



Forced-Air Produce Cooler

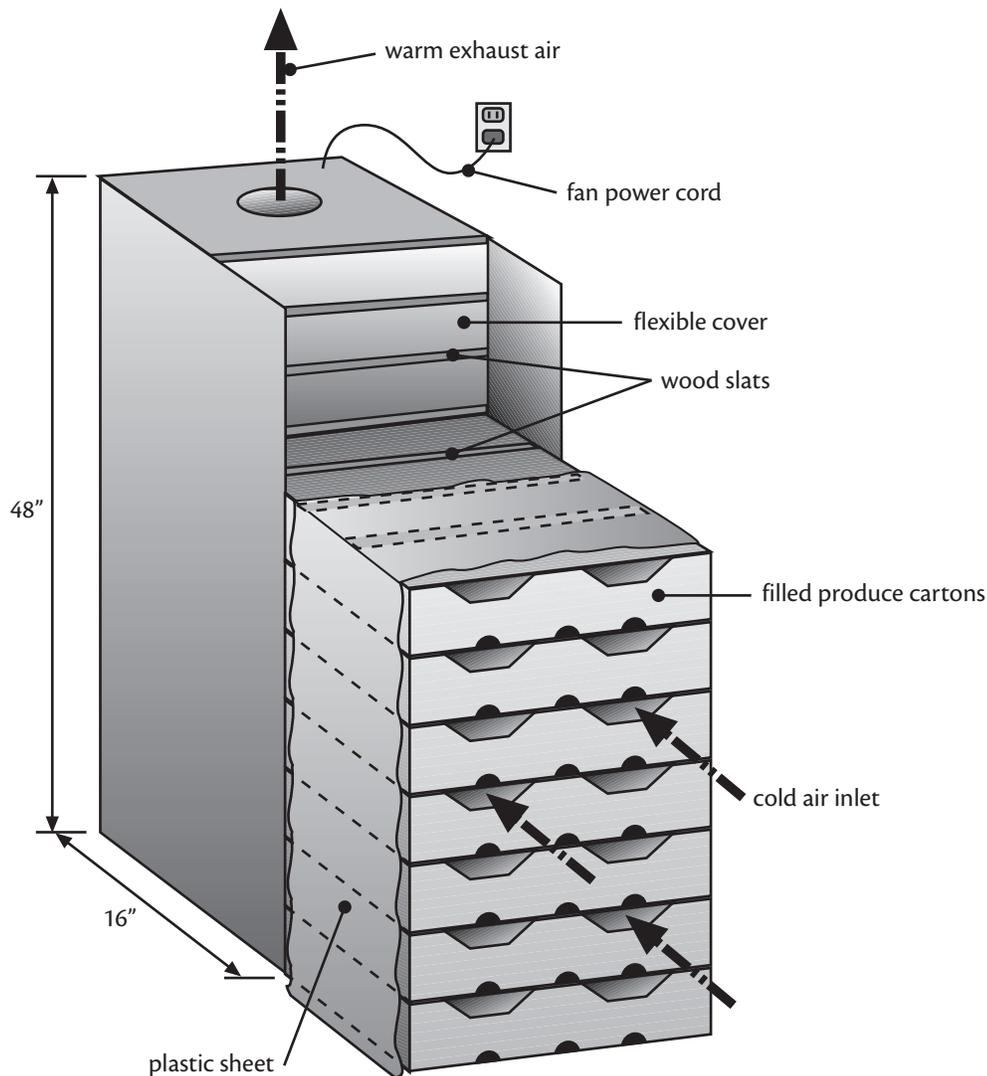
William Wilcke, Extension Agricultural Engineer, Virginia Tech

Herbert Stiles, Extension Horticulturist, Virginia Tech

Revised by Ramón A. Arancibia, Extension Horticulture Specialist, Eastern Shore Agricultural Research and Extension Center, Virginia Tech

Field heat removal from freshly harvested produce is critical for subsequent handling and storage. Heat removal should be done immediately after harvest to maximize storage potential of the produce. The longer heat removal is delayed, the shorter the shelf life. Force air cooling has been design to remove field heat to bring the produce temperature down to the storage temperature. This is a plan for a simple device you can build yourself to speed

cooling of non-wrapped produce packed in vented cartons. The cooler is designed for small fruits, but can easily be adapted for some vegetables and other specialty crops.. Some dimensions of the cooler depend on the size of produce cartons used, so select and measure your cartons before starting construction. The cooler is designed to cool one to three columns of cartons (about 15 cartons per column, depending on carton depth) at a time.



Tools needed:

Hammer
Drill

Saw
Screwdriver

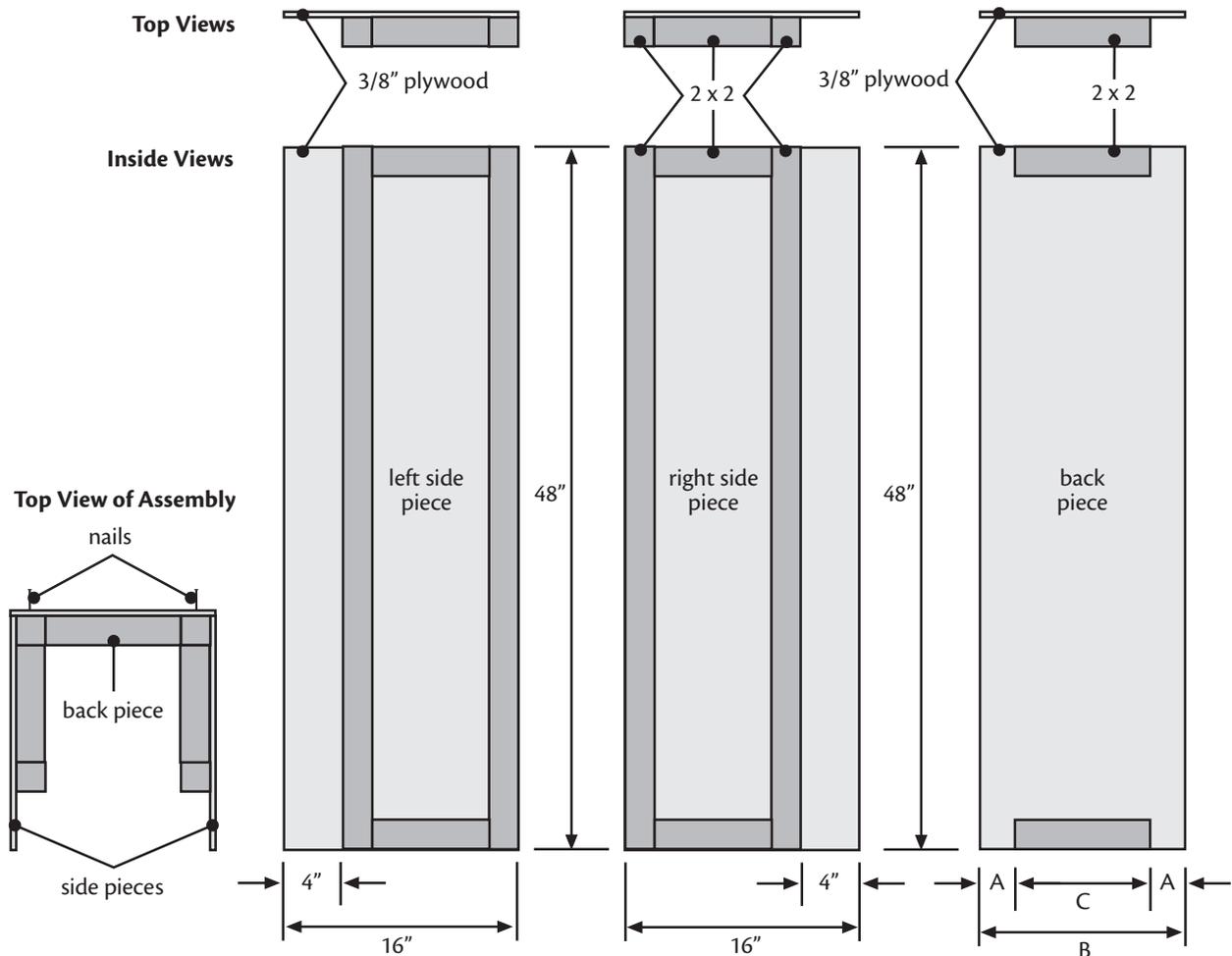
Square
Stapler

Tape measure
Caulking gun

Several small wrenches
Wire stripper (or knife)

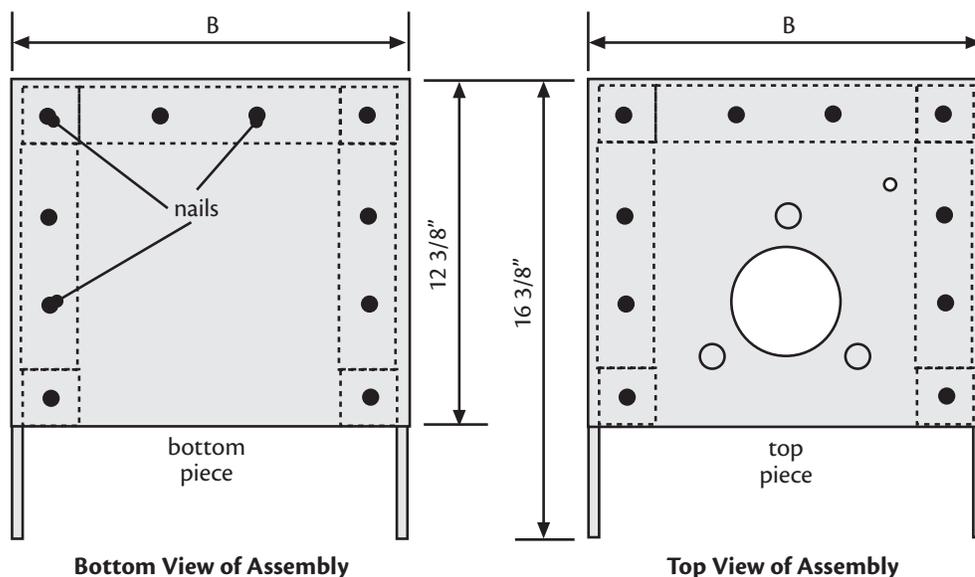
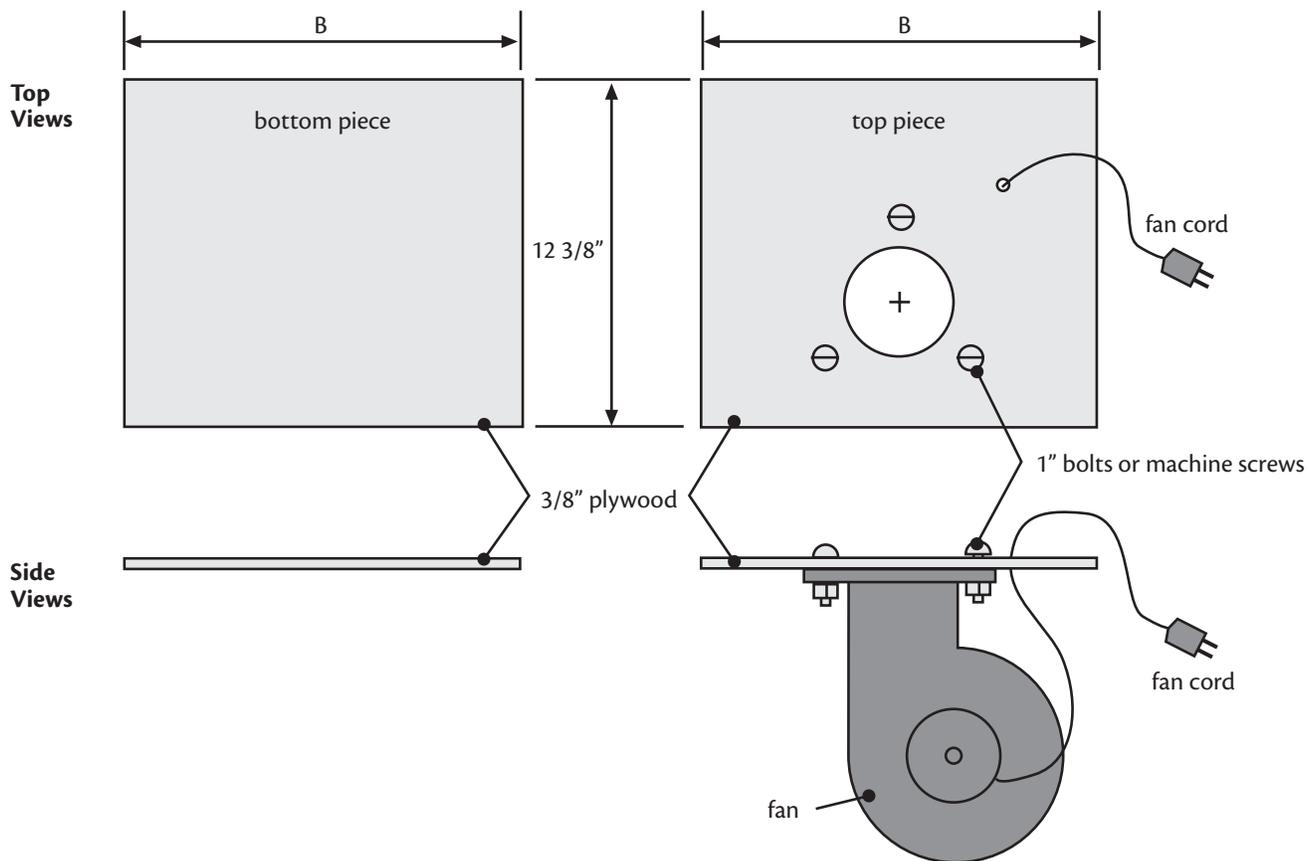
List of Materials

- One 4' x 8' sheet 3/8" exterior-glye plywood
- About 24 running ft of 2 x 2
- About 18" x 60" of vinyl or canvas fabric (width depends on length of produce cartons)
- About twelve 18"-long wood strips (lath or 1 x 1s)
- 1 lb. underlayment or other small nails
- Eight 1 1/4" #6 flat-head wood screws
- 1/4" x 1" bolts or machine screws (number required depends on number of bolt holes in fan housing)
- 8' electrical cord (rubber, two #14 conductors with ground)
- One grounded electric plug
- One tube caulk
- One small fan. Select a fan that delivers 1 cfm/lb. produce against 0.10" water pressure. Use the maximum pounds of produce that will be cooled at one time to determine total cfm required.



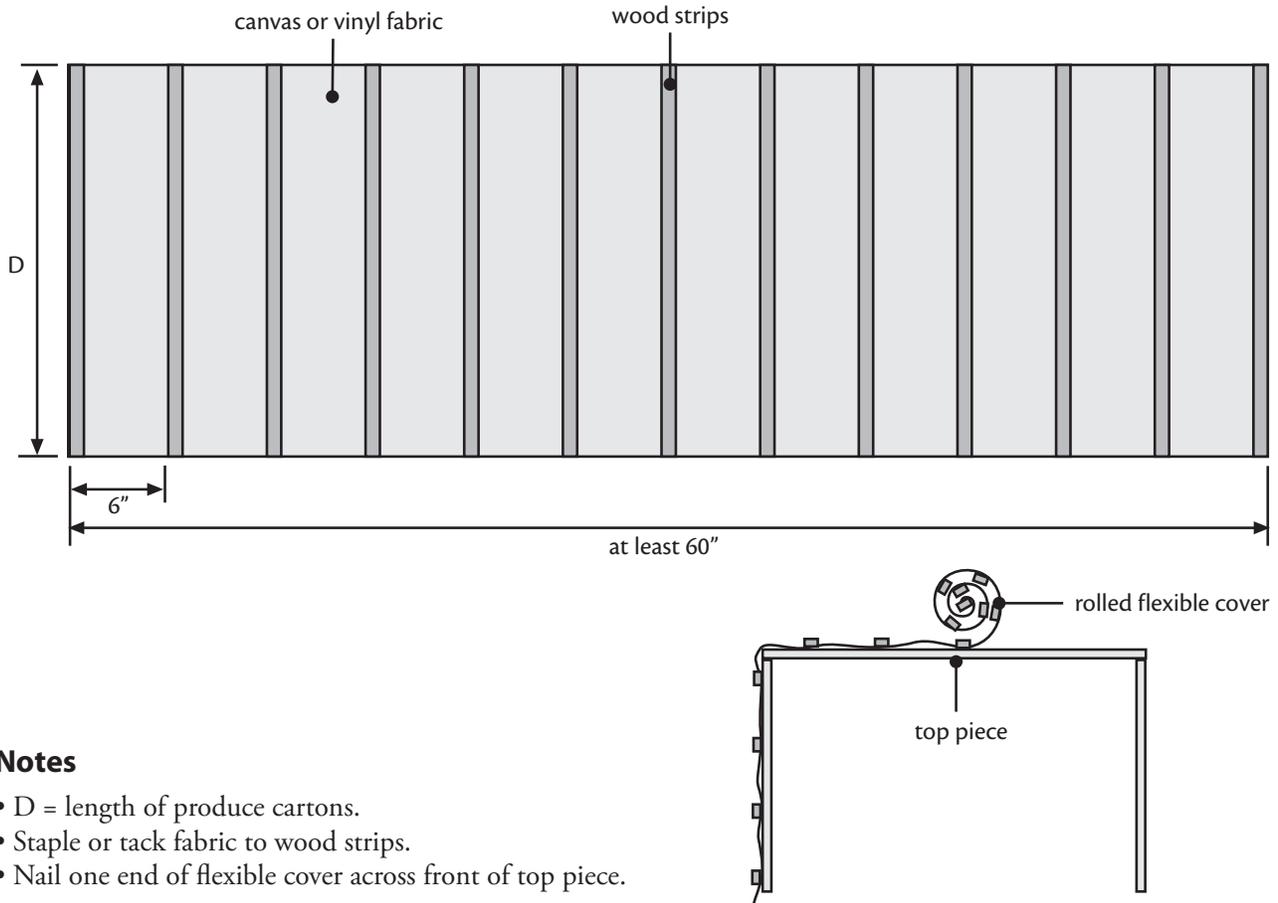
Notes

- A = thickness of 2x2; B = length of produce cartons + 1"; $C = B - (A + A)$.
- Nail plywood pieces to 2x2s with underlayment or other small nails. Then, nail back piece to side pieces, as shown.



Notes

- B = length of produce cartons + 1”.
- Cut hole to match fan outlet — will be rectangular for some fans.
- Nail bottom piece to page 2 assembly with underlayment nails.
- Attach top piece to page 2 assembly with 1 1/4” #6 flat-head wood screws.
- Drill hole slightly larger than fan cord diameter in top piece. Connect cord to motor (or plug) after running cord through hole. Caulk around cord after installation.
- Caulk any leaks at joints of cooler.



Operation

1. Place the forced-air cooler in a room maintained at proper temperature and 90 to 95% relative humidity for the type of produce being cooled. Keep in consideration that some produce are sensitive to chilling temperatures (between 32°F and 55°F).
2. Stack one to three columns of cartons against the open side of the cooler. Arrange the cartons so that air must pass through produce. The more columns, the slower the cooling process. Therefore, monitor temperature of the produce before removing it.
3. Unroll the flexible cover over the top cartons to prevent air from bypassing the produce. Air leaks reduce the efficiency of the system and take longer to cool down the produce.
4. Drape a sheet of light-weight plastic over the flexible cover and down the sides of the cartons. Negative pressure from the fan will draw the plastic against the cartons and reduce air leaks.
5. Plug in the fan.
6. Straighten the plastic and make sure it is not blocking air inlets on the ends of the cartons.
7. Operate until produce is within a few degrees of cold-room temperature. This will take 2 to 6 hours, depending on fan size, amount of produce, and initial temperature differences. Do not operate more than about 6 hours or produce will start to dry out. Make sure to maintain high humidity.
8. Move cooled produce to another part of the cold room and set another batch of warm produce against the cooler. If you want to start cooling more produce before the first batch is finished, you need to slide the partially-cooled columns back and set the warmest produce closest to the forced-air cooler to avoid reheating partially-cooled produce.