UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
FRUIT AND VEGETABLE DIVISION
PROCESSED PRODUCTS STANDARDIZATION AND INSPECTION BRANCH
WASHINGTON, D. C.

INSTRUCTIONS FOR INSPECTION

of

CANNED SAUERKRAUT

FOR USE OF USDA PROCESSED FOODS INSPECTORS

JUNE 1957

ACTION BY: All Employees Of The Branch

APPROVED BY: F. L. Southerland
Chief Of The Branch

FILE UNDER: CANNED SAUERKRAUT

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INSPECTORS' INSTRUCTIONS FOR CANNED SAUERKRAUT

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INSPECTORS' INSTRUCTIONS FOR CANNED SAUERKRAUT

June - 1957

I GENERAL

A Purpose and Scope.

The instructions contained herein explain and furnish technical information which will serve as a guide in the inspection of canned sauerkraut and will aid inspectors in attaining uniformity in applying the United States Standards for grades of this product and in the proper certification of the product. These instructions will also serve to familiarize the inspectors with the commercial product and the general packing procedure used by industry.

B Caution.

Inspectors are reminded that these are administrative instructions for their use only and are not for public distribution.

C Keep Instructions Current.

These instructions may be revised, in whole or in part, whenever the need for such revision is indicated. Therefore, any comments or suggestions such as detection of errors or the development of new and better inspection techniques should be forwarded in detail to the Washington office.

II PRODUCTION

A Relative Importance.

Sauerkraut, including both canned and bulk, is an important processed product.

Cabbage harvested for sauerkraut is an important cash crop for growers in areas where kraut is produced.

II PRODUCTION (Continued)

B Cabbage Crop Used for Sauerkraut.

During the five years from 1951 to 1955, inclusive, approximately 15 percent of the total U. S. cabbage crop was utilized in the manufacture of sauerkraut.

The following table shows the total number of tons of cabbage estimated available for harvest in the United States, including that for fresh market outlets and for sauerkraut manufacture, during the period from 1946 to 1955, inclusive.

Table I

U. S. Production of Cabbage for Fresh Market and for Sauerkraut Manufacture

Year	Total production (tons)	For fresh market 1/ (tons)	For sauerkraut manufacture (tons)
1951	1,285,400	1,110,600	174,800
1952	1,256,400	1,079,100	177,300
1953	1,458,400	1,232,000	226,400
1954	1,333,000	1,124,900	208,100
1955	1,155,300	994,600	160,700

1/ Includes small amount for dehydration.

C Most Sauerkraut is Canned.

During World War II, restrictions on the use of tin greatly reduced the quantity of sauerkraut canned. Since the close of the war, however, it is estimated that between two-thirds and three-fourths of the sauerkraut produced has been packed in cans. The remainder is generally marketed in bulk in barrels or packed in plastic bags or in glass. Sauerkraut packed in glass is usually preserved by the addition of not to exceed 1/10 of 1 percent benzoate of soda. Sauerkraut packed in plastic bags may be preserved either by refrigeration or by the addition of benzoate of soda.

II PRODUCTION (Continued)

D Principal Can Sizes Used for Sauerkraut.

In spite of the increased popularity of the No. 303 can, the No. 2-1/2 can is still the principal size used in packing sauerkraut, making up 39 percent of the number of cases packed during the 1954-55 season. The use of No. 303 cans increased from a relatively negligible proportion prior to 1949 to more than 30 percent of the total number of cases packed in 1954-55. Cases of six No. 10 cans made up 9 percent of the total cases packed in 1954-55.

E Principal Producing Areas.

New York, Wisconsin, and Ohio are the principal kraut packing States, accounting for about 75 percent of the total annual production. Moderate quantities are produced in Indiana and Michigan in the Middle West, and Washington, Oregon, Colorado, and Utah in the West.

All but a very small proportion of the sauerkraut pack is made in northern areas. This may be attributed in part to the heavier yields of fall cabbage obtained in those areas, and in part to the greater solidity and whiteness of heads.

The following table shows the quantity of cabbage grown for commercial sauerkraut manufacture in the United States during the five years from 1951 to 1955, inclusive.

II PRODUCTION (Continued)

E Principal Producing Areas. (Continued)

Table II

U. S. Production of Cabbage
for Commercial Sauerkraut Manufacture

State	1951 (tons)	1952 (tons)	1953 (tons)	1954 (tons)	1955 (tons)
New York	69,600	90,300	90,800	79,000	65,000
Ohio	18,000	12,500	21,800	19,000	9,200
Indiana	7,600	4,400	8,600	8,500	8,400
Illinois	1,200	800	1,200	800	--
Michigan	2,800	2,800	3,800	3,900	600
Wisconsin	46,000	37,800	67,100	52,600	41,000
Minnesota	1,100	700	800	--	--
Colorado	2,300	1,900	1,900	3,000	2,800
Washington	5,100	4,100	4,000	5,800	4,100
Other States 1/	21,100	22,000	26,400	34,900	29,600
Total	174,800	177,300	226,400	208,100	160,700

1/ Florida, Iowa, Maryland, Missouri, New Jersey, North Carolina, Oregon, Pennsylvania, Tennessee, Texas, Utah, and Virginia.

F Types and Varieties of Cabbage.

1 Domestic.

The greater proportion of the cabbage grown for the fresh market and used in the manufacture of sauerkraut is of varieties of the domestic type.

a Nearly all early cabbage grown in the South for the fresh market and the greater part of the late crop cabbage grown in the North is of the Domestic type.

This type includes many varieties with heads ranging from medium to large in size and in shape from round and pointed to distinctly flattened. Among the leading kraut varieties are All Head (All Head Early), Marion Market, and Copenhagen Market for early season processing; All Seasons, Flat Dutch, and Glory (Glory of Enkhuizen) for later packing.

II PRODUCTION (Continued)

F Types and Varieties of Cabbage. (Continued)

1 Domestic. (Continued)

b In some seasons when there is a shortage of domestic types, a considerable tonnage of Danish type cabbage may be used in the manufacture of kraut. The Danish type is characterized by medium sized, very compact heads, general spherical or somewhat top-shaped. The Danish type is used for storage to be sold later as fresh cabbage.

2 Red and Savoy cabbage.

These types are grown for the fresh market and are generally not used for sauerkraut. Red cabbage may be used in the production of a canned pickled cabbage.

G Securing Raw Material.

Sauerkraut packers may obtain their raw material in one of two ways:

1 By contract.

The canner contracts, prior to planting time, for delivery of the grower's crop at a stated price per ton. There is included under this heading a considerable amount of cabbage grown by the processor on his own land.

Contracting the crop in advance has the advantage of giving the packer an assured supply of cabbage at a known cost. Somewhat more than half of the acreage of cabbage destined for sauerkraut manufacture is planted under contract.

2 Open market purchases.

Acquiring supplies by purchasing from growers as needed relieves the packer from the necessity of financing growers, and enables him to take advantage of a period of heavy supplies and low prices.

II PRODUCTION (Continued)

G Securing Raw Material. (Continued)

2 Open market purchases. (Continued)

In most cases the heads are rough trimmed by the grower and loads are delivered at a flat price per ton. In a few cases packers have purchased cabbage on the basis of a sample of suitable size, the inspector determines the percentage of No. 1, No. 2, and cull heads in the grower's load at time of delivery. The grower is paid stipulated prices for the No. 1 and No. 2 heads, respectively, in the load and nothing for the culls.

III MANUFACTURE OF SAUERKRAUT

Sauerkraut is produced by the action of lactic acid bacteria which transforms the sugar in the cabbage into lactic acid. These bacteria are essentially anaerobic; that is, they grow best in a medium from which air is excluded. This condition is created by the addition of salt, which draws enough juice from the cabbage to help create the anaerobic conditions under which the desired bacteria will thrive.

A Delivery and Storage of Cabbage.

Cabbage may be used immediately on delivery or stored in bins at the plant until used. These storage bins should be enclosed and protected so that the cabbage can be stored into the winter, if necessary, without damage by freezing. The cabbage may be allowed to wilt slightly before shredding. The shreds of cabbage are not so easily broken and longer shreds may be obtained. The length of the shreds will depend principally on the size of the heads of cabbage used. Small heads will provide only short shreds with sometimes a "choppy" appearance. Large heads will provide long shreds when the cutter is properly adjusted.

B Coring and Trimming.

Heads of cabbage are cored before shredding. The heads are placed under a rapidly revolving augur with small horizontal blades. The blades cut the core into very fine pieces which are not objectionable in the finished product.

III MANUFACTURE OF SAUERKRAUT (Continued)

B Coring and Trimming. (Continued)

The heads are trimmed before coring and shredding or chopping. Trimming consists of removing portions of stems and heavy green outer leaves and cutting out blemished or discolored areas.

C Cutting, Shredding, or Chopping.

The heads of cabbage are cut into shreds by curved knives set into a rapidly revolving disc about three feet in diameter. The blades are usually set to cut shreds 1/32 inch in thickness. The cutter blades must be very sharp and properly set to give a clean, even cut.

Chopped kraut is prepared by means of a mill which cuts the cabbage into small pieces of varying degrees of fineness.

D Filling the Tanks.

Kraut tanks which may be constructed of cypress wood are usually set on a firm concrete foundation. The top of the tanks which may be 8 to 10 feet deep project 3 to 3-1/2 feet above the flooring built around the tanks. The tanks are usually placed in groups of 10 or 12 or more, depending on the size of the plant and the number of shredding and packing lines to be in operation during the season. The tanks are usually of a size to hold from 20 to as much as 100 tons of chopped or shredded cabbage. Each tank is provided with an opening in the bottom to drain off the excess of juice after the tank is opened for canning and to allow for cleaning after the tank has been emptied. A small opening may be provided in the side of the tank for sampling juice for analysis to determine the progress of fermentation.

The shredded cabbage from the cutter is usually conveyed by conveyor belt into a two-wheeled dump truck designed to carry 100 pounds of cabbage. The shredded or chopped cabbage is weighed into the truck in 100 pound lots, which is then pushed to the side of the tank and dumped.

The cabbage is spread evenly by workmen in the tank using hay forks. A weighted quantity of salt is then uniformly scattered over the cabbage. From 2 to 3 pounds of salt may be used for each 100 pounds of cabbage. The usual amount is 2-1/4 pounds of salt per 100 pounds of cabbage.

III MANUFACTURE OF SAUERKRAUT (Continued)

D Filling the Tanks. (Continued)

When the tank is full, heavy planks or wood sections cut to fit the inside of the tank may be placed on the cabbage and weighted down or may be held in place by a screw press. A new and improved method is to weight the cabbage down with water held in a plastic cover giving a depth of about two feet of water.

E Fermentation.

A number of different kinds of bacteria, yeasts, and mold spores are present in or on the cabbage as it comes from the field, ready to develop when conditions are favorable. The addition of salt to the shredded or chopped cabbage inhibits the growth of many of the undesirable organisms. The juice drawn from the shredded cabbage by the salt helps to create a condition favoring the growth of lactic acid bacteria.

An initial growth of yeast takes place, causing a frothy appearance and the evolution of carbon dioxide gas. Yeasts are aerobic (oxygen-loving) organisms, and their growth helps to exhaust the air present throughout the shredded cabbage, which favors the development of the lactic acid bacteria. A small amount of alcohol is formed by the activity of the yeast. The alcohol, usually less than 1/2 percent, is oxidized to acetic acid which also contributes to the flavor of the kraut.

Fermentation to the minimum acidity of 1.5 percent may be completed in a period as short as 10 days, or it may take several weeks, depending on the temperature. A temperature of about 85° F. is most favorable on the growth of lactic acid bacteria. The rate of fermentation is determined principally by the temperature of the cabbage in the tank. Fermentation tanks should be in a heated room in northern production areas where low temperatures prevail during the curing period. Some kraut manufacturers warm the shredded cabbage before it goes into the tank in cold weather or when customers' demands emphasize the need for as rapid fermentation as possible. It may be heated by passing it on an endless belt through a covered chamber where it is exposed for a few minutes to live steam. Kraut which has been cured rapidly and then canned promptly will usually be lighter in color than when it is slowly fermented and packed after holding in tank for long periods.

Fully fermented sauerkraut should have a lactic acid content of 1.6 to 2.0 percent and a residual sugar content of about 1.5 percent. The kraut may be held in the tanks in acceptable condition for a period of several months. Kraut tends to darken when left in the tank, and may acquire off flavors due to growth of contaminating mold yeast and bacteria.

IV CANNING SAUERKRAUT

A Opening the Tank.

The acidity of the kraut should be determined by means of laboratory tests to assure a properly cured product before the tank is opened. The tank should not be disturbed until the kraut is to be removed. Once opened, the tank should be packed out without delay. If not completely emptied within a day or two, enough juice should be left to cover the kraut and the cover replaced; otherwise, the exposed kraut will dry and discolor.

B Draining the Tank.

The excess juice is drained off by means of a tap in the bottom of the tank. In most cases this juice is discarded. A limited quantity is canned, however, and sold as sauerkraut juice. Some canners may use a portion of this juice to add to the kraut when canned. However, a hot salt (2 to 3 percent NaCl) brine is generally added to fill the cans.

C Heating and Filling Cans.

The sauerkraut is usually heated to about 120° F. before handfilling. The cans are then exhausted in a steam exhaust box for four to eight or ten minutes depending on the size of the cans.

When a mechanical filler is used, the kraut may be filled at a temperature of 180° F. to 185° F. The cans are then immediately closed and no further processing is necessary.

D Brining.

After filling, the cans are passed under a flow of hot brine containing two to three percent salt. Care should be taken not to overfill the cans, since this may result in the development of springers or flippers.

E Exhausting.

Exhausting is required to assure a good vacuum on the canned product. An exhaust of four to eight or ten minutes in a steam exhaust box is desirable, depending on the size of the can.

IV CANNING SAUERKRAUT (Continued)

F Processing.

Canned kraut is processed in an open kettle at boiling temperature. The period of processing will depend on the size of the can and the closing temperature. The following processes have been used when cooking in water at boiling temperature with a closing temperature of 140° F.:

No. 2 cans, 15 to 20 minutes
No. 2-1/2 cans, 25 to 30 minutes
No. 10 cans, 30 to 40 minutes

G Cooling.

After processing, the cans may be water cooled to 100° F. to 110° F. At this temperature the cooking is stopped and enough heat is left to dry the cans.

H Containers.

Plain cans are ordinarily used for sauerkraut. The acid brine acts slowly on the tinplate and may in time cause the production of enough hydrogen gas to produce flippers or springers, especially if the initial vacuum is low.

Enamel lined cans are sometimes used to reduce loss from hydrogen springers and to give the product a better appearance.

V FOOD AND DRUG REQUIREMENTS

A General Requirements.

The overall provisions of the Food, Drug, and Cosmetic Act apply in general to canned sauerkraut. The product must be packed under sanitary conditions, must not be adulterated or contaminated with decay, insects, or filth, and must be truthfully labeled.

B Standard of Identity.

No standard of identity or quality has been issued by the Food and Drug Administration for canned kraut under the current Food and Drug Act. However, under a previous definition adopted as a guide for enforcement officials the product was defined as follows: "Sauerkraut: The product, of characteristic flavor, obtained by the full fermentation, chiefly lactic, of properly

V FOOD AND DRUG REQUIREMENTS (Continued)

B Standard of Identity. (Continued)

prepared and shredded cabbage in the presence of not less than 2 percent nor more than 3 percent of salt. It contains upon completion of fermentation not less than 1.5 percent of acid, expressed as lactic acid. Sauerkraut which has been rebrined in the process of canning or repacking contains not less than 1 percent of acid expressed as lactic acid." It is implied that the product is clean and sound as required under the general provisions of the Food, Drug, and Cosmetic Act.

C Fill of Container, Drained Weight.

In an advisory issued by the Food and Drug Administration on the fill of container for canned kraut, the following minimum drained weights have been specified as conforming to good commercial practice.

Size of Container	Drained Weight (Ounces)
No. 2	16
No. 2-1/2	23
No. 10	80

The drained weight recommendations for these and other sizes of containers as provided in the grade standards for canned kraut conform to Food and Drug recommendations.

D Required Label Statements.

In addition to the name of the product, "Sauerkraut," the style should be shown on the label as "Shredded" or "Chopped." The net contents and the name of the packer or distributor must also be shown on the label.

VI INSPECTION OF THE PRODUCT

A Sampling.

The sampling rates prescribed in the rules and regulations and applicable inspectors' instructions should be followed. The condition of the containers in the lot, such as freedom from swells, springers, leakers, and rusty containers should be ascertained at time of sampling in accordance with applicable instructions. The number of cases in the lot and warehouse location should be recorded as a means of identification in the event that supervision of loading is requested. Whenever it appears that there may be some question as to the grade of the lot or the quality is likely to be irregular, or a wide variation in drained weight or other deviation is anticipated, the appropriate sampling plan should be selected in accordance with the plans provided in the regulations.

B Inspection Equipment and Material.

The following lists comprise the minimum equipment and supplies needed by the inspector on a field trip. These items of equipment would be needed when laboratory facilities are not available at the plant or warehouse where the inspection is to be made. A telephone call to the applicant or processor before proceeding on a field trip is often desirable to obtain information which will facilitate the handling of the inspection.

1 Equipment for inspection.

a Grading scales, net weight.

b Vacuum gauge.

c Can opener.

d Trays, white enamel, shallow, about 10" x 14".

e Trays, white enamel, deep, about 10" x 14".

f Depth gauge.

g Ruler.

h U. S. Standard No. 8 sieve of proper diameter for container size.

i U.S.D.A. color standards for canned kraut.

j Titration equipment and standardized solutions for salt (NaCl) and acidity determinations.

VI INSPECTION OF THE PRODUCT (Continued)

B Inspection Equipment and Material. (Continued)

2 Materials and supplies or information needed.

a U. S. Standards for Grades of Canned Sauerkraut.

b Federal Specifications.

c Inspectors' instructions for canned sauerkraut and any other supplemental instructions.

d Sampling sheets.

e Score sheets.

f Contract instructions and specifications, location and size of lot, name of applicant or contractor, and similar applicable data.

g Towels.

h Marking crayons.

i Sampling stamp.

j Application for inspection (Form FV-375).

C General Inspection Procedure.

The United States Standards for Grades of Canned Sauerkraut define and describe the requirements for the different grades and outline the procedure for inspecting the product. Certain of these requirements are contained in the product description. These include the provisions for preparation from clean, sound, well matured heads of the cabbage plant. It is the policy of the Branch, in so far as possible, to ascertain that the product complies with basic Food and Drug requirements in accordance with methods, procedures, and administrative guides provided for the use of inspectors and supervisors.

The authority for the application of methods and procedures and administrative guides not specifically outlined in the standards is contained in Section 52.2957 of the grade standards for canned kraut which states in part, "In addition to considering other requirements outlined in the standards . . ."

VI INSPECTION OF THE PRODUCT (Continued)

D Recording Inspection Data on Score Sheet.

The information required for recording in the score sheet includes label statement of quality, if any, brand name, statement of net contents, name of packer or distributor, code marks, or other identification, fill of container, size, kind, and condition of container, style of product, drained weight, and any other information which may be essential in the evaluation of the quality and condition of the product.

E Fill of Container.

1 Net weight.

The net weight of the product means the weight of the kraut and packing medium less the weight of the container. The usual procedure in making net weight determinations is to place a complete clean, dry, empty container on the weight plate of the scales or set the counterpoise on the tare beam to offset the weight of the container. The weight can then be recorded directly as the net weight of the product in the container. The average net weight of all the containers in the sample should be equal to or greater than the label statement of the net contents of the container. The net weight of any container which falls below the indicated label weight should be within the range of variability of good commercial practice.

2 Drained weight.

The drained weight of canned kraut should be determined in accordance with the procedure outlined in the standards.

3 Headspace.

When the headspace appears to be excessive, careful measurement of the headspace should be made with the depth gauge. If the headspace is in excess of 10 percent of the inside height of the container, it should be classified as slack filled.

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points.

1 Color.

The color of canned kraut will vary considerably, depending upon the cabbage used and the time elapsed between cutting and canning, as well as the time elapsed between canning and inspection, conditions of packing, additives, processing and cooling, and temperature of storage.

The color may vary from a very light or practically white color to a light cream and light straw color, then to a dark straw or greenish or yellowish appearance.

For lightest color, fully matured cabbage should be used, properly trimmed of all heavy outside green leaves.

Canned kraut has a tendency to darken after canning. This is noticeable when a considerable amount of green shreds is present which may become yellowish green, then dark straw in color. Kraut canned and stored for a year will likely show some color deterioration. Generally, * color (and other quality factors) deteriorate faster in * the slack-filled containers.

* Pinkish kraut is sometimes caused by excess salt * during fermentation. Some pink kraut is salty and possess * off-flavor.

(i) USDA Color Standards for Canned Sauerkraut.

* The United States Standards for Grades of * Canned Sauerkraut include limits for the predominating * and characteristic color and brightness of the product. * The color is evaluated and classified into the various * grade classifications by comparing the sample with the * USDA color model that most nearly matches the sauerkraut.

* 1965 Change

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. - (continued)

1 Color. - (continued)

(i) USDA Color Standards for Canned Sauerkraut. - (continued)

Directions for Use of Models.

Comparison of the canned sauerkraut with the color models is made in the following manner:

Evaluate the color promptly after opening and draining the canned sauerkraut. The product should be thick enough on the grading tray so no light is reflected through the product from the bottom.

"Fluff up" the shredded sauerkraut and mix thoroughly to assure a uniform sample.

Place the color model, shredded design up, on the sauerkraut and push the disc down so that the surface of the product and the model are about on the same plane.

View the sample and color model under conditions of lighting that approximate diffused north daylight (about 7500 degrees Kelvin).

Care of Models.

The color models are made of plastic and should be handled carefully to avoid scratching. The models should be cleansed immediately after using with water and a mild soap. The surfaces may be further cleaned and dried with a soft cloth. No abrasive cleaner should be used. It is suggested that they be replaced in the protective envelope that is furnished with the models. They should be stored in a cool dark place when not in actual use.

Availability of Color Standards.

These color standards may be purchased, and prices are available, from:

Magnuson Engineers, Inc.
509 Emory Street
San Jose, California 95110.

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. - (continued)

1 Color. - (continued)

(ii) Color Classification by Color Models.

These color standards, in the form of a textured surface disc, illustrate the following:

Model	Illustrates
No. 1 (Serial No. 12452) dated May 9, 1958	The darkest limit of light cream color to score as "good color" in the Grade A (Fancy) color range.
No. 1B (Serial No. 12150) dated October 14, 1957 (Note: It is expected the use of Model 1B will be incorporated into the grade standards when they are next revised)	Slightly greenish in color and is the maximum limit for green in Grade B (24 points). * Kraut that scores 25 or 26 points for color may be graded into the Grade A (Fancy) classification, provided the total score of the product is at least 90 points. Kraut eligible under this partial limiting rule (25 and 26 points) must be less green than Model 1B and must be lighter than Model 2. *
No. 2 (Serial No. 12151) undated	The darkest limit of cream to light straw color to score as "reasonably good color" in the Grade B (Extra Standard) color range.

* 1964 Change
* 1965 No Change

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. (Continued)

1 Color. (Continued)

ii Color classification. (Continued)

When the color is below the minimum for Grade B classification, as illustrated by kraut model No. 2 but is not off color, definitely dark or pink, a score in the Grade C classification may be given. When scored in the Grade C classification for color the product cannot be graded above Grade C due to the applicable limiting rule.

2 Cut.

The uniformity and length of the shreds in shredded style kraut and uniformity and size of pieces in chopped style kraut are considered in evaluating the factor of cut.

When the kraut is well cut the shreds in shredded style should be uniform in length and width with a minimum of short or irregular pieces. In chopped style kraut the pieces should be uniform in size with a minimum of very fine or very coarse pieces. When the cut is of the above uniformity a score in the Grade A classification can be given for this factor.

Kraut that is reasonably well cut should be reasonably uniform in thickness of shreds in the shredded style and not materially affected in appearance by short or irregular cut pieces. In chopped style kraut the pieces should be reasonably uniform in size and pieces noticeably larger or smaller than the predominant size should not materially affect the appearance of the product.

A score in the Grade C classification for the factor of cut limits the grade of the product to Grade B if the total score is 80 points or over.

When the appearance of shredded style kraut is not seriously affected by very short or very fine pieces or large and irregular pieces and the appearance of chopped kraut is not seriously affected by very fine pieces or large and irregular pieces the product may be considered to be fairly well cut, scoring in the Grade C classification.

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. (Continued)

2 Cut. (Continued)

When cut is scored in the Substandard classification the product cannot be graded above Substandard due to the limiting rule.

3 Defects.

The defects found in canned kraut which should be scored are coarse pieces of leaves, large coarse pieces of core material, and blemished, spotted, or otherwise dark or discolored pieces in the chopped or shredded styles.

The minor defects are large or coarse pieces of leaves and large or coarse pieces of core material.

The major defects are blemished, spotted, or otherwise discolored shreds and pieces of leaves or core material.

The evaluation of defects is on an appearance basis. In the inspection of kraut, the defects should be carefully separated and classified as major or minor. Coarse pieces of core material which occur in the product when the heads of cabbage are not first cored before cutting into shreds should be classified as minor defects, as previously indicated. This also applies to thick midrib sections of leaves of large heads of cabbage.

The discolored pieces which may be found should be classified as serious defects.

No area for discolored pieces is specified in the standards. However, as a guide the area of such material should not exceed 1/4 square inch (1/2" x 1/2") per 12 ounces net weight of product to score in the Grade A classification. Such an amount may be considered as not more than slightly affecting the appearance or eating quality of the product. A score in the Grade A classification may be given provided the presence of minor defects does not warrant a score below the Grade B classification.

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. (Continued)

3 Defects. (Continued)

An area of serious defects greater than 1/4 square inch but not greater than 1/2 square inch (1/2" x 1") per 12 ounces net weight may be considered as not materially affecting the appearance of the product. When scored in this classification for serious defects, the partial limiting rule provides that the product cannot be graded above U. S. Grade B regardless of the total score for the product. When scored in this classification only on account of pieces of core material or other minor defects, the product may be classified as Grade A, provided the total score for all defects is in the Grade A range.

In applying the guide, do not disregard the overall appearance requirement and be sure that the total defects present do not more than slightly affect the appearance in the Grade A classification or materially affect the appearance in the Grade B classification.

The presence of serious defects having an area greater than 1/2 square inch but not greater than 3/4 square inch (1/2" x 1-1/2") per 12 ounces net weight may be considered as not seriously affecting the appearance or eating quality of the product, provided the presence of minor defects does not warrant a score in the Substandard classification.

When the major and minor defects present are greater than indicated for a score in the Grade C classification, a score in the Substandard classification is warranted and the product may not be graded above Substandard.

4 Character.

The character of canned kraut is judged on the basis of tenderness and firmness which are desirable as contrasted with soft or mushy kraut which is objectionable.

When the kraut is crisp and firm without any noticeable toughness the factor of character may be scored in the Grade A classification. In the Grade B classification the

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. (Continued)

4 Character. (Continued)

kraut may be reasonably crisp and reasonably firm. Not more than very slight toughness may be permitted in the Grade B classification for character.

When the shreds or pieces in chopped kraut are not crisp or when the product is soft or slightly tough but not excessively soft or tough, character may be scored in the Grade C classification.

When the product is excessively soft or mushy, a score in the Substandard classification is given. The product cannot be graded above Substandard when character is scored in the Substandard classification regardless of the total score.

5 Flavor.

The flavor and odor of canned kraut are considered in evaluating this factor. The flavor of canned kraut is closely associated with the percent of salt and the acidity of the product. When fermentation has followed a normal pattern the product will have a clean, sharp flavor and odor characteristic of well made kraut.

The salt content of the canned product should fall within the range of 1.3 percent minimum to a maximum of 2.5 percent. The minimum acidity is 1 percent, calculated as lactic acid. When the product has a good, characteristic flavor that is entirely free from off flavors and odors, the flavor may be scored in the Grade A classification.

Kraut having a reasonably good flavor may be scored in the Grade B classification. As this is a limiting rule the product may not be graded above Grade B or Extra Standard, regardless of the total score for the product. As in the Grade A classification the kraut must be free from off flavors and off odors to score in the Grade B classification.

VI INSPECTION OF THE PRODUCT (Continued)

F Grade Factors Rated by Score Points. (Continued)

5 Flavor. (Continued)

A score in the Grade C classification is given when the product has a fairly good flavor and odor which is free from objectionable flavors and odors which may seriously affect the eating quality of the product. As this is a limiting rule the product cannot be graded above Grade C or Standard when flavor is scored in the Grade C classification.

When scored in the Substandard classification due to off flavors or odors, or for any other cause, the product cannot be graded above Substandard as this is a limiting rule.

VII CERTIFICATION

A General.

The certification of canned kraut and preparation of inspection reports shall be in accordance with applicable general instructions. The instructions in this section relating to certification are those which may differ or supplement such instructions as they apply to canned kraut.

1 Product name.

The product name is shown in the space indicated in the certificate as canned kraut. The product is properly identified as canned whether packed in glass or metal containers. When packaged in cellophane or other similar types of packaging material the word "Sauerkraut" or "Kraut" followed by "in plastic packages" or "in plastic containers" may be stated in the space for product name.

2 Fill of container.

The kraut with packing medium should occupy not less than 90 percent of the total capacity of glass and metal containers. When it appears that the containers are not well filled, the headspace should be measured with a headspace or depth gauge in the manner prescribed in the inspectors' instructions for making such determinations.

VII CERTIFICATION

A General. (Continued)

2 Fill of container. (Continued)

When containers are filled to less than 90 percent of their total capacity they should be certified as being below the recommended fill of container following the grade statement.

Example: Grade - U. S. Grade A or U. S. Fancy
Score 90 to 92 points
3 cans code SKTA below recommended fill of container (excessive headspace).

3 Drained weight.

In certifying drained weight the range of drained weights for the individual containers should be shown. Compliance with the recommended minimum drained weights for canned kraut is determined by averaging the drained weights of all the containers, provided that at least one-half of the containers meet the recommended minimum drained weight, and that those containers which fail to meet the recommended minimum drained weight are within the range of variability of good commercial practice, and that the average drained weight of all the containers does not fall below the recommended minimum drained weight. When the drained weight falls below the recommended minimum, this should be shown in the certificate as indicated in the following example.

Example: Grade - U. S. Grade A or U. S. Fancy
Score 90 to 92 points
Below recommended minimum drained weight. (See drained weights above.)

The average drained weight need not be shown in the certificate if all containers are above the recommended minimum drained weight, unless specifically requested by the applicant.

VII CERTIFICATION (Continued)

A General. (Continued)

4 Label statement.

When the containers are labeled, show only the pertinent statements in certificates, such as brand name, name of product, style of product, statement of net contents, and name and address of the distributor or packer.

Example: Flavorful brand chopped sauerkraut
Contents 1 pound, 11 ounces
Packed by Lakeland Canning Company
Lakeland, Ohio

5 Information to appear in certificates.

The following are examples of information which should appear in the body of the certificate in the space between principal title of label and the grade statement.

(a) Example: No. 2-1/2 cans

Net weight	-	28-1/2 to 29-1/2 ozs.
Vacuum	-	10 to 14 inches
Drained weight	-	24-1/4 to 26 ounces
Style	-	Chopped
Acidity (as lactic)	-	1.2 to 1.4 percent
Salt (NaCl)	-	1.5 to 1.8 percent

(b) Example: No. 10 cans

Net weight	-	99-1/2 to 105 ounces
Vacuum	-	10 to 17 inches
Drained weight	-	82 to 89 ounces
Acidity (as lactic)	-	1.28 to 1.59 percent
Salt (NaCl)	-	1.5 to 2.2 percent

6 Grade statement.

The following are examples of grade statements when inspection is made on the basis of the U. S. Standards and on applicable specifications:

VII CERTIFICATION (Continued)

A General. (Continued)

6 Grade statement. (Continued)

(a) Example: When sample is unofficially drawn
Grade - U. S. Grade A or U. S. Fancy
Score - 91 to 96 points

THE ABOVE STATEMENT IS THE GRADE OF UNOFFICIALLY DRAWN SAMPLES SUBMITTED BY THE APPLICANT

(b) Example: When inspected on the basis of Federal Specifications
Grade - Fancy (Grade A) in accordance with quality requirements of Federal Specification JJJ-S-71a. Also meets Quartermaster Corps minimum requirements with respect to vacuum.

(c) Example: When below recommended minimum drained weight
Grade - U. S. Grade A or U. S. Fancy
Score 93 to 97 points
Below recommended minimum drained weight. (See drained weight weights above.)

(d) Example: When product GNC account foreign material such as vinegar, flies, etc.
Grade - Grade not certified account presence of foreign material (insects and insect parts).

VIII INSPECTION DURING PACKING OPERATIONS

A Sanitation.

A continual check should be made of the condition of the equipment and building with particular attention to adequate lighting, cleanliness of the working areas, accessibility for efficient cleaning, and proper ventilation. It is the duty of the inspector to see that a high standard of sanitation is maintained. Insanitary conditions can be prevented by careful daily cleaning of all pieces of equipment, keeping floors free from an accumulation of trash and waste material. Floors should be flushed and drains kept open to carry off wash water and waste material.

B Raw Product.

The quality and condition of the raw product should be observed for color or maturity, condition, and freedom from damage by worms or insects.

C Trimming.

The heavy outer green leaves should be removed by the trimming operation. When heads are damaged by infestation all of the area of infestation should be carefully removed, as well as any other damage which may affect the quality of the kraut.

D Coring.

1 When shredded style kraut is being cut, the heads are cored following the trimming operation. The core is not removed by the coring operation but is cut into very fine pieces. The coring machine consists of a single blade, augur-like knife which revolves at high speed. The head is placed in position under the augur and then raised by a foot lever to engage the cutting blades. The head is raised to force the cutting blades through the entire length of the core. Coring should completely disintegrate the core. Check to determine efficiency of the coring operation.

VIII INSPECTION DURING PACKING OPERATIONS (Continued)

D Coring. (Continued)

2 When chopped kraut is made the coring operation may be dispensed with. The heads of cabbage, after trimming, may go directly to the chopper or disintegrator. Check operation of chopper for efficiency. Pieces should be of fairly uniform size without an excess of very fine or coarse pieces.

E Cutting or Shredding.

The cutter should be operated at the speed recommended by the manufacturer. The knives should be uniformly set to slice the cabbage to give approximately 1/16 inch thick shreds. Knives should be very sharp to give a clean cut shred as long as can be obtained from average size head.

F Heating or Steaming.

When kraut is made during cool weather the shreds or pieces of chopped cabbage may be heated by steaming at atmospheric pressure sufficiently to raise the temperature of the cabbage to about 80° F. in the tank. Heating accelerates fermentation, enabling the processor to pack out the kraut in from 10 days to two weeks, if necessary, to meet delivery schedules. Steaming should be carefully checked to prevent overheating and destruction of lactic acid bacteria which are essential to normal fermentation.

G Weighing and Salting.

The shredded or chopped kraut should be weighed into a dump cart or other container for conveying and emptying into the kraut tank. The cabbage should be evenly distributed in the tank. From 2 to 3 pounds of canner's grade salt is distributed uniformly over the cabbage as it is being distributed.

H Covering Tank after Filling.

When wooden tank covers or planks are used they may be weighted down with building blocks treated with an acid resisting, non-absorbent coating. The cover may also be held in place by a screw press which can be adjusted as required to hold the kraut under the juice which collects during fermentation. The cabbage should be covered with cheese cloth before

VIII INSPECTION DURING PACKING OPERATIONS (Continued)

H Covering Tank after Filling. (Continued)

the wooden tank covers are put in place. The cheese cloth keeps shreds and pieces of cabbage from working loose and floating in the juice which accumulates over the kraut. Off flavors may develop due to fermentation of this floating material by aerobic bacteria and scum forming yeasts.

The use of plastic covers is rapidly replacing other methods of weighting down the kraut after the tank is filled. The covers are designed to hold the amount of water required to press the kraut below the surface of the juice. The use of these covers has resulted in improved sanitary conditions and has practically eliminated the loss of off flavored and discolored kraut which frequently develops at the top of the tank when other methods are used.

I Analyses to Determine Progress of Curing.

Samples of juice for acidity determinations should be taken from near the center of the tank at intervals of 3 to 6 days, depending on the rate of fermentation. Samples should be taken by means of a 4- or 5-foot length of 1/4-inch stainless steel tubing. The salt content as well as the acidity should be determined by the applicable method outlined in the standards. The kraut may be canned when the acidity reaches 1.5 percent or over, calculated as lactic acid.

J Opening Tank for Packing.

Before removing wooden tank cover the juice over the top of the cover should be siphoned off and the cover scrubbed to remove any decomposed material. The scrub water is also siphoned off. The weights or screw press can then be removed to release the cover. The cover is taken off and the tank is then open for packing.

When plastic covers are used the water in the cover can be siphoned off and the cover folded up and removed, opening the tank for packing.

The bottom plug is then removed from the tank to drain off all or part of the excess of kraut juice which is not needed for canning.

VIII INSPECTION DURING PACKING OPERATIONS (Continued)

K Filling.

In a typical hand packing operation the kraut taken from the tank is heated to 110° F. - 125° F. in a tank of kraut juice or kraut juice and brine. When a mechanical kraut filler is used the temperature of filling is increased to 170° F. - 185° F. No further processing is necessary when kraut is filled at the higher temperature.

The filling operation should be carefully checked. Containers should be checked for ingoing weights at regular intervals to avoid drained weights below the recommended minimum for the size. The coding of containers should be checked after filling and closing. Errors in coding may be avoided by careful checking at this point.

L Brining and Exhausting.

When the product is hand packed, salt brine (2-3% NaCl) at near boiling temperature is added to completely fill the container. The containers then pass through a steam exhaust box to expel air and raise the temperature to 140° F. - 150° F. at the center of the can. Containers then pass through closing machines and are then placed in retort crates for open kettle processing in water at boiling temperature.

The salt brine should be checked for temperature and percent salt content. The brine should be added at a temperature near the boiling point to assure a good vacuum after processing and cooling to atmospheric temperature.

The time and temperature of the exhaust should be carefully checked. The resulting vacuum on containers after processing and cooling, as well as the efficiency of the sterilizing process, are directly related to the time and temperature of of the exhaust.

M Cooking Process.

Sufficient heat treatment to preserve the product in hermetically sealed containers without overcooking is the objective of the cooking process. Warehouse stacks should be observed daily for any evidence of spoilage which may be due to understerilization or leaky containers.

Overcooking which may unfavorably affect the color of the product should be avoided.

VIII INSPECTION DURING PACKING OPERATIONS (Continued)

N Cooling.

Overcooking may result from failure to cool the containers after processing. When containers are water cooled, excessive moisture should be removed from the cans following immersion in the cooling tank. Cooling to a temperature of 100° F. is recommended before the cans are cased. At this temperature no further cooking occurs and sufficient heat is retained to dry off the containers, thereby avoiding the rusting of metal containers and the metal closures of glass containers.

O Recommendations.

Daily cannery reports should be carefully prepared and promptly issued to the plant official designated to receive them. A written report, in addition to the daily cannery report, to cover special situations, may be necessary when an unsatisfactory condition is not promptly corrected. The inspector should endeavor to make recommendations to the management which will be helpful in maintaining adequate control of quality during packing operations. The inspector should consult his supervisor for advice if any unusual situation should develop in the plant. Suggestions should be made to the management whenever the opportunity is presented for improving plant operations and overcoming objectionable conditions.