart of a company is a topic of which small books could be written. Most text books say they must report to the President or C.E.O. of a company. What is done in the industry does not always fit the text book. Listed below are a few positions found for Quality Control within the corporate structure:

1. Reporting to the Shift Foreman with a dotted line to the Plant Manager. When this is the case, "Quality Assurance" is for auditing.
2. The Plant Quality Superintendent reporting to the Plant Manager.
3. Company Quality Control reporting to Operations, V.P. or Manager.
4. Reporting to the Sales Manager.
5. Reporting to the Engineering Department.
6. Reporting to the C.E.O. or the President of the Company
7. Reporting to the Plant Manager with a dotted line to Corporate Quality Assurance.

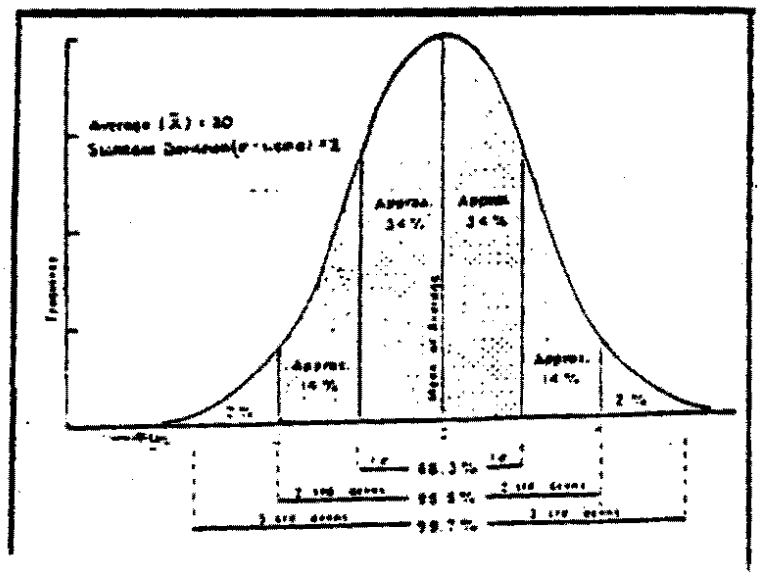
The ideal position for a Quality Assurance Department is No. 6 listed above. In this position it can function as a neutral department acting as a support unit for the three major departments. This way, the talents of the individuals within the departments can be put to the best use of the company.

IV. Functions Of A Quality Assurance Department

A. Responsibilities to the President of the Company:
One of the most important responsibilities of Quality Control is to provide a system of grading that has a sound mathematical basis of determining probability of correctness of the grades. Without this system a major part of the value of the Quality Assurance function is weakened.

1. STATISTICAL ANALYSIS
The two most important factors to a quality control system are 'probability of accuracy' and 'sample sizes'. These two factors are interrelated and are the heart of the third factor which is 'individual attribute'. Let me define these terms.

The word 'probability' is used in a manner denoting the chance of being correct. Probability is the mechanism for making the statistical inference. The statistician computes the limits around a sample factor so that the probability of the factor being included in the population parameter is known. In simple terms, when we know the tolerance for a defect we can plug it into a statistical formula which gives us the limits that will provide the 'probability' we desire. The "0" point in Figure 1 is the operating point for line control. The individual sample results should fluctuate around this line with an average near to or below this line. To gain a 95% 'probability' all samples should be under or between the "W" figures. Some may refer to the "W" as the A.Q.L.



Just for the record, we use both "P" charts which show the percentage of defective items in a sample or "np" charts which show the actual number of defective units in the sample.

ATTRIBUTE SYSTEM

The words 'attribute system' mean that a unit is judged as acceptable or not acceptable. No numerical measurement of acceptability is used. It is either good or bad, scoreable or not scoreable.

When we add the word 'individual' to the word attribute we mean that each factor of quality will be judged on each unit of product without regard for the presence of other factors. In other words, when we are measuring the factor of color we pay no attention to blemishes or stems present in the sample. When we are counting stems we pay no attention to the number of poor colored units present. Each factor of quality is given equal regard when determining the grade.

The term 'sample size' means the number of units within the sample. The sample size is very important in any sampling system if you are interested in reliable results.

To demonstrate this please look at figures 2, 3, and 4. We have taken a box of 500 marbles with 12% white ones representing defective units. Figure 2 demonstrates what happens when your sample size is too small. In it we sampled 10 marbles at a time. If you were accepting samples of 16% or less and working on the U.S.D.A. system of allowing 1 in 6 to fail, you would have rejected the complete lot.

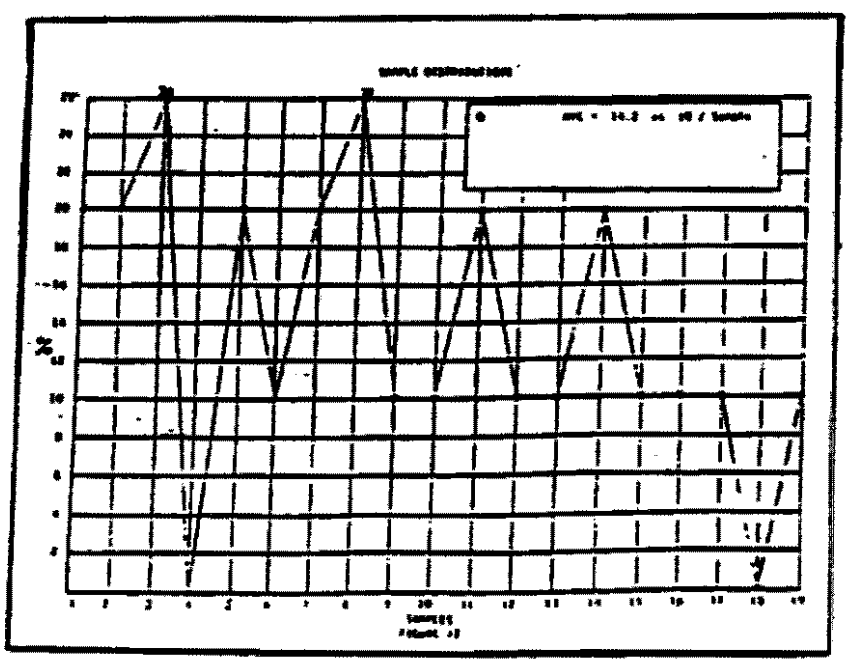
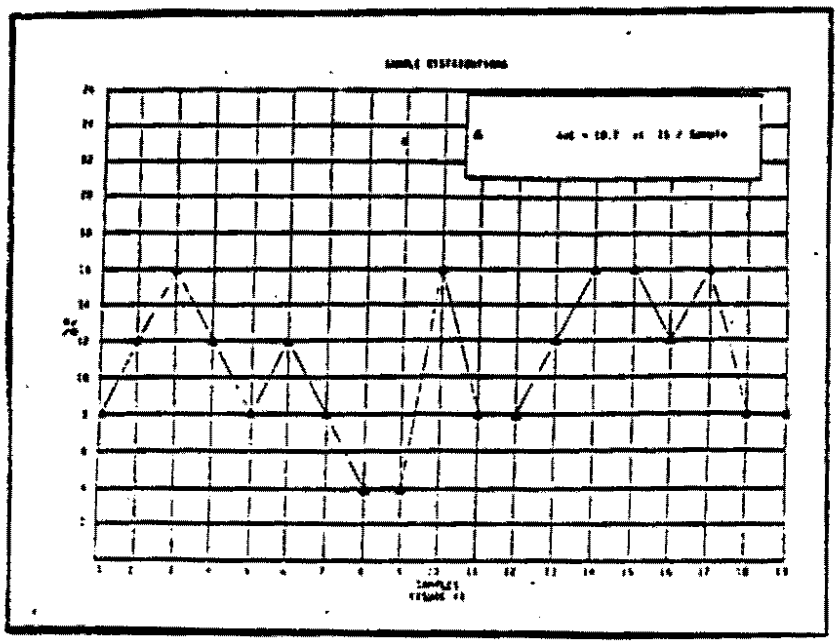
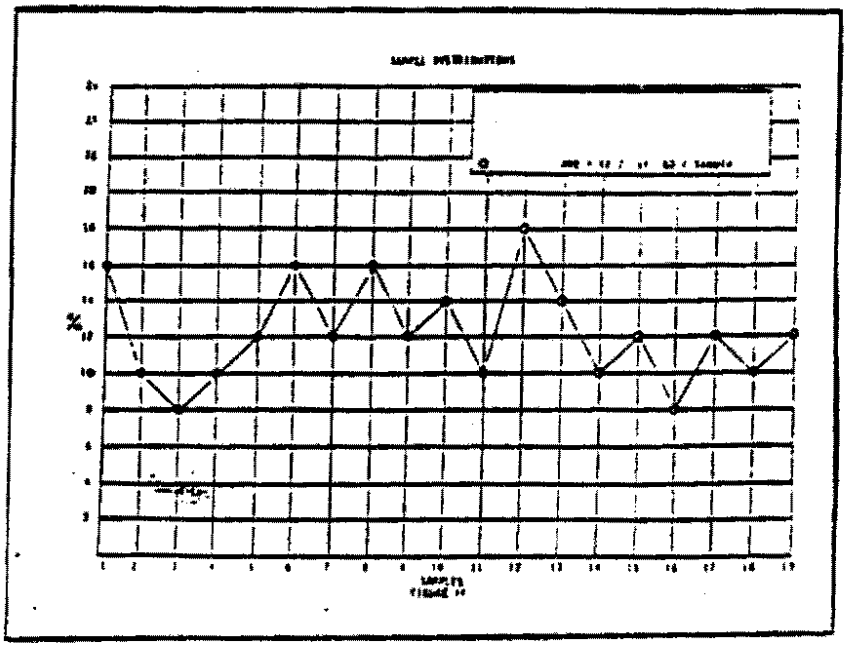


Figure 3 is the same box of marbles only this time we used 25 marbles as the sample size. You can see how the fluctuation became less.



In figure 4, we have increased the sample size to fifty and now the average is 12.5%, the fluctuations are small enough that you would accept the lot.



It became very obvious why the population within your sample is important to the accuracy of your results.

Now that we understand the basic reasoning let me provide you with an example. Assume you were buying cut green beans and you would accept 5% maximum on total blemish. Under most systems the sample size is set by weight without regard to the number of units within the sample. (Error number one.) Assume that you are buying cut green beans and you have a maximum limit tolerance of 5% blemishes. Assume that the sample size is 9 oz. which contains 200 beans. (5% of 200 = 10 beans) Under the present system all of the samples could have 10 beans with blemishes on them and still meet your requirements. (Error number two.) Let me explain why this will happen. If you look at the normal distribution curve (Fig. 1), to attain a tolerance of 5% you must have a "0" value (average for this processing operation) of 3.2 blemished beans (from sample of 200) and a "W" value of 6.7 blemished beans (2 sigma or standard deviation) for each sample. Now, if you have 10 blemished beans in each sample you have moved your normal distribution curve causing you to accept more than your 5% tolerance (it will be 7%). To have a 95% probability of correctness, you can not accept more than 6.7 defective units in any one sample

Let us look at another example which happens all of the time with the frozen pea industry. Most buyers require a maturity specification of no more than 10% sinkers in a 13% brine. Statistically we know that by operating up to 10% we will be providing the customer with a 95% probability that there will be peas up to 14% sinkers. To supply the 95% probability of meeting the 10% requirement you must run at the 6.7% level.

Presently there is only one frozen food packer and only two canners that use a system that takes the sample size into account when setting standards.

If we are to compare the individual attribute system of statistical quality control with the U.S.D.A.'s variable system of quality control used by 98% of the industry we would find that under the best conditions, 50% of the time they are accepting 26% of B grade or lower and are not aware of it. The variable standards and specifications promulgated by the U.S. Department of Agriculture contained sampling plans for allowances (tolerances) for defects that are not related to a specific acceptable quality level. This was not by design but just the way it happened to work out.

U.S.D.A. and others using the system (score points or variable system) were not aware of the accuracy of their decisions in assigning a grade to the product.

The sample unit size, more often than not, would vary with the size of the container with allowances for defects of various types expressed in terms of percent by count or percent by weight. Such decisions were based solely on the contents of the sample unit without regard to its relation to the total population.

Score points are assigned to the various quality factors in these standards on the erroneous assumption that such score points reflect the true quality level of the lot. This fallacy is still firmly believed by many people in the industry.

2. Grade Standards
   Grade standards are like a road map. If Production doesn't have a grade standard they don't know what they are producing. Without the standards the Sales Department won't know what they are selling. So you can see why the President wants this responsibility answered.

3. Food Safety Assurances
   The many issues such as sulfites, nutrient labeling and other issues make this an important responsibility.

4. Technical Advice

5. Neutral Opinions

6. Recall Systems Management and Auditing

B. Responsibility to Marketing and Sales Department
   1. Product Quality Guarantee.
   2. Training Programs for New Sales People.
   3. Source of Technical Information.
   4. Buyer Relations.
      a. Buyer Quality Assurance
      b. Training
      c. Specification
      d. Source of Technical Information
      e. Customer Relations
      f. Nutritional Information
      g. Answering Complaint Letters

C. Responsibilities to Operations
   1. Quality Control of Processing Products
   2. Relations With Regulatory Agencies
   3. Raw Product Audits
   4. Efficiency studies
   5. Audit of Old Inventory Quality
   6. Warehousing, handling and shipping Audits

I like to relate the position of Quality Assurance to that of the Supreme Court in our government. Quality Assurance sits between the Sales and Operations Departments just as the court sits between the Senate and the House of Representatives. I realize this maybe an exaggerated situation but in stating it this way you will realize the importance of a well organized Quality Assurance Department.

Foreword

THE AMERICAN FROZEN FOOD INSTITUTE . . .

. . . is a voluntary, non-profit association of companies which process frozen food products. The Institute implements many programs designed to advance the industry and enchance its relationships with consumers, retailers, distributors, suppliers, transporters, warehousemen and government agencies. Compilation of authoritative production statistics enables AFFI to provide information to these targeted audiences and others about the scope and size of the frozen food industry.

The statistics in this book are strictly historical and were compiled from reports received from individual processors and other sources as noted. The data presented in this book represent the commercial pack and do not include production in frozen food locker plants, or other non-commercial facilities.

This data shows calendar year production of individual commodities by region and container size. Wherever feasible, Retail, Food Service (Institutional) sizes and Bulk containerization have been separated. In some instances it has been necessary to consolidate certain packs with those of the next larger region or container size to ensure the confidentiality of individual processor performance.

"First Pack" and "Repack" data have been combined into "Final Container" making it possible to show more details of containerization. These tables may not reconcile with bulk freezing during the year because of the inclusion of product repacked from all sources, including carryover from the previous years.

All data presented in this book are shown in terms of thousands of pounds of production.

The cooperation of all frozen food processing firms in providing the essential data is gratefully acknowledged.

The format and techniques used in compilation of this report were developed under the direction of the AFFI Committee on Statistics. Such compilation took place in the Burlingame Office of the American Frozen Food Institute, 1838 El Camino Real, Burlingame, California 94010, telephone (650) 697-6835; fax (650) 697-6646; e-mail afficalif@aol.com. Members of the Statistics Committee are listed on page 7.

Copyright 2000
American Frozen Food Institute
2000 Corporate Ridge Ste 1000
McLean, Virginia 22102

Price $100.00

C O N T E N T S

(Number of Packers)		Page
	PART I - MISCELLANEOUS INFORMATION	
	A.F.F.I. Officers and Directors	6
	A.F.F.I. Committee On Statistics	7
	A.F.F.I. Schedule of Statistical Reports	8-9
	Freezer Stocks in Cold Storage - All Warehouses (USDA)	10-11
	Summary of Major Frozen Food Categories	12
	PART II - FRUITS & BERRIES	
	Pack of Recent Years by Product	15
	Pack of Recent Years by Region	16
11	Apples	17
4	Apricots	17
9	Cherries, Sweet	18
5	Peaches	18
6	Plums and Prunes	19
16	Blackberries	19-20
28	Blueberries, Cultivated	21
6	Blueberries, Wild	21
10	Boysenberries	22
3	Raspberries, Black	22
17	Raspberries, Red	22
35	Strawberries	23-24
25	Miscellaneous Fruit and Berries	25
	PART III - CONCENTRATES,CITRUS AND NON-CITRUS JUICES	
	Concentrated Citrus Juices	27
22	Concentrates and Juices (Non-Citrus)	27
19	Purees (Non-Citrus)	25
	PART IV - POTATO PRODUCTS	
8	French Fried	30
24	Potatoes - Other	30

91

C O N T E N T S

(Number of Packers)		Page
	PART V - VEGETABLES	
	Pack of Recent Years by Product	33
	Pack of Recent Years by Region	34
	Vegetable Mixes	60-62
6	Asparagus	35
14	Beans, Baby Limas	36
15	Beans, Green	37-38
4	Beans, Fordhook Lima	39
6	Beans, Butter, Speckled	39
9	Beans, Green, Italian	40
8	Beans, Wax	40
10	Broccoli	41-42
6	Brussels Sprouts	43
19	Carrots	44-45
6	Cauliflower	46
10	Celery	46
5	Collards	47
11	Corn-on-Cob	47
16	Cut Corn	48
4	Kale	49
6	Mushrooms	49
5	Mustard Greens	49
4	Okra	50
11	Onions	50
6	Peas, Black-eyed & Southern	51
21	Peas, Green	52
15	Peppers, Bell (Green, Red & Yellow)	53-54
4	Pumpkin and Cooked Squash	54
6	Rhubarb	55
7	Spinach	55
12	Squash, Summer & Zucchini	56
3	Sweet Potatoes and Yams	57
6	Turnip Greens	57
3	Turnips & Other Turnip Products	57
13	Miscellaneous Vegetables	58
23	Vegetable Mixes	59
17	Combinations and/or Blends	60
18	Miscellaneous Blends of Mixes	61

92

C O N T E N T S

Page

PART VI - FROZEN BREADED VEGETABLES

Natural Onion Products 63
Extruded Products 63
Other Breaded Vegetable Specialties 63
Companies Reporting 63

PART VII - SEAFOOD

Total Production 65
Production by Species. 65
Production of Major Items. 65

PART VIII - IMPORTS & EXPORTS

Imports of Fruit Commodities 67
Imports of Vegetable Commodities 68
Imports of Miscellaneous Vegetables. 69
Imports of Potato Products 70
Exports of Fruit Commodities 71
Exports of Vegetable Commodities 72-73
Exports of Potato Products 74

PART I

MISCELLANEOUS INFORMATION

AMERICAN FROZEN FOOD INSTITUTE

2 0 0 0

Officers

Chairman
Kathleen Kelly Spear
Kraft Foods, Inc.

First Vice Chairman
Rick Jacobson
Norpac Foods, Inc.

Second Vice Chairman
Kelly W. Brown
Smith Frozen Foods, Inc.

Immediate Past Chairman
George A. Franklin
Kellogg Company

President and Chief Executive Officer
Leslie G. Sarasin, CAE
American Frozen Food Institute

Board of Directors

Ricardo Alvarez
Ruiz Food Products, Inc.

Oscar M. Ancira, Jr.
Delimex

Robert P. Brubaker
King and Prince Seafood Corp.

Angela B. Cox
The Minute Maid Company

Theodore C. Cronk
The Pillsbury Company

Stephen Gunliffe
Nestle USA
Prepared Foods Division

Ben Frega
Agrilink Foods

Richard H. Grader
National Frozen Foods Corp.

Wayne Hanscom
McCain Foods USA

Gary Harrison
Mrs. Smith's Bakeries, Inc.

Stein Hordvik
ConAgra Frozen Foods

Lyle Hubbard
Gardenburger, Inc.

Mason A. Leonard
Pictsweet Frozen Foods

James E. Matthews
Heinz Frozen Food Co.

Howard Miller
Schwan's Sales Enterprises, Inc.

James R. Munyon
J.R. Simplot Company
Food Group

Thomas J. Ryan
Tropicana Products, Inc.

Stanley Schneider
Agvest Inc.

Douglas E. Sherman
Aurora Foods, Inc.

Gregory L. Smith
United Signature Foods

Arthur E. Symons, Jr.
Symons Frozen Foods, Inc.

Tim Twardzik
Ateeco, Inc.

Walt Wills
Vlasic Foods International

AMERICAN FROZEN FOOD INSTITUTE

2 0 0 0

Committee on Statistics

James M. Seabrook, Chairman
Seabrook Brothers & Sons, Inc.
P.O. Box 5103
Seabrook, NJ 08302

Richard Amirsehhi
Naturipe Berry Growers
P.O. Box 1630
Watsonville, CA 95077

Surinder Kang
Ruiz Food Products, Inc.
P.O. Box 37
Dinuba, CA 93618

Marcia Benmour
Agrilink Foods
520 N. Broadway
Green Bay, WI 54303

Linda A. Peterson
Peterson Farms, Inc.
3104 W. Baseline Rd.
Shelby, MI 49455

Richard H. Brown
Cebro Frozen Foods
2101 Orestimba Road
Newman, CA 95360

Ray Walker
Patterson Frozen Foods, Inc.
P.O. Box 114
Patterson, CA 95363

The format and techniques used in compilation of this report were developed under the direction of the AFFI Committee on Statistics. Such compilation took place in the Burlingame Office of the American Frozen Food Institute, 1838 El Camino Real, Burlingame, California 94010, telephone (650) 697-6835, fax (650) 697-6646, e-mail: afficalif@aol.com.

AMERICAN FROZEN FOOD INSTITUTE
SCHEDULE OF STATISTICAL REPORTS

ANNUAL REPORTS

Fruit & Berries *(Initial Freezing & Repack)*
National
Fruit & Berries *(Initial Freezing)*
California
Oregon, Washington, and Idaho *(Commodity Production Totals)*
Vegetables *(Initial Freezing & Repack)*
National
Vegetables *(Initial Freezing)*
California
Oregon, Washington and Idaho *(Commodity Production Totals)*
Vegetable Mixes
National
Potato Products *(Initial Freezing & Repack)*
National
Potato Products *(Initial Freezing)*
California
Oregon, Washington and Idaho *(Commodity Production Totals)*
Import Statistical Report
National *(Import Totals by Commodities)*
Export Statistical Report
National *(Export Totals by Commodities)*

SEMI-ANNUAL REPORTS *(January 1 - June 30)*

Spring Spinach
National *(Production Totals by container size, style and region)*
Potato Products *(Initial Freezing & Repack)*
National
Import Statistical Report
National *(Import Totals by Commodities)*
Export Statistical Report
National *(Export Totals by Commodities)*

SEMI-ANNUAL REPORTS *(July 1- December 31)*

Brussels Sprouts
California *(Production Totals by grade and container size)*
Cauliflower
California *(Production Totals by grade and container size)*
Spinach
National *(Production Totals by container size, style and region)*

PRELIMINARY *(Annual)*

Apricots
California *(Production Totals by style)*
Asparagus
National *(Production Totals by container size, style and region)*
Beans, Green
National *(Production Totals by region & style)*

47

AMERICAN FROZEN FOOD INSTITUTE
SCHEDULE OF STATISTICAL REPORTS

PRELIMINARY *(Annual)*, Continued...

- **Broccoli**
  - **National** *(Production Totals by grade, container size and style)*
- **Carrots**
  - **National** *(Production Totals by grade and style)*
- **Corn, Cut & Corn-on-Cob**
  - **National** *(Production Totals by region, grade and style)*
- **Lima Beans, Baby & Fordhook**
  - **National** *(Production Totals by style)*
- **Peaches**
  - **National** *(Production Totals)*
- **Peas, Green**
  - **National** *(Production Totals by grade and region)*
- **Strawberries**
  - **National & California**
    (Production Totals by grade, container size, style and region)

QUARTERLY PROGRESS REPORTS

- **Broccoli**
  - **California** *(Production Totals by container size & style)*

MONTHLY PROGRESS REPORTS *(During packing season, or as noted)*

- **Beans,Green**
  - **National** *(Production Totals by grade & style)*

ACREAGE SURVEYS

- **Acreage Intentions:** *(As of March 31)*
  - **Corn,Cut and Cob**
    - **National**
  - **Beans, Green**
    - **National**
  - **Peas, Green**
    - **National**
- **Acreage Intentions:** *(As of April 30)*
  - **Lima Beans, Baby and Fordhook**
    - **National**
- **Actual Acreage Planted:** *(As of February 15)*
  - **Spring Spinach**
    - **National**
- **Actual Planted and Harvested:** *(National)*
  - **Corn**
  - **Green Beans**
  - **Lima Beans**
  - **Peas**

FREEZER STOCKS IN COLD STORAGE - ALL WAREHOUSES - AS OF DECEMBER 31
NATIONAL AGRICULTURAL STATISTICS SERVICE (NASS)
AGRICULTURAL STATISTICS BOARD
U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON D.C.
(All Data Shown in Thousands of Pounds)

	1996	1997	1998	1999
FROZEN FRUITS				
Apples	75,665	63,067	66,381	72,517
Apricots	8,545	12,567	11,548	8,993
Blackberries	20,227	26,214	22,072	22,086
Blueberries	60,126	87,345	67,128	58,981
Boysenberries	3,561	5,897	4,528	5,133
Cherries, Tart	131,708	139,704	125,359	118,393
Cherries, Sweet	12,201	15,270	15,781	12,853
Grapes	4,879	3,492	5,444	4,722
Peaches	50,471	72,317	72,832	70,616
Black Raspberries	1,324	660	836	1,058
Red Raspberries	36,494	49,810	40,168	55,902
Total Strawberries	212,931	220,540	202,206	277,691
Other Frozen Fruits	473,832	536,232	574,472	746,084
TOTAL FROZEN FRUITS	1,091,964	1,233,115	1,208,755	1,455,029
FROZEN FRUIT JUICES				
Orange Juice Concentrate	1,069,372	1,503,354	1,764,444	1,330,675
Other Juice Concentrate	410,221	424,263	404,985	328,775
TOTAL FRUIT JUICES	1,479,593	1,927,617	2,169,429	1,659,450
FROZEN VEGETABLES				
Asparagus	8,353	6,908	6,162	12,076
Limas, Fordhook	15,209	17,231	12,209	15,302
Limas, Baby	44,036	54,990	64,213	56,691
Green Beans, Regular Cut	161,433	197,009	172,275	150,310
Green Beans,French Style	41,174	33,652	40,931	36,080
Broccoli,Spears	22,101	20,519	24,838	34,354
Broccoli,Chopped & Cuts	98,870	91,792	88,201	123,021
Brussels Sprouts	16,314	19,926	18,740	25,649
Carrots	281,791	300,870	256,527	307,197
Cauliflower	54,618	58,512	47,726	57,812
Corn,Cut	352,378	403,578	404,073	330,204
Corn,Cob	293,046	274,261	269,582	255,662
Mixed Vegetables	54,208	45,744	53,770	51,537
Okra	28,576	52,230	46,690	39,837
Onion Rings	10,040	11,031	15,735	17,026
Onions,Other Frozen	30,481	31,187	24,608	41,236
Black-eye Peas	9,795	9,344	8,038	6,517
Green Peas	208,357	219,533	277,888	276,154
Peas & Carrots Mixed	6,731	5,760	10,741	11,314
Spinach	47,868	67,092	69,378	73,349
Squash, Summer & Zucchini	58,749	75,397	70,274	58,254
Southern Greens	26,936	20,771	32,765	26,944
Other Frozen Vegetables	314,640	285,670	300,298	272,866
TOTAL FROZEN VEGETABLES	2,185,704	2,303,007	2,315,662	2,279,392
FROZEN POTATOES				
French Fried Potatoes	921,248	973,954	898,127	945,637
Other Frozen Potatoes	177,173	189,593	247,342	219,752
TOTAL FROZEN POTATOES	1,098,421	1,163,547	1,145,469	1,165,389

FREEZER STOCKS IN COLD STORAGE - ALL WAREHOUSES - AS OF DECEMBER 31
NATIONAL AGRICULTURAL STATISTICS SERVICE (NASS)
AGRICULTURAL STATISTICS BOARD
U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON D.C.

(Continued)

(All Data Shown in Thousands of Pounds)

	1996	1997	1998	1999
FROZEN POULTRY				
Frozen Chicken:				
Broilers,Fryers,Roasters. .	33,306	24,227	18,853	34,692
Hens.	5,705	7,407	6,266	7,763
Other Frozen Chicken. . . .	608,000	582,618	693,377	760,904
Total Frozen Chicken. . .	647,011	614,252	718,496	803,359
Frozen Turkey:				
Whole Turkeys	146,859	176,014	108,511	90,538
Other Turkeys	181,092	239,039	200,203	163,713
Total Frozen Turkey . . .	327,951	415,053	308,714	254,251
Frozen Ducks.	2,203	1,864	3,757	3,760
TOTAL FROZEN POULTRY. . .	977,165	1,031,169	1,030,967	1,061,370
FROZEN MEAT				
Frozen Beef:				
Boneless.	256,444	318,342	268,982	269,719
Beef Cuts	27,997	31,818	29,049	44,443
Total Frozen Beef	284,441	350,160	298,031	314,162
Frozen Pork:				
Picnics, Bone-in.	4,325	7,453	11,967	6,785
Ham	33,264	46,320	63,517	61,055
Bellies	38,032	44,763	72,529	40,300
Loins	18,428	22,224	27,622	26,920
Ribs.	70,440	55,610	75,904	66,662
Butts	5,953	9,920	15,868	10,482
Trimmings	32,091	51,609	73,436	54,752
Other	72,045	70,671	89,055	91,823
Total Frozen Pork	274,578	308,570	429,898	358,779
TOTAL FROZEN MEAT	559,019	658,730	727,929	672,941

160

SUMMARY OF PRODUCTION

MAJOR FROZEN FOOD CATEGORIES

(Data in Thousands of Pounds)

Commodity	*Page*	1996	1997	1998	1999
Frozen Vegetables (Other than Potatoes).	*33*	3,188,023	3,513,656	3,530,177	3,356,144
Frozen Potato Products .	*30*	8,419,203	8,381,370	8,723,707	8,765,173
Frozen Fruits & Berries.	*15*	944,387*	998,624	1,003,984	1,024,703
Total		12,551,613*	12,893,650	13,257,868	13,146,020
Frozen Concentrates/Juices (Thousands of Gallons).	*27*	264,191	309,653	313,695	219,550
Frozen Seafood.	*65*	511,603*	382,192*)1	362,940)1	387,447)1

)1 Does not include Salt & Fresh Water Fish, Bait and Animal Food, Shellfish, Fillets & Steaks.

* *Revised*

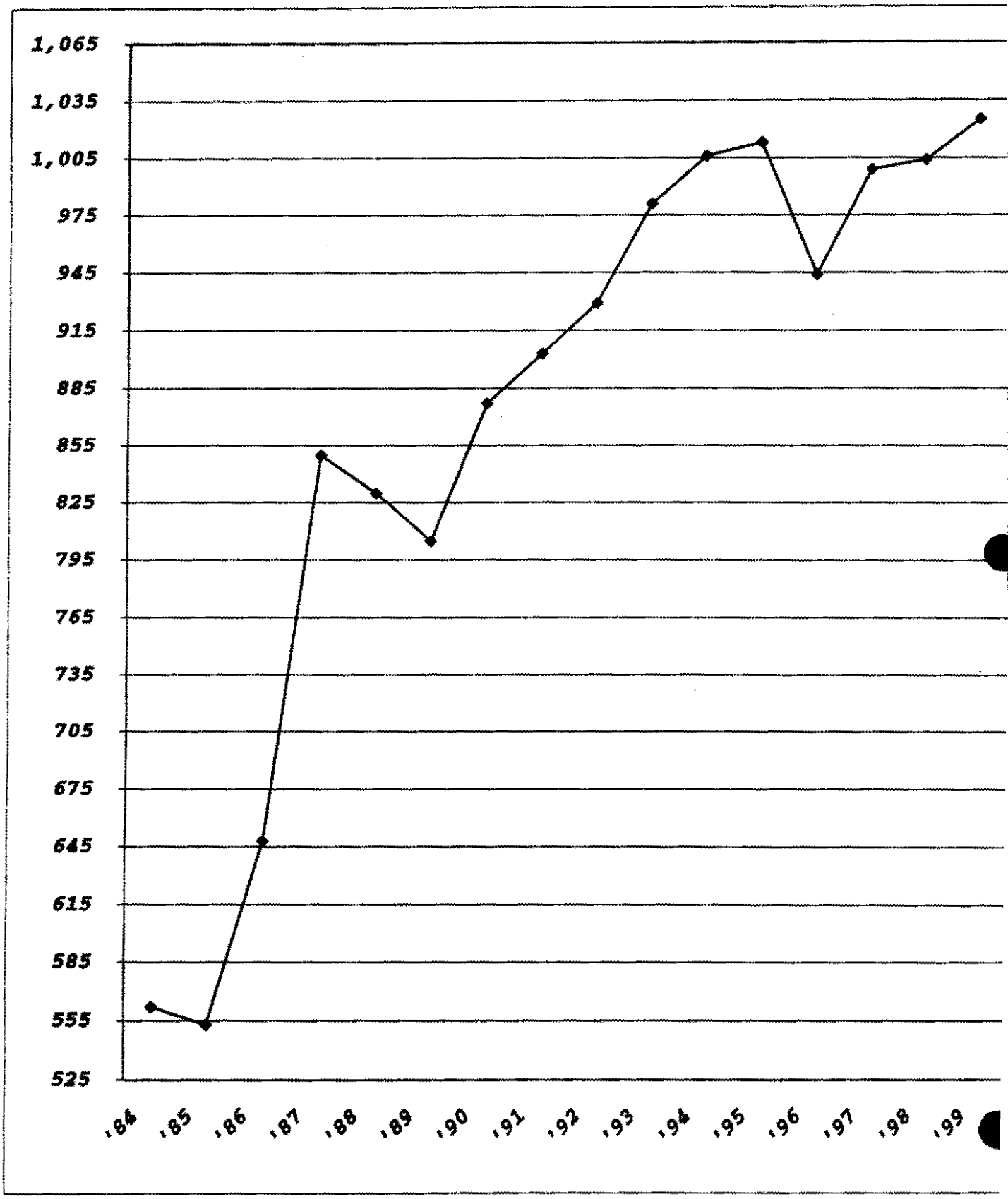
Source: American Frozen Food Institute

PART II

FROZEN FRUIT AND BERRY PACK STATISTICS

Total United States Pack

TOTAL FROZEN FRUITS AND BERRIES
Millions of Pounds



Source: American Frozen Food Institute

PART II

FROZEN FRUIT AND BERRY PACK STATISTICS

Total United States Pack
(Data in Thousands of Pounds)

Compiled by American Frozen Food Institute (c) 2000

1990	893,894	1995	1,012,736*
1991	902,705	1996	944,387*
1992	928,794	1997	998,624
1993	980,791	1998	1,003,984
1994	1,006,198	1999	1,024,703

Pack of Recent Years by Product

Product	Page	1996	1997	1998	1999
Fruits:					
Apples	*17*	114,332	119,180	124,866	111,944
Apricots	*17*	17,759	24,267	20,929	18,492
Cherries,Sweet	*18*	14,945	24,515	21,628	13,640
Peaches	*19*	109,598	124,220	110,491	123,942
Plums & Prunes	*19*	1,736	789	1,518	986
Purees,Non-Citrus	*25*	78,457	85,333	100,239	85,535
Berries:					
Blackberries	*20*	20,404	26,272	24,734	23,895
Blueberries,Cultivated	*21*	44,332	77,127	54,515	50,562
Blueberries,Wild	*21*	45,753	45,640	36,335	46,005
Boysenberries	*22*	5,288	4,983	3,338	4,703
Raspberries,Black	*22*	1,779	1,738	1,688	*)1*
Raspberries,Red	*22*	23,339	25,766	22,163	23,324
Strawberries,Whole	*23-24*	163,965	150,582	154,148	171,975
Strawberries,Sliced	*23-24*	166,174	177,568	219,676	247,793
Misc.Fruit & Berries	*25*	136,526*	110,644	107,716	101,907
Total		944,387*	998,624	1,003,984	1,024,703

---

* *Revised*
)1 Included with Miscellaneous Fruits & Berries

NOTE: *Summarized pack totals on Page 15 and 16 do not include frozen concentrated citrus juices and purees, nor other miscellaneous concentrates and juices. The production of these products are reported separately in gallons and appears on Page 27.*

FROZEN FRUIT AND BERRY PACK STATISTICS
(Cont'd)

Total United States Pack

Pack of Recent Years by Region
(Data in Thousands of Pounds)

Region	1996	1997	1998	1999
Northeast.	93,569	]	]	]
South.	16,690	] 96,989	] 67,769	] 72,582
Midwest.	133,372*	164,213	158,398	161,737
West	700,756	737,422	777,817	790,384
Total.	944,387*	998,624	1,003,984	1,024,703

** Revised*

The regions established to show Frozen Fruit and Berry Production in various parts of the country are as follows:

Northeast: *Connecticut, Maine, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island and Vermont.*

South: *Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia and West Virginia.*

Midwest: *Illinois, Indiana, Michigan, Minnesota, Nebraska, Ohio and Wisconsin.*

West: *Arizona, California, Colorado, Hawaii, Idaho, Montana, Oregon, Utah and Washington.*

In the case of certain commodities, it has become possible to publish separate data for California and the Northwest.

Source: American Frozen Food Institute

A P P L E S

Total United States Pack

(Data in Thousands of Pounds)

1990	125,540
1991	149,423
1992	115,525
1993	93,016
1994	91,709
1995	113,278
1996	114,332
1997	119,180
1998	124,866
1999	111,944

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Northeast	43,014	72,286	--	--
South				
Midwest	34,930		66,075	69,012
West	36,388	46,894	58,791	42,932
Total	114,332	119,180	124,866	111,944

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
20 Pound & under	934	9,770	13,168	769
25 to 28 Pound	17,117	3,420		
30 Pound	15,157	10,491	11,723	5,119
32 to 60 Pound	15,934	11,863		
I.Q.F.	54,776	74,826	95,683	85,937
Barrels	10,414	8,810	4,292	20,119
Total	114,332	119,180	124,866	111,944

Small quantities of various sizes were combined with nearest container size.

A P R I C O T S

Total United States Pack

(All production in the Western Region, chiefly in California)

1990	16,512
1991	15,626
1992	21,237
1993	17,901
1994	18,192
1995	10,046
1996	17,759
1997	24,267
1998	20,929
1999	18,492

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
F/S Poly/Carton	1,727)1	195)1	2,058	3,371
28 to 40 Pound		2,154		
Barrels & IQF	16,032	21,918	18,871	15,121
Total	17,759	24,267	20,929	18,492

)1 Includes small amount of Retail Poly/Ctn.
Small quantities of various sizes were combined with nearest container size.

Source: American Frozen Food Institute

105

S W E E T C H E R R I E S

Total United States Pack

1990	13,695
1991	14,555
1992	20,095
1993	16,037
1994	18,480
1995	27,032
1996	14,945
1997	24,515
1998	21,628
1999	13,640

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Midwest	4,951	7,775	9,745	7,086
West	9,994	16,740	11,883	6,554
Total	14,945	24,515	21,628	13,640

Pack, Repack and Final Container Size

Container Size	1996	1997	1998	1999
Retail Poly/Carton	1,468	908	]	]
Foodservice Poly/Carton	]	141	]	] 1,542
25 to 30 pound	] 2,336	2,331	] 6,238	1,638
Other Large Sizes	4,899	12,955	9,459	5,727
Barrels & IQF	6,242	8,180	5,931	4,733
Total	14,945	24,515	21,628	13,640

P E A C H E S

Total United States Pack

1990	111,203
1991	100,157
1992	99,010
1993	94,381
1994	102,073
1995	89,743*
1996	109,598
1997	124,220
1998	110,491
1999	123,942

PACK OF RECENT YEARS BY REGION

Region	1996	1997	1998	1999
Midwest	--]	]	]	]
West	109,598]	124,220]	110,491]	123,942
Total	109,598	124,220	110,491	123,942

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton/Poly	5,574	4,209	4,763	7,394
Foodservice				
Carton	18,015	20,866	]	17,765
Poly	3,545	3,662	] 32,036	6,145
Bulk				
Over 10 pounds	24,506	22,124	17,507	17,017
I.Q.F.	]	63,532	]	]
Barrels	] 57,958	9,827	] 56,185	] 75,621
Total	109,598	124,220	110,491	123,942

Source: American Frozen Food Institute

P L U M S & P R U N E S

Total United States Pack
(Data in Thousands of Pounds)

1990 . . .	986
1991 . . .	901
1992 . . .	1,229
1993 . . .	870
1994 . . .	1,181
1995 . . .	1,042
1996 . . .	1,736
1997 . . .	789
1998 . . .	1,518
1999 . . .	986

Pack of Recent Years by Region

Region	1996	1997	1998	1999
West & Midwest . .	1,736	789	1,518	986

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
30 pound	]	]	]	]
Other sizes	]	]	]	]
(over 10 pounds) . . .	] 1,736	] 789	] 1,518	] 550
Barrels & I.Q.F.	]	]	]	436
	---	---	---	---
Total	1,736	789	1,518	986

B L A C K B E R R I E S

(All Varieties Except Olallie Berries)
(Production Chiefly in the West)

Total United States Pack

PACK, REPACK AND FINAL CONTAINER SIZE

1990 . . .	18,619*
1991 . . .	13,647*
1992 . . .	31,498*
1993 . . .	23,118
1994 . . .	24,226
1995 . . .	26,823
1996 . . .	20,404
1997 . . .	26,272
1998 . . .	24,734
1999 . . .	20,404

	1996			
Container Size	Marion	Evergreen	Other	Total
Retail Poly/Ctn. .	1,682	]	]	]
F/S Poly/Carton. .	1,293	]	]	]
28 & 30 pound. . .	603	] 371	]	]
I.Q.F.	10,181	2,656	]	]
Other Sizes. . . .	]	--	] --	]
Barrels.	] 1,320	1,087	] 1,211	] 20,404
	---	---	---	---
Total. . .	15,079	4,114	1,211	20,404

* *Revised*

Source: American Frozen Food Institute

B L A C K B E R R I E S

(Continued)

(All Varieties Except Olallie Berries)
(Production Chiefly in the West)
Total United States Pack

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1997 Marion	1997 Evergreen	1997 Other	1997 Total
Retail Poly/Carton	1,886			
Foodservice Poly/Carton	2,169	158		
28 & 30 pound	1,288			
I.Q.F.	12,631	3,560	482	22,174
Other Sizes		--	--	
Barrels	2,804	1,358	-64)1	4,098
Total	20,778	5,076	418	26,272

Container Size	1998 Marion	1998 Evergreen	1998 Other	1998 Total
Retail Poly/Carton	1,047			
Foodservice Poly/Carton	918			
28 & 30 pound	7,203	1,439		
I.Q.F.				
Other Sizes	5,948	--	--	
Barrels	5,525	1,889	765	24,734
Total	20,641	3,328	765	24,734

Container Size	1999 Marion	1999 Evergreen	1999 Other	1999 Total
Retail Poly/Carton	1,162		--	
Foodservice Poly/Carton	1,058		--	
28 & 30 pound	1,907	564	390	5,081
I.Q.F.	10,097	2,653		
Other Sizes	--	--		
Barrels	3,770	1,755	539	18,814
Total	17,994	4,972	929	23,895

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

Source: American Frozen Food Institute

B L U E B E R R I E S *

Total United States Pack
(Data in Thousands of Pounds)

1990	102,141
1991	98,030
1992	123,738
1993	139,059
1994	110,017
1995	118,064
1996	90,085
1997	122,767
1998	90,850
1999	96,567

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Northeast & South	60,708	67,423	50,921	55,750
Midwest	18,313	39,350	24,491	30,473
West	11,064	15,994	15,438	10,344
Total	90,085	122,767	90,850	96,567

* *The data given represent the U.S. commercial pack and do not include quantities imported from Canada and Newfoundland.*

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Cultivated	1996 Wild	1996 Total	1997 Cultivated	1997 Wild	1997 Total
10 pound and under	10,097			9,166		
20 & 30 pound	25,305	24,426	59,828	45,969	30,331	85,466
Other large sizes (over 10 lbs.)	)1	--	)1	1,200	--	1,200
I.Q.F.	13,019			21,700		
Barrels	-4,089)2	21,327	30,257	-908)2	15,309	36,101
Total	44,332	45,753	90,085	77,127	45,640	122,767

Container Size	1998 Cultivated	1998 Wild	1998 Total	1999 Cultivated	1999 Wild	1999 Total
10 pound and under	9,590			5,145		
20-30 pound	34,030	34,925	78,545	37,844		
Other large sizes (over 10 lbs.)		--			46,005	96,567
I.Q.F.	10,436			10,207		
Barrels	459	1,410	12,305	-2,634)2		
Total	54,515	36,335	90,850	50,562	46,005	96,567

)1 Included w/Barrels
)2 Deficit attributable to previous years' carryover and imported products repacked in the U.S.

Source: American Frozen Food Institute

B O Y S E N B E R R I E S

Total United States Pack
(Production Chiefly in the West)
(Data in Thousands of Pounds)

1990 . . .	7,278
1991 . . .	5,619
1992 . . .	6,917
1993 . . .	4,437
1994 . . .	5,105
1995 . . .	3,459
1996 . . .	5,288
1997 . . .	4,983
1998 . . .	3,338
1999 . . .	4,703

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail/FS Poly/Carton . .	675	715		133
28 pound.				
30 pound.	292	449	1,404	685
I.Q.F.	2,769	2,804	761	
Other Sizes	--			2,809
Barrels	1,552	1,015	1,173	1,076
Total.	5,288	4,983	3,338	4,703

B L A C K R A S P B E R R I E S

Total United States Pack
(Production chiefly in the Northwest)
(Data in Thousands of Pounds)

1990 . . .	1,682
1991 . . .	1,813
1992 . . .	2,334
1993 . . .	1,325
1994 . . .	1,146
1995 . . .	2,224
1996 . . .	1,779
1997 . . .	1,738
1998 . . .	1,688
1999 . . .	)1

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
28 pound & Other Sizes. .	386	455	828	)1
Barrels & IQF	1,393	1,283	860	)1
Total	1,779	1,738	1,688	)1

Small quantities of various sizes were combined with nearest container size.
)1 Included with Miscellaneous Fruits & Berries

R E D R A S P B E R R I E S

Total United States Pack
(Production chiefly in the West)
(Data in Thousands of Pounds)

1990 . . .	26,289
1991 . . .	24,000
1992 . . .	29,811
1993 . . .	24,154
1994 . . .	28,754
1995 . . .	37,885
1996 . . .	23,339
1997 . . .	25,766
1998 . . .	22,163
1999 . . .	23,324

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton.	2,179			--
Poly.	5,451	8,223	3,184	2,270
Foodservice				
Carton.	2,580	895	1,315	1,641
Poly.	2,215	3,444	2,654	1,561
Bulk				
28 & 30 pound	3,609	4,112	3,413	4,948
Other large sizes . . .	709	3,558	2,409	915
Barrels & IQF	6,596	5,534	9,188	11,989
Total.	23,339	25,766	22,163	23,324

Source: American Frozen Food Institute

S T R A W B E R R I E S

Total United States Pack

(Data in Thousands of Pounds)

Year	Whole	Sliced	Total
1985	108,145	121,007	229,152
1986	101,189	136,415	237,604
1987	145,151	189,255	334,406
1988	132,224	142,386	274,610
1989	117,088	121,064	238,152
1990	144,401	161,523	305,924
1991	165,262	164,961	330,223
1992	127,116	141,378	268,494
1993	188,011	177,652	365,663
1994	199,421	169,614	369,035
1995	189,978*	181,160	371,138*
1996	163,965	166,174	330,139
1997	150,582	177,568	328,150
1998	154,148	219,676	373,824
1999	171,975	247,793	419,768

* *Revised*

S T R A W B E R R I E S 1 9 9 7

Region	Whole	Sliced	Total
Midwest	]	990	]
Northwest	] 15,668	27,614	] 44,272
California	134,914	148,964	283,878
Total	150,582	177,568	328,150

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	Whole	Sliced	Total
Retail			
Carton	2,143	29,027	31,170
Poly	18,314	6,647	24,961
Foodservice			
Carton	5,859	48,456	54,315
Poly	8,182	25,088	33,270
Bulk			
10 to 28 pound	780	5,434	6,214
30 pound	30,873	]	]
32 through 55 pound	5,178	] 46,954	] 83,005
I.Q.F.	56,212	]	]
Barrels	23,041	] 15,962	] 95,215
Total	150,582	177,568	328,150

Juice stock and puree not included in figures from 1985-99 (see pages 25 & 27)
Small quantities of other sizes were combined with nearest container size.

Source: American Frozen Food Institute

S T R A W B E R R I E S 1 9 9 8

Region	Whole	Sliced	Total
Midwest	]	791	]
Northwest	] 19,328	29,756	] 49,875
California	134,820	189,129	323,949
Total	154,148	219,676	373,824

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	Whole	Sliced	Total
Retail			
Carton/Poly	13,916	38,000	51,916
Foodservice			
Carton	8,995	35,997	44,992
Poly	10,486	20,091	30,577
Bulk			
10 to 28 pound	2,447	14,961	17,408
30 pound	23,307	59,022	82,329
32 through 55 pound	1,464	4,964	6,428
I.Q.F.	74,033	3,974	78,007
Barrels	19,500	42,667	62,167
Total	154,148	219,676	373,824

S T R A W B E R R I E S 1 9 9 9

Region	Whole	Sliced	Total
Midwest	105	411	516
Northwest	19,552	25,763	45,315
California	152,318	221,619	373,937
Total	171,975	247,793	419,768

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	Whole	Sliced	Total
Retail			
Carton/Poly	16,525	34,604	51,129
Foodservice			
Carton	15,912	]	]
Poly	13,531	] 103,607	] 133,050
Bulk			
10 to 28 pound	3,267	19,457	22,724
30 pound	39,416	32,478	71,894
32 through 55 pound	685	1,628	2,313
I.Q.F.	76,474	5,329	81,803
Barrels	6,165	50,690	56,855
Total	171,975	247,793	419,768

Juice stock and puree not included in figures from 1985-99 (see pages 25 & 27)
Small quantities of other sizes were combined with other container size.

Source: American Frozen Food Institute

M I S C E L L A N E O U S F R U I T & B E R R I E S

Total United States Pack
(Data in Thousands of Pounds)

1990	120,609*
1991	105,626*
1992	154,957*
1993	136,813
1994	173,099
1995	140,140
1996	136,526*
1997	110,644
1998	107,716
1999	101,907

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Northeast	6,537)1	]	]	]
Midwest	72,951*	] 70,475)1	] 70,155	] 64,007
West	57,038	40,169	37,561	37,900
Total	136,526*	110,644	107,716	101,907

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton/Poly	10,003	11,549	12,797	11,169
Foodservice Carton/Poly (10 lb. & Under)	26,915	16,864	24,015	27,818
Other sizes	77,706*	59,709	47,697	52,218
Barrels & IQF	21,902	22,522	23,207	10,702
Total	136,526*	110,644	107,716	101,907

1999 Data Includes: Avocado, Cantalope, Cranberries, Elderberries, Gooseberries, Grapes, Honeydew, Kiwi, Loganberries, Mangos, Melon Balls, Mixed Fruit, Ollalieberries, Oranges, Papaya, Pears, Pineapple, Raspberries (Black), RSP Cherries (74,442 pounds)

)1 Includes small amount of South
** Revised*

B E R R Y & F R U I T P U R E E S

(Other than Citrus)

1990	42,452
1991	41,875
1992	52,315
1993	63,928
1994	63,122
1995	71,862
1996	78,457
1997	85,333
1998	100,239
1999	85,535

Total United States Pack
Pack of Recent Years by Region

Region	1996	1997	1998	1999
Midwest	]	]	1,482	]
West	] 78,457	] 85,333	98,757	] 85,535
Total	78,457	85,333	100,239	85,535

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Foodservice Ctn/Poly	6,746)1	12,030	4,518)1	7,483)1
28 to 30 pound	8,927	11,668	9,317	8,014
Other Misc. Sizes	2,819	1,878	]	]
Barrels	59,965	59,757	] 86,404	] 70,038
Total	78,457	85,333	100,239	85,535

1999 data includes purees of Apricot, Apple, Banana, Blackberry (Marion, Evergreen), Black Currant, Blueberry, Boysenberry, Cherry (RSP & Sweet), Cranberry, Elderberry, Grape, Loganberry, Peach, Pear, Plum, Black & Red Raspberry, Strawberry.

)1 Includes small amount of Retail Carton/Poly.

Source: American Frozen Food Institute

PART III

CITRUS AND NON-CITRUS CONCENTRATES AND JUICES

Total United States Pack

PART III

CONCENTRATES, CITRUS & NON-CITRUS JUICES

CONCENTRATED CITRUS JUICES*

Thousands of Gallons Concentrated (Unreconstituted) Basis

Year	Orange	Grape-fruit	Tangerine	Limeade
1979-80	231,257	19,443	2,142	1,851
1980-81	174,537	20,763	1,175	N/A
1981-82	133,294	21,869	924	N/A
1982-83	169,577	14,483	334	N/A
1983-84	121,216	19,291	636	N/A
1984-85	118,472	24,802	285	N/A
1985-86	132,406	24,162	368	N/A
1986-87	145,056	28,875	373	N/A
1987-88	169,973	31,906	583	N/A
1988-89	174,717	32,466	495	N/A
1989-90	90,285	21,774	371	N/A
1990-91	151,396	21,672	279	N/A
1991-92	145,421	19,458	297	N/A
1992-93	208,662	31,527	329	N/A
1993-94	182,231	26,485	529	N/A
1994-95	216,502**	31,344	1,192	N/A
1995-96	202,353	26,930	1,102	N/A
1996-97	241,800	30,032	2,386	N/A
1997-98	253,734	24,223	1,461	N/A
1998-99	158,884	24,512	1,191	N/A

N/A Not Available
** This data is based upon reports from individual packers and reports of the Florida Citrus Processors Association. This pack is not included in the pack totals summarized on pages 15 & 16.*
*** Revised*

Note: For 1979-80, production was reported on a 45' Brix basis. The 1980-82 figures are expressed in 43.4' Brix basis. The 1983-99 figures are 42' Brix basis.

NON-CITRUS CONCENTRATES & JUICES

(Data in Thousands of Gallons)

1990	34,216
1991	44,321
1992	42,391
1993	32,917
1994	47,506
1995	47,852
1996	33,806
1997	35,435
1998	34,277
1999	34,963

1999 Production

Apple	7,616
Grape	8,098
Strawberry	7,747
Other	11,502
TOTAL	34,963

Note: Included above are concentrates and juices of fruits and berries, other than citrus, as reported by individual packers. This production is not included in totals summarized on pages 15 and 16.

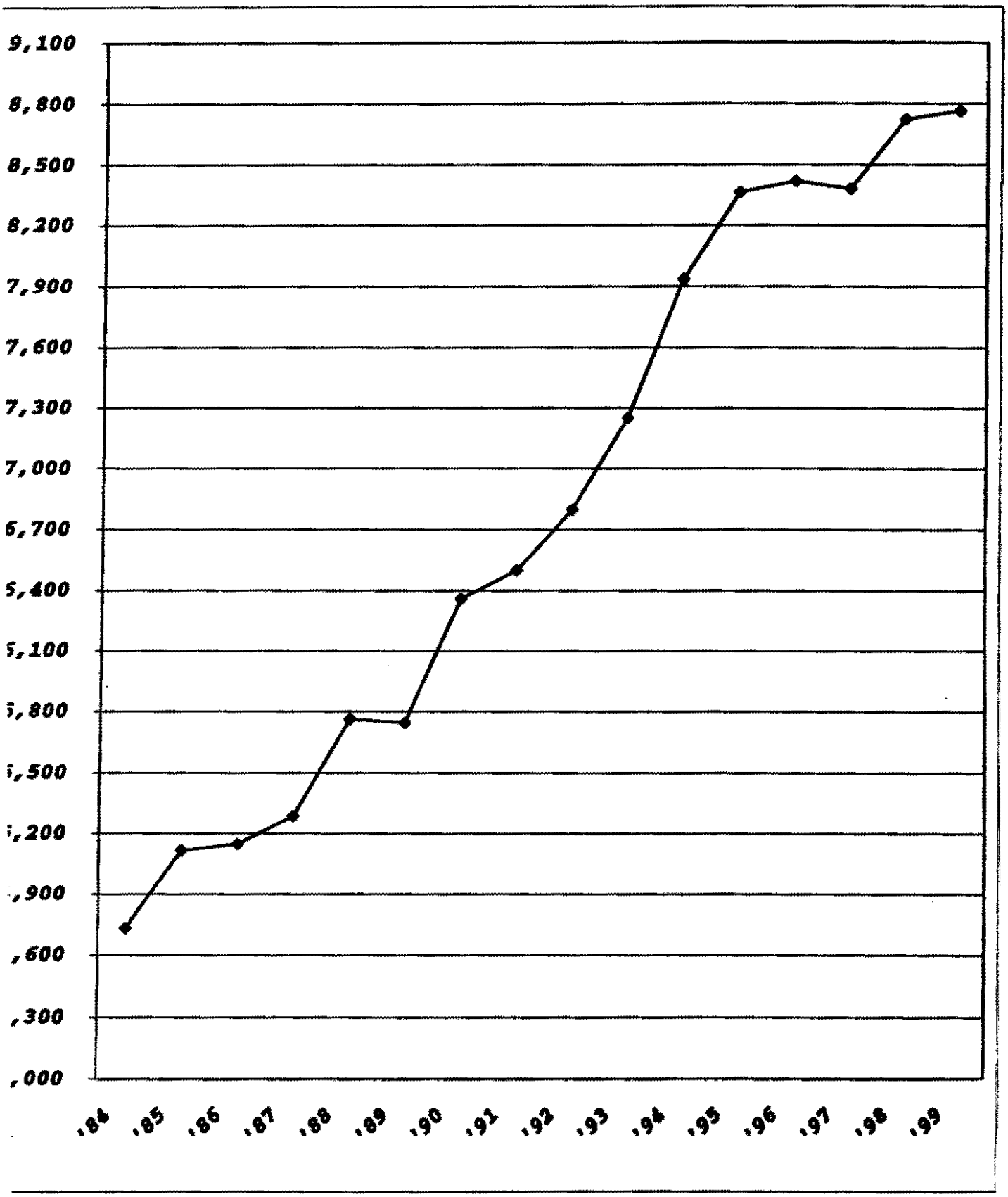
Source: American Frozen Food Institute

PART IV

FROZEN POTATO PRODUCTS PACK STATISTICS

Total United States Pack

FROZEN POTATO PRODUCTS
Millions of Pounds



Source: American Frozen Food Institute

17

PACK OF FROZEN POTATO PRODUCTS

Total United States Pack

F R E N C H F R I E D P O T A T O E S

STYLE OF PACK

PACK, REPACK AND FINAL CONTAINER SIZE
(Data in Thousands of Pounds)

FRENCH FRIES	1996	1997	1998	1999
Total Retail . . .	728,832	600,130	765,824	747,501
Total Foodservice.	6,540,532	6,600,186	6,746,504	6,789,620
Total Bulk	-24,313)1	11,506	-43,010)1	-78,346)1
ALL FRENCH FRIES. .	7,245,051	7,211,822	7,469,318	7,458,775

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

A L L F R O Z E N P O T A T O P R O D U C T S

1990	6,358,968	1995	8,364,909
1991	6,498,915	1996	8,419,203
1992	6,798,442	1997	8,381,370
1993	7,252,774	1998	8,723,707
1994	7,934,849	1999	8,765,173

Pack by Region

Region	1996	1997	1998	1999
California	10,072	8,864	6,763	6,974
East,Midwest & South .	1,726,071	1,702,846	2,002,669	1,724,247
Oregon,Idaho & Wash. .	6,683,060	6,669,660	6,714,275	7,033,952
U.S. TOTAL.	8,419,203	8,381,370	8,723,707	8,765,173

Pack by Styles

Styles	1996	1997	1998	1999
French Fries	7,245,051	7,211,822	7,469,318	7,458,775
Others)1.	1,174,152	1,169,548	1,254,389	1,306,398
GRAND TOTAL	8,419,203	8,381,370	8,723,707	8,765,173

)1 Includes Hash Browns and Miscellaneous Potato Products ("Tater" Products, Water Blanched, Whole, Diced, Stew, Puffs, Tasti Fries, Cottage Fries, Stuffed, Pancakes, Au Gratin, O'Brien, Morsels, Patties, Cubes, Home Fries, Oven Baked and Hush Puppies.)

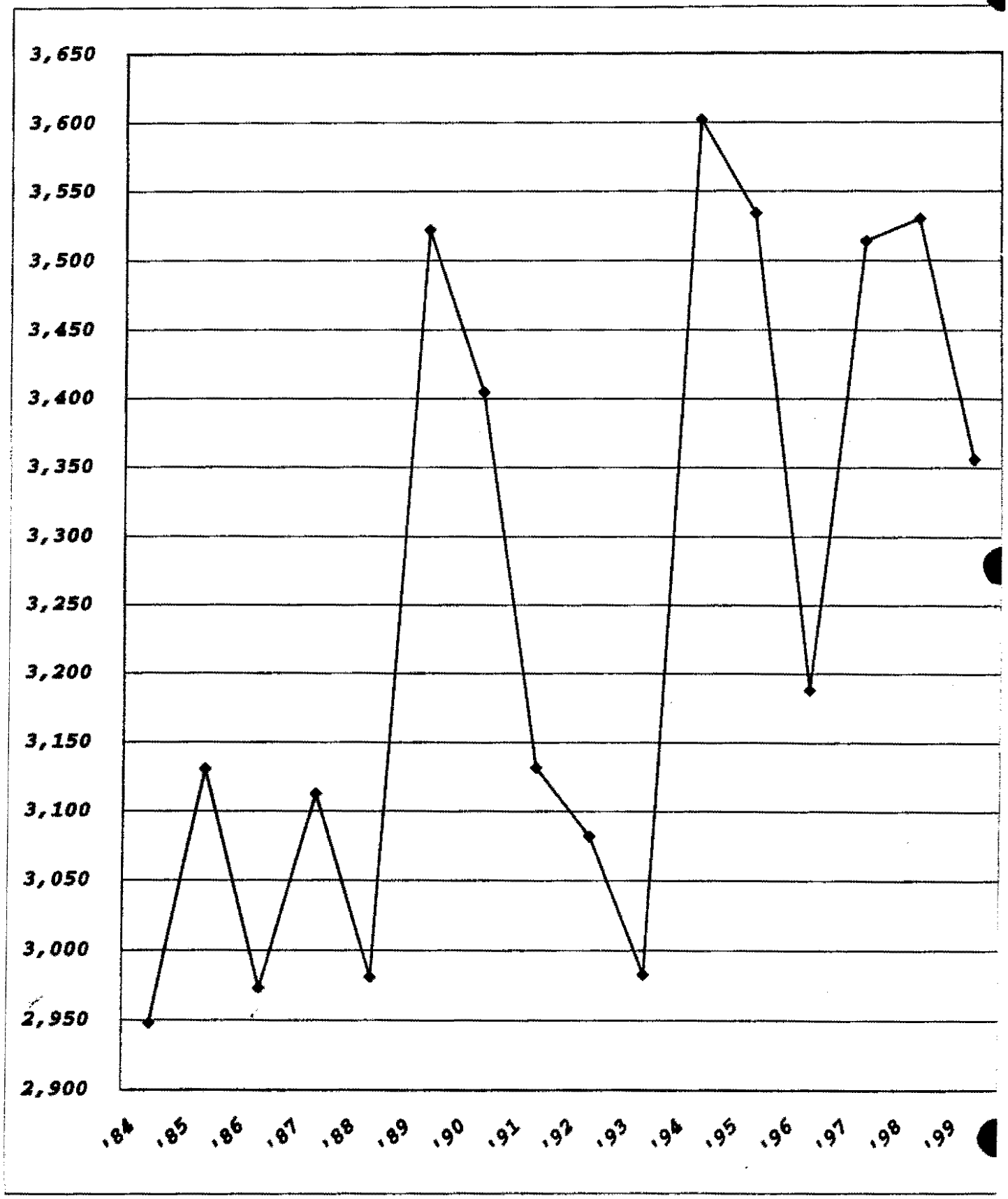
Source: American Frozen Food Institute

PART V

FROZEN VEGETABLE PACK STATISTICS

Total United States Pack

ANNUAL VEGETABLE PRODUCTION (Excluding Potatoes)
Millions of Pounds



Source: American Frozen Food Institute

PART V
FROZEN VEGETABLE PACK STATISTICS
Total United States Pack
(Data in Thousands of Pounds)
Compiled by The American Frozen Food Institute (c)2000

1990	9,763,970	1995	11,898,715
1991	9,634,580	1996	11,607,226
1992	9,880,573	1997	11,895,026
1993	10,236,106	1998	12,253,884
1994	11,536,930	1999	12,121,317

Pack of Recent Years by Product

Product	Page	1996	1997	1998	1999
Asparagus	35	10,364	10,103	9,792	12,439
Beans,Baby Lima	36	85,053	97,598	101,757	83,381
Beans,Green,Reg.Cut	37-38	232,711	231,625	214,871	207,345
Beans,Green,French Cut	37-38	65,041	75,086	73,613	54,955
Beans,Green,Whole	37-38	50,517	58,605	71,481	63,714
Beans,Fordhook Lima	39	22,645	25,872	22,962	14,369
Beans,Speckled Butter	39	4,577	5,170	7,298	8,515
Beans,Green,Italian	40	17,711	18,364	18,531	23,537
Beans,Wax	40	7,592	7,324	8,927	7,132
Broccoli,Cut,Chopped,Spears	41-42	138,387	109,013	144,361	174,283
Brussels Sprouts	43	30,154	26,436	33,062	35,264
Carrots,Chips & Diced	44-45	124,615	139,490	138,291	121,430
Carrots,Sliced,Crinkle & Chunks	44-45	149,407	146,495	113,891	165,742
Carrots,Nuggets,Strips Baby,Whole,Julienne, Shoestring & Other	44-45	123,945	123,059	135,912	137,519
Cauliflower	46	48,541	44,590	44,607	42,445
Celery	46	40,343	32,985	29,001	32,966
Collards	47	17,709	22,244	26,915	17,685
Corn-on-Cob	47	383,840	464,942	435,271	404,881
Corn,Cut	48	646,389	736,545	753,279	665,209
Kale	49	2,671	4,213	2,936	2,319
Mushrooms	49	23,219	22,537	20,415	25,117
Mustard Greens	49	11,294	13,139	10,349	11,152
Okra	50	60,847	57,725	85,762	90,004
Onions	50	111,021	115,980	122,289	123,414
Peas,Black-eyed/Southern	51	22,901	25,363	27,684	16,328
Peas,Green	52	369,390	468,074	491,377	444,050
Peppers,Bell(Green/Red)	53-54	44,858	40,746	42,599	53,876
Pumpkin & Cooked Squash	54	20,058	24,570	19,329	17,889
Rhubarb	55	6,910	7,505	6,558	6,353
Spinach	55	182,999	198,715	190,028	174,149
Squash,Summer & Zucchini	56	42,387	46,579	42,976	34,842
Sweet Potatoes & Yams	57	14,532	20,992	)1	)1
Turnip Greens	57	19,112	20,490	21,719	32,499
Turnips/Others	57	19,568	25,119	19,485	)2
Misc.Vegetables	58	36,715	46,363	42,849	51,341
Total Vegetables		3,188,023	3,513,656	3,530,177	3,356,144
Total Potato Products	30	8,419,203	8,381,370	8,723,707	8,765,173
Total Vegetables & Potato Products		11,607,226	11,895,026	12,253,884	12,121,317

)1 Included with Miscellaneous Vegetables
)2 Included with Turnip Greens
Vegetable mixes excluded (See pages 59-61)

121

FROZEN VEGETABLE PACK STATISTICS
(Cont'd)

Total United States Pack

Pack of Recent Years by Regions

(Data in Thousands of Pounds)

Region	1996	1997	1998	1999
East	730,547	720,133	826,578	735,207
South.	305,243	290,778	344,139	297,282
Midwest.	1,933,623	2,014,222	2,238,524	1,988,430
West	8,637,813	8,869,893	8,844,643	9,100,398
Total	11,607,226	11,895,026	12,253,884	12,121,317

The regions established to show Frozen Vegetable production in various parts of the country are as follows:

East: *Connecticut, Delaware, Maine, Maryland, Massachusetts, New Jersey, New York and Pennsylvania.*

South: *Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas and Virginia.*

Midwest: *Illinois, Indiana, Michigan, Minnesota, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.*

West: *Arizona, California, Colorado*, Idaho*, Montana, New Mexico, Oregon*, Utah*, Washington*, and Wyoming.*

In case of certain commodities, it has become possible to publish separate data for California and the Northwest.

* *Northwest Region*

Source: American Frozen Food Institute

A S P A R A G U S

Total United States Pack

1990	17,737
1991	13,595
1992	16,525
1993	14,522
1994	14,967
1995	13,985
1996	10,364
1997	10,103
1998	9,792
1999	12,439

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Midwest	4,743	5,632/1	9,792/1	12,439
West	5,621	4,471		
Total	10,364	10,103	9,792	12,439

STYLE OF PACK
PACK, REPACK AND FINAL CONTAINER SIZE

	Spears 1996	Spears 1997	Spears 1998	Spears 1999
Retail				
Carton	2,477	1,472	1,511	2,435
Poly			--	--
Foodservice				
Carton				
Poly				
Bulk	1,341	991	853	543
20 to 60 lb. & IQF				--
Tote				
Total	3,818	2,463	2,364	2,978

	Cuts & Tips 1996	Cuts & Tips 1997	Cuts & Tips 1998	Cuts & Tips 1999
Retail				
Carton	317		379	
Poly	814	945	1,670	1,387
Foodservice				
Carton			193	226
Poly	2,226	1,533	1,037	435
Bulk				
20 to 60 lb. & IQF	1,898			
Tote	1,291	5,162	4,149	7,413
Total	6,546	7,640	7,428	9,461

/1 Includes small amount of East.

Source: American Frozen Food Institute

B A B Y L I M A B E A N S

Total United States Pack

(Data in Thousands of Pounds)

1990 . . .	132,976
1991 . . .	72,931
1992 . . .	44,592
1993 . . .	66,464
1994 . . .	95,695
1995 . . .	101,295
1996 . . .	85,053
1997 . . .	97,598
1998 . . .	101,757
1999 . . .	83,381

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East and Midwest.	31,028	20,987	36,342	31,349
Northwest	20,747	34,395	29,291	15,902
California . . .	33,278	42,216	36,124	36,130
Total. .	85,053	97,598	101,757	83,381

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton	12,164	9,228	10,373	10,552
Poly	25,886	21,473	17,565	24,612
Foodservice				
Carton	3,732	5,358	4,748	5,838
Poly	6,056	6,474	8,522	5,769
20 pound	2,064	1,367	2,171	2,388
Bulk				
21 to 90 pound	278	244	1,001	]
Tote, Bin & IQF. . . .	22,236	41,625	47,477	] 28,729
Sub-Total	72,416	85,769	91,857	77,888
Other Uses. . . .*	12,637	11,829	9,900	5,493
Total.	85,053	97,598	101,757	83,381

---

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

Source: American Frozen Food Institute

G R E E N B E A N S
Total United States Pack
(Data in Thousands of Pounds)

1991 . . .	317,377	1994 . . .	351,336	1997 . . .	365,316
1992 . . .	279,703	1995 . . .	331,928	1998 . . .	359,965
1993 . . .	306,622	1996 . . .	348,269	1999 . . .	326,014

GREEN BEANS, Pack by Region, COMBINED TOTALS

	1996				1997			
	Regular/French Cut	Cut	Whole**	Total	Regular/French Cut	Cut	Whole**	Total
East & South.	72,616	20,359	]	]	54,155	30,100	]	
Midwest . . .	67,302	12,521	]18,042	]190,840	72,155	11,862	]19,632	187,904
West	92,793	32,161	32,475	157,429	105,315	33,124	38,973	177,412
Total.	232,711	65,041	50,517	348,269	231,625	75,086	58,605	365,316

GREEN BEANS, Style of Pack, COMBINED TOTALS
PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Regular Cut	French Cut	Whole**	Total
Retail				
Carton.	10,804	11,310	2,211	24,325
Poly.	49,359	20,455	13,858	83,672
Foodservice				
Carton.	9,385	4,769	4,279	18,433
Poly.	28,544	3,832	15,871	48,247
15 and 30 pound	9,779	824	559	11,162
Bulk				
31 to 60 pound & IQF. . .	18,342	]	]	]
Tote and Bin.	77,295	] 15,085	] 9,490	] 120,212
Sub-Total	203,508	56,275	46,268	306,051
*Other Uses** . . .	29,203	8,766	4,249	42,218
Total	232,711	65,041	50,517	348,269

Container Size	1997 Regular Cut	French Cut	Whole**	Total
Retail				
Carton.	7,590	8,675	]	]
Poly.	50,003	17,134	] 15,279	] 98,681
Foodservice				
Carton.	13,133	7,094	4,250	24,477
Poly.	25,266	3,514	15,223	44,003
15 and 30 pound	11,628	551	976	13,155
Bulk				
31 to 60 pound & IQF. . .	8,968	2,165	1,224	12,357
Tote and Bin.	90,030	27,894	18,886	136,810
Sub-Total	206,618	67,027	55,838	329,483
*Other Uses** . . .	25,007	8,059	2,767	35,833
Total	231,625	75,086	58,605	365,316

---

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*
** *May be repackaged into other styles.*

Source: American Frozen Food Institute

125

GREEN BEANS, Pack by Region, COMBINED TOTALS

(Data in Thousands of Pounds)

Region	1998 Regular/French Cut	1998 Cut	1998 Whole**	1998 Total	1999 Regular/French Cut	1999 Cut	1999 Whole**	1999 Total
East & South	65,181	24,197	]	]	47,756	17,521	]	]
Midwest . .	80,367	14,174	]32,373	]216,292	78,160	14,730	]20,141	]178,308
West . . .	69,323	35,242	39,108	143,673	81,429	22,704	43,573	147,706
Total.	214,871	73,613	71,481	359,965	207,345	54,955	63,714	326,014

GREEN BEANS, Style of Pack, COMBINED TOTALS

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1998 Regular Cut	1998 French Cut	1998 Whole**	1998 Total
Retail				
Carton.	8,219	9,296	]	]
Poly.	48,166	20,148	] 20,194	] 106,023
Foodservice				
Carton.	13,345	4,199	1,772	19,316
Poly.	19,167	3,833	16,473	39,473
15 and 30 pound	17,732	1,429	8,574	27,735
Bulk				
31 to 60 pound.	13,886	2,465	2,985	19,336
Tote, Bin & IQF	70,019	23,954	18,093	112,066
Sub-Total	190,534	65,324	68,091	323,949
*Other Uses** . . .	24,337	8,289	3,390	36,016
Total	214,871	73,613	71,481	359,965

Container Size	1999 Regular Cut	1999 French Cut	1999 Whole**	1999 Total
Retail				
Carton.	5,579	4,973	]	]
Poly.	39,602	16,448	] 15,461	] 82,063
Foodservice				
Carton.	15,162	3,150	3,299	21,611
Poly.	24,555	3,921	25,308	53,784
15 and 30 pound	11,583]	]	]	]
Bulk	]	]	]	]
31 to 60 pound.	7,867]	] 3,084	] 3,372	] 25,906
Tote, Bin & IQF	93,773	23,379	16,274	133,426
Sub-Total	198,121	54,955	63,714	316,790
*Other Uses** . . .	9,224	)1	)1	9,224
Total	207,345	54,955	63,714	326,014

---

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*

** *May be repackaged into other styles.*

)1 *Included with Tote, Bin & IQF.*

Source: American Frozen Food Institute

F O R D H O O K L I M A B E A N S

Total United States Pack
(Data in Thousands of Pounds)

1990	12,777
1991	17,058
1992	15,129
1993	13,322
1994	18,942
1995	20,489
1996	22,645
1997	25,872
1998	22,962
1999	14,369

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East & West.	22,645	25,872	22,962	14,369

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton.	4,802	3,736	6,325	5,533
Poly.	5,777	5,862	6,756	4,510
Foodservice				
Carton/Poly	1,614	1,986	3,353	2,559
20 pound case	]	]	677	558
Bulk	]	]		
21 to 60 pound	] 73	]	]	--
Tote, Bin & IQF	8,705	] 14,288	] 3,570	1,209
Sub-Total	20,971	25,872	20,681	14,369
*Other Uses**	1,674	*)1*	2,281	*)1*
Total.	22,645	25,872	22,962	14,369

)1 Included with Tote, Bin & IQF.
* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

S P E C K L E D B U T T E R B E A N S

1990	8,148
1991	9,528
1992	3,906
1993	3,642
1994	7,491
1995	7,664
1996	4,577
1997	5,170
1998	7,298
1999	8,515

Total United States Pack

Pack of Recent Years by Regions

Region	1996	1997	1998	1999
East, West & South . .	4,577	5,170	7,298	8,515

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton/Poly.	3,078	4,282	3,998	4,225
Foodservice Carton/Poly . .	912	1,888	1,744	414
20 to 60 pound.	877	]	236	493
Tote, Bin & IQF	-290*)1*	] -1,000*)1*	1,320	3,383
Total.	4,577	5,170	7,298	8,515

)1 Deficit attributable to previous year's carryover and imported product repacked in the U.S.

Source: American Frozen Food Institute

G R E E N B E A N S , I T A L I A N

Total United States Pack

(Data in Thousands of Pounds)

1990	27,160
1991	22,866
1992	20,061
1993	18,639
1994	25,197
1995	17,267
1996	17,711
1997	18,364
1998	18,531
1999	23,537

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East and Midwest	6,395	4,360)1	6,670)1	9,473
West	11,316	14,004	11,861	14,064
Total	17,711	18,364	18,531	23,537

)1 Includes small amount of South

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton	1,292	1,793	1,201	651
Retail Poly	3,574	2,240	3,349	1,723
Foodservice Carton	671	]	1,572	523
Foodservice Poly	3,970	] 4,353	4,039	4,250
10 to 60 pound carton	888	608	536	197
Bulk & IQF	4,405	7,708	6,166	16,193
Sub-Total	14,800	16,702	16,863	23,537
*Other Uses**	2,911	1,662	1,668	*)1*
Total	17,711	18,364	18,531	23,537

)1 Included with Bulk & IQF.

* *Initally frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

W A X B E A N S

Total United States Pack

1990	9,311
1991	8,048
1992	6,897
1993	6,091
1994	9,144
1995	7,120
1996	7,592
1997	7,324
1998	8,927
1999	7,132

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East and Midwest	4,195	] 7,324	] 8,927	] 7,132
West	3,397	]	]	]
Total	7,592	7,324	8,927	7,132

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton/Poly	759	530	899	858
Foodservice Carton/Poly	2,177	3,196	2,736	2,208
20 to 60 pound	966	307	345	334
Tote, IQF & Other Uses*	3,690	3,291	4,947	3,732
Total	7,592	7,324	8,927	7,132

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

Source: American Frozen Food Institute

B R O C C O L I
Total United States Pack
(Data in Thousands of Pounds)

1990 . . .	258,755
1991 . . .	174,470
1992 . . .	168,518
1993 . . .	165,183
1994 . . .	151,150
1995 . . .	205,471
1996 . . .	138,387
1997 . . .	109,013
1998 . . .	144,361
1999 . . .	174,283

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Midwest. . .	]		--	]
South. . . .	23,435 }1]	]		]
West	114,952]	109,013 }1]	144,361]	174,283
	---	---	---	---
Total .	138,387	109,013	144,361	174,283

STYLE OF PACK, COMBINED TOTALS
PACK, REPACK AND FINAL CONTAINER SIZE

1996

Container Size	Cuts	Chopped	Spears**	Total All Styles
Retail				
Carton	10,248	]	14,923	]
Poly	26,948	] 8,313	3,638	] 64,070
Foodservice				
Carton	13,084	1,821	17,601	32,506
Poly	6,988	2,106	1,067	10,161
Bulk				
20 to 60 pound	4,886	517	]	]
IQF.	17,288	5,962	] 9,209	] 37,862
Tote and Bin }2. . . .	-61,670	3,302	-7,110	-65,478
	---	---	---	---
Sub-total	17,772	22,021	39,328	79,121
*Other Uses**	47,945	}3	11,321	59,266
	---	---	---	---
Total	65,717	22,021	50,649	138,387

1997

Container Size	Cuts	Chopped	Spears**	Total All Styles
Retail				
Carton	8,710	2,588	14,421	25,719
Poly	21,202	4,263	5,127	30,592
Foodservice				
Carton	10,021	1,489	13,937	25,447
Poly	6,037	707	1,564	8,308
Bulk				
20 to 60 pound	] 15,958	439	] 5,599	] 26,052
IQF.	]	4,056	]	]
Tote and Bin }2. . . .	-61,368	3,152	3,229	-54,987
	---	---	---	---
Sub-total	560	16,694	43,877	61,131
*Other Uses**	47,882	}3	}3	47,882
	---	---	---	---
Total	48,442	16,694	43,877	109,013

}1 Includes small amount in the East
}2 Deficit attributable to previous years' carryover and imported product repacked in the U.S.
}3 Included with Tote & Bin
** Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*
*** May be repackaged into other styles.*

Source: American Frozen Food Institute

129

B R O C C O L I

(Continued)

Total United States Pack

(Data in Thousands of Pounds)

STYLE OF PACK, COMBINED TOTALS
PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	Cuts	Chopped	Spears**	Total All Styles
	1998			
Retail				
Carton	8,791	3,807	20,058	75,012
Poly	36,498	5,858		
Foodservice				
Carton	9,043	1,979	12,757	41,596
Poly	14,004		3,813	
Bulk				
20 to 60 pound	5,992	2,457	17,204	-26,114
Tote, Bin & IQF)1	-65,265	13,498		
Sub-total	9,063	27,599	53,832	90,494
*Other Uses**	53,867	)2	)2	53,867
Total	62,930	27,599	53,832	144,361

Container Size	Cuts	Chopped	Spears**	Total All Styles
	1999			
Retail				
Carton	37,467	4,220	13,945	71,458
Poly		9,582	6,244	
Foodservice				
Carton	11,584	5,701	15,475	45,018
Poly	10,157	2,101		
Bulk				
20 to 60 pound	4,163	288	107	4,558
Tote, Bin & IQF)1	-1,380	-5,883	54,959	47,696
Sub-total	61,991	16,009	90,730	168,730
*Other Uses**	5,553	)2	)2	5,553
Total	67,544	16,009	90,730	174,283

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.
)2 Included with Tote & Bin.

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*
** *May be repackaged into other styles.*

Source: American Frozen Food Institute

B R U S S E L S S P R O U T S

Total United States Pack

(Data in Thousands of Pounds)

1990 . . .	38,482
1991 . . .	34,619
1992 . . .	42,805
1993 . . .	46,950
1994 . . .	34,393
1995 . . .	25,519
1996 . . .	30,154
1997 . . .	26,436
1998 . . .	33,062
1999 . . .	35,264

Pack of Recent Years by Region

Region	1996	1997	1998	1999
West	30,154	26,436	33,062	35,264)1

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton	10,442	9,881	11,986	13,087
Poly	10,176	12,050	12,313	11,425
Foodservice				
Carton	]	2,436	]	]
Poly	] 6,111	3,737	] 8,901	] 9,162
Bulk				
20-60 pound	115	]	386	]
Tote, Bin & IQF.	3,310	] -4,174)2	-3,292)2	] 1,590
	---	---	---	---
Sub-Total	30,154	23,930	30,294	35,264
*Other Uses**	)3	2,506	2,768	)3
	---	---	---	---
Total	30,154	26,436	33,062	35,264

)1 Includes small amount of Midwest.
)2 Deficit attributable to previous years' carryover and imported product repacked in the U.S.
)3 Included with Tote, Bin & IQF.

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*

Source: American Frozen Food Institute

C A R R O T S

Total United States Pack
(Data in Thousands of Pounds)

1990 . . .	328,781
1991 . . .	318,001
1992 . . .	371,232
1993 . . .	403,174
1994 . . .	412,709
1995 . . .	418,816
1996 . . .	397,967
1997 . . .	409,044
1998 . . .	388,094
1999 . . .	424,691

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East & South. . .	50,605	57,815	47,574	60,759
Midwest	47,227	32,577	50,564	48,112
West.	300,135	318,652	289,956	315,820
Total	397,967	409,044	388,094	424,691

STYLE OF PACK, COMBINED TOTALS
PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Chips/ Diced	Sliced/ Cr.Cut/ Chunk	Baby/ Whole	Julienne/ Shoestrg/ Strips	Other	Total
Retail						
Carton.	]	331	]		--	]
Poly.	] 4,019	7,695	] 9,952		*j1*	] 21,997
Foodservice						
Carton.	1,723	11,509	3,223	]		]
Poly.	4,934	19,423	15,890	]	1,422	] 58,124
Bulk						
15 to 20 pound. . . .	4,513	8,606	4,298		420	17,837
21 to 60 pound. . . .	9,726	5,337	1,525		7,620	24,208
Totes, Bins & IQF . .	46,286	72,871	15,994		42,712	177,863
Sub-Total	71,201	125,772	50,882		52,174	300,029
*Other Uses** . .	53,414	23,635	3,328		17,561	97,938
Total	124,615	149,407	54,210		69,735	397,967

Container Size	1997 Chips/ Diced	Sliced/ Cr.Cut/ Chunk	Baby/ Whole	Julienne/ Shoestring/ Strips/Other	Total
Retail					
Carton.	]	303	]	--	]
Poly.	] 4,169	8,058	] 8,229	--	] 20,759
Foodservice					
Carton.	2,990	16,426	4,498	]	]
Poly.	3,074	15,572	14,382	] 615	] 57,557
Bulk					
15 to 20 pound. . . .	5,708	9,620	3,199	903	19,430
21 to 60 pound. . . .	6,478	2,746	850	5,508	15,582
Totes, Bins & IQF . .	72,288	80,136	18,831	47,092	218,347
Sub-Total	94,707	132,861	49,989	54,118	331,675
*Other Uses** . .	44,783	13,634	4,733	14,219	77,369
Total	139,490	146,495	54,722	68,337	409,044

---

j1 Included with Foodservice Carton
* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

Source: American Frozen Food Institute

CARROTS, STYLE OF PACK, COMBINED TOTALS

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1998 Chips/ Diced	1998 Sliced/ Cr.Cut/ Chunk	1998 Baby/ Whole	1998 Julienne/ Shoestring/ Strips/Other	1998 Total
Retail					
Carton.	]	464	2,576	--	]
Poly.	] 2,404	9,307	7,562	--	] 22,313
Foodservice					
Carton.	3,299	16,273	3,284	]	]
Poly.	2,958	18,706	14,740	] 468	] 59,728
Bulk					
15 to 20 pound. . . .	5,906	12,053	2,834	767	21,560
21 to 60 pound. . . .	15,653	11,162	1,772	5,661	34,248
Totes, Bins & IQF . .	63,891	30,964	-3,346)1	78,985	170,494
Sub-Total	94,111	98,929	29,422	85,881	308,343
*Other Uses** . .	44,180	14,962	5,590	15,019	79,751
Total	138,291	113,891	35,012	100,900	388,094

Container Size	1999 Chips/ Diced	1999 Sliced/ Cr.Cut/ Chunk	1999 Baby/ Whole	1999 Julienne/ Shoestring/ Strips/Other	1999 Total
Retail					
Carton.	]	2,743	]	--	]
Poly.	] 1,135	8,486	] 5,373	--	] 17,737
Foodservice					
Carton.	5,421	14,991	4,153	]	]
Poly.	3,406	15,923	16,722	] 1,093	] 61,709
Bulk					
15 to 20 pound. . . .	9,577	5,515	1,348	1,557	17,997
21 to 60 pound. . . .	6,803	5,570	]	9,872	]
Totes, Bins & IQF . .	78,121	109,421	] 21,170	76,231	] 307,188
Sub-Total	104,463	162,649	48,766	88,753	404,631
*Other Uses** . .	16,967	3,093	)2	)2	20,060
Total	121,430	165,742	48,766	88,753	424,691

)1 Deficit attributable to previous year's carryover and imported product repacked in the U.S.

)2 Included with Totes, Bins & IQF

** Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

Source: American Frozen Food Institute

C A U L I F L O W E R

Total United States Pack
(Data in Thousands of Pounds)

1990 . . .	80,081
1991 . . .	69,229
1992 . . .	70,317
1993 . . .	73,335
1994 . . .	66,878
1995 . . .	64,207
1996 . . .	48,541
1997 . . .	44,590
1998 . . .	44,607
1999 . . .	42,445

Pack of Recent Years by Region

Region	1996	1997	1998	1999
South		--		--
West.	48,541	44,590	44,607	42,445
Total. . . .	48,541	44,590	44,607	42,445

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton.	6,840	6,607	6,523	6,908
Poly.	5,295	5,568	5,492	5,461
Foodservice and Bulk				
Carton.	2,823	4,196	3,166	4,246
Poly.	4,636	3,063	8,306	6,238
20 to 60 pound & IQF. . . .	3,883	11,313	16,279	555
Bulk.	1,858	-4,652 *)1*	-17,455 *)1*	17,347
Sub-Total.	25,335	26,095	22,311	40,755
*Other Uses**	23,206	18,495	22,296	1,690
Total.	48,541	44,590	44,607	42,445

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.
** Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

C E L E R Y

Total United States Pack

1990 . . .	38,451
1991 . . .	28,383
1992 . . .	27,161
1993 . . .	36,668
1994 . . .	34,334
1995 . . .	32,279
1996 . . .	40,343
1997 . . .	32,985
1998 . . .	29,001
1999 . . .	32,966

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail & Foodservice. .	288	373	427	794
20 to 60 pound & IQF. .	28,047	18,948	15,443	19,635
Tote and Bin.	-306 *)1*	2,246	10,577	12,537
Sub-Total. . . .	28,029	21,567	26,447	32,966
Other Uses. .*	12,314	11,418	2,554	*)2*
Total.	40,343	32,985	29,001	32,966

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.
)2 Included with Tote & Bin.
** Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

Source: American Frozen Food Institute

C O L L A R D S

Total United States Pack
(Production Chiefly in the South)

(Data in Thousands of Pounds)

1990 . . .	20,676
1991 . . .	15,968
1992 . . .	15,981
1993 . . .	17,714
1994 . . .	20,871
1995 . . .	17,647
1996 . . .	17,709
1997 . . .	22,244
1998 . . .	26,915
1999 . . .	17,685

PACK, REPACK AND FINAL CONTAINER SIZE

Container	1996	1997	1998	1999
Retail Carton	3,023	]	]	]
Retail Poly	5,543	] 8,998	] 8,112	] 6,887
Foodservice Ctn/Poly.	9,580	10,750	16,053	15,910
Bulk & IQF.	-437)1	2,496	2,750	-5,112)1
Total.	17,709	22,244	26,915	17,685

)1 Deficit attributable to previous year's carryover and imported product repacked in the U.S.

C O R N - O N - C O B

Total United States Pack

1990 . . .	450,490
1991 . . .	440,540
1992 . . .	375,666
1993 . . .	377,657
1994 . . .	492,522
1995 . . .	414,662
1996 . . .	383,840
1997 . . .	464,942
1998 . . .	435,271
1999 . . .	404,881

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East & Midwest. . . .	126,473	159,854	143,725	120,672
West.	257,367	305,088	291,546	284,209
Total.	383,840	464,942	435,271	404,881

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999 Standard/Natural	1999 1/2 Ear	1999 Total
Retail						
2 to 8 ear. .	167,007]	]		67,826]	50,451]	
Foodservice	]	380,606]	465,405	] 3,962	]	207,582
9 to 96 ear .	230,894]	]		86,070]	62,273]	
Bulk						
Tote,Bin & IQF	-14,061)1	84,336	-30,134)1	33,237	-1,106)1 102,168	134,299
Total. .	383,840	464,942	435,271	187,133	2,856 214,892	404,881

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

Source: American Frozen Food Institute

135

C U T C O R N

Total United States Pack
(Data in Thousands of Pounds)

Pack of Recent Years by Region

1990 . . . 518,330	**Region**	**1996**	**1997**	**1998**	**1999**
1991 . . . 553,499					
1992 . . . 548,749	East.	92,542	86,661	106,055	100,053
1993 . . . 473,105	South				--
1994 . . . 686,140	Midwest	151,871	166,790	162,139	156,904
1995 . . . 694,110	West.	401,976	483,094	485,085	408,252
1996 . . . 646,389		---	---	---	---
1997 . . . 736,545	Total. . .	646,389	736,545	753,279	665,209
1998 . . . 753,279	---				
1999 . . . 665,209					

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 White	1996 Yellow	1996 Total	1997 White	1997 Yellow	1997 Total
Retail						
Carton		19,814			17,717	
Poly	5,884	157,330	183,028	9,820	152,365	179,902
Foodservice						
Carton		29,982			25,955	
Poly	4,034	98,079	132,095	2,205	78,708	106,86[illegible]
20 pound case. . . .		28,849		625	28,816	29,44[illegible]
Bulk						
21 to 70 pound . . .		75,971		1,120	81,736	82,856
Tote, Bin & IQF. . .	2,232	139,699	246,751	10,717	288,725	299,442
Sub-Total . . .	12,150	549,724	561,874	24,487	674,022	698,509
*Other Uses**	)1	84,515	84,515	)1	38,036	38,036
Total	12,150	634,239	646,389	24,487	712,058	736,545

Container Size	1998 White	1998 Yellow	1998 Total	1999 White	1999 Yellow	1999 Total
Retail						
Carton		15,385		--	6,277	6,277
Poly	11,849	179,519	206,753	10,670	133,188	143,858
Foodservice						
Carton		20,235			34,832	
Poly	3,420	71,048	94,703	3,295	73,199	111,326
20 pound case. . . .	482	33,062	33,544	788	55,234	56,022
Bulk						
21 to 70 pound . . .		88,408			39,863	
Tote, Bin & IQF. . .	11,052	278,823	378,283	17,167	277,438	334,468
Sub-Total . . .	26,803	686,480	713,283	31,920	620,031	651,951
*Other Uses**	)1	39,996	39,996	)1	13,258	132,258
Total	26,803	726,476	753,279	31,920	633,289	665,20[illegible]

)1 Included with Tote, Bin & IQF
* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*

Source: American Frozen Food Institute

K A L E

Total United States Pack
(Production Chiefly in the South)

(Data in Thousands of Pounds)

1990	4,196
1991	4,645
1992	4,109
1993	4,010
1994	3,212
1995	3,664
1996	2,671
1997	4,213
1998	2,936
1999	2,319

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton/Poly	1,095	1,180	1,142	]
Foodservice & Bulk				]
Carton/Poly/Totes/IQF	1,576	3,033	1,794	] 2,319
Total	2,671	4,213	2,936	2,319

M U S H R O O M S

Total United States Pack

1990	24,909
1992	26,143
1992	26,536
1993	21,535
1994	27,200
1995	26,778
1996	23,219
1997	22,537
1998	20,415
1999	25,117

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail	--	--	]	--
Foodservice, Bulk & IQF	20,039	19,995	] 18,380	25,117
Sub-Total	20,039	19,995	18,380	25,117
*Other Uses**	3,180	2,542	2,035	*)1*
Total	23,219	22,537	20,415	25,117

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*
)1 Included with Foodservice, Bulk & IQF

M U S T A R D G R E E N S

Total United States Pack
(Production Chiefly in the South)

1990	10,027
1991	10,710
1992	7,928
1993	12,311
1994	9,987
1995	10,302
1996	11,294
1997	13,139
1998	10,349
1999	11,152

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton	2,496	]	]	]
Poly	2,884	] 5,565	] 5,138	] 4,709
Foodservice & Bulk				
Carton/Poly	5,654	6,036	5,582	8,227
Tote & IQF	260	1,538	-371*)1*	-1,784*)1*
Total	11,294	13,139	10,349	11,152

)1 Deficit attributable to previous year's carryover and imported product repacked in the U.S.

Source: American Frozen Food Institute

O K R A

Total United States Pack
(Production Chiefly in the South)
(Data in Thousands of Pounds)

1990	64,748	1995	64,810
1991	66,295	1996	60,847
1992	61,738	1997	57,725
1993	34,593	1998	85,762
1994	65,114	1999	90,004

STYLE OF PACK, COMBINED TOTALS
PACK, ALL STYLES, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Whole	1996 Cut	1996 Total	1997 Whole	1997 Cut	1997 Total
Retail						
Carton	]	5,546	]	891	4,073	4,964
Poly	] 7,087	10,745	] 23,378	5,152	9,940	15,092
Foodservice and Bulk						
Carton/Poly	748	6,020	6,768	1,127	6,601	7,728
20 to 60 pound	171	3,948	4,119	]	11,068	]
Bulk & IQF	-2,605 *)1*	29,187	26,582	]-1,843 *)1*	20,716	] 29,941
Total	5,401	55,446	60,847	5,327	52,398	57,725

Container Size	1998 Whole & Cut	1999 Whole & Cut
Retail		
Carton	7,596	8,752
Poly	15,709	10,146
Foodservice and Bulk		
Carton/Poly	31,242	7,701
20 to 60 Pound	1,963	6,524
Bulk & IQF	29,252	56,881
Total	85,762	90,004

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

O N I O N S

Including Whole,Chopped,Sliced,Pearl,Strips,Etc.
(Production Chiefly in the West)
Total United States Pack

1990	78,331
1991	83,200
1992	85,222
1993	91,576
1994	100,138
1995	99,639
1996	111,021
1997	115,980
1998	122,289
1999	123,414

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton/Poly	4,640	3,570	6,161	2,875
Foodservice Ctn/Poly	3,335	2,758	4,218	3,765
20-60 pound	44,527	25,801	50,699	25,226
Bulk & IQF	46,025	74,941	50,835	71,634
Sub-Total	98,527	107,070	111,913	103,500
*Other Uses**	12,494	8,910	10,376	19,914
Total	111,021	115,980	122,289	123,414

---

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*

Source: American Frozen Food Institute

B L A C K - E Y E D P E A S

Including All Southern Peas* - Production Chiefly in the South

Total United States Pack

(Data in Thousands of Pounds)

1990	30,414	1995	29,352
1991	27,277	1996	22,901
1992	27,195	1997	25,363
1993	25,582	1998	27,684
1994	33,427	1999	16,328

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Black-eye/ Peas	1996 Other /So.Peas*	1996 Total /AllTypes	1997 Black-eye/ Peas	1997 Other /So.Peas*	1997 Total /AllTypes
Retail						
Carton	3,475	9,143	20,174	3,501	2,496	16,079
Poly	7,556			10,082		
Foodservice and Bulk						
Carton/Poly	2,790	4,195	6,985	5,106	1,668	6,774
Bulk & IQF	2,539	-6,797)1	-4,258)1	1,258	1,252	2,510
Total	16,360	6,541	22,901	19,947	5,416	25,363

Container Size	1998 Black-eye/ Peas	1998 Other /So.Peas*	1998 Total /AllTypes	1999 Black-eye/ Peas	1999 Other /So.Peas*	1999 Total /AllTypes
Retail						
Carton	3,415	7,340	15,982	3,374	1,496	8,949
Poly	5,227			4,079		
Foodservice and Bulk						
Carton/Poly	2,699	6,100	8,799	1,716	1,095	2,811
Bulk & IQF	9,044	-6,141)1	2,903	1,346	3,222	4,568
Total	20,385	7,299	27,684	10,515	5,813	16,328

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

* *Southern types; i.e., Butter, Creme, Crowder, Field, Green Acre, Lady, Peas with Snaps, Purple Hull, White Acre, etc.*

Source: American Frozen Food Institute

G R E E N P E A S

Total United States Pack

(Data in Thousands of Pounds)

1990 . . .	482,910
1991 . . .	488,467
1992 . . .	465,375
1993 . . .	391,943
1994 . . .	499,744
1995 . . .	505,350
1996 . . .	369,390
1997 . . .	468,074
1998 . . .	491,377
1999 . . .	444,050

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East	60,020	75,155	89,237	93,439
Midwest.	96,844	116,554	99,274	91,153
West	212,526	276,365	302,866	259,458
	---	---	---	---
Total	369,390	468,074	491,377	444,050

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton	17,532	13,235	14,653	21,519
Poly	122,094	124,879	129,458	99,889
Foodservice				
Carton	11,992	14,319	11,678	18,320
Poly	57,351	51,815	53,389	56,637
20 to 30 pound	19,651	28,677	19,818	20,661
Bulk				
31 to 60 pound	8,593	15,714	23,580	9,849
Tote, Bin & IQF. . . .	58,865	169,980	187,311	197,965
	---	---	---	---
Sub-Total	296,078	418,619	439,887	424,840
*Other Uses** . .	73,312	49,455	51,490	19,210
	---	---	---	---
Total	369,390	468,074	491,377	444,050

---

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*

Source: American Frozen Food Institute

B E L L P E P P E R S

Total United States Pack

(Data in Thousands of Pounds)

1990 . . .	36,585
1991 . . .	47,313
1992 . . .	57,935
1993 . . .	46,331
1994 . . .	42,787
1995 . . .	54,155
1996 . . .	44,858
1997 . . .	40,746
1998 . . .	42,599
1999 . . .	53,876

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East & South.	15,386	17,319	17,524	17,675)1
West.	29,472	23,427	25,075	36,201
Total.	44,858	40,746	42,599	53,876

)1 Includes small amount of Midwest

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Red	1996 Green	1996 Total	1997 Red/Yellow	1997 Green	1997 Total
Retail						
Carton/Poly	2,043	1,194	5,613	1,445	3,840	5,285
Foodservice and Bulk						
Carton/Poly		2,376				
21 to 60 pound. . .	4,912	4,905	9,817	10,049	7,893	17,942
Bulk & IQF.	10,524	7,153	17,677	5,114	3,999	9,113
Sub-Total. . .	17,479	15,628	33,107	16,608	15,732	32,340
Other Uses.*	9,650	2,101	11,751	6,838	1,568	8,406
Total.	27,129	17,729	44,858	23,446	17,300	40,746

Container Size	1998 Red/Yellow	1998 Green	1998 Total	1999 Red/Yellow	1999 Green	1999 Total
Retail						
Carton/Poly	2,525	4,391	6,916			
Foodservice and Bulk						
Carton/Poly				3,999		53,794
21 to 60 pound. . .	4,113	4,994	9,107		9,922	
Bulk & IQF.	10,190	7,896	18,086	26,992	12,881	
Sub-Total. . .	16,828	17,281	34,109	30,991	22,803	53,794
Other Uses.*	6,329	2,161	8,490	82	*)1*	82
Total.	23,157	19,442	42,599	31,073	22,803	53,876

---

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

)1 Included with Bulk & IQF.

Source: American Frozen Food Institute

141

BELL PEPPERS, STYLE OF PACK, COMBINED TOTALS

(Data in Thousands of Pounds)

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1999 Red/Ylw Diced	Red/Ylw Sliced/ Other	Total	Green Diced	Green Sliced/ Other	Total
Retail						
Carton/Poly.	]	]	]	812	]	]
Foodservice and Bulk	]	]	]		]	]
Carton/Poly.	] 1,418	] 2,581	] 3,999	2,503	]	]
20 to 60 Pound	1,638]	]		1,776	] 4,831	] 9,922
Bulk & IQF	13,768	] 11,586	] 26,992	8,135	4,746	12,881
Sub-Total	16,824	14,167	30,991	13,226	9,577	22,803
*Other Uses** . . .	82	*)1*	82	*)1*	*)1*	*)1*
Total	16,906	14,167	31,073	13,226	9,577	22,803

* *Initally frozen vegetable weight going into combination (mixed) vegetables, canned and prepared foods.*
)1 Included with Bulk & IQF.

P U M P K I N A N D C O O K E D S Q U A S H

Total United States Pack

1990 . . . 22,445
1991 . . . 20,782
1992 . . . 21,534
1993 . . . 24,196
1994 . . . 27,356
1995 . . . 28,097
1996 . . . 20,058
1997 . . . 24,570
1998 . . . 19,329
1999 . . . 17,889

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Midwest & West. . . .	20,058*)1*	24,570*)1*	19,329	17,889

)1 Includes small amount of East & South

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail				
Carton/Poly.	13,279	9,998	9,055	5,684
Foodservice & Bulk				
Carton/Poly.	]	5,643	3,591	3,979
21 to 60 pound	] 13,275	11,760	]	]
Bulk & IQF	-6,496*)2*	-2,831*)2*	] 6,683	] 8,226
Total	20,058	24,570	19,329	17,889

)2 Deficit attributable to previous years' carryover and imported product repacked in U.S.

Source: American Frozen Food Institute

R H U B A R B

Total United States Pack
(Data in Thousands of Pounds)

1990	9,116
1991	7,458
1992	6,426
1993	10,081
1994	7,525
1995	8,228
1996	6,910
1997	7,505
1998	6,558
1999	6,353

Pack of Recent Years by Region

Region	1996	1997	1998	1999
Midwest	]	1,516	]	]
West	] 6,910	5,989	] 6,558)1	] 6,353
Total	6,910	7,505	6,558	6,353

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton/Poly	631	558	]	]
Foodservice Carton/Poly & IQF	2,115	4,420	] 4,876	] 4,331
20 pound and over	4,164	2,527	1,682	2,022
Total	6,910	7,505	6,558	6,353

)1 Includes small amount of East.

S P I N A C H

Total United States Pack

1990	211,784
1991	141,644
1992	184,642
1993	167,147
1994	204,495
1995	185,640
1996	182,999
1997	198,715
1998	190,028
1999	174,149

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East & South	73,896	100,566	100,909]	
California	109,103	98,149	89,119]	174,149
Total	182,999	198,715	190,028	174,149

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	Leaf 1996	Leaf 1997	Leaf 1998	Leaf 1999
Retail				
Carton	23,811	22,253	18,219	20,717
Poly	9,374	8,357	10,795	11,912
Foodservice & Bulk				
Carton/Poly	14,376	16,560	14,725	34,907
20-60 pound, IQF & Tote	10,721	6,943	3,245	-8,839)1
Total	58,282	54,113	46,984	58,697

Container Size	Chopped 1996	Chopped 1997	Chopped 1998	Chopped 1999
Retail				
Carton	]	]	]	49,230
Poly	] 59,068	] 54,090	] 52,823	6,338
Foodservice & Bulk				
Carton/Poly	48,452	58,655	60,716	75,939
20-60 pound, IQF & Tote	17,197	31,857	29,505	-16,055)1
Total	124,717	144,602	143,044	115,452

)1 Deficit attributable to previous year's carryover and imported product repacked in the U.S.

Source: American Frozen Food Institute

S Q U A S H, S U M M E R

All Types, Including Zucchini

Total United States Pack

(Data in Thousands of Pounds)

1991	49,448	1994	58,050	1997	46,579
1992	58,184	1995	54,957	1998	42,976
1993	57,366	1996	42,387	1999	34,842

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996 Summer Squash	1996 Zucchini Squash	1996 Total AllTypes	1997 Summer Squash	1997 Zucchini Squash	1997 Total AllTypes
Retail Carton/Poly . .	2,655	1,846	4,501	936	992	1,928
Foodservice Carton . .	1,828	973	2,801	]	833]	
Foodservice Poly . . .	5,041	4,935	9,976	] 4,466	5,438]	10,737
20 - 60 pound & IQF. .	9,441	8,619	18,060	6,011	14,637	20,648
Bulk	-5,345)1	5,094	-251)1	1,148	8,080	9,228
Sub-Total	13,620	21,467	35,087	12,561	29,980	42,541
Other Uses *. .	2,534	4,766	7,300	1,043	2,995	4,038
Total	16,154	26,233	42,387	13,604	32,975	46,579

Container Size	1998 Summer Squash	1998 Zucchini Squash	1998 Total AllTypes	1999 Summer Squash	1999 Zucchini Squash	1999 Total AllTypes
Retail Carton/Poly . .	1,853	2,469	4,322	2,237	3,590	5,827
Foodservice Carton . .	]	]	]	]	576]	
Foodservice Poly . . .	] 9,703	] 6,626	] 16,329	] 1,941	3,091]	5,608
20 - 60 pound & IQF. .	1,083	3,284	4,367	2,254	5,192	7,446
Bulk	2,919	11,315	14,234	6,503	9,458	15,961
Sub-Total	15,558	23,694	39,252	12,935	21,907	34,842
Other Uses *. .	1,265	2,459	3,724	)2	)2	)2
Total	16,823	26,153	42,976	12,935	21,907	34,842

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.

)2 Included with Bulk

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

Source: American Frozen Food Institute

S W E E T P O T A T O E S & Y A M S

All Forms Including Candied, Diced, Sliced, Whole, Etc.
Total United States Pack

1990 . . .	19,772
1991 . . .	12,370
1992 . . .	19,456
1993 . . .	16,234
1994 . . .	19,506
1995 . . .	14,127
1996 . . .	14,532
1997 . . .	20,992
1998 . . .	)1
1999 . . .	)1

Pack of Recent Years by Region

Region	1996	1997	1998	1999
East and South. . . .	14,532	20,992	)1	)1

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton . . . .]	]	]	)1	)1
Foodservice Carton. .]	14,532]	20,992	)1	)1
Bulk. . . . . .]	]	]	)1	)1
	---	---	--	--
Total . . .	14,532	20,992	)1	)1

)1 Included with Miscellaneous Vegetables.

T U R N I P G R E E N S

Total United States Pack
(Production Chiefly in the South)
(Data in Thousands of Pounds)

1990 . . .	17,972
1991 . . .	16,646
1992 . . .	14,213
1993 . . .	17,666
1994 . . .	19,834
1995 . . .	18,203
1996 . . .	19,112
1997 . . .	20,490
1998 . . .	21,719
1999 . . .	32,499

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton	3,425	3,372	3,303	3,832
Retail Poly	3,332	3,142	2,721	2,648
Foodservice Ctn/Poly.	9,980	8,577	9,494	33,365
Bulk & IQF.	2,375	5,399	6,201	-7,346)1
	---	---	---	---
Total	19,112	20,490	21,719	32,499

)1 Deficit attributable to previous years' carryover and imported products repacked in the U.S.

T U R N I P S & O T H E R T U R N I P P R O D U C T S

Total United States Pack
(Production Chiefly in the South)

1990 . . .	19,603
1991 . . .	19,005
1992 . . .	18,290
1993 . . .	23,776
1994 . . .	21,998
1995 . . .	17,041
1996 . . .	19,568
1997 . . .	25,119
1998 . . .	19,485
1999 . . .	)2

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton . . . .]	]	]		)2
Retail Poly . . . . .]	3,801]	2,666]	3,395	)2
Foodservice Ctn/Poly.	15,704	13,793	17,624	)2
Bulk & IQF.	63	8,660	-1,534)1	)2
	---	---	---	--
Total	19,568	25,119	19,485	)2

)1 Deficit attributable to previous years' carryover and imported products repacked in the U.S.
)2 Included with Turnip Greens

Source: American Frozen Food Institute

145

M I S C E L L A N E O U S V E G E T A B L E S

Total United States Pack

1988	12,608	1994	38,575
1989	11,399	1995	41,004
1990	16,378	1996	36,715
1991	16,877	1997	46,363
1992	14,964	1998	42,849
1993	15,164	1999	51,341

PACK, REPACK AND FINAL CONTAINER SIZE

Container Size	1996	1997	1998	1999
Retail Carton	1,527	1,495	5,676	]
Retail Poly	3,796	1,886	1,113	] 4,964
Foodservice Carton	]	589	20,080	16,356
Foodservice Poly	] 9,878	8,640	3,416	1,517
20 to 60 pound	2,255	5,172	4,176	3,819
Tote, Bin & IQF	8,522	17,332	-3,452)1	24,685
Sub-Total	25,978	35,114	31,009	51,341
*Other Uses**	10,737	11,249	11,840	)2
Total	36,715	46,363	42,849	51,341

)1 Deficit attributable to previous years' carryover and imported product repacked in the U.S.
)2 Included with Tote, Bin & IQF.

* *Initially frozen vegetable weight going into combination (mixed) vegetables, canned & prepared foods.*

1999 Data Includes: Artichokes, Baby Cob Corn, Bamboo Shoots, Beans (Black, Kidney, Pink, Pinto, Soy, Sweet, White), Bean Sprouts, Bok Choy, Broccoli Rabe, Cabbage, Callaloo, Dandelions, Edamame, Escarole, Garlic, Ginger, Olives, Purees (Asparagus, Broccoli, Carrot, Corn, Green Bean, Pea, Sweet Potato), Rutabaga, Snow Peas, Sugar Snap Peas & Pods, Sweet Potatoes & Yams, Swiss Chard, Tomatoes, Water Chestnuts

Source: American Frozen Food Institute

V E G E T A B L E M I X E S

(Data in Thousands of Pounds)

Such items as Mixed Vegetables, Peas and Carrrots, Succotash and other mixes are reported separately and are not included in total industry vegetable production data which represents first freezing, including the mix components.

1991	235,107	1994	260,027	1997	256,214
1992	222,169	1995	291,661	1998	283,829
1993	228,679	1996	275,611	1999	274,097

Container Size	1996	1997	1998	1999
MIXED VEGETABLES				
Retail				
Carton	10,337	19,462	8,194	6,567
Poly	103,407	92,333	117,551	85,515
Foodservice and Bulk				
Carton	16,402	8,671	8,894	13,194
Poly	60,781	41,463	43,025	58,638
20 pound	9,128	15,266	17,348	10,385
30 pound and over	7,914	13,432	12,905	22,142
TOTAL	207,969	190,627	207,917	196,441
PEAS AND CARROTS				
Retail				
Carton	3,421	2,899	2,874	2,348
Poly	23,053	24,264	21,630	24,548
Foodservice and Bulk				
Carton	3,559	2,374	2,609	6,566
Poly	13,218	11,591	13,946	13,224
20 pound	2,558	3,228	5,408	2,450
30 pound and over	2,640	2,678	4,193	5,413
TOTAL	48,449	47,034	50,660	54,549
PEAS AND PEARL ONIONS				
Retail				
Carton	1,950	375	1,393	2,424
Poly	1,636	3,351	3,064	2,205
Foodservice and Bulk				
Carton/Poly	]	]	]	]
20 pound and over	] 2,790	] 3,254	] 3,779	] 3,038
TOTAL	6,376	6,980	8,236	7,667
STEW VEGETABLES				
Retail				
Carton/Poly	7,088	5,982	9,684	8,851
Foodservice & Bulk				
Carton/Poly	793	1,066	1,658	1,346
20 pound and over	404	254	909	728
TOTAL	8,285	7,302	12,251	10,925
SUCCOTASH				
Retail				
Carton	966	847	881	530
Poly	1,657	1,839	1,667	1,942
Foodservice				
Carton/Poly	1,847	]	1,970	1,852
20 pound and over	62	] 1,585	247	191
TOTAL	4,532	4,271	4,765	4,515
GRAND TOTAL	275,611	256,214	283,829	274,097

Source: American Frozen Food Institute

COMBINATIONS AND/OR BLENDS

(Data in Thousands of Pounds)

1994	258,444	1997	160,175
1995	176,164	1998	226,074
1996	177,909	1999	184,575

CALIFORNIA BLEND

Container Size	1996	1997	1998	1999
Retail				
Carton/Poly	39,359	36,352	45,206	42,046
Foodservice and Bulk				
Carton	7,911	8,286	7,273	8,386
Poly	17,576	17,672	32,887	20,666
20 pound and over	3,864	7,743	9,412	5,822
TOTAL	68,710	70,053	94,778	76,920

ITALIAN BLEND

Retail				
Carton/Poly	15,762	13,722	15,772	11,707
Foodservice				
Carton	3,919	3,745	5,833	5,063
Poly	7,824	4,711	12,215	12,246
20 pounds and over	1,812	2,499	3,804	2,861
TOTAL	29,317	24,677	37,624	31,877

NORTHWEST BLEND

Retail Poly/Ctn.				520
Foodservice Carton/Poly.	17,367	18,373	1,987*	3,160
Bulk				
TOTAL	17,367	18,373	1,987*	3,680

ORIENTAL BLEND

Retail				
Carton			5,947	
Poly	33,266	19,977	22,009	32,549
Foodservice and Bulk				
Carton			5,058	5,132
Poly	9,714	8,114	15,825	6,968
20 pound & Over	1,106	2,412	2,404	2,960
TOTAL	44,086	30,503	51,243	47,609

WINTER BLEND

Retail				
Carton/Poly	11,839	11,600	14,821	17,778
Foodservice and Bulk				
Carton/Poly	5,098	3,496	4,187	5,008
20 pound & over	1,492	1,473	2,670	1,703
TOTAL	18,429	16,569	21,678	24,489
GRAND TOTAL	177,909	160,175	226,074	184,575

* *Revised*

Approximate Composition of Blends:
CALIFORNIA BLEND *includes Broccoli,Cauliflower,Carrots.*
ITALIAN BLEND *includes Cauliflower,Zucchini,Italian Green Beans,and Onions.*
NORTHWEST BLEND *includes Corn,Green Beans,Sliced Carrots and Peas.*
ORIENTAL BLEND *includes Green Beans,Broccoli,Onions,Mushrooms.*
WINTER BLEND *includes Broccoli,Cauliflower.*

Source: American Frozen Food Institute

M I S C E L L A N E O U S B L E N D S & M I X E S

(Data in Thousands of Pounds)

1994	326,458	1997	255,507
1995	354,565	1998	315,448
1996	271,874	1999	316,545

VEGETABLES WITH PASTA

Container Size	1996	1997	1998	1999
Retail				
Carton/Poly	26,124	] 19,768	39,688	79,884
Foodservice and Bulk		]		
Carton/Poly	12,485	]	4,113	]
20 Pound & Over	--	]	--	] 24,354
TOTAL	38,609	19,768	43,801	104,238

CHUCKWAGON CORN

Retail				
Carton/Poly	1,230	1,929	1,788	799
Foodservice and Bulk				
Carton	773	709	1,443	859
Poly .]		388	1,405	]
20 Pound & Over .]	216	186	235	] 2,836
TOTAL	2,219	3,212	4,871	4,494

SOUP MIXES & GUMBO

Retail				
Carton/Poly	10,817	8,855	9,932	7,953
Foodservice and Bulk				
Carton/Poly	12,405	]	3,631	2,964
20 Pound & Over	1,494	] 7,026	1,992	973
TOTAL	24,716	15,881	15,555	11,890

OTHER COMBINATIONS

Retail				
Carton	9,286	3,714	10,535	1,921
Poly	115,008	152,334	142,758	119,579
Foodservice and Bulk				
Carton	3,420	6,138	5,563	4,627
Poly	76,064	46,122	75,434	51,764
20 pound .]		3,380	7,309	7,068
30 pound and over .]	2,552	4,958	9,622	10,964
TOTAL	206,330	216,646	251,221	195,923
GRAND TOTAL	271,874	255,507	315,448	316,545

Approximate Composition of Blends:
CHUCKWAGON CORN *includes Corn,Onion,Peppers.*

Source: American Frozen Food Institute

PART VI

FROZEN BREADED VEGETABLES

FROZEN BREADED VEGETABLES - FOODSERVICE & RETAIL

(Data in Thousands of Pounds)

Products	--1997-- Total	--1998-- Total	----------1999---------- Retail	Foodservice	Total
Natural Onion Rings					
Breaded	29,836	33,132	)1	42,675	42,675
Battered.	47,540	59,010	)1	61,761	61,761
Extruded Products					
Onion Rings	36,736	56,436	)1	82,616	82,616
Other	6,567	11,438	--	--	--
Other Breaded Products. .	89,168	88,754	13,071	69,246	82,317
GRAND TOTAL.	209,847	248,770	13,071	256,298	269,369

)1 Included with Foodservice.

The following companies participated in the 1999 survey by providing their production numbers:

Agrilink Foods
Fry Foods Inc.
**Great American Appetizers*
**Lake Erie Frozen Foods*
McCain USA Inc.
Rich-SeaPak Corp.
Mrs. Smith's Bakeries
Value Frozen Foods

The following companies participated in 1998 but <u>not</u> in 1999:

Appleton Produce Co.
Doskocil Specialty Brands
Superior Onion Ring

** New in 1999*

Source: American Frozen Food Institute

PART VII

TOTAL FROZEN SEAFOOD PRODUCTION

PART VII

S E A F O O D

Total Frozen Seafood Production
Frozen Seafood Production by Species
1 9 8 2 - 1 9 9 9
(Data in Thousands of Pounds)

Year	Salt Water Fish	Fresh Water Fish	Bait & Animal Food	Shellfish	Total
1982	117,210	1,156	47,251	79,707	245,324
1983	72,497	931	40,758	72,490	186,676
1984	77,959	1,081	33,242	75,812	188,094*
1985	102,561	1,173	36,977	64,509	205,220
1986	95,590	3,580	40,033	53,136	192,339
1987	82,151	1,600	30,950	39,420	154,121
1988	85,057	1,516	32,761	53,996	173,330
1989	80,287	879	41,315	52,292	174,773
1990	69,910	704	40,060	61,706	172,380
1991	68,014	723	40,677	49,521	158,935
1992	89,375	1,411	49,542	54,310	194,638
1993	86,526	461	42,116	57,551	186,654
1994	72,222	717	31,456	49,346	153,741
1995	80,676	1,215	19,209	44,818	145,918
1996	77,837	416	17,893	27,765	123,911
1997	N/A	N/A	N/A	N/A	N/A
1998	"	"	"	"	"
1999	"	"	"	"	"

FROZEN PRODUCTION OF MAJOR SEAFOOD ITEMS
1 9 8 2 - 1 9 9 9
(Data in Thousands of Pounds)

Year	Fillets	Steaks	Fish Sticks	Fish Portions	Breaded Shrimp
1982	N/A	N/A	91,178*	304,104*	94,341*
1983	59,681*	11,129*	86,928*	335,270*	100,106*
1984	71,303	9,385	92,441*	333,212*	94,522*
1985	N/A	11,331	96,239	330,362*	88,662*
1986	**	11,571	87,289*	341,655*	101,476*
1987	**	9,433	98,927*	323,968*	108,937*
1988	**	8,913	80,148	301,450*	99,471*
1989	**	10,298	89,112	279,864*	120,927*
1990	**	24,197	65,209	242,776*	110,760*
1991	**	15,585	63,286	204,697*	116,335*
1992	**	19,642	58,295	194,307	122,266*
1993	N/A	N/A	67,959*	206,165*	111,489*
1994	"	"	58,789*	196,289*	113,461*
1995	"	"	74,066*	251,217*	100,522*
1996	"	"	65,244	213,962	108,486
1997	"	"	69,167*	195,554	117,471*
1998	"	"	68,778	184,681	109,481
1999	"	"	65,019	203,279	119,149

* *Revised*
** *Included with Steaks*
N/A Not Available

Source: National Marine Fisheries Service
U.S. Dept. of Commerce

PART VIII

IMPORTS & EXPORTS

JANUARY THRU [redacted]EMBER 1999
IMPORTS OF FROZEN FRUITS

COUNTRIES/COMMODITIES (Kilograms)	BANANAS/ PLANTAINS	WILD BLUEBERRIES	CULTIVATED BLUEBERRIES	MANGOES	MELONS	PINEAPPLES	RASPBERRIES	STRAWBERIES	FRUIT, MISCELLANEOUS	TOTAL FRUIT
Andorra										
Argentina								36,832		36,832
Bosnia							20,000	158,233		178,233
Brazil							194,865	5,965	608	201,328
Bulgaria				103,092					18,000	121,092
Canada							54,500			54,500
Chile		7,859,906	5,860,344	2,948			3,899,929	447,128	453,082	18,523,334
China			78,286				4,406,206	206,721	1,266,820	5,957,036
Columbia	265,748					117,026	8,000	699,537	56,648	861,211
Costa Rica	3,732,709	2,067		66,748		33,723			473,674	841,853
Dominican Republic				14,509		2,536,806	4,000		521,961	7,111,041
Ecuador	2,503,702			154,703		18,425			532,375	703,503
El Salvador				269,280		182,326		1,271,363	28,030	4,255,721
Fiji				3,238					70,084	73,322
France				16,500						16,500
Guatemala	27,813						299	400	22,111	22,810
Haiti				56,172	273,556	26,790	46,523	213,732	414,610	1,059,196
Honduras	602,866			17,000						17,000
Hong Kong				27,363						630,281
Hungary									1,886	1,886
India							149,160			149,160
Israel				9,180						9,180
Jamaica								21,000		21,000
Korea									1,445	1,445
Macedonia									10,896	10,896
Mexico	48,999		42,579	5,779,430	2,514,493	720,123	1,241,436	75,240		1,318,676
Morocco							99,569	42,414,914	866,337	58,486,414
Netherlands								224,570		224,570
Nicaragua	4,200						59,156			59,156
Peru									16,959	21,159
Philippines	8,000			84,963				39,007		123,970
Poland									10,521	18,521
W. Samoa							31,365	22,000	4,545	57,910
Spain									16,000	16,000
Taiwan								35,002	7,500	42,502
Thailand	145,259				16,000	48,864			41,010	41,010
Turkey									7,620,294	7,830,487
Venezuela				25,220				13,000		13,000
Vietnam	45,660					156,204			5,240	30,465
									827,817	1,069,481
TOTALS	7,364,986	7,861,973	5,981,211	8,835,368	2,804,049	3,687,276	10,213,557	46,574,661	13,801,060	107,181,361
Miscellaneous Fruits:										
Apples										866,564
Blackberries/Mulberries/Red & White Currants										1,147,322
Boysenberries										446,879
Cherries, Sweet										47,188
Cherries, Tart										717,861
Cranberries										976,726
Logan/Gooss Berries/Black Currants										1,101,763
Papayas										474,382
TOTAL										5,711,486
TOTAL ALL FRUITS										112,892,813

SOURCE: U.S. DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS, FOREIGN TRADE DIVISION, TRADE DATA SERVICES, WASHINGTON DC 20233
(301) 457-2230 PHONE, (301) 457-2647 FAX

155

JANUARY THRU DECEMBER 1999
IMPORTS OF FROZEN VEGETABLES

COUNTRIES/COMMODITIES (Kilograms)	BAMBOO SHOOTS/ WATER CHESTNUTS	BEANS	BROCCOLI	BRUSSELS SPROUTS	CARROTS*	CAULIFLOWER	CORN, SWEET*	OKRA	PEAS*	SPINACH	VEGETABLES, MIXED	TOTAL VEGETABLES
Belgium		486,730	6,530	1,632,466	511,487	25,791				8,000		2,681,004
Bulgaria					5,626							5,626
Canada		6,891,470	702,765	1,125,737	1,300,306	721,172	10,623,697		10,861,493	18,479	11,634,294	43,879,413
Chile		99,252		17,418								116,670
China	6,286,649	1,270,132				413,422			6,358,121	6,274	35,171	14,369,769
Costa Rica			34,156								74,966	109,122
Dominican Republic							45,826		146,669		64,070	256,565
Ecuador			55,269				2,500		16,909			74,678
Egypt		27,033			39,732			180,549	1,600	4,400		253,314
El Salvador		134,624					5,269	1,396,250	143,798		20,179	1,702,140
France		36,971	4,271		20,833				8,664	28,661	60,016	159,416
Guatemala	6,540		30,269,564	2,030,787		1,120,770		3,127,263	2,441,852	19,051	636,098	39,651,925
Honduras											18,367	18,367
Hong Kong	150,145											150,145
India									4,059			4,059
Israel					813,814					9,000	21,271	844,085
Italy		29,624										29,624
Japan	310	9,968					400				814	11,512
Korea							36,216				5,570	41,786
Lebanon								2,304	25			2,329
Malaysia									689			689
Mexico		40,140	152,486,967	455,333	16,330	20,495,066	274,540	1,416,363	306,738	3,054,647	17,688,955	196,237,079
Netherlands		19,047		59,640		18,345					67,161	164,193
New Zealand									18,000			18,000
Nicaragua								37,766			3,975	41,741
Panama											9,324	9,324
Peru							37,222		108,810		8,321	154,353
Philippines	2,327											2,327
Poland				298,405		545,225					8,256	851,886
Portugal		90,000							24,000			114,000
So. Africa						114,240						114,240
Spain		55,425									62,351	117,776
Taiwan	43,069	1,221,163					17,098					1,281,330
Thailand	121,426	24,974		12,870			8,201		48,960		4,234	220,665
United Kingdom				70,030								70,030
Venezuela											3,726	3,726
TOTALS	6,610,466	10,416,573	183,559,522	5,702,686	2,706,128	23,454,031	11,050,989	6,164,495	20,490,387	3,146,512	30,427,119	303,732,908

JANUARY THRU DECEMBER 199[illegible]

IMPORTS OF FROZEN VEGETABLES

COUNTRIES/COMMODITIES (Kilograms)	BAMBOO SHOOTS/ WATER CHESTNUTS	BEANS	BROCCOLI	BRUSSELS SPROUTS	CARROTS*	CAULIFLOWER	CORN, SWEET*	OKRA	PEAS*	SPINACH	VEGETABLES, MIXED	TOTAL VEGETABLES
Miscellaneous Vegetables:												
Asparagus												1,761,804
Beans, Lima												231,310
Beans, String (Snap)												1,916,308
Chickpeas (Garbanzos)												33,213
Greens, Fiddlehead												4,718
Lentils												30,069
Mushrooms												948,648
Peas, Pigeon												2,799,479
Pea Pods/Water Chestnuts												39,831
Potatoes, Yellow*												2,382
Tomatoes												36,878
Vegetables, Leguminous												1,107,887
Vegetables, Miscellaneous*												73,376,890
TOTAL												[illegible]
TOTAL ALL VEGETABLES												[illegible]

* Includes Prepared & Preserved Product

157

JANUARY THRU DECEMBER 1999
IMPORTS OF FROZEN POTATOES

COUNTRIES/COMMODITIES *(KILOGRAMS)*	POTATOES*
Belgium	170,672
Canada	471,161,838
China	1,589
Columbia	27,249
Ecuador	441,250
France	39,807
India	201,567
Japan	20,735
Malaysia	960
Netherlands	268,902
Peru	28,716
Singapore	2,400
TOTALS	472,365,685

** Includes Prepared & Preserved Product*

JANU[illegible] THR[illegible] EM[illegible] 999

EXPORTS OF FROZEN FRUITS

COUNTRIES/COMMODITIES (KILOGRAMS)	BERRIES /1	WILD BLUEBERRIES	CULTIVATED BLUEBERRIES	CHERRIES, SWEET	CHERRIES, TART	STRAWBERRIES	MISC. FRUIT & NUTS	TOTAL FRUIT
Argentina	7,516						9,044	16,560
Aruba						1,701		1,701
Australia	103,955	54,528	221,858	602,231	31,511	1,399,983	531,913	2,976,379
Barbados				3,191				3,191
Belgium	6,415	138,701					19,369	164,485
Bermuda							36,445	36,445
Brazil							712	712
Canada	2,756,233	3,266,824	1,694,360	651,561	1,056,989	14,091,451	7,325,586	30,845,506
Chile							16,300	16,300
China				22,974			13,293	36,267
Cocos Island						8,860		8,860
Columbia						12,742	184,905	197,647
Costa Rica			2,979			4,242	896	8,117
Dominican Republic	374,386							374,386
Egypt						2,039		2,039
France	1,023	228,699		7,134		200,753	28,454	466,063
Germany	3,928	80,971	21,772				558,576	665,245
Guadeloupe		2,679						2,679
Guatemala						17,979	7,810	25,789
Honduras			1,168			2,856		4,024
Hong Kong				111,038			85,382	196,420
Iceland							5,739	5,739
Indonesia						3,729		3,729
Israel	29,634	44,638		206,855			246,197	528,322
Italy		39,716					8,000	47,716
Jamaica							3,596	3,596
Japan	166,528	3,008,803	2,290,436	115,164	125,578	14,811,171	3,484,252	23,961,932
Korea		58,165			154,970	36,672	245,600	494,427
Kuwait						59,932	3,431	63,363
Luxembourg							3,971	3,971
Malaysia							3,763	3,763
Marshall Islands							16,746	16,746
Mexico		19,578		539,346	663,275	141,006	3,404,308	4,767,513
Morocco							1,839	1,839
Netherlands	5,339	144,450	20,412		18,269		24,364	212,834
New Zealand		22,735				20,321	4,115	47,171
Panama			2,019			26,236	133,562	160,818
Saint Lucia	84,272							84,272
Saudi Arabia	5,071					120,361		125,432
Singapore	3,629					88,706	55,687	148,022
South Africa		17,971	23,068	32,461				73,460
Sweden	23,338							23,338
Switzerland	35,028							35,028
Taiwan	224		12,247	134,417	14,844		71,405	233,137
Thailand	15,575	9,068					3,805	28,448
United Kingdom	43,598	56,434	24,291	96,172	55,156	84,742	1,511,517	1,814,307
Venezuela						18,406	18,489	34,895
TOTALS	3,666,666	7,272,066	4,394,640	2,639,644	2,122,552	31,151,567	18,947,585	68,272,970

/1 Includes Raspberries, Blackberries, Mulberries, Loganberries, Currants (Black, White & Red) & Gooseberries

SOURCE: U.S. DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS, FOREIGN TRADE DIVISION, TRADE DATA SERVICES, WASHINGTON DC 20233
(301) 457-2238 PHONE, (301) 457-2647 FAX

154

JANUARY THRU DECEMBER 1999
EXPORTS OF FROZEN VEGETABLES

COUNTRIES/COMMODITIES (KILOGRAMS)	BEANS*	CARROTS*	CORN, SWEET*	PEAS*	SPINACH	VEGETABLES, MIXED	TOTAL VEGETABLES
Antigua		3,108	5,326				8,434
Argentina	1,283			10,859			12,142
Aruba	1,469		25,356				26,825
Australia	915,882		2,225,939	13,903	461,715	118,656	3,736,095
Bahamas	26,917		127,182	2,200		27,151	185,450
Bahrain			75,319				75,319
Barbados			43,118			22,922	66,040
Belgium			26,607				26,607
Belize						184	184
Bermuda					15,851	211,453	227,304
Brazil	29,195		28,691				57,886
Bulgaria			23,016				23,016
Canada	3,866,094	80,309	3,609,756	4,502,933	3,042,054	1,876,630	16,977,776
Cayman	480					3,455,834	3,456,314
Chile			86,013	5,098			91,111
China			3,248,614	540,769		102,386	3,891,769
Columbia			255,708	12,269		11,481	279,458
Costa Rica	5,333	119,748	109,307	104,549		22,647	361,584
Denmark		20,885	57,049			52,381	130,315
Dominican Republic	50,833		193,269	37,487		220,694	502,283
Ecuador			10,049				10,049
Egypt	160		40,937				41,097
France	8,263		569,316				577,579
French Polynesia	7,969		163,854	19,958		117,866	309,647
Germany	16,220		86,168				102,388
Greece			303,560				303,560
Grenada						9,072	9,072
Guatemala	17,962		12,686	7,856		45,062	83,566
Guyana			14,477				14,477
Haiti			9,328	11,368			20,696
Honduras			42,262	6,181		20,256	68,699
Hong Kong	22,267		4,920,041	164,422	3,562	1,769,928	6,900,220
Iceland			247,382				247,382
Indonesia			17,890	15,368			33,258
Ireland			332,339				332,339
Israel			149,279			17,250	166,529
Italy	18,144						18,144
Jamaica			5,598	4,240		45,245	55,083
Japan	1,144,650	2,398,193	42,029,594	4,782,605	26,128	11,588,105	61,967,275
Jordan	2,301		56,334				58,635
Korea	37,784	3,353	1,943,312	34,028			2,018,477
Kuwait	96,401		478,178	15,117		30,871	622,567
Lebanon			126,566	6,038			132,604
Liberia	13,000						13,000
Malaysia			298,737			49,574	348,311
Mexico	486,022	29,087	2,443,027	2,204,485	236,152	269,099	5,667,872
Netherlands	14,275	166,334	106,246	94,577		8,572	390,004
Netherland Antilles			40,630	28,187			68,817
New Zealand	9,139						9,139
Nicaragua			15,368				15,368
Norway			128,322				128,322
Oman			44,126				44,126
Pakistan			31,741				31,741
Palau						9,554	9,554
Panama	319,873	5,919	256,351	243,849		96,628	932,620
Peru	2,865						2,865
Philippines	19,873		332,572				352,445
Poland			135,011				135,011
Qatar			92,194				92,194
Russia	365		49,367			10,801	60,553
Saint Kitts & Nevis						2,896	2,896
Saint Vincent & the Grenadines						2,336	2,336
Saudi Arabia	6,512		2,074,049	3,674			2,084,235
Seychelles					11,659		11,659
Singapore			98,380			78,384	176,764
Spain			43,554			19,787	63,341
Suriname			5,605				5,605
Sweden			106,158				106,158
Switzerland			5,223				5,223

SOURCE: U.S. DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS, FOREIGN TRADE DIVISION, TRADE DATA SERVICES, WASHINGTON DC 20233
(301) 457-2239 PHONE, (301) 457-2647 FAX

JANUARY THRU DECEMBER 1999
EXPORTS OF FROZEN VEGETABLES

COUNTRIES/COMMODITIES (KILOGRAMS)	BEANS*	CARROTS*	CORN, SWEET*	PEAS*	SPINACH	VEGETABLES, MIXED	TOTAL VEGETABLES
Taiwan	20,162	8,006	1,376,601			506	1,407,475
Tanzania			8,856				8,856
Thailand			19,588			506	19,088
Trinidad		40,824				33,072	73,896
United Arab Emirates	24,855		510,230	21,604			556,689
United Kingdom	152,560		2,604,498	270,081	6,532	479	3,034,131
Uruguay			22,650				22,650
Venezuela	3,946		396,560	540,075		10,525	951,136
Vietnam			546,206				546,206
Yemen	17,080		9,600				26,680
Zimbabwe				15,987			15,987
TOTALS	7,364,164	2,873,766	73,613,150	15,716,725	3,[illegible]	36,376,[illegible]	121,[illegible],154
Miscellaneous Items:							
Asparagus							[illegible]
Roots & Tubers							[illegible]
Sweet Potatoes							[illegible]
Vegetables, Leguminous							[illegible]
Vegetables, Miscellaneous*							73,136,417
TOTAL							76,[illegible]
TOTAL ALL VEGETABLES							197,176,[illegible]

** Includes Prepared & Preserved Product*

SOURCE: U.S. DEPARTMENT OF COMMERCE, BUREAU OF THE CENSUS, FOREIGN TRADE DIVISION, TRADE DATA SERVICES, WASHINGTON DC 20233
(301) 457-2238 PHONE, (301) 457-2647 FAX

161

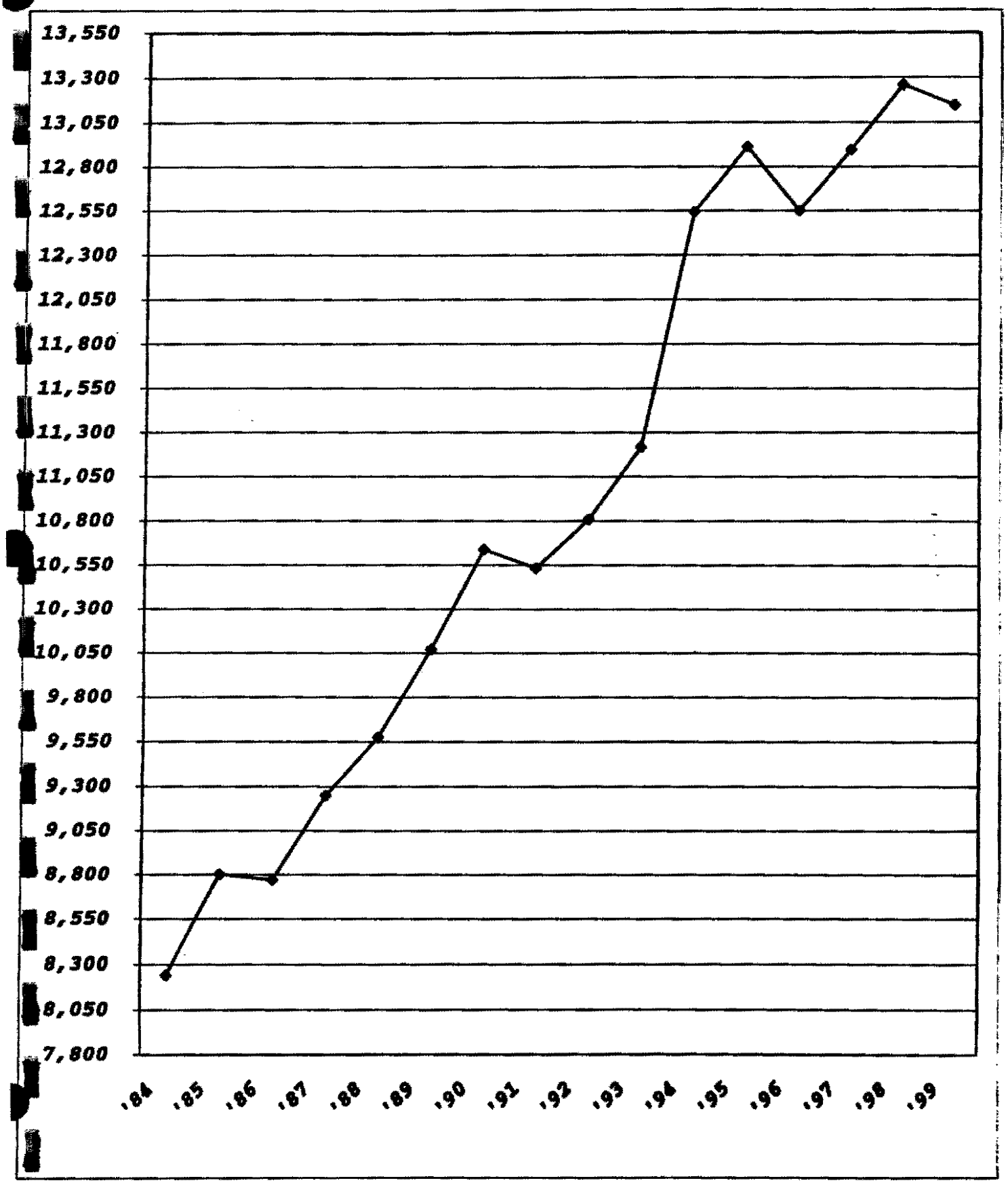
JANUARY THRU DECEMBER 1999
EXPORTS OF FROZEN POTATOES

COUNTRIES/COMMODITIES (KILOGRAMS)	POTATOES	COUNTRIES/COMMODITIES (KILOGRAMS)	POTATOES
Antigua	22,680	Japan	245,292,288
Argentina	956,899	Jordan	22,384
Aruba	640,152	Kenya	8,492
Australia	700,192	Korea	28,714,290
Bahamas	1,213,847	Kuwait	1,350,742
Bahrain	319,868	Macao	236,583
Barbados	91,781	Malaysia	10,138,835
Belgium	48,287	Martinique	246,838
Bermuda	48,963	Mexico	30,075,014
Brazil	424,694	Micronesia	3,311
British Virgin Islands	28,696	Netherlands	5,926,603
Brunei	127,440	Netherland Antilles	271,211
Cambodia	39,680	New Caledonia	22,232
Canada	19,975,765	New Zealand	103,310
Cayman	185,673	Nicaragua	275,556
Chile	2,082,141	Oman	137,874
China	14,505,841	Pakistan	736,090
Columbia	646,722	Panama	2,727,322
Costa Rica	1,615,411	Peru	793,048
Dominica	5,728	Philippines	16,626,632
Dominican Republic	2,048,473	Qatar	259,425
Ecuador	319,073	Russia	1,366,281
Egypt	35,192	Saint Lucia	39,426
El Salvador	865,182	Saint Kitts & Nevis	17,400
French Polynesia	1,344,006	Saint Vincent & the Grenadines	3,913
Germany	39,362	W. Samoa	4,822
Ghana	22,589	Saudi Arabia	1,900,365
Grenada	48,750	Singapore	10,377,253
Guadeloupe	389,117	Spain	36,645
Guatemala	855,242	Sri Lanka	182,432
Guyana	113,939	Suriname	137,794
Honduras	1,237,278	Taiwan	24,265,385
Hong Kong	29,233,277	Thailand	6,012,244
Hungary	4,668	Trinidad	2,115,274
Iceland	1,507,670	Turkey	409,887
India	314,462	United Arab Emirates	622,496
Indonesia	6,264,593	United Kingdom	7,645,680
Ireland	123,988	Uruguay	1,393,621
Israel	97,784	Venezuela	1,057,435
Italy	23,905	Vietnam	41,949
Jamaica	1,197,186	Yemen	4,355
		TOTALS	491,368,933

SOURCE:
U.S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS
FOREIGN TRADE DIVISION
TRADE DATA SERVICES
WASHINGTON DC 20233
(301) 457-2239 PHONE
(301) 457-2647 FAX

162

TOTAL FROZEN FRUITS AND VEGETABLES
Millions of Pounds



Source: American Frozen Food Institute

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 25.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.0	0.0	0.0	0.255	1.6	4.0	5.2
0.010	0.0	0.0	0.0	0.260	1.6	4.1	5.3
0.015	0.0	0.1	0.1	0.265	1.7	4.2	5.5
0.020	0.0	0.1	0.1	0.270	1.7	4.3	5.6
0.025	0.0	0.1	0.2	0.275	1.8	4.4	5.7
0.030	0.0	0.2	0.3	0.280	1.9	4.5	5.8
0.035	0.0	0.2	0.4	0.285	1.9	4.6	5.9
0.040	0.0	0.3	0.4	0.290	2.0	4.7	6.1
0.045	0.0	0.4	0.5	0.295	2.1	4.8	6.2
0.050	0.0	0.4	0.6	0.300	2.1	4.9	6.3
0.055	0.0	0.5	0.7	0.305	2.2	5.0	6.4
0.060	0.1	0.5	0.8	0.310	2.3	5.1	6.6
0.065	0.1	0.6	0.9	0.315	2.3	5.2	6.7
0.070	0.1	0.7	1.0	0.320	2.4	5.3	6.8
0.075	0.1	0.8	1.1	0.325	2.5	5.4	6.9
0.080	0.1	0.8	1.2	0.330	2.5	5.5	7.1
0.085	0.1	0.9	1.3	0.335	2.6	5.7	7.2
0.090	0.2	1.0	1.4	0.340	2.7	5.8	7.3
0.095	0.2	1.1	1.5	0.345	2.7	5.9	7.4
0.100	0.2	1.1	1.6	0.350	2.8	6.0	7.6
0.105	0.2	1.2	1.7	0.355	2.9	6.1	7.7
0.110	0.3	1.3	1.8	0.360	3.0	6.2	7.8
0.115	0.3	1.4	1.9	0.365	3.0	6.3	7.9
0.120	0.3	1.5	2.0	0.370	3.1	6.4	8.1
0.125	0.4	1.6	2.2	0.375	3.2	6.5	8.2
0.130	0.4	1.6	2.3	0.380	3.3	6.6	8.3
0.135	0.4	1.7	2.4	0.385	3.3	6.7	8.4
0.140	0.5	1.8	2.5	0.390	3.4	6.9	8.6
0.145	0.5	1.9	2.6	0.395	3.5	7.0	8.7
0.150	0.5	2.0	2.7	0.400	3.6	7.1	8.8
0.155	0.6	2.1	2.8	0.405	3.7	7.2	8.9
0.160	0.6	2.2	2.9	0.410	3.7	7.3	9.1
0.165	0.7	2.3	3.1	0.415	3.8	7.4	9.2
0.170	0.7	2.4	3.2	0.420	3.9	7.5	9.3
0.175	0.7	2.4	3.3	0.425	4.0	7.6	9.5
0.180	0.8	2.5	3.4	0.430	4.1	7.7	9.6
0.185	0.8	2.6	3.5	0.435	4.1	7.9	9.7
0.190	0.9	2.7	3.6	0.440	4.2	8.0	9.8
0.195	0.9	2.8	3.8	0.445	4.3	8.1	10.0
0.200	1.0	2.9	3.9	0.450	4.4	8.2	10.1
0.205	1.0	3.0	4.0	0.455	4.5	8.3	10.2
0.210	1.1	3.1	4.1	0.460	4.6	8.4	10.4
0.215	1.1	3.2	4.2	0.465	4.7	8.5	10.5
0.220	1.2	3.3	4.4	0.470	4.7	8.7	10.6
0.225	1.2	3.4	4.5	0.475	4.8	8.8	10.7
0.230	1.3	3.5	4.6	0.480	4.9	8.9	10.9
0.235	1.3	3.6	4.7	0.485	5.0	9.0	11.0
0.240	1.4	3.7	4.8	0.490	5.1	9.1	11.1
0.245	1.5	3.8	5.0	0.495	5.2	9.2	11.3
0.250	1.5	3.9	5.1	0.500	5.3	9.4	11.4

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 48.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.0	0.0	0.0	0.255	4.7	8.8	10.8
0.010	0.0	0.1	0.1	0.260	4.8	9.0	11.0
0.015	0.0	0.2	0.3	0.265	5.0	9.2	11.3
0.020	0.0	0.3	0.4	0.270	5.1	9.4	11.5
0.025	0.0	0.4	0.6	0.275	5.3	9.6	11.8
0.030	0.1	0.5	0.7	0.280	5.4	9.8	12.0
0.035	0.1	0.6	0.9	0.285	5.6	10.0	12.2
0.040	0.1	0.8	1.1	0.290	5.7	10.2	12.5
0.045	0.1	0.9	1.3	0.295	5.9	10.4	12.7
0.050	0.2	1.1	1.5	0.300	6.1	10.7	13.0
0.055	0.2	1.2	1.7	0.305	6.2	10.9	13.2
0.060	0.3	1.4	1.9	0.310	6.4	11.1	13.4
0.065	0.4	1.5	2.1	0.315	6.5	11.3	13.7
0.070	0.4	1.7	2.3	0.320	6.7	11.5	13.9
0.075	0.5	1.9	2.6	0.325	6.9	11.7	14.2
0.080	0.6	2.0	2.8	0.330	7.0	11.9	14.4
0.085	0.6	2.2	3.0	0.335	7.2	12.2	14.6
0.090	0.7	2.4	3.2	0.340	7.4	12.4	14.9
0.095	0.8	2.5	3.4	0.345	7.6	12.6	15.1
0.100	0.9	2.7	3.6	0.350	7.7	12.8	15.4
0.105	1.0	2.9	3.9	0.355	7.9	13.0	15.6
0.110	1.0	3.1	4.1	0.360	8.1	13.3	15.8
0.115	1.1	3.3	4.3	0.365	8.2	13.5	16.1
0.120	1.2	3.4	4.5	0.370	8.4	13.7	16.3
0.125	1.3	3.6	4.8	0.375	8.6	13.9	16.6
0.130	1.4	3.8	5.0	0.380	8.8	14.1	16.8
0.135	1.5	4.0	5.2	0.385	9.0	14.4	17.1
0.140	1.7	4.2	5.4	0.390	9.1	14.6	17.3
0.145	1.8	4.4	5.7	0.395	9.3	14.8	17.5
0.150	1.9	4.6	5.9	0.400	9.5	15.0	17.8
0.155	2.0	4.8	6.1	0.405	9.7	15.2	18.0
0.160	2.1	4.9	6.4	0.410	9.9	15.5	18.3
0.165	2.2	5.1	6.6	0.415	10.1	15.7	18.5
0.170	2.3	5.3	6.8	0.420	10.2	15.9	18.8
0.175	2.5	5.5	7.1	0.425	10.4	16.1	19.0
0.180	2.6	5.7	7.3	0.430	10.6	16.4	19.2
0.185	2.7	5.9	7.5	0.435	10.8	16.6	19.5
0.190	2.8	6.1	7.8	0.440	11.0	16.8	19.7
0.195	3.0	6.3	8.0	0.445	11.2	17.0	20.0
0.200	3.1	6.5	8.2	0.450	11.4	17.3	20.2
0.205	3.2	6.7	8.5	0.455	11.6	17.5	20.5
0.210	3.4	6.9	8.7	0.460	11.8	17.7	20.7
0.215	3.5	7.1	8.9	0.465	12.0	18.0	21.0
0.220	3.6	7.3	9.2	0.470	12.2	18.2	21.2
0.225	3.8	7.5	9.4	0.475	12.4	18.4	21.4
0.230	3.9	7.7	9.6	0.480	12.6	18.6	21.7
0.235	4.1	7.9	9.9	0.485	12.8	18.9	21.9
0.240	4.2	8.1	10.1	0.490	13.0	19.1	22.2
0.245	4.4	8.3	10.3	0.495	13.2	19.3	22.4
0.250	4.5	8.6	10.6	0.500	13.4	19.6	22.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 50.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.0	0.0	0.0	0.255	5.0	9.2	11.3
0.010	0.0	0.1	0.1	0.260	5.1	9.4	11.6
0.015	0.0	0.2	0.3	0.265	5.3	9.6	11.8
0.020	0.0	0.3	0.4	0.270	5.4	9.8	12.0
0.025	0.0	0.4	0.6	0.275	5.6	10.1	12.3
0.030	0.1	0.5	0.8	0.280	5.8	10.3	12.5
0.035	0.1	0.7	1.0	0.285	5.9	10.5	12.8
0.040	0.1	0.8	1.2	0.290	6.1	10.7	13.0
0.045	0.2	1.0	1.4	0.295	6.3	10.9	13.3
0.050	0.2	1.1	1.6	0.300	6.4	11.2	13.5
0.055	0.3	1.3	1.8	0.305	6.6	11.4	13.8
0.060	0.3	1.5	2.0	0.310	6.8	11.6	14.0
0.065	0.4	1.6	2.2	0.315	6.9	11.8	14.3
0.070	0.5	1.8	2.5	0.320	7.1	12.1	14.5
0.075	0.5	2.0	2.7	0.325	7.3	12.3	14.8
0.080	0.6	2.1	2.9	0.330	7.5	12.5	15.0
0.085	0.7	2.3	3.1	0.335	7.7	12.7	15.3
0.090	0.8	2.5	3.4	0.340	7.8	13.0	15.5
0.095	0.9	2.7	3.6	0.345	8.0	13.2	15.8
0.100	0.9	2.9	3.8	0.350	8.2	13.4	16.0
0.105	1.0	3.0	4.1	0.355	8.4	13.7	16.3
0.110	1.1	3.2	4.3	0.360	8.6	13.9	16.5
0.115	1.2	3.4	4.5	0.365	8.7	14.1	16.8
0.120	1.3	3.6	4.8	0.370	8.9	14.3	17.1
0.125	1.4	3.8	5.0	0.375	9.1	14.6	17.3
0.130	1.6	4.0	5.2	0.380	9.3	14.8	17.6
0.135	1.7	4.2	5.5	0.385	9.5	15.0	17.8
0.140	1.8	4.4	5.7	0.390	9.7	15.3	18.1
0.145	1.9	4.6	5.9	0.395	9.9	15.5	18.3
0.150	2.0	4.8	6.2	0.400	10.1	15.7	18.6
0.155	2.1	5.0	6.4	0.405	10.3	16.0	18.8
0.160	2.3	5.2	6.7	0.410	10.4	16.2	19.1
0.165	2.4	5.4	6.9	0.415	10.6	16.4	19.3
0.170	2.5	5.6	7.1	0.420	10.8	16.7	19.6
0.175	2.6	5.8	7.4	0.425	11.0	16.9	19.8
0.180	2.8	6.0	7.6	0.430	11.2	17.1	20.1
0.185	2.9	6.2	7.9	0.435	11.4	17.4	20.3
0.190	3.0	6.4	8.1	0.440	11.6	17.6	20.6
0.195	3.2	6.6	8.4	0.445	11.8	17.8	20.9
0.200	3.3	6.8	8.6	0.450	12.0	18.1	21.1
0.205	3.5	7.1	8.8	0.455	12.2	18.3	21.4
0.210	3.6	7.3	9.1	0.460	12.4	18.6	21.6
0.215	3.7	7.5	9.3	0.465	12.6	18.8	21.9
0.220	3.9	7.7	9.6	0.470	12.9	19.0	22.1
0.225	4.0	7.9	9.8	0.475	13.1	19.3	22.4
0.230	4.2	8.1	10.1	0.480	13.3	19.5	22.6
0.235	4.3	8.3	10.3	0.485	13.5	19.8	22.9
0.240	4.5	8.5	10.6	0.490	13.7	20.0	23.1
0.245	4.6	8.8	10.8	0.495	13.9	20.2	23.4
0.250	4.8	9.0	11.1	0.500	14.1	20.5	23.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 96.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.0	0.1	0.1	0.255	12.7	19.4	22.7
0.010	0.0	0.3	0.4	0.260	13.1	19.8	23.2
0.015	0.1	0.5	0.7	0.265	13.4	20.2	23.6
0.020	0.1	0.8	1.1	0.270	13.8	20.7	24.1
0.025	0.2	1.1	1.5	0.275	14.2	21.1	24.6
0.030	0.3	1.4	1.9	0.280	14.5	21.6	25.1
0.035	0.4	1.7	2.3	0.285	14.9	22.0	25.6
0.040	0.5	2.0	2.7	0.290	15.3	22.4	26.0
0.045	0.7	2.4	3.2	0.295	15.7	22.9	26.5
0.050	0.9	2.7	3.6	0.300	16.0	23.3	27.0
0.055	1.0	3.0	4.1	0.305	16.4	23.8	27.5
0.060	1.2	3.4	4.5	0.310	16.8	24.2	27.9
0.065	1.4	3.8	4.9	0.315	17.2	24.7	28.4
0.070	1.6	4.1	5.4	0.320	17.5	25.1	28.9
0.075	1.8	4.5	5.8	0.325	17.9	25.6	29.4
0.080	2.0	4.9	6.3	0.330	18.3	26.0	29.9
0.085	2.3	5.3	6.8	0.335	18.7	26.5	30.3
0.090	2.5	5.6	7.2	0.340	19.1	26.9	30.8
0.095	2.8	6.0	7.7	0.345	19.5	27.4	31.3
0.100	3.0	6.4	8.1	0.350	19.9	27.8	31.8
0.105	3.3	6.8	8.6	0.355	20.3	28.3	32.3
0.110	3.5	7.2	9.0	0.360	20.7	28.7	32.8
0.115	3.8	7.6	9.5	0.365	21.1	29.2	33.2
0.120	4.1	8.0	10.0	0.370	21.5	29.6	33.7
0.125	4.3	8.4	10.4	0.375	21.9	30.1	34.2
0.130	4.6	8.8	10.9	0.380	22.3	30.5	34.7
0.135	4.9	9.2	11.4	0.385	22.7	31.0	35.2
0.140	5.2	9.6	11.8	0.390	23.1	31.5	35.6
0.145	5.5	10.0	12.3	0.395	23.5	31.9	36.1
0.150	5.8	10.4	12.8	0.400	23.9	32.4	36.6
0.155	6.1	10.8	13.2	0.405	24.3	32.8	37.1
0.160	6.4	11.3	13.7	0.410	24.7	33.3	37.6
0.165	6.7	11.7	14.2	0.415	25.1	33.8	38.1
0.170	7.0	12.1	14.6	0.420	25.6	34.2	38.6
0.175	7.3	12.5	15.1	0.425	26.0	34.7	39.0
0.180	7.6	12.9	15.6	0.430	26.4	35.1	39.5
0.185	8.0	13.4	16.1	0.435	26.8	35.6	40.0
0.190	8.3	13.8	16.5	0.440	27.2	36.1	40.5
0.195	8.6	14.2	17.0	0.445	27.7	36.5	41.0
0.200	8.9	14.6	17.5	0.450	28.1	37.0	41.5
0.205	9.3	15.0	17.9	0.455	28.5	37.5	41.9
0.210	9.6	15.5	18.4	0.460	28.9	37.9	42.4
0.215	9.9	15.9	18.9	0.465	29.4	38.4	42.9
0.220	10.3	16.3	19.4	0.470	29.8	38.9	43.4
0.225	10.6	16.8	19.8	0.475	30.2	39.3	43.9
0.230	11.0	17.2	20.3	0.480	30.7	39.8	44.4
0.235	11.3	17.6	20.8	0.485	31.1	40.3	44.9
0.240	11.7	18.1	21.3	0.490	31.5	40.7	45.3
0.245	12.0	18.5	21.7	0.495	32.0	41.2	45.8
0.250	12.4	18.9	22.2	0.500	32.4	41.7	46.3

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 100.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.0	0.1	0.1	0.255	13.4	20.3	23.7
0.010	0.0	0.3	0.4	0.260	13.8	20.7	24.2
0.015	0.1	0.5	0.8	0.265	14.2	21.2	24.7
0.020	0.1	0.8	1.2	0.270	14.6	21.6	25.2
0.025	0.2	1.1	1.6	0.275	15.0	22.1	25.7
0.030	0.3	1.4	2.0	0.280	15.4	22.6	26.2
0.035	0.4	1.8	2.4	0.285	15.7	23.0	26.7
0.040	0.6	2.1	2.9	0.290	16.1	23.5	27.2
0.045	0.8	2.5	3.3	0.295	16.5	24.0	27.7
0.050	0.9	2.8	3.8	0.300	16.9	24.4	28.2
0.055	1.1	3.2	4.3	0.305	17.3	24.9	28.7
0.060	1.3	3.6	4.7	0.310	17.7	25.3	29.2
0.065	1.5	4.0	5.2	0.315	18.1	25.8	29.7
0.070	1.7	4.3	5.7	0.320	18.5	26.3	30.2
0.075	2.0	4.7	6.1	0.325	18.9	26.7	30.7
0.080	2.2	5.1	6.6	0.330	19.3	27.2	31.2
0.085	2.4	5.5	7.1	0.335	19.7	27.7	31.7
0.090	2.7	5.9	7.5	0.340	20.1	28.2	32.2
0.095	2.9	6.3	8.0	0.345	20.5	28.6	32.7
0.100	3.2	6.7	8.5	0.350	21.0	29.1	33.2
0.105	3.5	7.2	9.0	0.355	21.4	29.6	33.7
0.110	3.8	7.6	9.5	0.360	21.8	30.0	34.2
0.115	4.0	8.0	9.9	0.365	22.2	30.5	34.7
0.120	4.3	8.4	10.4	0.370	22.6	31.0	35.2
0.125	4.6	8.8	10.9	0.375	23.0	31.5	35.7
0.130	4.9	9.2	11.4	0.380	23.5	31.9	36.2
0.135	5.2	9.7	11.9	0.385	23.9	32.4	36.7
0.140	5.5	10.1	12.4	0.390	24.3	32.9	37.2
0.145	5.8	10.5	12.9	0.395	24.7	33.4	37.7
0.150	6.1	10.9	13.3	0.400	25.2	33.8	38.2
0.155	6.5	11.4	13.8	0.405	25.6	34.3	38.7
0.160	6.8	11.8	14.3	0.410	26.0	34.8	39.2
0.165	7.1	12.2	14.8	0.415	26.5	35.3	39.7
0.170	7.4	12.7	15.3	0.420	26.9	35.8	40.2
0.175	7.8	13.1	15.8	0.425	27.3	36.3	40.7
0.180	8.1	13.6	16.3	0.430	27.8	36.7	41.2
0.185	8.4	14.0	16.8	0.435	28.2	37.2	41.7
0.190	8.8	14.4	17.3	0.440	28.7	37.7	42.2
0.195	9.1	14.9	17.8	0.445	29.1	38.2	42.7
0.200	9.5	15.3	18.2	0.450	29.5	38.7	43.2
0.205	9.8	15.8	18.7	0.455	30.0	39.2	43.7
0.210	10.2	16.2	19.2	0.460	30.4	39.6	44.2
0.215	10.5	16.7	19.7	0.465	30.9	40.1	44.7
0.220	10.9	17.1	20.2	0.470	31.3	40.6	45.3
0.225	11.2	17.6	20.7	0.475	31.8	41.1	45.8
0.230	11.6	18.0	21.2	0.480	32.2	41.6	46.3
0.235	12.0	18.5	21.7	0.485	32.7	42.1	46.8
0.240	12.3	18.9	22.2	0.490	33.2	42.6	47.3
0.245	12.7	19.4	22.7	0.495	33.6	43.1	47.8
0.250	13.1	19.8	23.2	0.500	34.1	43.6	48.3

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 133.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.0	0.2	0.2	0.255	19.6	27.8	31.9
0.010	0.0	0.5	0.7	0.260	20.2	28.4	32.6
0.015	0.1	0.8	1.2	0.265	20.7	29.1	33.2
0.020	0.2	1.2	1.7	0.270	21.2	29.7	33.9
0.025	0.4	1.7	2.3	0.275	21.8	30.3	34.6
0.030	0.6	2.1	2.9	0.280	22.3	30.9	35.2
0.035	0.8	2.6	3.5	0.285	22.8	31.5	35.9
0.040	1.0	3.1	4.1	0.290	23.4	32.2	36.5
0.045	1.3	3.6	4.7	0.295	23.9	32.8	37.2
0.050	1.6	4.1	5.3	0.300	24.5	33.4	37.9
0.055	1.9	4.6	5.9	0.305	25.0	34.0	38.5
0.060	2.2	5.1	6.6	0.310	25.6	34.6	39.2
0.065	2.5	5.6	7.2	0.315	26.1	35.3	39.9
0.070	2.8	6.2	7.8	0.320	26.7	35.9	40.5
0.075	3.2	6.7	8.5	0.325	27.2	36.5	41.2
0.080	3.5	7.2	9.1	0.330	27.8	37.2	41.9
0.085	3.9	7.8	9.7	0.335	28.3	37.8	42.5
0.090	4.3	8.3	10.4	0.340	28.9	38.4	43.2
0.095	4.7	8.9	11.0	0.345	29.5	39.1	43.8
0.100	5.0	9.4	11.7	0.350	30.0	39.7	44.5
0.105	5.4	10.0	12.3	0.355	30.6	40.3	45.2
0.110	5.8	10.6	12.9	0.360	31.2	41.0	45.8
0.115	6.3	11.1	13.6	0.365	31.8	41.6	46.5
0.120	6.7	11.7	14.2	0.370	32.3	42.2	47.2
0.125	7.1	12.3	14.9	0.375	32.9	42.9	47.8
0.130	7.5	12.9	15.5	0.380	33.5	43.5	48.5
0.135	8.0	13.4	16.2	0.385	34.1	44.1	49.2
0.140	8.4	14.0	16.8	0.390	34.7	44.8	49.8
0.145	8.9	14.6	17.5	0.395	35.2	45.4	50.5
0.150	9.3	15.2	18.1	0.400	35.8	46.1	51.2
0.155	9.8	15.8	18.8	0.405	36.4	46.7	51.9
0.160	10.2	16.4	19.4	0.410	37.0	47.4	52.5
0.165	10.7	16.9	20.1	0.415	37.6	48.0	53.2
0.170	11.1	17.5	20.7	0.420	38.2	48.6	53.9
0.175	11.6	18.1	21.4	0.425	38.8	49.3	54.5
0.180	12.1	18.7	22.0	0.430	39.4	49.9	55.2
0.185	12.6	19.3	22.7	0.435	40.0	50.6	55.9
0.190	13.1	19.9	23.4	0.440	40.6	51.2	56.5
0.195	13.5	20.5	24.0	0.445	41.2	51.9	57.2
0.200	14.0	21.1	24.7	0.450	41.8	52.5	57.9
0.205	14.5	21.7	25.3	0.455	42.4	53.2	58.5
0.210	15.0	22.3	26.0	0.460	43.0	53.8	59.2
0.215	15.5	22.9	26.6	0.465	43.6	54.5	59.9
0.220	16.0	23.5	27.3	0.470	44.3	55.1	60.6
0.225	16.5	24.1	28.0	0.475	44.9	55.8	61.2
0.230	17.0	24.8	28.6	0.480	45.5	56.4	61.9
0.235	17.6	25.4	29.3	0.485	46.1	57.1	62.6
0.240	18.1	26.0	29.9	0.490	46.7	57.7	63.2
0.245	18.6	26.6	30.6	0.495	47.4	58.4	63.9
0.250	19.1	27.2	31.2	0.500	48.0	59.1	64.6

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 150.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.0	0.2	0.3	0.255	22.9	31.7	36.2
0.010	0.1	0.5	0.8	0.260	23.5	32.4	36.9
0.015	0.2	1.0	1.4	0.265	24.1	33.1	37.6
0.020	0.3	1.4	2.0	0.270	24.8	33.8	38.4
0.025	0.5	1.9	2.7	0.275	25.4	34.5	39.1
0.030	0.7	2.5	3.3	0.280	26.0	35.2	39.9
0.035	1.0	3.0	4.0	0.285	26.6	36.0	40.6
0.040	1.3	3.6	4.7	0.290	27.2	36.7	41.4
0.045	1.6	4.1	5.4	0.295	27.8	37.4	42.1
0.050	1.9	4.7	6.1	0.300	28.5	38.1	42.9
0.055	2.3	5.3	6.8	0.305	29.1	38.8	43.6
0.060	2.7	5.9	7.5	0.310	29.7	39.5	44.4
0.065	3.0	6.5	8.2	0.315	30.4	40.2	45.1
0.070	3.4	7.1	9.0	0.320	31.0	40.9	45.9
0.075	3.9	7.7	9.7	0.325	31.6	41.6	46.6
0.080	4.3	8.3	10.4	0.330	32.3	42.3	47.4
0.085	4.7	9.0	11.1	0.335	32.9	43.0	48.1
0.090	5.1	9.6	11.8	0.340	33.6	43.8	48.9
0.095	5.6	10.2	12.6	0.345	34.2	44.5	49.6
0.100	6.1	10.9	13.3	0.350	34.9	45.2	50.4
0.105	6.5	11.5	14.0	0.355	35.5	45.9	51.1
0.110	7.0	12.2	14.7	0.360	36.2	46.6	51.9
0.115	7.5	12.8	15.5	0.365	36.8	47.3	52.6
0.120	8.0	13.5	16.2	0.370	37.5	48.1	53.4
0.125	8.5	14.1	16.9	0.375	38.1	48.8	54.1
0.130	9.0	14.8	17.7	0.380	38.8	49.5	54.9
0.135	9.5	15.4	18.4	0.385	39.5	50.2	55.6
0.140	10.0	16.1	19.1	0.390	40.1	51.0	56.4
0.145	10.5	16.7	19.9	0.395	40.8	51.7	57.1
0.150	11.0	17.4	20.6	0.400	41.5	52.4	57.9
0.155	11.5	18.1	21.3	0.405	42.1	53.1	58.6
0.160	12.1	18.7	22.1	0.410	42.8	53.9	59.4
0.165	12.6	19.4	22.8	0.415	43.5	54.6	60.1
0.170	13.2	20.1	23.5	0.420	44.2	55.3	60.9
0.175	13.7	20.8	24.3	0.425	44.8	56.0	61.7
0.180	14.2	21.4	25.0	0.430	45.5	56.8	62.4
0.185	14.8	22.1	25.8	0.435	46.2	57.5	63.2
0.190	15.4	22.8	26.5	0.440	46.9	58.2	63.9
0.195	15.9	23.5	27.2	0.445	47.6	59.0	64.7
0.200	16.5	24.1	28.0	0.450	48.3	59.7	65.4
0.205	17.1	24.8	28.7	0.455	49.0	60.4	66.2
0.210	17.6	25.5	29.5	0.460	49.6	61.2	66.9
0.215	18.2	26.2	30.2	0.465	50.3	61.9	67.7
0.220	18.8	26.9	30.9	0.470	51.0	62.6	68.5
0.225	19.4	27.6	31.7	0.475	51.7	63.4	69.2
0.230	20.0	28.3	32.4	0.480	52.4	64.1	70.0
0.235	20.5	29.0	33.2	0.485	53.1	64.9	70.7
0.240	21.1	29.7	33.9	0.490	53.9	65.6	71.5
0.245	21.7	30.4	34.7	0.495	54.6	66.3	72.2
0.250	22.3	31.0	35.4	0.500	55.3	67.1	73.0

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 200.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.0	0.3	0.4	0.255	32.9	43.4	48.7
0.010	0.1	0.8	1.2	0.260	33.8	44.4	49.7
0.015	0.3	1.4	2.0	0.265	34.6	45.3	50.7
0.020	0.6	2.1	2.9	0.270	35.4	46.2	51.6
0.025	0.9	2.8	3.8	0.275	36.3	47.2	52.6
0.030	1.3	3.6	4.7	0.280	37.1	48.1	53.6
0.035	1.7	4.3	5.6	0.285	38.0	49.1	54.6
0.040	2.2	5.1	6.6	0.290	38.8	50.0	55.6
0.045	2.7	5.9	7.5	0.295	39.7	51.0	56.6
0.050	3.2	6.7	8.5	0.300	40.6	51.9	57.6
0.055	3.7	7.5	9.4	0.305	41.4	52.9	58.6
0.060	4.2	8.3	10.4	0.310	42.3	53.8	59.6
0.065	4.8	9.2	11.3	0.315	43.2	54.8	60.6
0.070	5.4	10.0	12.3	0.320	44.0	55.8	61.6
0.075	6.0	10.8	13.3	0.325	44.9	56.7	62.6
0.080	6.6	11.7	14.2	0.330	45.8	57.7	63.6
0.085	7.3	12.5	15.2	0.335	46.7	58.6	64.6
0.090	7.9	13.4	16.2	0.340	47.6	59.6	65.6
0.095	8.5	14.3	17.1	0.345	48.4	60.6	66.6
0.100	9.2	15.1	18.1	0.350	49.3	61.5	67.6
0.105	9.9	16.0	19.1	0.355	50.2	62.5	68.6
0.110	10.6	16.9	20.1	0.360	51.1	63.4	69.6
0.115	11.3	17.8	21.0	0.365	52.0	64.4	70.6
0.120	11.9	18.7	22.0	0.370	52.9	65.4	71.6
0.125	12.7	19.5	23.0	0.375	53.8	66.3	72.6
0.130	13.4	20.4	24.0	0.380	54.7	67.3	73.6
0.135	14.1	21.3	24.9	0.385	55.6	68.3	74.6
0.140	14.8	22.2	25.9	0.390	56.5	69.3	75.6
0.145	15.5	23.1	26.9	0.395	57.4	70.2	76.6
0.150	16.3	24.0	27.9	0.400	58.3	71.2	77.6
0.155	17.0	24.9	28.9	0.405	59.3	72.2	78.6
0.160	17.8	25.8	29.9	0.410	60.2	73.1	79.6
0.165	18.5	26.7	30.8	0.415	61.1	74.1	80.6
0.170	19.3	27.7	31.8	0.420	62.0	75.1	81.6
0.175	20.1	28.6	32.8	0.425	62.9	76.1	82.6
0.180	20.8	29.5	33.8	0.430	63.9	77.1	83.6
0.185	21.6	30.4	34.8	0.435	64.8	78.0	84.7
0.190	22.4	31.3	35.8	0.440	65.7	79.0	85.7
0.195	23.2	32.2	36.8	0.445	66.7	80.0	86.7
0.200	24.0	33.2	37.8	0.450	67.6	81.0	87.7
0.205	24.8	34.1	38.7	0.455	68.5	82.0	88.7
0.210	25.6	35.0	39.7	0.460	69.5	82.9	89.7
0.215	26.4	35.9	40.7	0.465	70.4	83.9	90.7
0.220	27.2	36.9	41.7	0.470	71.4	84.9	91.7
0.225	28.0	37.8	42.7	0.475	72.3	85.9	92.7
0.230	28.8	38.7	43.7	0.480	73.3	86.9	93.7
0.235	29.6	39.7	44.7	0.485	74.2	87.9	94.7
0.240	30.4	40.6	45.7	0.490	75.2	88.9	95.7
0.245	31.3	41.5	46.7	0.495	76.1	89.9	96.7
0.250	32.1	42.5	47.7	0.500	77.1	90.8	97.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 250.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.0	0.4	0.6	0.255	43.3	55.2	61.2
0.010	0.2	1.1	1.6	0.260	44.3	56.4	62.4
0.015	0.5	1.9	2.7	0.265	45.4	57.6	63.7
0.020	0.9	2.8	3.8	0.270	46.5	58.8	64.9
0.025	1.4	3.8	4.9	0.275	47.6	60.0	66.2
0.030	1.9	4.7	6.1	0.280	48.6	61.2	67.4
0.035	2.5	5.7	7.3	0.285	49.7	62.4	68.7
0.040	3.2	6.7	8.4	0.290	50.8	63.6	69.9
0.045	3.8	7.7	9.6	0.295	51.9	64.7	71.2
0.050	4.5	8.7	10.8	0.300	53.0	65.9	72.4
0.055	5.2	9.8	12.0	0.305	54.1	67.1	73.7
0.060	6.0	10.8	13.2	0.310	55.2	68.3	74.9
0.065	6.8	11.9	14.4	0.315	56.3	69.5	76.1
0.070	7.5	12.9	15.6	0.320	57.4	70.7	77.4
0.075	8.3	14.0	16.9	0.325	58.6	71.9	78.6
0.080	9.2	15.1	18.1	0.330	59.7	73.1	79.9
0.085	10.0	16.2	19.3	0.335	60.8	74.4	81.1
0.090	10.8	17.3	20.5	0.340	61.9	75.6	82.4
0.095	11.7	18.4	21.7	0.345	63.0	76.8	83.6
0.100	12.6	19.5	22.9	0.350	64.2	78.0	84.9
0.105	13.5	20.6	24.2	0.355	65.3	79.2	86.1
0.110	14.4	21.7	25.4	0.360	66.4	80.4	87.4
0.115	15.3	22.8	26.6	0.365	67.6	81.6	88.6
0.120	16.2	24.0	27.8	0.370	68.7	82.8	89.9
0.125	17.1	25.1	29.1	0.375	69.9	84.0	91.1
0.130	18.0	26.2	30.3	0.380	71.0	85.3	92.4
0.135	19.0	27.3	31.5	0.385	72.1	86.5	93.6
0.140	19.9	28.5	32.8	0.390	73.3	87.7	94.9
0.145	20.9	29.6	34.0	0.395	74.4	88.9	96.1
0.150	21.8	30.7	35.2	0.400	75.6	90.1	97.4
0.155	22.8	31.9	36.4	0.405	76.8	91.4	98.6
0.160	23.8	33.0	37.7	0.410	77.9	92.6	99.9
0.165	24.7	34.2	38.9	0.415	79.1	93.8	101.2
0.170	25.7	35.3	40.1	0.420	80.3	95.0	102.4
0.175	26.7	36.5	41.4	0.425	81.4	96.2	103.7
0.180	27.7	37.6	42.6	0.430	82.6	97.5	104.9
0.185	28.7	38.8	43.8	0.435	83.8	98.7	106.2
0.190	29.7	40.0	45.1	0.440	85.0	99.9	107.4
0.195	30.7	41.1	46.3	0.445	86.1	101.2	108.7
0.200	31.8	42.3	47.6	0.450	87.3	102.4	109.9
0.205	32.8	43.5	48.8	0.455	88.5	103.6	111.2
0.210	33.8	44.6	50.0	0.460	89.7	104.9	112.4
0.215	34.8	45.8	51.3	0.465	90.9	106.1	113.7
0.220	35.9	47.0	52.5	0.470	92.1	107.3	115.0
0.225	36.9	48.1	53.8	0.475	93.3	108.6	116.2
0.230	38.0	49.3	55.0	0.480	94.5	109.8	117.5
0.235	39.0	50.5	56.2	0.485	95.7	111.0	118.7
0.240	40.1	51.7	57.5	0.490	96.9	112.3	120.0
0.245	41.1	52.9	58.7	0.495	98.1	113.5	121.2
0.250	42.2	54.0	60.0	0.500	99.3	114.8	122.5

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 284.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.1	0.5	0.7	0.255	50.4	63.3	69.7
0.010	0.3	1.3	1.9	0.260	51.7	64.7	71.2
0.015	0.7	2.3	3.1	0.265	52.9	66.0	72.6
0.020	1.2	3.3	4.4	0.270	54.1	67.4	74.0
0.025	1.8	4.4	5.7	0.275	55.4	68.7	75.4
0.030	2.4	5.5	7.0	0.280	56.6	70.1	76.8
0.035	3.1	6.6	8.4	0.285	57.9	71.4	78.2
0.040	3.9	7.8	9.7	0.290	59.1	72.8	79.6
0.045	4.7	9.0	11.1	0.295	60.4	74.2	81.1
0.050	5.5	10.1	12.5	0.300	61.6	75.5	82.5
0.055	6.3	11.3	13.8	0.305	62.9	76.9	83.9
0.060	7.2	12.5	15.2	0.310	64.2	78.3	85.3
0.065	8.1	13.8	16.6	0.315	65.4	79.6	86.7
0.070	9.1	15.0	17.9	0.320	66.7	81.0	88.1
0.075	10.0	16.2	19.3	0.325	68.0	82.4	89.5
0.080	11.0	17.5	20.7	0.330	69.3	83.7	91.0
0.085	11.9	18.7	22.1	0.335	70.5	85.1	92.4
0.090	12.9	20.0	23.5	0.340	71.8	86.5	93.8
0.095	13.9	21.2	24.9	0.345	73.1	87.9	95.2
0.100	15.0	22.5	26.2	0.350	74.4	89.2	96.6
0.105	16.0	23.8	27.6	0.355	75.7	90.6	98.1
0.110	17.0	25.0	29.0	0.360	77.0	92.0	99.5
0.115	18.1	26.3	30.4	0.365	78.3	93.4	100.9
0.120	19.1	27.6	31.8	0.370	79.6	94.8	102.3
0.125	20.2	28.9	33.2	0.375	80.9	96.1	103.7
0.130	21.3	30.2	34.6	0.380	82.2	97.5	105.2
0.135	22.4	31.5	36.0	0.385	83.5	98.9	106.6
0.140	23.5	32.8	37.4	0.390	84.9	100.3	108.0
0.145	24.6	34.1	38.8	0.395	86.2	101.7	109.4
0.150	25.7	35.4	40.2	0.400	87.5	103.1	110.8
0.155	26.8	36.7	41.6	0.405	88.8	104.5	112.3
0.160	27.9	38.0	43.0	0.410	90.2	105.8	113.7
0.165	29.1	39.3	44.4	0.415	91.5	107.2	115.1
0.170	30.2	40.6	45.8	0.420	92.8	108.6	116.5
0.175	31.4	41.9	47.2	0.425	94.2	110.0	118.0
0.180	32.5	43.2	48.6	0.430	95.5	111.4	119.4
0.185	33.7	44.6	50.0	0.435	96.8	112.8	120.8
0.190	34.8	45.9	51.4	0.440	98.2	114.2	122.2
0.195	36.0	47.2	52.8	0.445	99.5	115.6	123.7
0.200	37.2	48.6	54.2	0.450	100.9	117.0	125.1
0.205	38.4	49.9	55.6	0.455	102.2	118.4	126.5
0.210	39.5	51.2	57.1	0.460	103.6	119.8	127.9
0.215	40.7	52.6	58.5	0.465	105.0	121.2	129.4
0.220	41.9	53.9	59.9	0.470	106.3	122.6	130.8
0.225	43.1	55.2	61.3	0.475	107.7	124.0	132.2
0.230	44.3	56.6	62.7	0.480	109.0	125.4	133.6
0.235	45.5	57.9	64.1	0.485	110.4	126.8	135.1
0.240	46.8	59.3	65.5	0.490	111.8	128.3	136.5
0.245	48.0	60.6	66.9	0.495	113.2	129.7	137.9
0.250	49.2	62.0	68.3	0.500	114.5	131.1	139.3

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 300.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.1	0.5	0.8	0.255	53.8	67.1	73.8
0.010	0.3	1.4	2.0	0.260	55.1	68.5	75.3
0.015	0.7	2.5	3.3	0.265	56.4	70.0	76.7
0.020	1.3	3.6	4.7	0.270	57.8	71.4	78.2
0.025	1.9	4.7	6.1	0.275	59.1	72.8	79.7
0.030	2.6	5.9	7.5	0.280	60.4	74.3	81.2
0.035	3.4	7.1	8.9	0.285	61.7	75.7	82.7
0.040	4.2	8.3	10.3	0.290	63.0	77.2	84.2
0.045	5.1	9.5	11.8	0.295	64.4	78.6	85.7
0.050	6.0	10.8	13.2	0.300	65.7	80.0	87.2
0.055	6.9	12.1	14.7	0.305	67.1	81.5	88.7
0.060	7.8	13.4	16.1	0.310	68.4	82.9	90.2
0.065	8.8	14.6	17.6	0.315	69.7	84.4	91.7
0.070	9.8	15.9	19.0	0.320	71.1	85.8	93.2
0.075	10.8	17.3	20.5	0.325	72.4	87.3	94.7
0.080	11.8	18.6	21.9	0.330	73.8	88.7	96.2
0.085	12.9	19.9	23.4	0.335	75.2	90.2	97.7
0.090	13.9	21.2	24.9	0.340	76.5	91.6	99.2
0.095	15.0	22.6	26.3	0.345	77.9	93.1	100.7
0.100	16.1	23.9	27.8	0.350	79.3	94.5	102.2
0.105	17.2	25.2	29.3	0.355	80.6	96.0	103.7
0.110	18.3	26.6	30.7	0.360	82.0	97.5	105.2
0.115	19.4	28.0	32.2	0.365	83.4	98.9	106.7
0.120	20.6	29.3	33.7	0.370	84.8	100.4	108.2
0.125	21.7	30.7	35.2	0.375	86.2	101.8	109.7
0.130	22.9	32.0	36.6	0.380	87.6	103.3	111.2
0.135	24.0	33.4	38.1	0.385	88.9	104.8	112.7
0.140	25.2	34.8	39.6	0.390	90.3	106.2	114.2
0.145	26.4	36.2	41.1	0.395	91.7	107.7	115.7
0.150	27.5	37.5	42.6	0.400	93.1	109.2	117.2
0.155	28.7	38.9	44.0	0.405	94.5	110.6	118.7
0.160	29.9	40.3	45.5	0.410	95.9	112.1	120.2
0.165	31.1	41.7	47.0	0.415	97.4	113.6	121.7
0.170	32.4	43.1	48.5	0.420	98.8	115.1	123.2
0.175	33.6	44.5	50.0	0.425	100.2	116.5	124.7
0.180	34.8	45.9	51.4	0.430	101.6	118.0	126.2
0.185	36.0	47.3	52.9	0.435	103.0	119.5	127.7
0.190	37.3	48.7	54.4	0.440	104.5	121.0	129.2
0.195	38.5	50.1	55.9	0.445	105.9	122.4	130.7
0.200	39.8	51.5	57.4	0.450	107.3	123.9	132.2
0.205	41.0	52.9	58.9	0.455	108.7	125.4	133.7
0.210	42.3	54.3	60.4	0.460	110.2	126.9	135.2
0.215	43.5	55.7	61.8	0.465	111.6	128.4	136.7
0.220	44.8	57.2	63.3	0.470	113.1	129.8	138.2
0.225	46.1	58.6	64.8	0.475	114.5	131.3	139.7
0.230	47.4	60.0	66.3	0.480	115.9	132.8	141.2
0.235	48.6	61.4	67.8	0.485	117.4	134.3	142.8
0.240	49.9	62.8	69.3	0.490	118.8	135.8	144.3
0.245	51.2	64.3	70.8	0.495	120.3	137.3	145.8
0.250	52.5	65.7	72.3	0.500	121.8	138.8	147.3

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 350.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.1	0.7	1.0	0.255	64.6	79.1	86.3
0.010	0.4	1.8	2.4	0.260	66.1	80.8	88.1
0.015	1.0	3.0	4.0	0.265	67.7	82.4	89.8
0.020	1.7	4.3	5.6	0.270	69.2	84.1	91.6
0.025	2.5	5.7	7.3	0.275	70.8	85.8	93.3
0.030	3.4	7.1	8.9	0.280	72.3	87.5	95.0
0.035	4.4	8.5	10.6	0.285	73.9	89.2	96.8
0.040	5.4	10.0	12.3	0.290	75.5	90.8	98.5
0.045	6.4	11.4	13.9	0.295	77.0	92.5	100.3
0.050	7.5	12.9	15.6	0.300	78.6	94.2	102.0
0.055	8.6	14.4	17.3	0.305	80.2	95.9	103.8
0.060	9.8	15.9	19.0	0.310	81.8	97.6	105.5
0.065	10.9	17.5	20.7	0.315	83.3	99.3	107.3
0.070	12.1	19.0	22.4	0.320	84.9	101.0	109.0
0.075	13.4	20.5	24.1	0.325	86.5	102.7	110.7
0.080	14.6	22.1	25.8	0.330	88.1	104.4	112.5
0.085	15.9	23.6	27.5	0.335	89.7	106.1	114.2
0.090	17.1	25.2	29.2	0.340	91.3	107.8	116.0
0.095	18.4	26.8	31.0	0.345	92.9	109.5	117.7
0.100	19.7	28.4	32.7	0.350	94.6	111.2	119.5
0.105	21.1	29.9	34.4	0.355	96.2	112.9	121.2
0.110	22.4	31.5	36.1	0.360	97.8	114.6	123.0
0.115	23.7	33.1	37.8	0.365	99.4	116.3	124.7
0.120	25.1	34.7	39.6	0.370	101.0	118.0	126.5
0.125	26.4	36.3	41.3	0.375	102.7	119.7	128.2
0.130	27.8	37.9	43.0	0.380	104.3	121.4	130.0
0.135	29.2	39.6	44.7	0.385	105.9	123.1	131.7
0.140	30.6	41.2	46.4	0.390	107.6	124.8	133.5
0.145	32.0	42.8	48.2	0.395	109.2	126.6	135.2
0.150	33.4	44.4	49.9	0.400	110.9	128.3	137.0
0.155	34.8	46.0	51.6	0.405	112.5	130.0	138.7
0.160	36.3	47.7	53.4	0.410	114.2	131.7	140.5
0.165	37.7	49.3	55.1	0.415	115.8	133.4	142.2
0.170	39.1	50.9	56.8	0.420	117.5	135.2	144.0
0.175	40.6	52.6	58.6	0.425	119.2	136.9	145.7
0.180	42.0	54.2	60.3	0.430	120.8	138.6	147.5
0.185	43.5	55.8	62.0	0.435	122.5	140.3	149.3
0.190	45.0	57.5	63.7	0.440	124.2	142.1	151.0
0.195	46.4	59.1	65.5	0.445	125.8	143.8	152.8
0.200	47.9	60.8	67.2	0.450	127.5	145.5	154.5
0.205	49.4	62.4	69.0	0.455	129.2	147.2	156.3
0.210	50.9	64.1	70.7	0.460	130.9	149.0	158.0
0.215	52.4	65.8	72.4	0.465	132.6	150.7	159.8
0.220	53.9	67.4	74.2	0.470	134.2	152.4	161.5
0.225	55.4	69.1	75.9	0.475	135.9	154.2	163.3
0.230	56.9	70.7	77.6	0.480	137.6	155.9	165.1
0.235	58.4	72.4	79.4	0.485	139.3	157.6	166.8
0.240	60.0	74.1	81.1	0.490	141.0	159.4	168.6
0.245	61.5	75.7	82.9	0.495	142.7	161.1	170.3
0.250	63.0	77.4	84.6	0.500	144.4	162.9	172.1

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 400.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.1	0.8	1.2	0.255	75.4	91.1	98.9
0.010	0.6	2.1	2.9	0.260	77.2	93.0	100.9
0.015	1.3	3.6	4.7	0.265	79.0	94.9	102.9
0.020	2.2	5.1	6.6	0.270	80.8	96.9	104.9
0.025	3.1	6.7	8.4	0.275	82.6	98.8	106.9
0.030	4.2	8.3	10.3	0.280	84.4	100.7	108.9
0.035	5.4	10.0	12.2	0.285	86.2	102.6	110.9
0.040	6.6	11.6	14.2	0.290	88.0	104.6	112.9
0.045	7.8	13.3	16.1	0.295	89.8	106.5	114.9
0.050	9.1	15.1	18.0	0.300	91.6	108.4	116.8
0.055	10.4	16.8	20.0	0.305	93.5	110.4	118.8
0.060	11.8	18.5	21.9	0.310	95.3	112.3	120.8
0.065	13.2	20.3	23.9	0.315	97.1	114.3	122.8
0.070	14.6	22.1	25.8	0.320	98.9	116.2	124.8
0.075	16.0	23.8	27.8	0.325	100.8	118.1	126.8
0.080	17.5	25.6	29.7	0.330	102.6	120.1	128.8
0.085	18.9	27.4	31.7	0.335	104.5	122.0	130.8
0.090	20.4	29.2	33.6	0.340	106.3	124.0	132.8
0.095	21.9	31.0	35.6	0.345	108.2	125.9	134.8
0.100	23.5	32.9	37.6	0.350	110.0	127.9	136.8
0.105	25.0	34.7	39.5	0.355	111.9	129.8	138.8
0.110	26.6	36.5	41.5	0.360	113.7	131.8	140.8
0.115	28.1	38.3	43.5	0.365	115.6	133.7	142.8
0.120	29.7	40.2	45.4	0.370	117.5	135.7	144.8
0.125	31.3	42.0	47.4	0.375	119.3	137.6	146.8
0.130	32.9	43.9	49.4	0.380	121.2	139.6	148.8
0.135	34.5	45.7	51.3	0.385	123.1	141.6	150.8
0.140	36.1	47.6	53.3	0.390	125.0	143.5	152.8
0.145	37.7	49.4	55.3	0.395	126.9	145.5	154.8
0.150	39.4	51.3	57.3	0.400	128.8	147.5	156.8
0.155	41.0	53.2	59.2	0.405	130.7	149.4	158.8
0.160	42.7	55.0	61.2	0.410	132.6	151.4	160.8
0.165	44.4	56.9	63.2	0.415	134.5	153.4	162.8
0.170	46.0	58.8	65.2	0.420	136.4	155.3	164.8
0.175	47.7	60.7	67.2	0.425	138.3	157.3	166.8
0.180	49.4	62.6	69.1	0.430	140.2	159.3	168.8
0.185	51.1	64.4	71.1	0.435	142.1	161.2	170.8
0.190	52.8	66.3	73.1	0.440	144.0	163.2	172.8
0.195	54.5	68.2	75.1	0.445	145.9	165.2	174.8
0.200	56.2	70.1	77.1	0.450	147.9	167.2	176.8
0.205	57.9	72.0	79.0	0.455	149.8	169.2	178.8
0.210	59.7	73.9	81.0	0.460	151.7	171.1	180.8
0.215	61.4	75.8	83.0	0.465	153.7	173.1	182.8
0.220	63.1	77.7	85.0	0.470	155.6	175.1	184.9
0.225	64.9	79.6	87.0	0.475	157.5	177.1	186.9
0.230	66.6	81.5	89.0	0.480	159.5	179.1	188.9
0.235	68.4	83.4	91.0	0.485	161.4	181.1	190.9
0.240	70.1	85.3	93.0	0.490	163.4	183.0	192.9
0.245	71.9	87.3	94.9	0.495	165.3	185.0	194.9
0.250	73.7	89.2	96.9	0.500	167.3	187.0	196.9

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 450.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.2	1.0	1.4	0.255	86.4	103.2	111.5
0.010	0.7	2.5	3.3	0.260	88.5	105.3	113.8
0.015	1.6	4.1	5.4	0.265	90.5	107.5	116.0
0.020	2.6	5.9	7.5	0.270	92.5	109.7	118.2
0.025	3.8	7.7	9.6	0.275	94.5	111.8	120.5
0.030	5.1	9.5	11.8	0.280	96.6	114.0	122.7
0.035	6.4	11.4	13.9	0.285	98.6	116.2	125.0
0.040	7.8	13.3	16.1	0.290	100.7	118.4	127.2
0.045	9.2	15.3	18.3	0.295	102.7	120.5	129.4
0.050	10.7	17.2	20.4	0.300	104.8	122.7	131.7
0.055	12.3	19.2	22.6	0.305	106.8	124.9	133.9
0.060	13.8	21.2	24.8	0.310	108.9	127.1	136.2
0.065	15.4	23.2	27.0	0.315	111.0	129.3	138.4
0.070	17.1	25.2	29.2	0.320	113.1	131.5	140.7
0.075	18.7	27.2	31.4	0.325	115.1	133.6	142.9
0.080	20.4	29.2	33.6	0.330	117.2	135.8	145.2
0.085	22.1	31.2	35.8	0.335	119.3	138.0	147.4
0.090	23.8	33.3	38.0	0.340	121.4	140.2	149.6
0.095	25.5	35.3	40.2	0.345	123.5	142.4	151.9
0.100	27.3	37.4	42.4	0.350	125.6	144.6	154.1
0.105	29.0	39.5	44.7	0.355	127.7	146.8	156.4
0.110	30.8	41.5	46.9	0.360	129.8	149.0	158.6
0.115	32.6	43.6	49.1	0.365	131.9	151.2	160.9
0.120	34.4	45.7	51.3	0.370	134.0	153.4	163.1
0.125	36.2	47.8	53.5	0.375	136.1	155.6	165.4
0.130	38.0	49.8	55.7	0.380	138.3	157.8	167.6
0.135	39.9	51.9	58.0	0.385	140.4	160.0	169.9
0.140	41.7	54.0	60.2	0.390	142.5	162.3	172.1
0.145	43.6	56.1	62.4	0.395	144.7	164.5	174.4
0.150	45.5	58.2	64.6	0.400	146.8	166.7	176.6
0.155	47.3	60.4	66.9	0.405	148.9	168.9	178.9
0.160	49.2	62.5	69.1	0.410	151.1	171.1	181.1
0.165	51.1	64.6	71.3	0.415	153.2	173.3	183.4
0.170	53.0	66.7	73.5	0.420	155.4	175.5	185.6
0.175	54.9	68.8	75.8	0.425	157.5	177.8	187.9
0.180	56.9	71.0	78.0	0.430	159.7	180.0	190.1
0.185	58.8	73.1	80.2	0.435	161.9	182.2	192.4
0.190	60.7	75.2	82.5	0.440	164.0	184.4	194.6
0.195	62.7	77.3	84.7	0.445	166.2	186.7	196.9
0.200	64.6	79.5	86.9	0.450	168.4	188.9	199.2
0.205	66.6	81.6	89.2	0.455	170.5	191.1	201.4
0.210	68.5	83.8	91.4	0.460	172.7	193.3	203.7
0.215	70.5	85.9	93.6	0.465	174.9	195.6	205.9
0.220	72.5	88.1	95.9	0.470	177.1	197.8	208.2
0.225	74.4	90.2	98.1	0.475	179.3	200.0	210.4
0.230	76.4	92.4	100.3	0.480	181.5	202.3	212.7
0.235	78.4	94.5	102.6	0.485	183.7	204.5	214.9
0.240	80.4	96.7	104.8	0.490	185.9	206.8	217.2
0.245	82.4	98.8	107.0	0.495	188.1	209.0	219.5
0.250	84.4	101.0	109.3	0.500	190.3	211.2	221.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 454.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.2	1.0	1.4	0.255	87.3	104.1	112.5
0.010	0.8	2.5	3.4	0.260	89.4	106.3	114.8
0.015	1.6	4.2	5.4	0.265	91.4	108.5	117.0
0.020	2.7	5.9	7.6	0.270	93.5	110.7	119.3
0.025	3.9	7.8	9.7	0.275	95.5	112.9	121.6
0.030	5.1	9.6	11.9	0.280	97.6	115.1	123.8
0.035	6.5	11.5	14.1	0.285	99.6	117.3	126.1
0.040	7.9	13.5	16.2	0.290	101.7	119.5	128.3
0.045	9.4	15.4	18.4	0.295	103.8	121.7	130.6
0.050	10.9	17.4	20.6	0.300	105.8	123.9	132.9
0.055	12.4	19.4	22.8	0.305	107.9	126.1	135.1
0.060	14.0	21.4	25.1	0.310	110.0	128.3	137.4
0.065	15.6	23.4	27.3	0.315	112.1	130.5	139.7
0.070	17.3	25.4	29.5	0.320	114.2	132.7	141.9
0.075	18.9	27.4	31.7	0.325	116.3	134.9	144.2
0.080	20.6	29.5	33.9	0.330	118.4	137.1	146.5
0.085	22.3	31.5	36.2	0.335	120.5	139.3	148.7
0.090	24.1	33.6	38.4	0.340	122.6	141.5	151.0
0.095	25.8	35.7	40.6	0.345	124.7	143.7	153.3
0.100	27.6	37.8	42.8	0.350	126.8	146.0	155.5
0.105	29.4	39.8	45.1	0.355	129.0	148.2	157.8
0.110	31.1	41.9	47.3	0.360	131.1	150.4	160.1
0.115	33.0	44.0	49.5	0.365	133.2	152.6	162.3
0.120	34.8	46.1	51.8	0.370	135.4	154.8	164.6
0.125	36.6	48.2	54.0	0.375	137.5	157.1	166.9
0.130	38.5	50.3	56.3	0.380	139.6	159.3	169.1
0.135	40.3	52.4	58.5	0.385	141.8	161.5	171.4
0.140	42.2	54.6	60.7	0.390	143.9	163.8	173.7
0.145	44.1	56.7	63.0	0.395	146.1	166.0	175.9
0.150	45.9	58.8	65.2	0.400	148.2	168.2	178.2
0.155	47.8	60.9	67.5	0.405	150.4	170.5	180.5
0.160	49.7	63.1	69.7	0.410	152.6	172.7	182.8
0.165	51.7	65.2	72.0	0.415	154.7	174.9	185.0
0.170	53.6	67.3	74.2	0.420	156.9	177.2	187.3
0.175	55.5	69.5	76.5	0.425	159.1	179.4	189.6
0.180	57.5	71.6	78.7	0.430	161.3	181.6	191.8
0.185	59.4	73.8	81.0	0.435	163.4	183.9	194.1
0.190	61.4	75.9	83.2	0.440	165.6	186.1	196.4
0.195	63.3	78.1	85.5	0.445	167.8	188.4	198.7
0.200	65.3	80.2	87.7	0.450	170.0	190.6	200.9
0.205	67.3	82.4	90.0	0.455	172.2	192.9	203.2
0.210	69.2	84.6	92.2	0.460	174.4	195.1	205.5
0.215	71.2	86.7	94.5	0.465	176.6	197.4	207.8
0.220	73.2	88.9	96.7	0.470	178.8	199.6	210.0
0.225	75.2	91.1	99.0	0.475	181.0	201.9	212.3
0.230	77.2	93.2	101.2	0.480	183.2	204.1	214.6
0.235	79.2	95.4	103.5	0.485	185.5	206.4	216.9
0.240	81.2	97.6	105.7	0.490	187.7	208.7	219.1
0.245	83.3	99.8	108.0	0.495	189.9	210.9	221.4
0.250	85.3	101.9	110.3	0.500	192.1	213.2	223.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 500.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.2	1.1	1.6	0.255	97.5	115.3	124.1
0.010	0.9	2.8	3.8	0.260	99.8	117.7	126.6
0.015	1.9	4.7	6.1	0.265	102.1	120.1	129.1
0.020	3.1	6.7	8.4	0.270	104.3	122.5	131.6
0.025	4.5	8.7	10.8	0.275	106.6	124.9	134.1
0.030	5.9	10.8	13.2	0.280	108.9	127.3	136.6
0.035	7.5	12.9	15.6	0.285	111.2	129.8	139.1
0.040	9.1	15.0	18.0	0.290	113.5	132.2	141.5
0.045	10.7	17.2	20.4	0.295	115.7	134.6	144.0
0.050	12.4	19.4	22.9	0.300	118.0	137.0	146.5
0.055	14.2	21.6	25.3	0.305	120.3	139.5	149.0
0.060	16.0	23.8	27.7	0.310	122.7	141.9	151.5
0.065	17.8	26.0	30.2	0.315	125.0	144.3	154.0
0.070	19.6	28.3	32.6	0.320	127.3	146.8	156.5
0.075	21.5	30.5	35.1	0.325	129.6	149.2	159.0
0.080	23.4	32.8	37.5	0.330	131.9	151.6	161.5
0.085	25.3	35.1	40.0	0.335	134.3	154.1	164.0
0.090	27.2	37.4	42.4	0.340	136.6	156.5	166.5
0.095	29.2	39.6	44.9	0.345	138.9	159.0	169.0
0.100	31.1	41.9	47.3	0.350	141.3	161.4	171.5
0.105	33.1	44.2	49.8	0.355	143.6	163.9	174.0
0.110	35.1	46.6	52.3	0.360	146.0	166.3	176.5
0.115	37.1	48.9	54.7	0.365	148.3	168.8	179.0
0.120	39.2	51.2	57.2	0.370	150.7	171.2	181.5
0.125	41.2	53.5	59.7	0.375	153.0	173.7	184.0
0.130	43.3	55.8	62.1	0.380	155.4	176.1	186.5
0.135	45.3	58.2	64.6	0.385	157.8	178.6	189.0
0.140	47.4	60.5	67.1	0.390	160.2	181.0	191.5
0.145	49.5	62.9	69.5	0.395	162.5	183.5	194.0
0.150	51.6	65.2	72.0	0.400	164.9	186.0	196.5
0.155	53.7	67.6	74.5	0.405	167.3	188.4	199.0
0.160	55.8	69.9	77.0	0.410	169.7	190.9	201.5
0.165	58.0	72.3	79.4	0.415	172.1	193.3	204.0
0.170	60.1	74.6	81.9	0.420	174.5	195.8	206.5
0.175	62.2	77.0	84.4	0.425	176.9	198.3	209.0
0.180	64.4	79.4	86.9	0.430	179.3	200.8	211.5
0.185	66.6	81.7	89.3	0.435	181.7	203.2	214.0
0.190	68.7	84.1	91.8	0.440	184.1	205.7	216.5
0.195	70.9	86.5	94.3	0.445	186.5	208.2	219.0
0.200	73.1	88.9	96.8	0.450	189.0	210.6	221.5
0.205	75.3	91.3	99.3	0.455	191.4	213.1	224.0
0.210	77.5	93.7	101.7	0.460	193.8	215.6	226.5
0.215	79.7	96.0	104.2	0.465	196.2	218.1	229.0
0.220	81.9	98.4	106.7	0.470	198.7	220.6	231.5
0.225	84.1	100.8	109.2	0.475	201.1	223.1	234.0
0.230	86.3	103.2	111.7	0.480	203.6	225.5	236.5
0.235	88.6	105.6	114.2	0.485	206.0	228.0	239.0
0.240	90.8	108.0	116.7	0.490	208.5	230.5	241.5
0.245	93.0	110.4	119.1	0.495	210.9	233.0	244.0
0.250	95.3	112.8	121.6	0.500	213.4	235.5	246.5

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 650.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.4	1.6	2.2	0.255	131.3	151.7	162.0
0.010	1.5	3.9	5.2	0.260	134.2	154.9	165.2
0.015	3.0	6.5	8.2	0.265	137.2	158.0	168.4
0.020	4.8	9.1	11.3	0.270	140.2	161.2	171.7
0.025	6.7	11.8	14.4	0.275	143.2	164.3	174.9
0.030	8.7	14.6	17.5	0.280	146.2	167.5	178.1
0.035	10.9	17.4	20.7	0.285	149.2	170.7	181.4
0.040	13.1	20.2	23.8	0.290	152.2	173.8	184.6
0.045	15.4	23.1	27.0	0.295	155.3	177.0	187.9
0.050	17.7	26.0	30.2	0.300	158.3	180.2	191.1
0.055	20.1	28.9	33.3	0.305	161.3	183.3	194.3
0.060	22.5	31.8	36.5	0.310	164.3	186.5	197.6
0.065	25.0	34.8	39.7	0.315	167.4	189.7	200.8
0.070	27.5	37.7	42.9	0.320	170.4	192.9	204.1
0.075	30.0	40.7	46.1	0.325	173.5	196.0	207.3
0.080	32.6	43.7	49.3	0.330	176.5	199.2	210.6
0.085	35.2	46.7	52.5	0.335	179.6	202.4	213.8
0.090	37.8	49.7	55.7	0.340	182.7	205.6	217.0
0.095	40.4	52.7	58.9	0.345	185.7	208.8	220.3
0.100	43.0	55.7	62.1	0.350	188.8	212.0	223.5
0.105	45.7	58.7	65.3	0.355	191.9	215.2	226.8
0.110	48.4	61.8	68.5	0.360	195.0	218.3	230.0
0.115	51.1	64.8	71.7	0.365	198.1	221.5	233.3
0.120	53.8	67.9	74.9	0.370	201.2	224.7	236.5
0.125	56.5	70.9	78.1	0.375	204.3	227.9	239.8
0.130	59.3	74.0	81.3	0.380	207.4	231.1	243.0
0.135	62.1	77.0	84.5	0.385	210.5	234.3	246.3
0.140	64.8	80.1	87.7	0.390	213.6	237.5	249.5
0.145	67.6	83.2	91.0	0.395	216.7	240.7	252.8
0.150	70.4	86.3	94.2	0.400	219.8	244.0	256.0
0.155	73.2	89.3	97.4	0.405	223.0	247.2	259.3
0.160	76.0	92.4	100.6	0.410	226.1	250.4	262.5
0.165	78.9	95.5	103.8	0.415	229.2	253.6	265.8
0.170	81.7	98.6	107.1	0.420	232.4	256.8	269.0
0.175	84.6	101.7	110.3	0.425	235.5	260.0	272.3
0.180	87.4	104.8	113.5	0.430	238.7	263.2	275.5
0.185	90.3	107.9	116.7	0.435	241.8	266.4	278.8
0.190	93.2	111.0	120.0	0.440	245.0	269.7	282.0
0.195	96.0	114.1	123.2	0.445	248.1	272.9	285.3
0.200	98.9	117.3	126.4	0.450	251.3	276.1	288.5
0.205	101.8	120.4	129.6	0.455	254.5	279.3	291.8
0.210	104.8	123.5	132.9	0.460	257.6	282.6	295.0
0.215	107.7	126.6	136.1	0.465	260.8	285.8	298.3
0.220	110.6	129.8	139.3	0.470	264.0	289.0	301.6
0.225	113.5	132.9	142.6	0.475	267.2	292.3	304.8
0.230	116.5	136.0	145.8	0.480	270.4	295.5	308.1
0.235	119.4	139.2	149.0	0.485	273.6	298.7	311.3
0.240	122.4	142.3	152.3	0.490	276.8	302.0	314.6
0.245	125.3	145.4	155.5	0.495	280.0	305.2	317.8
0.250	128.3	148.6	158.7	0.500	283.2	308.4	321.1

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 700.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.005	0.4	1.8	2.4	0.255	142.6	163.9	174.6
0.010	1.7	4.3	5.6	0.260	145.8	167.3	178.1
0.015	3.4	7.1	8.9	0.265	149.1	170.7	181.6
0.020	5.3	9.9	12.2	0.270	152.3	174.1	185.0
0.025	7.4	12.9	15.6	0.275	155.5	177.5	188.5
0.030	9.7	15.9	19.0	0.280	158.8	180.9	192.0
0.035	12.0	18.9	22.4	0.285	162.0	184.4	195.5
0.040	14.5	22.0	25.8	0.290	165.3	187.8	199.0
0.045	17.0	25.1	29.2	0.295	168.6	191.2	202.5
0.050	19.5	28.2	32.6	0.300	171.8	194.6	206.0
0.055	22.1	31.4	36.0	0.305	175.1	198.0	209.5
0.060	24.8	34.5	39.4	0.310	178.4	201.4	213.0
0.065	27.5	37.7	42.9	0.315	181.7	204.9	216.4
0.070	30.2	40.9	46.3	0.320	184.9	208.3	219.9
0.075	32.9	44.1	49.7	0.325	188.2	211.7	223.4
0.080	35.7	47.4	53.2	0.330	191.5	215.1	226.9
0.085	38.5	50.6	56.6	0.335	194.8	218.6	230.4
0.090	41.4	53.8	60.1	0.340	198.2	222.0	233.9
0.095	44.2	57.1	63.5	0.345	201.5	225.4	237.4
0.100	47.1	60.3	67.0	0.350	204.8	228.9	240.9
0.105	50.0	63.6	70.4	0.355	208.1	232.3	244.4
0.110	52.9	66.9	73.9	0.360	211.4	235.7	247.9
0.115	55.8	70.2	77.3	0.365	214.8	239.2	251.4
0.120	58.8	73.5	80.8	0.370	218.1	242.6	254.9
0.125	61.7	76.8	84.3	0.375	221.5	246.1	258.4
0.130	64.7	80.1	87.7	0.380	224.8	249.5	261.9
0.135	67.7	83.4	91.2	0.385	228.2	253.0	265.4
0.140	70.7	86.7	94.6	0.390	231.5	256.4	268.9
0.145	73.7	90.0	98.1	0.395	234.9	259.9	272.4
0.150	76.8	93.3	101.6	0.400	238.3	263.3	275.9
0.155	79.8	96.6	105.0	0.405	241.6	266.8	279.4
0.160	82.9	100.0	108.5	0.410	245.0	270.3	282.9
0.165	85.9	103.3	112.0	0.415	248.4	273.7	286.4
0.170	89.0	106.6	115.5	0.420	251.8	277.2	289.9
0.175	92.1	110.0	118.9	0.425	255.2	280.6	293.4
0.180	95.2	113.3	122.4	0.430	258.6	284.1	296.9
0.185	98.3	116.7	125.9	0.435	262.0	287.6	300.4
0.190	101.4	120.0	129.3	0.440	265.4	291.0	303.9
0.195	104.5	123.4	132.8	0.445	268.8	294.5	307.4
0.200	107.7	126.8	136.3	0.450	272.2	298.0	310.9
0.205	110.8	130.1	139.8	0.455	275.6	301.5	314.4
0.210	114.0	133.5	143.3	0.460	279.0	304.9	317.9
0.215	117.1	136.9	146.7	0.465	282.5	308.4	321.4
0.220	120.3	140.2	150.2	0.470	285.9	311.9	324.9
0.225	123.4	143.6	153.7	0.475	289.3	315.4	328.4
0.230	126.6	147.0	157.2	0.480	292.8	318.9	331.9
0.235	129.8	150.4	160.7	0.485	296.2	322.4	335.4
0.240	133.0	153.8	164.1	0.490	299.7	325.8	338.9
0.245	136.2	157.1	167.6	0.495	303.1	329.3	342.4
0.250	139.4	160.5	171.1	0.500	306.6	332.8	345.9

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 550.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.3	1.3	1.8	0.255	108.7	127.4	136.7
0.010	1.1	3.2	4.2	0.260	111.2	130.0	139.5
0.015	2.3	5.3	6.8	0.265	113.7	132.7	142.2
0.020	3.7	7.5	9.4	0.270	116.2	135.4	144.9
0.025	5.2	9.7	12.0	0.275	118.7	138.0	147.7
0.030	6.8	12.0	14.6	0.280	121.3	140.7	150.4
0.035	8.6	14.4	17.3	0.285	123.8	143.4	153.2
0.040	10.4	16.8	20.0	0.290	126.3	146.0	155.9
0.045	12.2	19.2	22.6	0.295	128.8	148.7	158.6
0.050	14.2	21.6	25.3	0.300	131.4	151.4	161.4
0.055	16.1	24.0	28.0	0.305	133.9	154.1	164.1
0.060	18.1	26.5	30.7	0.310	136.5	156.7	166.9
0.065	20.1	28.9	33.3	0.315	139.0	159.4	169.6
0.070	22.2	31.4	36.0	0.320	141.6	162.1	172.4
0.075	24.3	33.9	38.7	0.325	144.2	164.8	175.1
0.080	26.4	36.4	41.4	0.330	146.7	167.5	177.8
0.085	28.5	38.9	44.1	0.335	149.3	170.2	180.6
0.090	30.7	41.5	46.8	0.340	151.9	172.8	183.3
0.095	32.9	44.0	49.5	0.345	154.5	175.5	186.1
0.100	35.1	46.5	52.2	0.350	157.0	178.2	188.8
0.105	37.3	49.1	55.0	0.355	159.6	180.9	191.6
0.110	39.5	51.6	57.7	0.360	162.2	183.6	194.3
0.115	41.7	54.2	60.4	0.365	164.8	186.3	197.1
0.120	44.0	56.7	63.1	0.370	167.4	189.0	199.8
0.125	46.3	59.3	65.8	0.375	170.0	191.7	202.6
0.130	48.6	61.9	68.5	0.380	172.7	194.4	205.3
0.135	50.9	64.4	71.2	0.385	175.3	197.1	208.1
0.140	53.2	67.0	74.0	0.390	177.9	199.8	210.8
0.145	55.5	69.6	76.7	0.395	180.5	202.5	213.6
0.150	57.8	72.2	79.4	0.400	183.1	205.3	216.3
0.155	60.2	74.8	82.1	0.405	185.8	208.0	219.1
0.160	62.5	77.4	84.8	0.410	188.4	210.7	221.8
0.165	64.9	80.0	87.6	0.415	191.1	213.4	224.6
0.170	67.2	82.6	90.3	0.420	193.7	216.1	227.3
0.175	69.6	85.2	93.0	0.425	196.4	218.8	230.1
0.180	72.0	87.8	95.7	0.430	199.0	221.5	232.8
0.185	74.4	90.4	98.5	0.435	201.7	224.3	235.6
0.190	76.8	93.1	101.2	0.440	204.3	227.0	238.3
0.195	79.2	95.7	103.9	0.445	207.0	229.7	241.1
0.200	81.6	98.3	106.7	0.450	209.7	232.4	243.8
0.205	84.1	100.9	109.4	0.455	212.3	235.2	246.6
0.210	86.5	103.6	112.1	0.460	215.0	237.9	249.3
0.215	88.9	106.2	114.9	0.465	217.7	240.6	252.1
0.220	91.4	108.9	117.6	0.470	220.4	243.4	254.8
0.225	93.8	111.5	120.3	0.475	223.1	246.1	257.6
0.230	96.3	114.1	123.0	0.480	225.8	248.8	260.4
0.235	98.8	116.8	125.8	0.485	228.4	251.6	263.1
0.240	101.3	119.4	128.5	0.490	231.1	254.3	265.9
0.245	103.7	122.1	131.3	0.495	233.9	257.0	268.6
0.250	106.2	124.7	134.0	0.500	236.6	259.8	271.4

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 600.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.3	1.4	2.0	0.255	120.0	139.5	149.3
0.010	1.3	3.6	4.7	0.260	122.7	142.5	152.3
0.015	2.6	5.9	7.5	0.265	125.4	145.4	155.3
0.020	4.2	8.3	10.3	0.270	128.2	148.3	158.3
0.025	5.9	10.8	13.2	0.275	130.9	151.2	161.3
0.030	7.8	13.3	16.1	0.280	133.7	154.1	164.3
0.035	9.7	15.9	19.0	0.285	136.5	157.0	167.3
0.040	11.7	18.5	21.9	0.290	139.2	159.9	170.3
0.045	13.8	21.1	24.8	0.295	142.0	162.8	173.3
0.050	15.9	23.8	27.7	0.300	144.8	165.8	176.2
0.055	18.1	26.5	30.6	0.305	147.6	168.7	179.2
0.060	20.3	29.2	33.6	0.310	150.4	171.6	182.2
0.065	22.5	31.9	36.5	0.315	153.2	174.5	185.2
0.070	24.8	34.6	39.5	0.320	156.0	177.5	188.2
0.075	27.1	37.3	42.4	0.325	158.8	180.4	191.2
0.080	29.5	40.1	45.3	0.330	161.6	183.3	194.2
0.085	31.8	42.8	48.3	0.335	164.4	186.3	197.2
0.090	34.2	45.6	51.2	0.340	167.2	189.2	200.2
0.095	36.6	48.3	54.2	0.345	170.1	192.1	203.2
0.100	39.0	51.1	57.2	0.350	172.9	195.1	206.2
0.105	41.5	53.9	60.1	0.355	175.7	198.0	209.2
0.110	43.9	56.7	63.1	0.360	178.6	201.0	212.2
0.115	46.4	59.5	66.0	0.365	181.4	203.9	215.2
0.120	48.9	62.3	69.0	0.370	184.3	206.9	218.2
0.125	51.4	65.1	72.0	0.375	187.1	209.8	221.2
0.130	53.9	67.9	74.9	0.380	190.0	212.8	224.2
0.135	56.4	70.7	77.9	0.385	192.8	215.7	227.2
0.140	59.0	73.6	80.8	0.390	195.7	218.7	230.2
0.145	61.5	76.4	83.8	0.395	198.6	221.6	233.2
0.150	64.1	79.2	86.8	0.400	201.5	224.6	236.2
0.155	66.7	82.1	89.8	0.405	204.3	227.5	239.2
0.160	69.2	84.9	92.7	0.410	207.2	230.5	242.2
0.165	71.8	87.7	95.7	0.415	210.1	233.5	245.2
0.170	74.4	90.6	98.7	0.420	213.0	236.4	248.2
0.175	77.1	93.5	101.6	0.425	215.9	239.4	251.2
0.180	79.7	96.3	104.6	0.430	218.8	242.4	254.2
0.185	82.3	99.2	107.6	0.435	221.7	245.3	257.2
0.190	85.0	102.0	110.6	0.440	224.6	248.3	260.2
0.195	87.6	104.9	113.6	0.445	227.5	251.3	263.2
0.200	90.3	107.8	116.5	0.450	230.4	254.3	266.2
0.205	92.9	110.7	119.5	0.455	233.4	257.2	269.2
0.210	95.6	113.5	122.5	0.460	236.3	260.2	272.2
0.215	98.3	116.4	125.5	0.465	239.2	263.2	275.2
0.220	101.0	119.3	128.5	0.470	242.1	266.2	278.2
0.225	103.7	122.2	131.4	0.475	245.1	269.2	281.2
0.230	106.4	125.1	134.4	0.480	248.0	272.1	284.2
0.235	109.1	128.0	137.4	0.485	251.0	275.1	287.2
0.240	111.8	130.9	140.4	0.490	253.9	278.1	290.2
0.245	114.5	133.7	143.4	0.495	256.9	281.1	293.2
0.250	117.2	136.6	146.4	0.500	259.8	284.1	296.2

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 750.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.5	1.9	2.7	0.255	154.0	176.2	187.2
0.010	1.9	4.7	6.1	0.260	157.5	179.8	191.0
0.015	3.8	7.7	9.6	0.265	161.0	183.4	194.7
0.020	5.9	10.8	13.2	0.270	164.4	187.1	198.4
0.025	8.2	13.9	16.8	0.275	167.9	190.7	202.2
0.030	10.7	17.2	20.4	0.280	171.4	194.4	205.9
0.035	13.2	20.5	24.1	0.285	174.9	198.1	209.6
0.040	15.9	23.8	27.7	0.290	178.4	201.7	213.4
0.045	18.6	27.1	31.4	0.295	181.9	205.4	217.1
0.050	21.4	30.5	35.0	0.300	185.4	209.0	220.9
0.055	24.2	33.9	38.7	0.305	188.9	212.7	224.6
0.060	27.1	37.3	42.4	0.310	192.4	216.4	228.3
0.065	30.0	40.7	46.0	0.315	196.0	220.0	232.1
0.070	32.9	44.1	49.7	0.320	199.5	223.7	235.8
0.075	35.9	47.6	53.4	0.325	203.0	227.4	239.6
0.080	38.9	51.0	57.1	0.330	206.6	231.1	243.3
0.085	41.9	54.5	60.8	0.335	210.1	234.7	247.0
0.090	45.0	58.0	64.5	0.340	213.7	238.4	250.8
0.095	48.1	61.5	68.2	0.345	217.3	242.1	254.5
0.100	51.2	65.0	71.9	0.350	220.8	245.8	258.3
0.105	54.3	68.5	75.6	0.355	224.4	249.5	262.0
0.110	57.4	72.0	79.3	0.360	228.0	253.2	265.8
0.115	60.6	75.5	83.0	0.365	231.6	256.9	269.5
0.120	63.8	79.1	86.7	0.370	235.1	260.5	273.3
0.125	67.0	82.6	90.4	0.375	238.7	264.2	277.0
0.130	70.2	86.1	94.1	0.380	242.3	267.9	280.7
0.135	73.4	89.7	97.8	0.385	245.9	271.6	284.5
0.140	76.7	93.3	101.5	0.390	249.5	275.3	288.2
0.145	79.9	96.8	105.3	0.395	253.1	279.0	292.0
0.150	83.2	100.4	109.0	0.400	256.8	282.7	295.7
0.155	86.5	103.9	112.7	0.405	260.4	286.5	299.5
0.160	89.7	107.5	116.4	0.410	264.0	290.2	303.2
0.165	93.0	111.1	120.1	0.415	267.6	293.9	307.0
0.170	96.4	114.7	123.9	0.420	271.3	297.6	310.7
0.175	99.7	118.3	127.6	0.425	274.9	301.3	314.5
0.180	103.0	121.9	131.3	0.430	278.5	305.0	318.2
0.185	106.4	125.5	135.0	0.435	282.2	308.7	322.0
0.190	109.7	129.1	138.7	0.440	285.8	312.4	325.7
0.195	113.1	132.7	142.5	0.445	289.5	316.2	329.5
0.200	116.4	136.3	146.2	0.450	293.2	319.9	333.3
0.205	119.8	139.9	149.9	0.455	296.8	323.6	337.0
0.210	123.2	143.5	153.6	0.460	300.5	327.3	340.8
0.215	126.6	147.1	157.4	0.465	304.2	331.1	344.5
0.220	130.0	150.7	161.1	0.470	307.9	334.8	348.3
0.225	133.4	154.4	164.8	0.475	311.5	338.5	352.0
0.230	136.8	158.0	168.6	0.480	315.2	342.3	355.8
0.235	140.3	161.6	172.3	0.485	318.9	346.0	359.5
0.240	143.7	165.2	176.0	0.490	322.6	349.7	363.3
0.245	147.1	168.9	179.8	0.495	326.3	353.5	367.1
0.250	150.6	172.5	183.5	0.500	330.0	357.2	370.8

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 800.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.6	2.1	2.9	0.255	165.5	188.4	199.9
0.010	2.2	5.1	6.5	0.260	169.2	192.3	203.8
0.015	4.2	8.3	10.3	0.265	172.9	196.2	207.8
0.020	6.5	11.6	14.1	0.270	176.6	200.1	211.8
0.025	9.0	15.0	18.0	0.275	180.3	204.0	215.8
0.030	11.7	18.5	21.9	0.280	184.1	207.9	219.8
0.035	14.5	22.0	25.8	0.285	187.8	211.8	223.8
0.040	17.3	25.5	29.7	0.290	191.5	215.7	227.8
0.045	20.2	29.1	33.6	0.295	195.3	219.6	231.7
0.050	23.2	32.7	37.5	0.300	199.0	223.5	235.7
0.055	26.3	36.3	41.4	0.305	202.8	227.4	239.7
0.060	29.4	40.0	45.3	0.310	206.6	231.3	243.7
0.065	32.5	43.6	49.2	0.315	210.3	235.2	247.7
0.070	35.7	47.3	53.2	0.320	214.1	239.2	251.7
0.075	38.9	51.0	57.1	0.325	217.9	243.1	255.7
0.080	42.1	54.7	61.0	0.330	221.7	247.0	259.7
0.085	45.4	58.4	65.0	0.335	225.5	250.9	263.7
0.090	48.6	62.2	68.9	0.340	229.3	254.9	267.7
0.095	52.0	65.9	72.9	0.345	233.1	258.8	271.7
0.100	55.3	69.6	76.8	0.350	236.9	262.7	275.6
0.105	58.6	73.4	80.8	0.355	240.7	266.7	279.6
0.110	62.0	77.1	84.7	0.360	244.5	270.6	283.6
0.115	65.4	80.9	88.7	0.365	248.4	274.5	287.6
0.120	68.8	84.7	92.6	0.370	252.2	278.5	291.6
0.125	72.3	88.5	96.6	0.375	256.0	282.4	295.6
0.130	75.7	92.3	100.5	0.380	259.9	286.4	299.6
0.135	79.2	96.0	104.5	0.385	263.7	290.3	303.6
0.140	82.6	99.8	108.5	0.390	267.6	294.3	307.6
0.145	86.1	103.7	112.4	0.395	271.4	298.2	311.6
0.150	89.6	107.5	116.4	0.400	275.3	302.2	315.6
0.155	93.1	111.3	120.3	0.405	279.2	306.1	319.6
0.160	96.7	115.1	124.3	0.410	283.0	310.1	323.6
0.165	100.2	118.9	128.3	0.415	286.9	314.0	327.6
0.170	103.7	122.7	132.3	0.420	290.8	318.0	331.6
0.175	107.3	126.6	136.2	0.425	294.7	322.0	335.6
0.180	110.9	130.4	140.2	0.430	298.6	325.9	339.6
0.185	114.5	134.3	144.2	0.435	302.5	329.9	343.6
0.190	118.0	138.1	148.1	0.440	306.4	333.9	347.6
0.195	121.6	142.0	152.1	0.445	310.3	337.8	351.6
0.200	125.2	145.8	156.1	0.450	314.2	341.8	355.6
0.205	128.9	149.7	160.1	0.455	318.1	345.8	359.6
0.210	132.5	153.5	164.0	0.460	322.0	349.8	363.6
0.215	136.1	157.4	168.0	0.465	325.9	353.7	367.6
0.220	139.8	161.2	172.0	0.470	329.9	357.7	371.6
0.225	143.4	165.1	176.0	0.475	333.8	361.7	375.6
0.230	147.1	169.0	179.9	0.480	337.7	365.7	379.7
0.235	150.7	172.9	183.9	0.485	341.7	369.7	383.7
0.240	154.4	176.7	187.9	0.490	345.6	373.7	387.7
0.245	158.1	180.6	191.9	0.495	349.6	377.6	391.7
0.250	161.8	184.5	195.9	0.500	353.5	381.6	395.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 850.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.7	2.3	3.1	0.255	177.0	200.7	212.5
0.010	2.4	5.5	7.0	0.260	180.9	204.8	216.7
0.015	4.6	8.9	11.0	0.265	184.9	208.9	221.0
0.020	7.1	12.4	15.1	0.270	188.8	213.1	225.2
0.025	9.8	16.1	19.2	0.275	192.8	217.2	229.4
0.030	12.7	19.8	23.3	0.280	196.8	221.4	233.7
0.035	15.7	23.5	27.5	0.285	200.8	225.5	237.9
0.040	18.8	27.3	31.6	0.290	204.7	229.7	242.1
0.045	21.9	31.1	35.7	0.295	208.7	233.8	246.4
0.050	25.1	35.0	39.9	0.300	212.7	238.0	250.6
0.055	28.4	38.8	44.1	0.305	216.7	242.1	254.9
0.060	31.7	42.7	48.2	0.310	220.7	246.3	259.1
0.065	35.0	46.6	52.4	0.315	224.8	250.5	263.3
0.070	38.4	50.5	56.6	0.320	228.8	254.6	267.6
0.075	41.9	54.5	60.8	0.325	232.8	258.8	271.8
0.080	45.3	58.4	65.0	0.330	236.8	263.0	276.1
0.085	48.8	62.4	69.1	0.335	240.9	267.2	280.3
0.090	52.3	66.3	73.3	0.340	244.9	271.3	284.5
0.095	55.9	70.3	77.5	0.345	249.0	275.5	288.8
0.100	59.4	74.3	81.7	0.350	253.0	279.7	293.0
0.105	63.0	78.3	85.9	0.355	257.1	283.9	297.3
0.110	66.6	82.3	90.1	0.360	261.2	288.1	301.5
0.115	70.2	86.3	94.3	0.365	265.2	292.2	305.8
0.120	73.9	90.3	98.5	0.370	269.3	296.4	310.0
0.125	77.6	94.3	102.7	0.375	273.4	300.6	314.2
0.130	81.2	98.4	106.9	0.380	277.5	304.8	318.5
0.135	84.9	102.4	111.2	0.385	281.6	309.0	322.7
0.140	88.6	106.5	115.4	0.390	285.7	313.2	327.0
0.145	92.4	110.5	119.6	0.395	289.8	317.4	331.2
0.150	96.1	114.6	123.8	0.400	293.9	321.6	335.5
0.155	99.8	118.6	128.0	0.405	298.0	325.8	339.7
0.160	103.6	122.7	132.2	0.410	302.1	330.0	344.0
0.165	107.4	126.7	136.4	0.415	306.2	334.2	348.2
0.170	111.2	130.8	140.7	0.420	310.4	338.4	352.5
0.175	115.0	134.9	144.9	0.425	314.5	342.7	356.7
0.180	118.8	139.0	149.1	0.430	318.6	346.9	361.0
0.185	122.6	143.1	153.3	0.435	322.8	351.1	365.2
0.190	126.4	147.2	157.5	0.440	326.9	355.3	369.5
0.195	130.3	151.3	161.8	0.445	331.1	359.5	373.7
0.200	134.1	155.4	166.0	0.450	335.2	363.7	378.0
0.205	138.0	159.5	170.2	0.455	339.4	368.0	382.2
0.210	141.8	163.6	174.4	0.460	343.6	372.2	386.5
0.215	145.7	167.7	178.7	0.465	347.8	376.4	390.8
0.220	149.6	171.8	182.9	0.470	351.9	380.7	395.0
0.225	153.5	175.9	187.1	0.475	356.1	384.9	399.3
0.230	157.4	180.0	191.3	0.480	360.3	389.1	403.5
0.235	161.3	184.1	195.6	0.485	364.5	393.4	407.8
0.240	165.2	188.3	199.8	0.490	368.7	397.6	412.0
0.245	169.1	192.4	204.0	0.495	372.9	401.8	416.3
0.250	173.0	196.5	208.3	0.500	377.1	406.1	420.6

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 900.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.7	2.5	3.3	0.255	188.5	212.9	225.1
0.010	2.6	5.9	7.5	0.260	192.7	217.3	229.6
0.015	5.0	9.5	11.7	0.265	196.9	221.7	234.1
0.020	7.8	13.3	16.1	0.270	201.1	226.1	238.6
0.025	10.7	17.2	20.4	0.275	205.3	230.5	243.1
0.030	13.7	21.1	24.8	0.280	209.5	234.9	247.6
0.035	16.9	25.1	29.2	0.285	213.7	239.3	252.0
0.040	20.2	29.1	33.5	0.290	218.0	243.7	256.5
0.045	23.6	33.2	37.9	0.295	222.2	248.1	261.0
0.050	27.0	37.2	42.4	0.300	226.4	252.5	265.5
0.055	30.5	41.3	46.8	0.305	230.7	256.9	270.0
0.060	34.0	45.5	51.2	0.310	234.9	261.3	274.5
0.065	37.6	49.6	55.6	0.315	239.2	265.7	279.0
0.070	41.2	53.8	60.0	0.320	243.5	270.1	283.5
0.075	44.9	57.9	64.5	0.325	247.7	274.5	287.9
0.080	48.6	62.1	68.9	0.330	252.0	279.0	292.4
0.085	52.3	66.3	73.3	0.335	256.3	283.4	296.9
0.090	56.0	70.5	77.8	0.340	260.6	287.8	301.4
0.095	59.8	74.7	82.2	0.345	264.9	292.2	305.9
0.100	63.6	79.0	86.7	0.350	269.2	296.7	310.4
0.105	67.4	83.2	91.1	0.355	273.5	301.1	314.9
0.110	71.2	87.4	95.5	0.360	277.8	305.5	319.4
0.115	75.1	91.7	100.0	0.365	282.1	310.0	323.9
0.120	79.0	96.0	104.5	0.370	286.5	314.4	328.4
0.125	82.9	100.2	108.9	0.375	290.8	318.8	332.9
0.130	86.8	104.5	113.4	0.380	295.1	323.3	337.4
0.135	90.7	108.8	117.8	0.385	299.5	327.7	341.9
0.140	94.7	113.1	122.3	0.390	303.8	332.2	346.4
0.145	98.6	117.4	126.7	0.395	308.2	336.6	350.9
0.150	102.6	121.7	131.2	0.400	312.5	341.1	355.4
0.155	106.6	126.0	135.7	0.405	316.9	345.5	359.9
0.160	110.6	130.3	140.1	0.410	321.2	350.0	364.4
0.165	114.6	134.6	144.6	0.415	325.6	354.4	368.9
0.170	118.6	138.9	149.1	0.420	330.0	358.9	373.4
0.175	122.6	143.2	153.5	0.425	334.4	363.4	377.9
0.180	126.7	147.6	158.0	0.430	338.8	367.8	382.4
0.185	130.7	151.9	162.5	0.435	343.2	372.3	386.9
0.190	134.8	156.2	166.9	0.440	347.5	376.8	391.4
0.195	138.9	160.6	171.4	0.445	351.9	381.2	395.9
0.200	143.0	164.9	175.9	0.450	356.4	385.7	400.4
0.205	147.1	169.3	180.4	0.455	360.8	390.2	404.9
0.210	151.2	173.6	184.8	0.460	365.2	394.6	409.4
0.215	155.3	178.0	189.3	0.465	369.6	399.1	413.9
0.220	159.4	182.3	193.8	0.470	374.0	403.6	418.4
0.225	163.5	186.7	198.3	0.475	378.5	408.1	422.9
0.230	167.7	191.1	202.7	0.480	382.9	412.6	427.4
0.235	171.8	195.4	207.2	0.485	387.3	417.1	431.9
0.240	176.0	199.8	211.7	0.490	391.8	421.5	436.4
0.245	180.2	204.2	216.2	0.495	396.2	426.0	440.9
0.250	184.3	208.5	220.7	0.500	400.7	430.5	445.4

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 1000.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.0	0.3	0.4	0.026	13.0	20.2	23.8
0.0015	0.1	0.5	0.8	0.027	13.7	21.1	24.8
0.0020	0.1	0.8	1.2	0.028	14.4	22.0	25.7
0.0025	0.2	1.1	1.6	0.029	15.1	22.9	26.7
0.0030	0.3	1.4	2.0	0.030	15.8	23.7	27.7
0.0035	0.4	1.8	2.4	0.031	16.6	24.6	28.7
0.0040	0.6	2.1	2.9	0.032	17.3	25.5	29.6
0.0045	0.7	2.5	3.3	0.033	18.0	26.4	30.6
0.0050	0.9	2.8	3.8	0.034	18.7	27.3	31.6
0.0055	1.1	3.2	4.2	0.035	19.5	28.2	32.6
0.0060	1.3	3.6	4.7	0.036	20.2	29.1	33.5
0.0065	1.5	3.9	5.1	0.037	20.9	30.0	34.5
0.0070	1.7	4.3	5.6	0.038	21.7	30.9	35.5
0.0075	1.9	4.7	6.1	0.039	22.4	31.8	36.5
0.0080	2.1	5.1	6.5	0.040	23.2	32.7	37.4
0.0085	2.4	5.5	7.0	0.041	23.9	33.6	38.4
0.0090	2.6	5.9	7.5	0.042	24.7	34.5	39.4
0.0095	2.9	6.3	8.0	0.043	25.4	35.4	40.4
0.0100	3.1	6.7	8.4	0.044	26.2	36.3	41.4
0.0105	3.4	7.1	8.9	0.045	27.0	37.2	42.3
0.0110	3.6	7.5	9.4	0.046	27.7	38.1	43.3
0.0115	3.9	7.9	9.8	0.047	28.5	39.0	44.3
0.0120	4.2	8.3	10.3	0.048	29.3	39.9	45.3
0.0125	4.5	8.7	10.8	0.049	30.1	40.9	46.3
0.0130	4.7	9.1	11.3	0.050	30.8	41.8	47.2
0.0135	5.0	9.5	11.7	0.051	31.6	42.7	48.2
0.0140	5.3	9.9	12.2	0.052	32.4	43.6	49.2
0.0145	5.6	10.3	12.7	0.053	33.2	44.5	50.2
0.0150	5.9	10.8	13.2	0.054	34.0	45.4	51.2
0.0155	6.2	11.2	13.7	0.055	34.8	46.4	52.1
0.0160	6.5	11.6	14.1	0.056	35.6	47.3	53.1
0.0165	6.8	12.0	14.6	0.057	36.4	48.2	54.1
0.0170	7.1	12.4	15.1	0.058	37.2	49.1	55.1
0.0175	7.4	12.9	15.6	0.059	38.0	50.0	56.1
0.0180	7.7	13.3	16.1	0.060	38.8	51.0	57.1
0.0185	8.1	13.7	16.5	0.061	39.6	51.9	58.0
0.0190	8.4	14.1	17.0	0.062	40.4	52.8	59.0
0.0195	8.7	14.6	17.5	0.063	41.2	53.7	60.0
0.0200	9.0	15.0	18.0	0.064	42.0	54.7	61.0
0.0205	9.3	15.4	18.5	0.065	42.8	55.6	62.0
0.0210	9.7	15.9	19.0	0.066	43.6	56.5	63.0
0.0215	10.0	16.3	19.4	0.067	44.4	57.4	63.9
0.0220	10.3	16.7	19.9	0.068	45.2	58.4	64.9
0.0225	10.7	17.2	20.4	0.069	46.0	59.3	65.9
0.0230	11.0	17.6	20.9	0.070	46.9	60.2	66.9
0.0235	11.3	18.0	21.4	0.071	47.7	61.1	67.9
0.0240	11.7	18.5	21.9	0.072	48.5	62.1	68.9
0.0245	12.0	18.9	22.3	0.073	49.3	63.0	69.9
0.0250	12.4	19.3	22.8	0.074	50.1	63.9	70.8
				0.075	51.0	64.9	71.8

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 950.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.005	0.8	2.6	3.5	0.255	200.1	225.2	237.8
0.010	2.9	6.3	8.0	0.260	204.5	229.8	242.5
0.015	5.5	10.1	12.5	0.265	208.9	234.5	247.2
0.020	8.4	14.1	17.0	0.270	213.4	239.1	252.0
0.025	11.5	18.3	21.6	0.275	217.8	243.8	256.7
0.030	14.8	22.4	26.2	0.280	222.3	248.4	261.4
0.035	18.2	26.6	30.9	0.285	226.8	253.0	266.2
0.040	21.7	30.9	35.5	0.290	231.2	257.7	270.9
0.045	25.3	35.2	40.1	0.295	235.7	262.3	275.6
0.050	28.9	39.5	44.8	0.300	240.2	267.0	280.4
0.055	32.6	43.8	49.5	0.305	244.7	271.6	285.1
0.060	36.4	48.2	54.1	0.310	249.2	276.3	289.9
0.065	40.2	52.6	58.8	0.315	253.7	281.0	294.6
0.070	44.0	57.0	63.5	0.320	258.2	285.6	299.3
0.075	47.9	61.4	68.1	0.325	262.7	290.3	304.1
0.080	51.8	65.8	72.8	0.330	267.2	295.0	308.8
0.085	55.8	70.3	77.5	0.335	271.8	299.6	313.6
0.090	59.7	74.7	82.2	0.340	276.3	304.3	318.3
0.095	63.8	79.2	86.9	0.345	280.8	309.0	323.0
0.100	67.8	83.6	91.6	0.350	285.4	313.7	327.8
0.105	71.8	88.1	96.3	0.355	289.9	318.3	332.5
0.110	75.9	92.6	101.0	0.360	294.5	323.0	337.3
0.115	80.0	97.1	105.7	0.365	299.1	327.7	342.0
0.120	84.1	101.6	110.4	0.370	303.6	332.4	346.8
0.125	88.2	106.1	115.1	0.375	308.2	337.1	351.5
0.130	92.4	110.6	119.8	0.380	312.8	341.8	356.3
0.135	96.5	115.2	124.5	0.385	317.4	346.5	361.0
0.140	100.7	119.7	129.2	0.390	322.0	351.2	365.7
0.145	104.9	124.2	133.9	0.395	326.6	355.9	370.5
0.150	109.1	128.8	138.6	0.400	331.2	360.6	375.2
0.155	113.3	133.3	143.3	0.405	335.8	365.3	380.0
0.160	117.6	137.9	148.0	0.410	340.4	370.0	384.7
0.165	121.8	142.4	152.8	0.415	345.0	374.7	389.5
0.170	126.1	147.0	157.5	0.420	349.6	379.4	394.2
0.175	130.4	151.6	162.2	0.425	354.3	384.1	399.0
0.180	134.6	156.2	166.9	0.430	358.9	388.8	403.7
0.185	138.9	160.7	171.6	0.435	363.6	393.5	408.5
0.190	143.3	165.3	176.3	0.440	368.2	398.2	413.2
0.195	147.6	169.9	181.1	0.445	372.8	402.9	418.0
0.200	151.9	174.5	185.8	0.450	377.5	407.7	422.8
0.205	156.2	179.1	190.5	0.455	382.2	412.4	427.5
0.210	160.6	183.7	195.2	0.460	386.8	417.1	432.3
0.215	164.9	188.3	200.0	0.465	391.5	421.8	437.0
0.220	169.3	192.9	204.7	0.470	396.2	426.6	441.8
0.225	173.7	197.5	209.4	0.475	400.9	431.3	446.5
0.230	178.0	202.1	214.1	0.480	405.5	436.0	451.3
0.235	182.4	206.7	218.9	0.485	410.2	440.8	456.0
0.240	186.8	211.3	223.6	0.490	414.9	445.5	460.8
0.245	191.2	216.0	228.3	0.495	419.6	450.2	465.5
0.250	195.7	220.6	233.0	0.500	424.3	455.0	470.3

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 1200.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.0	0.4	0.6	0.026	16.7	24.8	28.8
0.0015	0.1	0.7	1.0	0.027	17.5	25.9	30.0
0.0020	0.2	1.1	1.5	0.028	18.4	26.9	31.2
0.0025	0.3	1.4	2.0	0.029	19.3	28.0	32.4
0.0030	0.5	1.8	2.5	0.030	20.2	29.1	33.5
0.0035	0.6	2.3	3.1	0.031	21.1	30.2	34.7
0.0040	0.8	2.7	3.6	0.032	21.9	31.2	35.9
0.0045	1.1	3.1	4.1	0.033	22.8	32.3	37.0
0.0050	1.3	3.6	4.7	0.034	23.7	33.4	38.2
0.0055	1.5	4.0	5.2	0.035	24.6	34.5	39.4
0.0060	1.8	4.5	5.8	0.036	25.6	35.6	40.6
0.0065	2.1	4.9	6.4	0.037	26.5	36.7	41.7
0.0070	2.3	5.4	6.9	0.038	27.4	37.7	42.9
0.0075	2.6	5.9	7.5	0.039	28.3	38.8	44.1
0.0080	2.9	6.3	8.0	0.040	29.2	39.9	45.3
0.0085	3.2	6.8	8.6	0.041	30.2	41.0	46.4
0.0090	3.5	7.3	9.2	0.042	31.1	42.1	47.6
0.0095	3.9	7.8	9.7	0.043	32.0	43.2	48.8
0.0100	4.2	8.3	10.3	0.044	33.0	44.3	50.0
0.0105	4.5	8.8	10.9	0.045	33.9	45.4	51.1
0.0110	4.9	9.3	11.5	0.046	34.9	46.5	52.3
0.0115	5.2	9.8	12.0	0.047	35.8	47.6	53.5
0.0120	5.6	10.3	12.6	0.048	36.8	48.7	54.7
0.0125	5.9	10.8	13.2	0.049	37.7	49.8	55.9
0.0130	6.3	11.3	13.8	0.050	38.7	50.9	57.0
0.0135	6.6	11.8	14.3	0.051	39.6	52.0	58.2
0.0140	7.0	12.3	14.9	0.052	40.6	53.1	59.4
0.0145	7.4	12.8	15.5	0.053	41.6	54.2	60.6
0.0150	7.7	13.3	16.1	0.054	42.5	55.4	61.8
0.0155	8.1	13.8	16.6	0.055	43.5	56.5	62.9
0.0160	8.5	14.3	17.2	0.056	44.5	57.6	64.1
0.0165	8.9	14.8	17.8	0.057	45.5	58.7	65.3
0.0170	9.3	15.3	18.4	0.058	46.4	59.8	66.5
0.0175	9.7	15.9	19.0	0.059	47.4	60.9	67.7
0.0180	10.1	16.4	19.5	0.060	48.4	62.0	68.8
0.0185	10.5	16.9	20.1	0.061	49.4	63.1	70.0
0.0190	10.9	17.4	20.7	0.062	50.4	64.3	71.2
0.0195	11.3	17.9	21.3	0.063	51.4	65.4	72.4
0.0200	11.7	18.5	21.9	0.064	52.3	66.5	73.6
0.0205	12.1	19.0	22.4	0.065	53.3	67.6	74.8
0.0210	12.5	19.5	23.0	0.066	54.3	68.7	75.9
0.0215	12.9	20.0	23.6	0.067	55.3	69.9	77.1
0.0220	13.3	20.6	24.2	0.068	56.3	71.0	78.3
0.0225	13.7	21.1	24.8	0.069	57.3	72.1	79.5
0.0230	14.1	21.6	25.3	0.070	58.3	73.2	80.7
0.0235	14.6	22.1	25.9	0.071	59.3	74.3	81.9
0.0240	15.0	22.7	26.5	0.072	60.3	75.5	83.0
0.0245	15.4	23.2	27.1	0.073	61.3	76.6	84.2
0.0250	15.8	23.7	27.7	0.074	62.3	77.7	85.4
				0.075	63.3	78.8	86.6

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 1300.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.0	0.4	0.6	0.026	18.6	27.1	31.4
0.0015	0.1	0.8	1.1	0.027	19.5	28.3	32.6
0.0020	0.2	1.2	1.7	0.028	20.5	29.4	33.9
0.0025	0.4	1.6	2.2	0.029	21.4	30.6	35.2
0.0030	0.6	2.0	2.8	0.030	22.4	31.8	36.5
0.0035	0.8	2.5	3.4	0.031	23.4	32.9	37.7
0.0040	1.0	3.0	4.0	0.032	24.3	34.1	39.0
0.0045	1.2	3.4	4.5	0.033	25.3	35.3	40.3
0.0050	1.5	3.9	5.1	0.034	26.3	36.5	41.5
0.0055	1.8	4.4	5.7	0.035	27.3	37.6	42.8
0.0060	2.1	4.9	6.4	0.036	28.3	38.8	44.1
0.0065	2.4	5.4	7.0	0.037	29.3	40.0	45.4
0.0070	2.7	5.9	7.6	0.038	30.3	41.2	46.6
0.0075	3.0	6.5	8.2	0.039	31.3	42.4	47.9
0.0080	3.3	7.0	8.8	0.040	32.3	43.6	49.2
0.0085	3.7	7.5	9.4	0.041	33.4	44.8	50.5
0.0090	4.0	8.0	10.0	0.042	34.4	45.9	51.7
0.0095	4.4	8.6	10.6	0.043	35.4	47.1	53.0
0.0100	4.7	9.1	11.3	0.044	36.4	48.3	54.3
0.0105	5.1	9.6	11.9	0.045	37.5	49.5	55.6
0.0110	5.5	10.2	12.5	0.046	38.5	50.7	56.8
0.0115	5.9	10.7	13.1	0.047	39.5	51.9	58.1
0.0120	6.3	11.3	13.8	0.048	40.6	53.1	59.4
0.0125	6.7	11.8	14.4	0.049	41.6	54.3	60.7
0.0130	7.1	12.4	15.0	0.050	42.7	55.5	61.9
0.0135	7.5	12.9	15.6	0.051	43.7	56.7	63.2
0.0140	7.9	13.5	16.3	0.052	44.8	57.9	64.5
0.0145	8.3	14.0	16.9	0.053	45.8	59.1	65.8
0.0150	8.7	14.6	17.5	0.054	46.9	60.3	67.1
0.0155	9.1	15.1	18.1	0.055	48.0	61.5	68.3
0.0160	9.5	15.7	18.8	0.056	49.0	62.8	69.6
0.0165	10.0	16.2	19.4	0.057	50.1	64.0	70.9
0.0170	10.4	16.8	20.0	0.058	51.2	65.2	72.2
0.0175	10.8	17.4	20.6	0.059	52.2	66.4	73.5
0.0180	11.3	17.9	21.3	0.060	53.3	67.6	74.7
0.0185	11.7	18.5	21.9	0.061	54.4	68.8	76.0
0.0190	12.1	19.1	22.5	0.062	55.4	70.0	77.3
0.0195	12.6	19.6	23.2	0.063	56.5	71.2	78.6
0.0200	13.0	20.2	23.8	0.064	57.6	72.4	79.9
0.0205	13.5	20.8	24.4	0.065	58.7	73.7	81.1
0.0210	13.9	21.3	25.1	0.066	59.8	74.9	82.4
0.0215	14.4	21.9	25.7	0.067	60.9	76.1	83.7
0.0220	14.8	22.5	26.3	0.068	62.0	77.3	85.0
0.0225	15.3	23.1	26.9	0.069	63.0	78.5	86.3
0.0230	15.7	23.6	27.6	0.070	64.1	79.8	87.6
0.0235	16.2	24.2	28.2	0.071	65.2	81.0	88.8
0.0240	16.7	24.8	28.8	0.072	66.3	82.2	90.1
0.0245	17.1	25.4	29.5	0.073	67.4	83.4	91.4
0.0250	17.6	25.9	30.1	0.074	68.5	84.6	92.7
				0.075	69.6	85.9	94.0

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 1330.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.0	0.5	0.7	0.026	19.1	27.8	32.1
0.0015	0.1	0.8	1.2	0.027	20.1	29.0	33.4
0.0020	0.2	1.2	1.7	0.028	21.1	30.2	34.7
0.0025	0.4	1.7	2.3	0.029	22.1	31.4	36.0
0.0030	0.6	2.1	2.9	0.030	23.1	32.6	37.3
0.0035	0.8	2.6	3.5	0.031	24.1	33.8	38.6
0.0040	1.0	3.1	4.1	0.032	25.1	35.0	39.9
0.0045	1.3	3.5	4.7	0.033	26.1	36.2	41.2
0.0050	1.6	4.0	5.3	0.034	27.1	37.4	42.5
0.0055	1.8	4.5	5.9	0.035	28.1	38.6	43.8
0.0060	2.1	5.1	6.5	0.036	29.1	39.8	45.1
0.0065	2.5	5.6	7.1	0.037	30.2	41.0	46.4
0.0070	2.8	6.1	7.8	0.038	31.2	42.2	47.7
0.0075	3.1	6.6	8.4	0.039	32.2	43.4	49.1
0.0080	3.5	7.2	9.0	0.040	33.3	44.7	50.4
0.0085	3.8	7.7	9.7	0.041	34.3	45.9	51.7
0.0090	4.2	8.2	10.3	0.042	35.4	47.1	53.0
0.0095	4.5	8.8	10.9	0.043	36.4	48.3	54.3
0.0100	4.9	9.3	11.6	0.044	37.5	49.5	55.6
0.0105	5.3	9.9	12.2	0.045	38.5	50.8	56.9
0.0110	5.7	10.4	12.8	0.046	39.6	52.0	58.2
0.0115	6.1	11.0	13.5	0.047	40.7	53.2	59.5
0.0120	6.5	11.6	14.1	0.048	41.7	54.4	60.8
0.0125	6.9	12.1	14.7	0.049	42.8	55.7	62.1
0.0130	7.3	12.7	15.4	0.050	43.9	56.9	63.4
0.0135	7.7	13.2	16.0	0.051	45.0	58.1	64.7
0.0140	8.1	13.8	16.7	0.052	46.0	59.4	66.0
0.0145	8.6	14.4	17.3	0.053	47.1	60.6	67.3
0.0150	9.0	15.0	17.9	0.054	48.2	61.8	68.7
0.0155	9.4	15.5	18.6	0.055	49.3	63.1	70.0
0.0160	9.8	16.1	19.2	0.056	50.4	64.3	71.3
0.0165	10.3	16.7	19.9	0.057	51.5	65.5	72.6
0.0170	10.7	17.2	20.5	0.058	52.6	66.8	73.9
0.0175	11.2	17.8	21.2	0.059	53.7	68.0	75.2
0.0180	11.6	18.4	21.8	0.060	54.8	69.3	76.5
0.0185	12.1	19.0	22.4	0.061	55.9	70.5	77.8
0.0190	12.5	19.6	23.1	0.062	57.0	71.7	79.1
0.0195	13.0	20.1	23.7	0.063	58.1	73.0	80.4
0.0200	13.4	20.7	24.4	0.064	59.2	74.2	81.8
0.0205	13.9	21.3	25.0	0.065	60.3	75.5	83.1
0.0210	14.4	21.9	25.7	0.066	61.4	76.7	84.4
0.0215	14.8	22.5	26.3	0.067	62.5	78.0	85.7
0.0220	15.3	23.1	27.0	0.068	63.6	79.2	87.0
0.0225	15.8	23.7	27.6	0.069	64.8	80.5	88.3
0.0230	16.2	24.2	28.3	0.070	65.9	81.7	89.6
0.0235	16.7	24.8	28.9	0.071	67.0	83.0	90.9
0.0240	17.2	25.4	29.5	0.072	68.1	84.2	92.3
0.0245	17.7	26.0	30.2	0.073	69.3	85.5	93.6
0.0250	18.1	26.6	30.8	0.074	70.4	86.7	94.9
				0.075	71.5	88.0	96.2

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 1500.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.1	0.5	0.8	0.026	22.4	31.8	36.4
0.0015	0.2	1.0	1.4	0.027	23.5	33.1	37.9
0.0020	0.3	1.4	2.0	0.028	24.6	34.5	39.4
0.0025	0.5	1.9	2.7	0.029	25.8	35.8	40.8
0.0030	0.7	2.5	3.3	0.030	26.9	37.2	42.3
0.0035	1.0	3.0	4.0	0.031	28.0	38.5	43.8
0.0040	1.3	3.6	4.7	0.032	29.2	39.9	45.2
0.0045	1.6	4.1	5.4	0.033	30.4	41.3	46.7
0.0050	1.9	4.7	6.1	0.034	31.5	42.6	48.2
0.0055	2.3	5.3	6.8	0.035	32.7	44.0	49.7
0.0060	2.6	5.9	7.5	0.036	33.9	45.4	51.1
0.0065	3.0	6.5	8.2	0.037	35.0	46.8	52.6
0.0070	3.4	7.1	8.9	0.038	36.2	48.1	54.1
0.0075	3.8	7.7	9.6	0.039	37.4	49.5	55.5
0.0080	4.2	8.3	10.3	0.040	38.6	50.9	57.0
0.0085	4.6	8.9	11.0	0.041	39.8	52.3	58.5
0.0090	5.0	9.5	11.7	0.042	41.0	53.6	60.0
0.0095	5.5	10.1	12.5	0.043	42.2	55.0	61.4
0.0100	5.9	10.8	13.2	0.044	43.4	56.4	62.9
0.0105	6.4	11.4	13.9	0.045	44.6	57.8	64.4
0.0110	6.8	12.0	14.6	0.046	45.9	59.2	65.9
0.0115	7.3	12.6	15.3	0.047	47.1	60.6	67.3
0.0120	7.7	13.3	16.1	0.048	48.3	62.0	68.8
0.0125	8.2	13.9	16.8	0.049	49.5	63.4	70.3
0.0130	8.7	14.6	17.5	0.050	50.8	64.8	71.8
0.0135	9.2	15.2	18.2	0.051	52.0	66.2	73.2
0.0140	9.7	15.9	18.9	0.052	53.2	67.6	74.7
0.0145	10.1	16.5	19.7	0.053	54.5	69.0	76.2
0.0150	10.6	17.1	20.4	0.054	55.7	70.4	77.7
0.0155	11.1	17.8	21.1	0.055	57.0	71.8	79.2
0.0160	11.7	18.5	21.9	0.056	58.2	73.2	80.6
0.0165	12.2	19.1	22.6	0.057	59.4	74.6	82.1
0.0170	12.7	19.8	23.3	0.058	60.7	76.0	83.6
0.0175	13.2	20.4	24.0	0.059	62.0	77.4	85.1
0.0180	13.7	21.1	24.8	0.060	63.2	78.8	86.6
0.0185	14.2	21.7	25.5	0.061	64.5	80.2	88.0
0.0190	14.8	22.4	26.2	0.062	65.7	81.6	89.5
0.0195	15.3	23.1	26.9	0.063	67.0	83.0	91.0
0.0200	15.8	23.7	27.7	0.064	68.3	84.4	92.5
0.0205	16.3	24.4	28.4	0.065	69.5	85.8	93.9
0.0210	16.9	25.0	29.1	0.066	70.8	87.2	95.4
0.0215	17.4	25.7	29.9	0.067	72.1	88.6	96.9
0.0220	18.0	26.4	30.6	0.068	73.3	90.0	98.4
0.0225	18.5	27.0	31.3	0.069	74.6	91.5	99.9
0.0230	19.0	27.7	32.1	0.070	75.9	92.9	101.4
0.0235	19.6	28.4	32.8	0.071	77.2	94.3	102.8
0.0240	20.1	29.1	33.5	0.072	78.5	95.7	104.3
0.0245	20.7	29.7	34.2	0.073	79.7	97.1	105.8
0.0250	21.3	30.4	35.0	0.074	81.0	98.5	107.3
				0.075	82.3	99.9	108.8

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

Sample size (N) = 1700

t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL
0.0005	0.0	0.2	0.3	0.026	26.3	36.4	41.5	0.076	96.6	115.7	125.2
0.0010	0.1	0.7	0.9	0.027	27.6	38.0	43.2	0.077	98.1	117.3	126.9
0.0015	0.2	1.2	1.6	0.028	28.9	39.5	44.8	0.078	99.6	118.9	128.6
0.0020	0.4	1.7	2.3	0.029	30.2	41.1	46.5	0.079	101.0	120.5	130.3
0.0025	0.7	2.3	3.1	0.030	31.5	42.6	48.2	0.080	102.5	122.2	132.0
0.0030	0.9	2.9	3.9	0.031	32.8	44.2	49.8	0.081	104.0	123.8	133.7
0.0035	1.3	3.5	4.6	0.032	34.2	45.7	51.5	0.082	105.5	125.4	135.3
0.0040	1.6	4.2	5.4	0.033	35.5	47.3	53.2	0.083	107.0	127.0	137.0
0.0045	2.0	4.8	6.2	0.034	36.8	48.8	54.8	0.084	108.5	128.6	138.7
0.0050	2.4	5.5	7.0	0.035	38.2	50.4	56.5	0.085	110.0	130.2	140.4
0.0055	2.8	6.1	7.8	0.036	39.5	52.0	58.2	0.086	111.5	131.9	142.1
0.0060	3.2	6.8	8.6	0.037	40.9	53.5	59.9	0.087	112.9	133.5	143.8
0.0065	3.7	7.5	9.4	0.038	42.3	55.1	61.5	0.088	114.4	135.1	145.4
0.0070	4.1	8.2	10.2	0.039	43.6	56.7	63.2	0.089	115.9	136.7	147.1
0.0075	4.6	8.9	11.0	0.040	45.0	58.2	64.9	0.090	117.4	138.3	148.8
0.0080	5.1	9.6	11.8	0.041	46.4	59.8	66.5	0.091	118.9	140.0	150.5
0.0085	5.6	10.3	12.6	0.042	47.8	61.4	68.2	0.092	120.4	141.6	152.2
0.0090	6.1	11.0	13.5	0.043	49.2	63.0	69.9	0.093	121.9	143.2	153.9
0.0095	6.6	11.7	14.3	0.044	50.5	64.6	71.6	0.094	123.4	144.8	155.5
0.0100	7.1	12.4	15.1	0.045	51.9	66.1	73.2	0.095	124.9	146.5	157.2
0.0105	7.6	13.2	15.9	0.046	53.3	67.7	74.9	0.096	126.4	148.1	158.9
0.0110	8.2	13.9	16.7	0.047	54.7	69.3	76.6	0.097	128.0	149.7	160.6
0.0115	8.7	14.6	17.5	0.048	56.1	70.9	78.3	0.098	129.5	151.3	162.3
0.0120	9.3	15.3	18.4	0.049	57.6	72.5	79.9	0.099	131.0	153.0	164.0
0.0125	9.8	16.1	19.2	0.050	59.0	74.1	81.6	0.100	132.5	154.6	165.6
0.0130	10.4	16.8	20.0	0.051	60.4	75.6	83.3	0.101	134.0	156.2	167.3
0.0135	10.9	17.5	20.8	0.052	61.8	77.2	85.0	0.102	135.5	157.8	169.0
0.0140	11.5	18.3	21.7	0.053	63.2	78.8	86.6	0.103	137.0	159.5	170.7
0.0145	12.1	19.0	22.5	0.054	64.6	80.4	88.3	0.104	138.5	161.1	172.4
0.0150	12.7	19.8	23.3	0.055	66.1	82.0	90.0	0.105	140.1	162.7	174.1
0.0155	13.2	20.5	24.1	0.056	67.5	83.6	91.7	0.106	141.6	164.4	175.8
0.0160	13.8	21.2	25.0	0.057	68.9	85.2	93.3	0.107	143.1	166.0	177.4
0.0165	14.4	22.0	25.8	0.058	70.4	86.8	95.0	0.108	144.6	167.6	179.1
0.0170	15.0	22.7	26.6	0.059	71.8	88.4	96.7	0.109	146.1	169.3	180.8
0.0175	15.6	23.5	27.4	0.060	73.3	90.0	98.4	0.110	147.7	170.9	182.5
0.0180	16.2	24.2	28.3	0.061	74.7	91.6	100.0	0.111	149.2	172.5	184.2
0.0185	16.8	25.0	29.1	0.062	76.1	93.2	101.7	0.112	150.7	174.1	185.9
0.0190	17.4	25.8	29.9	0.063	77.6	94.8	103.4	0.113	152.2	175.8	187.6
0.0195	18.1	26.5	30.7	0.064	79.0	96.4	105.1	0.114	153.8	177.4	189.2
0.0200	18.7	27.3	31.6	0.065	80.5	98.0	106.8	0.115	155.3	179.0	190.9
0.0205	19.3	28.0	32.4	0.066	81.9	99.6	108.4	0.116	156.8	180.7	192.6
0.0210	19.9	28.8	33.2	0.067	83.4	101.2	110.1	0.117	158.3	182.3	194.3
0.0215	20.5	29.5	34.0	0.068	84.9	102.8	111.8	0.118	159.9	183.9	196.0
0.0220	21.2	30.3	34.9	0.069	86.3	104.4	113.5	0.119	161.4	185.6	197.7
0.0225	21.8	31.1	35.7	0.070	87.8	106.0	115.2	0.120	162.9	187.2	199.4
0.0230	22.4	31.8	36.5	0.071	89.3	107.6	116.8	0.121	164.5	188.9	201.0
0.0235	23.1	32.6	37.4	0.072	90.7	109.3	118.5	0.122	166.0	190.5	202.7
0.0240	23.7	33.4	38.2	0.073	92.2	110.9	120.2	0.123	167.5	192.1	204.4
0.0245	24.3	34.1	39.0	0.074	93.7	112.5	121.9	0.124	169.1	193.8	206.1
0.0250	25.0	34.9	39.9	0.075	95.1	114.1	123.6	0.125	170.6	195.4	207.8

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

Sample size (N) = 1600

t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL
0.0005	0.0	0.2	0.3	0.026	24.3	34.1	39.0	0.076	90.1	108.5	117.7
0.0010	0.1	0.6	0.9	0.027	25.5	35.5	40.5	0.077	91.5	110.0	119.3
0.0015	0.2	1.1	1.5	0.028	26.7	37.0	42.1	0.078	92.9	111.6	120.9
0.0020	0.4	1.6	2.2	0.029	28.0	38.4	43.7	0.079	94.2	113.1	122.5
0.0025	0.6	2.1	2.9	0.030	29.2	39.9	45.2	0.080	95.6	114.6	124.1
0.0030	0.8	2.7	3.6	0.031	30.4	41.3	46.8	0.081	97.0	116.1	125.7
0.0035	1.1	3.3	4.3	0.032	31.7	42.8	48.4	0.082	98.4	117.6	127.2
0.0040	1.4	3.9	5.1	0.033	32.9	44.3	49.9	0.083	99.8	119.1	128.8
0.0045	1.8	4.5	5.8	0.034	34.2	45.7	51.5	0.084	101.2	120.7	130.4
0.0050	2.1	5.1	6.5	0.035	35.4	47.2	53.1	0.085	102.6	122.2	132.0
0.0055	2.5	5.7	7.3	0.036	36.7	48.7	54.7	0.086	104.0	123.7	133.6
0.0060	2.9	6.3	8.0	0.037	38.0	50.1	56.2	0.087	105.4	125.2	135.2
0.0065	3.3	7.0	8.8	0.038	39.2	51.6	57.8	0.088	106.8	126.8	136.7
0.0070	3.8	7.6	9.6	0.039	40.5	53.1	59.4	0.089	108.2	128.3	138.3
0.0075	4.2	8.3	10.3	0.040	41.8	54.6	60.9	0.090	109.6	129.8	139.9
0.0080	4.6	8.9	11.1	0.041	43.1	56.0	62.5	0.091	111.0	131.3	141.5
0.0085	5.1	9.6	11.8	0.042	44.4	57.5	64.1	0.092	112.4	132.9	143.1
0.0090	5.5	10.3	12.6	0.043	45.7	59.0	65.7	0.093	113.8	134.4	144.7
0.0095	6.0	10.9	13.4	0.044	47.0	60.5	67.2	0.094	115.2	135.9	146.2
0.0100	6.5	11.6	14.1	0.045	48.3	62.0	68.8	0.095	116.6	137.4	147.8
0.0105	7.0	12.3	14.9	0.046	49.6	63.5	70.4	0.096	118.0	139.0	149.4
0.0110	7.5	12.9	15.7	0.047	50.9	64.9	72.0	0.097	119.5	140.5	151.0
0.0115	8.0	13.6	16.4	0.048	52.2	66.4	73.5	0.098	120.9	142.0	152.6
0.0120	8.5	14.3	17.2	0.049	53.5	67.9	75.1	0.099	122.3	143.5	154.2
0.0125	9.0	15.0	18.0	0.050	54.9	69.4	76.7	0.100	123.7	145.1	155.8
0.0130	9.5	15.7	18.8	0.051	56.2	70.9	78.3	0.101	125.1	146.6	157.3
0.0135	10.0	16.4	19.5	0.052	57.5	72.4	79.8	0.102	126.5	148.1	158.9
0.0140	10.6	17.1	20.3	0.053	58.8	73.9	81.4	0.103	128.0	149.7	160.5
0.0145	11.1	17.8	21.1	0.054	60.2	75.4	83.0	0.104	129.4	151.2	162.1
0.0150	11.6	18.4	21.8	0.055	61.5	76.9	84.6	0.105	130.8	152.7	163.7
0.0155	12.2	19.1	22.6	0.056	62.8	78.4	86.1	0.106	132.2	154.3	165.3
0.0160	12.7	19.8	23.4	0.057	64.2	79.9	87.7	0.107	133.6	155.8	166.9
0.0165	13.3	20.5	24.2	0.058	65.5	81.4	89.3	0.108	135.1	157.3	168.4
0.0170	13.8	21.2	25.0	0.059	66.9	82.9	90.9	0.109	136.5	158.8	170.0
0.0175	14.4	22.0	25.7	0.060	68.2	84.4	92.5	0.110	137.9	160.4	171.6
0.0180	15.0	22.7	26.5	0.061	69.6	85.9	94.0	0.111	139.4	161.9	173.2
0.0185	15.5	23.4	27.3	0.062	70.9	87.4	95.6	0.112	140.8	163.5	174.8
0.0190	16.1	24.1	28.1	0.063	72.3	88.9	97.2	0.113	142.2	165.0	176.4
0.0195	16.7	24.8	28.8	0.064	73.6	90.4	98.8	0.114	143.7	166.5	178.0
0.0200	17.2	25.5	29.6	0.065	75.0	91.9	100.4	0.115	145.1	168.1	179.5
0.0205	17.8	26.2	30.4	0.066	76.4	93.4	101.9	0.116	146.5	169.6	181.1
0.0210	18.4	26.9	31.2	0.067	77.7	94.9	103.5	0.117	148.0	171.1	182.7
0.0215	19.0	27.6	32.0	0.068	79.1	96.4	105.1	0.118	149.4	172.7	184.3
0.0220	19.6	28.3	32.7	0.069	80.5	97.9	106.7	0.119	150.8	174.2	185.9
0.0225	20.1	29.1	33.5	0.070	81.8	99.4	108.3	0.120	152.3	175.7	187.5
0.0230	20.7	29.8	34.3	0.071	83.2	101.0	109.8	0.121	153.7	177.3	189.1
0.0235	21.3	30.5	35.1	0.072	84.6	102.5	111.4	0.122	155.1	178.8	190.7
0.0240	21.9	31.2	35.9	0.073	85.9	104.0	113.0	0.123	156.6	180.4	192.2
0.0245	22.5	31.9	36.6	0.074	87.3	105.5	114.6	0.124	158.0	181.9	193.8
0.0250	23.1	32.6	37.4	0.075	88.7	107.0	116.2	0.125	159.5	183.4	195.4

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

Sample size (N) = 1800

t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL
0.0005	0.0	0.3	0.4	0.026	28.2	38.8	44.1	0.076	103.2	122.9	132.8
0.0010	0.1	0.7	1.0	0.027	29.6	40.4	45.8	0.077	104.7	124.6	134.5
0.0015	0.2	1.2	1.7	0.028	31.0	42.1	47.6	0.078	106.3	126.3	136.3
0.0020	0.5	1.8	2.5	0.029	32.4	43.7	49.4	0.079	107.9	128.0	138.1
0.0025	0.7	2.5	3.3	0.030	33.8	45.4	51.1	0.080	109.5	129.7	139.9
0.0030	1.1	3.1	4.1	0.031	35.2	47.0	52.9	0.081	111.0	131.4	141.7
0.0035	1.4	3.8	5.0	0.032	36.7	48.7	54.6	0.082	112.6	133.2	143.4
0.0040	1.8	4.5	5.8	0.033	38.1	50.3	56.4	0.083	114.2	134.9	145.2
0.0045	2.2	5.2	6.6	0.034	39.5	52.0	58.2	0.084	115.8	136.6	147.0
0.0050	2.6	5.9	7.5	0.035	41.0	53.6	60.0	0.085	117.4	138.3	148.8
0.0055	3.1	6.6	8.3	0.036	42.4	55.3	61.7	0.086	118.9	140.0	150.6
0.0060	3.5	7.3	9.2	0.037	43.9	56.9	63.5	0.087	120.5	141.7	152.3
0.0065	4.0	8.0	10.0	0.038	45.3	58.6	65.3	0.088	122.1	143.5	154.1
0.0070	4.5	8.8	10.9	0.039	46.8	60.3	67.0	0.089	123.7	145.2	155.9
0.0075	5.0	9.5	11.7	0.040	48.2	61.9	68.8	0.090	125.3	146.9	157.7
0.0080	5.5	10.2	12.6	0.041	49.7	63.6	70.6	0.091	126.9	148.6	159.5
0.0085	6.1	11.0	13.5	0.042	51.2	65.3	72.3	0.092	128.5	150.3	161.3
0.0090	6.6	11.8	14.3	0.043	52.7	67.0	74.1	0.093	130.1	152.1	163.0
0.0095	7.2	12.5	15.2	0.044	54.1	68.6	75.9	0.094	131.7	153.8	164.8
0.0100	7.7	13.3	16.1	0.045	55.6	70.3	77.7	0.095	133.3	155.5	166.6
0.0105	8.3	14.0	16.9	0.046	57.1	72.0	79.4	0.096	134.9	157.2	168.4
0.0110	8.9	14.8	17.8	0.047	58.6	73.7	81.2	0.097	136.5	159.0	170.2
0.0115	9.5	15.6	18.7	0.048	60.1	75.4	83.0	0.098	138.1	160.7	172.0
0.0120	10.0	16.4	19.5	0.049	61.6	77.0	84.8	0.099	139.7	162.4	173.7
0.0125	10.6	17.1	20.4	0.050	63.1	78.7	86.5	0.100	141.3	164.1	175.5
0.0130	11.2	17.9	21.3	0.051	64.6	80.4	88.3	0.101	142.9	165.8	177.3
0.0135	11.8	18.7	22.1	0.052	66.1	82.1	90.1	0.102	144.5	167.6	179.1
0.0140	12.5	19.5	23.0	0.053	67.6	83.8	91.8	0.103	146.1	169.3	180.9
0.0145	13.1	20.3	23.9	0.054	69.2	85.5	93.6	0.104	147.7	171.0	182.7
0.0150	13.7	21.1	24.8	0.055	70.7	87.2	95.4	0.105	149.3	172.8	184.5
0.0155	14.3	21.9	25.6	0.056	72.2	88.9	97.2	0.106	151.0	174.5	186.2
0.0160	15.0	22.7	26.5	0.057	73.7	90.5	99.0	0.107	152.6	176.2	188.0
0.0165	15.6	23.4	27.4	0.058	75.3	92.2	100.7	0.108	154.2	177.9	189.8
0.0170	16.2	24.2	28.3	0.059	76.8	93.9	102.5	0.109	155.8	179.7	191.6
0.0175	16.9	25.0	29.1	0.060	78.3	95.6	104.3	0.110	157.4	181.4	193.4
0.0180	17.5	25.8	30.0	0.061	79.9	97.3	106.1	0.111	159.0	183.1	195.2
0.0185	18.2	26.6	30.9	0.062	81.4	99.0	107.8	0.112	160.7	184.9	197.0
0.0190	18.8	27.4	31.8	0.063	82.9	100.7	109.6	0.113	162.3	186.6	198.7
0.0195	19.5	28.2	32.6	0.064	84.5	102.4	111.4	0.114	163.9	188.3	200.5
0.0200	20.1	29.1	33.5	0.065	86.0	104.1	113.2	0.115	165.5	190.1	202.3
0.0205	20.8	29.9	34.4	0.066	87.6	105.8	115.0	0.116	167.2	191.8	204.1
0.0210	21.5	30.7	35.3	0.067	89.1	107.5	116.7	0.117	168.8	193.5	205.9
0.0215	22.1	31.5	36.1	0.068	90.7	109.2	118.5	0.118	170.4	195.2	207.7
0.0220	22.8	32.3	37.0	0.069	92.2	110.9	120.3	0.119	172.0	197.0	209.5
0.0225	23.5	33.1	37.9	0.070	93.8	112.6	122.1	0.120	173.7	198.7	211.2
0.0230	24.1	33.9	38.8	0.071	95.3	114.3	123.8	0.121	175.3	200.4	213.0
0.0235	24.8	34.7	39.7	0.072	96.9	116.1	125.6	0.122	176.9	202.2	214.8
0.0240	25.5	35.5	40.5	0.073	98.5	117.8	127.4	0.123	178.6	203.9	216.6
0.0245	26.2	36.3	41.4	0.074	100.0	119.5	129.2	0.124	180.2	205.7	218.4
0.0250	26.9	37.2	42.3	0.075	101.6	121.2	131.0	0.125	181.8	207.4	220.2

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

Sample size (N) = 1900

t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL	t(%)	STD	AQL	UCL
0.0005	0.0	0.3	0.4	0.026	30.2	41.2	46.6	0.076	109.8	130.1	140.3
0.0010	0.1	0.8	1.1	0.027	31.7	42.9	48.5	0.077	111.4	131.9	142.1
0.0015	0.3	1.3	1.9	0.028	33.2	44.6	50.3	0.078	113.1	133.7	144.0
0.0020	0.5	2.0	2.7	0.029	34.7	46.4	52.2	0.079	114.7	135.5	145.9
0.0025	0.8	2.6	3.5	0.030	36.2	48.1	54.1	0.080	116.4	137.3	147.8
0.0030	1.2	3.3	4.4	0.031	37.7	49.8	55.9	0.081	118.1	139.1	149.7
0.0035	1.6	4.0	5.3	0.032	39.2	51.6	57.8	0.082	119.8	140.9	151.5
0.0040	2.0	4.8	6.2	0.033	40.7	53.3	59.7	0.083	121.4	142.8	153.4
0.0045	2.4	5.5	7.1	0.034	42.2	55.1	61.5	0.084	123.1	144.6	155.3
0.0050	2.9	6.3	7.9	0.035	43.8	56.8	63.4	0.085	124.8	146.4	157.2
0.0055	3.4	7.0	8.8	0.036	45.3	58.6	65.3	0.086	126.5	148.2	159.1
0.0060	3.9	7.8	9.7	0.037	46.8	60.4	67.1	0.087	128.2	150.0	161.0
0.0065	4.4	8.6	10.6	0.038	48.4	62.1	69.0	0.088	129.8	151.8	162.8
0.0070	4.9	9.3	11.6	0.039	49.9	63.9	70.9	0.089	131.5	153.7	164.7
0.0075	5.5	10.1	12.5	0.040	51.5	65.7	72.7	0.090	133.2	155.5	166.6
0.0080	6.0	10.9	13.4	0.041	53.1	67.4	74.6	0.091	134.9	157.3	168.5
0.0085	6.6	11.7	14.3	0.042	54.6	69.2	76.5	0.092	136.6	159.1	170.4
0.0090	7.2	12.5	15.2	0.043	56.2	71.0	78.3	0.093	138.3	160.9	172.2
0.0095	7.8	13.3	16.1	0.044	57.8	72.7	80.2	0.094	140.0	162.7	174.1
0.0100	8.4	14.1	17.0	0.045	59.3	74.5	82.1	0.095	141.7	164.6	176.0
0.0105	9.0	14.9	17.9	0.046	60.9	76.3	84.0	0.096	143.4	166.4	177.9
0.0110	9.6	15.8	18.8	0.047	62.5	78.1	85.8	0.097	145.1	168.2	179.8
0.0115	10.2	16.6	19.8	0.048	64.1	79.8	87.7	0.098	146.8	170.0	181.7
0.0120	10.8	17.4	20.7	0.049	65.7	81.6	89.6	0.099	148.5	171.8	183.5
0.0125	11.5	18.2	21.6	0.050	67.3	83.4	91.4	0.100	150.2	173.7	185.4
0.0130	12.1	19.1	22.5	0.051	68.9	85.2	93.3	0.101	151.9	175.5	187.3
0.0135	12.8	19.9	23.4	0.052	70.5	87.0	95.2	0.102	153.6	177.3	189.2
0.0140	13.4	20.7	24.4	0.053	72.1	88.7	97.1	0.103	155.3	179.1	191.1
0.0145	14.1	21.5	25.3	0.054	73.7	90.5	98.9	0.104	157.0	181.0	193.0
0.0150	14.7	22.4	26.2	0.055	75.3	92.3	100.8	0.105	158.7	182.8	194.8
0.0155	15.4	23.2	27.1	0.056	76.9	94.1	102.7	0.106	160.4	184.6	196.7
0.0160	16.1	24.1	28.1	0.057	78.5	95.9	104.6	0.107	162.1	186.4	198.6
0.0165	16.8	24.9	29.0	0.058	80.2	97.7	106.4	0.108	163.8	188.3	200.5
0.0170	17.4	25.7	29.9	0.059	81.8	99.5	108.3	0.109	165.5	190.1	202.4
0.0175	18.1	26.6	30.8	0.060	83.4	101.3	110.2	0.110	167.2	191.9	204.3
0.0180	18.8	27.4	31.8	0.061	85.0	103.1	112.1	0.111	168.9	193.8	206.2
0.0185	19.5	28.3	32.7	0.062	86.7	104.9	114.0	0.112	170.7	195.6	208.0
0.0190	20.2	29.1	33.6	0.063	88.3	106.7	115.8	0.113	172.4	197.4	209.9
0.0195	20.9	30.0	34.5	0.064	89.9	108.5	117.7	0.114	174.1	199.2	211.8
0.0200	21.6	30.8	35.5	0.065	91.6	110.3	119.6	0.115	175.8	201.1	213.7
0.0205	22.3	31.7	36.4	0.066	93.2	112.1	121.5	0.116	177.5	202.9	215.6
0.0210	23.0	32.5	37.3	0.067	94.9	113.9	123.3	0.117	179.2	204.7	217.5
0.0215	23.7	33.4	38.2	0.068	96.5	115.7	125.2	0.118	181.0	206.6	219.4
0.0220	24.4	34.3	39.2	0.069	98.2	117.5	127.1	0.119	182.7	208.4	221.2
0.0225	25.2	35.1	40.1	0.070	99.8	119.3	129.0	0.120	184.4	210.2	223.1
0.0230	25.9	36.0	41.0	0.071	101.5	121.1	130.9	0.121	186.1	212.1	225.0
0.0235	26.6	36.8	42.0	0.072	103.1	122.9	132.7	0.122	187.9	213.9	226.9
0.0240	27.3	37.7	42.9	0.073	104.8	124.7	134.6	0.123	189.6	215.7	228.8
0.0245	28.0	38.6	43.8	0.074	106.4	126.5	136.5	0.124	191.3	217.6	230.7
0.0250	28.8	39.4	44.7	0.075	108.1	128.3	138.4	0.125	193.1	219.4	232.6

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 2000.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.1	0.8	1.2	0.026	32.3	43.5	49.2
0.0015	0.3	1.4	2.0	0.027	33.8	45.3	51.1
0.0020	0.6	2.1	2.9	0.028	35.4	47.2	53.1
0.0025	0.9	2.8	3.8	0.029	37.0	49.0	55.0
0.0030	1.3	3.6	4.7	0.030	38.6	50.8	57.0
0.0035	1.7	4.3	5.6	0.031	40.1	52.7	59.0
0.0040	2.1	5.1	6.5	0.032	41.7	54.5	60.9
0.0045	2.6	5.9	7.5	0.033	43.4	56.4	62.9
0.0050	3.1	6.7	8.4	0.034	45.0	58.2	64.9
0.0055	3.6	7.5	9.4	0.035	46.6	60.1	66.8
0.0060	4.2	8.3	10.3	0.036	48.2	61.9	68.8
0.0065	4.7	9.1	11.3	0.037	49.8	63.8	70.8
0.0070	5.3	9.9	12.2	0.038	51.5	65.6	72.7
0.0075	5.9	10.7	13.2	0.039	53.1	67.5	74.7
0.0080	6.5	11.6	14.1	0.040	54.8	69.4	76.7
0.0085	7.1	12.4	15.1	0.041	56.4	71.2	78.6
0.0090	7.7	13.3	16.1	0.042	58.1	73.1	80.6
0.0095	8.4	14.1	17.0	0.043	59.7	75.0	82.6
0.0100	9.0	15.0	18.0	0.044	61.4	76.8	84.5
0.0105	9.6	15.8	18.9	0.045	63.1	78.7	86.5
0.0110	10.3	16.7	19.9	0.046	64.7	80.6	88.5
0.0115	11.0	17.6	20.9	0.047	66.4	82.4	90.5
0.0120	11.6	18.4	21.8	0.048	68.1	84.3	92.4
0.0125	12.3	19.3	22.8	0.049	69.8	86.2	94.4
0.0130	13.0	20.2	23.8	0.050	71.5	88.1	96.4
0.0135	13.7	21.1	24.8	0.051	73.2	90.0	98.3
0.0140	14.4	21.9	25.7	0.052	74.9	91.8	100.3
0.0145	15.1	22.8	26.7	0.053	76.6	93.7	102.3
0.0150	15.8	23.7	27.7	0.054	78.3	95.6	104.3
0.0155	16.5	24.6	28.6	0.055	80.0	97.5	106.2
0.0160	17.2	25.5	29.6	0.056	81.7	99.4	108.2
0.0165	17.9	26.4	30.6	0.057	83.4	101.3	110.2
0.0170	18.7	27.3	31.6	0.058	85.1	103.1	112.2
0.0175	19.4	28.2	32.5	0.059	86.8	105.0	114.1
0.0180	20.1	29.0	33.5	0.060	88.5	106.9	116.1
0.0185	20.9	29.9	34.5	0.061	90.2	108.8	118.1
0.0190	21.6	30.8	35.5	0.062	92.0	110.7	120.1
0.0195	22.3	31.7	36.4	0.063	93.7	112.6	122.0
0.0200	23.1	32.6	37.4	0.064	95.4	114.5	124.0
0.0205	23.8	33.5	38.4	0.065	97.2	116.4	126.0
0.0210	24.6	34.4	39.4	0.066	98.9	118.3	128.0
0.0215	25.3	35.3	40.3	0.067	100.6	120.2	130.0
0.0220	26.1	36.2	41.3	0.068	102.4	122.1	131.9
0.0225	26.9	37.2	42.3	0.069	104.1	124.0	133.9
0.0230	27.6	38.1	43.3	0.070	105.9	125.9	135.9
0.0235	28.4	39.0	44.3	0.071	107.6	127.8	137.9
0.0240	29.2	39.9	45.2	0.072	109.3	129.7	139.9
0.0245	29.9	40.8	46.2	0.073	111.1	131.6	141.8
0.0250	30.7	41.7	47.2	0.074	112.9	133.5	143.8
				0.075	114.6	135.4	145.8

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 2100.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.0010	0.1	0.9	1.3	0.026	34.3	45.9	51.7
0.0015	0.4	1.5	2.1	0.027	35.9	47.8	53.8
0.0020	0.6	2.3	3.1	0.028	37.6	49.7	55.8
0.0025	1.0	3.0	4.0	0.029	39.3	51.7	57.9
0.0030	1.4	3.8	5.0	0.030	40.9	53.6	59.9
0.0035	1.9	4.6	5.9	0.031	42.6	55.5	62.0
0.0040	2.3	5.4	6.9	0.032	44.3	57.5	64.1
0.0045	2.8	6.2	7.9	0.033	46.0	59.4	66.1
0.0050	3.4	7.1	8.9	0.034	47.7	61.4	68.2
0.0055	3.9	7.9	9.9	0.035	49.4	63.3	70.3
0.0060	4.5	8.8	10.9	0.036	51.1	65.3	72.3
0.0065	5.1	9.6	11.9	0.037	52.9	67.2	74.4
0.0070	5.7	10.5	12.9	0.038	54.6	69.2	76.5
0.0075	6.3	11.4	13.9	0.039	56.3	71.1	78.5
0.0080	7.0	12.3	14.9	0.040	58.1	73.1	80.6
0.0085	7.6	13.2	15.9	0.041	59.8	75.0	82.7
0.0090	8.3	14.0	16.9	0.042	61.5	77.0	84.7
0.0095	9.0	14.9	17.9	0.043	63.3	79.0	86.8
0.0100	9.6	15.8	18.9	0.044	65.1	80.9	88.9
0.0105	10.3	16.8	20.0	0.045	66.8	82.9	90.9
0.0110	11.0	17.7	21.0	0.046	68.6	84.9	93.0
0.0115	11.7	18.6	22.0	0.047	70.3	86.8	95.1
0.0120	12.5	19.5	23.0	0.048	72.1	88.8	97.2
0.0125	13.2	20.4	24.0	0.049	73.9	90.8	99.2
0.0130	13.9	21.3	25.0	0.050	75.7	92.8	101.3
0.0135	14.6	22.3	26.1	0.051	77.5	94.7	103.4
0.0140	15.4	23.2	27.1	0.052	79.2	96.7	105.4
0.0145	16.1	24.1	28.1	0.053	81.0	98.7	107.5
0.0150	16.9	25.0	29.1	0.054	82.8	100.7	109.6
0.0155	17.6	26.0	30.1	0.055	84.6	102.7	111.7
0.0160	18.4	26.9	31.2	0.056	86.4	104.6	113.7
0.0165	19.1	27.8	32.2	0.057	88.2	106.6	115.8
0.0170	19.9	28.8	33.2	0.058	90.0	108.6	117.9
0.0175	20.7	29.7	34.2	0.059	91.8	110.6	120.0
0.0180	21.4	30.7	35.3	0.060	93.7	112.6	122.0
0.0185	22.2	31.6	36.3	0.061	95.5	114.6	124.1
0.0190	23.0	32.5	37.3	0.062	97.3	116.6	126.2
0.0195	23.8	33.5	38.3	0.063	99.1	118.6	128.3
0.0200	24.6	34.4	39.4	0.064	100.9	120.5	130.3
0.0205	25.4	35.4	40.4	0.065	102.8	122.5	132.4
0.0210	26.2	36.3	41.4	0.066	104.6	124.5	134.5
0.0215	27.0	37.3	42.4	0.067	106.4	126.5	136.6
0.0220	27.8	38.2	43.5	0.068	108.3	128.5	138.7
0.0225	28.6	39.2	44.5	0.069	110.1	130.5	140.7
0.0230	29.4	40.1	45.5	0.070	111.9	132.5	142.8
0.0235	30.2	41.1	46.6	0.071	113.8	134.5	144.9
0.0240	31.0	42.1	47.6	0.072	115.6	136.5	147.0
0.0245	31.8	43.0	48.6	0.073	117.5	138.5	149.0
0.0250	32.6	44.0	49.6	0.074	119.3	140.5	151.1
				0.075	121.1	142.5	153.2

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 2200.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.2	0.9	1.3	0.026	36.3	48.3	54.2
0.0015	0.4	1.6	2.3	0.027	38.1	50.3	56.4
0.0020	0.7	2.4	3.2	0.028	39.8	52.3	58.6
0.0025	1.1	3.2	4.2	0.029	41.6	54.3	60.7
0.0030	1.5	4.0	5.2	0.030	43.3	56.4	62.9
0.0035	2.0	4.8	6.3	0.031	45.1	58.4	65.0
0.0040	2.5	5.7	7.3	0.032	46.9	60.4	67.2
0.0045	3.1	6.6	8.3	0.033	48.7	62.5	69.4
0.0050	3.6	7.5	9.4	0.034	50.5	64.5	71.5
0.0055	4.2	8.4	10.4	0.035	52.3	66.6	73.7
0.0060	4.9	9.3	11.5	0.036	54.1	68.6	75.9
0.0065	5.5	10.2	12.5	0.037	55.9	70.6	78.0
0.0070	6.1	11.1	13.6	0.038	57.7	72.7	80.2
0.0075	6.8	12.0	14.6	0.039	59.5	74.8	82.4
0.0080	7.5	12.9	15.7	0.040	61.4	76.8	84.5
0.0085	8.2	13.9	16.7	0.041	63.2	78.9	86.7
0.0090	8.9	14.8	17.8	0.042	65.0	80.9	88.9
0.0095	9.6	15.8	18.8	0.043	66.9	83.0	91.0
0.0100	10.3	16.7	19.9	0.044	68.7	85.0	93.2
0.0105	11.0	17.7	21.0	0.045	70.6	87.1	95.4
0.0110	11.8	18.6	22.0	0.046	72.4	89.2	97.5
0.0115	12.5	19.6	23.1	0.047	74.3	91.2	99.7
0.0120	13.3	20.5	24.2	0.048	76.2	93.3	101.9
0.0125	14.0	21.5	25.2	0.049	78.0	95.4	104.1
0.0130	14.8	22.5	26.3	0.050	79.9	97.5	106.2
0.0135	15.6	23.4	27.4	0.051	81.8	99.5	108.4
0.0140	16.4	24.4	28.4	0.052	83.7	101.6	110.6
0.0145	17.1	25.4	29.5	0.053	85.5	103.7	112.7
0.0150	17.9	26.4	30.6	0.054	87.4	105.8	114.9
0.0155	18.7	27.3	31.7	0.055	89.3	107.8	117.1
0.0160	19.5	28.3	32.7	0.056	91.2	109.9	119.3
0.0165	20.3	29.3	33.8	0.057	93.1	112.0	121.4
0.0170	21.1	30.3	34.9	0.058	95.0	114.1	123.6
0.0175	22.0	31.3	35.9	0.059	96.9	116.2	125.8
0.0180	22.8	32.3	37.0	0.060	98.8	118.2	128.0
0.0185	23.6	33.3	38.1	0.061	100.7	120.3	130.1
0.0190	24.4	34.3	39.2	0.062	102.6	122.4	132.3
0.0195	25.3	35.2	40.2	0.063	104.6	124.5	134.5
0.0200	26.1	36.2	41.3	0.064	106.5	126.6	136.7
0.0205	26.9	37.2	42.4	0.065	108.4	128.7	138.8
0.0210	27.8	38.2	43.5	0.066	110.3	130.8	141.0
0.0215	28.6	39.2	44.5	0.067	112.2	132.9	143.2
0.0220	29.4	40.2	45.6	0.068	114.2	135.0	145.4
0.0225	30.3	41.2	46.7	0.069	116.1	137.1	147.5
0.0230	31.2	42.2	47.8	0.070	118.0	139.2	149.7
0.0235	32.0	43.2	48.9	0.071	120.0	141.3	151.9
0.0240	32.9	44.2	49.9	0.072	121.9	143.4	154.1
0.0245	33.7	45.2	51.0	0.073	123.8	145.4	156.3
0.0250	34.6	46.3	52.1	0.074	125.8	147.5	158.4
				0.075	127.7	149.6	160.6

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 2300.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.2	1.0	1.4	0.026	38.4	50.7	56.8
0.0015	0.4	1.7	2.4	0.027	40.2	52.8	59.1
0.0020	0.8	2.5	3.4	0.028	42.0	54.9	61.3
0.0025	1.2	3.4	4.5	0.029	43.9	57.0	63.6
0.0030	1.7	4.2	5.5	0.030	45.7	59.1	65.8
0.0035	2.2	5.1	6.6	0.031	47.6	61.3	68.1
0.0040	2.7	6.0	7.7	0.032	49.5	63.4	70.4
0.0045	3.3	6.9	8.7	0.033	51.4	65.5	72.6
0.0050	3.9	7.9	9.8	0.034	53.2	67.7	74.9
0.0055	4.5	8.8	10.9	0.035	55.1	69.8	77.1
0.0060	5.2	9.7	12.0	0.036	57.0	71.9	79.4
0.0065	5.9	10.7	13.1	0.037	58.9	74.1	81.7
0.0070	6.6	11.7	14.2	0.038	60.8	76.2	83.9
0.0075	7.3	12.6	15.3	0.039	62.8	78.4	86.2
0.0080	8.0	13.6	16.4	0.040	64.7	80.5	88.5
0.0085	8.7	14.6	17.5	0.041	66.6	82.7	90.7
0.0090	9.4	15.6	18.7	0.042	68.5	84.8	93.0
0.0095	10.2	16.6	19.8	0.043	70.5	87.0	95.3
0.0100	11.0	17.6	20.9	0.044	72.4	89.2	97.5
0.0105	11.7	18.6	22.0	0.045	74.4	91.3	99.8
0.0110	12.5	19.6	23.1	0.046	76.3	93.5	102.1
0.0115	13.3	20.6	24.2	0.047	78.3	95.7	104.3
0.0120	14.1	21.6	25.3	0.048	80.2	97.8	106.6
0.0125	14.9	22.6	26.4	0.049	82.2	100.0	108.9
0.0130	15.7	23.6	27.6	0.050	84.1	102.2	111.2
0.0135	16.5	24.6	28.7	0.051	86.1	104.3	113.4
0.0140	17.4	25.7	29.8	0.052	88.1	106.5	115.7
0.0145	18.2	26.7	30.9	0.053	90.1	108.7	118.0
0.0150	19.0	27.7	32.0	0.054	92.0	110.8	120.2
0.0155	19.9	28.7	33.2	0.055	94.0	113.0	122.5
0.0160	20.7	29.8	34.3	0.056	96.0	115.2	124.8
0.0165	21.5	30.8	35.4	0.057	98.0	117.4	127.1
0.0170	22.4	31.8	36.5	0.058	100.0	119.6	129.3
0.0175	23.3	32.9	37.7	0.059	102.0	121.7	131.6
0.0180	24.1	33.9	38.8	0.060	104.0	123.9	133.9
0.0185	25.0	34.9	39.9	0.061	106.0	126.1	136.2
0.0190	25.9	36.0	41.0	0.062	108.0	128.3	138.4
0.0195	26.7	37.0	42.1	0.063	110.0	130.5	140.7
0.0200	27.6	38.0	43.3	0.064	112.0	132.7	143.0
0.0205	28.5	39.1	44.4	0.065	114.0	134.9	145.3
0.0210	29.4	40.1	45.5	0.066	116.0	137.0	147.5
0.0215	30.3	41.2	46.6	0.067	118.1	139.2	149.8
0.0220	31.1	42.2	47.8	0.068	120.1	141.4	152.1
0.0225	32.0	43.3	48.9	0.069	122.1	143.6	154.4
0.0230	32.9	44.3	50.0	0.070	124.1	145.8	156.6
0.0235	33.8	45.4	51.2	0.071	126.2	148.0	158.9
0.0240	34.7	46.4	52.3	0.072	128.2	150.2	161.2
0.0245	35.6	47.5	53.4	0.073	130.2	152.4	163.5
0.0250	36.5	48.5	54.5	0.074	132.3	154.6	165.8
				0.075	134.3	156.8	168.0

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 2400.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.2	1.1	1.5	0.026	40.4	53.0	59.3
0.0015	0.5	1.8	2.5	0.027	42.3	55.2	61.7
0.0020	0.8	2.7	3.6	0.028	44.3	57.5	64.1
0.0025	1.3	3.6	4.7	0.029	46.2	59.7	66.4
0.0030	1.8	4.5	5.8	0.030	48.2	61.9	68.8
0.0035	2.3	5.4	6.9	0.031	50.1	64.1	71.1
0.0040	2.9	6.3	8.0	0.032	52.1	66.4	73.5
0.0045	3.5	7.3	9.2	0.033	54.1	68.6	75.9
0.0050	4.2	8.3	10.3	0.034	56.0	70.8	78.2
0.0055	4.9	9.3	11.5	0.035	58.0	73.1	80.6
0.0060	5.5	10.2	12.6	0.036	60.0	75.3	82.9
0.0065	6.3	11.2	13.7	0.037	62.0	77.5	85.3
0.0070	7.0	12.3	14.9	0.038	64.0	79.8	87.7
0.0075	7.7	13.3	16.1	0.039	66.0	82.0	90.0
0.0080	8.5	14.3	17.2	0.040	68.0	84.3	92.4
0.0085	9.3	15.3	18.4	0.041	70.0	86.5	94.8
0.0090	10.0	16.4	19.5	0.042	72.1	88.8	97.1
0.0095	10.8	17.4	20.7	0.043	74.1	91.0	99.5
0.0100	11.6	18.4	21.8	0.044	76.1	93.3	101.9
0.0105	12.4	19.5	23.0	0.045	78.2	95.5	104.2
0.0110	13.3	20.5	24.2	0.046	80.2	97.8	106.6
0.0115	14.1	21.6	25.3	0.047	82.2	100.1	109.0
0.0120	14.9	22.6	26.5	0.048	84.3	102.3	111.4
0.0125	15.8	23.7	27.7	0.049	86.3	104.6	113.7
0.0130	16.6	24.8	28.8	0.050	88.4	106.9	116.1
0.0135	17.5	25.8	30.0	0.051	90.5	109.1	118.5
0.0140	18.4	26.9	31.2	0.052	92.5	111.4	120.8
0.0145	19.2	28.0	32.3	0.053	94.6	113.7	123.2
0.0150	20.1	29.0	33.5	0.054	96.7	115.9	125.6
0.0155	21.0	30.1	34.7	0.055	98.8	118.2	127.9
0.0160	21.9	31.2	35.8	0.056	100.8	120.5	130.3
0.0165	22.8	32.3	37.0	0.057	102.9	122.8	132.7
0.0170	23.7	33.3	38.2	0.058	105.0	125.0	135.1
0.0175	24.6	34.4	39.4	0.059	107.1	127.3	137.4
0.0180	25.5	35.5	40.5	0.060	109.2	129.6	139.8
0.0185	26.4	36.6	41.7	0.061	111.3	131.9	142.2
0.0190	27.3	37.7	42.9	0.062	113.4	134.2	144.6
0.0195	28.2	38.8	44.1	0.063	115.5	136.5	146.9
0.0200	29.1	39.9	45.2	0.064	117.6	138.7	149.3
0.0205	30.1	41.0	46.4	0.065	119.7	141.0	151.7
0.0210	31.0	42.0	47.6	0.066	121.8	143.3	154.1
0.0215	31.9	43.1	48.8	0.067	123.9	145.6	156.4
0.0220	32.8	44.2	49.9	0.068	126.0	147.9	158.8
0.0225	33.8	45.3	51.1	0.069	128.1	150.2	161.2
0.0230	34.7	46.4	52.3	0.070	130.3	152.5	163.6
0.0235	35.7	47.5	53.5	0.071	132.4	154.8	165.9
0.0240	36.6	48.6	54.6	0.072	134.5	157.1	168.3
0.0245	37.6	49.7	55.8	0.073	136.6	159.3	170.7
0.0250	38.5	50.8	57.0	0.074	138.8	161.6	173.1
				0.075	140.9	163.9	175.5

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 2500.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.0010	0.2	1.1	1.6	0.026	42.5	55.4	61.9
0.0015	0.5	1.9	2.7	0.027	44.5	57.7	64.3
0.0020	0.9	2.8	3.8	0.028	46.5	60.0	66.8
0.0025	1.4	3.7	4.9	0.029	48.6	62.4	69.3
0.0030	1.9	4.7	6.1	0.030	50.6	64.7	71.7
0.0035	2.5	5.7	7.2	0.031	52.6	67.0	74.2
0.0040	3.1	6.7	8.4	0.032	54.7	69.3	76.6
0.0045	3.8	7.7	9.6	0.033	56.8	71.7	79.1
0.0050	4.5	8.7	10.8	0.034	58.8	74.0	81.6
0.0055	5.2	9.7	12.0	0.035	60.9	76.3	84.0
0.0060	5.9	10.7	13.2	0.036	63.0	78.7	86.5
0.0065	6.6	11.8	14.4	0.037	65.1	81.0	89.0
0.0070	7.4	12.9	15.6	0.038	67.2	83.3	91.4
0.0075	8.2	13.9	16.8	0.039	69.3	85.7	93.9
0.0080	9.0	15.0	18.0	0.040	71.4	88.0	96.3
0.0085	9.8	16.1	19.2	0.041	73.5	90.4	98.8
0.0090	10.6	17.1	20.4	0.042	75.6	92.7	101.3
0.0095	11.5	18.2	21.6	0.043	77.7	95.1	103.7
0.0100	12.3	19.3	22.8	0.044	79.8	97.4	106.2
0.0105	13.2	20.4	24.0	0.045	82.0	99.8	108.7
0.0110	14.0	21.5	25.2	0.046	84.1	102.1	111.1
0.0115	14.9	22.6	26.4	0.047	86.2	104.5	113.6
0.0120	15.8	23.7	27.7	0.048	88.4	106.9	116.1
0.0125	16.7	24.8	28.9	0.049	90.5	109.2	118.6
0.0130	17.6	25.9	30.1	0.050	92.7	111.6	121.0
0.0135	18.5	27.0	31.3	0.051	94.8	113.9	123.5
0.0140	19.4	28.1	32.5	0.052	97.0	116.3	126.0
0.0145	20.3	29.3	33.7	0.053	99.2	118.7	128.4
0.0150	21.2	30.4	35.0	0.054	101.3	121.0	130.9
0.0155	22.1	31.5	36.2	0.055	103.5	123.4	133.4
0.0160	23.1	32.6	37.4	0.056	105.7	125.8	135.9
0.0165	24.0	33.7	38.6	0.057	107.8	128.2	138.3
0.0170	24.9	34.9	39.8	0.058	110.0	130.5	140.8
0.0175	25.9	36.0	41.1	0.059	112.2	132.9	143.3
0.0180	26.8	37.1	42.3	0.060	114.4	135.3	145.7
0.0185	27.8	38.3	43.5	0.061	116.6	137.7	148.2
0.0190	28.7	39.4	44.7	0.062	118.8	140.1	150.7
0.0195	29.7	40.5	46.0	0.063	121.0	142.4	153.2
0.0200	30.7	41.7	47.2	0.064	123.2	144.8	155.6
0.0205	31.6	42.8	48.4	0.065	125.4	147.2	158.1
0.0210	32.6	44.0	49.6	0.066	127.6	149.6	160.6
0.0215	33.6	45.1	50.9	0.067	129.8	152.0	163.1
0.0220	34.6	46.2	52.1	0.068	132.0	154.4	165.5
0.0225	35.5	47.4	53.3	0.069	134.2	156.7	168.0
0.0230	36.5	48.5	54.5	0.070	136.4	159.1	170.5
0.0235	37.5	49.7	55.8	0.071	138.6	161.5	173.0
0.0240	38.5	50.8	57.0	0.072	140.9	163.9	175.4
0.0245	39.5	52.0	58.2	0.073	143.1	166.3	177.9
0.0250	40.5	53.1	59.4	0.074	145.3	168.7	180.4
				0.075	147.5	171.1	182.9

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 3000.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.3	1.4	2.0	0.026	53.0	67.4	74.7
0.0015	0.7	2.5	3.3	0.027	55.5	70.2	77.6
0.0020	1.3	3.6	4.7	0.028	57.9	73.0	80.6
0.0025	1.9	4.7	6.1	0.029	60.4	75.8	83.5
0.0030	2.6	5.9	7.5	0.030	62.9	78.6	86.5
0.0035	3.4	7.1	8.9	0.031	65.4	81.4	89.4
0.0040	4.2	8.3	10.3	0.032	67.9	84.2	92.4
0.0045	5.0	9.5	11.7	0.033	70.5	87.0	95.3
0.0050	5.9	10.7	13.2	0.034	73.0	89.9	98.3
0.0055	6.8	12.0	14.6	0.035	75.5	92.7	101.3
0.0060	7.7	13.3	16.0	0.036	78.1	95.5	104.2
0.0065	8.7	14.6	17.5	0.037	80.6	98.3	107.2
0.0070	9.6	15.8	18.9	0.038	83.2	101.1	110.1
0.0075	10.6	17.1	20.4	0.039	85.7	104.0	113.1
0.0080	11.6	18.4	21.8	0.040	88.3	106.8	116.1
0.0085	12.6	19.7	23.3	0.041	90.9	109.6	119.0
0.0090	13.7	21.1	24.7	0.042	93.4	112.5	122.0
0.0095	14.7	22.4	26.2	0.043	96.0	115.3	125.0
0.0100	15.8	23.7	27.7	0.044	98.6	118.2	127.9
0.0105	16.8	25.0	29.1	0.045	101.2	121.0	130.9
0.0110	17.9	26.4	30.6	0.046	103.8	123.8	133.8
0.0115	19.0	27.7	32.0	0.047	106.4	126.7	136.8
0.0120	20.1	29.0	33.5	0.048	109.0	129.5	139.8
0.0125	21.2	30.4	35.0	0.049	111.6	132.4	142.7
0.0130	22.3	31.7	36.4	0.050	114.3	135.2	145.7
0.0135	23.4	33.1	37.9	0.051	116.9	138.1	148.7
0.0140	24.5	34.4	39.4	0.052	119.5	140.9	151.6
0.0145	25.7	35.8	40.8	0.053	122.1	143.8	154.6
0.0150	26.8	37.1	42.3	0.054	124.8	146.6	157.6
0.0155	28.0	38.5	43.8	0.055	127.4	149.5	160.6
0.0160	29.1	39.8	45.2	0.056	130.1	152.4	163.5
0.0165	30.3	41.2	46.7	0.057	132.7	155.2	166.5
0.0170	31.4	42.6	48.2	0.058	135.4	158.1	169.5
0.0175	32.6	43.9	49.6	0.059	138.0	161.0	172.4
0.0180	33.8	45.3	51.1	0.060	140.7	163.8	175.4
0.0185	34.9	46.7	52.6	0.061	143.3	166.7	178.4
0.0190	36.1	48.1	54.0	0.062	146.0	169.6	181.3
0.0195	37.3	49.4	55.5	0.063	148.7	172.4	184.3
0.0200	38.5	50.8	57.0	0.064	151.3	175.3	187.3
0.0205	39.7	52.2	58.4	0.065	154.0	178.2	190.3
0.0210	40.9	53.6	59.9	0.066	156.7	181.0	193.2
0.0215	42.1	55.0	61.4	0.067	159.4	183.9	196.2
0.0220	43.3	56.3	62.9	0.068	162.0	186.8	199.2
0.0225	44.5	57.7	64.3	0.069	164.7	189.7	202.1
0.0230	45.7	59.1	65.8	0.070	167.4	192.5	205.1
0.0235	46.9	60.5	67.3	0.071	170.1	195.4	208.1
0.0240	48.1	61.9	68.8	0.072	172.8	198.3	211.1
0.0245	49.3	63.3	70.2	0.073	175.5	201.2	214.0
0.0250	50.6	64.7	71.7	0.074	178.2	204.1	217.0
				0.075	180.9	207.0	220.0

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 3500.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.0010	0.4	1.8	2.4	0.026	63.7	79.5	87.4
0.0015	1.0	3.0	4.0	0.027	66.6	82.8	90.5
0.0020	1.7	4.3	5.6	0.028	69.6	86.1	94.3
0.0025	2.5	5.7	7.2	0.029	72.5	89.4	97.8
0.0030	3.4	7.1	8.9	0.030	75.5	92.7	101.2
0.0035	4.3	8.5	10.5	0.031	78.4	95.9	104.7
0.0040	5.3	9.9	12.2	0.032	81.4	99.2	108.2
0.0045	6.3	11.4	13.9	0.033	84.4	102.5	111.6
0.0050	7.4	12.8	15.6	0.034	87.4	105.8	115.1
0.0055	8.5	14.3	17.3	0.035	90.4	109.1	118.5
0.0060	9.6	15.8	18.9	0.036	93.4	112.4	122.0
0.0065	10.8	17.3	20.6	0.037	96.4	115.7	125.4
0.0070	12.0	18.9	22.3	0.038	99.4	119.1	128.9
0.0075	13.2	20.4	24.0	0.039	102.4	122.4	132.3
0.0080	14.4	21.9	25.7	0.040	105.5	125.7	135.8
0.0085	15.6	23.5	27.4	0.041	108.5	129.0	139.3
0.0090	16.8	25.0	29.1	0.042	111.5	132.3	142.7
0.0095	18.1	26.6	30.8	0.043	114.6	135.7	146.2
0.0100	19.4	28.1	32.5	0.044	117.7	139.0	149.6
0.0105	20.6	29.7	34.2	0.045	120.7	142.3	153.1
0.0110	21.9	31.3	35.9	0.046	123.8	145.6	156.6
0.0115	23.2	32.8	37.6	0.047	126.9	149.0	160.0
0.0120	24.5	34.4	39.3	0.048	129.9	152.3	163.5
0.0125	25.9	36.0	41.1	0.049	133.0	155.6	167.0
0.0130	27.2	37.6	42.8	0.050	136.1	159.0	170.4
0.0135	28.5	39.2	44.5	0.051	139.2	162.3	173.9
0.0140	29.9	40.7	46.2	0.052	142.3	165.7	177.4
0.0145	31.2	42.3	47.9	0.053	145.4	169.0	180.8
0.0150	32.6	43.9	49.6	0.054	148.5	172.4	184.3
0.0155	33.9	45.5	51.3	0.055	151.6	175.7	187.7
0.0160	35.3	47.1	53.0	0.056	154.7	179.1	191.2
0.0165	36.7	48.7	54.8	0.057	157.9	182.4	194.7
0.0170	38.1	50.3	56.5	0.058	161.0	185.8	198.2
0.0175	39.5	51.9	58.2	0.059	164.1	189.1	201.6
0.0180	40.9	53.6	59.9	0.060	167.2	192.5	205.1
0.0185	42.2	55.2	61.6	0.061	170.4	195.8	208.6
0.0190	43.7	56.8	63.3	0.062	173.5	199.2	212.0
0.0195	45.1	58.4	65.1	0.063	176.6	202.5	215.5
0.0200	46.5	60.0	66.8	0.064	179.8	205.9	219.0
0.0205	47.9	61.6	68.5	0.065	182.9	209.3	222.4
0.0210	49.3	63.3	70.2	0.066	186.1	212.6	225.9
0.0215	50.7	64.9	71.9	0.067	189.2	216.0	229.4
0.0220	52.2	66.5	73.7	0.068	192.4	219.4	232.8
0.0225	53.6	68.1	75.4	0.069	195.6	222.7	236.3
0.0230	55.0	69.8	77.1	0.070	198.7	226.1	239.8
0.0235	56.5	71.4	78.8	0.071	201.9	229.5	243.3
0.0240	57.9	73.0	80.6	0.072	205.0	232.8	246.7
0.0245	59.4	74.6	82.3	0.073	208.2	236.2	250.2
0.0250	60.8	76.3	84.0	0.074	211.4	239.6	253.7
				0.075	214.6	243.0	257.1

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 4000.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.6	2.1	2.9	0.026	74.6	91.7	100.3
0.0015	1.3	3.6	4.7	0.027	78.0	95.5	104.2
0.0020	2.1	5.1	6.5	0.028	81.4	99.2	108.1
0.0025	3.1	6.7	8.4	0.029	84.8	103.0	112.1
0.0030	4.2	8.3	10.3	0.030	88.2	106.7	116.0
0.0035	5.3	9.9	12.2	0.031	91.6	110.5	120.0
0.0040	6.5	11.6	14.1	0.032	95.0	114.3	123.9
0.0045	7.7	13.3	16.0	0.033	98.5	118.1	127.9
0.0050	9.0	15.0	18.0	0.034	101.9	121.9	131.8
0.0055	10.3	16.7	19.9	0.035	105.4	125.7	135.8
0.0060	11.6	18.4	21.8	0.036	108.9	129.5	139.7
0.0065	13.0	20.2	23.8	0.037	112.3	133.2	143.7
0.0070	14.4	21.9	25.7	0.038	115.8	137.0	147.7
0.0075	15.8	23.7	27.7	0.039	119.3	140.8	151.6
0.0080	17.2	25.5	29.6	0.040	122.8	144.7	155.6
0.0085	18.6	27.2	31.5	0.041	126.3	148.5	159.5
0.0090	20.1	29.0	33.5	0.042	129.8	152.3	163.5
0.0095	21.6	30.8	35.4	0.043	133.4	156.1	167.4
0.0100	23.0	32.6	37.4	0.044	136.9	159.9	171.4
0.0105	24.5	34.4	39.3	0.045	140.4	163.7	175.4
0.0110	26.0	36.2	41.3	0.046	144.0	167.5	179.3
0.0115	27.6	38.0	43.3	0.047	147.5	171.4	183.3
0.0120	29.1	39.8	45.2	0.048	151.1	175.2	187.2
0.0125	30.6	41.7	47.2	0.049	154.6	179.0	191.2
0.0130	32.2	43.5	49.1	0.050	158.2	182.8	195.2
0.0135	33.7	45.3	51.1	0.051	161.7	186.7	199.1
0.0140	35.3	47.1	53.0	0.052	165.3	190.5	203.1
0.0145	36.9	49.0	55.0	0.053	168.9	194.3	207.0
0.0150	38.5	50.8	57.0	0.054	172.5	198.2	211.0
0.0155	40.0	52.6	58.9	0.055	176.1	202.0	215.0
0.0160	41.6	54.5	60.9	0.056	179.6	205.8	218.9
0.0165	43.2	56.3	62.9	0.057	183.2	209.7	222.9
0.0170	44.8	58.2	64.8	0.058	186.8	213.5	226.9
0.0175	46.5	60.0	66.8	0.059	190.4	217.4	230.8
0.0180	48.1	61.9	68.7	0.060	194.0	221.2	234.8
0.0185	49.7	63.7	70.7	0.061	197.6	225.1	238.8
0.0190	51.3	65.6	72.7	0.062	201.3	228.9	242.7
0.0195	53.0	67.4	74.6	0.063	204.9	232.8	246.7
0.0200	54.6	69.3	76.6	0.064	208.5	236.6	250.7
0.0205	56.2	71.1	78.6	0.065	212.1	240.5	254.6
0.0210	57.9	73.0	80.5	0.066	215.7	244.3	258.6
0.0215	59.5	74.9	82.5	0.067	219.4	248.2	262.6
0.0220	61.2	76.7	84.5	0.068	223.0	252.0	266.5
0.0225	62.9	78.6	86.5	0.069	226.6	255.9	270.5
0.0230	64.5	80.5	88.4	0.070	230.3	259.7	274.5
0.0235	66.2	82.3	90.4	0.071	233.9	263.6	278.4
0.0240	67.9	84.2	92.4	0.072	237.6	267.5	282.4
0.0245	69.5	86.1	94.3	0.073	241.2	271.3	286.4
0.0250	71.2	87.9	96.3	0.074	244.9	275.2	290.4
				0.075	248.5	279.1	294.3

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 4500.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UC
0.0010	0.7	2.5	3.3	0.026	85.6	103.9	113.
0.0015	1.6	4.1	5.4	0.027	89.4	108.1	117.
0.0020	2.6	5.9	7.5	0.028	93.3	112.4	121.
0.0025	3.8	7.7	9.6	0.029	97.1	116.6	126.
0.0030	5.0	9.5	11.7	0.030	101.0	120.9	130.
0.0035	6.3	11.4	13.9	0.031	104.9	125.2	135.
0.0040	7.7	13.3	16.0	0.032	108.8	129.4	139.
0.0045	9.1	15.2	18.2	0.033	112.7	133.7	144.
0.0050	10.6	17.1	20.4	0.034	116.6	138.0	148.
0.0055	12.1	19.1	22.6	0.035	120.6	142.2	153.
0.0060	13.7	21.0	24.7	0.036	124.5	146.5	157.
0.0065	15.2	23.0	26.9	0.037	128.5	150.8	162.
0.0070	16.8	25.0	29.1	0.038	132.4	155.1	166.
0.0075	18.4	27.0	31.3	0.039	136.4	159.4	170.
0.0080	20.1	29.0	33.5	0.040	140.4	163.7	175.
0.0085	21.7	31.0	35.7	0.041	144.3	168.0	179.
0.0090	23.4	33.1	37.9	0.042	148.3	172.3	184.
0.0095	25.1	35.1	40.1	0.043	152.3	176.6	188.
0.0100	26.8	37.1	42.3	0.044	156.3	180.9	193.
0.0105	28.5	39.2	44.5	0.045	160.3	185.2	197.
0.0110	30.2	41.2	46.7	0.046	164.3	189.5	202.
0.0115	32.0	43.2	48.9	0.047	168.3	193.8	206.
0.0120	33.7	45.3	51.1	0.048	172.4	198.1	211.
0.0125	35.5	47.4	53.3	0.049	176.4	202.4	215.
0.0130	37.3	49.4	55.5	0.050	180.4	206.7	219.
0.0135	39.0	51.5	57.7	0.051	184.5	211.1	224.
0.0140	40.8	53.5	59.9	0.052	188.5	215.4	228.
0.0145	42.6	55.6	62.1	0.053	192.6	219.7	233.
0.0150	44.4	57.7	64.3	0.054	196.6	224.0	237.
0.0155	46.2	59.8	66.5	0.055	200.7	228.4	242.
0.0160	48.1	61.8	68.7	0.056	204.7	232.7	246.
0.0165	49.9	63.9	71.0	0.057	208.8	237.0	251.
0.0170	51.7	66.0	73.2	0.058	212.9	241.4	255.
0.0175	53.6	68.1	75.4	0.059	216.9	245.7	260.
0.0180	55.4	70.2	77.6	0.060	221.0	250.0	264.
0.0185	57.3	72.3	79.8	0.061	225.1	254.4	269.
0.0190	59.1	74.4	82.0	0.062	229.2	258.7	273.4
0.0195	61.0	76.5	84.2	0.063	233.3	263.0	277.9
0.0200	62.8	78.6	86.4	0.064	237.4	267.4	282.4
0.0205	64.7	80.7	88.7	0.065	241.5	271.7	286.8
0.0210	66.6	82.8	90.9	0.066	245.6	276.1	291.3
0.0215	68.5	84.9	93.1	0.067	249.7	280.4	295.8
0.0220	70.3	87.0	95.3	0.068	253.8	284.8	300.2
0.0225	72.2	89.1	97.5	0.069	257.9	289.1	304.7
0.0230	74.1	91.2	99.7	0.070	262.0	293.5	309.2
0.0235	76.0	93.3	102.0	0.071	266.2	297.8	313.6
0.0240	77.9	95.4	104.2	0.072	270.3	302.2	318.1
0.0245	79.8	97.6	106.4	0.073	274.4	306.5	322.6
0.0250	81.7	99.7	108.6	0.074	278.6	310.9	327.0
				0.075	282.7	315.2	331.5

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 5000.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	0.9	2.8	3.8	0.026	96.7	116.2	125.9
0.0015	1.9	4.7	6.1	0.027	101.0	120.9	130.8
0.0020	3.1	6.6	8.4	0.028	105.3	125.6	135.8
0.0025	4.5	8.7	10.8	0.029	109.6	130.4	140.7
0.0030	5.9	10.7	13.2	0.030	114.0	135.1	145.6
0.0035	7.4	12.8	15.6	0.031	118.3	139.8	150.6
0.0040	9.0	15.0	18.0	0.032	122.7	144.6	155.5
0.0045	10.6	17.1	20.4	0.033	127.1	149.4	160.5
0.0050	12.3	19.3	22.8	0.034	131.5	154.1	165.4
0.0055	14.0	21.5	25.2	0.035	135.9	158.9	170.4
0.0060	15.8	23.7	27.7	0.036	140.3	163.6	175.3
0.0065	17.5	25.9	30.1	0.037	144.7	168.4	180.3
0.0070	19.3	28.1	32.5	0.038	149.1	173.2	185.2
0.0075	21.2	30.4	35.0	0.039	153.6	178.0	190.2
0.0080	23.0	32.6	37.4	0.040	158.0	182.8	195.1
0.0085	24.9	34.9	39.8	0.041	162.5	187.5	200.1
0.0090	26.8	37.1	42.3	0.042	166.9	192.3	205.0
0.0095	28.7	39.4	44.7	0.043	171.4	197.1	210.0
0.0100	30.6	41.6	47.2	0.044	175.9	201.9	214.9
0.0105	32.5	43.9	49.6	0.045	180.3	206.7	219.9
0.0110	34.5	46.2	52.1	0.046	184.8	211.5	224.8
0.0115	36.5	48.5	54.5	0.047	189.3	216.3	229.8
0.0120	38.4	50.8	57.0	0.048	193.8	221.1	234.8
0.0125	40.4	53.1	59.4	0.049	198.3	225.9	239.7
0.0130	42.4	55.4	61.9	0.050	202.8	230.7	244.7
0.0135	44.4	57.7	64.3	0.051	207.3	235.5	249.6
0.0140	46.4	60.0	66.8	0.052	211.8	240.3	254.6
0.0145	48.4	62.3	69.2	0.053	216.4	245.2	259.5
0.0150	50.5	64.6	71.7	0.054	220.9	250.0	264.5
0.0155	52.5	66.9	74.1	0.055	225.4	254.8	269.5
0.0160	54.6	69.3	76.6	0.056	230.0	259.6	274.4
0.0165	56.6	71.6	79.1	0.057	234.5	264.4	279.4
0.0170	58.7	73.9	81.5	0.058	239.1	269.3	284.3
0.0175	60.7	76.2	84.0	0.059	243.6	274.1	289.3
0.0180	62.8	78.6	86.4	0.060	248.2	278.9	294.3
0.0185	64.9	80.9	88.9	0.061	252.8	283.7	299.2
0.0190	67.0	83.2	91.4	0.062	257.3	288.6	304.2
0.0195	69.1	85.6	93.8	0.063	261.9	293.4	309.1
0.0200	71.2	87.9	96.3	0.064	266.5	298.2	314.1
0.0205	73.3	90.3	98.8	0.065	271.0	303.1	319.1
0.0210	75.4	92.6	101.2	0.066	275.6	307.9	324.0
0.0215	77.5	95.0	103.7	0.067	280.2	312.7	329.0
0.0220	79.6	97.3	106.2	0.068	284.8	317.6	334.0
0.0225	81.7	99.7	108.6	0.069	289.4	322.4	338.9
0.0230	83.8	102.0	111.1	0.070	294.0	327.3	343.9
0.0235	86.0	104.4	113.6	0.071	298.6	332.1	348.9
0.0240	88.1	106.7	116.0	0.072	303.2	337.0	353.8
0.0245	90.2	109.1	118.5	0.073	307.8	341.8	358.8
0.0250	92.4	111.4	121.0	0.074	312.4	346.7	363.8
				0.075	317.0	351.5	368.7

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 7500.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL
0.0010	1.9	4.7	6.1	0.026	153.4	177.9	190.1
0.0015	3.8	7.7	9.6	0.027	160.0	185.0	197.5
0.0020	5.9	10.7	13.2	0.028	166.7	192.2	205.0
0.0025	8.2	13.9	16.8	0.029	173.4	199.4	212.4
0.0030	10.6	17.1	20.4	0.030	180.1	206.6	219.8
0.0035	13.1	20.4	24.0	0.031	186.8	213.8	227.3
0.0040	15.8	23.7	27.6	0.032	193.5	221.0	234.7
0.0045	18.4	27.0	31.3	0.033	200.2	228.2	242.1
0.0050	21.2	30.4	34.9	0.034	207.0	235.4	249.6
0.0055	23.9	33.7	38.6	0.035	213.8	242.6	257.0
0.0060	26.8	37.1	42.3	0.036	220.5	249.8	264.4
0.0065	29.6	40.5	45.9	0.037	227.3	257.0	271.9
0.0070	32.5	43.9	49.6	0.038	234.1	264.2	279.3
0.0075	35.5	47.3	53.3	0.039	240.9	271.5	286.7
0.0080	38.4	50.8	56.9	0.040	247.7	278.7	294.2
0.0085	41.4	54.2	60.6	0.041	254.6	285.9	301.6
0.0090	44.4	57.7	64.3	0.042	261.4	293.2	309.1
0.0095	47.4	61.1	68.0	0.043	268.3	300.4	316.5
0.0100	50.4	64.6	71.7	0.044	275.1	307.7	323.9
0.0105	53.5	68.1	75.4	0.045	282.0	314.9	331.4
0.0110	56.6	71.6	79.0	0.046	288.8	322.2	338.8
0.0115	59.7	75.0	82.7	0.047	295.7	329.4	346.3
0.0120	62.8	78.5	86.4	0.048	302.6	336.7	353.7
0.0125	65.9	82.0	90.1	0.049	309.5	343.9	361.2
0.0130	69.0	85.5	93.8	0.050	316.4	351.2	368.6
0.0135	72.1	89.1	97.5	0.051	323.3	358.5	376.1
0.0140	75.3	92.6	101.2	0.052	330.2	365.8	383.5
0.0145	78.5	96.1	104.9	0.053	337.1	373.0	391.0
0.0150	81.6	99.6	108.6	0.054	344.1	380.3	398.4
0.0155	84.8	103.1	112.3	0.055	351.0	387.6	405.9
0.0160	88.0	106.7	116.0	0.056	357.9	394.9	413.3
0.0165	91.2	110.2	119.7	0.057	364.9	402.1	420.8
0.0170	94.4	113.7	123.4	0.058	371.8	409.4	428.2
0.0175	97.6	117.3	127.1	0.059	378.8	416.7	435.7
0.0180	100.9	120.8	130.8	0.060	385.7	424.0	443.1
0.0185	104.1	124.4	134.5	0.061	392.7	431.3	450.6
0.0190	107.3	127.9	138.2	0.062	399.7	438.6	458.0
0.0195	110.6	131.5	141.9	0.063	406.7	445.9	465.5
0.0200	113.9	135.0	145.6	0.064	413.6	453.2	472.9
0.0205	117.1	138.6	149.3	0.065	420.6	460.5	480.4
0.0210	120.4	142.1	153.0	0.066	427.6	467.8	487.9
0.0215	123.7	145.7	156.7	0.067	434.6	475.1	495.3
0.0220	126.9	149.3	160.4	0.068	441.6	482.4	502.8
0.0225	130.2	152.8	164.2	0.069	448.6	489.7	510.2
0.0230	133.5	156.4	167.9	0.070	455.6	497.0	517.7
0.0235	136.8	160.0	171.6	0.071	462.6	504.3	525.1
0.0240	140.1	163.6	175.3	0.072	469.7	511.6	532.6
0.0245	143.4	167.1	179.0	0.073	476.7	518.9	540.1
0.0250	146.7	170.7	182.7	0.074	483.7	526.2	547.5
				0.075	490.7	533.6	555.0

STATISTICAL QUALITY CONTROL LIMITS
FILE II -- FRACTION DEFECTIVE

N = 15000.0

't'	'STD'	'AQL'	'UCL'	't'	'STD'	'AQL'	'UCL'
0.0010	5.9	10.7	13.2	0.026	329.5	365.5	383.4
0.0015	10.6	17.1	20.4	0.027	343.3	380.0	398.3
0.0020	15.7	23.7	27.6	0.028	357.2	394.5	413.2
0.0025	21.2	30.3	34.9	0.029	371.0	409.1	428.1
0.0030	26.8	37.1	42.3	0.030	384.9	423.6	443.0
0.0035	32.5	43.9	49.6	0.031	398.8	438.2	457.9
0.0040	38.4	50.8	56.9	0.032	412.7	452.8	472.8
0.0045	44.3	57.6	64.3	0.033	426.6	467.3	487.7
0.0050	50.4	64.6	71.7	0.034	440.6	481.9	502.6
0.0055	56.5	71.5	79.0	0.035	454.5	496.5	517.5
0.0060	62.7	78.5	86.4	0.036	468.5	511.1	532.4
0.0065	68.9	85.5	93.8	0.037	482.5	525.7	547.3
0.0070	75.2	92.5	101.2	0.038	496.5	540.3	562.2
0.0075	81.6	99.6	108.6	0.039	510.5	554.9	577.2
0.0080	87.9	106.6	116.0	0.040	524.6	569.6	592.1
0.0085	94.3	113.7	123.4	0.041	538.6	584.2	607.0
0.0090	100.8	120.8	130.8	0.042	552.7	598.8	621.9
0.0095	107.2	127.9	138.2	0.043	566.8	613.5	636.8
0.0100	113.7	135.0	145.6	0.044	580.8	628.1	651.7
0.0105	120.2	142.1	153.0	0.045	594.9	642.8	666.7
0.0110	126.8	149.2	160.4	0.046	609.1	657.4	681.6
0.0115	133.3	156.3	167.8	0.047	623.2	672.1	696.5
0.0120	139.9	163.5	175.2	0.048	637.3	686.7	711.4
0.0125	146.5	170.6	182.7	0.049	651.5	701.4	726.3
0.0130	153.1	177.8	190.1	0.050	665.6	716.1	741.3
0.0135	159.8	184.9	197.5	0.051	679.8	730.7	756.2
0.0140	166.4	192.1	204.9	0.052	693.9	745.4	771.1
0.0145	173.1	199.3	212.4	0.053	708.1	760.1	786.1
0.0150	179.8	206.5	219.8	0.054	722.3	774.8	801.0
0.0155	186.5	213.6	227.2	0.055	736.5	789.4	815.9
0.0160	193.2	220.8	234.6	0.056	750.7	804.1	830.8
0.0165	199.9	228.0	242.1	0.057	764.9	818.8	845.8
0.0170	206.7	235.2	249.5	0.058	779.2	833.5	860.7
0.0175	213.4	242.4	256.9	0.059	793.4	848.2	875.6
0.0180	220.2	249.6	264.4	0.060	807.6	862.9	890.6
0.0185	226.9	256.8	271.8	0.061	821.9	877.6	905.5
0.0190	233.7	264.1	279.2	0.062	836.1	892.3	920.4
0.0195	240.5	271.3	286.7	0.063	850.4	907.0	935.4
0.0200	247.3	278.5	294.1	0.064	864.7	921.8	950.3
0.0205	254.1	285.7	301.5	0.065	878.9	936.5	965.2
0.0210	260.9	293.0	309.0	0.066	893.2	951.2	980.2
0.0215	267.8	300.2	316.4	0.067	907.5	965.9	995.1
0.0220	274.6	307.4	323.9	0.068	921.8	980.6	1010.1
0.0225	281.4	314.7	331.3	0.069	936.1	995.4	1025.0
0.0230	288.3	321.9	338.7	0.070	950.4	1010.1	1039.9
0.0235	295.2	329.2	346.2	0.071	964.7	1024.8	1054.9
0.0240	302.0	336.4	353.6	0.072	979.1	1039.6	1069.8
0.0245	308.9	343.7	361.1	0.073	993.4	1054.3	1084.8
0.0250	315.8	350.9	368.5	0.074	1007.7	1069.0	1099.7
				0.075	1022.1	1083.8	1114.6

AGRIPAC, INC.
FROZEN SPECIFICATIONS

DATE: July 1993
APPROVED: John O'Grady

Cut Green Beans-B Grade

The product shall be manufactured, processed, packed, handled, and shipped in accordance with good manufacturing practices. It shall be stored and shipped in containers at temperatures and under conditions necessary to preserve the quality of the product. The finished product shall comply with all applicable local, State, and Federal laws and regulations relating to foods, drugs, cosmetics, additives and coding.

The Cut Green beans shall be blanched and frozen as rapidly as possible to a temperature of 0°F, with an absolute maximum of 10°F. All handling and shipping shall also be done in a manner to maintain holding temperatures at 0°F.

The finished product shall conform to all the requirements for USDA Grade B or USDA Fancy specifications in addition to the following:

Sieve:

Combination of 2,3,4 sieve

Size:

One inch (1") cut. Specification for short units are as follows:

FACTOR	SAMPLE SIZE OZ.	A.Q.L. UNITS	TOLERANCE
Units <1/2"	9	28.6	17.5%

Attribute	Sample Size	Tolerance*	Lot average
< 1/2"	9 oz.	14.0%	14.8 units

Color:

Units that vary noticeably from the bright deep dark green color typical of young tender beans for any reason shall be scored as defective. This may include, but is not limited to, overmature, oxidation, desiccation, etc.

Attribute	Sample Size	A.Q.L.	Tolerance
Off Color	9 oz.	15.1%	10.0%

AGRIPAC, INC.
FROZEN SPECIFICATIONS
CUT GREEN BEANS

Defects:

Definitions: all definitions are as defined by the USDA standards except as follows:

Critical Blemish - units that show obvious rot of any size.

Major Blemish - includes critical blemish.
- units immediately obvious as defective when viewed with the aggregate of all units in the sample and are blemished to the extent the approximate area of a 1/8" circle, except insect damage which is scored when obviously defective, regardless of the area affected.

Total Blemish - includes critical and major blemish.
- all light discoloration or blemishes of extent exceeding a 1/8" diameter circle which are obvious as the units are examined individually.

Mechanical Damage - ragged cuts exceeding 1/4 inch along the longitudinal axis of the unit, split beans (each piece counts as one unit) or bias cut beans with the diagonal cut exceeding 1/2 inch along the longitudinal axis of the bean.

Defect Process Standards(Based on 200 units per 9 oz.)

Attribute	Sample Size	Tolerance	A.Q.L.
EVM	225 oz.	0.35%	12.8
Stems	90 oz.	1.50%	23.7
Crit. Blemish	90 oz.	1.00%	13.3
Major Blemish	90 oz.	2.50%	41.7
Total Blemish	9 oz.	8.00%	11.6
Mech. Damage	9 oz.	6.00%	8.3

Character:

Shall be tender full fleshed product with the following specifications:

Attribute	Sample Size	A.Q.L.	Tolerance
Fiber/T.S.	9 oz.	6.7%	5.0%
<A Character	9 oz.	24.0%	15.0%
<B Character	9 oz.	0.0%	

AGRIPAC, INC.
FROZEN SPECIFICATIONS
CUT GREEN BEANS (CONT.)

Flavor and Odor:

Shall possess a normal flavor and odor characteristic of the variety and shall be free of off or questionable flavors and odors of any kind.

Blanch:

Negative catalase and peroxidase is required. Over blanching should be avoided.

Bacteria Counts:

Not more than 20% over 80,000 standard plate count and none over 100,000 per gram. Coliform counts should not be over 100 per gram.

Samples:

Samples for each lot shall be furnished prior to shipment for approval by Agripac, inc. Quality Control personnel. All grade sheets shall be made available upon request. Final acceptance shall be determined at the point of packaging.

TOLERANCE FOR CERTIFICATION	The number of deviants as applied to these specifications shall be the same as those outlined in "U.S.D.A. Regulations Governing Inspection and Certification of Processed Fruits and Vegetables and Related Products" except where different deviants are specified for a particular factor or characteristic.
PALLET CONFIGURATION:	To be determined by Coordinators and/or the purchase order.
EXTERIOR CASE CODING:	To be supplied at a later date.
CASE PACKAGING SPECS:	To be supplied at a later date.

Federated Group, Inc.

Product Specification

PRODUCT:	QUALITY:	EFFECTIVE DATE:
Asparagus Spears, Cut, Frozen	First Label 53-06A	Revised: 11/01/95 Supersedes: 04/20/82

FEDERATED Group First Label Frozen Cut Asparagus shall conform to U.S. Standards for Grades of Frozen Asparagus and shall be U.S. Grade A or U.S. Fancy with the following additions and modifications.

SCORED FACTORS	MINIMUM POINTS ACCEPTED
Color	18
Uniformity of Length	9
Absence of Defects	28
Character	37
TOTAL	92

VARIETY: Mary Washington or similar varieties.

STYLE: 1 inch cuts, -20% Head Material.

TYPE: All green.

COLOR: One sample in ten (10) may contain one (1) unit which is partially white or which not more than one (1) sample in twenty (20) may contain a white butt (white completely around butt).

UNIFORMITY OF SIZE: Approximately 80% or more of the units by count shall range from 3/4" to 1-1/4" with not more than 3% under 3/4" and not more than 3% larger than 1-1/4" with none larger than 1-1/2" or shorter than 1/2".

The diameter of the cuts on any given package must fall within 3/8 to 5/8 inch.

Not more than three (3) units by count may vary ± 1/16 inch from the given size ranges (based on 100 unit samples).

DEFECTS: Defective units shall not average more than 6% by count (based on 100 unit samples). Not more than one (1) out of six (6) samples may contain a seriously damaged unit.

CHARACTER: Not more than one (1) unit per sample may have noticeable fiber development present. Fiber shall be considered to be noticeable if, after cooking, it chews stringy or leaves a fibrous residue in the mouth.

When the merchandise is inspected by the Processed Products Inspection Branch the U.S.D.A., a certificate shall be issued for the certifiable factors stating: "Meets quality requirements of Federated Group, Inc., specification for Asparagus Spears Cut, Frozen, Federated Group First Label."

The product shall be processed and packed in accordance with good manufacturing practices and the temperatures of storage shall be such so as to preserve the product and container. In addition, the product must meet all local, State and Federal Food, Drug, Health, and Weights and Measures Regulations and comply with all Pesticide Acts. The product shall be shipped in transportation equipment and under conditions which will protect the quality of the product.

FLAVOR & ODOR: After cooking, must have a characteristic odor and flavor free of foreign or objectionable flavors or odors.

BLANCHING: A negative peroxidase test must be taken at the start of production and in addition, once every four (4) hours during production.

FILL: A short filled or over filled appearance shall not be evident.

NET WEIGHT: The average net weight of samples must be equal to or exceed the declared net weight and not more than 10% of the samples shall be below the declared label weight with no excessive under-fills.

PACKAGING: The product shall be packaged correctly in packaging materials previously approved by Federated Group, Inc. The containers shall be properly sealed, neat, clean and free of damage.

CODING: Each container shall be legibly coded utilizing the open "sell by" format and each plant must advise Federated Group of the plant coding system used. Codes of shipped merchandise are to be listed on invoices.

SAMPLING: One package of each type of product produced under each code shall be held under refrigeration and kept for review by a member of Federated Group's Quality Assurance staff.

AGRIPAC, INC.
FROZEN PRODUCT SPECIFICATIONS
JANUARY 1993

IQF LEAF SPINACH

The product shall be manufactured, processed, packed, handled and shipped in accordance with good commercial practices. It shall be stored and shipped in containers at temperatures and under conditions necessary to preserve the quality of the product. The finished product shall comply with all applicable local, State and Federal laws and regulations relating to foods, drugs, additives and coding.

The Leaf Spinach shall be blanched and frozen as rapidly as possible to a temperature of 0°F, with an absolute maximum of 10°F. All handling and shipping shall also be done in a manner to maintain holding temperatures at 0°F.

The finished product shall conform to all the requirements for USDA Grade A or USDA Fancy specifications in addition to the following:

Blanch:

Inactivation of catalase and peroxidase enzymes is required. Over blanching should be avoided.

Defects:

Definitions: all definitions are as defined by the USDA standards except as follows:

Blemish: Refers to damage by discoloration or other injury, including transparent areas greater than a given area affecting a leaf or stem. The magnitude and severity of the damaged areas determine the affect upon the product quality and are counted accordingly.

Severe Blemish - Each unit of severe damage is counted as four units of total damage. A severely damaged unit is any one leaf, stem, or portion thereof, which is damaged by discoloration or other injury which covers an aggregate area of more than four square inches.

Major Blemish - Each unit of major damage is counted as two units of total damage. Major damage refers to damage by discoloration or other injury covering an aggregate area of from one inch to not more than four square inches on any one surface of a leaf, stem, or portion there of.

Defects: (cont.)

Major Blemish (cont.) Include all leaves showing dark, "wet" mildew (mildew which penetrates the surface), or insect injury that may, in aggregate area, exceed 3/32 of a square inch.

Minor Blemish - Each unit of minor damage is counted as one unit of total damage. Minor damage refers to discoloration or other injury damage on a leaf, stem, or portion thereof, which exceeds the aggregate of 3/32 square inch, but is less than the aggregate area of one square inch. Include soiled stem ends in which dark discoloration extends more than 1/4 inch up the stem, and all transparent areas not associated with discoloration of any kind exceeding 1/2 square inch or surface area.

Insignificant Blemish - Units of insignificant damage are not counted in total damage. Transparent areas not associated with discoloration which, in aggregate,are not more than 1/2 square inch in area on a leaf, and discolored areas aggregating not more than 3/32 square inch on a leaf, stem, or portion thereof, are considered insignificant. Any damage which materially affects the appearance or eating quality which may be 3/32 square inch or less, such as dark, "wet" mildew damage, is considered as minor damage.

Seed Head: This is the seed bearing portion of a spinach plant. Score as defective all such seed heads that exceed one inch in length.

Crowns: Solid area of a spinach plant between the root and attached leaf or clusters of leaves, usually dark green in color. Score as defective any portion of a crown regardless of size.

Root Stub: Any portion of the root structure, whether or not leaves are attached. This root structure is white or yellow in color. Score as defective all portions of roots, regardless of size.E. Grass and Weeds: Classify into three groups.

Total green grass and weeds: - Group into four inch lengths, or equivalents. Score each four inch piece or equivalent as one piece.

Objectionable green grass and weeds - Weeds which are objectionable in appearance, such as broad leaf types exceeding 1/2 inch width. Score these in one inch equivalent lengths.

Defects: (cont.)

Major Blemish (cont.) Include all leaves showing dark, "wet" mildew (mildew which penetrates the surface), or insect injury that may, in aggregate area, exceed 3/32 of a square inch.

Minor Blemish - Each unit of minor damage is counted as one unit of total damage. Minor damage refers to discoloration or other injury damage on a leaf, stem, or portion thereof, which exceeds the aggregate of 3/32 square inch, but is less than the aggregate area of one square inch. Include soiled stem ends in which dark discoloration extends more than 1/4 inch up the stem, and all transparent areas not associated with discoloration of any kind exceeding 1/2 square inch or surface area.

Insignificant Blemish - Units of insignificant damage are not counted in total damage. Transparent areas not associated with discoloration which, in aggregate,are not more than 1/2 square inch in area on a leaf, and discolored areas aggregating not more than 3/32 square inch on a leaf, stem, or portion thereof, are considered insignificant. Any damage which materially affects the appearance or eating quality which may be 3/32 square inch or less, such as dark, "wet" mildew damage, is considered as minor damage.

Seed Head: This is the seed bearing portion of a spinach plant. Score as defective all such seed heads that exceed one inch in length.

Crowns: Solid area of a spinach plant between the root and attached leaf or clusters of leaves, usually dark green in color. Score as defective any portion of a crown regardless of size.

Root Stub: Any portion of the root structure, whether or not leaves are attached. This root structure is white or yellow in color. Score as defective all portions of roots, regardless of size.E. Grass and Weeds: Classify into three groups.

Total green grass and weeds: - Group into four inch lengths, or equivalents. Score each four inch piece or equivalent as one piece.

Objectionable green grass and weeds - Weeds which are objectionable in appearance, such as broad leaf types exceeding 1/2 inch width. Score these in one inch equivalent lengths.

AGRIPAC, INC.
FROZEN PRODUCT SPECIFICATIONS
JANUARY 1993

IQF LEAF SPINACH

The product shall be manufactured, processed, packed, handled and shipped in accordance with good commercial practices. It shall be stored and shipped in containers at temperatures and under conditions necessary to preserve the quality of the product. The finished product shall comply with all applicable local, State and Federal laws and regulations relating to foods, drugs, additives and coding.

The Leaf Spinach shall be blanched and frozen as rapidly as possible to a temperature of 0°F, with an absolute maximum of 10°F. All handling and shipping shall also be done in a manner to maintain holding temperatures at 0°F.

The finished product shall conform to all the requirements for USDA Grade A or USDA Fancy specifications in addition to the following:

Blanch:

Inactivation of catalase and peroxidase enzymes is required. Over blanching should be avoided.

Defects:

Definitions: all definitions are as defined by the USDA standards except as follows:

Blemish: Refers to damage by discoloration or other injury, including transparent areas greater than a given area affecting a leaf or stem. The magnitude and severity of the damaged areas determine the affect upon the product quality and are counted accordingly.

Severe Blemish - Each unit of severe damage is counted as four units of total damage. A severely damaged unit is any one leaf, stem, or portion thereof, which is damaged by discoloration or other injury which covers an aggregate area of more than four square inches.

Major Blemish - Each unit of major damage is counted as two units of total damage. Major damage refers to damage by discoloration or other injury covering an aggregate area of from one inch to not more than four square inches on any one surface of a leaf, stem, or portion there of.

220

Total green grass and weeds (cont.) Non-green grass and weeds - Scored regardless of size with each piece being one unit.

Stem Material: Procedure

1. Take a 10 ounce sample.

2. Dump sample into deep pan and fill with water to a depth of approximately two inches.

3. Take portions of the sample, cutting the stem from the leaf portion.

4. Set each cut portion into a pile on a flat pan. When the entire sample has been cut, place the two piles into an eight mesh screen, pour any water remaining on the flat pan over it, and drain for exactly two minutes.

5. At the end of two minutes weigh the portion that is stem material and record.

6. Then add the leaf material portion to the scale. Record the total weight (stem and leaf material).

7. Take the weight of the sample (stem and leaf material) and divide it into the weight of the stem material. This will give the percentage of stem material when multiplied by 100.

Defect Process Standards

Attribute	Sample Size	Tolerance	AQL*
Total Blemish	60 oz.	25.0 units	19.3 units
Grass & Weeds,Total**	120 oz.	12.0 units	8.3 units
Grass & Weeds,Object.***	120 oz.	0.0 units	0.0 units
Non-Grass & Weeds	240 oz.	4.0 units	2.1 units
Root Stubs	120 oz.	4.0 units	2.1 units
Seed Heads	120 oz.	6.0 units	3.6 units
Root Crowns	120 oz.	6.0 units	3.6 units
Stem Material****	10 oz.	26.0 %	20.2 %

** Four inch equivalent lengths
*** One inch equivalent lengths
**** Percent by weight

* acceptable quality limit - equates to the maximum lot average acceptable in order to maintain a 95% confidence level that the tolerance will not be exceeded.

Flavor and Odor:

Shall possess a good flavor and odor characteristic of the variety and shall be free of off or questionable flavors and/or odors of any kind. No grit of silt may be present which would affect the eating quality of the product.

Coding:

Each package and shipping case should be legibly coded in a position free from other printed material. The interpretation of the coding system used shall be made available.

Weights:

The average net weight of each lot shall be equal to or exceed the declared net weight, with no excessive underfills being present within the lot.

Bacteria Counts:

Standard Plate Count	100,000/g maximum
Coliforms	100/g maximum
E.Coli	0/g

Samples:

Upon request, samples for each lot shall be set aside for in house inspection or shipped to Agripac, Inc. All grade sheets shall also be made available for review upon request. Final acceptance shall be determined at the point of receipt.

Flavor and Odor:

Shall possess a good flavor and odor characteristic of the variety and shall be free of off or questionable flavors and/or odors of any kind. No grit of silt may be present which would affect the eating quality of the product.

Coding:

Each package and shipping case should be legibly coded in a position free from other printed material. The interpretation of the coding system used shall be made available.

Weights:

The average net weight of each lot shall be equal to or exceed the declared net weight, with no excessive underfills being present within the lot.

Bacteria Counts:

Standard Plate Count	100,000/g maximum
Coliforms	100/g maximum
E.Coli	0/g

Samples:

Upon request, samples for each lot shall be set aside for in house inspection or shipped to Agripac, Inc. All grade sheets shall also be made available for review upon request. Final acceptance shall be determined at the point of receipt.

United States Department of Agriculture

Agricultural Marketing Service

Fruit and Vegetable Division

Processed Products Branch

United States Standards for Grades of Frozen Strawberries

February 1, 1958

224

This is the fifth issue, as amended, of the United States Standards for Grades of Frozen Strawberries, published in the **FEDERAL REGISTER** of January 3, 1958 (23 FR 43) to become effective February 1, 1958. This issue supersedes the fifth issue, which has been in effect since April 16, 1955.

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

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

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

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

Chief, Processed Products Branch
Fruit and Vegetable Division, AMS
U.S. Department of Agriculture
P.O. Box 96456, Rm. 0709, So. Bldg.
Washington, D.C. 20090-6456

UNITED STATES STANDARDS FOR GRADES OF

FROZEN STRAWBERRIES

EFFECTIVE FEBRUARY 1, 1958

Section		Page No.
52.1981	Product description.	2
52.1982	Styles of frozen strawberries.	2
52.1983	Sizes of whole frozen strawberries.	2
52.1984	Grades of frozen strawberries.	2
52.1985	Ascertaining the grade.	3
52.1986	Ascertaining the rating of each factor.	4
52.1987	Color.	4
52.1988	Defects.	6
52.1989	Character.	9
52.1990	Definition of terms.	10
52.1991	Explanation of analysis.	10
52.1992	Ascertaining the grade of a lot.	11
52.1993	Score sheet for frozen strawberries.	12

Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended (7 U.S.C. 1622, 1624).

. . . . . .

Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

§52.1981 Product description.

Frozen strawberries means the frozen product prepared from sound, properly ripened fresh fruit of the strawberry plant by stemming, proper washing, sorting, and proper draining, may be packed with or without packing medium, and are then frozen in accordance with good commercial practice and maintained at temperatures necessary for the preservation of the product.

§52.1982 Styles of frozen strawberries.

(a) **Whole or whole strawberries** means frozen strawberries that retain approximately their original conformation.

(b) **Slices or sliced strawberries** means frozen strawberries produced by slicing whole strawberries into two or more slices.

§52.1983 Sizes of whole frozen strawberries.

Except with respect to U.S. Grade A or U.S. Fancy, the size of the whole frozen strawberry is not incorporated in the grades of the finished product since size, as such, is not a factor of quality for the purpose of these grades. When used in connection with the following sizes of whole frozen strawberries, the term **diameter** means the greatest dimension measured at right angles to a straight line running from the stem to the apex:

(a) **Small size** means whole frozen strawberries that measure less than 5/8 inch in diameter.

(b) **Medium size** means whole frozen strawberries that measure 5/8 inch to 1-1/4 inches, inclusive, in diameter.

(c) **Large size** means whole frozen strawberries that measure more than 1-1/4 inches in diameter.

§52.1984 Grades of frozen strawberries.

(a) **U.S. Grade A or U.S. Fancy** is the quality of frozen strawberries that possess similar varietal characteristics; that possess a good flavor; that possess a good color; that are practically free from defects; that possess a good character; that score not less than 90 points when scored in accordance with the scoring system outlined in this subpart and that with respect to whole style contain not more than 5 percent, by count, of whole strawberries that are **small size,** (less than 5/8 inch in diameter).

227

(b) **U.S. Grade B or U.S. Choice** is the quality of frozen strawberries that possess similar varietal characteristics; that possess a good flavor; that possess a reasonably good color; that are reasonably free from defects; that possess a reasonably good character; and that score not less than 80 points when scored in accordance with the scoring system outlined in this subpart.

(c) **U.S. Grade C or U.S. Standard** is the quality of frozen strawberries that possess similar varietal characteristics; that possess a fairly good flavor; that possess a fairly good color; that are fairly free from defects; that possess a fairly good character; and that score not less than 70 points when scored in accordance with the scoring system outlined in this subpart.

(d) **Substandard** is the quality of frozen strawberries that fail to meet the requirements of U.S. Grade C or U.S. Standard.

§52.1985 Ascertaining the grade.

(a) **General.** The grade of frozen strawberries is determined immediately after thawing to the extent that the units may be separated easily, and are free from ice crystals. In addition the grade of frozen strawberries is ascertained by considering the factors of quality which are not scored and those which are scored as follows:

(1) Factors which are not scored.

(i) Varietal characteristics.

(ii) Flavor and odor.

(iii) Size relative to U.S. Grade A or U.S. Fancy.

(2) Factors which are scored. The relative importance of each factor which is scored is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

Factors	Points
Color	40
Defects	40
Character	20
Total Score	100

228

(b) **Good flavor** means that the product has a good characteristic normal flavor and odor, and is free from objectionable flavors or objectionable odors of any kind.

(c) **Fairly good flavor** means that the product may be lacking in good characteristic normal flavor and odor but is free from objectionable flavors or objectionable odors of any kind.

§52.1986 Ascertaining the rating for the factors which are scored.

The essential variations within each factor which is scored are so described that the value may be ascertained for such factors and expressed numerically. The numerical range within each factor is inclusive. For example, the range "36 to 40 points" means 36, 37, 38, 39, or 40 points.

§52.1987 Color.

(a) **"A" classification.** Frozen strawberries that possess a good color may be given a score of 36 to 40 points. **Good color** means that the frozen strawberries as a mass possess a reasonably uniform good characteristic pink to red color which is not more than slightly affected by a dull, gray, or reddish-brown cast; and in addition:

(1) With respect to whole style 85 percent or more, by count, of the strawberries have at least a good characteristic pink to red color over practically the entire surface and of the remainder not more than 5 percent, by count, of all the strawberries may have less than four-fifths of the surface area of a good characteristic pink to red color, or are materially darkened; and that:

(2) With respect to sliced style 85 percent or more, by weight, of the slices have at least a good characteristic pink to red color over practically the entire outer surface (not including cut surfaces) and of the remainder not more than 5 percent, by weight, of all the slices may have less than one-half of the outer surface (not including cut surfaces) of a good characteristic pink to red color, or are materially darkened.

(b) **"B" classification.** If the frozen strawberries possess a reasonably good color, a score of 32 to 35 points may be given. Frozen strawberries that fall into this classification shall not be graded above U.S. Grade B or U.S. Choice, regardless of the total score for the product (this is a limiting rule). **Reasonably good color** means that the frozen strawberries as a mass possess a fairly uniform good characteristic pink to red color which is not materially affected by dull, gray, or reddish-brown cast; and in addition:

(1) With respect to whole style 75 percent or more, by count, of the strawberries have at least a good characteristic pink to red color over practically the entire surface, and of the remainder not more than 10 percent, by count, of all the strawberries may have less than four-fifths of the surface area of a good characteristic pink or red color, or are materially darkened; and that:

(2) With respect to sliced style 75 percent or more, by weight, of the slices have at least a good characteristic pink to red color over practically the entire outer surface (not including cut surfaces) and of the remainder not more than 10 percent, by weight, of all the slices may have less than one-half of the outer surface (not including cut surfaces) of a good characteristic pink to red color, or are materially darkened.

(c) **"C" classification.** If the frozen strawberries possess a fairly good color, a score of 28 to 31 points may be given. Frozen strawberries that fall into this classification shall not be graded above U.S. grade C or U.S. Standard, regardless of the total score for the product (this is a limiting rule). **Fairly good color** means that the frozen strawberries as a mass possess a predominant characteristic pink to red color and may show a dull, gray, or slightly dark color, but not to the extent that the appearance or eating quality is seriously affected; and in addition:

(1) With respect to whole style not more than 15 percent, by count, of all the strawberries may have less than four-fifths of the surface area of a characteristic pink to red color, or are materially darkened.

(2) With respect to sliced style not more than 15 percent, by weight, of all the slices may have less than one-half of the outer surface (not including cut surfaces) of a characteristic pink to red color, or are materially darkened.

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

§52.1988 Defects.

(a) **General.** The factor of defects refers to the degree of freedom from grit, sand, or silt, from harmless extraneous material, caps and portions thereof, sepal-like bracts and portions thereof, stems, short stems, and damaged strawberries.

(1) **Harmless extraneous material** means vegetable substances such as weeds, weed seeds, grass, and leaves and any portions thereof that are harmless.

(2) **Grit, sand, or silt means** any particles of earthy material.

(3) **Short stem** means a stem that is 1/8 inch or less in length and which may include the center portion of a cap to which no sepal-like bract or portion thereof is attached.

(4) **Stem** means a stem, either loose or attached, that is longer than 1/8 inch.

(5) **Cap** means a loose or attached full cap or portion of a cap to which at least one sepal-like bract or a portion thereof is attached. A short stem that is attached to the cap is considered a part of the cap. A stem that is attached to the cap is considered a separate defect.

(6) **Damaged strawberry** means a strawberry or any physically separated portion thereof that is affected by hard seedy or deformed end, and deformed or damaged areas to the extent that the appearance or eating quality is materially affected. Minute, insignificant injuries are not considered as damaged.

(b) **"A" classification.** Frozen strawberries that are practically free from defects may be given a score of 36 to 40 points. **Practically free from defects** has the following meanings with respect to the following styles of frozen strawberries:

(1) **Whole.** No grit, sand, or silt may be present that affects the appearance or eating quality of the product and for each 16 ounces of net weight there may be present an area of not more than 1/4 square inch comprising harmless extraneous material such as leaves

231

and portions thereof, caps and portions thereof, and loose sepal-like bracts and portions thereof; not more than two stems, including not more than one stem which may exceed 1/2 inch in length, or one small piece of harmless extraneous material that is not measurable by area such as weeds, weed seeds, and blades of grass; and not more than 16 short stems; and there may be present not more than a total of 5 percent, by weight, that are damaged strawberries.

(2) **Sliced.** No grit, sand, or silt may be present that affects the appearance or eating quality of the product, and for each 16 ounces of net weight there may be present an area of not more than 1/4 square inch comprising harmless extraneous material such as leaves and portions thereof, caps and portions thereof, and loose sepal-like bracts and portions thereof; not more than one stem which may exceed 1/2 inch in length, or one small piece of harmless extraneous material that is not measurable by area such as weeds, weed seeds and blades of grass; and not more than 16 short stems and there may be present not more than a total of 2-1/2 percent, by weight, that are damaged strawberries.

(c) **"B" classification.** If the frozen strawberries are reasonably free from defects, a score of 32 to 35 points may be given. Frozen strawberries that fall into this classification shall not be graded above U.S. Grade B or U.S. Choice, regardless of the total score for the product (this is a limiting rule). **Reasonably free from defects** has the following meanings with respect to the following styles of frozen strawberries:

(1) **Whole.** No grit, sand, or silt may be present that affects the appearance or eating quality of the product, and for each 16 ounces of net weight there may be present an area of not more than 1/2 square inch comprising harmless extraneous material such as leaves and portions thereof, caps and portions thereof, and loose sepal-like bracts and portions thereof; not more than four stems, including not more than one stem which may exceed 1/2 inch in length, or one small piece of harmless extraneous material that is not measurable by area such as weeds, weed seeds, and blades of grass; and not more than 32 short stems; and there may be present not more than a total of 10 percent, by weight, that are damaged strawberries.

(2) **Sliced.** No grit, sand, or silt may be present that affects the appearance or eating quality of the product, and for each 16 ounces of net weight there may be present an area of not more than 1/2 square inch comprising harmless extraneous material such as leaves

232

and portions thereof, caps and portions thereof, and loose sepal-like bracts and portions thereof; not more than four stems, including not more than one stem which may exceed 1/2 inch in length, or one small piece of harmless extraneous material that is not measurable by area such as weeds, weed seeds and blades of grass; and not more than 32 short stems and there may be present not more than a total of 5 percent, by weight, that are damaged strawberries.

(d) **"C " Classification.** If the frozen strawberries are fairly free from defects, a score of 28 to 31 points may be given. Frozen strawberries that fall into this classification shall not be graded above U.S. Grade C or U.S. Standard, regardless of the total score for the product (this is a limiting rule). **Fairly free from defects** has the following meanings with respect to the following styles of frozen strawberries:

(1) **Whole.** A trace of grit, sand or silt may be present that does not materially affect the appearance or eating quality of the product, and for each 16 ounces of net weight there may be present an area of not more than 3/4 square inch comprising harmless extraneous material such as leaves and portions thereof, caps and portions thereof, and loose sepal-like bracts and portions thereof; not more than six stems, including not more than one stem which may exceed 3/4 inch in length, or two small pieces of harmless extraneous material that is not measurable by area such as weeds, weed seeds, and blades of grass; and there may be present not more than a total of 12 percent, by weight, that are damaged strawberries.

(2) **Sliced.** A trace of grit, sand, or silt may be present that does not materially affect the appearance or eating quality of the product, and for each 16 ounces of net weight there may be present an area of not more than 3/4 square inch comprising harmless extraneous material such as leaves and portions thereof, caps and portions thereof, and loose sepal-like bracts and portions thereof; not more than six stems, including not more than one stem which may exceed 3/4 inch in length, or two small pieces of harmless extraneous material that is not measurable by area such as weeds, weed seeds, and blades of grass; and there may be present not more than a total of 6 percent, by weight, that are damaged strawberries.

(e) **"Sstd" classification.** Frozen strawberries that fail to meet the requirements of paragraph (d) of this section may be given a score of 0 to 27 points and shall not be graded above Substandard, regardless of the total score of the product (this is a limiting rule).

§52.1989 Character.

(a) **General.** The factor of character refers to firmness, the degree of wholeness, degree of seediness, degree of disintegration as evidenced by partial strawberries and mushy strawberries.

(1) **Partial strawberry in whole style** means that less than three-quarters of the apparent whole strawberry remains intact.

(2) **Mushy strawberries in whole and sliced styles** means strawberries that are so soft they are a pulpy mass or are badly disintegrated.

(b) **"A" classification.** Frozen strawberries that possess a good character may be given a score of 18 to 20 points. **Good character** means that the strawberries are reasonably firm, that the appearance and eating quality of the product are not materially affected by disintegration or seediness and that:

(1) With respect to whole style not more than 10 percent, by weight, of strawberries may consist, in the aggregate, of partial strawberries or mushy strawberries or a combination thereof, and that:

(2) With respect to sliced style not more than 20 percent, by weight, of strawberries may consist, in the aggregate, of mushy strawberries.

(c) **"B" classification.** If the frozen strawberries have a reasonably good character, a score of 16 or 17 points may be given. Frozen strawberries that fall into this classification shall not be graded above U.S. Grade B or U.S. Choice, regardless of the total score for the product (this is a limiting rule). **Reasonably good character** means that the strawberries are fairly firm, that the appearance and eating quality of the product are not seriously affected by seediness or disintegration, and that:

(1) With respect to whole style not more than 20 percent, by weight, of strawberries may consist, in the aggregate, of partial strawberries or mushy strawberries or a combination thereof, and that:

(2) With respect to sliced style not more than 30 percent, by weight, of

234

strawberries may consist, in the aggregate, of mushy strawberries.

(d) **"C" classification.** If the frozen strawberries have a fairly good character, a score of 14 or 15 points may be given. Frozen strawberries that fall into this classification shall not be graded above U.S. Grade C or U.S. Standard, regardless of the total score for the product (this is a limiting rule). **Fairly good character** means that the strawberries are fairly firm, and that:

(1) With respect to whole style not more than 30 percent, by weight, of strawberries may consist, in the aggregate, of partial strawberries or mushy strawberries or a combination thereof, and that:

(2) With respect to sliced style not more than 50 percent, by weight, of strawberries may consist, in the aggregate, of mushy strawberries.

(e) **"Sstd" classification.** Frozen strawberries that fail to meet the requirements of paragraph (d) of this section may be given a score of 0 to 13 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.1990 Definition of terms.

(a) **By weight of strawberries.** By weight of strawberries means the strawberry ingredient exclusive of the surrounding medium.

(b) **Area.** Area means the aggregate surface covered by the material stated when such material or portions thereof are placed in a contiguous position with no intervening spaces.

§52.1991 Explanation of analysis.

(a) **By weight of strawberries** in frozen strawberries is determined by the following method:

(1) **Equipment** -- flat grading tray, table fork, two glass beakers, and a torsion or triple beam balance.

(2) **Procedure.**

(i) If the sample is of 16 ounces or less use the entire sample, but if the sample is of a size exceeding 16 ounces use a representative 16-ounce aliquot for sliced style and a 32-ounce representative aliquot for whole style.

235

(ii) Thaw the sample to the extent that the strawberries may be separated easily and are free of ice crystals.

(iii) Place the thawed sample on a flat grading tray, raise one end of the tray approximately one inch so the packing medium drains to the other end of the tray. For a given factor (viz., color, defects or character) (a) separate those units (or that material) which fall into the categories specified in the standards, [A table fork or similar utensil may be used to facilitate the separation]; (b) Using the table fork remove that portion of the strawberry material which has been separated in (a) of this subdivision and weigh; (c) Using the table fork remove the remaining strawberry material exclusive of packing medium from the tray and weigh; (d) The sum of the weights obtained in (b) and (c) of this subdivision is the weight of strawberry ingredient; and (e) Calculate the percent, by weight, of the separated material and divide the weight of such material found in (b) of this subdivision by the total weight of strawberry material.

§52.1992 Ascertaining the grade of a lot.

The grade of a lot of frozen strawberries covered by these standards is determined by the procedures set forth in the "Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products" (7 CFR 52.1 through 52.83).

§52.1993 Score sheet for frozen strawberries.

Number, size and kind of container		
Label: Style or pack: Fruit-sugar ratio (if shown)		
Container mark or identification	Containers or sample Cases	Average
Net weight (ounces)		
Style		
Size or sizes (whole)		
Under 5/8" (percent by count)		

Factors	Score Points		
Color	40	"A"	36-40
		"B"	32-35 1/
		"C"	28-31 1/
		"SStd"	0-27 1/
Defects	40	"A"	36-40
		"B"	32-35 1/
		"C"	28-31 1/
		"SStd"	0-27 1/
Character	20	"A"	18-20
		"B"	16-17 1/
		"C"	14-15 1/
		"SStd"	0-13 1/
Total Score	100		

Flavor and odor	
U.S. Grade	

1/ Indicates limiting rule.

237

Dated this 27th day of December 1957, to become effective on February 1, 1958.
(Sec. 205, 60 Stat. 1090, as amended; 7 U.S.C. 1624)

[SEAL] Frank E. Blood
Acting Deputy Administrator,
Marketing Services.

[F. R. Doc. 58-39; Filed, Jan. 2, 1958; 8:52 a.m.]

Published in the Federal Register, March 16, 1955 (20 F.R. 1580)
Amendments published in the Federal Register January 3, 1958 (23 F.R. 43).

United States
Department of
Agriculture

Agricultural
Marketing
Service

Fruit and
Vegetable
Division

Processed
Products
Branch

United States Standards for Grades of Frozen Whole Kernel (or Whole Grain) Corn

Effective August 1, 1952

This is the fourth issue of the United States Standards for Grades of Frozen Whole Kernel (or Whole Grain) Corn, published in the **FEDERAL REGISTER** of August 1, 1952 (17 FR 7038) to become effective August 1, 1952. This issue supersedes the third issue, which has been in effect since April 16, 1944.

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

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

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

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

Chief, Processed Products Branch
Fruit and Vegetable Division, AMS
U.S. Department of Agriculture
P.O. Box 96456, Rm. 0709, So. Bldg.
Washington, D.C. 20090-6456

UNITED STATES STANDARDS FOR GRADES OF

FROZEN WHOLE KERNEL (OR WHOLE GRAIN) CORN

EFFECTIVE AUGUST 1, 1952

Section		Page No.
§52.911	Product description.	2
§52.912	Color of frozen whole kernel (or whole grain) corn.	2
§52.913	Grades of frozen whole kernel (or whole grain) corn.	2
§52.914	Ascertaining the grade.	4
§52.915	Ascertaining the rating of the factors which are scored.	4
§52.916	Color.	4
§52.917	Absence of defects.	6
§52.918	Tenderness and maturity.	7
§52.919	Ascertaining the grade of a lot.	8
§52.920	Score sheet for frozen whole kernel (or whole grain) corn.	9

Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended (7 U.S.C. 1622, 1624).

Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

§52.911 Product description.

Frozen whole kernel (or whole grain) corn means the frozen product prepared from fresh, clean, sound, succulent kernels of sweet corn of either the white or golden (or yellow) varieties by removing husk and silk; by sorting, trimming, and washing; and by blanching before or after removal from the cob. The frozen whole kernel (or whole grain) corn is frozen in accordance with good commercial practice and maintained at temperatures necessary for the preservation of the product.

§52.912 Color of frozen whole kernel (or whole grain) corn.

(a) Golden (or Yellow).

(b) White.

§52.913 Grades of frozen whole kernel (or whole grain) corn.

(a) **U.S. Grade A or U.S. Fancy** is the quality of frozen whole kernel (or whole grain) corn that possesses similar varietal characteristics; that possesses a good flavor and odor; that is tender; that possesses a good color; that is practically free from defects; and that for those factors which are scored in accordance with the scoring system outlined in this subpart, the total score is not less than 90 points: **Provided** that the frozen whole kernel (or whole grain) corn may possess a reasonably good color if the total score is not less than 90 points.

(b) **U.S. Grade B or U.S. Extra Standard** is the quality of frozen whole kernel (or whole grain) corn that possesses similar varietal characteristics; that possesses a good flavor and odor; that is reasonably tender; that possesses a reasonably good color; that is reasonably free from defects; and that for those factors which are scored in accordance with the scoring system outlined in this subpart, the total score is not less than 80 points: **Provided,** that frozen whole kernel (or whole grain) corn may possess a fairly good color, scoring not less than 7 points if the total score is not less than 80 points.

(c) **U.S. Grade C or U.S. Standard** is the quality of frozen whole kernel (or whole grain) corn that possesses similar varietal characteristics; that possesses a fairly good flavor and odor; that is fairly tender; that possesses a fairly good color; that is fairly free from defects; and that scores not less than 70 points when scored in accordance with the scoring system outlined in this subpart.

(d) **Substandard** is the quality of frozen whole kernel (or whole grain) corn that fails to meet the requirements of U.S. Grade C or U.S. Standard.

§52.914 Ascertaining the grade.

(a) The grade of frozen whole kernel (or whole grain) corn may be ascertained by considering, in conunction with the requirements of the respective grade, the respective ratings for the factors of color, absence of defects, and tenderness and maturity.

(b) The relative importance of each factor which is scored is expressed numerically on the scale of 100. The maximum number of points that may be given such factor is:

Factors	Points
Color	10
Absence of Defects	40
Tenderness and maturity	50
Total Score	100

(c) The grade of frozen whole kernel (or whole grain) corn is determined immediately after thawing to the extent that the product is substantially free from ice crystals. The product is cooked to determine flavor and odor.

(d) **Good flavor and odor** means that the product, after cooking, has a good characteristic normal flavor and odor and is free from obectionable flavors and objectionable odors of any kind.

(e) **Fairly good flavor and odor** means that the product, after cooking, may be lacking in good flavor and odor but is free from objectionable flavors and objectionable odors of any kind.

§52.915 Ascertaining the rating of the factors which are scored.

The essential variations within each factor which is scored are so described that the value may be ascertained for such factors and expressed numerically. The numerical range within each factor which is scored is inclusive (for example, **36 to 40 points** means 36, 37, 38, 39, or 40 points).

242

§52.916 Color.

(a) **"A" classification.** Frozen whole kernel (or whole grain) corn that possesses a good color may be given a score of 9 or 10 points. **Good color** means that the kernels possess a practically uniform color typical of tender sweet corn and that the product is bright and is practically free from **off-variety** kernels.

(b) **"B" classification.** If the frozen whole kernel corn (or whole grain) corn possesses a reasonably good color, a score of 8 points may be given. **Reasonably good color** means that the kernels possess a reasonably uniform color typical of reasonably tender sweet corn and that the product is reasonaby bright and reasonably free from **off-variety** kernels.

(c) **"C" classification.** Frozen whole kernel (or whole grain) corn tht possesses a fairly good color may be given a score of 6 or 7 points. Frozen whole kernel (or whole grain) corn that scores 6 points in this classification shall not be graded above U.S. Grade C or U.S. Standard, regardless of the total score for the product (this is a partial limiting rule). **Fairly good color** means that the kernels possess a fairly uniform color typical of fairly tender sweet corn and that the product may be dull but not to the extent that the appearance is seriously affected, and is fairly free from **off-variety** kernels.

(d) **"SStd" classification.** Frozen whole kernel (or whole grain) corn that fails to meet the requirements of paragraph (c) of this section may be given a score of 0 to 5 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.917 Absence of defects.

(a) **General.** The factor of absence of defects refers to the degree of freedom from pieces of cob, husk, silk, or other harmless extraneous vegetable matter, from pulled kernels, ragged kernels, crushed kernels, loose skins, and from damaged or seriously damaged kernels.

(1) **Damaged kernel** means any kernel affected by insect injury or damaged by discoloration, pathological injury, or by other means to the extent that the appearance or eating quality is materially affected.

(2) **Seriously damaged kernel** means damaged to such an extent that the appearance or eating quality is seriously affected.

(b) **"A" classification.** Frozen whole kernel (or whole grain) corn that is practically free from defects may be given a score of 36 to 40 points. **Practically free from defects** means that pieces of cob, husk, silk, or other harmless extraneous vegetable matter, pulled kernels, ragged kernels, crushed kernels, loose skins, and damaged or seriously damaged kernels may be present that do not more than slightly affect the appearance or eating quality of the product.

(c) **"B" classification.** If the frozen whole kernel (or whole grain) corn is reasonably free from defects, a score of 32 to 35 points may be given. Frozen whole kernel (or whole grain) corn that falls into this classification shall not be graded above U.S. Grade B or U.S. Extra Standard, regardless of the total score for the product (this is a limiting rule). **Reasonably free from defects** means that pieces of cob, husk, silk, or other harmless extraneous vegetable matter, pulled kernels, ragged kernels, crushed kernels, loose skins, and damaged or seriously damaged kernels may be present that do not materially affect the appearance or eating quality of the product.

(d) **"C" classification.** Frozen whole kernel (or whole grain) corn tht is fairly free from defects may be given a score of 28 to 31 points. Frozen whole kernel or whole grain) corn that falls into this classification shall not be graded above U.S. Grade C or U.S. Standard, regardless of the total score for the product (this is a limiting rule). **Fairly free from defects** means that pieces of cob, husk, silk, or other harmless extraneous vegetable matter, pulled kernels, ragged kernels, crushed kernels, loose skins, and damaged or seriously damaged kernels may be present that do not seriously affect the appearance or eating quality of the product.

(e) **"SStd" classification.** Frozen whole kernel (or whole grain) corn that fails to meet the requirements of paragraph (d) of this section may be given a score of 0 to 27 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.918 Tenderness and maturity.

(a) **"A" classification.** Frozen whole kernel (or whole grain) corn that is tender may be given a score of 45 to 50 points. **Tender** means that the kernels are in the milk or early cream stage of maturity and have a tender texture.

24F

(b) **"B" classification.** If the frozen whole kernel (or whole grain) corn is reasonably tender, a score of 40 to 44 points may be given. Frozen whole kernel (or whole grain) corn that falls into this classification shall not be graded above U.S. Grade B or U.S. Extra Standard, regardless of the total score for the product (this is a limiting rule). **Reasonably tender** means that the kernels are in the cream stage of maturity and have a reasonably tender texture.

(c) **"C" classification.** Frozen whole kernel (or whole grain) corn that is fairly tender may be given a score of 36 to 39 points. Frozen whole kernel (or whole grain) corn that falls into this classification shall not be graded above U.S. Grade C or U.S. Standard, regardless of the total score for the product (this is a limiting rule). **Fairly tender** means that the kernels are in the early dough or dough stage and have a fairly tender texture.

(d) **"SStd" classification.** Frozen whole kernel (or whole grain) corn that fails to meet the requirements of paragraph (c) of this section may be given a score of 0 to 35 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.919 Ascertaining the grade of a lot.

The grade of a lot of frozen whole kernel (or whole grain) corn covered by these standards is determined by the procedures set forth in the "Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products" (52.1 through 52.83).

§52.920 Score sheet for frozen whole kernel (or whole grain) corn.

Number, size and kind of container .....
Container marks or identification .....
Label .....
Net weight (ounces) .....

Factors	Score Points		
Color	10	"A"	9-10
		"B"	8
		"C"	6-07 1/
		"SStd"	0-05 2/
Absence of defects	40	"A"	36-40
		"B"	32-35
		"C"	28-31 2/
		"SStd"	0-27 2/
Tenderness and maturity	50	"A"	45-50
		"B"	40-44 2/
		"C"	36-39 2/
		"SStd"	0-35 2/
Total Score	100		

Grade .....
Flavor and odor .....

1/ Indicates partial limiting rule
2/ Indicates limiting rule.

Recodified in the Federal Register of December 9, 1953 (18 F. R. 7927)
Section 52.919 amended May 22, 1957 (22 F. R. 3535)

United States
Department of
Agriculture

Agricultural
Marketing
Service

Fruit and
Vegetable
Division

Processed
Products
Branch

United States Standards for Grades of Frozen Peas

Effective date May 28, 1959

This is the sixth issue of the United States Standards for Grades of Frozen Peas, published in the **FEDERAL REGISTER** of May 28, 1959 (24 FR 3782) to become effective May 28, 1959. This issue supersedes the fifth issue, which has been in effect since March 15, 1945.

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

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

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

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

Chief, Processed Products Branch
Fruit and Vegetable Division, AMS
U.S. Department of Agriculture
P.O. Box 96456, Rm. 0709, So. Bldg.
Washington, D.C. 20090-6456

United States Standards for Grades of Frozen Peas

Section		Page No.
§52.3511	Product description.	2
§52.3512	Grades of frozen peas.	2
§52.3513	Ascertaining the grade.	2
§52.3514	Ascertaining the rating for the factors which are scored.	3
§52.3515	Color.	4
§52.3516	Defects.	4
§52.3517	Tenderness and maturity.	11
§52.3518	Brine flotation test.	12
§52.3519	Ascertaining the grade of a lot.	12
§52.3520	Score sheet for frozen peas.	13

Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended (7 U.S.C. 1622, 1624).

Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

§52.3511 Product description.

Frozen peas means the frozen product prepared from the clean, sound, succulent seed of the common garden pea (Pisum sativum) by shelling, washing, blanching, sorting, proper draining, and is frozen in accordance with good commercial practice and maintained at temperatures necessary for the preservation of the product.

§52.3512 Grades of frozen peas.

(a) **U.S. Grade A** (or **U.S. Fancy**) is the quality of frozen peas that possess similar varietal characteristics; that possess a good flavor; that possess a good color; that are practically free from defects; that are tender; and for those factors which are rated in accordance with the scoring system outlined in this subpart the total score is not less than 90 points: **Provided,** that the frozen peas may possess a reasonably good color, scoring not less than 17 points and may be only reasonably free from defects with respect to pieces of peas if the total score is not less than 90 points.

(b) **U.S. Grade B (or U.S. Extra Standard)** is the quality of frozen peas that possess similar varietal characteristics; that possess a fairly good flavor; that possess a reasonably good color; that are reasonably free from defects; that are reasonably tender; and for those factors which are rated in accordance with the scoring system outlined in this subpart the total score is not less than 80 points: **Provided,** that the frozen peas may possess a fairly good color and may be fairly free from defects with respect to pieces of peas if the total score is not less than 80 points

(c) **U.S. Grade C (or U.S. Standard)** is the quality of frozen peas that possess similar varietal characteristics; that possess a fairly good flavor; that possess a fairly good color; that are fairly free from defects; that are fairly tender; and that for those factors which are scored in accordance with the scoring system outlined in this subpart the total score is not less than 70 points: **Provided,** that the frozen peas may fail to meet the requirements of this paragraph for defects with respect to pieces of peas if the total score is not less than 70 points.

(d) **Substandard**is the quality of frozen peas that fail to meet the requirements of U.S. Grade C.

§52.3513 Ascertaining the grade.

(a) **General.** In addition to considering other requirements outlined in the standards the following quality factors are evaluated in ascertaining the grade of the product:

250

(1) Factors not rated by score points.

(i) Varietal characteristics.

(ii) Flavor.

(2) **Factors rated by score points.** The relative importance of each factor which is rated is expressed numerically on the scale of 100. The maximum number of points that may be given for each such factor is:

Factors	Points
Color	20
Defects	40
Tenderness and maturity	40
Total score	100

(b) **Evaluation of quality.** Flavor and the factor of tenderness and maturity is determined after the product has reached room temperature and after cooking. The rating for the factors of color and defects and the evaluation of similar varietal characteristics are determined immediately after the product has reached room temperature or may be determined immediately after thawing so that the product is free from ice crystals.

(c) **Definitions of requirements not rated by score points.**

(1) **Good flavor** means that the product has a good characteristic flavor and odor for the maturity and is free from objectionable flavors and objectionable odors of any kind.

(2) **Fairly good flavor** means that the product may be lacking in good flavor but is free from objectionable flavors and objectionable odors of any kind.

§52.3514 Ascertaining the rating for the factors which are scored.

The essential variations within each factor which is scored are so described that the value may be ascertained for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive. (For example, **36 to 40 points** means 36, 37, 38, 39, or 40 points.)

251

§52.3515 Color.

(a) **"A" classification.** Frozen peas that possess a good color may be given a score of 18 to 20 points. **Good color** means that the frozen peas possess a bright, practically uniform, good, green color that is typical for the variety; that peas which vary markedly from such typical green color do not more than slightly affect the overall color appearance; and that not more than one-half of 1 percent, by count, of the peas may be blond, cream colored, or seriously detract from the overall color appearance.

(b) **"B" classification.** If the frozen peas possess a reasonably good color, a score of 16 or 17 points may be given. Frozen peas that score 16 points in this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a partial limiting rule). **Reasonably good color** means that the frozen peas possess a reasonably bright and reasonably uniform green color typical for the variety; that peas which vary markedly from such typical green color do not materially affect the overall color appearance; and that not more than 1-1/2 percent, by count, of the peas may be blond, cream colored, or seriously detract from the overall color appearance.

(c) **"C" classification.** Frozen peas that possess a fairly good color may be given a score of 14 or 15 points. Frozen peas that fall into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a partial limiting rule). **Fairly good color** means that the frozen peas possess a fairly uniform green color typical for the variety, which may be dull but not off color; that peas which vary markedly from such typical green color do not seriously affect the overall color appearance; and that not more than 2 percent, by count, of all the peas may be blond, cream colored, or seriously detract from the overall color appearance.

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

§52.3516 Defects.

(a) **General.** The factor of defects refers to the degree of freedom from harmless extraneous vegetable material, pieces of peas, blemished peas, seriously blemished peas, and other defects which affect the appearance or eating quality of the product.

(b) **Definition of defects.**

(1) **Harmless extraneous vegetable material** means:

(i) Group 1; flat material. Succulent vegetable material common to the pea plant, such as leaves and pea pods;

(ii) Group 2; spherical material. Non-deleterious or non-poisonous types of nightshade berries,thistle buds, or other similar spherical vegetable material from other plants similar in color to frozen peas.

(iii) Group 3; cylindrical material. Cylindrical vegetable material, such as stems, common to the pea plant or from other plants which are similar in color to frozen peas.

(2) **Pieces of pea** (broken pea) means:

(i) A whole pea from which a cotyledon or a large portion thereof has become separated;

(ii) Two detached whole cotyledons;

(iii) Pieces of cotyledon aggregating the equivalent of an average size cotyledon; and

(iv) A whole detached skin or portions of detached skin aggregating the equivalent of an average size whole skin.

(3) **Blemished pea** means a pea that is blemished by discoloration or by other means that does not materially affect the appearance or eating quality of the pea.

(4) **Seriously blemished pea** means a pea that is hard, shriveled, spotted, discolored, or otherwise blemished to an extent that the appearance or eating quality is seriously affected. Peas commonly referred to as **blond** or **cream colored** peas are not considered seriously blemished peas.

(c) **Determination of allowances.**

(1) **Determining percent, by count, of pieces of peas.**

(i) The percent, by count, of pieces of peas is determined by dividing the total number of pieces of peas by the total number of peas and pieces of peas.

(ii) A pea held together by its skin, even though the cotyledons are partly crushed or the skin split, is not considered as a broken pea or piece of pea.

(2) **Harmless extraneous vegetable material.**

(i) The allowances for harmless extraneous vegetable material are based on 30 ounces of frozen peas. When considering sample units of less than 30 ounces, the allowances provided in this section for the respective grade classification will be permitted in a single sample unit: **Provided,** that the average of such defects in the entire sample does not exceed such allowance.

(d) **"A" classification.** Frozen peas that are practically free from defects may be given a score of 36 to 40 points. **Practically free from defects** means that: (See Table I of this subpart)

(1) For each 30 ounces of net weight there may be present not more than the following amounts of harmless extraneous vegetable material;

(i) Group 1; flat material, pieces having an aggregate area of not more than 1/4 square inch (equivalent to 1/2 inch x 1/2 inch) on the surface; or 1 piece of any size;

(ii) Group 2; spherical material, 1 unit; or

(iii) Group 3; cylindrical material, a piece or pieces which singly or in the aggregate do not exceed 1/2 inch in length.

(2) Not more than 7 percent, by count, of the peas may be pieces of peas;

(3) Not more than 2 percent, by count, of the peas may be blemished including not more than one-half of 1 percent, by count, of all the peas that may be seriously blemished;

254

(4) The presence of harmless extraneous vegetable material, pieces of peas, blemished peas, seriously blemished peas, and other defects individually or collectively, does not more than slightly affect the appearance or eating quality of the product.

(e) **"B" classification.** Frozen peas that are reasonably free from defects may be given a score of 32 to 35 points. Frozen peas that fall into this classification, except for pieces of peas, shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a partial limiting rule). **Reasonably free from defects** means that: (see Table I of this subpart)

(1) For each 30 ounces of net weight there may be present not more than the following amounts of harmless extraneous vegetable material:

(i) When present as a single group:

(a) Group 1; flat material, pieces having an aggregate area of not more than 1/2 square inch (equivalent to 1/2 inch x 1 inch) on the surface; or 1 piece of any size; or

(b) Group 2; spherical material, 2 units; or

(c) Group 3; cylindrical material, a piece or pieces which singly or in the aggregate do not exceed 1 inch in length.

(ii) When present in combination, not more than 2 of any of the following groups:

(a) Group 1; flat material, pieces having an aggregate area of not more than 1/4 square inch (equivalent to 1/2 inch x 1/2 inch) on the surface; or 1 piece of any size;

(b) Group 2; spherical material, 1 unit;

(c) Group 3; cylindrical material, a piece or pieces which singly or in the aggregate do not exceed 1/2 inch in length.

(2) Not more than 10 percent, by count, of the peas may be pieces of peas;

255

(3) Not more than 4 percent, by count, of the peas may be blemished including not more than 1 percent, by count, of all the peas that may be seriously blemished;

(4) The presence of harmless extraneous vegetable material, pieces of peas, blemished peas, seriously blemished peas, and other defects, individually or collectively, does not materially affect the appearance or eating quality of the product.

(f) **"C" classification.** Frozen peas that are fairly free from defects may be given a score of 28 to 31 points. Frozen peas that fall into this classification, except for pieces of peas, shall not be graded above U.S. Grade C, regardless of the total score for the product (this is a partial limiting rule). **Fairly free from defects** means that: (see Table I of this subpart)

(1) For each 30 ounces of net weight there may be present not more than the following amounts of harmless extraneous vegetable material:

(i) When present as a single group:

(a) Group 1; flat material, pieces having an aggregate area of not more than 1 square inch (equivalent to 1 inch x 1 inch) on the surface; or 1 piece of any size; or

(b) Group 2; spherical material, 3 units; or

(c) Group 3; cylindrical material, a piece or pieces which singly or in the aggregate do not exceed 2 inches in length.

(ii) When present in combination, not more than 2 of any of the following groups:

(a) Group 1; flat material, pieces having an aggregate area of not more than 1/2 square inch (equivalent to 1/2 inch x 1 inch) on the surface; or 1 piece of any size;

(b) Group 2; spherical material, 2 units;

(c) Group 3; cylindrical material, a piece or pieces which singly or in the aggregate do not exceed 1 inch in length.

(2) Not more than 15 percent, by count, of the peas may be pieces of peas;

(3) Not more than 6 percent, by count, of the peas may be blemished including not more than 3 percent, by count, of all the peas that may be seriously blemished;

(4) The presence of harmless extraneous vegetable material, pieces of peas, blemished peas, seriously blemished peas, and other defects, individually or collectively, does not seriously affect the appearance or eating quality of the product.

(g) **"SStd" classification.** Frozen peas that fail to meet the requirements of paragraph (f) of this section may be given a score of 0 to 27 points. Frozen peas that fall into this classification, except for pieces of peas that exceed 15 percent, by count, but do not exceed 20 percent, by count, shall not be graded above Substandard, regardless of the total score for the product (this is a partial limiting rule).

257

Table I - Summary of Maximum Allowances for Defects

Kind of defect	Grade Classification				
	Grade A	Grade B		Grade C	
		When present as single group	Combination of any two	When present as single group	Combination of any two
Harmless extraneous vegetable material (for each 30 oz)					
Group 1 - Flat material	1/4 square inch or 1 piece of any size.	1/2 square inch or 1 piece of any size.	1/4 square inch or 1 piece of any size.	1 square inch or piece of any size.	1/2 square in. or 1 piece of any size.
	or	or		or	
Group 2 - Spherical material	1 unit	2 units	1 unit	3 units	2 units.
	or	or		or	
Group 3 - Cylindrical material	1 piece of pieces not exceeding 1/2 in. aggregate.	1 piece or pieces not exceeding 1 in. aggregate.	1 piece or pieces not exceeding 1/2 in. aggregate,	1 piece or pieces not exceeding 2 in. aggregate.	1 piece or pieces not exceeding 1 in. aggregate.
Pieces of peas	7 percent 1/ by count	10 percent 1/ by count		15 percent 1/ by count.	
Blemished peas	2 percent by count	4 percent by count		6 percent by count.	
	which includes	**which includes**		**which includes**	
Seriously blemished peas	1/2 percent by count	1 percent by count		3 percent by count	

1/ Limiting rule does not apply

§52.3517 Tenderness and maturity.

(a) **General.** The factor of tenderness and maturity refers to the degree of maturity of frozen peas as determined on the basis of the brine flotation test set forth in §52.3518 by first removing the skins from the peas, and as reflected in the tenderness determined on the cooked product.

(b) **"A" classification.** Frozen peas that are tender may be given a score of 36 to 40 points. **Tender** means that the peas are in such a stage of maturity that not more than 10 percent, by count, of the peas may sink in a solution containing 13 percent, by weight, of salt (See Table II of this subpart); and that the frozen peas after cooking are very tender upon eating.

(c) **"B" classification.** Frozen peas that are reasonably tender may be given a score of 32 to 35 points. Frozen peas that fall into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). **Reasonably tender** means that the peas are in such a stage of maturity that not more than 12 percent, by count, of the peas may sink in a solution containing 15 percent, by weight, of salt (See Table II of this subpart); and that the frozen peas after cooking are reasonably tender upon eating.

(d) **"C" classification.** Frozen peas that are fairly tender may be given a score of 28 to 31 points. Frozen peas that fall into this classification shall not be graded above U.S. Grade C, regardless of the total score for the product (this is a limiting rule). **Fairly tender** means that the peas are in such a stage of maturity that not more than 16 percent, by count, of the peas may sink in a solution containing 16 percent, by weight, of salt (See Table II of this subpart); and that the frozen peas after cooking are fairly tender upon eating.

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

Table II - Summary of Maximum Allowances for the Brine Test

Grade classification	Score range	Maximum number of peas (skins removed)that sink in 10 seconds	Salt in solution
			Percent
Grade A	36 to 40	10 percent by count	13
Grade B	32 to 35	12 percent by count	15
Grade C	28 to 31	16 percent by count	16

§52.3518 Brine flotation test.

(a) **Explanation.** The brine flotation test utilizes salt solutions of various specific gravities to separate the peas according to maturity. The brine solutions are based on the percentage by weight of pure salt (NaCl) in solution at 20 degrees C. In making the test the brine solutions are standardized to the proper specific gravity equivalent to the specified **percent of salt solutions at 20 degrees C.** by using a salometer spindle accurately calibrated at 20 degrees C. A 250 ml glass beaker or similar receptacle is filled with the brine solution to a depth of approximately 2 inches. The brine solution and sample must be at the same temperature and should closely approximate 20 degrees C.

(b) **Procedure.** After carefully removing the skins from the peas, place the peas into the solution. Pieces of peas and loose skin should not be used in making the brine flotation test. If cotyledons divide, use both cotyledons in the test and consider the 2 separated cotyledons as 1 pea; and, if an odd cotyledon sinks, consider it as one pea. Only peas that sink to the bottom, of the receptacle within 10 seconds after immersion are counted as **peas that sink**.

§52.3519 Ascertaining the grade of a lot.

The grade of a lot of frozen peas covered by these standards is determined by the procedures set forth in the **Regulations Governing Inspection and Certification of Processed Fruit and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products** (7 CFR 52.1 through 52.83).

§52.3520 Score sheet for frozen peas.

Size and kind of container .....
Container mark or identification .....
Label .....
Net weight (ounces) .....

Factors	Score Points		
Color	20	"A"	18-20
		"B"	16-17 2/
		"C"	14-15 2/
		"SStd"	0-13 1/
Defects	40	"A"	36-40
		"B"	32-35 2/
		"C"	28-31 2/
		"SStd"	0-27 2/
Tenderness and maturity	40	"A"	36-40
		"B"	32-35 1/
		"C"	28-31 1/
Total Score	100	"SStd"	0-27 1/

Flavor ( ) Good ( ) Fairly good ( ) Off .....
Varietal characteristics ( ) Similar ( ) Dissimilar .....
U.S. Grade .....

1/ Indicates limiting rule.
2/ Indicates partial limiting rule.

The United States Standards for Grade of Frozen Peas (which is the sixth issue) contained in this subpart shall become effective fifteen days after the date of publication in the **FEDERAL REGISTER** and thereupon will supersede the United States Standards for Grades of Frozen Peas which have been in effect since March 15, 1945.

Dated: May 7, 1959

Roy W. Lennartson,
Deputy Administrator,
Marketing Services.

Published in the Federal Register, May 12, 1959 24 F. R. 3782)

United States
Department of
Agriculture

Agricultural
Marketing
Service

Fruit and
Vegetable
Division

Processed
Products
Branch

United States Standards for Grades of Frozen Green Beans and Frozen Wax Beans

Effective date August 19, 1996

262

This is the seventh issue of the United States Standards for Grades of Frozen Green Beans and Frozen Wax Beans published in the **FEDERAL REGISTER** of July 19, 1996 (61 FR 37663) to become effective August 19, 1996. This issue supersedes the sixth issue, as amended which has been in effect since July 11, 1983.

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

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

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

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

Chief, Processed Products Branch
Fruit and Vegetable Division, AMS
U.S. Department of Agriculture
P.O. Box 96456, Rm. 0726, So. Bldg.
Washington, D.C. 20090-6456

United States Standards for Grades of Frozen Green Beans and Frozen Wax Beans

Section		Page No.
§52.2321	Product description.	2
§52.2322	Styles.	2
§52.2323	Types.	2
§52.2324	Kinds of pack.	3
§52.2325	Definitions of terms.	3
§52.2326	Grades.	6
§52.2327	Factors of quality.	7
§52.2328	Allowances for defects.	9
§52.2329	Sample size	19
§52.2330	Quality requirement criteria.	19

Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended (7 U.S.C. 1622, 1624).

Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

§52.2321 Product description.

Frozen green beans and **frozen wax beans**, hereinafter called frozen beans, means the frozen product prepared from the clean, sound, succulent pods of the bean plant. The pods are stemmed, washed, blanched, sorted, and properly drained. The product is frozen in accordance with good commercial practice and maintained at temperatures necessary for the preservation of the product.

§52.2322 Styles.

(a) **Whole** means frozen beans consisting of whole pods, which after removal of either or both ends, are not less than 44 mm (1.75 in) in length.

(b) **Cut or cuts** means frozen beans consisting of pods that are cut transversely into pieces less than 70 mm (2.75 in) but not less than 19 mm (0.75 in) in length.

(c) **Short cut or short cuts** means frozen beans consisting of pieces of pods of which 75 percent or more are less than 19 mm (0.75 in) in length and not more than 1 percent are more than 32 mm (1.25 in) in length.

(d) **Mixed** means a mixture of two or more of the following styles of frozen beans: whole, cut, or short cut.

(e) **Sliced lengthwise, or French style** means frozen green beans consisting of pods that are sliced lengthwise.

§52.2323 Types.

The type of frozen beans is not incorporated in the grades of finished product, since it is not a factor of quality. The types of frozen beans are described as **round type** and **Romano or Italian type**.

(a) **Round type** means frozen beans having a width not greater than 1-1/2 times the thickness of the beans.

(b) **Romano or Italian type** means frozen beans having a width greater than 1-1/2 times the thickness of the beans.

§52.2324 Kinds of pack.

The kind of pack of frozen beans is not incorporated in the grades of finished product, since it is not a factor of quality. The kinds of pack of frozen beans are described as **regular process, extended blanch process, and special pack.**

(a) **Regular process** means the frozen beans are processed in such a manner that the brightness is not affected by the process.

(b) **Extended blanch process** means the frozen beans are intentionally processed in such a manner that the brightness is affected by the process.

(c) **Special pack** means the frozen bean pack intentionally contains beans of two or more varietal characteristics (such as a mixture of green and wax beans).

§52.2325 Definitions of terms.

(a) **Acceptable Quality Level (AQL)** means the maximum percent of defective units or the maximum number of defects per hundred units of product that, for the purpose of acceptance sampling, can be considered satisfactory as a process average.

(b) **Blemish.**

(1) **Minor blemish** means any unit which is affected by scars, pathological injury, insect injury or other means in which the aggregate area affected exceeds the area of a circle 3 mm (0.125 in) in diameter or the appearance or eating quality of the unit is slightly affected.

(2) **Major blemish** means any unit which is affected or damaged by discoloration or any other means to the extent that the appearance or eating quality of the unit is more than slightly affected.

(3) **Total blemish** means the total of the major and minor blemishes.

(c) **Brightness**means the extent that the overall appearance of the sample unit as a mass is affected by dullness. (Applies to **regular process** only).

(1) Grade A: Not affected.

(2) Grade B: Slightly affected.

(3) Grade C: Materially affected.

(4) Substandard: Seriously affected.

(d) **Character.**

(1) **Round type - Green Beans.**

(i) **Good character** means the pods are full fleshed; after cooking, the pods are tender and the seeds are not mealy.

(ii) **Reasonably good character** means the pods are reasonably fleshy; after cooking, the pods are tender and the seeds are not mealy.

(iii) **Fairly good character** means the pods have not entirely lost their fleshy structure; after cooking, the pods are fairly tender and the seeds may be slightly mealy.

(iv) **Poor character** means the beans fail the requirements for fairly good character.

(2) **Round type - Wax Beans.**

(i) **Good character** means the pods are full fleshed and may show slight breakdown of the flesh between seed cavities; after cooking, the pods are tender and the seeds are not mealy.

(ii) **Reasonably good character** means the pods are reasonably fleshy and may show substantial breakdown of the flesh between the seed cavities; after cooking, the pods are tender and the seeds are not mealy.

(iii) **Fairly good character** means the pods may show total breakdown of the flesh between the seed cavities with no definite seed pocket, but still retain flesh on the inside pod wall; after cooking, the pods are fairly tender and the seeds may be slightly mealy.

(iv) **Poor character** means the beans fail the requirements for fairly good character.

(3) **Romano or Italian type.**

(i) **Good character** means the pods have a full inner membrane, typical of the variety and are tender after cooking.

(ii) **Reasonably good character** means the pods have a reasonably well developed inner membrane and are reasonably tender after cooking.

(iii) **Fairly good character** means the pods may lack an inner membrane; and are fairly tender after cooking.

(iv) **Poor character** means the beans fail the requirements for fairly good character.

(e) **Color defective** means a unit that varies markedly from the color that is normally expected for the variety and grade.

(f) **Defect** means any nonconformance of a unit of product from a specified requirement of a single quality characteristic.

(g) **Extraneous vegetable material (EVM)** means harmless vegetable material (other than the bean pods) including, but not limited to, stalk, vine material, [vine material with stem(s) attached], leaves of the bean plant, and leaves or portions of other harmless plants.

(h) **Fiber.**

(1) **Edible fiber** means fiber developed in the wall of the bean pod that, after cooking, is noticeable upon chewing, but can be consumed with the rest of the bean material without objection.

(2) **Inedible fiber** means fiber developed in the wall of the bean pod that, after cooking, is objectionable upon chewing and tends to separate from the rest of the bean material.

(i) **Flavor and odor.** Good flavor and odor means the product, after cooking, has a characteristic green bean or wax bean flavor and odor typical of the varietal type and is free from objectionable flavors and odors.

(j) **Mechanical damage** means a unit, in all styles except French, that is broken or split into two parts (equals 1 defect), is crushed, or is damaged by mechanical means to such an extent that the appearance is seriously affected; and for whole and cut styles has very ragged edges that are greater than 8 mm (5/16 in).

(k) **Short piece** means a unit in cut style, that is less than 13 mm (0.50 in) in length, and a unit in whole style that is less than 44 mm (1.75 in) in length, measured along the longest dimension parallel to the bean suture line.

(l) **Single sample unit** means the amount of product specified (500 grams for French style and 400 units for all other styles) to be used for unofficial inspection. It may be:

(1) The entire contents of a container;

(2) A portion of the contents of a container; or

(3) A combination of the contents of two or more containers.

(m) **Sloughing** means the separation of the outer surface layer of tissue from the pod.

(n) **Small pieces and odd cuts, in French style only**, mean pieces of pod less than 19 mm (0.75 in) in length or pieces of pod not conforming to the normal appearance of a sliced lengthwise bean unit.

(o) **Stem** means any part or portion (loose or attached) of the hard or tough fibrous material that attaches the bean pod to the vine.

(p) **Tolerance**means the percentage of defective units allowed for each quality factor for a specified sample size.

(q) **Unit** means a bean pod or any individual portion thereof.

§52.2326 Grades.

(a) **U.S. Grade A** is the quality of frozen beans that:

(1) Meets the following prerequisites in which the beans:

(i) Have similar varietal characteristics (except special packs);

(ii) Have a good flavor and odor;

(iii) Have a good overall brightness that is not affected by dullness (regular process only); and

(iv) Are not materially affected by sloughing.

(2) Is within the limits for defects as specified in Section 52.2328, as applicable for the style.

(b) **U.S. Grade B** is the quality of frozen beans that:

(1) Meets the following prerequisites in which the beans:

(i) Have similar varietal characteristics (except special packs);

(ii) Have a good flavor and odor;

(iii) Have a reasonably good overall brightness (regular process only); and

(iv) Are not materially affected by sloughing.

(2) Is within the limits for defects as specified in Section 52.2328, as applicable for the style.

(c) **U.S. Grade C** is the quality of frozen beans that:

(1) Meets the following prerequisites in which the beans:

(i) Have similar varietal characteristics (except special packs);

(ii) Have a good flavor and odor;

(iii) Have a fairly good overall brightness (regular process only); and

(iv) Are not seriously affected by sloughing.

(2) Is within the limits for defects as specified in Section 52.2328, as applicable for the style.

(d) **Substandard** is the quality of frozen beans that fail the requirements of U.S. Grade C.

§52.2327 Factors of quality.

The grade of frozen beans is based on requirements for the following quality factors:

(a) Prerequisite quality factors.

(1) Varietal characteristics (except special packs);

(2) Flavor and odor;

(3) Brightness (regular process only); and

(4) Sloughing.

(b) Classified quality factors.

(1) Extraneous vegetable material (EVM);

(2) Stems;

(3) Major blemishes;

(4) Total blemishes;

(5) Mechanical damage;

(6) Short pieces (Cut, Whole Style);

(7) Small pieces and odd cuts (French Style);

(8) Color defectives;

(9) Character;

(10) Inedible fiber; and

(11) Edible fiber.

§52.2328 Allowances for defects.

Table I
Prerequisite Factors for Frozen Green Beans and Wax Beans 1/

Factors	Grade A	Grade B	Grade C
Varietal Characteristics	Similar	Similar	Similar
Flavor and Odor	Good	Good	Good
Brightness	Good	Reasonably Good	Fairly Good
Sloughing	Not Materially Affected	Not Materially Affected	Not Seriously Affected

1/ Determined container-by-container.

272

Table II
Acceptance Numbers for Whole, and Cut Style Frozen Green Beans and Wax Beans
Grade A

Sample Units x Sample Unit Size			1x400	1.5x400	3x400	6x400	13x400	21x400	29x400
Units of Product			400 1/	600 2/	1200	2400	5200	8400	11600
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
0.25	0.162	Extraneous Vegetable Material	2	2	4	7	13	19	26
0.75	0.58	Stems	5	6	11	20	39	60	81
1.25	1.02	Major Blemishes	7	10	18	33	65	101	136
3.75	3.30	Total Blemishes (Major + Minor)	19	27	50	94	193	304	415
3.00	2.60	Mechanical Damage	16	22	40	75	154	242	330
20.00	19.10	Short Pieces, Whole Style	89	130	251	490	1040	1664	2285
8.50	7.90	Short Pieces, Cut Style	41	59	111	212	444	706	966
1.75	1.48	Edible Fiber	10	14	25	45	91	142	193
0.10	0.05	Inedible Fiber	1	1	2	3	5	7	10
5.50	5.00	Color Defectives	27	39	73	138	286	454	620
10.75	10.10	Character - "B"	50	72	138	266	561	894	1225
1.25	1.02	Character - "C"	7	10	18	33	65	101	136
0.10	0.05	Character - "SStd"	1	1	2	3	5	7	10

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 5200.

Table IIa
Acceptance Numbers for Whole, and Cut Style Frozen Green Beans and Wax Beans
Grade B

Sample Units x Sample unit Size			1x400	1.5x400	3x400	6x400	13x400	21x400	29x400
Units of Product			400 1/	600 2/	1200	2400	5200	8400	11600
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
.50	0.366	Extraneous Vegetable Material	3	4	8	13	26	40	53
1.50	1.25	Stems	8	12	21	39	78	122	165
2.50	2.17	Major Blemishes	13	19	34	64	130	204	278
6.75	6.20	Total Blemishes (Major + Minor)	33	47	88	169	352	559	763
6.00	5.50	Mechanical Damage	30	42	79	151	314	498	680
N/A	N/A	Short Pieces, Whole Style	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12.50	11.80	Short Pieces, Cut Style	58	84	160	309	652	1040	1426
4.50	4.00	Edible Fiber	22	32	59	112	232	366	500
1.50	1.25	Inedible Fiber	8	12	21	39	78	122	165
10.75	10.10	Color Defectives	50	72	138	266	561	894	1225
N/A	N/A	Character - "B"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10.75	10.10	Character - "C"	50	72	138	266	561	894	1225
1.25	1.02	Character - "SStd"	7	10	18	33	65	101	136

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 5200.

Table IIb
Acceptance Numbers for Whole, and Cut Style Frozen Green Beans and Wax Beans
Grade C

Sample Units x Sample unit Size			1x400	1.5x400	3x400	6x400	13x400	21x400	29x400
Units of Product			400 1/	600 2/	1200	2400	5200	8400	11600
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
1.00	0.80	Extraneous Vegetable Material	6	8	15	26	52	80	108
3.00	2.60	Stems	16	22	40	75	154	242	330
3.75	3.30	Major Blemishes	19	27	50	94	193	304	415
12.75	12.00	Total Blemishes (Major + Minor)	58	85	162	314	663	1057	1449
10.75	10.10	Mechanical Damage	50	72	138	266	561	894	1225
N/A	N/A	Short Pieces, Whole Style	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18.25	17.40	Short Pieces, Cut Style	82	119	230	448	950	1519	2085
8.50	7.90	Edible Fiber	41	59	111	212	444	706	966
3.75	3.30	Inedible Fiber	19	27	50	94	193	304	415
17.75	16.90	Color Defectives	80	116	224	435	923	1476	2027
N/A	N/A	Character - "B"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	Character - "C"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10.75	10.10	Character - "SStd"	50	72	138	266	561	894	1225

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 5200.

275

Table III
Acceptance Numbers for Short Cut, and Mixed Cut Style Frozen Green Beans and Wax Beans
Grade A

Sample Units x Sample unit Size			1x400	1.5x400	3x400	6x400	13x400	21x400	29x400
Units of Product			400 1/	600 2/	1200	2400	5200	8400	11600
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
0.25	0.162	Extraneous Vegetable Material	2	2	4	7	13	19	26
0.75	0.58	Stems	5	6	11	20	39	60	81
1.25	1.02	Major Blemishes	7	10	18	33	65	101	136
3.75	3.30	Total Blemishes (Major + Minor)	19	27	50	94	193	304	415
3.00	2.60	Mechanical Damage	16	22	40	75	154	242	330
1.75	1.48	Edible Fiber	10	14	25	45	91	142	193
0.10	0.05	Inedible Fiber	1	1	2	3	5	7	10
5.50	5.00	Color Defectives	27	39	73	138	286	454	620
10.75	10.10	Character - "B"	50	72	138	266	561	894	1225
1.25	1.02	Character - "C"	7	10	18	33	65	101	136
0.10	0.05	Character - "SStd"	1	1	2	3	5	7	10

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 5200.

Table IIIa
Acceptance Numbers for Short Cut, and Mixed Cut Style Frozen Green Beans and Wax Beans
Grade B

Sample Units x Sample unit Size			1x400	1.5x400	3x400	6x400	13x400	21x400	29x400
Units of Product			400 1/	600 2/	1200	2400	5200	8400	11600
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
0.50	0.366	Extraneous Vegetable Material	3	4	8	13	26	40	53
1.50	1.25	Stems	8	12	21	39	78	122	165
2.50	2.17	Major Blemishes	13	19	34	64	130	204	278
6.75	6.20	Total Blemishes (Major + Minor)	33	47	88	169	352	559	763
6.00	5.50	Mechanical Damage	30	42	79	151	314	498	680
4.50	4.00	Edible Fiber	22	32	59	112	232	366	500
1.50	1.25	Inedible Fiber	8	12	21	39	78	122	165
10.75	10.10	Color Defectives	50	72	138	266	561	894	1225
N/A	N/A	Character - "B"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10.75	10.10	Character - "C"	50	72	138	266	561	894	1225
1.25	1.02	Character - "SStd"	7	10	18	33	65	101	136

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 5200.

Table IIIb
Acceptance Numbers for Short Cut, and Mixed Cut Style Frozen Green Beans and Wax Beans
Grade C

Sample Units x Sample unit Size			1x400	1.5x400	3x400	6x400	13x400	21x400	29x400
Units of Product			400 1/	600 2/	1200	2400	5200	8400	11600
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
1.00	0.80	Extraneous Vegetable Material	6	8	15	26	52	80	108
3.00	2.60	Stems	16	22	40	75	154	242	330
3.75	3.30	Major Blemishes	19	27	50	94	193	304	415
8.50	7.90	Total Blemishes (Major + Minor)	41	59	111	212	444	706	966
10.75	10.10	Mechanical Damage	50	72	138	266	561	894	1225
8.50	7.90	Edible Fiber	41	59	111	212	444	706	966
3.75	3.30	Inedible Fiber	19	27	50	94	193	304	415
17.75	16.90	Color Defectives	80	116	224	435	923	1476	2027
N/A	N/A	Character - "B"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	Character - "C"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10.725	10.10	Character - "SStd"	50	72	138	266	561	894	1225

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 5200.

Table IV
Acceptance Numbers for French Style Frozen Green Beans and Wax Beans
Grade A

Sample Units x Sample unit Size			1x200x2.5	1.5x200x2.5	3x200x2.5	6x200x2.5	13x200x2.5	21x200x2.5	29x200x2.5
Grams of Product			500 1/	750 2/	1500	3000	6500	10500	14500
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
0.25	0.153	Extraneous Vegetable Material (No. of Pieces)	1	1	2	4	7	10	14
0.75	0.541	Stems (No. of stems)	3	4	6	11	20	30	41
1.25	0.961	Major Blemishes (Grams)	10	15	25	43	83	128	170
2.50	2.05	Total Blemishes [(Grams) Major + Minor]	18	25	45	83	163	253	343
10.0	9.0	Small pieces & odd cuts (Grams)	63	88	165	313	648	1025	1400
5.50	4.80	Color Defectives (Grams)	38	50	95	175	358	563	765
N/A	N/A	Character - "B" (Grams)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
6.75	6.00	Character - "C" (Grams)	45	63	115	215	440	695	945
1.75	1.40	Character - "SStd" (Grams)	13	18	33	58	115	178	240

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 2600.

Table IVa
Acceptance Numbers for French Style Frozen Green Beans and Wax Beans
Grade B

Sample Units x Sample unit Size			1x200x2.5	1.5x200x2.5	3x200x2.5	6x200x2.5	13x200x2.5	21x200x2.5	29x200x2.5
Grams of Product			500 1/	750 2/	1500	3000	6500	10500	14500
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
0.50	0.325	Extraneous Vegetable Material (No. of Pieces)	2	2	4	7	13	20	26
1.50	1.16	Stems (No. of stems)	5	6	11	20	39	60	81
2.50	2.05	Major Blemishes (Grams)	18	25	45	83	163	253	343
3.75	3.20	Total Blemishes [(Grams) Major + Minor]	25	38	65	120	245	383	520
15.0	13.9	Small pieces & odd cuts (Grams)	90	128	243	465	978	1553	2125
10.75	9.80	Color Defectives (Grams)	68	95	178	338	703	1113	1520
N/A	N/A	Character - "B"	N/A	N/A	N/A	N/A	N/A	N/A	N/A
20.00	18.80	Character - "C" (Grams)	118	168	320	620	1305	2078	2848
5.50	4.80	Character - "SStd" (Grams)	38	50	95	175	358	563	765

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 2600.

Table IVb
Acceptance Numbers for French Style Frozen Green Beans and Wax Beans
Grade C

Sample Units x Sample unit Size			1x200x2.5	1.5x200x2.5	3x200x2.5	6x200x2.5	13x200x2.5	21x200x2.5	29x200x2.5
Grams of Product			500 1/	750 2/	1500	3000	6500	10500	14500
TOL	AQL 3/	Quality Factors	Acceptance Numbers						
1.00	0.733	Extraneous Vegetable Material (No. of Pieces)	3	4	8	13	26	40	53
3.00	2.50	Stems (No. of stems)	8	12	21	39	78	122	165
3.75	3.20	Major Blemishes (Grams)	25	38	65	120	245	383	520
10.75	9.80	Total Blemishes [(Grams) Major + Minor]	68	95	178	338	703	1113	1520
20.0	18.8	Small pieces & odd cuts (Grams)	118	168	320	620	1305	2078	2848
17.75	16.60	Color Defectives (Grams)	105	150	285	550	1158	1843	2523
N/A	N/A	Character - "B" (Grams)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N/A	N/A	Character - "C" (Grams)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
12.50	11.50	Character - "SStd" (Grams)	75	108	205	390	813	1293	1768

1/ For unofficial samples.
2/ For use with small container sizes only.
3/ AQL calculated from tolerance (TOL) at 2600.

§52.2329 Sample size.

The sample size used to determine whether the requirements of these standards are met shall be as specified in the sampling plans and procedures contained in 7 CFR 52.1 through 52.83.

§52.2330 Quality requirement criteria.

(a) Lot inspection. A lot of frozen beans is considered as meeting the requirements for quality if:

(1) The prerequisite requirements specified in Section 52.2326 and Section 52.2328, Table I are met; and

(2) None of the allowances for the individual quality factors specified in Tables II, IIa, IIb, III, IIIa, IIIb, IV, IVa, and IVb of Section 52.2328, as applicable for the style, are exceeded.

(b) Single sample unit. Each unofficial sample unit submitted for quality evaluation will be treated individually and is considered as meeting the requirements for quality if:

(1) The prerequisites requirements specified in Section 52.2326 and Section 52.2328, Table I are met; and

(2) The Acceptable Quality Levels in Tables II, IIa, IIb, III, IIIa, IIIb, IV, IVa, and IVb of Section 52.2328, as applicable for the style, are not exceeded.

Dated:

/s/ _____
Robert C. Keeney
Director
Fruit and Vegetable Division