Germination Chamber Case Study

Name: Leon Vehaba

Farm Name: Poughkeepsie Farm Project

Email: leon@farmproject.org

Case study prepared by Crystal Stewart of Cornell Cooperative Extension's Eastern NY Commercial Horticulture Program: enych.cce.cornell.edu or cls263@cornell.edu

Key considerations for chamber design: Leon wanted to have two different chamber areas that could be set at different temperatures (one for tomatoes, for example, and one for lettuce). In order to accomplish this goal, he created two chambers which face each other in the head house to the greenhouse. The design provided is for one of the two chambers, which accommodates 96 flats. Other key considerations were that the chamber be cleanable, durable, simple, fixable, have temperature alarms, and be rodent-proof.

Materials	#	Unit Cost	Total
Box Materials			
2 x 4's Doug Fir (12, 10' and 20, 8')	1	$74.3	$74.3
1/2" plywood (walls)	6	$19.16	$114.96
3/4" pressure treated plywood	1	$44.5	$44.5
2" Blue foam insulation	8	$41.1	$328.8
Swivel casters	8	$14.25	$114
Chamber shelving			
Metal shelving base	1	$210	$210
Metal shelves	9	$43	$387
Freight	1	$192	$192
Temp/RH Control Materials			
Monnit temp. and humidity monitor	1	$224	$224
Monnit cellular gateway	.5	$249	$124.5
Digital thermostat	1	$83	$83
Water pan gasket and auto-fill valve	1	$35.7	$35.7
Aluminum pan	1	$27.94	$27.94
Wiring hardware and materials	1	$154.61	$154.61
Grand total			$2115.31

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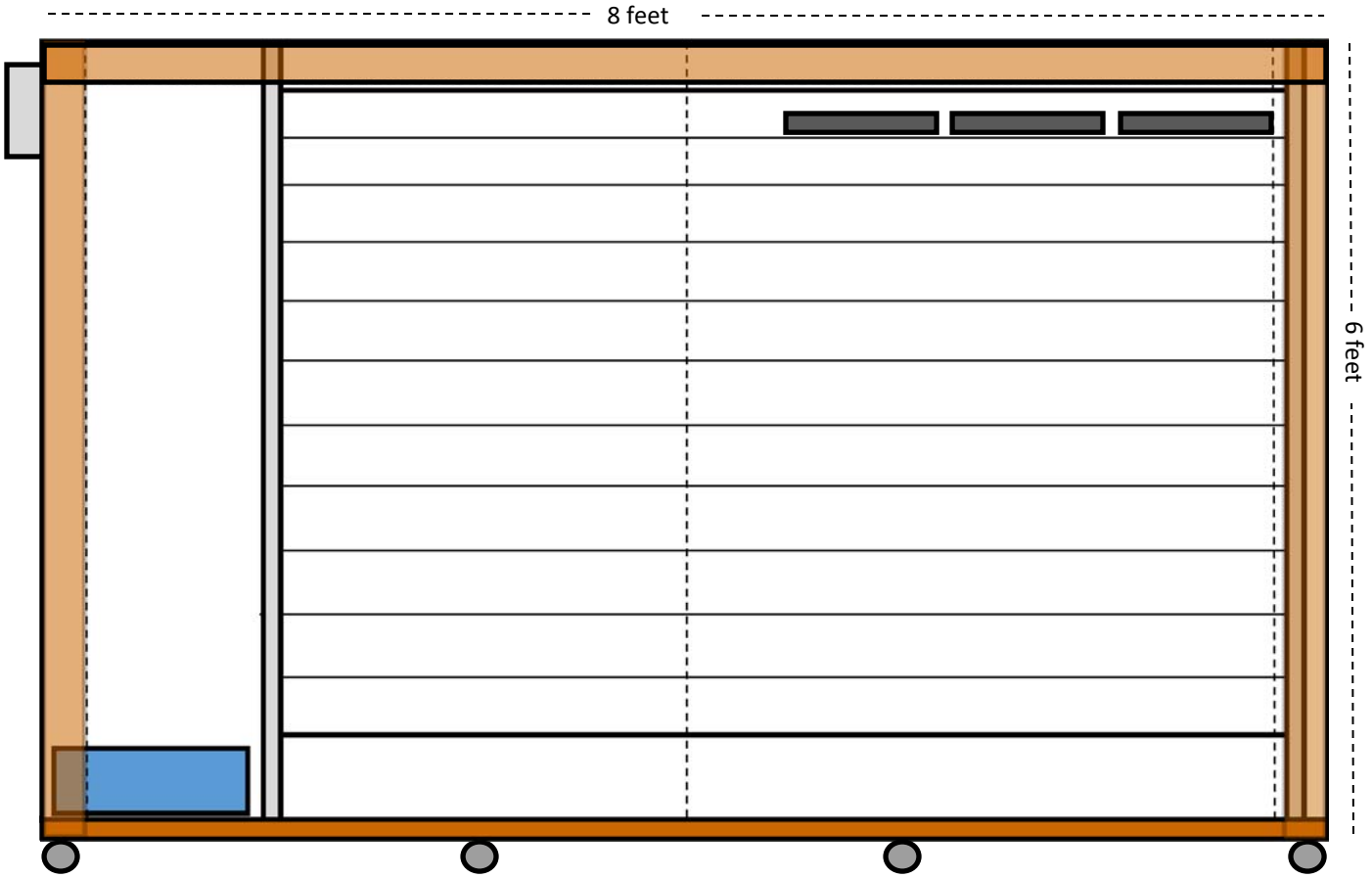
Construction overview: the germination chamber is made of an untreated lumber frame with a plywood exterior and blue foam inside. All exposed wood on the inside was painted with leftover water resistant paint to slow rotting. The plants are placed in a pre-made shelving unit and the temperature/humidity control is located on the floor next to the shelving unit. The door is made of two pieces of blue foam held with wood.

The unit is deep enough to accommodate flats length-wise with room for air exchange around the shelving unit—almost 48 inches.



This unit could be easily made to accommodate a variety of spaces, with the box consisting entirely of common lumber. The key technology features of this chamber are the temperature and humidity monitors, which allow the farmer to constantly monitor the chamber despite not living at the farm. Each chamber needs its own monitor, but the cellular relay which conveys information is shared by the two units.

This chamber was placed in the headhouse, but had to have new electrical lines brought to it from the box. This increased the cost of the unit, but placement in a temperature-moderated area brings down the long-term costs of operation and increases the convenience of the unit.

Key Suppliers for this Project:

- Monnit Greenhouse Monitors: info@monnit.com, 1-801-561-5555
- Johnson Controls Digital Thermostat: Available through Amazon
- Metal shelving units: Wellmaster: http://www.wellmaster.ca/

Germination Chamber Case Study

Name: Lenny Prezorski

Farm Name: Cold Spring Farm

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Case study prepared by Crystal Stewart of Cornell Cooperative Extension's Eastern NY Commercial Horticulture Program: enych.cce.cornell.edu or cls263@cornell.edu

"We begin germination on March 1st and continue until June. A wide variety of flower and vegetable seeds are germinated throughout this period. We go from impatiens to seedless watermelon and would especially like to be able to germinate light sensitive seeds."

This chamber consists of an custom-fabricated metal frame with poly-coated racks. The insulation is solid foam board. Humidity and heat are provided by a water pan with a heat element placed in the bottom. The thermostat controls are mounted on the outside of the unit. Supplemental lighting is mounted on the top of the unit, providing illumination to the first row of trays.

Metal Frame Costs			
	# of Units	Unit Cost	Total
1.75" Square steel greenhouse endwall tubing	66	$2.35	$155.10
1/2" galvanized conduit for shelf supports	18	$5.50	$99.00
Fabrication cost	1	$650	$650.00
Casters, 4 inch rigid	2	$22.99	$45.98
Casters, 4 inch swivel	2	$22.99	$45.98
Insulation and Shelving Costs			
Close mesh pantry shelving	9	$21.97	$198
2-inch foam board (4'x8' sheets)	4	$33.92	$135.68
Tuff-R r12 insulation board 7/8"	2	$31.95	$63.90
Foamboard adhesive	2	$3.58	$7.16
Tek Screws, box of 30	1	$5.49	$5.49
Electronic Equipment			
Thermostat	1	$116.72	$116.72
LED lighting strip	1	$201.15	$201.15
Aluminum pan and heating elen	1	$61.53	$61.53
Assembly of chamber			
Labor	10	$20	$200.00
Grand Total			$1,985.42

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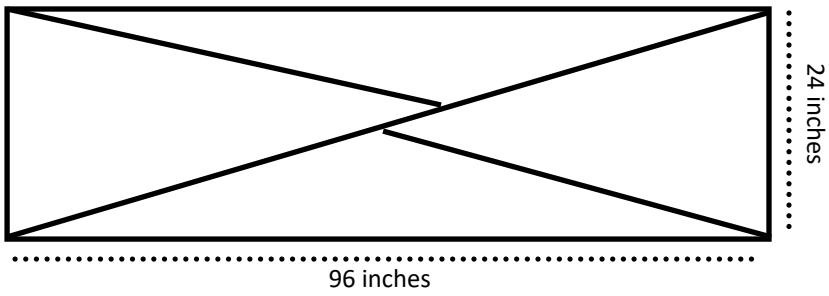
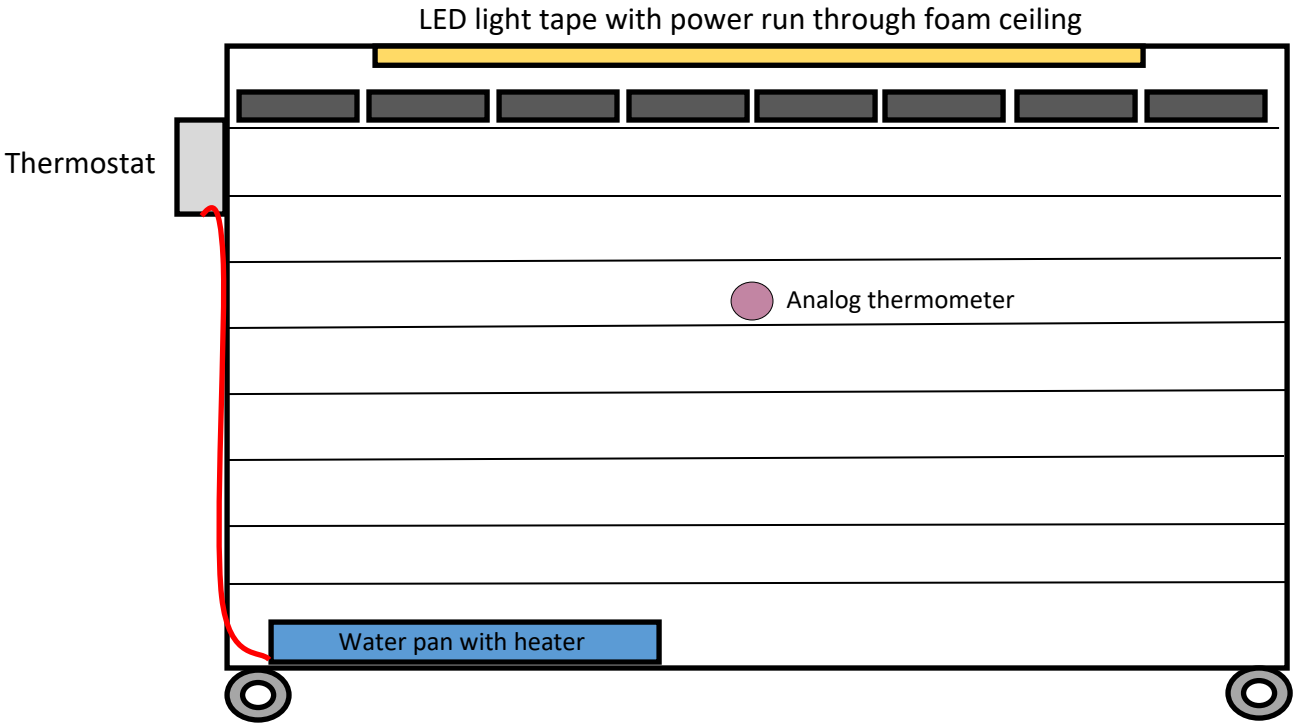
Construction Sketches

Top view of shelf support: the dimensions of the unit are 24x96, with cross braces made of welded conduit on each shelf to support the wire mesh. Nine shelves are welded to the frame, which is described below. An LED light strip is mounted on the ceiling of the chamber.



Side view: the frame is made from square 1.75 inch steel greenhouse endwall framing material. Foam board is attached on the outside of the framing using Tek Screws. The door is a piece of foam board the size of the front mounted on a channel that allows it to slide. It is held in place by a 2x2 piece of lumber across the front (see picture next to profile)



This chamber is located inside the greenhouse, and is powered by an extension cord. Because the unit is in the greenhouse, high temperature controls have been a more significant factor than low temperature controls, which are automatically corrected by the heating element located in the chamber. During year one of use, high temperatures were regulated by opening the door of the chamber to release warm air. This strategy relies on human monitoring and intervention, which is not ideal. In the future Lenny would like to install a thermostat-driven exhaust fan in the chamber.

The fact that the chamber needs venting for temperature control may contribute to sub-optimal relative humidity as moisture is lost during the venting process. This is a concern which growers wanting to site chambers in the greenhouse instead of a cooler head house should be aware of.

Key Suppliers for this Project:

- Waterproof LED strip light: Allied Electronic: http://www.alliedelec.com/
- Steel endwall framing: Nolts Greenhouse Supply: http://noltsgreenhousesupplies.com/

Germination Chamber Case Study

Name: Adam Hainer Farm Name: Juniper Hill Farm

Growing Information from the survey: We would like to have the ability to germinate at least 40-1020 trays at a time from the months of February—April. The chamber would need a to be controlled to about 80 degrees Fahrenheit at the highest . The space we have available is 2 feet deep x 8 feet long x 6.5 feet high and we have electricity and water available to us as utilities. Basic fluorescent lighting could work since we would like to grow lettuce past the germination stage. We do not have simultaneous germination conditions. Some of our germination protocol can be stacked for a short period of time.

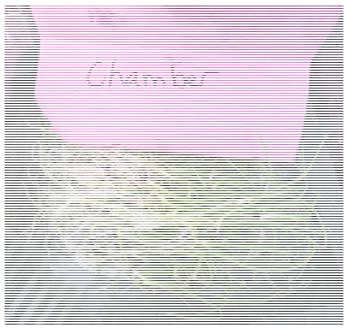
Construction details

Ultimately, Adam opted to build a germination chamber "headhouse" rather than build the chamber he had originally conceived of. This chamber is situated at the end of two tunnels, and has access to both by short sidewalks. The chamber was built on a poured concrete pad with radiant heat in the floox (PEX). The frame is 2x4 lumber with hard spray foam insulation. Low levels of light are supplied to the room by fluorescent bulbs.

This chamber design has proven efficient and effective, but not as efficient and effective as the other chamber designs. There are issues with relative humidity with the radiant heat floor as opposed to heating a smaller chamber with a heat unit in a water pan. Keeping the temperature in the optimal range requires significantly less energy heating the greenhouse, and does offer significant savings in that regard.

An additional benefit of this design is that this room can also be used to cure crops in the fall such as sweet potatoes and squash.

While this design is not considered in the top two for chambers, it is still noteworthy. If growers are looking to create a larger, multipurpose space, they can reach out to Adam regarding construction of a similar structure.



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Germination Chamber Case Study

Name: Carlington Henry

Farm Name: Hepworth Farms

Email: rap.56@hotmail.com

Phone: 845-943-1166

Growing Information: We have a greenhouse space available for a 30'x80' germination chamber. We would like to allow 5x5' for the growing space. We usually start seeding greens mid March through the end of April and will seed brassica crops and lettuce again in the fall. The germination chamber will be needed about 3-4 months of the year. The greenhouse is heated and we would germinate any additional trays here. The temperature would be 75 degrees Fahrenheit in the day and 55 degrees as a low in the night. Gas and electric are our available utilities. No stacking of trays and we have a need for multiple germination conditions.

Construction details: Lighting is needed and we have to be able to roll shelved charts into the chamber. Stacked shelves will be an issue if lights are only located on the ceiling. If the chamber has automatic humidity and temp control along with a display on the outside it would be useful. It should also be easy to clean. The tray size is 21" x 11" and the self cart width is shelf chart width is 22" height 6' 9" length 5' 8.5".

Two chambers were constructed by Hepworth Farms. The dimensions are 7'4" high on the inside, depth is 4' and 8' 2" long. Two shelved carts are able to roll and fit into each chamber which holds up to 156 germination trays. Lighting will be added to the germination chambers so that germinated trays can be held longer in the chambers, an active ventilation system will need to be added to prevent overheating.

Before building these chambers the Hepworths draped plastic over two or more charts and placed a humidifier and heater in between them (top left picture).

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Germination Chamber Case Study

Name: Jody Bolluyt and Jean-Paul Courtens

Farm Name: Roxbury Farm

Growing Information: The chamber will be used for everything from onion to lettuce transplants, starting in March and continuing through July or August. We need to be able to germinate up to 64 trays at a time, and need too have enough light in the chamber to germinate lettuce. We don't have a head house, and will be putting the chamber in the greenhouse. We also don't have time to built a chamber, and would prefer to buy an out of the box model.

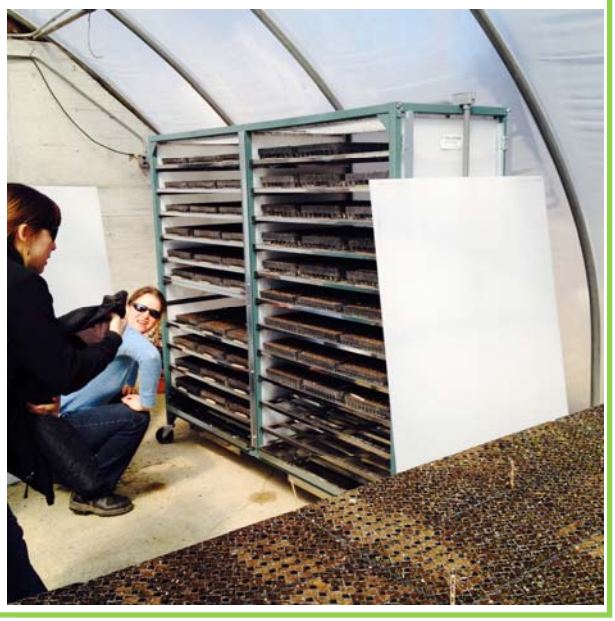
Construction details: Roxbury farm purchased a Pro-Grow Space Saver PC-70 Dual-Zone Chamber.

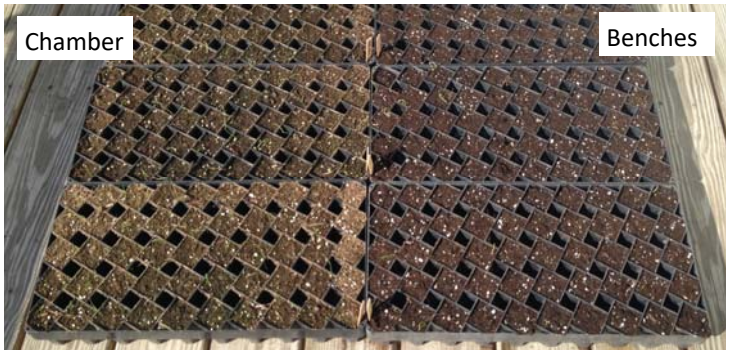
FEATURES:

- Heavy duty welded steel frame. - Factory paint with **stainless steel brackets**.
- **Stainless steel shelves.** - Storage rack for removable door panels.
- Special **low heat, low density** electric heaters. - Heavy duty swivel casters.
- Durable pro-grow thermostats for temperature control. Range 40-100 Deg. F.
- Pro-grow "WATER SAVER" Special design returns condensed moisture to water pan, reducing refills. **Eliminates need for external water tank. Cleanout drain in tank.**

The rationale behind this chamber was that it could accommodate the right number of flats, advertised not needing watering, had dual thermostats, and was easily cleaned. The chamber presented immediate issues being cited in the greenhouse, however. Because it was in a warm environment for half the day, the heater elements in the water pan never came on. The relative humidity in the chamber dropped, and the flats dried out. The water which evaporated from the flats condensed on the roof of the chamber and rained onto the top shelves, saturating those plants.

This chamber might work well in a head house, but is not suitable for use in a greenhouse. This was the only chamber which had lower germination rates in the chamber than on benches. Another issue with energy use is the lack of insulation.





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