

Hello and welcome to Food Safety for Wash/Pack facilities, a training series brought to you by the Cornell Vegetable Program. Implementing food safety practices in wash/pack facilities is critical for ensuring that foodborne pathogens are not introduced or spread as produce is sorted, graded, washed, and packed.

This is Caitlin Tucker, Program Assistant for the Cornell Vegetable Program. Throughout this series, I will walk you through principles of food safety, the ideal wash/pack facility layout, post-harvest water management, cleaning and sanitizing, and tips for cleaning larger washing equipment. Because food safety is a company-wide responsibility, we invite all farm employees to participate in this training.

Here are some highlights from Part 1: How to Create a Worker Training Program.

- Bacteria, viruses, and parasites can cause foodborne illnesses
- Workers, animals, water, soil amendments, tools, surface, and equipment can all serve as sources of contamination
- Worker health and hygiene is critical for ensuring food safety on the farm.
- Farms should have policies on clothing, footwear, jewelry, glove-wearing, illness, injuries, etc.
- Handwashing can go a long way to stop the contamination spread
- Workers who are ill or injured can also spread contamination

Let's begin!

## **Food Safety for Wash/Pack Facilities, Part 2: The Ideal Wash/Pack Facility**

### **Objectives for Part 2:**

- Introduce the 5 Principles of Hygienic Design
- Highlight the importance of Standard Operating Procedures (SOPs)
- Review concept of ergonomic design
- Provide examples of "ideal" wash/pack layouts
- Review other considerations for wash/pack facilities: lighting, drainage, flooring, walls, pest management, etc.

### **Why Focus on the Wash/Pack Facility?**

Whether you're in the planning stages for a wash/pack facility, or already have one up and running, it's important to set aside time to think about design and layout and any modifications that can be made to improve food safety. This is because wash/pack lines are bottlenecks - all produce on the farm may need to go through the facility to be sorted, graded, washed, or packed. From a food safety standpoint, even the smallest amount of contamination could explode into a much bigger contamination event under the right conditions. Focusing on the wash/pack facility can help to minimize risk of microbial contamination and reduce opportunities for cross-contamination.

There are other benefits to focusing on the wash/pack facility layout –

Organizing supplies, separating clean vs. dirty areas to reduce cleaning time, or modifying equipment can trim off minutes or hours you spend in the wash/pack line. This helps to free up your time, save you money, increase efficiency and thoroughness.

Modifying the facility to meet worker's needs can go a long way in reducing injuries, and improving health and safety of employees.

And finally, being able to move produce through the wash/pack line, reducing microbial contamination, and streamlining cleaning procedures can improve the overall quality of the produce.

**Before we dive into the details, it's important to recognize that there is no one "ideal" wash/pack facility.**

Facilities should be designed or modified to meet your farm's needs. That being said, facilities can be outdoors and open to the environment, or indoors and closed to the environment. Every facility will have its own food safety risks that need to be addressed, but you should feel free to design your facility as you see fit.

### **Key Things that Should be in All Wash/Pack Facilities**

Whether your facility is indoors or outdoors, there are a few key things that should be present in all facilities:

- Should have sufficient space for you and equipment to move around
- It should be organized and uncluttered
- It should have adequate light so you can effectively sort and wash produce, and clean and sanitize equipment
- It should allow you to clean and sanitize food contact surfaces
- Facilitate pest management
- And finally, it should be intentionally designed.

### **General Design Considerations**

When we talk about intentional design or modification, there are 5 key principles of hygienic design that should help guide you through that process. These 5 Principles were developed by Chris Callahan at the University of Vermont

Following these principles can help to minimize or eliminate foodborne pathogen harborage points within Wash/Pack Facilities. They are as follows:

1. Visible and reachable surfaces
2. Smooth and cleanable surfaces
3. No collection points
4. Compatible materials
5. Preventing contamination

Let's Review each Principle in more depth...

#### **Number 1: Visible and Reachable Surfaces**

- If you cannot see a surface, or reach a surface, it cannot be adequately maintained, cleaned, or sanitized!
- When purchasing new equipment...consider whether disassembly and reassembly will be easy?
- Use standardized operating procedures to properly disassemble and reassemble equipment
- Mirrors and flashlights are helpful to see into depths of some equipment.

#### **Number 2: Smooth and Cleanable**

- Porous or coarse surfaces can easily trap and accumulate soil, vegetable debris, and contaminants. Choose equipment or tables that have smooth surfaces to facilitate better cleaning.

- Choose equipment or surfaces that are smooth, or have rounded welds.
- Choose continuous welds over intermittent welds . Continuous welds are those that span the entire length of the joint. Intermittent welds are those that appear tacked together.

### Number 3: No Collection Points

- Soil or debris can collect in: cracks, gaps, spaces, rough welds, screw threads, corners, behind flaps, leg supports
- If soil and debris can collect in these spaces, so can moisture. This can lead to corrosion of metal in equipment in these collection points.
- Investigate collection points on equipment and throughout the facility in the off-season
- Develop SOPs that describe where to find these for cleaning
- Fans and blowers can be used after cleaning and sanitizing to help promote quick and thorough drying

### Number 4: Compatible Materials

- Match food contact materials to the type of produce being handled or minimize the force of contact. Consider produce that has thin skins or those that can be easily bruised.
- Cleaners and sanitizers should be compatible with the equipment or food surfaces they are being used on.
- This is because some chemicals, like sanitizers, may be corrosive when applied to equipment. This could lead to significant wear and tear of metal surfaces over time.

### Number 5: Prevent Contamination

- Prevention is key! It is much better to be proactive about reducing contamination in the wash/pack facility compared to reacting to food safety risks that pop up.
- You should always exclude animals from the wash/pack facility. This may include birds, rats, mice, squirrels, insects, as well as cats or dogs.
  - Consider which pest problems are predominate in your wash/pack facility and optimize your pest management strategies to target those pests. This may include using rafter netting, hardware cloth in framing, setting traps, etc.
- Remove culls and trash daily – this can help to reduce pests from coming into the facility. This will also help to reduce insect populations. Insects are capable of spreading contamination too!
- Keep Items at least 6" away from walls. Many rodents like tight, hidden spaces.
- It's also very important that you pay attention to walls, ceilings, and floors when it comes to cleaning

### Ergonomics

Beyond the 5 principles of hygienic design, another feature you should consider is Ergonomics. Ergonomic design involves designing the facility to meet the needs of the workers rather than requiring workers to adapt to the facility layout. This can help significantly reduce repetitive strain from bending, leaning, etc.

Some things you might consider include the height of tables or wash pack equipment. If you are working with lighter items, the efficient work height is halfway between your wrist and elbow. For heavier items, work height should be slightly lower. Could some of your employees use step stools? Can some tasks be done while sitting? Employees spend a lot of time in the wash/pack facility over the course of the season. Even small modifications can help to improve worker safety, health, and overall wellbeing.

## Layout

And now let's talk about overall layout. Here's one layout that's less than ideal. What issues do you see? Is this an efficient layout? Should the table for weighing, and bagging be in the center of the facility close to the washing stations? This may open up opportunities for contamination. Is there enough room for people and equipment to move around.

Here are some examples of "ideal" wash/pack layouts. Remember – there's no one right way to design your facility. An ideal may be unattainable, but here are some workflows that can better facilitate food safety.

On the top left, we have a u-shaped design. There is a very clear, unidirectional flow from the field, to being wash, dried, spun, packed, and loaded. This helps to reduce cross-contamination.

Another option in the bottom left is a shared workstation design that may better facilitate multiple employees working in the wash/pack facility. Again, there's a very clear unidirectional flow.

But perhaps you require a more varied layout, such as the one on the right that facilitates washing and packing of different types of crops such as root crops and leafy greens. We still have a unidirectional flow that corresponds to the produce getting progressively cleaner.

Here is another layout from Robert Hadad that includes additional components of a wash/pack facility including restrooms, pallet areas for dirty harvest bins and clean harvest bins. But don't limit yourself to these designs - There are numerous designs out there – take the time to review a few, pick and choose the best features of each and modify them to fit your wash/pack needs.

## Layout Considerations to Prevent Cross-Contamination

And finally, here are some additional layout considerations to help prevent cross-contamination.

- Separate dirty vs. clean; wet vs. dry – this can be done by using color coded pallets, or being intentional with the facility layout
- Color coded, tools, brushes for use on equipment vs. floors vs. cull bins or trash cans
- Keep supplies close at hand so you don't have to trek across the room to get what you need
- Be intentional in locating trash and cull piles.
- Have separate areas for tools, measuring sanitizers, supplies
- Locate first aid kits and eye wash stations in areas that make sense
- Keep hoses off of floors, out of sinks, tubs – hoses can easily pick up or spread contamination if left on the ground to be walked upon or if they sit in puddles of water

## Food Safety Considerations for Other Key Features of Wash/Pack Facilities

Now that we've talked about the big picture, let's review food safety considerations for other key features of wash/pack facilities.

## Doorways

If possible, install thresholds. This can help to prevent water intrusion as well as make it easier to move wheeled equipment, dolly's, carts, etc.

Keep doors closed whenever possible. This can deter pests from entering.

Reduce dirt, dust, heat loss with doorway curtains, but be mindful of the length. They should not brush against the floor. Consider all of the equipment and/people that may pass through and brush up against the curtain. How will you clean them? How often will you clean them?

## Walls

If your facility has walls, wall-paneling material is of concern. Avoid bare wood – it is impossible to sanitize. Strive for washable walls. Smooth surfaces make the task of cleaning up after washing and packing produce a whole lot easier

Allow for 6 inches of space between equipment, storage shelves, and other objects to deter pests and to allow for easier cleaning.

Walls could be covered with a water resistant paneling, such as fiberglass reinforced panels (RFP). These panels provide a smooth surface that is impermeable to water and easy to wash stuck material off without ruining the surface (unless you use steel wool or something really abrasive).

## Lighting

Generally, most repurposed barns and sheds are lacking in good lighting. Ideally, there needs to be enough light for workers to sort and cull easily, wash effectively (making sure debris is off produce or to correctly read SOPs or labels on sanitizers or cleaners, and end of the day equipment cleaning. Light fixtures need to have bulbs covered to prevent any glass from dropping onto the produce if broken. The fixtures should be positioned to give adequate light for workers and not cast shadows in the wrong places.

## Flooring

The biggest concern with flooring is standing water. Listeria has been found in standing water in wash/pack houses. If equipment is rolled through these puddles, or if workers walk through puddles, contamination can very easily be spread throughout the facility. It is important be intentional with water movement – new flooring can have a pitch of  $\frac{1}{4}$  inch per foot (2%) to make for an easily drainable surface. You should also balance clean-ability with functionality, meaning floors should be smooth enough to clean and easy for roll carts and equipment to move, but rough enough to provide traction to minimize slip hazards.

Curbing or cove bases can be used to provide a smooth transition between the wall and the floor to allow for better clean ability.

Carpet should be avoided – it is impossible to clean and sanitize due to all of the minute harborage points for pathogens and soils and debris.

Mats can be beneficial for workers that are standing for long periods of time, but consider that they can also trap moisture and debris, and serve as harborage points for contamination if they are not routinely moved, cleaned, and sanitized.

## Drainage

Proper drainage is a must. You should make sure your facility has enough drains to allow for quick draining. They should be checked regularly to make sure they are in good working order so that back-flooding does not occur.

Make sure they are also cleaned regularly, and sufficiently to prevent bacteria, like *Listeria*, from establishing.

Floor squeegees are helpful to direct the flow of water if your floor is not sloped to facilitate drainage, but understand that they will need to be cleaned frequently as well, otherwise you could be squeegee-ing contamination across the facility.

Circular drains are okay – if they can be cleaned out. Ideally, though, your facility would have trough or grate drains. These drains should be large enough so that you can take the grate off, shovel debris out, and sufficiently clean and sanitize.

If your wash/pack facility is located outside, you should still have proper drainage. If possible, siting the location on slightly sloping ground. Several inches of crushed gravel can allow water to drain down without pooling underfoot. Landscape fabric over bare ground can also be used as long as a gravel-filled furrow is in place to catch water coming off the wash line or under other equipment. One problem with landscape fabric on bare ground is that if the ground becomes compacted, water will have a difficult time percolating through. This will cause muddy spots to develop and seep upwards through the fabric.

## Discharging Waste Water

In addition to proper drainage, you should also be aware of how wastewater from washing and packing should be discharged.

- What are the local and state regulations?
- Water could be discharged into grassy vegetative area away from surface water, ditches, and veg fields.
- Do not discharge into septic systems or storm drains
- Do not discharge if there is high concentrations of sanitizers (higher than label directions)
- If sediments build up in wash water, do not dump into landfills, streams, or other waterways

## Storage

Items that should be stored in wash/pack facilities include:

- Harvesting Tools, Harvest Containers
- Cleaning Brushes
- PPE, eye wash stations, first aid kits
- Sanitizers and Detergents
- Thermometers, monitoring strips, measuring cups
- Packing Supplies

Items that should never be stored in wash/pack facilities include:

- Pesticides
- Fertilizers
- field tools
- personal items
- or non-food grade lubricants

### Considerations for tables and equipment

Key features of tables:

- Be easy to clean! Surfaces should be smooth; seams should be sealed. Use surfaces that are non-absorbent.
- They should be quick drying
- It is helpful if they are lightweight to facilitate moving, reinforced to support heavy bins, equipment, and modular.

### For Wash/Rinse Tables

- The purpose of a wash/rinse table is to remove excessive soil or plant debris. This ultimately helps to reduce interior clean up.
- They can be located outside of the facility.
- Depending on the crop, this can be set up so this IS the washing step.
- It may be possible for you to run sanitizer injection line
- Where this table is located should have excellent drainage to move dirty water out and away from the wash/pack area.
- Foot pedal valve could be used for hands free washing.

### “Dirty Table”

- This table should be used to keep things off the floor, but within reach, such as full harvest bins. It could also be used for sorting.
- This table should not be used for washing
- The Surface can be non-absorbent...or not. Seams can be sealed... or not, but it should be easy to clean!

### Pack Tables

- Screen tops can help facilitate drip drying produce
- Solid top could be useful if you're using the table to fill boxes or containers
- Make sure you have enough space for:
  - A Scale
  - Clipboard (recordkeeping)
  - Labeling

**And finally, if possible, purchase or modify equipment or tables with wheels! Wheels can allow for easy movement for cleaning, rearranging the facility, etc. But make sure they have a locking mechanism!**

## Pest Management

It is incredibly important that you keep animals out of the wash/pack facility.

- If you recall from Part 1, all animals can carry or spread diseases that can contaminate food – like E. coli, Salmonella, etc.
- This includes rodents, birds, flies...and pets!
- Rodents may be looking for food, a place to hide, or nest
- Birds may be looking to build nests
- Insects attracted to cull piles and garbage
- Pets may follow owners, or be searching for food

Here are some tips for managing pests:

- Inspect all walls, doors, windows for cracks, holes, spaces, then repair
- Deter birds from roosting with nets or spikes
- Use window screens & keep doors closed, if possible
- Mow vegetation around building frequently
- Do not store things right up against walls
- Empty garbage & cull bins daily or as needed
- Cover produce when leaving for lunch or breaks
- Keep pets at home, or outside
- Use traps for mice, rats
- Dump culls far away from facility and field production

If you plan to use traps for managing mice or other rodents, here are some things you should consider:

- Keep pallets and other items 12-18" away from inside walls
- Place live traps for indoor management; avoid using bait indoors because it could attract rodents inside
- Never use poisons!!! → There is a risk produce may become contaminated with the poison.
- Place outdoor bait traps along perimeter every 30-50ft
- Map where traps are and check them regularly!

## In Summary...

- Be intentional about facility design or modification
- Consider the 5 Principles of Hygienic Design, ergonomics, and layout
- Adequate lighting, clean-ability, organization, good drainage, and pest management are all important features of a wash/pack facility
- Rodents, birds, insects, and pets can introduce or spread contamination within a wash/pack facility

## Resources

Here are some Resources to help get you started on designing or modifying your wash/pack facility that improve food safety, align with the principles of hygienic design, and facilitate ergonomics.

[The "Ideal" Wash and Pack Facility Layout](#)

[Getting Started with Wash/Pack Facilities](#)

[Hygienic and Sanitary Design for Produce Farms](#)

[Hygienic Design on Produce Farms \(VIDEO\)](#)

[Ergonomics for Farmworkers](#)



**Thank you for watching Part 2: The Ideal Wash-Pack Facility.** If you have any questions or would like clarification or help identifying resources, do not hesitate to reach out. You can reach Extension Specialist [Robert Hadad via email](#) or by phone at 585-739-4065. You can [email Program Assistant, Caitlin Tucker](#) or call 573-544-4783.

Learn more about the [Cornell Vegetable Program](#)

Up Next: Part 3 – Post-Harvest Water Management