



# Transfarmation



## 16' x 16' Building Conversion for Specialty Mushroom Cultivation

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This plan was created in collaboration with **Kevin Melman**, owner of **FUNJ. Shrooming Company**.

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This conversion plan is for a building with a concrete floor with a drain.

Conversion Plan Contents:

- Overhead schematic
- Cooling system details
- Cooler space details
- Details about fruiting chamber structure, humidification, exhaust, and air intake
- Full list of equipment and materials
- Final estimated budget



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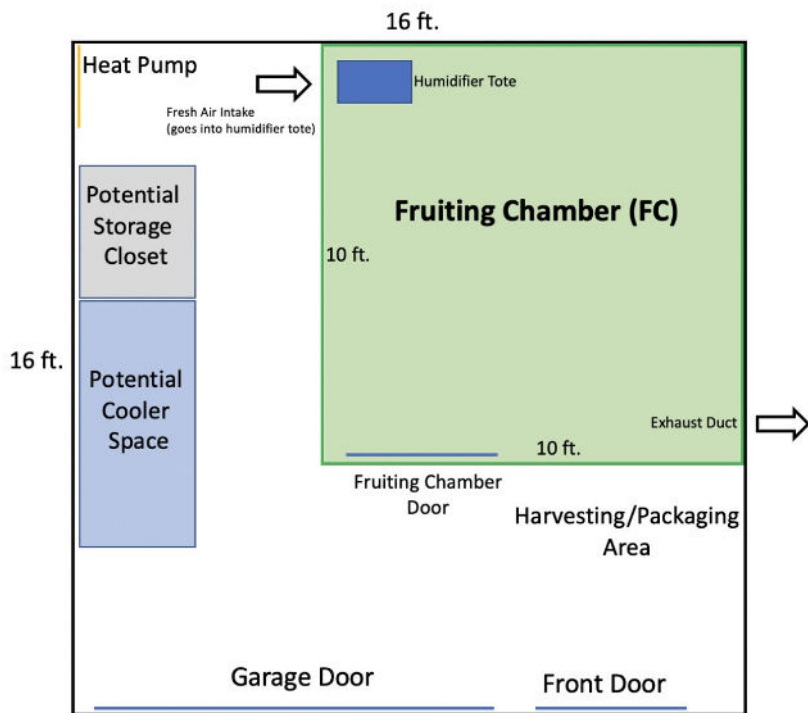


Figure 1. Overhead schematic of 16' x 16' building.

## Cooling System for the Entire Operation

A heat pump is likely the best idea for this building.

The general rule is to allocate one ton (12,000 BTU) per 100 sq. ft. of fruiting space. Oversizing is always a safer bet.

The heat pump can be placed in one of the following areas:

- Outside the fruiting chamber on a wall or, if possible, above the fruiting chamber in an attic to cool the entire building
- In a small room called a preconditioning chamber
  - This is more complicated but is popular for larger grow operations.
  - Essentially, a small room or chamber is cooled to the appropriate temperature, and then air from the room is directed through ducts into the fruiting chamber.
  - This ensures efficient cooling, as you don't need to worry about cooling your entire structure.
  - [This video](#) shows an example of a preconditioning chamber.

Kevin recommends placing the heat pump outside the fruiting chamber and not being concerned with preconditioning chambers. The only caveat is that the structure must be insulated enough to maintain a cool temperature (55°F–62°F is ideal, up to 68°F is acceptable, but over 70°F will promote contaminants).

## Cooler Space

Cooler space is necessary for storage of ready-to-fruit (R2F) blocks and fresh harvested mushrooms.

Each R2F block is about 10' x 8' x 8' (~0.40 cu. ft.) and can be expected to yield about 2 lb. of fresh mushrooms.

- To harvest 100 lb. per week, you should put 50 blocks into the fruiting chamber each week.
- This means you would want a monthly order of 200 R2F blocks, **requiring 80 cu. ft. of cooler space** (e.g., a 4' x 4' x 5' cooler section).

Store fresh mushrooms in boxes in the cooler.

- About 15 lb. can typically fit in one 24' x 18' x 8' box.
- You should be able to fit **100 lb. of mushrooms in a 4' x 2' space** in boxes stacked a few high.

## Options for Cooler Space

Walk-in cooler (prefabricated panels you put together)

- Pros: Most sophisticated, good insulation, usually simple construction
- Con: Most expensive option

Insulated box with a window AC unit and CoolBot (Kevin's recommendation)

- Pros: Inexpensive, relatively easy to build. Insulated boxes can be built against a wall (so you need to build only three walls and a ceiling) for little cost, mainly for wood and insulating foam board (minimum R-value of 25). Repairs are also inexpensive and easy, as air conditioners are relatively cheap.
- Cons: More involved construction, including cutting a hole in the side of the building; challenges reaching appropriate temperature. Air conditioners can sometimes not cool the space down to nearly freezing (oversize AC units are recommended).

Chest freezers run on thermostats to keep the temperature around 34°F–36°F

- Pros: Cheapest option, efficient. Thermostats are efficient (Kevin uses Inkbird brand), and chests are more efficient than standing refrigerators.
- Cons: Occasional ice buildup on the freezing panel, difficulty finding very large chest freezers, little vertical storage.



Figure 2. Photo of a fruiting chamber with portable shelving.



Figure 3. Photo of a fruiting chamber with fixed shelving.

## Fruiting Chamber Design

Shelving options vary by material and portability.

Construct shelving with pressure-treated two-by-fours and conduit piping (plastic or metal).

- Pros: Cheap, easy to clean. Pressure-treated boards measuring 2' x 4' x 8' cost about \$11 each. Posts should be placed every two to four feet (see figure 3).
- Con: Not portable

Construct shelving with pressure-treated two-by-fours and pallets.

- Pros: Cheap, portable. Pallets can be found for free.
- Con: Tougher to clean

Use premade shelving.

- Pros: Portable, easy to clean.
- Con: Much more expensive. [The Shelving Store](#) is great because they offer affordable shelving and sell replacement parts. A shelf measuring 48' x 18' x 72' with casters costs around \$300. An average-size fruiting chamber can hold about five to seven shelves, so the total cost would be about \$1,500–\$2,100.

## Humidification System

- The House of Hydro offers humidification products and ideas that are perfect for a small fruiting chamber.
- [Their website](#) features a guide to building a humidifier with one of their disc foggers, a plastic tote, a fan, and ducting.
- For a 10' x 10' fruiting chamber, one [12-disc fogger per tote](#) (\$300) is recommended.
- You may need to build two humidifier totes, but one can be enough if you have fans for humidity distribution.
- Kevin recommends placing a small fan under the fogger and pointing it upward to help with distribution. You may need to experiment.
  - Always have hygrometers in various parts of the fruiting chamber to ensure even distribution of humidity.

- Intake air should come from outside the fruiting chamber to ensure water in the tote stays clean.

### Fresh Air Intake and Exhaust

Intake air should come from outside the fruiting chamber and into the humidifier.

Exhaust should be placed low in the room and by a corner opposite the humidifier.

- This ensures the fog has time to disperse evenly and is not being sucked away before distributing around the fruiting chamber.
- A low placement is recommended because CO2 tends to sink, and mushrooms produce a lot of CO2.
- For proper fresh air exchange, you should replace the air in the fruiting chamber quickly. If the fruiting chamber is 800 cu. ft., get a fan that can exchange air in the space at least four to five times per hour.

Ensure negative pressure.

- Always keep exhaust on, even if you have to use a dampener duct or a fan with a dial.
- Ensure the exhaust is pulling more CFM (cu. ft. per minute) than the intake.
- If a fruiting chamber has positive pressure, mushroom spores will spill out into the rest of the building, which poses a health hazard.

### Full Building Materials List

- Metal studs for fruiting chamber (placed 24 inches on center, as structure is not load bearing): \$11 x 20 = \$220
- Coroplast walls: \$8 per two-by-four-foot sheet x 10 per wall x four walls = \$320
- Shelves: About \$200 (build your own) to \$1,800 (buy premade). Estimate is based on the assumption that three walls have shelves against them.
- Cooler: Building a CoolBot walk-in can be done for around \$1,800 (~\$200 for wood, ~\$800 for insulation, \$400 for CoolBot device, and \$400 for two-ton AC unit).

**TOTAL ESTIMATED MATERIALS COST: \$2,540** (build stationary shelving) to **\$4,140** (buy wire shelving with casters)

### Full Equipment List

House of Hydro fogger and DIY humidifier equipment: **\$450**

Humidistat: **\$60**

Mist output controller: **\$30**

Lighting (cool-spectrum LEDs are best): **\$40**

Light timer: **\$10**

CO2 sensor (exhaust can hook into this if you want): **\$280**

Respirator and extra filters: **\$45**

Variable-speed exhaust fan: **\$200**

Fresh-air intake fan: **\$100**

Two-ton heat pump: **\$5,000** (including labor)

**TOTAL EQUIPMENT BUDGET ESTIMATE: \$6,215**

### Estimated Budget

Building materials (assuming you buy rolling shelves): **\$4,140**

Fruiting chamber equipment and cooling system: **\$6,215**

**TOTAL BUDGET ESTIMATE (upper end): \$10,355**