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How to Build a Portable Electric Food Dehydrator

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Oregon State University
Extension Service

Figure 1.—*Tabletop-size food dehydrator for home use*

You can use a small dehydrator in your home to preserve many types of fruits, blanched vegetables, meats, and nuts and to make specialty confections from fresh, natural products.

The dehydrator shown in figure 1 and described in the drawings in figure 2 provides 8½ square feet of tray surface, which can accommodate approximately 18 pounds of fresh, moist product.

The necessary heat for evaporating the moisture is supplied by standard household light bulbs, which are efficient and relatively safe heating elements. Or you could use two porcelain-Nichrome wire heating elements with the same total wattage.

You can use an 8-inch household-type electric fan for air circulation, or you could buy a 6-inch- or 8-inch-diameter air-duct circulating fan from an electrical supply house.

The dehydrator box described here is easy to build. It requires only two forms of wood building materials: ½-inch plywood and ¾-inch square wood strips. The necessary lumber and electrical supplies are shown in figure 3.

You can build it with a hand saw, a coping saw or compass saw, drill, countersink, screwdriver, and knife. You'll need a square or tape for measurements.

The drying trays may be built with wood frames. The bottoms may be of wood slats, metal mesh, or molded plastic mesh. You could buy prefabricated aluminum window screens for use as trays. They are lightweight, sturdy, and easy to clean, and they relieve you of much of the more difficult construction.

Construction materials

1 sheet of ½-inch, 4 × 8 foot, A-C exterior plywood

9 4-foot pieces of 1 × 1-inch nominal (¾ × ¾-inch actual) wood strips

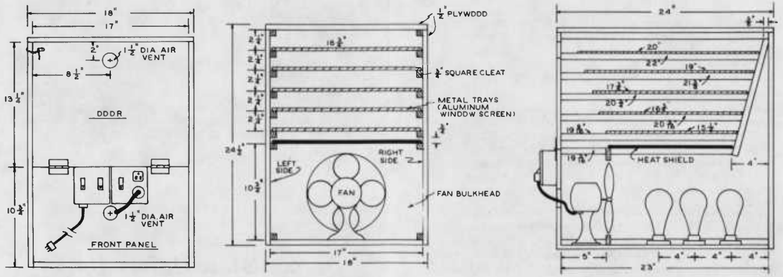

Figure 2.—*Front and two-section views of dehydrator construction*

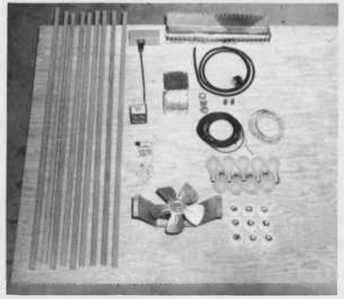

Figure 3.—*Materials needed for construction*

1 8-inch fan

1 set of aluminum screens for trays: 16¾ × 20, 16¾ × 19, 16¾ × 17¾, 16¾ × 16¾, and 16¾ × 15½ inches

1 pair of 2-inch, metal butt hinges

1 ball chain or equivalent door latch

9 porcelain surface-mount sockets with concealed contacts

9 75-watt light bulbs

15 feet of #14 copper wire covered with asbestos or silicon-base insulation rated at 150° C or higher

6 feet of #14 wire extension cord, with male plug

1 36-inch length of heavy-duty household aluminum foil wrap

116 1-inch No. 8 flathead wood screws (nails and glue may be used instead)

18 ¾-inch No. 7 roundhead wood or sheet-metal screws

1 10-amp-capacity thermostat, 100-160° F (38-71° C) range, either air-type or hot-water-tank immersion type (available through appliance repair shops)

1 4-inch electrical surface utility box with blank cover

2 ½-inch utility box compression fittings

2 wire nuts

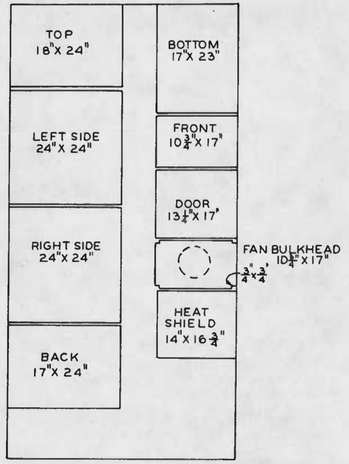

Figure 4.—*Cutting plan to obtain the necessary plywood parts with a minimum of saw cuts*

Cutting and assembly

The cutting diagram in figure 4 shows how you can cut all of the ½-inch plywood pieces from the single 4 × 8-foot sheet. It is usually most satisfactory to measure from the factory-cut edges as shown. Be sure to allow for saw kerfs between adjacent pieces.

1. Cut the plywood sections to size and the 1 × 1 strips to the lengths shown. Then assemble the side panels as shown in figure 5.
2. Next, lay out the porcelain sockets and fasten them to the base, as shown in figure 6. Fasten the asbestos- or silicon-covered wire to the porcelain socket.
3. Connect the wire that goes to the yellow screws on the sockets to the thermostat, mounted near the rear on the left side panel. (The yellow screws on the

Figure 5.—*Right side panel, showing cleats assembled to the inside surface*

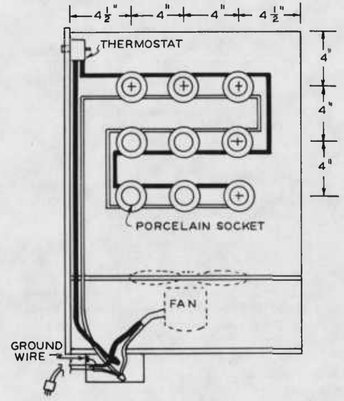

Figure 6.—*Layout of socket locations and wiring plan (bottom view)*

socket connect to the center pole, rather than the threaded wall of the socket.)

4. Connect the wire that goes to the white screws to the white wire in the extension cord.
5. Connect the third wire (green) in the extension cord directly to the junction box, mounted on the front panel.
6. If you're using a *household-type fan* with its base still attached, fasten it in place on the dehydrator base and cut the hole in the fan bulkhead to fit.
7. If you're using a *duct-type fan*, cut the necessary hole (about 8½ inches in diameter for an 8-inch fan; about 6½ inches in diameter for a 6-inch fan) in the bulkhead and fasten the fan-mounting frame directly to the bulkhead.
8. Now set the bulkhead in place (5 to 5½ inches from the front panel) and fasten it temporarily in position by two screws through the left side panel, as shown in figure 7.
9. Center the 1½-inch-diameter air vent hole in the front panel, directly in front of the fan motor, about 1 inch away from the motor. This will allow the cold air to enter and pass over the motor, to cool it.

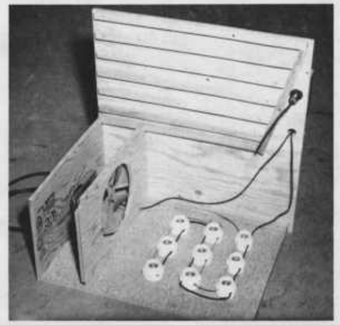

Figure 7.—*Bottom front, left side, and bulkhead assembled with sockets, fan, wiring, and thermostat in place (note that the thermometer sensing element projects into the space behind the trays)*

10. Next, fasten the right side, back, and top in place.
11. Enclose the heat shield with a heavy-duty household aluminum wrap. This provides a reflective surface to protect the plywood heat shield. It also provides a smooth surface on the top of the shield for easier removal of juices that may drip from the drying trays.
12. You could build the drying trays or buy aluminum window screens made to the sizes listed. You can order these through your local lumber of building supply dealer. If they don't have a ready source of supply, you can obtain further information about suppliers through your county Extension office.
13. If you prefer to build the trays, we suggest that you make a light, wooden frame and use either molded plastic or aluminum screen or smooth wood strips. Most woven plastic screens will sag badly under load and heat. Black metal screens will rust—and leave stains on your food products.
14. You'll need some type of adjustable latch to hold the door in a partially opened position during the early stages of drying, when the moisture is being removed rapidly. A ball-link chain with a catch (see figures 2 and 3) provides a ready adjustment for the amount of door opening.
15. As a check on your thermostat setting, you should have a thermometer capable of service in the 100-160° F (38-71° C) range. The dial type (figure 8) is rugged and easy to read. A kitchen-type meat thermometer will also serve.

Figure 8.—*Dial-type thermometer useful in monitoring dehydrator temperature*

16. The sensing part of your thermometer should project through the box into the space above the trays, for accurate indication of the drying temperature. (If you place this sensing element in the heating chamber with the light bulbs, your thermometer will give a misleadingly high reading.)

Operation

For most moist fruits and blanched vegetables, load the trays at the rate of 1 to 2 pounds of fresh product per square foot of tray surface.

Place nuts and meats only one layer deep on the trays.

The following thermostat settings are *suggestions:*

Nuts	100-105° F
Meat (jerky)	start at 100°, increase to 165° (internal temp. 155°); *follow professional advice for your situation*
Fruits	135-145°
Vegetables	140-150° (max. 165°)

During the early stages of drying, open the door about ½ to ¾ inch at the top to allow easy escape of moisture-laden air.

As moist air exhausts at the top, fresh air will be taken in along the sides of the partially opened door.

Test to determine when the first, high-moisture drying stage is completed. Hold your hand or a mirror at the opening at the top of the door.

When moisture no longer tends to condense, close the door. The air exchange provided by the two 1½-inch-diameter vents should be enough to complete the drying process.

Maintenance

The electric fan motor is supplied by a stream of fresh air from the lower vent, positioned in front of the motor, but it will still operate at a higher temperature than in normal, open-room service.

Lubricate the motor bearings with 30-weight engine oil. Lighter grade household or sewing machine oil may tend to gum and stall the fan motor after extended service.

Wash trays with hot water and a detergent when they become soiled with dried-on juices. If you purchased aluminum window screens with an aluminum wedge strip to hold the screen in place, you can put them in an electric dishwasher without damage.

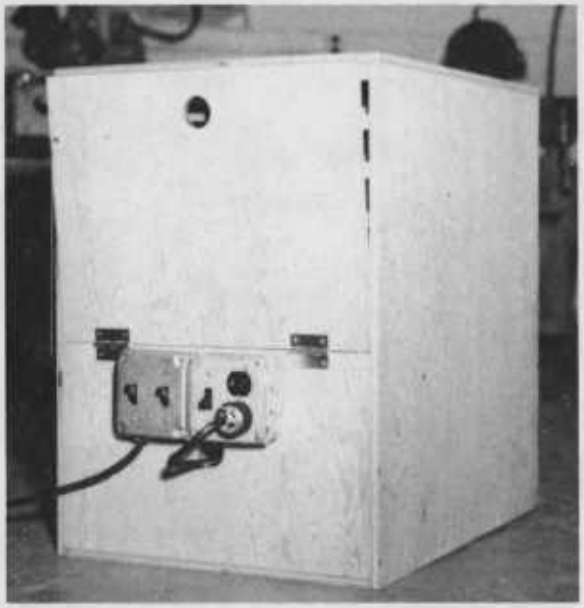

Figure 9.—*Dehydrator cabinet, showing three switches used to control heat input (note the use of a duplex outlet, which you could use to plug in the fan, instead of wiring it in permanently)*

Alternate construction and operation

You can build the dehydrator without a thermostat. You would then control temperature by using switches to operate various numbers of light bulbs. Figure 9 shows such a unit, with three separate switches, each controlling three bulbs in the heating chamber. The wiring diagram is shown in figure 10.

Turn on all three switches for at least the first hour or two when the dehydrator is loaded with moist product.

As soon as the temperature comes up to the desired level (and the extra heat is not needed to warm large amounts of incoming fresh air), turn off one or two switches and complete the drying at the reduced heating rate.

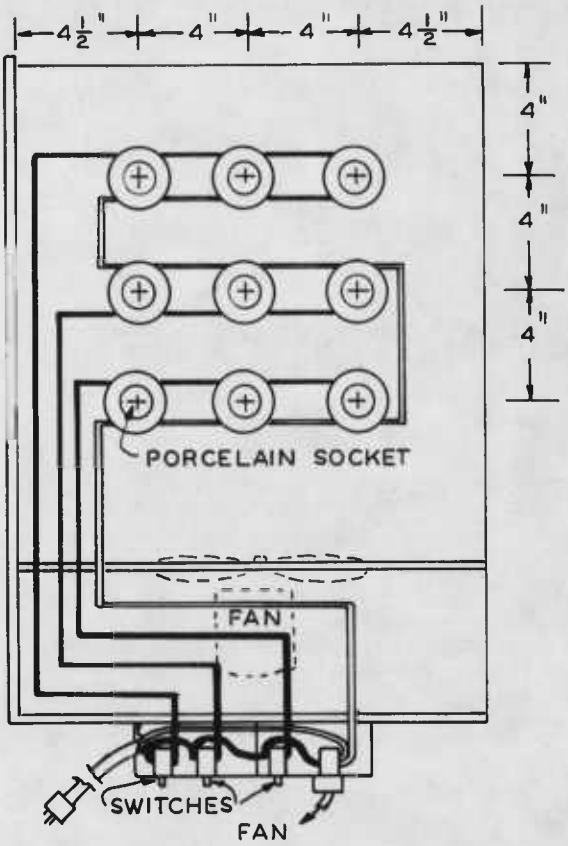

Figure 10.—*Socket location layout and wiring plan for use with three-switch control*

Drying Fruits and Vegetables at Home (Oregon State University Extension Service publication EC 889) contains practical instructions you can use in your home. For a single copy, send 25¢ plus 25¢ postage to Bulletin Room, Oregon State University, Corvallis 97331.

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This publication was prepared by Dale E. Kirk, professor emeritus of agricultural engineering, Oregon State University. Mention of trade names or commercial products does not imply endorsement, and the fact that trade names or products are not mentioned does not imply a criticism of those not mentioned.

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