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Service

Fruit and
Vegetable
Program

Specialty
Crops
Inspection
Division

Potatoes for Processing

Inspection Instructions

August 2015

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

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

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

Comments may be submitted to:

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These instructions replace the Potatoes for Processing Inspection Instructions dated May 2015, and include, but not limited to, all previous correspondence, memos, inspection instructions, or procedures.

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GENERAL

If you encounter problems not covered by these instructions, contact your supervisor. If you must take immediate action, use sound judgment and notify your supervisor as soon as possible.

Refer to the General Shipping Point Manual, the [General Market Manual](#), and the [Fresh Fruit and Vegetable Certificate \(FV-300\) Manual](#) for additional information on subjects not covered in these instructions.

Any portion of these instructions beginning with §51 and followed with **bold** print is material copied directly from the [U.S. Standards for Grades of Potatoes for Processing](#).

Potatoes for processing are mostly scored on a waste basis rather than on appearance. Therefore, the [U.S. Standards for Grades of Potatoes for Processing](#) underscore describing the amount of waste required to remove the defective portion.

INSPECTOR RESPONSIBILITIES

You are responsible for accurately determining the grade of potatoes for all lots or loads specified for inspection.

Contracts between growers and processors usually specify a base price per hundred weight (cwt) or ton based on specified grade(s), contract specifications, or a combination thereof.

Processors reserve the right by contract to reject all lots or loads of potatoes that do not meet the minimum requirements contained in the contract. The Federal-State Inspection Service (referred to as the "Inspection Service" in the remainder of these instructions) does not have the authority to accept or reject lots or loads of potatoes. Accepting or rejecting lots or loads is the processor's responsibility.

ADHERENCE TO CONTRACT SPECIFICATIONS

Be familiar with the requirements of contract specifications. Contract specifications may change during a processing season. When a change to contract specification occurs, the processor must notify the appropriate State inspection office, in writing. Do not grade lots based on the processor's verbal notification of a contract deviation.

It is the processor's responsibility to notifying the growers or their representatives of any deviation from, or return to, the contract specification.

GENERAL COMPUTATIONS

Unless otherwise specified in a contract, calculate the following on the basis of weight:

- Percentage of dirt and foreign material are determined by dividing the weight of dirt and foreign material by the gross weight of the sample less the container weight.
- Percentages of all classifications pertaining to potatoes, such as soft rot, unusable material, U.S. No. 1, etc. and various categories within these classifications, such as U.S. No. 1, 2 inch or 4 ounce minimum, U.S. No. 1, 10-ounce minimum, etc. are determined by dividing the classifications or categories within a classification by the gross weight of clean potatoes.

INSPECTION FACILITIES AND EQUIPMENT

Grading areas and facilities are generally furnished by the processor. It is the responsibility of the supervisor, with the cooperation of the processor, to ensure that all equipment is in proper working order. To ensure accuracy, have large capacity scales inspected and certified by an approved agency. Proper lighting and an adequate water supply are critical. Lighting sources which produce natural “daylight” type light are preferred at the following sites:

- External Grading Area
- Internal Defect Determination Area
- Glucose Content
- Bruise Free
- Fry Color Determination

EQUIPMENT

Contract specifications and inspection circumstances dictate the equipment needed to perform an inspection.

To ensure accuracy, check scales and record weights at the beginning of each shift and periodically throughout the day. Record the check weights in a log.

Use a flat and thin bladed knife to determine waste on potatoes, and to cut for internal disorders, or to make exploratory cuts. These may include traditional inspection knives, paring knives or any similar instrument. Do not use a scoop knife (trim line knife).

Check ring sizers and sizing cards for accuracy with calipers at the beginning of the season and periodically during the season.

SAMPLING

A “sample” is a representative part or a single item from a larger whole or group presented for inspection or shown as evidence of quality.

The importance of obtaining representative samples cannot be over emphasized. Accurate certification is possible only if the samples examined are representative of the lot or load.

If sampling is not under the direct supervision of the Inspection Service, it is the supervisor’s responsibility to report this on the notesheets or certificates.

SAMPLING METHODS

Sampling may be drawn either by hand or mechanical techniques:

Hand Sampling: An official sample obtained by manually passing a tray through the flow of potatoes by a licensed sample puller.

Mechanical Sampling: An official sample obtained mechanically by a licensed sample puller. The mechanical sampler will remove approximately the same amount as the hand tray.

Note: The Inspection Service must approve all mechanical samplers used for official sampling.

Three types of approved sampling techniques are currently used. These are:

1. **Federal-State Sampling:** The sampler is either a licensed employee or other authorized personnel of the Inspection Service. The Inspection Service assumes full responsibility for employees in this position, ensuring that proper sampling methods and procedures are followed.
2. **Supervised Sampling:** The sampler is an employee of the company and has received documented training by the Inspection Service in the correct sampling policy, procedures and ethics. Although there may be company personnel overseeing the sampler(s), the responsibility of proper sampling methods,

procedures, sample identity and security remain with the Inspection Service. Document and schedule visits by Inspection Service supervisory staff to ensure good supervision. Notesheets and certificates or computer printouts from this type of sampling must indicate that "Supervised Sampling" was used. If proper sampling methods and procedures were not followed, designate the sample as a "submitted" sample.

3. **Submitted Samples:** Samples are drawn, identified and controlled by the processor and/or grower, and submitted to the Inspection Service for grading. Notesheets and certificates or computer printouts resulting from this type of sampling must show "Submitted Samples."

Certification is limited to the potatoes within the sample only. The following statements may be used:

- "This certificate restricted to submitted samples which the company states covers 750-100 pound sacks."
- "This certificate restricted to samples submitted by company personnel who state covers the delivery of 40,000 pounds of potatoes."
- "This certificate restricted to sample weight only."

The supervisor is ultimately responsible for the integrity of the sample.

SAMPLING PROCEDURES

The sample must be representative of the quality, condition, size, dirt and foreign material of the whole load/lot. Unless specified by request or contract, do not have the sample represent less than 1/2 of 1 percent of the total gross weight. Larger sampling rates are acceptable.

Sampling procedures will vary depending upon the processing areas and physical setup of the grading line. Typically the sample is drawn and divided or split mechanically, only a portion of the sample is graded, with the remaining portion being used for additional tests such as bruise free or specific gravity determinations. Other times the entire sample is graded. The graded portion of the split sample is generally half, but may be specified by request or contract.

Larger sample size and the frequency of samples will reduce the chances of inaccurate results. For example, twenty properly drawn 25 pound samples should be more representative than ten properly drawn 50 pound samples. Increasing the frequency of samples improves the chances of sampling all parts of a load and also reduces the possibility of inaccurate results.

It is the responsibility of the Inspection Service to outline sampling procedures. Due to varied and assorted types of equipment used, it may be necessary to reassess the circumstances and apply sampling procedures more appropriate to the particular situation.

States that perform sampling use sample trays that are similar, but may vary in size and shape. Sampling is done by holding the tray at the end of a bulk truck's unloading apparatus as the potatoes fall into conveyors that will in turn deposit the potatoes in a pile or heap.

Dirt, stones, foreign material, clods as well as adhering material, deposited in bulk trucks by mechanical harvesters may be a problem. When potatoes are unloaded from the truck, loose dirt tends to localize in the area of the unloading belt or chain. Processors emphasize the accurate determination of the percentage of dirt, or material other than potatoes present in a lot of potatoes. Some contracts specify the type of unloading machinery allowed on trucks.

To properly sample, hold the tray in a fixed position. When the unloading belt or chain is wider than the sample tray, use one of the following methods for drawing samples:

- Draw sample from alternate sides of the unloading belt; or,
- "Pass through" the sample tray from one side of the belt to the other. This may be strenuous, but should not in any way sacrifice the accuracy of the samples.

After sample is drawn, carefully deposit it in a sample bin(s), burlap sack(s) or film bag(s). This could include that day's run for individual growers. A single day's harvesting from the same field for the individual grower may constitute a single lot under that grower's purchase order number.

SAMPLING EQUIPMENT

Lidded Bin System: This system is by far the most secure and easiest to control. Each bin holds approximately 1,000 pounds of potatoes. After the bins are filled, they are sealed; sample slips bearing pertinent information are either inserted in the bin or attached to the outside of the bin. It has been noted that double-lidded bins are the most efficient.

Another advantage of the bin system is that the bins at the grading station are usually individually weighed and handled by machinery and dumped mechanically. This method helps to stabilize the accuracy of the dirt tare factor and helps to eliminate bruises caused by handling.

Sack System: This system utilizes burlap sacks; film lined burlap sacks, or even heavy-duty film bags. Potatoes that are part of a sample are emptied into the sack or bag, usually containing up to 80 pounds. The biggest disadvantage with the sack system is the possibility of losing dirt, increased bruising and the additional labor needed for handling.

REMINDERS ABOUT SAMPLING

- Sample representatively for accurate certification.
- Supervisors are responsible for sample selection and must correct imbalances when found in the process.
- Check sample bins or bags for any apparent damage.
- Eliminate all chance for possible sample tampering.
- No unauthorized people in the sampling area unless accompanied by the sampling supervisor or sampler.
- Do not tolerate interference from any party. Report such incidents to the supervisor immediately.

HANDLING OF MISSING, DAMAGED, OR INACCURATE SAMPLES

The following instructions cover the handling of missing, damaged or inaccurate samples and refer to samples officially drawn or supervised by the Inspection Service. In all cases the responsible supervisor or the inspector in charge must carefully assess the situation before applying corrective measures.

Scale Ticket(s) Received on Unsampled Loads

- Group the unsampled ticket number(s) with their corresponding weight(s) on the notesheet. Adjacent to each unsampled ticket number(s) show that no sample(s) were taken from the load. Subtract the weight of the load(s) with missing samples from the total weight of the lot.
- Notify the applicant of the facts concerning unsampled load(s). If the applicant requests that unsampled load(s) and their scale ticket number(s) be included on the certificate or produce receipt, obtain a written statement from the applicant. Use the Request for Inspection Form or provide a blanket request that covers the entire season sampling period.

Damaged Samples

- On the notesheet, group the damaged sample ticket numbers with their corresponding weight. Adjacent each ticket number; indicate the samples were damaged and not suitable for inspection. Subtract the weight of the corresponding ticket number(s) with damaged sample(s) from the total weight of the lot. If a portion of the lot was not sampled, or if there were samples that were damaged and not included in the inspection process, report the fact(s) on the certificate.
- Notify the applicant that the sample(s) were damaged and could not be used for inspection results. If the applicant requests that the scale ticket number(s) of the corresponding damaged sample(s) be included on the certificate or produce receipt, request a statement from the applicant in writing. Use the “Request for Inspection Form” or provide a blanket request that covers the entire season sampling period.
- Do not score damage that is clearly from grading machinery.

Obvious Errors

If an obvious error has occurred, do not use previous or post inspection results to average or aid in determining what corrections are necessary. If essential information is not available to make necessary corrections, write a remarks statement on the report or certificate that clearly indicates which attributes of the lot are not certified.

WATER GAIN

The “water gain” (also called “water adjustment”) is the amount of water a lot of potatoes will pick up in the weight during the washing process.

Some contracts will specify the percentage of water gain. The computation for water gain is shown only on the inspection notesheet.

Unless otherwise specified or agreed to by buyer and seller, compute the water gain at 1%. The percentage used for water gain must be common knowledge to all parties when adjusting the net weight of the sample.

DIRT TARE

Deductions for dirt, rocks, vines and foreign material are determined by the following process:

- Weigh samples in containers (gross) and dump.
- Weigh empty containers (tare). Subtract tare from gross to equal total potato and dirt weight.
- Wash, grade and re-weigh potatoes to obtain potato and water weight.
- Subtract water gain equals total potato weight.
- Subtract the total potato weight from the total potato and dirt weight.
- The difference equals dirt tare.

Another process for determining dirt tare is:

- Weigh samples in containers (gross) and dump.
- Weigh empty containers (tare).
- Wash and re-weigh potatoes before dividing the sample.
- Water gain is subtracted from the total potato weight.
- Subtract total potato weight from the total sample weight, less container weight.
- The difference equals dirt tare.

Either process achieves dirt tare. The two processes are summarized as follows:

$$\begin{array}{r} \text{Sample Weighed} \\ - \text{Empty Containers} \\ \hline = \text{Potatoes and dirt} \end{array}$$

$$\begin{array}{r} \text{Washed Potatoes} \\ - \text{Water Gain} \\ \hline = \text{Potatoes} \end{array}$$

$$\begin{array}{r} \text{Potatoes and Dirt} \\ - \text{Potatoes} \\ \hline = \text{Dirt} \end{array}$$

Or

$$\begin{array}{r} \text{Gross Weight} \\ - \text{Container Weight} \\ \hline = \text{Gross Contents} \end{array}$$

$$\begin{array}{r} \text{Gross Contents} \\ - \text{Potatoes (corrected for water gain)} \\ \hline = \text{Dirt} \end{array}$$

APPLICATION OF STANDARDS

In any lot which fails to meet the requirement of the respective grades or size categories, the general application of tolerances does not apply when determining the percentages of potatoes. However, for lots which are graded or pre-sorted for size or quality and offered for inspection and are required meeting one of the grades, the following tolerances by weight are provided.

§51.3414 Application of standards...

(a) For defects:

- (1) U.S. No. 1 Processing: 10 percent for potatoes which fail to meet the requirements of this grade including not more than one-half of this tolerance, or 5 percent, for serious damage by any means, including therein not more than 2 percent for potatoes which are frozen or affected by soft rot or wet breakdown.**
- (2) U.S. No. 2 Processing: 10 percent for potatoes which fail to meet the requirements of this grade including not more than one-half of this tolerance, or 5 percent, for potatoes which are seriously damaged by internal defects occurring entirely within the vascular ring, including therein not more than 2 percent for potatoes which are frozen or affected by soft rot or wet breakdown.**

(b) For loose sprouts, dirt and foreign material: 2 percent.

(c) For off-size:

- (1) Undersize: 3 percent when the minimum size specified is less than 2-1/4 inches in diameter or less than 5 ounces in weight; and 5 percent when the minimum size specified is 2-1/4 inches or more in diameter or 5 ounces or more in weight.**
- (2) Oversize: 10 percent.**

SUMMARY OF TOLERANCES

<p>U.S. No. 1 Processing</p>	<ul style="list-style-type: none"> • 10% total defects, <i>including</i> • 5% serious damage, <i>including</i> • 2% frozen, soft rot, or wet breakdown.
<p>U.S. No. 2 Processing</p>	<ul style="list-style-type: none"> • 10% total defects, <i>including</i> • 5% serious damage by internal defects entirely within the vascular ring, <i>including</i> • 2% frozen, soft rot, or wet breakdown.
<p>U.S. No. 1 Processing U.S. No. 2 Processing</p>	<ul style="list-style-type: none"> • 2% loose sprouts, dirt, and foreign material. • 3% undersize (<i>except</i> 5% undersize for 2-1/4 inch diameter and larger, or 5 ounce minimum and larger). • 10% oversize.

INSPECTION TERMS

Use the following definitions in the grading of potatoes for processing:

Damage: Any defect or combination of defects other than those listed in the “Classification of Defects” Tables ([External](#) / [Internal](#)), which cannot be removed without a loss of more than 5% of the total weight of the potato.

Exploratory Cuts: The cut made to determine the presence of hidden defective material. This could be the surface appearance of cuts, crevices, growth cracks, lenticels, folded ends, superficial bruises or any similar factor. Do not consider the flesh exposed in the process of making an exploratory cut when determining if more than 50% of the tuber’s surface is exposed.

Foreign Material: Applies to seed pieces and material other than potatoes.

Serious Damage: Any defect or combination of defects, other than those listed in the “Classification of Defects” Tables ([External](#) / [Internal](#)), which cannot be removed without a loss of more than 10% of the total weight of the potato.

Unusable Material: Consists of defective portions of potatoes, and potatoes which are frozen, affected by freezing injury, soft rot, wet breakdown, Blackheart, Late Blight Tuber Rot, Southern Bacterial Wilt, Bacterial Ring Rot, or which are seriously damaged by internal defects or contain insects, worms or larvae.

Usable Piece: The portion of the potato remaining after trimming or as it occurs in the sample. Provided, that it meets the following requirements:

- Does not have any unusable material;
- Unless otherwise specified, weighs at least 4 ounces; and,
- At least 50% of peel remains after trimming.

As it occurs in the sample means the individual potato or piece of potato found in the sample at time of inspection.

The possible determination of a usable piece depends on one of the following conditions:

- Defective material by weight exceeds 10%;
- Aggregate (external) surface area exposed in specific defects exceed that allowed in U.S. No. 2 Processing; and,
- Area affected (internal) is greater than that allowed in U.S. No. 2 Processing, except in the case of those internal defects which are considered as unusable material.

The area exposed either mechanically prior to grading, or the area exposed in removing defective material, when in combination cannot expose more than 50% of the surface area.

Waste: The defective portion of the potato that remains after the potato has been peeled in the normal preparation for processing.

SIZE DETERMINATION

Determine size only in terms of diameter or weight.

Diameter: The greatest dimension in terms of inches or fractions of an inch measured at right angles to the longitudinal axis, without regard to the position of the stem end.

Weight: The minimum or maximum weight of a potato measured in terms of whole ounces.

When a maximum size is designated, the potato is not considered being oversize until it weighs to the next highest ounce.

A potato is not considered as meeting any size or any incentive size, such as 10 ounces, until it is graded or trimmed (or specified otherwise by contract). When determining weight of a usable piece, only the usable piece is weighed.

Unless otherwise specified, the minimum size for U.S. No. 1 Processing is 2 inches or 4 ounces and for U.S. No. 2 Processing 1-1/2 inches or 4 ounces in weight.

EXTERNAL DEFECTS

§51.3415 Definitions.

“External Defects” are defects which can be detected externally. Cutting may be required to determine the extent of the injury.

SURFACE AREA

Surface Area: When used in conjunction with the Classification of Defects Tables ([External](#) / [Internal](#)), means that the aggregate area of the defect will not exceed the percentage of surface specified.

Judge defects permitting a percentage of surface area or a percentage of waste on the following basis:

- Score against the respective grade when exceeding the aggregate surface area permitted.
- Score against the respective grade when the allowable aggregate surface area is not exceeded for the applicable grade, but has waste material exceeding 5% or 10% respectively.

CUTTING PROCEDURES FOR EXTERNAL DEFECTS

Waste Basis: Potatoes having more than 10% waste by weight or having defects exceeding a specified area will not meet U.S. No. 2 Processing requirements. Unless prohibited by contract, trim away all defective material to determine whether or not a “usable piece” remains.

Method of Trimming: Remove defective material by flat, curved or scoop cuts only. Use whichever removes the least amount of non-defective material. Do not use a vee-cut or boring cut. When removing defective material, include only an acceptable amount of uninjured tissue, such as in the normal preparation for processing.

Remove defective areas with care on an individual potato. When several defects are located on the individual potato, make every effort to remove defective portions with one smooth cut. When judging cuts as they occur in the sample, make an exploratory cut to determine if defective material is masked or disguised under the cut surface. Also examine the discoloration, the area covered by dirt, or healed scar tissues of the cut surface.

Peelable and Non-peelable Areas: When applying a waste basis to a combination of peelable and non-peelable areas, only consider the non-peelable areas as defective material.

CLASSIFICATION OF DEFECTS (EXTERNAL)

Defects	Maximum Allowed for U.S. No. 1 Processing	Maximum Allowed for U.S. No. 2 Processing
Air cracks	5% waste	10% waste
Blackleg	5% waste	10% waste
Bruises	5% waste	10% waste
Cuts	Smooth, not more than 10% of surface	Smooth, not more than 1/3 of surface
Enlarged lenticels, discolored or sunken	5% waste	10% waste
Flea beetle	5% waste	10% waste
Folded end	5% waste	10% waste
Fusarium tuber rot	5% waste	10% waste
Grass, wireworm	5% waste	10% waste
Greening, light	5% waste	10% waste
Growth cracks	USDA Visual Aid ¹	10% waste
Grub	5% waste	10% waste
Ingrown sprouts	5% waste	10% waste
Nematodes	5% waste	10% waste
Rhizoctonia, solid or thick mounded	Not more than 10% of the surface.	Not more than 25% of the surface
Rodent, bird damage	5% waste	10% waste
Scab, pitted	5% waste	10% waste
Scab, russet	25% of surface or 5% waste	50% of surface or 10% waste
Scab, surface	25% of surface or 5% waste	50% of surface or 10% waste
Scab, surface (elephant hide)	10% of surface or 5% waste	25% of surface or 10% waste
Second growth	5% waste	10% waste
Scaling, surface cracks – when cracked, thick and has depth	10% of surface or 5% waste	25% of surface or 10% waste
Sunburn	5% waste	10% waste
Sunken discolored areas	5% waste	10% waste

¹ POT-L-1, USDA Visual Aid maximum allowed for U.S. No. 1

BROKEN KNOBS/SECOND GROWTH

Potatoes that do not meet the requirements of U.S. No. 1 Processing due to one or more broken knobs (as it may occur in the sample) may be classed as U.S. No. 2 Processing on the basis of cuts (not more than 1/3 of the surface exposed and not jagged or rough). However, if the same potato has an additional defect(s), trim all defective material. After trimming, the potato would be classed as a usable piece, provided it meets the requirements as defined in the U.S. Standards.

FIRMNESS

Both grades require potatoes to be “moderately firm.”

§51.3415 Definitions... “Moderately firm” means that the potato is not seriously shriveled or flabby.

Scoring Guide

Serious damage: Report potatoes that are seriously shriveled or flabby as “Not moderately firm” and score against the serious damage tolerance for all grades.

GROWTH CRACKS

Scoring Guide

Damage: When a growth crack(s) affects more than 1/2 the length of the potato in the aggregate on round varieties (see [USDA Visual Aid POT-L-1](#), page 25, photo 118), or more than 1/3 length in the aggregate on long varieties, or the depth is greater than outlined in the chart below.

DEPTH ALLOWED FOR GROWTH CRACKS

Diameter	Weight	U.S. No. 1 (Depth)
Potato is:	Potato is:	Not more than:
Less than 2 inches	Less than 4 ounces	1/8 inch
2 to 2-1/2 inches	4 to 6 ounces	1/4 inch
More than 2-1/2 to 3 inches	More than 6 to 8 ounces	3/8 inch
More than 3 inches	More than 8 ounces	1/2 inch

Serious damage: When growth crack(s) affects more than 10% waste, or appearance is worse than [USDA Visual Aid POT-L-1](#), page 25, photos 119 and 120.

NEMATODES

Scoring Guide

Damage: When causing more than 5% waste.

Serious damage: When causing more than 10% waste. When seriously damaged, do not attempt to form a usable piece.

NOTE: If nematodes are found in potatoes with little external indications, determine “damage” and “serious damage” on a composite sample basis. Follow the same sampling procedure used in determining percentages for internal defects (see [Internal Defects](#) section).

SHAPE

The U.S. No. 1 Processing grade requires potatoes to be “fairly well shaped.” The U.S. No. 2 Processing grade requires potatoes to be “not seriously misshapen.”

§51.3415 Definitions.

“Fairly well shaped” means that the potato is not materially pointed, dumbbell-shaped, or otherwise deformed.

“Not seriously misshapen” means that the potato is not seriously deformed and causing more than 10% waste when determining the non-peelable area directly due to shape.

Scoring Guide

Damage: When not meeting the requirements of “Fairly well shaped” report as “Not fairly well shaped.”

Serious damage: When not meeting the requirements of “Not Seriously Misshapen” report as “Seriously misshapen.”

Visual Aids: Refer to the Official Visual Aids for Potatoes, [USDA Visual Aid POT.-L-1](#), pages 3 to 4, photos 14 to 22.

TRIMMING TO MAKE USABLE PIECES(S)

When a tuber is seriously misshapen (e.g., causing an excess of 10% waste of non-peelable area), the potatoes may be trimmed to make a usable piece provided that the following three criteria are met.

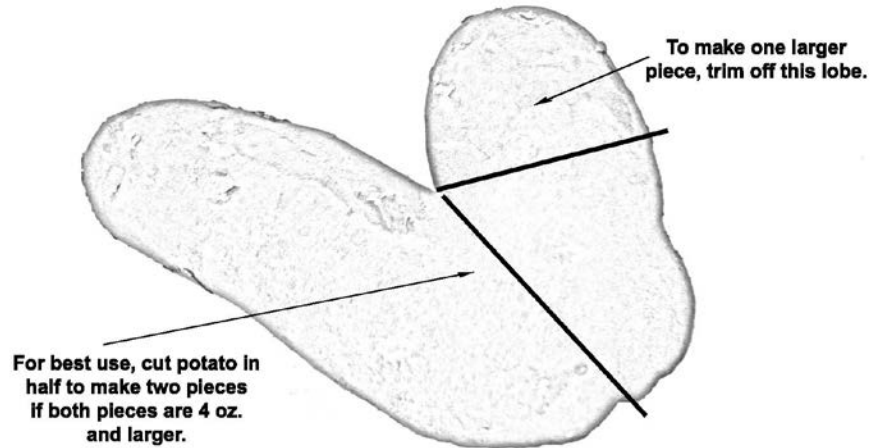
- There is no unusable material, such as defective portions of potatoes, and potatoes which are frozen, affected by freezing injury, soft rot, wet breakdown, insects, worms, larvae, Blackheart, Late Blight Tuber Rot, Southern Bacterial Wilt, Bacterial Ring Rot, or which are seriously damaged by internal defects.
- Must have at least 50% of the peel remaining after trimming.
- Weigh at least 4 ounces, unless otherwise specified.

NOTE: When trimming potatoes, always cut to maximize value and use.

See following examples for trimming potatoes to make a usable piece(s).

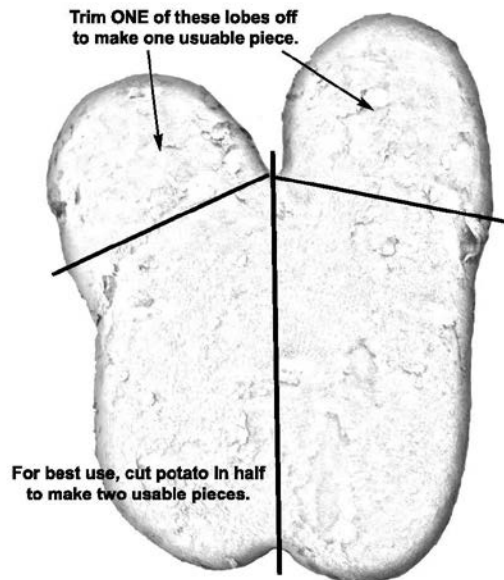
Example 1: After determining that there is more than 10% waste due to non-peelable area, follow the three criteria for usable piece and trim the potato creating as little waste as possible.

Cull before trimming; usable piece(s) after trimming.



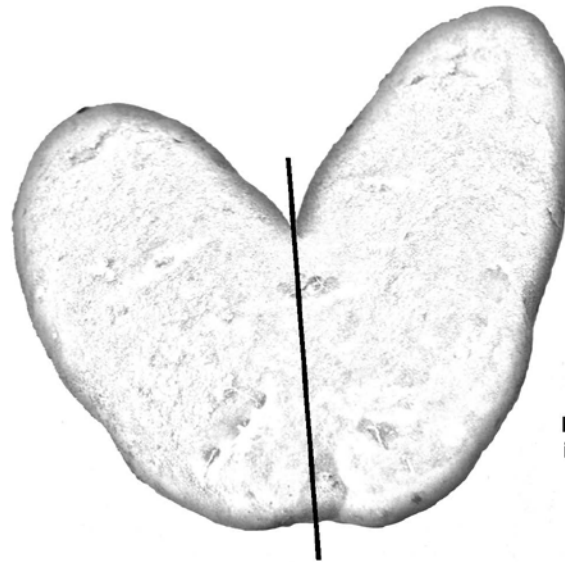
Example 2: After determining that there is more than 10% waste due to non-peelable area, determine the best cut to reduce waste. In this case, cut the potato in half to make two usable pieces (if both are 4 oz. and larger and at least 50% of peel remains after trimming). If not meeting criteria, or if a larger piece is desired, cut off one of the lobes to make one usable piece.

Cull before trimming; usable piece(s) after trimming.



Example 3: If more than 10% waste due to non-peelable area, then trim as follows:

Cull before trimming; two usable pieces after trimming.

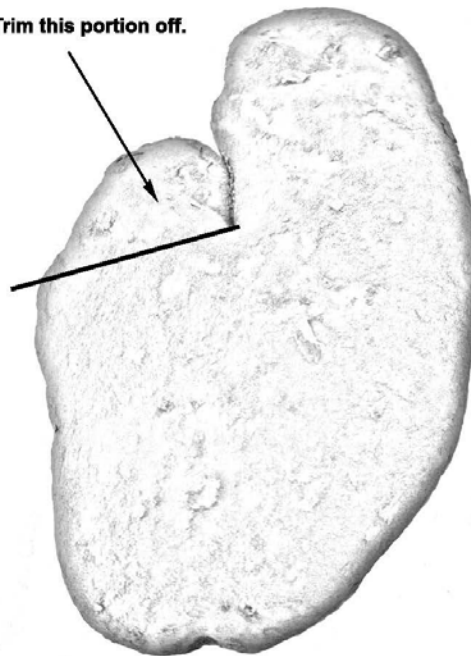


**Cut potato in half
(pieces are usable if
both 4 oz. and larger, and
if at least 50% of the peel
remains on each piece).**

Example 4: If more than 10% waste due to non-peelable area, then trim as follows:

Cull before trimming; usable piece after trimming.

Trim this portion off.



SIMILAR VARIETAL CHARACTERISTICS

Both grades require potatoes to be of “similar varietal characteristics.”

§51.3415 Definitions...“Similar varietal characteristics” means that the potatoes in any lot have the same general shape, color, and character of skin and color of flesh.

Scoring Guide

Report potatoes that are not of similar varietal characteristics as “Dissimilar varietal characteristics” and score against the total tolerance of the grade being applied.

INTERNAL DEFECTS

§51.3415 Definitions...“Internal Defects” are defects which cannot be detected without cutting the potato.

CLASSIFICATION OF DEFECTS (INTERNAL)

Defects	Maximum allowed for U.S. No. 1 Processing	Maximum allowed for U.S. No. 2 Processing
Occurring outside of, or not entirely confined to the vascular ring		
Internal Black Spot	When spots are darker than the official color chip (POT-CC-2) after removing 5% of total weight of the potato.	When spots are darker than the official color chip (POT-CC-2) after removing 10% of total weight of the potato.
Internal Discoloration, Vascular Browning, Fusarium Wilt, Net Necrosis, Other Necrosis, Stem End Browning.	5% waste.	10% waste.
Occurring entirely within the vascular ring		
Hollow Heart or Hollow Heart with Discoloration.	Area affected not to exceed that of a circle 7/8 inch in diameter in a 10 ounce potato. ¹	Area affected not to exceed that of a circle 1-1/4 inches in diameter in a 10 ounce potato. ¹
Light Brown Discoloration (Brown Center).	Area affected not to exceed that of a circle 7/8 inch in diameter in a 10 ounce potato. ¹	Area affected not to exceed that of a circle 1-1/4 inches in diameter in a 10 ounce potato. ¹
Internal Brown Spot and similar discoloration (Heat Necrosis).	Not more than the equivalent of 3 scattered spots 1/8 inch in diameter in a potato 6 ounces in weight or 2-1/2 inches in diameter. ²	Not more than the equivalent of 6 scattered spots 1/8 inch in diameter in a potato 6 ounces in weight or 2-1/2 inches in diameter. ²

¹ Or correspondingly lesser or greater areas in smaller or larger potatoes.

² Or correspondingly lesser or greater number of spots in smaller or larger potatoes.

EQUATION OF AREAS

Equation of areas on smaller or larger potatoes is in reference to the following internal defects:

- Hollow Heart;
- Hollow Heart with Discoloration; and
- Light Brown Discoloration (Brown Center).

These dimensions are based on area affected, not aggregate area.

Potato is:	Maximum Area allowed (Diameter) Processing No. 1	Maximum Area allowed (Diameter) Processing No. 2
4 ounces	3/8 inch	5/8 inch
6 ounces	1/2 inch	3/4 inch
7 ounces	5/8 inch	7/8 inch
8 ounces	3/4 inch	1 inch
10 ounces	7/8 inch	1-1/4 inches
14 ounces	1 inch	1-1/2 inches
16 ounces	1-1/8 inches	1-5/8 inches
20 ounces	1-1/4 inches	1-7/8 inches
24 ounces	1-3/8 inches	2 inches
28 ounces	1-1/2 inches	2-1/4 inches
32 ounces	1-5/8 inches	2-1/2 inches

Use color chip [POT-CC-1](#) when determining the effect of “Brown Center” or “Brown Core.” Score as damage or serious damage when the affected area is at least this shade or darker, and exceeds the specified area. Measure the affected area with a diameter gauge (plastic card). The potato is not damaged or seriously damaged until the affected area (when the plastic gauge is laid on it) extends beyond the confines of the appropriate measured circle.

CUTTING PROCEDURES FOR INTERNAL DEFECTS

DEFECTS NOT ENTIRELY CONFINED TO THE VASCULAR RING

Internal discoloration affecting the vascular ring or occurring between the vascular ring and the skin of the potato is scored on a waste basis. Make an exploratory cut on a minimum of five potatoes. When scorable defects are found, see [Sampling Procedures for Internal Defects](#) section.

1. Special consideration is given to Net Necrosis. Although it may be found on the side of the potato, it is generally confined to the stem end, and is consequently scored on a waste basis. See Figure 1.
2. Nematodes with no external indication are treated as an internal defect and scored at the internal defect determination area. Make numerous cuts at 1/8-inch intervals from stem to blossom end of the potato.

NOTE: If nematodes show both external and internal indications, treat all of it as either an internal defect or an external defect depending on which has the greatest amount.

Figure 1

For Net Necrosis, Stem End Browning, Vascular Browning, Internal Black Spot, and similar defects clip the stem end of the tuber, prior to using waste method below.



In cutting to remove waste caused by Net Necrosis and other similar discoloration at the stem end, use a straight cut if the discoloration extends more than 1/2 of the circumference around the potato. If the discoloration affects 1/2 or less of the circumference around the potato, make the cut on that particular side, using a curved cut to reduce the removal of uninjured flesh.

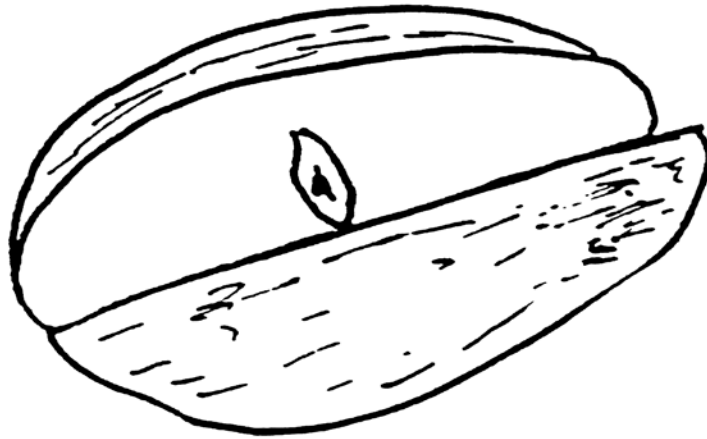
DEFECTS OCCURRING ENTIRELY WITHIN THE VASCULAR RING

Defects occurring entirely within the vascular ring are determined on a more complex basis.

1. For Hollow Heart and Hollow Heart with Discoloration and Light Brown Discoloration (Brown Center) make one cut from stem to blossom end parallel to the longitudinal axis. Expose the greatest area possible when making this cut. See Figure 2.

Figure 2

For Hollow Heart, Hollow Heart with Discoloration and Brown Center, type of defects, cut the tuber lengthwise.



2. For Internal Brown Spot and other similar discoloration (heat necrosis). The potato is cut at 1/2-inch intervals perpendicular to the longitudinal axis. See Figures 3 and 4.

Figure 3

For all other internal discoloration type defects that occur within the vascular ring, cut the potato in half-inch slices.

NOTE: Dotted lines indicate location of internal discolored areas.

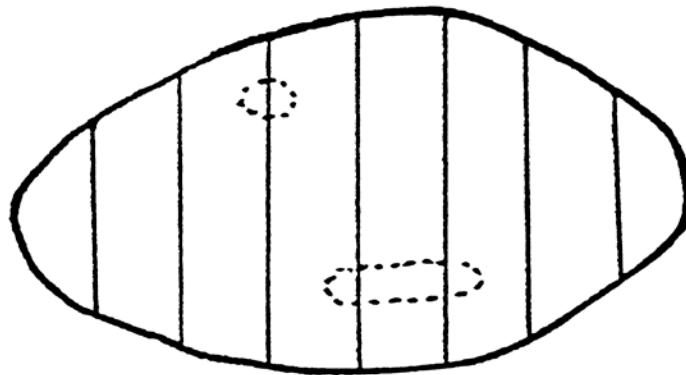
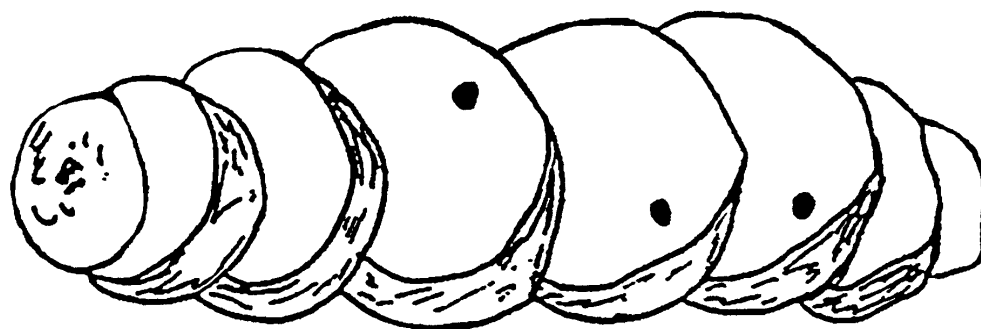


Figure 4

Slices laid out for examination. Consider only spots on upper side of the slice.



SAMPLING PROCEDURES FOR INTERNAL DEFECTS

- When determining damage and serious damage for grade determination, draw a subsample from each “breakdown” or “determination.”
- When determining damage and serious damage for various sizes “breakdown,” draw subsamples from each. In most instances, the previous bullet and this bullet are combined for determining internal defects for size as well as grade.
- When determining damage and serious damage for the lot as a whole, use a composite sample taken from all subsamples at the time of unloading. In the event a sample divider is used, intermittent samples taken from the unused portion may be utilized.

SAMPLE SIZE

Use the following procedure when cutting for internal defects and bruise free determination:

Undivided sample:

- Cut a minimum 10% of each subdivision of grade or size.
- Cut at least 10 pounds if a subdivision is less than 100 pounds.
- Cut entire contents of a subdivision if it is less than 10 pounds.

Divided Sample:

- Cut a minimum 15% of each subdivision of grade or size.
- Cut at least 15 pounds if a subdivision is less than 100 pounds.
- Cut the entire contents if a subdivision is less than 15 pounds.

PINK EYE–PINK ROT

Most processor/grower contracts for potatoes going into storage make reference to potatoes affected by symptoms characteristic of Pink Eye-Pink Rot. This is usually found in the Definition, Refusal or Tare sections of a contract, all of which emphasizes the importance and seriousness of this factor.

Contracts for potatoes going directly into plants or coming out of storage for immediate use may not contain any reference to “symptom(s) characteristic of Pink Eye-Pink Rot.” These factors would be scored as damage or serious damage, unless progressing to the point of soft rot (soft, mushy or leaking condition).

Pink Eye-Pink Rot is extremely difficult to diagnose, even by expert pathologists, so it is important that the proper procedures are followed for identification and verification of the presence of characteristic symptom(s).

These symptoms include:

- Pink to brown patchy discoloration around the eye, or
- Discolored tissues around the eyes have turned light brown and have become wrinkled and cracked.

Depending on contract specifications, two separate guidelines (free from basis or waste basis) must be followed when handling these symptoms(s).

FREE FROM BASIS

When upon casual external examination in the normal process of grading, symptom(s) characteristic of Pink Eye-Pink Rot seem to be evident; make an exploratory cut for the purpose of verification.

Make exploratory cut(s) at least 1/16 but not more than 1/8 of an inch thick using the same procedure as cut(s) made for external defects. When the cut exposes plainly visible, irregular sized, tan to pink discolored flesh, score the entire tuber against the grade being applied as showing “Symptom(s) characteristic of Pink Eye-Pink Rot” (see [Figure 5: Free From Basis](#)).

Figure 5: Free From Basis

NOTE: Do not use the underside of the peel or slice in the verification of this disorder.

Only the exposed surface
is used for verification.



No less than 1/16 or more
than 1/8 of an inch thick.

WASTE BASIS

Scoring Guide

Damage: When causing more than 5% waste.

Serious damage: When causing more than 10% waste.

NOTE: If it has progressed to a soft, mushy or leaking condition, score and report as soft rot.

FREE FROM DEFECTS

“Free from defects” are serious in nature. Familiarity with free from defects is very important because they are usually classed as cull material on which refusal may be based. Free from defects are scored on sight (e.g., any amount is scorable) and include the following.

BACTERIAL RING ROT

Bacterial Ring Rot is an important potato disease. It develops rapidly when stored at 64 to 72 °F and only slightly at 37 °F. Infected potatoes may appear healthy at harvest, but can develop characteristic symptoms in storage. Potatoes affected by Bacterial Ring Rot are very susceptible to secondary infection especially soft rot organisms. Potatoes from diseased plants may show various stages of decay up to complete disintegration. Bring suspected tubers to the supervisor’s attention for verification.

Scoring Guide

Always serious damage.

NOTE: If the tuber is affected to the extent that a wet exudate is readily squeezed out, or the Bacterial Ring Rot is advanced to the stage of breaking down into a soft and mushy condition, score and report as Soft Rot.

BLACKHEART

Blackheart develops in tubers while they are growing or while they are in transit or storage. It occurs in all varieties of potatoes from all growing areas. It is important because normally no external symptoms are apparent, and the blackened internal tissue makes the tubers worthless for processing purposes. The internal symptoms are a dark gray to purplish discoloration, which later becomes jet black. The discolored areas are usually sharply set off from the healthy tissues. The discoloration is generally restricted to the heart of the potato, but may radiate to the exterior. Excessive heat and/or the lack of oxygen cause these symptoms. On washed potatoes the external appearance of tubers affected by Blackheart may appear duller than tubers not affected.

If discovered on the grading table at the defect determination area during the course of normal grading, bring it to the attention of the crew chief or the person(s) performing internal grading.

Scoring Guide

Always serious damage.

FREEZING / FREEZING INJURY

Freezing may occur when temperatures drop below 30.9°F. Use the term “frozen” only when ice crystals are present. Use the term “freezing injury” when potatoes are not in a frozen condition at time of inspection (they may or may not have been frozen but show injury).

There are basically three types of freezing injury:

1. Field frost (freeze damage): Usually occurs prior to harvest and appears as bluish-gray blotches beneath the skin, generally on one side of the tuber. The affected area may also be dry, leathery and severely sunburned from exposure.
2. Freezing necrosis: Causes blackening of vascular elements of the tuber, results in a net-like pattern, scattered throughout the tuber within the vascular ring.
3. Blotch necrosis: Usually forms irregular areas of various sizes, ranging from opaque blue gray to black.

Report these three types as “Freezing Injury.”

Scoring Guide

Always serious damage.

NOTE: If potatoes become soft and watery after thawing, score and report as “Wet Breakdown”. If there is evidence of secondary infection after thawing (e.g., disintegrates upon touch, mushy, leaky, moldy, etc.), score and report as “Soft Rot.”

LATE BLIGHT TUBER ROT

Late Blight Tuber Rot is also an important disease of potatoes. During wet, cool seasons it may cause serious crop losses in any potato growing area. When not complicated by secondary organisms, the decay is reddish-brown or purplish-brown in color and spreads irregularly from the surface through the flesh like the diffusion of a brown stain. Under storage conditions, the disease is typically a dry rot, forming moderately firm, dry, or leathery irregular sunken patches, which under favorable conditions, such as high humidity and temperatures, may involve the entire potato. These patches frequently have a metallic tinge, especially on the border of healthy tissue.

When secondary bacteria invade during storage, the potatoes enter the wet rot stage.

Scoring Guide

Always serious damage: When present in any degree and in a dry rot stage, report as “Dry rot” and score against the serious damage tolerance for the grade being applied. When in a wet rot stage, report as “Soft rot” and score against the 2% soft rot tolerance.

SOFT ROT / WET BREAKDOWN

All rots, regardless of the name or type, are scored and reported as “Soft Rot” when the rot is soft, mushy, or in a leaky condition.

Potatoes that exhibit a wet leaking condition after thawing, score and report as “Wet Breakdown.”

Scoring Guide

Always serious damage: Classify all tubers affected by soft rot or wet breakdown as unusable material regardless of the area affected.

SOUTHERN BACTERIAL WILT (BROWN ROT)

This disease may attack all varieties of potatoes with varying degrees of severity. It is primarily a disease of potato crops in the South Atlantic and Gulf Coast States. For this reason, it is often referred to as Southern Bacterial Wilt (SBW). However, the disease has been reported as far north as Ohio, Michigan, and Idaho. In the early stages, the potatoes, when cut, show the vascular ring is moist and brown with a slight exudation from the discolored ring. In many cases, pockets develop in the vascular region, containing droplets of bacterial ooze. Frequently, there are no external indications, and the presence of the disease may be detected only by cutting the potatoes. An external indication of this disease can sometimes be sunken spots at the stem, or gray colored spots on the surface. In advanced stages SBW is known as Brown Rot.

Scoring Guide

Always serious damage: Report as “Southern Bacterial Wilt.”

NOTE: If SBW has advanced to the Brown Rot stage (soft and mushy), score and report as “Soft Rot.”

WORMS AND INSECTS

Scoring Guide

Always serious damage: When worms or insects are present in a tuber (meaning the worms or insects are embedded or burrowed in the potato), the entire tuber is classed as unusable material.

NOTE: When worms or insects are not present in a tuber, worm or insect injury are not free from defects and injury is determined on a waste basis. When more than 5% waste score as damage and when more than 10% waste score as serious damage.

Nematodes are scored differently (see [External Defects / Nematodes](#) section).

OPTIONAL TESTS

Tests for specific gravity and fry color are not mandated in the [U.S. Standards for Grades of Potatoes for Processing](#); these tests are available when specifically requested. Most processing contracts include incentive and/or refusal clauses based on specific gravity.

SPECIFIC GRAVITY

Accurate determination of specific gravity is extremely important to the processing industry. It is the means by which the percentage of dry-matter content (solids) of a lot is calculated. The percentage of dry-matter has a direct effect on the processing quality of the raw product as well as the quality of the finished product. Determine the specific gravity in accordance with the following procedure:

SAMPLING FOR SPECIFIC GRAVITY

The potatoes used for such determination will be:

- Taken randomly from a composite sample drawn from containers throughout a load; or
- A sample from a bulk load or storage bin(s); or
- From a portion of the divided sample which was initially drawn or submitted for grade or contract determinations.

Potatoes utilized in the determination of specific gravity will be clean and taken from the general run of the lot (field run) or from specific grade breakdowns depending on

contract and/or request specification. Use potatoes for specific gravity that are free from all rots and obvious free from defects. Whenever possible, do not use potatoes that have been cut, either for external or internal defects. Cut potatoes with excessive exposed surface may cause a false specific gravity reading. Avoid using the size of tubers showing the occurrence of hollow heart in the specific gravity sample.

DETERMINING SPECIFIC GRAVITY

Specific gravity can be determined by two acceptable methods: The Weight in Air and Weight in Water Method or the Hydrometer Method.

Weight in Air and Weight in Water Method:

This method consists of weighing a representative sample in air and then weighing the same sample when immersed in water. Keep water reasonably clean.

Select from the original sample drawn, three samples of at least 5000 grams (about 11 pounds each). The specific gravity of the sample is calculated as: [weight in air] divided by [weight in air minus weight in water] equals [specific gravity].

Examples:

- If three samples of potatoes weigh 5000 grams each in air and 396, 414, and 388 grams in water the specific gravity for this lot would be:

$$\begin{array}{r}
 \underline{5000 \text{ grams}} \\
 5000 - 396 \text{ grams} = 1.0860 \\
 \underline{5000 \text{ grams}} \\
 5000 - 414 \text{ grams} = 1.0903 \\
 \underline{5000 \text{ grams}} \\
 5000 - 388 \text{ grams} = \underline{1.0841} \\
 \text{Total } 3.2604 \div 3 = 1.0868
 \end{array}$$

- If three samples of potatoes weighed 11 pounds each in air and 0.88, 0.91, and 0.86 pounds in water, the specific gravity for this lot would be:

$$\begin{array}{r}
 \underline{11 \text{ lbs.}} \\
 11 \text{ lbs.} - 0.88 = 1.0870 \\
 \underline{11 \text{ lbs.}} \\
 11 \text{ lbs.} - 0.91 = 1.0902 \\
 \underline{11 \text{ lbs.}} \\
 11 \text{ lbs.} - 0.86 = \underline{1.0848} \\
 \text{Total } 3.2620 \div 3 = 1.0873
 \end{array}$$

The specific gravity figure is then corrected for temperature variations as prescribed by [Table I](#) in the standards. The corrected specific gravity for any lot of potatoes will be the average of the 3 corrected readings.

When requested to convert the weight in water of 5000 gram samples used in the weight in air versus weight in water method of specific gravity determinations, use the conversion to total solids based on [Table II](#) in the standards.

NOTE: When using Tables I and II, do not round gravity figures or drop the last digit. Both tables are included in these instructions.

Hydrometer Method:

Although this method is seldom used in potatoes for processing, the equipment and procedures used are listed below:

Equipment

- 30 gallon drum.
- Scale that weighs in pound graduations.
- Potato hydrometer.
- Basket.
- Steel rod 10-1/2" x1/2."

Calibration

- Place steel rod in the basket instead of eight pounds of potatoes.
- Attach basket and rod to the hydrometer bulb and lower into drum of water.
- Ensure the hydrometer reads 1.070. If it does not, adjust the chart in the hydrometer until the water level of the hydrometer is at 1.070.

From the original sample select, three-eight pound washed samples of uniform and average size potatoes for the lot, unless contract specifications state otherwise. The sample should be free from defects, particularly hollow heart and relatively free from cut surfaces. It may be necessary to cut one potato in the sample to obtain exactly eight pounds.

Place one eight pound sample in the wire basket and then:

- Hold the potatoes and the basket in one hand and, with the other, attach the hook of the bulb onto the wire loop in the center of the basket.
- Place the potatoes and bulb into the 30-gallon drum of clean water and allow the basket containing the potatoes to sink slowly.
- Find the specific gravity by reading the chart in the neck of hydrometer at water level.

Repeat this process for the other two samples. Record the pulp temperature of the potatoes and the water temperature of each sample. Record all data on the Specific Gravity Control Sheet as described in the weight in air-weight in water method. The corrected specific gravity of any lot of potatoes will be the average of 3 corrected readings.

EXAMPLE OF SPECIFIC GRAVITY NOTESHEET:

SPECIFIC GRAVITY CONTROL SHEET

Grower _____
 Field _____
 Storage _____
 Bin _____

Date _____
 Page of _____
 Certificate No. _____
 Inspector _____

Scale Ticket No.	Sample Weight In Water	Sample Weight In Water	Weight Air Minus Weight In Water	Specific Gravity	Tuber Temp.	Water Temp.	Temp. Correction	Corrected Specified Gravity
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)

NOTE: Above columns are not numbered on the actual control sheet, however, for the sake of clarity they are numbered here. Normally, only fill out numbers (1), (2), (3), (6), and (7). There are still some plants where you are responsible for computing and entering all vital statistics on the control sheet.

NOTE: When requested to convert the weight in water samples used in the weight in air versus weight in water method of specific gravity determinations, use [Table II](#) to covert to total solids.

TABLE I – CORRECTION FACTORS FOR SPECIFIC GRAVITY OF POTATOES¹

(Corrected to zero at 50 °F potato temperature and 50 °F water temperature)

Tuber temp (°F)	Water temperature (°F)									
	38	40	45	50	55	60	65	70	75	80
38.....	-0.0021	-0.0020	-0.0018	-0.0018	-0.0020	-0.0023	-0.0029	-0.0038	-0.0047	-0.0056
40.....	-0.0017	-0.0016	-0.0014	-0.0014	-0.0016	-0.0019	-0.0025	-0.0034	-0.0043	-0.0052
45.....	-0.0009	-0.0008	-0.0006	-0.0006	-0.0008	-0.0011	-0.0017	-0.0026	-0.0035	-0.0044
50.....	-0.0003	-0.0002	0000	0000	-0.0002	-0.0005	-0.0011	-0.0020	-0.0029	-0.0038
55.....	+0.0001	+0.0002	+0.0004	+0.0004	+0.0002	-0.0001	-0.0007	-0.0016	-0.0025	-0.0034
60.....	+0.0004	+0.0005	+0.0007	+0.0007	+0.0005	+0.0002	-0.0004	-0.0013	-0.0022	-0.0031
65.....	+0.0005	+0.0006	+0.0008	+0.0008	+0.0006	+0.0003	-0.0003	-0.0012	-0.0021	-0.0030
70.....	+0.0006	+0.0007	+0.0009	+0.0009	+0.0007	+0.0004	-0.0002	-0.0011	-0.0020	-0.0029
75.....	+0.0007	+0.0008	+0.0010	+0.0010	+0.0008	+0.0005	-0.0001	-0.0010	-0.0019	-0.0028
80.....	+0.0008	+0.0009	+0.0011	+0.0011	+0.0009	+0.0006	0000	-0.0009	-0.0018	-0.0027
85.....	+0.0009	+0.0010	+0.0012	+0.0012	+0.0010	+0.0007	+0.0001	-0.0008	-0.0017	-0.0026
90.....	+0.0010	+0.0011	+0.0013	+0.0013	+0.0011	+0.0008	+0.0002	-0.0007	-0.0016	-0.0025
95.....	+0.0011	+0.0012	+0.0014	+0.0014	+0.0012	+0.0009	+0.0003	-0.0006	-0.0015	-0.0024
100.....	+0.0012	+0.0013	+0.0015	+0.0015	+0.0013	+0.0010	+0.0004	-0.0005	-0.0014	-0.0023

Whenever a temperature falls between two sets of numbers use the following rounding procedures: When the number is less than 2.5 round down to the next lowest temperature, for example 52.4° rounds down to 50°. Round up to the next highest temperature when the number is 2.5 or more; for example 52.5° rounds up to 55°.

¹ To apply the correction factor, change the actual specific gravity reading by adding or subtracting the appropriate factor according to the plus or minus sign.

TABLE II – SPECIFIC GRAVITY CONVERSION CHART

For 5,000 grams of potatoes

Water Weight	Specific Gravity	Total Solids	Water Weight	Specific Gravity	Total Solids	Water Weight	Specific Gravity	Total Solids
300	1.0638	17.2	358	1.0771	20.1	400	1.0870	22.2
310	1.0661	17.7	360	1.0776	20.2	402	1.0874	22.3
320	1.0684	18.2	362	1.0780	20.3	404	1.0879	22.4
322	1.0688	18.3	364	1.0785	20.4	406	1.0884	22.5
324	1.0693	18.4	366	1.0790	20.5	408	1.0888	22.6
326	1.0697	18.5	368	1.0794	20.6	410	1.0893	22.7
328	1.0702	18.6	370	1.0799	20.7	412	1.0898	22.8
330	1.0707	18.7	372	1.0804	20.8	414	1.0903	22.9
332	1.0711	18.8	374	1.0808	20.9	416	1.0908	23.0
334	1.0716	18.9	376	1.0813	21.0	418	1.0912	23.1
336	1.0720	19.0	378	1.0818	21.1	420	1.0917	23.2
338	1.0725	19.1	380	1.0822	21.2	422	1.0922	23.4
340	1.0730	19.2	382	1.0827	21.3	424	1.0926	23.5
342	1.0734	19.3	384	1.0832	21.4	426	1.0931	23.6
344	1.0739	19.4	386	1.0836	21.5	428	1.0936	23.7
346	1.0743	19.5	388	1.0841	21.6	430	1.0941	23.7
348	1.0748	19.6	390	1.0846	21.7	432	1.0946	23.9
350	1.0753	19.7	392	1.0851	21.8	440	1.0965	24.4
352	1.0757	19.8	394	1.0855	21.9	450	1.0989	24.9
354	1.0762	19.9	396	1.0860	22.0	460	1.1013	25.4
356	1.0766	20.0	398	1.0865	22.1	470	1.1040	26.0

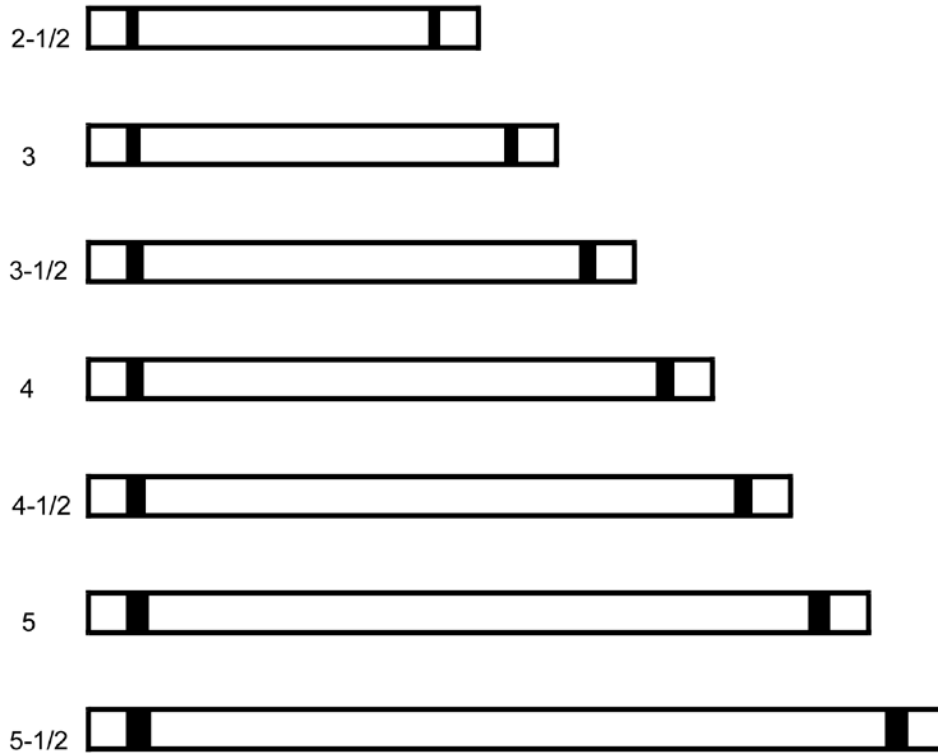
Whenever the recorded water weight for an individual reading falls between two sets of numbers as indicated above, use the next higher reading. Example: For a water weight reading of “371,” use the “372” specific gravity reading.

GLUCOSE CONTENT

In the manufacture of French fries and related products, the sugar content of the potatoes is closely related to the color produced. The processor's quality control staff usually performs the determination of glucose content (also called testing for reducing sugar). However, there are times the Inspection Service is asked to run the glucose test. When requested, use the following procedures:

- Select 15 potatoes at random from the graded sample or from the non-graded portion of the divided sample, provided the tubers are free from defects.
- Cut each potato lengthwise, from stem to eye end.
- Place the glucose test tape on the cut surface on the long axis in the middle of the potato. Ensure that the piece of tape used is sufficiently long so that the portion of the tape touched by fingers is not placed on the cut surface.
- Replace the other half of potato to moisten tape. Separate the halves, remove tape, and, after 1 minute, compare the color of the tape with the color chart on the tape container.
- Typically, contract specifications state that if more than 5% of the test tape is darker color than permitted (when compared to the tape container chart) the glucose content is considered excessive. A chart contained in these instructions will serve as a guide in determining if more than 5% of the area of the test tape is darker color than permitted. Do not average test tape readings.

INCHES



NOTE: The two solid areas in each rectangle represent the maximum amount of an equivalent strip of test tape, when applied to a potato of the same size, which is permitted to indicate the presence of more than one tenth of 1% glucose. Each solid area represents 2-1/2% of the total length of the tape.

Most contracts specify or the processor's quality control guidelines do not permit glucose content of more than one-tenth of one percent on more than 5% of the surface.

FRY COLOR

Frying quality of potatoes is very important in potatoes for processing. Processors may refuse lots with undesirable frying characteristics, which do not meet contract specifications.

When sugar ends, high sugar and/or fry color determination is requested. Use the following procedures for determining fry color (unless otherwise specified by request or contract specification):

- Randomly select a minimum of 20 potatoes free of external defects occurring on the ends.
- Cut each potato lengthwise in 1/2 inch (12.7 mm) square strips (unless otherwise specified by request or contract specification). Ensure stem end is toward the blade and take care not to damage the ends of the strips. Obtain one strip as near the center as possible from each potato that is free from internal defects.
- Place the strips in the basket.
- Place basket containing strips in fryer after the temperature of the oil is at least 350 °F, but not over 375 °F.
- Fry for 3 minutes at 350 °F or 2-1/2 minutes at 375 °F. It is critical to check temperature of oil with a thermometer.
- Remove strips from oil and place on white surface.
- Determine fry color within 2 minutes of removal from oil.

NOTE: Change oil daily when there is heavy usage. Change when it is obviously dirty; contains a moderate amount of suspended or sunken particles; noticeably smoking; or has an apparent off-odor. It is advisable to use the same type and quality of oil as being used in processing plant frying operations.

The fried strips may be compared to the following:

- Munsell Color Standards for Frozen French Fried Potatoes and reported according to contract specifications.
- USDA approved colorimeter, Agtron H-30A or H-300A, or any other approved electronic colorimeter, that has been properly calibrated and standardized. Contract specifications must specify one or more of the color designations with corresponding colorimeter indices.

After sample fry strips are prepared and test fried, and in absence of a colorimeter, determine fry color by comparing the darkest side of each sample fry strip with the Munsell Color Chart for French Fried Potatoes. In determining the 0, 1, 2, 3, or 4 color of the fry strip, a fry strip may show a darker variation than the numbered illustrations. For example, a fry strip may have a color that falls between a number 2 and a number 3, but is still a number 2 until it reaches the color equal to a number 3.

Report fry color using the following definitions unless otherwise specified.

Sugar End: A sample fry strip which when prepared and test fried has a predominant color of number 3 or darker when compared with the USDA Munsell Color Chart for French Fried Potatoes on any two sides extending 1/2 inch or more from the end of the sample fry strip.

High Sugar: A sample fry strip which when prepared and test fried has a predominant color of number 3 or darker when compared with the “USDA Munsell Color Chart for French Fried Potatoes” on any two sides of the fry strip affecting 1/2 the length or more from the end of the sample fry strip.

Predominant Color: An area with more than one color which is scored based on the predominant color. For example, if 1/3 of the area is a number 3 color and 2/3 of the area is a number 1 color, score the area as a number 1.

BRUISE FREE

“Bruise free” is the complete absence of any discoloration due to impact in the handling process, no matter how slight. Contracts and/or requests may be written to vary from definition for various reasons.

DETERMINING BRUISE FREE

Bruise free can only be determined after the complete removal of the skin. If the amount of peel removed is not specified on a grower-processor contract, for consistency and uniformity, use a range of 10% to 15% peel loss. If peel loss outside this range occurs, adjust the equipment to correct the problem. The sample is still valid regardless of the percentage of peel loss.

Unless otherwise directed by the applicant or contract specifications, use the following definitions to distinguish “old bruises” from “fresh bruises” in the bruise free determination when potatoes are coming out of storage:

Fresh Bruises: Typically a shade of pink or a bright shiny gray to jet black color and show no sign of dry or dry starchy flesh.

Old Bruises: Typically dull gray, light brown or other colors, which may show a dry or dry starchy appearance in the flesh. Also, old bruises may show a separation of the flesh or some corkiness of the flesh.

NOTE: Applications of the above definitions are characteristic of bruises within a 48 hour period from initial movement of potatoes from storage.

REMINDERS ABOUT BRUISE FREE

In all cases, bruise free is a very important part of processor/grower contracts. Keep in mind the following points concerning bruise free. For lighting requirements refer to the [Inspection Facilities and Equipment](#) section.

- Score all bruising when coming from the field.
- Unless otherwise specified by contract, hold samples of potatoes going into storage at least 48 hours before making the bruise free determination.
- Score only old bruises when coming out of storage, unless otherwise specified by contract.
- Contracts generally specify size of bruise allowed.
- Do not score bruises that were clearly a result of grading machinery.
- Score Internal Black Spot, which normally occurs when potatoes experience a slight jolt or bruise during handling, as bruises.
- Unless otherwise specified, use weight as the basis of calculating percentages¹.
- Even though plant personnel regulate the caustic peeler solution, bring to their attention if tubers are inadequately peeled or if excessively peeled.
- If two sets of electronic eyes are used to count bruise free tubers and one set of eyes records a higher count of “unbruised” tubers, use the higher count as the official count.
- When electronic eyes do not count properly, bring to the immediate attention of plant personnel.
- Most bruise free grading lines are in the proximity of the peeler; if this is the case, make personal safety a priority. Proper use of personal protective equipment

¹ Determine the percentage of bruise free by dividing the weight of the potatoes found to be “bruise free” by the total weight of all peeled potatoes used in the bruise free sample.

such as goggles and splash aprons, may be required if you are exposed to the chemicals used in a caustic peeler.