Session 6 Handling And Sanitation
Harvest, Postharvest, and Transportation

Harvest | Receive | Clean | Sort | Pack | Cool | Store | Transport

Prepare Your Materials
1. Harvest, Postharvest, Transportation Action Plan
2. Harvest, Post Harvest, Zone Management Plan
3. Sanitation Plan
4. Wash Line & Packing Shed Design for Food Safety
Handling And Sanitation

Harvest | Receive | Clean | Sort | Pack | Cool | Store | Transport

- Physical
- Chemical
- Biological

Where is the potential for contamination?
What are produce contact surfaces?
Cleanliness

General Cleanliness
- Keep things in their place
- Managing pests, trash, sweeping, standing water . . .

Cleaning (3-step)
- Physical removal of dirt from surface, using soap and potable water

Sanitizing (4-step)
- Treating a surface with a sanitizer to reduce microorganisms after it has been cleaned
4-Step Sanitizing Process

1. Remove obvious dirt and debris
2. Apply soap and scrub surfaces
3. Rinse with potable water
4. Apply a sanitizer. Let surface air dry

You can’t sanitize a dirty surface

FSMA: “. . . as frequently as reasonably necessary”
Sanitation Plan, General Cleanliness, Cleaning, Sanitizing

Sanitation Plan

In making your plan, consider:
- Toilet and hand washing facilities
- All produce contact surfaces
- Harvest tools and equipment
- Harvest and transport vehicles
- Harvest containers
- Coolers, ice machines
- Packing shed
- Storage areas, food and equipment
- Measuring instruments
- Floors
- Packing lines
- Packing tables
- Field implements

Once you have a cleaning plan, create your recordkeeping systems.
FSMA requires documentation of the date & method of **cleaning and sanitizing** equipment used for harvesting, packing, and holding activities.

<table>
<thead>
<tr>
<th>Item or Area Zone 1-4</th>
<th>General Cleanliness, as indicated, or as needed</th>
<th>Cleaning as indicated, or as needed</th>
<th>Sanitized 4-step, as indicated, or as needed</th>
</tr>
</thead>
</table>
You must inspect, maintain, and clean and, when necessary and appropriate, sanitize all food contact surfaces of equipment and tools as frequently as reasonably necessary to protect against contamination of covered produce.

Zone 1 – Produce contact surface
Food Safety ACTION PLAN

General Harvest, Post Harvest, and Transportation Policy – Contact Surfaces

If an object comes into contact with fresh produce it must be clean and in good working condition and sanitized as frequently as necessary. This includes:

<table>
<thead>
<tr>
<th>Area of Food Safety Action</th>
<th>What</th>
<th>How SOP or Practice</th>
<th>Who</th>
<th>When</th>
<th>Training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Policies To Reduce Risk</td>
<td>How is this done?</td>
<td>Who is required to do this?</td>
<td>When is this done?</td>
<td>What training done, who, and when?</td>
<td></td>
</tr>
</tbody>
</table>
Harvest Containers
- At the start of harvest season, wash and sanitize all harvest containers.
- Prior to each field harvest, inspect all harvest totes, to ensure cleanliness.
- Remove any dirt or debris. Wash and sanitize containers that have any leftover produce, rotting organic matter or signs of rodents.
- Store harvest containers off the ground and protected from access by animals and birds.
Poll: Why do some farmers paint lines and dots on harvest containers?

1. Many produce farmers studied art and they are into creating beauty in the field
2. It’s their system to designate which containers should be used for specific tasks to minimize the potential for contamination
3. They have an in-law who works for Rust-Oleum and gives them free samples of the new colors at Christmas
4. None of the above
- Prior to each field harvest, inspect all harvest totes to ensure cleanliness
- Correct problems with harvest containers or equipment and/or report to the right person

### Harvest, Postharvest, Transportation, and Equipment Sanitation and Practices – Action Plan

State clearly what you plan to do and create accountability

<table>
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<tr>
<th>Area of Food Safety Action</th>
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<td></td>
<td>How is this done?</td>
<td>Who is required to do this?</td>
<td>When is this done?</td>
<td>What training is done, who, and when?</td>
<td>What records are kept for this action? Where?</td>
</tr>
<tr>
<td>Problems with harvest containers or equipment</td>
<td></td>
<td>Is the practice or SOP written?</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

What should you look for in the inspection?
What should you and your staff do if things aren’t right?
Old or wooden equipment can be cleaned on a regular basis, can be sanitized.

Zone 1 – Produce contact surface
You must use equipment and tools that are of adequate design, construction, and workmanship to enable them to be adequately cleaned and properly maintained.

How would you clean the pouch?
PRACTICES

• Inspect and clean harvest tools prior to use.
• Sanitize harvest tools prior to use.
• Use harvest tools only for harvesting produce.
• At the end of each day, clean and store tools secure from animal contamination.
Establish Cleaning Systems for Harvest Equipment

Before using your knife, wash with soap and water, rinse and dip into sanitizing water.

Antes de usar su cuchillo, lavarlo con jabón y agua, enjuagar y ponerlo en el agua con Tsunami.
How frequent? How vulnerable is the crop?

Equipment and tools must be installed and maintained as to facilitate cleaning of the equipment and of all adjacent spaces.

Zone 1 – Produce contact surface
Zone 4- outside or adjacent to packing area

Keep Contamination Out Of Flow Zones

If it’s in the environment it can get on the produce.
Where does the wash water go?
Zone 3 – Areas and materials inside of packing area
Zone 2 – Areas and surfaces close to contact surfaces
Pathogens are often below our feet. How would we clean these cracks?

Maintain and clean all non-food-contact surfaces of equipment and tools used during harvesting, packing, and holding as frequently as reasonably necessary to protect against contamination of covered produce.
Hygienic Design

• **Smooth Surfaces** – Pathogens attach to rough surfaces

• **Scratch Free** – Pathogens can hide in scratches

• **NO Produce/Soil Catching** – Nutrient source

• **Hollow Bodies** – Harbor and reproduction area

Policy examples: Food contact surfaces are designed and maintained to minimize harboring dirt, filth, food, and microorganisms

Equipment and tools are of adequate design, construction, and workmanship to enable them to be adequately cleaned and properly maintained
Zone 1 – Food contact surfaces
### Harvest, Post Harvest, Zone Management Plan

Think through your packing shed or a field packing operation on your farm.

1. Identify: What tools and materials do you use in each zone?
2. Identify: What potential risks for contamination are in each zone?
3. Plan: What policies or practices do you want to have to minimize risk?

<table>
<thead>
<tr>
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<tr>
<td>Zone 1</td>
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<td>Zone 2</td>
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<td>Zone 3</td>
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<td></td>
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<tr>
<td>Zone 4</td>
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</tbody>
</table>

1. Fill in the plan for an area of your farm
2. Share and discuss
BOTH COVERED AND EXCLUDED PRODUCE?

If the excluded produce is not in accordance you must:
- Keep covered produce separate from excluded produce, (except when they are placed in the same container for distribution)
- Adequately clean and sanitize, food contact surfaces that contact excluded produce before using on covered produce.
FSMA: You must establish and keep documentation of the date and method of cleaning and sanitizing of equipment used in covered harvesting, packing, or holding activities.
15 Minute Break Out – Fill In Sanitation Schedule Action Plan

Farm Name________________________________________ Address __________________________

Sanitation Plan

In making your plan, consider:
- Toilet and hand washing facilities
- All produce contact surfaces
- Harvest tools and equipment
- Harvest and transport vehicles
- Harvest containers
- Coolers, ice machines
- Packing shed
- Storage areas, food and equipment
- Measuring instruments
- Floors
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- Packing tables
- Field implements

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Produce Rule Harvest Training

Training on Produce Rule standards that are applicable to the employee’s job responsibilities; and

Persons who conduct harvest must receive training on:

1. Inspecting harvest containers and equipment to ensure they are functioning, clean, and maintained not to be a source of contamination

2. Correcting problems with harvest containers or equipment and/or reporting to the right person

3. What produce must not be harvested
You must not distribute dropped covered produce (drops to the ground before harvest) does not include:
- root crops that grow underground (carrots)
- crops that grow on the ground (squash)
- produce that is intentionally dropped to the ground as part of harvesting (such as almonds)

POLICY?
Pooping on people

In 12 easy lessons.

PICK IT CLEAN
Scout – Manage – Record

Pre-Harvest Accessment
Document
Inform Workers
Make a decision about what to do with contamination

**RISK ASSESSMENT - General**

<table>
<thead>
<tr>
<th>Inspection Date</th>
<th>Location/Field</th>
<th>Risks identified?</th>
<th>Corrective and/or preventative actions if necessary</th>
<th>Identified by: initials</th>
<th>Date Corrective action completed</th>
<th>Completed by: initials</th>
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Pick It Clean!

Policy and Training - Action Plan!
- Harvesters avoid cut produce surfaces contacting soil by . . .
- Excessive dirt and mud are removed as much as possible from produce at harvest
Poll:

Which of the advice is helpful to guide a farm on when to choose vented and when to use solid bottom harvest containers.

1. With pest infected crops, use containers with holes so bugs and other pests can fall through.

2. When it’s raining, use containers with holes because we don’t want harvested crops to sit in dirty pooled water.

3. Use of solid bottom containers can help prevent soil from contacting cut surfaces.

4. All of the above
Trim or not? What is the Market? In the field or shed?
FRESH PRODUCE SHOULD BE SEEN NOT HEARD!!
minimize the potential for contamination of produce or food contact surfaces with known or reasonably foreseeable hazards.
Food safety always trumps efficiency and quality
Produce that is received from the field is protected from possible contamination.
Produce that is received from the field is protected from possible contamination.
Lot Tracking: Product Identification at Harvest

Policy: All containers of harvested produce leaving the field must be labeled with field and date lot numbers.
Break Out – Discussion &/or Fill In Harvest Action Plan

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<td></td>
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<td></td>
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<td>Potable Water</td>
<td>All water that directly contacts covered produce during or after harvest, used on contact surfaces, used to make ice that will contact produce or produce contact surfaces, and for washing hands during and after harvest activities must be potable.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
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Packing Sheds
Minimum Packing Shed Requirements

Food safety CAN be accomplished WITHOUT a state-of-the-art shed.

• Shade and protection from the elements
• **Potable** (safe to drink) water
• Access to **toilet** and **hand washing** facilities
• A system to **sanitize** equipment and tools
• **Cold storage** is necessary unless:
  - Ship immediately after cooling
  - Grow crops that are not sensitive to warm temps
• Non-porous, cleanable **food-contact** surfaces
• **Designated** space, not shared with machines/repair
• Adequate **Drainage**
• **Don’t attract and harbor:** Rodents, flies, birds and pets
It does not require a state of the art packing facility to reduce risk on these issues.

- Physical
- Chemical
- Biological
Pest Control In Buildings

(a) take measures reasonably necessary to protect produce, food contact surfaces, and food-packing materials from contamination by pests in buildings, including routine monitoring for pests as necessary and appropriate.

(b) For fully-enclosed buildings, you must take measures to exclude pests from your buildings.

(c) For partially-enclosed buildings, you must take measures to prevent pests from becoming established in your buildings (such as by use of screens or by monitoring for the presence of pests and removing them when present).
Identify and list other areas that may introduce food safety risks, such as animals or adjacent land use.
Eliminate pest nesting areas
What Zone Do You Want Your Culls/Trash In?
Perform And Record Regular Inspection
Monitor and Control For Pests
Hot Spot –
1. Make necessary changes to system
2. Clean and sanitize
3. Upgrade control and monitoring until the area is rodent free for 10 days
The common housefly is a known carrier of diseases and pathogens, including Listeria and even Salmonella.
What pest related risks should be monitored/managed?
**Wash Line & Packing Shed Design for Food Safety**

Robert Hadad  CCE: Cornell Vegetable Program WNY Regional Vegetable Specialist rgh26@cornell.edu

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**Developing Sanitation SOPs**
The Standard Operating Procedure (SOPs) for cleaning and sanitation should be documented, and should include:

- Cleaning and sanitizing schedule
- Name and type of cleaners to be used
- Cleaning instructions, including a
- Cleanser – rinse - sanitizer sequence

**Daily Maintenance:**
- “Dirty” area is separate from “clean”
- Remove culls every day
- Keep garbage bins covered
- Keep outside grounds clear of debris
- No standing water

**Construction & Set-up:**
- Keep pallets 1 foot from the walls
- Cover all light bulbs
- Seal doors and windows
- Fix holes in insulated walls
- Use easily washable surfaces

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**Poor Cleaning & Maintenance Can Increase Bacterial Risks**

These areas should be replaced, repaired or meticulously cleaned as appropriate in wash/pack area & cooler

- Cracked hoses
- Hollow framework
- Poorly-maintained filters
- Standing water
- Open bearings
- Porous surfaces – ex. Wood
- Condensate; especially walls, ceilings, and pipes over packing lines
- Damp insulation
- Rubber seals around doors
- Light switches
- Cleaning tools
- Trash cans
- Icemakers

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**Produce Contamination Sources**

- Packing line sanitation
- Use only food-grade lubricants
- Storage of containers used for packing and shipping produce
- Cull bin
- Hand washing practices of workers
- Quality of gloves used on the packing line
- Tools
- Workers’ clothes

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Packing sheds can be any size, shape, and configuration, from a permanent building to a canopy at the edge of a field (four sticks and a lid). What really matters is allowing enough room to accomplish the tasks without contaminating the finished product during packing. Divide the facility into a “dirty” area and “clean” area. If produce is washed, then it is crucial that washed product is not exposed to unwashed produce and the workers doing the washing are clean themselves.

The washing station set up must have enough room to move produce in and out. The set-up should consider drainage to keep the floor as dry as possible, to prevent pooling or splashing onto clean produce or tracking soil into the clean area.

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This material is based upon work supported by USDA/NIFA under award number 2012-49200-20031.
Break Out

1. Working though each of the 6 text boxes, take turns reading the information out loud, then have a group discussion, why does it matter and questions. Make note of things you want to implement on your farm.

2. Discuss the diagram.

3. Draw your packing shed layout as presently is, or as you plan to create it.

4. Document policies and practices as needed on the Action Plan

5. Rate the systems needing future action.
WASHING PRODUCE

Wash systems need to be evaluated for food safety risk. Farms may change their practices as a result.

Food Safety and Water

- Pathogens can transfer from product to product
- Pathogens can be imbibed
  - Depth
  - Length of time
  - Temperature
## Sanitizers For Fresh Produce Washing

<table>
<thead>
<tr>
<th></th>
<th>Rinse Required</th>
<th>pH Control</th>
<th>NOP Allowed</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tsunami™ (Ecolab)</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>Produce only</td>
</tr>
<tr>
<td>StorOx (BioSafe)</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>Produce &amp; contact</td>
</tr>
<tr>
<td>SaniDate (BioSafe)</td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
<td>Produce &amp; contact</td>
</tr>
</tbody>
</table>

### BENEFITS of peroxide based cleaners:
- No taste residue
- No dumping restrictions, environmentally responsible
- Less affected by organic matter than chloride
- **Effective against microorganisms that affect shelf-life**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>YES</th>
<th>YES</th>
<th>Produce &amp; contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine Bleach</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sanitizer must be labeled for contact with product – Read the label
Download process, UC Davis, IA State, U of M, Penn State
Sanitizer: Goal, Prevent Cross Contamination

- Reduces risk of pathogen infiltration
- Reduces plant pathogens that affect shelf life

product-to-washwater-to-product
The anti-microbial must be used according to label and tested as specified.

- Test strips: Correct Concentration. Record.
- Efficacy decreases with time. Direct.
- Discard and change water as needed.
Monitor and Change

“Turbid” water reduces sanitizer efficacy

Turbidity is an “indicator only.” Judge the water quality by the test strip not by eye.
Wash tank water is changed [how often] and water sanitizer [say what the sanitizer product is] levels are maintained at [insert levels here], and tested [say testing method and how often] and documented on the Water Sanitizer Log.

<table>
<thead>
<tr>
<th>Product being washed</th>
<th>Date</th>
<th>Time</th>
<th>Water temp °F</th>
<th>pH</th>
<th>Pre Test results from dip strip</th>
<th>Corrective actions taken</th>
<th>Post test results from dip strip</th>
<th>Initials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green Beans</td>
<td>9/10/11</td>
<td>9:15 am</td>
<td>45</td>
<td>6.5</td>
<td>70 ppm</td>
<td>Added X amount Tsunami</td>
<td>80 ppm</td>
<td>MP</td>
</tr>
</tbody>
</table>
Sanitizer Questions?
Minimize The Potential For Contamination

– Wear clean outer garments.
  – Change clothing or don aprons if coming from the field.

– Maintain personal cleanliness.

– Wash hands thoroughly:
  – Before starting work.
  – After each absence from work station.
  – At any time when hands become soiled.
We have to distinguish between water use for quality and for food safety.

Step 1
- Hydro-Clean

Step 2
- Hydro-Cool
- Hydro-Crisp

If there is a food safety consequence, it trumps cleaning, cooling, and crisping
The “industry” is generally moving away from dunk tanks and into spray systems.
Leafy greens have been associated with more food borne illness than other vegetables

• Eaten raw with no cooking step to kill pathogens.
• Grow close to the ground. Soil is often on the crop. Can lead to contamination with harmful bacteria.
• There are many cut surfaces
• Often immersed in water.
Do Not Interpret This Research To Mean That Pathogens Can Be Washed Off Of Produce!

E. coli in leafy greens wash water after 1, 2 or 3 rinses

Shows the reduction of e-coli in the rinse water
Vern Grubinger – University of Vermont
• Reduced microbe levels in water
• Extended shelf life
• Provided a cleaner, higher quality product

**Triple Washing Greens**

USE A SANITIZER!

<table>
<thead>
<tr>
<th>First Rinse</th>
<th>Second Rinse</th>
<th>Third Rinse</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>↓ 91%</td>
<td>↓ 98%</td>
</tr>
</tbody>
</table>

Average reduction of E. coli in leafy greens wash water, compared with a single rinse
WATER TEMPERATURE

must maintain and monitor the temperature of water at a temperature that is appropriate for the commodity and operation (considering the time and depth of submersion) and is adequate to minimize the potential for infiltration of microorganisms . . .
Harmonized GAP and Water Temperature

- Tomatoes
- Mangos
- Cantaloupe

http://www.cantaloupe-guidance.org/docs>
Use The Proper Temperature of Water In The Dunk Tank

“For leaf and root crops, water is used to cool the product. Because water comes directly from the ground, it is cooled to approximately 48° on receipt from the field.”

-- Rock Springs Farm, Chris Blanchard Food Safety Plan

for melons, tomatoes, and cantaloupe, “pulp temperature” of produce should be cooler than the water
Poll: Instruments or controls you use to measure, regulate, or record temperatures, pH, sanitizer efficacy or other conditions, in order to control or prevent the growth of microorganisms of public health significance, must be:
1. Accurate and precise as necessary;
2. Adequately maintained; and
3. Adequate in number for their designated uses
4. All of the above
Packaging
- Cleanable or designed for single use; and
- Unlikely to support growth or transfer of bacteria
- If you reuse, food contact surfaces must be clean: you must clean packaging or using a clean liner
Poll: The Produce Rule says farmers can reuse packing materials as long as:

1. there are no visible indicators of pests such as feces or chewed holes on materials
2. the materials are stored inside a building
3. there is no visible bacteria, viruses or mold on them
4. the produce that was in it before was washed in water with sanitizer.
5. all of the above are necessary to reuse used packing materials
6. none of the above are sufficient criteria for reusing packing materials
Ice Cooling

- Sanitize Machine
- Ice Policies
- Do NOT drip on other

[Notice sign: Potable Drinking Water]
Buying Ice? Off-farm Inputs.

When we buy something from off the farm that we would document on farm:

- Ask the company for verification (ex: that the ice was made in a sanitary fashion with potable water)

- We might need to have an internal practice of inspecting bags before using and handling carefully to prevent contamination
"Temperature abuse of commercially produced, fresh-cut salad greens is most likely to occur during retail storage."

Report:
GROWTH OF ESCHERICHIA COLI O157:H7 AND LISTERIA MONOCYTOGENES IN PACKAGED FRESH-CUT ROMAINE MIX AT FLUCTUATING TEMPERATURES DURING COMMERCIAL TRANSPORT, RETAIL STORAGE, AND DISPLAY

E. coli O157:H7 and L. monocytogenes generally increased <2 log CFU/g during transport, retail storage, and display.
Equipment used to transport produce must be:
- Adequately clean before use in transporting produce
- Adequate for use in transporting produce

- General cleanliness
- Has it been used for other purposes?
- Broken plastic, glass windows, metal parts
- Does the load need to be covered?
- Is refrigeration crucial to prevent pathogen growth?
**Inspect vehicles for the following items:**

<table>
<thead>
<tr>
<th>1.</th>
<th>Signs of pest intrusion</th>
<th>4.</th>
<th>Foreign materials: manure, garbage, glass, oil, chemicals, plant or animal debris, etc.</th>
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<tbody>
<tr>
<td>2.</td>
<td>Damage (e.g., splinters, holes)</td>
<td>5.</td>
<td>Maintenance required (e.g., hinges, locks or load-securing devices)</td>
</tr>
<tr>
<td>3.</td>
<td>Odors (e.g., chemicals, oil)</td>
<td>6.</td>
<td>Refrigeration (e.g., leaking)</td>
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**Corrective Actions:** If any hazards were identified above, the following may be considered:

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<thead>
<tr>
<th>A.</th>
<th>Refusal to load product onto vehicle</th>
<th>B.</th>
<th>Sweep</th>
<th>C.</th>
<th>Rinse</th>
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<td>D.</td>
<td>Maintenance (e.g. repair hinges, locks, load securing devices)</td>
<td>E.</td>
<td>Wash/clean with soap</td>
<td>F.</td>
<td>Other</td>
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![Diagram of vehicle components with questions regarding integrity and damage]

- Air delivery chute intact?
- Door seal damage?
- Side door seal tight?
- Door damage?
- Wall damage?
- Front bulkhead installed?
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<td>Policies To Reduce Risk</td>
<td></td>
<td>-How is this done?</td>
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<td>-Is a practice or SOP written?</td>
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<td>Potable Water</td>
<td>All water that directly contacts covered produce during or after harvest, used on contact surfaces, used to make ice that will contact produce or produce contact surfaces, and for washing hands during and after harvest activities must be potable.</td>
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<tr>
<td>Produce Contact Surfaces</td>
<td>If an object comes into contact with fresh produce it must be clean and in good working</td>
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*Note: This is a partial screenshot of the document. The table continues with other entries and columns.*
Materials Needed
- Write a Standard Operating Procedure
- Paper and writing tool

1. Break into small groups (2-4 people)
2. As a group, write a SOP on one of the listed Policies, utilizing the handout Write a Standard Operating Procedure
   - Cleaning and Sanitizing Food Contact Surfaces
   - If Blood And Other Body Fluids In Contact With Produce And/Or Food Contact Surfaces
   - Produce Contamination in Field by an Animal
3. Full classroom discussion: groups report on their SOP & discuss

Write a Standard Operating Procedures (SOP) to Minimize Potential Risks

SOPs should include:
• Title, Date, and Author: Descriptive title, date written and updated, and who wrote it
• Responsibility: Who does it and who makes sure it gets done
• When: When and how often the procedure is performed