

Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain

2ND EDITION



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Acknowledgements:

2nd Edition Editors:

David Gombas, Ph.D., United Fresh Produce Association (corresponding editor)
Ed Beckman, California Tomato Farmers
Reggie Brown, Florida Tomato Exchange
Bob Carey, Publix Super Markets, Inc.
Filindo Colace, Thomas Colace Company
Donna Garren, Ph.D., National Restaurant Association
John Gurrisi, Darden Restaurants
Bev Kempf, Club Chef
JM Procacci, Procacci Brothers
Walter Ram, The Giumarra Companies
Martha Roberts, Ph.D., University of Florida IFAS

Additional Contributors and Reviewers:

Tom Bruno, DiMare Fresh	Sean Picquelle, Taco Bell
Chris Cunnane, Procacci Brothers	Bill Pool, Wegmans
Suresh Decosta, McDonalds	Arthur Quiggle, Wholesale Produce
Fried DeSchouwer, Greenhouse Produce Company, LLC	Michael Roberson, Publix Super Markets, Inc.
Tony DiMare, DiMare Fresh	Larry Robertson, Darden Restaurants
Bob Elliott, Sunkist Growers	Jim Rushing, Pacific Tomato Growers
Josh Funk, KFC	Dirk Sampath, DiMare Fresh
Billy Heller, Pacific Tomato Growers	John Sikina, Procacci Brothers
Johnna Hepner, Markon	Michelle Smith, Ph.D., FDA CFSAN
Don Ikemoto, Yum Brands	Mitch Smith, McDonalds
Tom Lovelace, McEntire Produce	Mike Spinazzola, Subway
Sam Maglio, Maglio & Company	Kathleen Staley, USDA AMS
Rose Martin, Ontario Greenhouse Vegetable Growers	Trevor Suslow, Ph.D., University of California - Davis
Buddy McEntire, McEntire Produce	Samantha Winters, Florida Tomato Exchange
Ross McKenny, Del Monte	Brian Zomorodi, Ready Pac
John Millwater, Fresh Express	
Courtney Parker, Ph.D., Fresh Express	

User's Note

These guidelines provide recommended food safety practices that are intended to minimize the microbiological hazards associated with fresh and fresh-cut tomato products. The intent of drafting this document is to provide currently available information on food safety and handling in a manner consistent with existing applicable regulations, standards and guidelines. The information provided herein is offered in good faith and believed to be reliable, but is made without warranty, express or implied, as to merchantability, fitness for a particular purpose, or any other matter. These recommended guidelines were not designed to apply to any specific operation. It is the responsibility of the user of this document to verify that these guidelines are appropriate for its operation. The publishing trade associations, their members and contributors do not assume any responsibility for compliance with applicable laws and regulations, and recommend that users consult with their own legal and technical advisers to be sure that their own procedures meet with applicable requirements.

Foreword

The North American Tomato Trade Work Group (NATTWG) published in 2006 the first edition of Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain. In the two years since that document, several initiatives have resulted in significant new learnings about potential risks and control measures at all points in the fresh tomato supply chain. Some of those initiatives include the FDA Tomato Safety Initiative, voluntary efforts by the Florida Tomato Exchange and the California Tomato Farmers to develop USDA-verified audit criteria and programs for tomato production and harvest practices in those states, and several retail and foodservice buyer initiatives to further define tomato safe growing and handling practices. Members of NATTWG and United Fresh Produce Association initiated this second edition to capture those learnings and to include the perspectives of a wider scope of contributors. Significant efforts were made to involve as many associations, agencies, companies and individuals with expertise in food safety practices for one or more steps in the fresh tomato supply chain as possible. All perspectives were considered. Under the leadership of the editors identified in the acknowledgments, over forty contributors collaborated to develop the guidelines presented in this edition.

The guidelines presented in this edition represent a current understanding of conditions and controls that should be considered by every company in the tomato supply chain for their respective operations. In some cases, a company may need to consider the guidelines in more than one module. For example, companies involved in Field Packing should also consider the recommendations in the Open Field Production module, and companies involved in Repacking should also consider the recommendations in the Packinghouse module.

Recently, efforts have been made to more prescriptively define food safety practices for some fresh produce commodities, including the use of quantitative “metrics”. While that was considered for this edition, the editors recognize that risks and controls are likely to be different between tomato sub-commodities and between tomato growing regions, and concluded that sufficient science with which to set metrics is currently lacking. Therefore, while the editors believe that this edition provides a comprehensive set of considerations, it is left to a future edition to identify a scientifically-based process for setting quantitative acceptance criteria for those considerations.

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Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain

I. Introduction

In 1998, the U.S. Food and Drug Administration (FDA) issued its “Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables.” The practices outlined in this and other documents are collectively known as Good Agricultural Practices or GAPs. GAPs provide general food safety guidance on critical production steps where food safety might be compromised during the growing, harvesting, transportation, cooling, packing and storage of fresh produce. More specifically, GAP guidance alerts the entire supply chain, including fruit and vegetable growers, shippers, handlers, packers, processors and buyers, to the potential microbiological hazards associated with various aspects of the production chain including: land history, adjacent land use, water quality, worker hygiene, pesticide and fertilizer use, equipment sanitation and product transportation. The vast majority of the fresh tomato industry has adopted GAPs as part of normal production operations. Indeed the majority of fresh tomato producers undergo either internal or external third-party GAP audits on a regular basis to monitor and verify adherence to their GAPs programs. These audit results are often shared with customers as verification of the producer’s commitment to food safety and GAPs. While the produce industry has an admirable record of providing the general public with safe, nutritious fruits and vegetables, it remains committed to continuous improvement with regard to food safety.

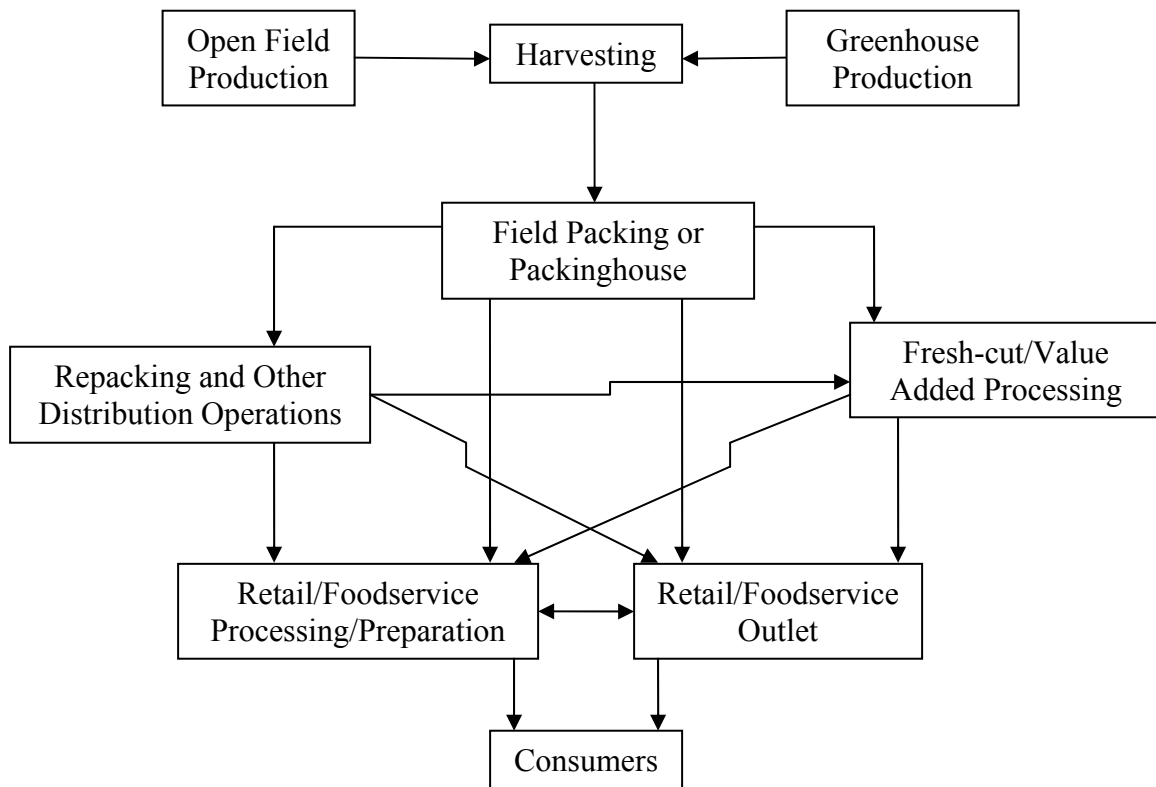
In 2004, the FDA published a food safety action plan that specifically requested produce industry leadership in developing the next generation of food safety guidance for fresh fruits and vegetables. These new commodity-specific guidelines focus on providing guidance that enhances the safe growing, processing, distribution and handling of commodities from the field to the end user. In the last 10 years, the focus of food safety efforts has been on the farm, initial cooling and distribution points and value-added processing operations. Fruit and vegetable processing operations have developed sophisticated food safety programs largely centered on current Good Manufacturing Practices (GMPs) and the principles of Hazard Analysis Critical Control Point (HACCP) programs. Food safety programs for fresh-cut and value added produce have recently been supplemented by FDA’s 2008 “Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables”. As we develop a greater understanding of food safety issues relative to the full spectrum of supply and distribution channels for fruits and vegetables it has become clear that the next generation of food safety guidance needs to encompass the entire supply chain.

II. Scope and Use of Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain

The scope of this document pertains only to fresh and fresh-cut tomato products, and does not include cooked tomato products, tomato juice, or tomatoes intended to be

cooked. This document does not include considerations for products commingled with non-produce ingredients (e.g. salad kits which may contains meat, cheese, and/or dressings), although the tomatoes used in such products should be produced, harvested and otherwise handled in a manner consistent with the recommendations in this document. The distribution chain for fresh tomatoes can be complex, in that tomatoes may be sold direct or indirect to the buyer; tomatoes are often subject to repacking for size and/or quality. As a result, there is no single distribution chain. The distribution chain may be simple or very complex, with tomatoes being handled by a number of entities prior to being offered for sale to the consumer. The model distribution chain for the purpose of this document provides an overview of only a few of the many paths a fresh tomato can take prior to the end user. It is the intent of this document to cover all significant aspects of the tomato supply chain, from production to delivery to the consumer.

Figure 1. General Supply Chain Flow for Fresh Tomatoes



Safe production, packing, processing, distribution and handling of fresh and fresh-cut tomatoes depend upon a myriad of factors and the diligent efforts and food safety commitment of all parties throughout the distribution chain. No single resource document can anticipate every food safety issue or provide answers to all food safety questions. These guidelines are not intended to replace other food safety programs, but are meant to be used in conjunction with them to address food safety hazards known to affect the

tomato supply chain. These guidelines focus on minimizing the microbial food safety hazards by providing actions, based on the best available science, that have been shown to be effective to reduce, control or eliminate microbial contamination of tomatoes in the field to fork supply chain. Because of sub-commodity, regional and operational practice differences, not all of these actions will be applicable to all tomato handling operations. However, it is suggested that all companies involved in the fresh tomato farm to table supply chain consider the recommendations contained within these guidelines in developing their company-specific food safety program. Every effort to provide food safety education to supply chain partners should be made as well, to ensure that opportunities to prevent contamination are not lost as tomatoes pass from one point of the supply chain to the next. Together with the commitment of each party along the supply chain to review and implement these guidelines, the fresh produce industry is doing its part to provide a consistent, safe supply of produce to the market.

For the purposes of this guidance, the tomato supply chain has been divided into eight primary modules:

- open field production,
- harvest practices,
- field packing,
- greenhouse production,
- packinghouse,
- repacking and other distribution operations,
- fresh-cut processing (value-added), and
- foodservice and retail.

Multiple modules will apply to many users of these guidelines. Users should not assume that a single module will cover their entire tomato operation.

Each of these modules contains key considerations for potential sources of pathogen contamination that may be reasonably likely to occur in the absence of control. While not the focus of this document, reference materials for chemical, physical and other food safety hazards and controls, and other resources that may be useful, are provided in the Appendix.

III. Open Field Production

The development of good agricultural practices for field tomato production must consider all the elements of the field production system; field site, land use, adjacent land use, agricultural inputs (e.g., irrigation water, fertilizers), workers and production practices. Microbial contamination can occur from a number of sources; evaluation of these risks, and their management, are essential to proper food safety procedures in the production of fresh tomatoes.

1. Preventing/Minimizing Risks in the Field - Field Management

Field producers must give consideration to the control of microbial contamination in the selection and management of production sites.

- a. Tomato growers should determine previous usage of land if at all possible and should assess and mitigate conditions that may pose a food safety risk in and near production fields.
- b. Conduct an environmental assessment including topography, land history, risk of flooding, adjacent land use and domestic animal and wildlife presence.
 - i. Routinely review field environments and maintain records of assessments and any corrective actions.
 - ii. Consider the potential for flooding to create conditions that may pose a food safety risk. Flooding is the uncontrolled introduction of large amounts of water into the production area. Additional guidance related to flood events can be found at in the Appendix.
- c. Tomato fields should not be located in any area that can receive runoff or drainage from an animal operation or any other source of contamination.
- d. Steps shall be taken to avoid, prevent or mitigate run-off into the field from any animal operation or other conditions that may pose a food safety risk.
- e. Areas of tomato fields that have been contaminated by run-off from an animal operation shall not be harvested for fresh or fresh-cut consumption.
- f. Procedures used to mitigate risks shall be documented.

2. Animal Exclusion

- a. Measures shall be taken to exclude domestic animals and livestock from tomato fields.
- b. Measures shall be taken to minimize wildlife presence. These measures may include the use of barriers or other deterrents, minimizing wildlife attractants and opportunities for harborage, redirecting wildlife to non-sensitive areas and/or by other methods identified by wildlife experts.
- c. If animal intrusion is detected, measures shall be taken to remove or prevent the harvest of any potentially contaminated product.

3. Adjacent Land Use

- a. Assess adjacent land for activities or conditions that may pose a risk to tomato safety. Hazards may include, but not be limited to: livestock, wildlife, landfills, sewage treatment, chemical plants, or other conditions that pose a food safety risk.
- b. Appropriate measures shall be taken to mitigate any identified food safety hazards. These measures may include berms, fences, ditches, buffer zones or other strategies to effectively mitigate any hazards.

4. Water Use in the Field

- a. Water Source
 - i. Document the source(s) of water for each field and agricultural use (e.g., irrigation, crop protection spray).
 - ii. Identify potential sources of contamination of agricultural water at its source and during distribution and holding.
 - iii. Ensure that any well used is properly designed, located, constructed and maintained in such a way as to prevent contamination.

- iv. Ensure any water being utilized for irrigation is not contaminated with animal or human feces and meets the standard for *E. coli* in recreational waters contained in 40 CFR Part 131.41(c), or other standard based on available science.
- v. Allow for appropriate water treatment methods and/or identify alternate water sources to ensure water quality is consistent with appropriate standards.
- vi. Consider the potential for facilities and equipment used for holding and/or distribution of agricultural water to be a source of contamination.
- b. Water Use
 - i. Any foliar application of water to tomatoes shall meet the microbial standards for potable water contained in 40 CFR Part 141.63.
- c. Microbial Monitoring
 - i. Analyze and maintain records of testing of agricultural waters.
 - ii. Corrective actions shall be established and taken if standards are not met.
 - iii. Establish a monitoring frequency for water appropriate to the source and other relevant factors.

5. **Hygienic Practices in Tomato Fields**

Ensure that production crews, visitors or other field personnel are aware of food safety risk reduction principles and that they agree to adhere to the firm's practices and policies.

- a. Written Policies and Employee Training
 - i. Operations shall develop and implement written GAP and Employee Hygiene Practices.
 - ii. All employees shall receive mandatory safe product handling and personal hygiene education at time of hire, with periodic reinforcements, at least seasonally.
 - iii. Training sessions shall be documented, with records kept of topics covered, date, names and signatures of those in attendance.
 - iv. Routine oversight and periodic self audits shall be used to verify and document compliance with worker hygiene and sanitation policies and practices.
- b. Cleanliness/Sanitation
 - i. Sanitary facilities shall be provided for all field workers and visitors during planting, harvesting or other field activities. Toilet facilities shall be provided with a minimum of one per twenty employees and be readily accessible, located not more than ¼ (0.25) mile of all employees.
 - ii. Toilet facilities shall be designed, located, operated and serviced in a manner that does not pose a source of contamination of the field.
 - iii. Toilet facilities shall have appropriate hand washing stations, including collection of gray water.
 - iv. Toilet facilities shall be maintained in a clean and sanitary condition and properly stocked with soap, water for handwashing that meets the microbial standard for potable water, single use towels, toilet paper, etc. and a written record of cleaning shall be kept.

- v. Restroom cleaning equipment shall be labeled and segregated so as not to pose a risk of contamination.
- vi. Policies shall require hand washing with soap and water at the appropriate time such as before starting work, after breaks, using the restrooms, sneezing, or coughing.
- c. Health
 - i. Employees, visitors and other field personnel with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses shall be restricted from working with or in the vicinity of tomatoes or tomato contact surfaces.
 - ii. Employees, visitors and other field personnel with open sores, cuts, burns, boils, etc., shall report to a supervisor before working or entering the field. The supervisor shall determine if the employee will be allowed to work with or in the vicinity of tomatoes or tomato contact surfaces.
- d. Hygiene
 - i. Employees, visitors and other field personnel shall have designated areas for eating, drinking, smoking, breaks, personal effects, etc.
 - ii. There shall be a written policy prohibiting eating, drinking, chewing gum, and using tobacco in fields except in clearly designated areas.
 - iii. Drinking water shall be provided with either fountains or single use containers. Drinking water containers shall be handled in a manner that prevents them from becoming sources of contamination.
 - iv. There shall be a written policy restricting jewelry in the field.
 - v. Employees, visitors and other field personnel shall wear clean and suitable outer garments. Consider, as appropriate to the operation, hair restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
 - vi. Other good food handling techniques shall be developed as appropriate to the specific operation to prevent cross contamination.

6. **Gloves**

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If tomatoes are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all operators who handle tomatoes in the field.

a. Disposable Gloves

- i. The use of single use disposable gloves for hand contact with tomatoes is recommended.
- ii. Hands shall be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
- iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.

b. Reusable Gloves

- i. Reusable gloves are not recommended for hand contact with tomatoes but, if used, the following requirements shall apply.
- ii. The gloves must be made of materials that can be readily cleaned and sanitized.
- iii. It is the responsibility of the production company to ensure that gloves are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves shall not be permitted to be taken home by workers for cleaning and sanitizing.
- iv. Appropriately cleaned and sanitized gloves shall be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- v. Gloves not in use should be stored appropriately.
- vi. Gloves that have come in contact with the ground or other non-food contact surfaces shall be changed.

7. Crop Production Practices

Assess risk of all production inputs to reduce contamination risk.

- a. Chemical Fertilizers
 - i. Follow manufacturer's instructions for usage and storage.
- b. Fertilizers Containing Manures, Composts or Biosolids
 - i. Only properly treated manures and biosolids are allowed for use in tomato fields.
 - ii. If treated manures or biosolids are used, records of composition, dates of treatment, methods utilized, application dates and any test results or process verification data demonstrating compliance with microbial standards must be documented.
- c. Pesticides (Crop Protection Treatments)
 - i. Pesticide chemicals used must comply with all requirements of EPA registration and any federal, state or local regulations.
 - ii. Pesticides must be appropriately registered for such use and must be used in accordance with label directions. Pesticide uses shall be documented.
 - iii. Pesticides shall be applied by trained, licensed or certified pesticide personnel, as required by regulation.
 - iv. Pesticides for foliar application shall only be mixed with water that meets microbial standard for potable water contained in 40 CFR Part 141.63.
- d. Chemicals Used on Product
 - i. Chemicals used on product that are not registered pesticides may be permitted for food contact use if allowed under regulations of the U.S. Food and Drug Administration (FDA).

8. Equipment and Containers

- a. Any surfaces or equipment intended to touch fresh produce is a food contact surface and must be cleaned and sanitized at a frequency sufficient to prevent the surfaces from becoming a source of contamination.
- b. Reusable containers and food contact equipment and utensils shall be constructed of materials that can be easily cleaned and sanitized.
- c. Clean and sanitize containers, bins, food contact equipment and utensils at least daily during use, or more often as needed, to remove sand, grit, dirt, and other residue.
- d. Establish routine cleaning and sanitizing procedures and maintain these sanitation standard operating procedures in writing.
- e. Maintain all equipment and surfaces in such a way as to minimize contamination of, and injury to, tomatoes.
- f. All containers shall be marked for their intended use (trash, etc.).

9. Record Keeping

Appropriate record keeping provides evidence of operating conditions and practices and facilitates periodic review and evaluation of those practices.

- a. Records documenting adherence to these practices, such as those addressing environmental assessments, employee training, water usage, pest control, crop production practices, and any needed corrective actions, for the operation must be maintained and producible in a reasonable amount of time.
- b. The source of all agricultural inputs used in the production of the crop (e.g., seeds, transplants, fertilizers, pesticides) shall be recorded.
- c. Records shall be retained for at least two years, or as required by regulation.

IV. Harvest Practices

Tomatoes for harvest shall have been produced according to Good Agricultural Practices and the recommendations described in the prior section on Open Field Production.

1. Preharvest Assessment

A preharvest assessment provides a last opportunity to evaluate any safety risks that may impact the potential for the tomatoes to be contaminated. The field man, ranch manager or other responsible person shall ensure that an assessment is performed as close as practical prior to the beginning of harvest, for example, not more than 7 days prior to the beginning of harvest.

- a. Conduct an environmental assessment including topography, land history, adjacent land use and domestic animal and wildlife presence.
 - i. Review field environments and records of assessments and corrective actions.
- b. Tomato fields should not be located in any area that can receive runoff or drainage from an animal operation or any other source of contamination.
- c. Domestic animals and livestock have been excluded from tomato fields.
- d. Wildlife presence has been minimized.
- e. If animal intrusion is detected, measures shall be taken to remove or prevent the harvest of any potentially contaminated product.
- f. Run-off from any animal operation has been prevented.

- g. The source of water for irrigation for each crop has been documented and criteria have been met.
- h. Procedures used to identify risks and mitigate those risks have been documented, followed and are reviewed.
- i. If tomatoes are harvested at multiple times, fields should be assessed sufficiently to assure that new risk factors have not emerged.

2. Hygienic Practices in Tomato Fields

Ensure that harvest contractors and crews have been trained in food safety risk reduction principles and that they agree to adhere to the firm's practices.

- a. Written Policies and Employee Training
 - i. Operations shall develop and implement written GAP and Employee Hygiene Practices.
 - ii. All employees shall receive mandatory safe product handling and personal hygiene education at time of hire, with periodic reinforcements, at least seasonally.
 - iii. Training sessions shall be documented, with records kept of topics covered, date, names and signatures of those in attendance.
 - iv. Periodic (e.g., daily, weekly, monthly, quarterly, as appropriate) self audits shall be used to verify and document compliance with worker hygiene and sanitation policies and practices.
- b. Cleanliness/Sanitation
 - i. Sanitation facilities (i.e., toilet and handwashing facilities) shall be provided for all field workers and visitors during harvest. Toilet facilities shall be provided with a minimum of one per twenty employees and readily accessible, located not more than ¼ (0.25) mile of all employees.
 - ii. Toilet facilities shall be located and serviced in a manner to not be a source of contamination of the field.
 - iii. Toilet facilities shall have appropriate hand washing stations.
 - iv. Toilet facilities shall be maintained in a clean and sanitary condition and properly stocked with soap, water for handwashing that meets the microbial standard for potable water, single use towels, toilet paper, etc. and a written record of cleaning shall be kept.
 - v. Restroom cleaning equipment shall be labeled and segregated so as not to pose a risk of contamination.
 - vi. Policies shall require hand washing with soap and water at the appropriate time such as before starting work, after breaks, using the restrooms, sneezing, or coughing.
- c. Health
 - i. Worker health policies shall restrict employees with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses from working with or in the vicinity of tomatoes or tomato contact surfaces.
 - ii. Employees with open sores, cuts, burns, boils, etc., shall report to a supervisor before working. The supervisor shall determine if the employee will be allowed to work with or in the vicinity of tomatoes or tomato contact surfaces.

- d. Hygiene
 - i. Employees shall have designated areas for eating, drinking, smoking, breaks, personal effects, etc.
 - ii. There shall be a written policy prohibiting eating, drinking, chewing gum, and using tobacco in fields except in clearly designated areas.
 - iii. Drinking water shall be provided with either fountains or single use containers. Drinking water containers shall be handled in a manner that prevents them from becoming sources of contamination.
 - iv. There shall be a written policy restricting jewelry in the field.
 - v. Employees shall wear clean and suitable outer garments. Consider, as appropriate to the operation, hair restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
 - vi. Other good food handling techniques shall be developed as appropriate to the specific operation to prevent cross contamination.
- e. Harvest crews are trained to recognize and report any food safety risks or hazards observed during the harvest operation.

3. **Gloves**

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If tomatoes are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all harvest operators who handle tomatoes.

- a. Disposable Gloves
 - i. The use of single use disposable gloves for harvesting of tomatoes is recommended.
 - ii. Hands shall be washed before putting on gloves.
 - iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
 - iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- b. Reusable Gloves
 - i. Reusable gloves are not recommended for harvesting but, if used, the following requirements shall apply.
 - ii. The gloves must be made of materials that can be readily cleaned and sanitized.
 - iii. It is the responsibility of the harvest company to ensure that gloves are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves shall not be permitted to be taken home by workers for cleaning and sanitizing.
 - iv. Appropriately cleaned and sanitized gloves shall be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving

handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.

- v. Gloves that have come in contact with the ground or other non-food contact surfaces shall be changed.

4. Equipment and Containers

- a. Any surfaces or equipment intended to contact fresh produce is a food contact surface and must be cleaned and sanitized at a frequency sufficient to prevent the surfaces from becoming a source of contamination.
- b. Reusable containers and food contact equipment and utensils shall be constructed of impervious materials that can be cleaned and sanitized.
- c. Any containers used to hold tomatoes that are received back from a packing house must be checked for cleanliness prior to use.
- d. Clean and sanitize harvest containers, bins, food contact equipment and utensils at least daily during use, or more often as needed, to remove sand, grit, dirt, and other residue.
- e. Establish routine cleaning and sanitizing procedures and maintain these standard operating procedures in writing.
- f. Maintain all equipment and surfaces in such a way as to minimize contamination of and injury to tomatoes.
- g. Records shall be maintained of cleaning procedures and their implementation.

5. Tomato or Equipment Sanitizing Agents Used During Harvest

- a. EPA considers any chemical making an antimicrobial claim, including those used to sanitize equipment and tomatoes, to be a pesticide.
- b. Sanitizing chemicals used must comply with all requirements of EPA registration and any federal, state or local regulations.
- c. Sanitizing chemicals must be appropriately registered for such use and must be used in accordance with label directions. Sanitizing chemicals uses shall be documented.
- d. Chemicals used on product that are not registered pesticides may be permitted for food contact use if allowed under regulations of the U.S. Food and Drug Administration (FDA).

6. Debris Removal

Dirt, stems and leaves should be removed from tomatoes to the degree practical in the field, in a manner that does not pose a risk of contamination.

7. Exclusion from Harvest

- a. Tomatoes that have fallen from the plant to the ground (i.e., “drops”) shall not be harvested.
- b. Tomatoes contacted by any fecal material shall not be harvested.
- c. If animal intrusion is detected, measures shall be taken to remove or prevent the harvest of any potentially contaminated product.
- d. Damaged, soft or decayed tomatoes should be excluded, to the degree possible.

8. Culling, Sorting and Removal of Damaged Tomatoes

Damaged or decayed tomatoes provides a potential source of contamination.

- a. Damaged, soft or decayed tomatoes should be removed, to the degree possible, to minimize microbial contamination.

9. Record Keeping and Traceability

Record keeping provides evidence of reviews and evaluations to document those practices. Records shall also be kept to assure traceability of harvested tomatoes.

- a. Records documenting adherence to these practices, such as those addressing preharvest assessments, employee training, for the operation must be maintained and producible in a reasonable amount of time.
- b. Traceability practices shall be utilized to ensure that all tomatoes are traceable to their origin at least one step forward and one step back.
- c. Record shall be retained for at least two years, or as required by regulation.

V. Field Packing

Field packing of tomatoes includes any practices to grade, sort, size, clean, pack or palletize tomatoes in the field into containers for commerce. Field packing is conducted in the field and may not include cleaning or washing. Field packed tomatoes are not intended to be transferred to a packinghouse for further handling. Care must be taken to ensure that practices and conditions do not contribute to contamination.

1. Prerequisites for Field Packing Tomatoes

Packing of tomatoes in the field must meet all Good Agricultural Practices (GAPs) included in this document in Section III Open Field Production including field management, site and adjacent land use, water use, hygienic practices, production practices, harvesting procedures and record keeping in addition to the requirements further detailed in this Section on Field Packing.

2. Field Packing Tomatoes

Employees packing tomatoes in the field shall be supervised in order to ensure the safety of the product. Field packed tomatoes may not undergo any further cleaning or sanitizing. If materials such as cloths are used repeatedly for cleaning the tomatoes, steps shall be taken to ensure that they do not become a source of contamination. Hygienic practices for field packing employees shall be followed and verified by supervisors. These hygienic practices shall include frequent handwashing and sanitizing.

- a. Culling
Packing tomatoes in the field generally occurs with mature ripe tomatoes so extra care to cull and remove any damaged tomatoes shall occur.
- b. Hygienic Procedures
Minimum legal requirements for field sanitization facilities and procedures

are prescribed in the Occupational Safety and Health Act, 29 CFR, Part 1928.110.

- c. Packing tomatoes with bare hands (without gloves) shall require increased handwashing frequency to prevent contamination. This frequency shall be documented and be measured in time or number of units packed, such as “at least every 30 minutes or after the packing of every 20 boxes, and additionally as needed”.
- d. A written procedure for hygienic practices for field packed operations and records showing compliance must be available.
- e. Documentation of employee training on hygienic procedures for the field packing of tomatoes shall be retained and available.

3. Gloves

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all field packing operators who handle tomatoes, both picking and packing.

a. Disposable Gloves

- i. The use of single use disposable gloves for field packing of tomatoes is recommended.
- ii. Hands shall be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
- iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.

b. Reusable Gloves

- i. Reusable gloves are not recommended for field packing but, if used, the following requirements shall apply.
- ii. The gloves must be made of materials that can be readily cleaned and sanitized.
- iii. It is the responsibility of the field packing company to ensure that gloves are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves shall not be permitted to be taken home by workers for cleaning and sanitizing.
- iv. Appropriately cleaned and sanitized gloves shall be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- v. Gloves that have come in contact with the ground or other non-food contact surfaces shall be changed.

4. Exclusion from Harvest

- a. Tomatoes that have fallen from the plant to the ground (i.e., “drops”) shall not be harvested.
- b. Tomatoes contacted by any fecal material shall not be harvested.
- c. If animal intrusion is detected, measures shall be taken to remove or prevent the harvest of any potentially contaminated product.
- d. Damaged, soft or decayed tomatoes should be excluded, to the degree possible.

5. Cleaning Procedures

The marketplace demands that dirt and debris be removed from a final packing of tomatoes or any fruit or vegetable. The manner in which tomatoes packed in the field are cleaned is of major importance and can be a source of either direct contamination or cross contamination with potentially harmful microorganisms.

- a. **Cleaning Materials Including Cloths**
 - i. Firms packing tomatoes in the field must have a written policy for the use and sanitization of cloths used for cleaning.
 - ii. If materials, such as cloths, are used repeatedly for cleaning tomatoes, special steps shall be taken to ensure they do not become a source of direct or cross contamination.
 - iii. If cloths are moistened to facilitate cleaning, only single use, potable water shall be used. Cloths shall not be moistened by repeated immersion in a bucket.
 - iv. Cleaning cloths should be replaced after each box packed.
 - v. It is the responsibility of the field packing company to ensure that cloths are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized before reuse, following a procedure validated to eliminate any potential contamination of public health concern. Cloths shall not be permitted to be taken home by workers for cleaning and sanitizing.
 - vi. Documentation of the training of workers in appropriate use of cloths for cleaning must be available.
- b. All cleaning procedures shall be documented.

6. Containers for Field Packing Tomatoes

All containers shall be stored in a manner to prevent contamination. Special attention shall be given to contamination risks from rodents, birds and other pests.

- a. All packaging material is inspected upon arrival and stored in a clean manner.
- b. Containers used for field packing may not be stored in the field unless protected from potential contamination.
- c. Picking and packing containers shall be distinguishable from those serving other purposes.
- d. Reuse of single use containers, e.g., corrugated, for the field packing of tomatoes is prohibited.
- e. Reusable containers, such as reusable plastic containers (“RPCs”), shall be cleaned and sanitized by a documented procedure before reuse, and shall be properly labeled for current use.
- f. Containers shall be protected from direct contact with the ground.

- g. Containers shall be properly labeled with information sufficient for traceability, including identification of the firm packing the tomatoes. Reusable containers shall have inaccurate labels removed before reuse.
- 7. Tomato or Equipment Sanitizing Agents Used During Harvest**
 - a. EPA considers any chemical making an antimicrobial claim, including those used to sanitize equipment and tomatoes, to be a pesticide.
 - b. Sanitizing chemicals used must comply with all requirements of EPA registration and any federal, state or local regulations.
 - c. Sanitizing chemicals must be appropriately registered for such use and must be used in accordance with label directions. Sanitizing chemicals uses shall be documented.
 - d. Chemicals used on product that are not registered pesticides may be permitted for food contact use if allowed under regulations of the U.S. Food and Drug Administration (FDA).
- 8. Equipment and Picking Containers in the Field**
 - a. Any surface that touches tomatoes in the field is a food contact surface and must be clean and sanitary.
 - b. Harvest containers, food contact surfaces, and utensils shall be cleaned and sanitized at least daily or more often as needed, to remove sand, grit, dirt, and other residue.
- 9. Reduction of Microbiological Levels on Tomatoes in the Field**
 - a. Tomatoes packed in the field should be washed with sanitizer, in accordance with label instructions, to reduce microbial levels.
 - i. Consumer-ready containers shall be labeled to identify when the product has been field packed without washing.
 - b. A written procedure for washing and sanitization as well as records of implementation of the procedure shall be maintained.
 - c. The water used for washing tomatoes shall be of microbial quality equivalent to potable water and have sufficient sanitizer to prevent cross contamination. The water antimicrobial shall be monitored at a frequency sufficient to maintain sanitary conditions.
 - d. Products used for sanitization must be appropriately registered by the Environmental Protection Agency (EPA) for such use, and must be used in accordance with label instructions for concentration and contact time.
 - e. Products for sanitization may include:
 - i. Hypochlorite
 - ii. Gaseous ozone
 - iii. Aqueous ozone (ozonated water)
 - iv. Peroxyacetic acid
 - v. Aqueous chlorine dioxide
 - vi. Other EPA-registered, appropriately labeled agents that have been shown to reduce the level of pathogens such as *Salmonella* or *E. coli* O157:H7 by three logs (99.9%) or more.

- f. Cold water immersion as a cooling technique shall not be done.
 - g. Water temperature shall be maintained at least 10°F warmer than the pulp temperature of the tomato. Water temperature shall be monitored at least hourly.
- 10. Transportation of Field Packed Tomatoes**
- a. Transportation vehicles should be sufficiently clean so as not to be a source of contamination.
 - b. Inspect transportation vehicles for cleanliness, odors, visible dirt and debris before loading. If needed, the vehicle shall be cleaned or cleaned and sanitized by a documented procedure prior to loading.
 - c. If non-dedicated vehicles are used for transportation, verify records of prior loads. Should there be any doubt as to previous loads transported or a potential risk from microbial contamination, such as from raw animal proteins, garbage or other refuse, then the vehicle shall be cleaned and sanitized by a documented procedure prior to use.
- 11. Storage**
- Any area used to collect or store tomatoes packed in the field must be maintained in a clean and sanitary manner.
- 12. Traceability, Labeling and Record Keeping**
- All tomatoes shall be traceable at least one step forward and one step back. This shall include appropriate labeling of each case.
- a. Documentation of field packed tomatoes shall include sufficient information about the harvest (i.e., field location and history, grower, personnel/crew involved in the harvesting and packing) as well as the customer receiving the product to allow for the appropriate tracing of product.
 - b. Containers shall be accurately labeled with commodity name, field packer firm name and information sufficient to allow for identification of grower, ranch and field location, harvest crew and date of harvest/field pack.
 - c. Labels that are inaccurate shall be removed prior to packing.
 - d. A documented recall program, including a traceability system to track tomatoes forward to customers, shall be developed and tested at least annually. A record of this test shall be maintained and be available.
 - e. Traceability records shall be readily available.
 - f. All records recommended in this section shall be maintained for at least two years and be readily available.

VI. Greenhouse Production

For the purposes of this guidance, a greenhouse is presumed to be enclosed. Note that this section does not apply to shade houses or other open structure, which shall follow recommendations for field production. Harvesting of greenhouse tomatoes shall follow recommendations in Section IV Harvest Practices.

1. Greenhouse

- a. The greenhouse shall be enclosed.
- b. A foot dip station or other measure should be used to prevent the introduction of harmful microorganisms or agents and a written record of the sanitizer and maintenance kept.
- c. Soil or other growth medium shall be suitable for its intended purpose.
- d. Adequate hand washing stations shall be available with single use towels. These stations shall be designed to drain or capture all waste water in a manner that does not pose a contamination hazard to the greenhouse.
- e. Signs identifying policies and food safety principles shall be conspicuously posted in appropriate languages.
- f. Trash cans shall be present, adequate in number and location.

2. Grounds

- a. The grounds about a greenhouse under the control of the operator shall be kept in a condition that will protect against contamination of tomatoes. The methods for adequate maintenance of grounds include, but are not limited to:
 - i. Properly storing equipment, removing litter and waste, and cutting weeds or grass within the immediate vicinity of the plant buildings or structures that may constitute an attractant, breeding place, or harborage for pests.
 - ii. Maintaining roads, yards, and parking lots so that they do not constitute a source of contamination in areas where tomatoes are exposed.
 - iii. Adequately draining areas that may contribute contamination to food by seepage, foot-borne filth, or providing a breeding place for pests.
 - iv. Operating systems for waste treatment and disposal in an adequate manner so that they do not constitute a source of contamination in areas where tomatoes are exposed.
- b. If the greenhouse grounds are bordered by grounds not under the operator's control and not maintained in the manner described in paragraph (a) (i) through (iii) of this section, care shall be exercised in the greenhouse by inspection, extermination, or other means to exclude pests, dirt, and filth that may be a source of food contamination.
- c. It is recommended that the land adjacent to the greenhouse should not be a significant source of contamination. Hazards may include but not be limited to livestock, wildlife, landfills, chemical plants, etc.
- d. Appropriate measures shall be taken to minimize any food safety hazards from surrounding land use or environment. These measures may include berms, fences, ditches, buffer zones or other strategies to effectively mitigate any hazards. Records shall be kept of the measures used.

3. Pest Control

- a. Rodent, birds, amphibians (e.g., tree frogs), reptiles and other facility pests.
 - i. Effective measures shall be taken to exclude pests from the greenhouse and to protect against the contamination of tomatoes by pests.

- ii. The use of insecticides or rodenticides shall be permitted only under precautions and restrictions that will protect against the contamination of tomatoes, food-contact surfaces, and packaging materials.
- b. Pesticides (Crop Protection Treatments)
 - i. Only trained or, where applicable, licensed personnel shall apply crop protection products.
 - ii. Standard Operating Procedures shall be developed for pesticide applicators, application equipment, storage, and usage (handling, mixing, diluting, etc.).
 - iii. Application instructions on the pesticide labels shall be followed including but not limited to dilution ratios, time intervals, reentry times, etc. and crop protection records shall be maintained and kept current.
 - iv. The greenhouse operation shall comply with all federal, state, and local regulations regarding pesticide usage and recordkeeping.
 - v. Pesticides shall be properly and securely stored. Empty pesticide containers shall be disposed according to the label or regulatory requirements.
 - vi. Water used for spray applications shall meet the microbial standards for potable water contained in 40 CFR Part 141.63.
 - vii. Loading, diluting, mixing, etc. of pesticides shall not be done in a manner that will potentially contaminate the water source.
 - viii. Cleaning of pesticide equipment shall not be done in a manner that will potentially contaminate the water source.
- c. No domestic animals or other animals are permitted in areas where tomatoes are packed, handled or stored.

4. Preharvest Agricultural Water

- a. Water Source
 - i. Document the source of water for irrigation for each crop.
 - ii. Identify potential sources of contamination of irrigation water
 - iii. Ensure that any well used is properly designed, constructed and maintained in such a way as to prevent contamination.
 - iv. Water source(s), storage and distribution systems shall be regularly maintained and protected from potential sources of contamination. Any material that may pose a risk of contamination such as trash, plant material, etc. shall be removed.
 - v. Appropriate backflow prevention devices (e.g., air gaps, backflow valves) shall be used to protect water quality at the source and during distribution and use.
 - vi. Ensure any water being utilized for irrigation is not contaminated with animal or human feces.
 - vii. Non-foliar irrigation water shall meet the standard for *E. coli* in recreational waters contained in 40 CFR Part 131.41(c), or other standard based on available science.

- viii. Any foliar application of water to tomatoes, whether intentional or unintentional, should meet the microbial standards for potable water contained in 40 CFR Part 141.63.
- ix. Allow for appropriate water treatment methods to bring water into compliance with required standards.
- b. Microbial Monitoring
 - i. Analyze and maintain records of testing of agricultural waters used with tomato production to minimize potential for microbial contamination.
 - ii. Corrective actions shall be established and taken if standards are not met.
 - iii. Establish a monitoring frequency for water appropriate to the source.
- c. Water source(s) shall be protected from cross contamination from fertilizers, pesticides, etc.

5. Fertilizers

Assess risk of all production inputs to reduce contamination risk.

- a. Chemical, Non-organic Fertilizer
 - i. Follow manufacturer's instructions for usage and storage.
 - ii. All fertilizers shall be properly stored and labeled.
- b. Fertilizers Containing Manures, Composts or Biosolids
 - i. Do not use untreated manure. Only properly treated manures and biosolids are allowed for use in tomato fields.
 - ii. All manure should be properly composted and incorporated into the soil no less than 60 days prior to harvest. (California Code of Regulations Title 14, Division 7; and Title 27, Division 2.)
 - iii. If treated manures or biosolids are used, records of composition, dates of treatment, methods utilized, application dates and any test results or process verification data demonstrating compliance with microbial standards must be documented.
- c. Inert substrates shall be treated in such a way as not to pose a risk of contamination.
- d. Fertilizer mixing areas shall not present a contamination hazard to tomatoes.

6. Tomato or Equipment Sanitizing Agents Used During Harvest

- a. EPA considers any chemical making an antimicrobial claim, including those used to sanitize equipment and tomatoes, to be a pesticide.
- b. Sanitizing chemicals used must comply with all requirements of EPA registration and any federal, state or local regulations.
- c. Sanitizing chemicals must be appropriately registered for such use and must be used in accordance with label directions. Sanitizing chemicals uses shall be documented.
- d. Chemicals used on product that are not registered pesticides may be permitted for food contact use if allowed under regulations of the U.S. Food and Drug Administration (FDA).

7. Equipment and Containers

- a. Any surfaces or equipment intended to touch fresh produce is a food contact surface and must be cleaned and sanitized at a frequency sufficient to prevent the surfaces from becoming a source of contamination.
 - b. Reusable containers and food contact equipment and utensils shall be constructed of impervious materials that can be easily cleaned and sanitized.
 - c. Clean and sanitize containers, bins, food contact equipment and utensils at least daily during use, or more often as needed, to remove sand, grit, dirt, and other residue.
 - d. Establish routine cleaning and sanitizing procedures and maintain these standard operating procedures in writing.
 - e. Maintain all equipment and surfaces in such a way as to minimize contamination of and injury to tomatoes.
 - f. All containers shall be marked for their intended use (trash, etc.).
- 8. Employee Hygiene Policies and Employee Training**
- a. Facilities shall develop and implement written GAP/GMP and Employee Hygiene Practices.
 - b. All employees shall receive mandatory safe product handling and personal hygiene education at time of hire and at least annually.
 - c. Training sessions shall be documented, with records kept of topics covered, date, names and signatures of those in attendance.
 - d. Periodic (e.g., daily, weekly, monthly, quarterly, as appropriate) self audits shall be used to verify and document compliance with worker hygiene and sanitation policies and practices.
- 9. Handwashing and Toilet Facilities**
- a. Restrooms shall be available to all personnel (at least one toilet for every 20 employees) and located in proximity to greenhouse, but should not be a source of contamination. Restrooms should not open directly into greenhouse production areas. Restrooms that do open directly into greenhouse production areas should be equipped with self-closing mechanisms or have a maze-type entrance/exit.
 - b. Toilet facilities shall be maintained in a clean and sanitary condition and adequately stocked with soap, water for handwashing that meets the microbial standard for potable water (including hot water where available), single use towels, toilet paper, etc.
 - c. A written record of cleaning shall be kept.
 - d. Handwashing signs shall be posted in restrooms. Signs should be multilingual or pictorial, as appropriate to the workforce.
 - e. Other Hand-washing facilities.
Hand-washing facilities shall be adequate in number and location, and be furnished with running water at a suitable temperature. Compliance with this requirement may be accomplished by providing:
 - i. Hand-washing and, where appropriate, hand-sanitizing facilities at each location where good sanitary practices require their use.

- ii. Soap and water for handwashing that meets the microbial standard for potable water (including hot water where available).
 - iii. Single use towels or air drying devices.
 - iv. Handwashing signs posted at all stations. Signs should be multilingual or pictorial, as appropriate to the workforce
 - v. Refuse receptacles that are constructed and maintained in a manner that protects against contamination of tomatoes.
- f. Provisions shall be in place for capture, disposal or drainage of gray water in a manner that prevents contamination of the environment.

10. Handwashing Practices

- a. Policies shall require hand washing with soap and water at the appropriate time such as before starting work, after breaks, visiting the locker rooms, using the restrooms, sneezing, coughing, touching any unsanitary surface or material or anytime hands become soiled.
- b. Sanitizers may not be used in lieu of proper handwashing, but should be used in addition to handwashing.
- c. If gloves are used when contacting tomatoes or food contact surfaces, policies will clearly communicate that gloves are not a replacement for good handwashing practices, and that single use gloves must be replaced, and reusable gloves must be washed and sanitized, whenever they become soiled.

11. Gloves

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If tomatoes are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all greenhouse operators who handle tomatoes, both picking and packing.

- a. Disposable Gloves
 - i. The use of single use disposable gloves for hand contact with tomatoes is recommended.
 - ii. Hands shall be washed before putting on gloves.
 - iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
 - iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- b. Reusable Gloves
 - i. Reusable gloves are not recommended for hand contact with tomatoes but, if used, the following requirements shall apply.
 - ii. The gloves must be made of materials that can be readily cleaned and sanitized.
 - iii. It is the responsibility of the production company to ensure that gloves are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized daily by a procedure validated

to eliminate any potential contamination of public health concern. Gloves shall not be permitted to be taken home by workers for cleaning and sanitizing.

- iv. Appropriately cleaned and sanitized gloves shall be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- v. Gloves that have come in contact with the ground or other non-food contact surfaces shall be changed.

12. Health Policies

- a. Worker health policies shall restrict employees with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses from working with or in the vicinity of tomatoes or tomato contact surfaces.
- b. Employees with open sores, cuts, burns, boils, etc., shall report to a supervisor before working. The supervisor shall determine if the employee will be allowed to work with or in the vicinity of tomatoes or tomato contact surfaces.
- c. Establish and communicate a clear policy that prohibits workers who report or are observed to have diarrhea or symptoms of illness from activities that may contact tomatoes or tomato contact surfaces.

13. Other Hygienic Practices

- a. Employees shall have designated areas for eating, drinking, smoking, breaks, personal effects, etc.
- b. There shall be a written policy prohibiting eating, drinking, chewing gum, and using tobacco in fields or facilities except in clearly designated areas.
- c. Drinking water shall be provided with either fountains or single use containers. Drinking water containers shall be handled in a manner that prevents them from becoming sources of contamination.
- d. There shall be a written policy restricting jewelry in the workplace.
- e. Employees shall wear clean and suitable outer garments. Consider, as appropriate to the operation, hair restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
- f. Outer garments and gloves shall be changed after cleaning drains, restrooms or other activities that may result in contamination.
- g. Other good food handling techniques shall be developed as appropriate to the specific operation to prevent cross contamination.
- h. Glass containers shall not be allowed in the greenhouse.
- i. A glass clean up procedure shall be developed and employees trained accordingly.

14. Cleaning and Washing Procedures

When tomatoes are cleaned with cloths or by washing, the manner in which tomatoes packed in the greenhouse are cleaned is of major importance and can be

- a source of either direct contamination or cross contamination with potentially harmful microorganisms.
- a. Cleaning Materials Including Cloths
 - i. Firms packing tomatoes in the greenhouse must have a written policy for the use and sanitization of cloths used for cleaning.
 - ii. If materials, such as cloths, are used repeatedly for cleaning tomatoes, special steps shall be taken to ensure they do not become a source of direct or cross contamination.
 - iii. If cloths are moistened to facilitate cleaning, only single use, potable water shall be used. Cloths shall not be moistened by repeated immersion in a bucket.
 - iv. Cleaning cloths should be replaced after each box packed.
 - v. It is the responsibility of the greenhouse to ensure that cloths are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized before reuse, following a procedure validated to eliminate any potential contamination of public health concern. Cloths shall not be permitted to be taken home by workers for cleaning and sanitizing.
 - vi. Documentation of the training of workers in appropriate use of cloths for cleaning must be available.
 - b. Washing

Internalization of bacteria into the stem scar has been demonstrated with tomatoes submerged in water that is cooler in temperature than the pulp of the tomato. When the tomato cools, a vacuum is created causing water, and potentially pathogens, to be drawn into pores on the tomatoes. Therefore, water temperature relative to pulp temperature, and water quality, are critical considerations for maintaining the safety of the product.

 - i. The water used for washing tomatoes shall be of microbial quality equivalent to potable water and have sufficient sanitizer to prevent cross contamination. The water antimicrobial shall be monitored at a frequency sufficient to maintain sanitary conditions.
 - ii. Cold water immersion as a cooling technique shall not be done.
 - iii. Water temperature shall be maintained at least 10°F warmer than the pulp temperature of the tomato. Water temperature shall be monitored at least hourly.
 - iv. A written procedure for washing and sanitization as well as records of implementation of the procedure shall be maintained.
 - v. Products for sanitization of wash water may include:
 - (1) Hypochlorite
 - (2) Gaseous ozone
 - (3) Aqueous ozone (ozonated water)
 - (4) Peroxyacetic acid
 - (5) Aqueous chlorine dioxide
 - (6) Other EPA-registered, appropriately labeled agents that have been shown to reduce the level of pathogens such as *Salmonella* or *E. coli* O157:H7 by three logs (99.9%) or more.
 - c. All cleaning procedures shall be documented.

15. Packaging Materials

The greenhouse shall minimize the risk of contamination by adopting written plans that address each of the following issues:

- a. All packaging material shall be inspected upon arrival and stored in a clean manner.
- b. Pallets used to keep finished product off the floor shall be visually clean.
- c. Bins, trays, and pallets shall be maintained in clean operational condition according to SSOPs.
- d. Bins, trays, and pallets shall be stored in a secure, clean location.
- e. Finished produce containers shall be distinguished from those serving other purposes.
- f. Storage locations shall be kept free of evidence of pest infestation, including but not limited to rodents, birds or insects.

16. Record Keeping and Traceability

All levels of the tomato supply chain shall maintain adequate traceability to a minimum of one step forward (immediate next recipient) and one step back (immediate previous supplier).

- a. Greenhouse Packing
 - i. Documentation of greenhouse packed tomatoes shall include sufficient information about the harvest (i.e., greenhouse location and history, grower, personnel/crew involved in the harvesting and packing) as well as the customer receiving the product to allow for the appropriate tracing of product.
 - ii. Containers shall be accurately labeled with commodity name, greenhouse firm name and information sufficient to allow for greenhouse identification and date of harvest/pack.
 - iii. If using clean and sanitary reusable containers, ensure that labels are accurate prior to packing.
- b. Packinghouse Packed Greenhouse Tomatoes
 - i. The greenhouse shall maintain supply chain information available to the packinghouse to facilitate accurate traceability; i.e., quantity, greenhouse identification and date of harvest/pack.
 - c. Customer-ready containers shall be labeled to identify when the product has been greenhouse packed without washing.
 - d. A documented recall program, including a traceability system to track tomatoes forward to customers, shall be developed and tested at least annually. A record of this test shall be kept on file.
 - e. All records recommended in this section shall be maintained for at least two years and be readily available.

VII. Packinghouse

A well designed and managed packinghouse and food safety program can greatly reduce the risk of chemical, physical and microbial contamination but the risk can

never be totally eliminated. Poor or inconsistent food safety practices can greatly increase this risk. Sanitary conditions and proper food safety practices are critical to product safety.

The needs of each packinghouse may vary due to location, environment, the volume of tomatoes handled, the type of tomatoes handled, local regulations and many other variables but the overall goal of any effective packinghouse food safety program is to minimize risk of contamination. There may be multiple strategies for effectively dealing with individual hazards.

The general requirements for the packing of fresh tomatoes are that facilities shall meet the requirements for packinghouse and grounds, processing, packing, holding and retailing of foods, equipment and utensils, sanitary facilities and controls, sanitary operations and processes and controls as provided for under 21 CFR Part 110 or its equivalent, as appropriate to the facility. This shall extend to all aspects of the packinghouse, including ripening and holding rooms.

1. Grounds

- a. The grounds about a packinghouse under the control of the operator shall be kept in a condition that will protect against contamination of tomatoes. The methods for adequate maintenance of grounds include, but are not limited to:
 - i. Properly storing equipment, removing litter and waste, and cutting weeds or grass within the immediate vicinity of the plant buildings or structures that may constitute an attractant, breeding place, or harborage for pests.
 - ii. Maintaining roads, yards, and parking lots so that they do not constitute a source of contamination in areas where tomatoes are exposed.
 - iii. Adequately draining areas that may contribute contamination to food by seepage, foot-borne filth, or providing a breeding place for pests.
 - iv. Operating systems for waste treatment and disposal in an adequate manner so that they do not constitute a source of contamination in areas where tomatoes are exposed.
- b. If the packinghouse grounds are bordered by grounds not under the operator's control and not maintained in the manner described in paragraph (a) (i) through (iii) of this section, care shall be exercised in the packinghouse by inspection, extermination, or other means to exclude pests, dirt, and filth that may be a source of food contamination.
- c. It is recommended that the land adjacent to the packinghouse should not be a significant source of contamination. Hazards may include but not be limited to livestock, wildlife, landfills, chemical plants, etc.
- d. Appropriate measures shall be taken to minimize any food safety hazards from surrounding land use or environment. These measures may include berms, fences, ditches, buffer zones or other strategies to effectively mitigate any hazards. Records shall be kept of the measures used.

2. General Maintenance

- a. Buildings, fixtures, and other physical facilities of the packinghouse shall be maintained in a clean and sanitary condition and shall be kept in repair sufficient to prevent food from becoming adulterated. Cleaning and sanitizing of utensils and equipment shall be conducted in a manner that protects against contamination of food, food contact surfaces or packaging materials.
- b. Establish Sanitation Standard Operating Procedures (SSOPs) related to the general cleaning and sanitation of the facility, including maintenance of dump tanks, bump pads, brush rollers, sponge rollers, and other equipment to minimize damage to fruit. While a cleaning schedule is part of SSOPs, the volume of tomatoes handled may require more frequent attention to cleaning. Minor surface injuries such as abrasions that might not result in the culling of a tomato have been shown to promote survival of pathogens, especially in combination with fruit waxes.
- c. Cleaning compounds, sanitizers, pesticides and all other chemicals shall be labeled, handled, and stored in a manner that does not pose a risk of contamination to food, food-contact surfaces, or food packaging materials. Food-grade and non-food grade chemicals shall be kept separate in order to minimize the risk of accidentally substituting one for the other. These products shall be used in accordance with manufacturers' label instructions and all federal, state, and local regulations shall be followed.
- d. Pest control
Rodents, birds, amphibians (e.g., tree frogs), reptiles and other facility pests.
 - i. A written and implemented pest control program shall be in place to protect the packinghouse from pests.
 - ii. The use of insecticides or rodenticides is permitted only under precautions and restrictions that will protect against the contamination of food, food-contact surfaces, and food-packaging materials. Generally, only non-toxic traps and pest control devices are used inside the packinghouse.
 - iii. No domestic animals or other animals are permitted in areas where tomatoes are packed, handled or stored.
- e. Sanitation of food-contact surfaces.
 - i. All food-contact surfaces, including utensils and food-contact surfaces of equipment, shall be cleaned and sanitized in keeping with an established, documented sanitation standard operating procedure (SSOP) to protect against contamination of food.
 - ii. Non-food-contact surfaces shall be cleaned and sanitized in accordance to the facility's SSOP or more frequently if necessary to protect tomatoes from contamination.
 - iii. Single-service articles (such as utensils intended for one-time use, paper cups, and paper towels) should be stored in appropriate containers and shall be handled, dispensed, used, and disposed of in a manner that protects against contamination of food or food-contact surfaces.
 - iv. Sanitizing products shall be registered for their intended use and cleaning and sanitizing products used according to manufacturers' label instructions.

- f. Cleaned and sanitized portable equipment with food-contact surfaces and utensils should be stored in a location and manner that protects food-contact surfaces from contamination.
- 3. Water Supply and Plumbing**
- a. The water supply shall be sufficient for the operations intended and shall be derived from an adequate source. Any water that contacts food or food-contact surfaces, intended or unintended, shall meet the microbial standards as set forth by the U.S. Environmental Protection Agency for drinking water.
 - b. Running water shall be available at suitable temperature and volume where it is needed for packing, cleaning, sanitation, and employee hygiene.
 - c. **Plumbing**
Plumbing shall be of adequate size and design and adequately installed and maintained to:
 - i. Supply sufficient quantities of water to required locations throughout the packinghouse.
 - ii. Properly convey sewage and liquid disposable waste from the packinghouse in a manner that does not pose a risk of contamination to food, water supplies, equipment, or utensils or create an unsanitary condition.
 - iii. Provide adequate floor drainage in all areas where floors are subject to flooding-type cleaning or where normal operations release or discharge water or other liquid waste on the floor.
 - iv. Protect against backflow from, or cross-connection between, piping systems that discharge wastewater or sewage and piping systems that carry water for food or food manufacturing. Appropriate backflow prevention devices (e.g., air gaps, backflow valves) shall be used to protect water quality at the source and during distribution and use.
 - d. **Sewage disposal**
Sewage shall be properly disposed into appropriate sewer, septic or alternative systems that do not pose a risk of contamination.
- 4. Trash and Tomato Waste Disposal**
- Trash and tomato waste shall be handled, stored and disposed in a manner that minimizes odors, minimizes the potential for attracting or harboring pests, and minimizes the risk of contamination of tomatoes, food and non-food contact surfaces, and water supplies.
- 5. Receiving**
- a. Ensure tomatoes are from suppliers following Good Agricultural Practices or other recognized, similar food safety requirements, and these guidelines.
 - b. Establish a written procedure for inspecting, accepting or rejecting incoming loads.
 - c. Ensure that incoming documentation provides sufficient information to facilitate traceability to the source.
 - d. Records of incoming inspections shall be maintained.

6. Packaging Materials

- a. Packaging material shall be inspected upon arrival. The goal is to ensure that packaging material is free from contamination upon arrival and that materials are stored in a means as to prevent contamination.
- b. The packinghouse shall minimize the risk of contamination by adopting written plans that address each of the following issues:
 - i. All packaging material is inspected upon arrival, stored in a clean manner.
 - ii. Pallets used to keep finished product off the floor are visually clean.
 - iii. Bins, trays, and pallets are maintained in clean operational condition according to SSOPs.
 - iv. Bins, trays, and pallets are stored in a secure, clean location.
 - v. Finished produce containers are distinguished from those serving other purposes.
 - vi. There is no evidence of rodent, bird, or insect infestations in the storage locations.

7. Postharvest Washing of Fresh Tomatoes

Water quality, both in the field and at the packinghouse, is a critical issue for achieving and maintaining safety. When tomatoes are washed, the quality of post harvest water that contacts fresh produce during postharvest flume transport, cleaning, grading, and surface treatment application is widely recognized as an essential pathogen control point for fresh produce.

- a. Water Quality

Packinghouses shall follow Good Manufacturing Practices (GMPs) to ensure that all water is of adequate quality throughout all packing operations from start-up to the last packed unit. Water used in postharvest operations must be changed as necessary for the given operation; water used in the first dump tank may need to be changed more frequently than water used in subsequent processes.

 - i. Follow GMPs to ensure that all water is of adequate quality at start-up and throughout all packing operations.
 - ii. Documentation of microbial test results for the source water shall be maintained available for inspection within a reasonable amount of time.
 - iii. The dump tank shall be cleaned and the water changed daily and more often as needed.
 - iv. Untreated surface waters are not permitted for any uses in packinghouses or other postharvest contact.
- b. Water Quality Requirements
 - i. While the general consensus is that a packinghouse operator shall use water of appropriate microbial quality for the postharvest processes to be performed, some packinghouses are regulated to ensure that water is in keeping with approved standards. As a matter of reference, those standards are as follows:
 - ii. State of Florida and California Tomato Farmers Cooperative
According to regulations in the State of Florida, only water that meets the

microbial standards for potable water as set forth by the U.S. Environmental Protection Agency in 40 CFR Part 141.63 (<2 MPN generic *E. coli* /100ml) may be used in the packing facility. California Tomato Farmers Cooperative has adopted the same standards.

- c. Temperature and Disinfection of Water Supplies Used in Postharvest Applications.
Internalization of bacteria into the stem scar has been demonstrated with tomatoes submerged in water that is cooler in temperature than the pulp of the tomato. When the tomato cools, a vacuum is created causing water, and potentially pathogens, to be drawn into pores on the tomatoes. Therefore, water temperature relative to pulp temperature, and water quality, are critical considerations for maintaining the safety of the product.
 - i. The water used for washing tomatoes shall be of microbial quality equivalent to potable water and have sufficient sanitizer to prevent cross contamination. The water antimicrobial shall be monitored at a frequency sufficient to maintain sanitary conditions.
 - ii. Cold water immersion as a cooling technique shall not be done.
 - iii. Water temperature shall be maintained at least 10°F warmer than the pulp temperature of the tomato. Water temperature shall be monitored at least hourly.
 - iv. If water quality maintenance is based on manually monitoring chlorine levels, then free chlorine and pH must be monitored at least at start-up and every hour thereafter, and recorded. Total chlorine measurements do not accurately represent antimicrobial effectiveness. It is critical that pH be maintained in the range of 6.5-7.5 to ensure that chlorine is effective. Measuring devices must have sufficient precision to ensure levels are within established limits and accuracy should be verified periodically.
 - v. If water quality maintenance is based on Oxidation Reduction Potential (ORP), maintain an ORP of at least 650 mV.
 - vi. Other water disinfectants may be used, but must be registered with U.S. EPA for its intended purposes. If water quality maintenance is based on other water disinfectant treatments, follow manufacturer recommendations for monitoring and limits.
 - vii. When monitoring oxidant concentrations electronically, the monitoring should be verified against a chemical test that measures disinfectant levels (and pH where applicable) at start-up and at least every 2 hours thereafter, and recorded.
 - viii. Electronic monitoring devices shall be calibrated at a frequency sufficient to ensure continuous accuracy.
- d. Removal of Injured/Damaged Tomatoes
Establish procedures to identify and remove injured and damaged tomatoes from dump tanks to reduce microbial contamination. To the degree possible, damaged, soft or decayed tomatoes should be removed whenever detected in order to minimize microbial contamination.

8. Employee Hygiene, Written Policies and Employee Training

- a. Facilities shall develop and implement written GMP and Employee Hygiene Practices.
- b. All employees shall receive mandatory safe product handling and personal hygiene education at time of hire and at least annually.
- c. Training sessions shall be documented, with records kept of topics covered, date, names and signatures of those in attendance.
- d. Periodic (e.g., daily, weekly, monthly, quarterly, as appropriate) self audits shall be used to verify and document compliance with worker hygiene and sanitation policies and practices.

9. Handwashing And Toilet Facilities

- a. Restrooms shall be available to all personnel (at least one toilet for every 20 employees) and located in proximity to food handling areas, but not so close that they could be a source of contamination. Restrooms should not open directly into food handling areas. Restrooms that do open directly into food handling areas should be equipped with self-closing mechanisms or have a maze-type entrance/exit.
- b. Toilet facilities shall be maintained in a clean and sanitary condition and adequately stocked with soap, water for handwashing that meets the microbial standard for potable water (including hot water where available), single use towels, toilet paper, etc.
- c. A written record of cleaning shall be kept.
- d. Restroom cleaning equipment shall be labeled and segregated so as not to pose a risk of contamination.
- e. Handwashing signs shall be posted in restrooms. Signs should be multilingual or pictorial, as appropriate to the workforce.
- f. Other Hand-washing facilities.
Hand-washing facilities shall be adequate in number and location, and be furnished with running water at a suitable temperature. Compliance with this requirement may be accomplished by providing:
 - i. Hand-washing and, where appropriate, hand-sanitizing facilities at each location where good sanitary practices require their use.
 - ii. Soap and water for handwashing that meets the microbial standard for potable water (including hot water where available).
 - iii. Single use towels or air drying devices.
 - iv. Handwashing signs shall be posted at all stations . Signs should be multilingual or pictorial, as appropriate to the workforce
 - v. Refuse receptacles that are constructed and maintained in a manner that protects against contamination of food.
 - vi. Sanitizers may not be used in lieu of proper handwashing.
 - vii. Provisions shall be in place for capture, disposal or drainage of gray water in a manner that prevents contamination of the environment.

10. Handwashing Practices

- a. Written policies shall require hand washing with soap and water at the appropriate time such as before starting work, after breaks, visiting the locker

rooms, using the restrooms, sneezing, coughing, touching any unsanitary surface or material or anytime hands become soiled.

- b. If gloves are used when contacting tomatoes or food contact surfaces, policies will clearly communicate that gloves are not a replacement for good handwashing practices, and that single use gloves must be replaced, and reusable gloves must be washed and sanitized, whenever they become soiled.

11. Health Policies

- a. Worker health policies shall restrict employees with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses from working with or in the vicinity of tomatoes or tomato contact surfaces.
- b. Employees with open sores, cuts, burns, boils, etc., shall report to a supervisor before working. The supervisor shall determine if the employee will be allowed to work with or in the vicinity of tomatoes or tomato contact surfaces.
- c. Establish and communicate a clear policy that prohibits workers who report or are observed to have diarrhea or symptoms of illness from activities that may contact tomatoes or tomato contact surfaces.

12. Other Hygienic Practices

- a. Employees shall have designated areas for eating, drinking, smoking, breaks, personal effects, etc.
- b. There shall be a written policy prohibiting eating, drinking, chewing gum, and using tobacco in fields or facilities except in clearly designated areas.
- c. Drinking water shall be provided with either fountains or single use containers. Drinking water containers shall be handled in a manner that prevents them from becoming sources of contamination.
- d. There shall be a written policy restricting jewelry in the workplace.
- e. Employees shall wear clean and suitable outer garments. Consider, as appropriate to the operation, hair restraints, plastic aprons and sleeves, restricting nail polish or false nails, and empty pockets above the waist.
- f. Outer garments and gloves shall be changed after cleaning drains, restrooms or other activities that may result in contamination.
- g. Other good food handling techniques shall be developed as appropriate to the specific operation to prevent cross contamination.

13. Gloves

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If tomatoes are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all operators who handle tomatoes in the packinghouse.

- a. Disposable Gloves
 - i. The use of single use disposable gloves for hand contact with tomatoes is recommended.

- ii. Hands shall be washed before putting on gloves.
- iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
- iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- b. Reusable Gloves
 - i. Reusable gloves are not recommended for hand contact with tomatoes but, if used, the following requirements shall apply.
 - ii. The gloves must be made of materials that can be readily cleaned and sanitized.
 - iii. It is the responsibility of the production company to ensure that gloves are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves shall not be permitted to be taken home by workers for cleaning and sanitizing.
 - iv. Appropriately cleaned and sanitized gloves shall be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
 - v. Gloves that have come in contact with the ground or other non-food contact surfaces shall be changed.

14. Storage, Ripening Rooms and Distribution Facilities

- a. Storage ripening rooms and distribution facilities shall be kept clean and sanitary, with debris minimized. All walls, floors, ceilings and other surfaces shall be systematically and periodically cleaned and sanitized to avoid the build-up of mold or other potential contaminants.
- b. Product shall be palletized to avoid direct contact with the floor.
- c. A perimeter between pallets and walls shall be maintained to facilitate visual inspection of pest control and sanitation.
- d. Product on hold or rejected, shall be clearly identified and segregated from other product.
- e. There shall be no storage of trash or waste in the storage or ripening rooms.

15. Transportation

- a. Transportation vehicles should be sufficiently clean so as not to be a source of contamination.
- b. Inspect transportation vehicles for cleanliness, odors, visible dirt and debris before loading. If needed, the vehicle shall be cleaned or cleaned and sanitized by a documented procedure prior to loading.
- c. If non-dedicated vehicles are used for transportation, verify records of prior loads. Should there be any doubt as to previous loads transported or a potential risk from microbial contamination, such as from raw animal

proteins, garbage or other refuse, then the vehicle shall be cleaned and sanitized by a documented procedure prior to use.

16. Record Keeping, Product Labeling and Traceability

All levels of the tomato supply chain shall maintain adequate traceability to a minimum of one step forward (immediate next recipient) and one step back (immediate previous supplier).

- a. Documentation maintained by the packinghouse shall include sufficient information about the source (i.e., production location, lot identification, personnel/crew involved in the harvesting) as well as the customer receiving the product to allow for the appropriate tracing of product.
- b. The packer shall have established procedures to ensure that traceability information about the source is retained with product as it moves through the packinghouse processes to shipping.
- c. Corrugated containers shall be new and accurately labeled with commodity name, packinghouse firm name, and lot identification sufficient to allow for accurate traceability.
- d. Only containers able to be cleaned and sanitized (e.g., reusable plastic containers, “RPCs”) may be reused. If using reusable containers, they shall be cleaned and sanitized before reuse. Ensure that labels are accurate prior to reusing for packing.
- e. A documented recall program, including a traceability system to track tomatoes forward to customers, shall be developed and tested at least annually. A record of this test shall be kept on file.
- f. All records recommended in this section shall be maintained for at least two years and be readily available.

VIII. Repacking and Other Distribution Operations

Everyone in the supply chain that handles tomatoes, including repackers, terminal markets and other facilities, has a responsibility to ensure and maintain the safety and traceability of the product.

1. Prerequisites for Repacking of Tomatoes

Repacking of tomatoes must meet all requirements included in this document in Section V – Packinghouse, including receiving, water supply and plumbing, trash and tomato waste disposal, general maintenance, packaging material requirements, postharvest washing of fresh tomatoes, employee hygiene, written policies and employee training, handwashing and toilet facilities, handwashing practices, health policies, other hygienic practices, gloves, storage and ripening rooms, product labeling/traceability, and transportation, in addition to the requirements further detailed in this Section on repacking.

2. Traceability, Lot Identification

All levels of the tomato supply chain shall maintain adequate traceability to a minimum of one step forward (immediate next recipient) and one step back

(immediate previous supplier). In addition to requirements described in Section VII- Packinghouse, repacking operations shall:

- a. Establish procedures to maintain lot identity of tomatoes throughout the repacking process.
 - i. Documentation maintained by the repacker for each lot received shall include sufficient information about the source (i.e., production location, supplier identification, lot identification) as well as the customer receiving the product to allow for the appropriate tracing of product.
 - ii. Ensure that the information is retained with product as it moves through the packinghouse processes to shipping.
 - iii. It is preferred that incoming lots are not mixed/commingled during repacking. However, if incoming lots are mixed/commingled, then documentation shall be maintained to identify all included sources.
 - iv. Traceability records shall be readily available.
 - v. Effectiveness of these procedures shall be tested at least annually. A record of this test shall be kept on file.
- b. If tomato lots are not mixed/commingled, then tomatoes may be repacked into their original boxes. When original containers of a packinghouse supplier are to be reused, and the tomatoes are removed and resorted, and returned to that clean and sanitary container the repacker must label the container as being repacked, the commodity, repacker name and provide lot identification.
- c. If tomato lots are commingled, then tomatoes should be repacked into new boxes that are clean and sanitary and accurately labeled with the repacker's information and lot identification that maintains the integrity of traceability information to the included sources. In the event of a recall, all lots in the commingled lot are affected.
- d. Used boxes may only be used as secondary shipping containers, provided that the original identification information on the box has been obliterated or otherwise made clear that it is no longer accurate. Used boxes may only be used as primary containers for mixed/commingled lots if they are clean, sanitary and the original identification information on the box is still accurate to the original source of all of the tomatoes in the box.

3. Cleaning Materials Including Cloths

If materials, such as cloths, are used repeatedly for cleaning tomatoes, special steps shall be taken to ensure they do not become a source of direct or cross contamination.

- a. Firms repacking must have a written policy for the use and sanitization of cloths used for cleaning tomatoes.
- b. If cloths are moistened to facilitate cleaning, only single use, potable water shall be used. Cloths shall not be moistened by repeated immersion in a bucket.
- c. Cleaning cloths should be replaced after each box packed.
- d. Cloths shall be washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized by the firm before reuse following a procedure validated to eliminate any potential

contamination of public health concern. Cloths shall not be permitted to be taken home by workers for cleaning and sanitizing.

- e. Documentation of the training of workers in appropriate use of cloths for cleaning must be available.
4. **Cross-docking and Terminal Markets**
 - a. Tomato handling at facilities that primarily redistribute tomatoes, whether or not they repack, sort or otherwise change the contents in the container, are also required to follow the recommendations in these guidelines, as appropriate to their specific operation.

IX. Fresh-cut Processing (Value-Added)

Processing fresh produce into fresh-cut products increases the risk of bacterial growth and contamination by breaking the natural exterior barrier of the produce. The release of plant cellular fluids when tomatoes are cut provides a nutritive medium in which pathogens, if present, can survive or grow. The processing of fresh tomatoes without proper sanitation procedures in the processing environment increases the potential for contamination by pathogens. In addition, the degree of handling and product mixing common to many fresh-cut processing operations can provide opportunities for contamination and for spreading contamination through a large volume of product.

There have been recorded incidents where facilities have received unwashed tomatoes, placed them into ripening rooms, then into ice water baths to firm the tomatoes for processing. Such practices may lead to water infiltration and the microbial contamination of the tomatoes. It is essential processors are familiar with their raw material suppliers, whether the tomatoes have been washed and develop appropriate steps to maintain water quality and minimize the potential for infiltration.

1. **Receiving**
 - a. Ensure tomatoes are from suppliers following Good Agricultural Practices and/or Good Manufacturing Practices, as appropriate, or other recognized, similar food safety requirements, and these guidelines.
 - b. Establish a written procedure for inspecting, accepting or rejecting incoming loads.
 - c. Ensure that incoming documentation provides sufficient information to facilitate traceability to the source.
 - d. Records of incoming inspections shall be maintained.
2. **Facility Sanitation**

Comprehensive sanitation programs, with trained sanitation personnel, reduces the risk of product microbial contamination from equipment, floors and drains. Improper use of chemicals may lead to inadequately cleaned equipment or chemical contamination of equipment. A written pest control program will reduce

the risk of rodent, insect or bird infestations of the facility, which could lead to product contamination.

- a. Raw, processing and finished product segregation shall be addressed by using physical barriers or other adequate control separating these areas and the use of disinfectant foam/dip at the entrance to processing area.
- b. A documented sanitation program shall be in place that meets regulatory requirements and ensures the cleanliness of product handling equipment and facility, including storage, processing and other rooms.
- c. Facilities shall define and maintain cleaning frequencies: include peripherals (walls, ceilings, light fixtures, cooling units, etc).
- d. Chemicals shall be registered with U.S. EPA and used in accordance with label instructions for time, temperature, concentration and application.
- e. Facilities should establish a sampling program for incoming chemicals at a given frequency that verifies the suppliers' Certificates of Analysis (COA).
- f. A written program shall be implemented that monitors adequacy and compliance of the sanitation program.
- g. The results of the verification program shall be documented and monitored to identify areas of opportunity for continuous improvement.
- h. A program (e.g., color coding) shall be in place to readily identify and segregate food contact vs. non-food contact equipment and utensils used in the sanitation program.
- i. Hands shall be cleaned and sanitized prior to handling clean equipment.
- j. Product shall be protected or removed during cleaning and sanitizing operations to reduce the potential for cross contamination.
- k. Sanitation personnel shall not spray floors or drains with high-pressure hoses (resulting aerosol may contaminate product surfaces).
- l. Sanitation personnel shall remove excess water from cleaned equipment.
- m. Sanitation personnel shall not place product contact equipment directly onto the floor.
- n. Facilities shall properly identify and segregate equipment used to clean drains and floors and shall not use equipment aids with wooden or hollow handles.
- o. A program shall be in place that minimizes or eliminates the potential for environmental pathogens. Environmental swabs should be used to verify the effectiveness of the program.
- p. A preventive maintenance program shall be in place that identifies areas of opportunities for continuous improvement; e.g., use only food grade lubricants when possible, avoid over-lubricating and wipe off excess, welds should be smooth and sanitary, catch pans shall be placed under motors and bearings which are located over product zones or traffic areas, equipment should be free of rust.
- q. Facilities shall develop and implement a written pest control program to include a licensed pest control technician, adequate monitoring frequencies and pest control devices to control the infiltration of rodents and insect monitoring/ control. Pesticides shall be EPA approved for the methods, target pests, and locations where they are used.

3. Employee Health and Hygiene

- a. Facilities shall develop and implement written GMP and Employee Hygiene Practices, with mandatory training for all employees at time of hire and at least annually.
- b. Worker health policies shall restrict employees with symptoms of diarrhea, fever, vomiting or other potentially infectious illnesses from working with or in the vicinity of tomatoes or tomato contact surfaces.
- c. Employees with open sores, cuts, burns, boils, etc., shall report to a supervisor before working. The supervisor shall determine if the employee will be allowed to work with or in the vicinity of tomatoes or tomato contact surfaces.
- d. Establish and communicate a clear policy that prohibits workers who report or are observed to have diarrhea or symptoms of illness from activities that may contact tomatoes or tomato contact surfaces.
- e. Written policies shall require hand washing with soap and water at the appropriate time such as before starting work, after breaks, visiting the locker rooms, using the restrooms, sneezing, coughing, touching any unsanitary surface or material or anytime hands become soiled.
- f. Policies shall require employees working with open products to wear clean outer garments, gloves and hairnets.
- g. Plastic aprons and sleeves may also be required.
- h. Written procedures shall be developed to define conditions when outer garments and gloves shall be changed, such as after cleaning drains, restrooms or other similar areas.

4. Gloves

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If tomatoes are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all operators who handle tomatoes in processing facilities.

- a. Disposable Gloves
 - i. The use of single use disposable gloves for hand contact with tomatoes is recommended.
 - ii. Hands shall be washed before putting on gloves.
 - iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
 - iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- b. Reusable Gloves
 - i. Reusable gloves are not recommended for hand contact with tomatoes but, if used, the following requirements shall apply.
 - ii. The gloves must be made of materials that can be readily cleaned and sanitized.

- iii. It is the responsibility of the production company to ensure that gloves are washed in hot water ($\geq 140^{\circ}\text{F}$) and sanitized daily by a procedure validated to eliminate any potential contamination of public health concern. Gloves shall not be permitted to be taken home by workers for cleaning and sanitizing.
- iv. Appropriately cleaned and sanitized gloves shall be issued each day and at such times as needed during the day. Reusable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- v. Gloves that have come in contact with the ground or other non-food contact surfaces shall be changed.

5. **Raw, Intact Product Storage**

- a. Storage containers as well as storage facilities shall be designed with the proper materials and construction to facilitate cleaning.
- b. Containers and product shall be stored in a manner that minimizes the potential for contamination. This may include, but is not limited to, protecting stored containers and product with liners/covers and ensuring storage areas are clean and devoid of pests.
- c. Storage temperature of whole, intact tomatoes is critical to maintaining the quality of the product. Tomatoes stored at refrigeration temperatures for extended periods of time may result in decreased quality of raw product, increasing the likelihood of damaging the product during processing. Storage temperatures should also be maintained at sufficient temperatures to ensure required finished product temperatures are achieved.

6. **Sorting**

Use of damaged product or further damaging tomatoes with poor handling practices could provide openings for colonization and growth of pathogens. It is important to remove damaged or decayed raw material and maintain gentle handling practices to reduce the risk of contamination.

- a. Secondary containers used for packing sorted tomatoes shall be maintained in clean and sanitary condition.
- b. Tomatoes that show signs of physical damage such as skin breaks or decay shall be culled from processing. Culled tomatoes shall be disposed of properly so as not to serve as a contaminant.
- c. The sorting process shall be performed in a manner ensuring that further damage to the tomato is minimized.
- d. Lot identity shall be maintained throughout the sorting process.
- e. Preventive measures shall be implemented to remove foreign/extraneous materials.

7. **Whole Tomato Wash**

Internalization of bacteria into the stem scar has been demonstrated with tomatoes submerged in water that is cooler in temperature than the pulp of the tomato.

When the tomato cools, a vacuum is created causing water, and potentially pathogens, to be drawn into pores on the tomatoes. Therefore, water temperature relative to pulp temperature, and water quality, are critical considerations for maintaining the safety of the product.

- a. The water used in processing shall be of microbial quality equivalent to potable water and have sufficient sanitizer to prevent cross contamination. The water antimicrobial shall be monitored at a frequency sufficient to maintain sanitary conditions.
- b. Whole tomatoes should be pre-cooled by air in a cold room prior to processing.
- c. Cold water immersion as a cooling technique shall not be done.
- d. Water temperature shall be maintained at least 10°F warmer than the pulp temperature of the tomato. Water temperature shall be monitored at least hourly.
- e. Water antimicrobials shall be registered with U.S. EPA and used in accordance with manufacturer's label instructions, particularly for concentration and contact time. Tomatoes shall not be submerged in more than one foot of water for more than two minutes total time.
- f. If water quality maintenance is based on manually monitoring chlorine levels, then free chlorine and pH must be monitored at least at start-up and every hour thereafter, and recorded. It is critical that pH be maintained in the range of 6.5-7.5 to ensure that chlorine is effective. Total chlorine measurements do not accurately represent antimicrobial effectiveness. Measurements must have sufficient precision to ensure levels are within established limits.
- g. If water quality maintenance is based on Oxidation Reduction Potential (ORP), the wash water shall be maintained at an ORP sufficient to assure a level of at least 650 mV [see Appendix].
- h. If water quality maintenance is based on other water disinfectant treatments, follow manufacturer recommendations for monitoring and limits.
- i. When monitoring oxidant concentrations electronically, the monitoring should be verified against a chemical test that measures disinfectant levels (and pH where applicable) at start-up and at least every 2 hours thereafter, and recorded.
- j. Electronic monitoring devices shall be calibrated at a frequency sufficient to ensure continuous accuracy.
- k. If spray systems are utilized in place of whole tomato immersion, the processor shall design the line so that the entire tomato surface is rinsed.

8. Cutting

Blade condition relating to sharpness and damage should be monitored regularly. Improperly maintained blades can result in damaged and bruised tissue, which can make the product more susceptible to support microbial growth during the shelf life.

9. Cut Tomato Washing

Appropriately utilized, antimicrobial chemicals help minimize the potential for

microbial contamination of the processing water, reducing the risk of cross-contamination of the product. Processors may refer to 21 CFR 173.315 for information about approved wash water chemicals.

- a. The water used in washing shall be of microbial quality equivalent to potable water.
- b. Sufficient sanitizer with adequate dwell time shall be used to prevent microbial build-up over time. The sanitizer shall be monitored at a frequency sufficient to maintain sanitary conditions.
- c. Wash water temperature shall be monitored to assure finished products do not exceed refrigerated temperatures ($\leq 41^{\circ}\text{F}$).

10. Packaging

- a. An effective system shall be maintained to prevent the use of contaminated, damaged, or defective cartons, trays and totes in order to prevent microbial contamination of the fresh-cut tomatoes during packing operations.
- b. Packaging materials coming into direct contact with the fresh-cut tomatoes shall be appropriately identified, including traceability to their source.
- c. Packaging containers and cartons shall be used for their intended purpose only.
- d. Packaging materials shall be stored in a manner to protect them from contamination, such as away from pests, dirt, cleaning chemicals, and water condensation from overhead equipment and structures.
- e. Primary or secondary finished fresh-cut tomato product containers shall be labeled with recommended storage instructions (e.g., “Keep Refrigerated”) and storage temperature to inform all persons handling the product of the recommended storage conditions.
- f. Primary and secondary packaging shall be coded to ensure traceability.

11. Storage Rooms and Distribution Facilities

- a. Finished products shall be stored at refrigerated temperatures not to exceed 41°F .
- b. Storage rooms and distribution facilities shall be kept clean and sanitary, with debris minimized. All walls, floors, ceilings and other surfaces shall be systematically and periodically cleaned and sanitized to avoid the build-up of mold or other potential contaminants.
- c. Product shall be palletized to avoid direct contact with the floor.
- d. A perimeter between pallets and walls shall be maintained to facilitate visual inspection of pest control and sanitation.
- e. Product on hold or rejected, shall be clearly identified and segregated from other product.
- f. There shall be no storage of trash or waste in the storage rooms.

12. Transportation

Finished products transported in sanitary and refrigerated coolers and vehicles reduce the risk for physical, chemical and microbial contamination.

- a. Finished products shall be transported at refrigerated temperatures not to exceed 41°F.
- b. Finished products shall be transported in pre-cooled vehicles equipped with a calibrated temperature monitoring device.
- c. Transportation vehicles should be sufficiently clean so as not to be a source of contamination.
- d. Inspect transportation vehicles for cleanliness, odors, visible dirt and debris before loading. If needed, the vehicle shall be cleaned or cleaned and sanitized by a documented procedure prior to loading.
- e. If non-dedicated vehicles are used for transportation, verify records of prior loads. Should there be any doubt as to previous loads transported or a potential risk from microbial contamination, such as from raw animal proteins, garbage or other refuse, then the vehicle shall be cleaned and sanitized by a documented procedure prior to use.

13. Traceability and Labels

All levels of the tomato supply chain shall maintain adequate traceability to a minimum of one step forward (immediate next recipient) and one step back (immediate previous supplier).

- a. Documentation maintained by the processor shall include sufficient information about the source (e.g., production location, packer/repacker, lot identification, as appropriate to the source of tomatoes) as well as the customer receiving the product to allow for the appropriate tracing of product.
- b. The processor shall have established procedures to ensure that traceability information about the source is retained with product as it moves through the processes to shipping.
- c. Primary and secondary containers shall be accurately labeled with commodity name, processor firm name or identification code, and lot identification sufficient to allow for accurate traceability.
- d. Traceability records shall be readily available.
- e. A documented recall program, including a traceability system to track tomatoes forward to customers, shall be developed and tested at least annually. A record of this test shall be kept on file.

14. Record Keeping

Food processors are required to keep records on file to verify processes.

- a. All processing, receiving and shipping records shall be maintained on file for a minimum of one year from processing.
- b. A document control program should be established to ensure customer confidentiality of specifications and proprietary documents.
- c. Records to be maintained shall include:
 - i. Sanitation records
 - ii. Pest Control records
 - iii. Maintenance records
 - iv. Facility inspection records
 - v. Employee training records

- vi. Incoming inspection records
- vii. Customer complaint records
- viii. Incoming water quality records
- ix. Water treatment and monitoring records
- x. Equipment calibration records
- xi. Temperature control records
- xii. Finished product inspection records
- xiii. Microbiological records (environmental, product)
- xiv. Distribution records

X. Foodservice and Retail

1. Purchasing

- a. Ensure tomatoes are from suppliers following Good Agricultural Practices and/or Good Manufacturing Practices, as appropriate, or other recognized, similar food safety requirements, and these guidelines. Practices can be verified through documented self-inspections, audits done by qualified government or private sector food safety auditors, and/or other appropriate mechanism of assurance.

2. Receiving – Whole and Fresh-cut Tomatoes

- a. Establish written procedures for inspecting, accepting or rejecting incoming loads. Procedures should include the condition of transportation vehicles as well as incoming product requirements.
- b. Ensure that incoming documentation provides sufficient information to facilitate traceability to the immediate prior supplier.
- c. Records of incoming inspections shall be maintained.
- d. Cut tomatoes (i.e., sliced, diced or chopped) shall be received at $\leq 41^{\circ}\text{F}$, and requires continuous temperature control during transport.
- e. Cut tomatoes $>41^{\circ}\text{F}$ at receipt shall be rejected.

3. Storage – Whole and Fresh-cut Tomatoes

- a. Whole tomatoes shall be maintained at the temperature recommended for the variety and the particular stage of ripening.
- b. Cut tomatoes shall be maintained at $\leq 41^{\circ}\text{F}$, in accordance with recommendations in the current edition of the Food Code or appropriate state and local regulations.
- c. Tomatoes shall be raised off the floor and stored in a manner to prevent cross contamination from raw food products, chemicals, or unsanitary conditions.

4. Facility Sanitation

- a. Sanitation of retail and foodservice facilities shall be in compliance with the current edition of the pertinent federal, state or local Food Code.

5. Employee Health and Hygiene

- a. Employee health and hygiene policies and practices at retail and foodservice facilities shall be in compliance with the current edition of the pertinent federal, state or local Food Code.

6. Preparation within Foodservice/Retail Establishments

- a. Facility
 - i. A facility preparing tomatoes shall be designed consistent with the current edition of the Food Code and appropriate state and local regulations, including but not limited to:
 - (1) Floors, walls and ceilings that can be effectively cleaned and sanitized.
 - (2) Closing external doors and windows.
 - (3) Water that is adequate and suitable for product and product contact surfaces.
 - (4) Sufficient hot water for intended use.
 - (5) Adequate storing of cleaning and sanitizing chemicals and supplies to prevent cross contamination.
 - (6) Adequate hand-wash facilities.
 - (7) Adequate provisions to wash, sanitize and dry equipment and utensils.
 - (8) Maintain an effective pest control program with no signs of insect or rodent activity.
- b. Equipment
 - i. When preparing or further handling tomatoes at retail, follow the Food Code or state/local requirements regarding facilities and equipment, temperature control, cleaning and sanitizing, and personal hygiene.
 - ii. Equipment and utensils used to hold, cut, dice or slice tomatoes should be designed for that purpose. Equipment shall be easily cleaned, free from damage that prevents proper cleaning, and stored in a manner that will not contribute to product contamination. Examples of equipment include but are not limited to:
 - (1) Cutting boards
 - (2) Thermometers
 - (3) Utensils
 - (4) Disposable gloves
 - (5) Safety gloves
 - (6) Finished product containers
- c. Employees preparing cut tomatoes shall adhere to safe food handling practices as directed by the most current edition of the Food Code. Employees shall:
 - i. Be adequately trained in safe food handling procedures.
 - ii. Be free from symptoms or diagnosed transmissible diseases as defined within the most current edition of the Food Code.
 - iii. Implement and practice good hand washing procedures, such as at the start of the shift, after breaks, visiting restrooms, sneezing, coughing, handling trash or money, or anytime hands become soiled.

- iv. Do not allow food, drink or tobacco products in the food preparation, cleaning or storage areas except as permitted by the Food Code or state/local requirements.
- v. Wear clean uniform and/or outer clothing.
- vi. Minimize bare hand contact with tomatoes to be sold as ready-to-eat. Options may include clean and sanitary utensils or disposable gloves.
- vii. Utilize hair and beard nets when appropriate.
- viii. Practice good retail practices and food handling techniques to prevent cross contamination.

7. **Gloves**

There continues to be scientific debate as to whether the handling of tomatoes or other foods with bare hands, washed frequently with proper hand washing procedures, is safer than the use of gloves. If tomatoes are handled with bare hands, documentation of hand washing procedures must be made as indicated above. If gloves are utilized, a procedure for glove use must be documented and followed. The following applies to all food service/retail operators who handle tomatoes.

- a. Disposable Gloves
 - i. The use of single use disposable gloves for hand contact of tomatoes is recommended.
 - ii. Hands shall be washed before putting on gloves.
 - iii. Hand sanitizers may be used, but not as a substitute for proper washing of hands.
 - iv. Disposable gloves must be changed after meals, smoking, using toilet facilities, any process involving handling of materials other than tomatoes or when the gloves have become torn, soiled or otherwise contaminated.
- b. Reusable Gloves
 - i. Reusable gloves are not authorized for hand contact of ready-to-eat tomatoes at foodservice/retail operations. When gloves are utilized, only single-use, disposable gloves should be worn.

8. **Tomato Washing and Culling**

To prevent exterior microorganisms from infiltrating the interior of the tomato during washing, ensure the wash water temperature is at least 10°F warmer than the internal tomato pulp temperature.

- a. To prevent the growth of bacteria during the cutting, slicing or dicing operation, the following precautions should be taken:
 - i. Whole tomatoes should be free of obvious signs of filth, and skin damage such as punctures, cuts or breaks.
- b. Washing tomatoes before cutting shall be performed by either:
 - i. Continuous running water or
 - ii. If chemicals are used to wash tomatoes, they must conform to 21 CFR 173.315 and be used according to the manufacturer's label instructions for recommended concentration and contact time.
 - iii. Soaking tomatoes or storing them in standing water is not recommended.

- 9. Storing Cut/Sliced/Diced or Repackaged Tomatoes**
 - a. After cutting, tomatoes shall be chilled to and maintained at $\leq 41^{\circ}\text{F}$.
 - b. Cut tomatoes must be stored in a covered container and above other items that may cause contamination.
 - c. Tomatoes must be stored off the floor and in a manner to prevent cross contamination from raw food products, or unsanitary conditions.
 - d. Cut tomatoes that are held longer than 24 hours must indicate the date or day by which the food shall be consumed on the premises, sold, or discarded.

- 10. Displaying Cut Tomatoes for the End Consumer**
 - a. Maintain cut fruit at $\leq 41^{\circ}\text{F}$ during display.
 - b. If time only is used as a public health control and allowed by your licensing regulatory authority, written procedures shall be prepared in advance, maintained in the food establishment and made available to the regulatory authority upon request. Refer to the current edition of the Food Code for details of displaying cut/sliced/diced tomatoes without temperature control.
 - c. Packaged cut fruit may not be stored in direct contact with ice or water if the food is subject to the entry of water because of the nature of its packaging, wrapping, or container or its positioning in the ice or water.

- 11. Displaying Whole Tomatoes for the End Consumer**
 - a. Whole tomatoes should be free of obvious signs of filth, and skin damage such as punctures, cuts or breaks.

- 12. Traceability and Record Keeping**
 - a. All levels of the tomato supply chain shall maintain traceability consistent with record keeping requirements in 21 CFR part 1, subpart J (1.326-1.368). Distributors to direct-to-consumer retail and foodservice operations shall maintain traceability to a minimum of one step back (immediate previous supplier) and one step forward (immediate next recipient). Direct-to-consumer retail and foodservice operations shall maintain purchase records that will facilitate traceability.
 - b. Each facility's ability to comply with the above (12.a) shall be verified at least annually. A record of this verification shall be kept on file.
 - c. All records recommended in this section shall be maintained for at least six months and be readily available.
 - d. Recognizing that bulk tomatoes may be commingled in a display, in the event of a recall, all lots in the commingled lot are affected.

XI. Appendix

- A Notice to Growers, Food Manufacturers, Food Warehouse Managers, and Transporters of Food Products on How to Dispose of Contaminated Food. Updated September 7, 2006. <http://www.cfsan.fda.gov/~dms/fsdisas3.html>
- A Notice to Growers, Food Manufacturers, Food Warehouse Managers, and Transporters of Food Products About the Safety of Food Affected by Hurricanes, Flooding, and Power Outages. Updated September 7, 2006. <http://www.cfsan.fda.gov/~dms/fsdisas1.html>
- Guide to Minimize Microbial Food Safety Hazards of Fresh-cut Fruits and Vegetables. 2008. <http://www.cfsan.fda.gov/~dms/guidance.html>
- Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables. 1998. <http://www.cfsan.fda.gov/~acrobat/prodguid.pdf>
- Suslow, Trevor V. Oxidation-Reduction Potential (ORP) for Water Disinfection Monitoring, Control, and Documentation. Univ. California Publication 8149. <http://postharvest.ucdavis.edu/datastorefiles/234-406.pdf>
- Commodity Specific Food Safety Guidelines for the Fresh Tomato Supply Chain, Edition 1.0. 2006. <http://www.cfsan.fda.gov/~dms/tomatsup.html>
- Code of Federal Regulations. <http://www.gpoaccess.gov/cfr/index.html>