Packing Shed Sanitation

Major area of concern:
It is the last area in the production operation in which a shipper has control of the product.

Contamination in the grading, washing and packing procedures are extremely costly.

Acknowledgement:
Dr. James Rushing, Clemson University
Dr. Trevor Suslow, Univ. Calif. Davis
Drs. Jeff Breacht, Jerry Bartz, U Steven Sargent, Univ. of Florida

TCE/TAMU
GAPs “No Brainier”

Major Sources of Packing Shed Contamination

# 1. Water / ice
# 2. Workers
# 3. Animals, Fowl & Insects
**WATER & ICE**
*(Reduce the risk for contamination!)*

- The major guidelines and practices regarding the use of water in the field also are appropriate in the shed.
- Sanitation is the key
ICE and sanitation

Ice is FROZEN WATER!

- Only use ice made from potable water
- Prohibit ice contact soil, debris, and non essential workers
- Do not place ice on floors or allow worker to walk in this area
- Need to have an above floor container from which ice is to be used
- Clean and sanitize ice makers routinely

One of the most abused areas (even in well run sheds such as this)

Ice is often overlooked as a source or carrier of pathogens
Proper handling and use of ice can reduce potential problems
Ice stored on floors without any barriers to reduce contact with workers, animals, birds etc becomes very venerable to contamination.
Often is the placed on produced just prior to loading on trucks for transporting to markets.
This can serve as a incubation chamber if ice has come in contact with microbes, resulting in the spread of these organisms as the ice melts
Icing area should be enclosed

- Ice machine
- Ice Stock pile
- Top Icing area
- Loading dock

Clean and Sanitize regularly

Above Ground, Semi enclosed
A well designed and managed facility and operation can greatly minimize microbial risks.

- Product pre-cleaning area location
- Easily accessible
- Minimal clutter
- Smooth surfaces
- Pressure washing capability
- Floor drains
A well designed and managed facility and operation can greatly minimize microbial risks.  
- Product pre-cleaning area location 
- Easily accessible 
- Minimal clutter 
- Smooth surfaces 
- Pressure washing capability 
- Floor drains
KEEP FIELD TRASH IN THE FIELD

- Pre-clean and pre-grade produce prior to bringing into shed
- Dump wash water to clean and remove field heat.
  - Continuously monitor dump water chlorine and pH levels
    - At best bacteria levels are reduced
    - Cannot get 100% kill (only with the use of irradiation)

Whenever possible, leave potential problems in the field. Pre grading and cleaning will help.

Use of dump tanks to clean and convey produce is a common practice. This water needs to be clean and sanitizer levels maintained. Debris ties up chlorine and reduces its effectiveness.
Packing house sanitation is even more important than field sanitation because this is the final process stage for produce.

Good field GAPs and implementation can be rendered useless if GAPs or GMPs are not followed.
Biofilms

- Sticky to slimy accumulations of fungi and bacteria that accumulate on wet surfaces
- Chlorine doesn’t penetrate biofilms, but will prevent their formation
- Change water daily and maintain constant sanitizer levels in dump tanks and spray washers
Accumulated Organic Matter

- Contact of plant material with surfaces:
  - *leaves waxes and plant sap accumulations*
  - *plant residues + moisture + microbes + warm temperatures = biofilms*

- Partially decayed plant material:
  - *sticks to surfaces*
  - *is loaded with microbes*
  - *chlorine won’t work until deposit is dispersed*
Sanitation in the Packinghouse

- Water is widely used in packing sheds
- Microbes survive and grow on wet surfaces
- Sanitize facilities & equipment regularly
  - Daily: packing line equipment (particularly areas that remain wet, floors, drains) breakrooms/bathrooms
  - Monthly or between loads: cold room floors, walls, ceilings, cooling units, doors, and curtains
Floor Drains

- Serve no purpose if they are clogged
- Inspect and clean frequently
Sanitation in the Packinghouse

- **Discard fruits and vegetables that fall on the floor**
- **No animals in packinghouse** (domestic or otherwise)
- **Prepare cartons only as needed**
Sanitation in the Packinghouse

- Remove fruit and vegetable culls and debris promptly
- Provide restrooms and hand-washing stations
- Maintain sanitation records
GMPs dictate that workers should never be allowed to eat, smoke, or drink while working on a grading belt.
Open access always offers the potential for contamination by rodents, birds, pets etc.

Workers are by far a much bigger problem. They are the last people to touch produce prior to shipment.

Train shed worker as well on the importance and procedures needed to insure safety.

Personnel hygiene is always an issue and should be constantly stressed among workers

Problems of note In this situation:

- workers have placed their shoes on a conveyor.
- Packing line are being used as a break room
- Sanitation is some what lacing, (see the stacking devise circled in yellow)
BREAK ROOMS ARE NEEDED

• Grading and packing is a boring job
• Break rooms should be a clean and pleasant
• Place to recoup energy
• Should contain table and chairs
• Rest room facilities
• Lockers
Developing a System for Maintaining Packing Shed Cleanliness

- Develop protocols for cleaning each area in the shed
- Develop a schedule for cleaning
- Assign cleaning responsibility for each area to an individual
- Perform routine inspections of each area and correct any problems

Although shed workers are a major source of contaminations, visitors can also cause potential problems with contamination.

Visitors are becoming an even more important issue in light of the bio-terrorism concerns now surfacing in this country.

Do not allow anyone other than employees to wander around the sheds unaccompanied.
FACILITIES & Equipment
Cleaning Procedures

- Empty and sweep cold rooms
- Pre-rinse equipment or walls
- Visually inspect surfaces
- Apply appropriate cleanser
  - Scrub from top, downward
- Do not allow cleanser to dry on surfaces
  - Rinse from top, downward
FACILITIES & Equipment Cleaning Procedures Con’t

- Visually re-inspect surfaces
- Apply a high level sanitizer (800 ppm quaternary ammonia)
  - Let stand for 20 minutes
  - Rinse with potable water
- Apply regular level sanitizer (200 ppm quat)
  - Rinse with potable water
Final Steps

- Clean and put away supplies
- Document cleaning practices
- Periodic QA inspection/swabs
- Training
Pest Control
Another area of need

Brad Easterling, IPMA / TCE
Standard Operating Procedures

Pests should be excluded from the packing shed, including rodents, birds, and insects. A pest control program should be documented, including inspection schedules and reporting procedures. The packing shed should be closed to the outdoors as much as possible with tightly sealed doors and windows, fine mesh screens and cracks and holes should be repaired promptly, including leaks in the roof.
All SOP’s, policies, and schedules should be documented and kept where employees have access to them. All documentation must have a place for verification by a supervisor including an area for pest control. All records should be kept on file for a minimum of 2 years.
Pests Include:

- Rodents
- Birds
- Snakes
- Insects
- Pets
Prevention of Pests in Store Rooms

Land immediately adjacent to store rooms and packing sheds should have a buffer of bare soil around them to discourage high populations of rodents, birds, insects, reptiles, and amphibians from living next to the store rooms.
Prevention cont.

Loading docks should be kept clean and dry as to minimize the potential for pest infestation. If possible, loading docks should also have tight fitting doors that can be closed when not in use.
Prevention cont.

Care should be taken to prevent birds and other pests from contaminating packing equipment, surface areas, packing areas and storage areas.
Empty containers and unformed containers should be stored off of the floor and bare soil surfaces. This keeps insects, rodents and other pests from using the containers as shelter, nesting materials, and nesting sites.
Prevention cont.

A space of at least 18 inches should be kept between pallets, storage containers, equipment, and the wall. This allows room to check for rodent tracks and droppings and to clean the store rooms.
Maintaining sanitary conditions outside of the shed is important because it deters rodents from entering the building and limits the risk of contamination from being brought in from outside the building. This includes keeping trash, debris, weeds, and standing water from accumulating on the grounds outside of the shed.
In order to minimize the attraction of pests to the packing shed or store room; cull piles should not be left in the shed or on the grounds outside of the shed.

All garbage, whether in a trash can or dumpster should be kept with a lid on it to prevent insect and rodent problems.
Bird Control

Birds are an important consideration in the sanitation of packing sheds and store rooms because of their ability to carry bacteria over a large area. Effective bird control is difficult due to their flying and abilities to get into small holes. Several methods of bird control are available, but none are 100%.
Bird Control cont.

Reflective tape
Inflatable ball with eyes
Audible sounds
Windmills
Scarecrows
Owls
Rubber snakes
Rodent Control

- Exclusion
- Sanitation
- Live traps
- Mouse/Rat traps
- Bait stations
Rodent Control cont.
Rodent Control cont.
PACKING SHEDS AND VISITORS

Only authorized personnel in packing sheds
Absolutely no children or pets
Authorized visitors also need training
   Do not allow them to touch produce
   Make certain shoes etc are cleaned prior to entering the shed
   Control their access to areas of minimum exposure to produce
   Keep large numbers in groups guided by a knowledgeable employee

Although shed workers are a major source of contaminations, visitors can also cause potential problems with contamination.

Visitors are becoming an even more important issue in light of the bio-terrorism concerns now surfacing in this country.

Do not allow anyone other than employees to wander around the sheds unaccompanied.
Temperature management

- Low temperatures supplement good sanitation practices
- Avoid delays that postpone cooling
- Consider:
  - Time from harvest to packinghouse
  - Time from arrival to cooling of produce
  - Speed of cooling & final temperature
Temperature management

- **Cooling method**
  - forced-air, hydrocooling, vacuum cooling, package & top icing
  - 7/8 cool (7/8 of field heat removed before storage or transport)

- **Proper hydrocooler management**
  - water sanitized continuously
  - incomplete cooling = wet, warm produce = Potential for pathogen buildup
Temperature management

- **Storage and transport temperatures**
  - Optimum temperatures for fruits and vegetables range from 32°F/0°C to 59°F/15°C
  - Most human pathogens grow slowly or not at all below 45°F/7°C
  - *Listeria monocytogenes* is a special concern in refrigerated environments

- **Maintain records of temperature management**
# Examples of Storage & Transit Conditions for Vegetables

<table>
<thead>
<tr>
<th>Vegetable</th>
<th>Recommended</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Temp.</td>
<td>% R Hy</td>
</tr>
<tr>
<td><strong>Cole Crops</strong></td>
<td>32</td>
<td>90-95</td>
</tr>
<tr>
<td><strong>Curcurbits</strong></td>
<td>50-55</td>
<td>85-90</td>
</tr>
<tr>
<td><strong>Leafy Greens</strong></td>
<td>32</td>
<td>90-95</td>
</tr>
<tr>
<td><strong>Tomato (ripe)</strong></td>
<td>45-55</td>
<td>85-90</td>
</tr>
<tr>
<td><strong>(Mature green)</strong></td>
<td>55-60</td>
<td>85-90</td>
</tr>
<tr>
<td><strong>Pepper</strong></td>
<td>45-50</td>
<td>85-90</td>
</tr>
</tbody>
</table>
All products are harmed by exposure to excessively high and low temperatures. Temperate commodities should ideally be transported/stored at 32°F to 38°F (0°C to 3°C). Tropical and subtropical products must be transported at higher temperatures to avoid chilling injury.

Courtesy of Patrick Brecht and American President Lines

**PRESENTER:** Read this slide text to audience.
Temperature Affects Food Quality and Health Risks

Low temperatures preserve the quality of food (its aroma, flavor, texture and appearance), and protect it from spoilage. Chill cargo should be at its lowest safe temperature and frozen cargo must be 15°F (9°C) or lower at the time of loading.

Courtesy of Patrick Brecht and American President Lines

**PRESENTER:** Read this slide text to audience.
Load from an Enclosed, Pre-cooled Dock

- Enhances produce quality by maintaining optimum product temperature and reducing the potential for contamination
Packing Shed Hazards

- Water sanitation
- Equipment sanitation
- Animal exclusion
- Employee sanitation practices

Packing and storage facilities should always be maintained in a clean condition.
SHIPPING AND TRANSPORTATION
(vulnerable contamination areas)

- LOADING
- UNLOADING
  - *Fork lifts*
  - *Pallets / totes*
  - *Loading docks*
  - *Truck vans*

Pointless to produce a clean safe product and place it In a dirty or contaminated van !!
REQUIRED OF VANS PRIOR TO LOADING

- Determine prior load
- Pre-cleaned
- Sanitized
  - *If needed, provide equipment for cleaning and sanitizing*
LOAD PRODUCE ONLY IN CLEAN PRECOOLED VANS

- **THE PRODUCE IS YOURS, YOUR WILL BE RESPONSIBLE FOR IT.**
- **INSIST ON PRE COOLED WASHED VANS PRIOR TO LOADING**
- **MAY BE MONEY WELL SPENT TO INSTALL A POWER WASH STATION.**
- **CHECK PRIOR LOAD HAULED.**
Transportation & distribution
(cleanliness & Sanitation)

Pre-clean & pre-rinse Inside & out)
Use adequate contact time
Proper cleaner selection

- Aluminum panels & floors
- Utilize moderately alkaline
  + corrosion inhibitors
- Wood panels, utilize
  polyphosphates + surfactants
Dry Cleaning of Evaporator Coils and Fins

* Vacuum
* Gaseous oxidizers
Transportation & Distribution
Sanitation & Cleanliness

- Adequate mechanical disinfecting
  - Cleaning Equipment utilize
    - 6-8 gpm @ 650-850 psi & 130-150°F
  - Clean water rinse utilize
    - 60-80 psi & 130-150°F
Truck Features to Check Prior to Loading

- Air delivery chute intact?
- Door seal damage?
- Side door seal tight?
- Door damage?
- Wall damage?
- Front bulkhead installed?
- Floor clean?
- Floor drains open (clean)?
PRE-COOL VANS PRIOR TO LOADING

- Cool to temperature required by product
  - Maintains product quality
  - Reduces produce “sweating”
  - Reduces microbial development
Request temperature records be maintained in transit.
The Postharvest “Golden Rule”

Cool It Fast & Keep It Cool!

- Who is responsible?
  - growers, packers, shippers, receivers, storage operators & retailers
- What should the stakeholders do?
  - assure rapid movement of products at desired holding temperatures
  - constant refrigeration

The Golden Rule of Postharvest is:
Transportation

- Link in a Cold Chain From the Grower to the Consumer
- Pre-transit Handling of Perishables Dictates Quality and Shelf Life After Transport

Transportation is a very important food safety link between grower and consumer.
Stowing – No Hot Spots!

- **Block stowing (bottom-air)**  
  - air flows through vent holes in boxes

- **Airflow stowing patterns (top-air)**  
  - air flows down the entire length of the load in channels between boxes

- **Bracing and filling**

- **Avoid blocking air movement, which causes “short cycling”**

Proper stowing is important for effective cooling during transit.
Use packaging as part of temperature management.

- **To aid temperature management**
  - Appropriate venting for bottom-air or top-air delivery

- **To protect the product**
  - Stacking strength
  - Moisture resistance

**Product Packaging**

Courtesy of Jeff Brecht
The other kind of air delivery system is “bottom-air delivery”.

**PRESENTER:** EXPLAIN SLIDE.
There are two common types of air delivery systems in transport trailers: This slide shows “top-air delivery”. **PRESENTER: EXPLAIN THIS SLIDE.**
These are examples of incorrect stowage.
Recording Thermometers

- Usually placed to measure discharge air temperature
- Provide documentation of refrigeration (‘reefer’) unit performance
- Newer types have probes to record product temperatures, too
- Calibrate the temperature sensors!

Using the recording thermometer is a good idea.
Transportation

- Link in a Cold Chain From the Grower to the Consumer
- Pre-transit Handling of Perishables Dictates Quality and Shelf Life After Transport

Transportation is a very important food safety link between grower and consumer.
The Golden Rule of Postharvest is:
Desirable Features For Temperature Management

- High capacity fan
- Solid front return-air bulkhead
- Deep floor for air circulation
- Temperature monitored in discharge from refrigeration unit
- Air channels in walls for air circulation and to help isolate load from the environment

Trailers should have: **PRESENTER: READ THE SLIDE.**
**Recommendations**

- Cool products rapidly after harvest and maintain cold chain throughout handling
- Set maximum acceptable temperatures for each commodity carried
- Use recording thermometers with probes to monitor product temperature
- Maintain records of reefer performance and maintenance

In summary, cool produce, keep it cool and clean during transport and RECORD your efforts.
Recommendations (cont.)

- Use packaging compatible with the air delivery system, with excellent ventilation and strength
  - stow properly
- Regularly inspect and sanitize trucks & containers
- Maintain records of prior cargoes and equipment cleaning

Also, stow properly, use correct air delivery system and keep records!
A clean packing house is a safe packing house

- Clean and disinfect all surfaces
- Pressure wash walls from top down
- Discard fruits and vegetables that fall on the floor
- No animals in packinghouse (domestic or otherwise)
- Prepare cartons only as needed
- Remove fruit and vegetable culls and debris promptly
- Provide restrooms and hand-washing stations
  - Have an effective pest control program
- Maintain sanitation records