



Building and Operating an Observation Beehive

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An observation beehive can provide an interesting, educational, and entertaining exhibit in classrooms, in park and campground clubhouses, and in businesses. Once installed, it requires minimal care and maintenance.

If this is your first experience working with bees, you might want to ask a beekeeper to help you get started. Hobbyist beekeepers generally are willing to share their experiences, offer suggestions, or even assist you in getting started. You can purchase packaged bees and a queen from commercial sources. It is much simpler, however, if you obtain a marked queen and frames containing brood and honey from a beekeeper. Both methods of starting an observation beehive are described below.

Construction and Location

The observation beehive described in Figure A is unique. Whereas conventional observation hives occasionally must be dismantled and the components readjusted, this hive's component parts (frames) can be manipulated indoors without losing bees.

Anyone with a home workshop can make this observation beehive. Acrylic plastic (Plexiglas or Lucite) is better than glass because it will not break. You can purchase frames along with an appropriate foundation from a bee supply house. If you choose to make the frames in a home shop instead, use well-seasoned wood and make construction exact to avoid escape openings for the bees. The hive in Figure A consists of six interconnected frames and frame holders, but you will also need to construct two extra frame holders for manipulating the units once the hive is operating. The frame holders (Figure E) should be interchangeable, and therefore they must be identical. The plans in Figure A are drawn to use the standard 6 1/4-inch shallow frame, but you could use other frame sizes with appropriate

adjustments. Resting the hive on a pipe (Figure B) allows the hive to turn on the threads for better viewing, but you must provide a stop so the union does not separate. The height is adjustable to suit the needs of your audience or viewers.

Locate your outside opening where it won't interfere with people, especially small children. Avoid open doors, street-level windows, or sidewalks. A second story window or higher is ideal for the outlet but is not always possible or necessary. Do not put the hive in direct sunlight, as this will cause overheating and probably will kill the bees.

It is best to install your observation hive when fruit trees or dandelions begin to bloom in the spring. If you do install the bees early, be sure you have enough food (sugar or honey) in reserve so that they don't starve on cold days.

Installation from an Existing Colony

Three frames of brood and honey are the optimum for starting your colony. One frame should contain substantial amounts of sealed brood. If you start the hive early, use two frames containing honey; use one if you start later. The third frame can contain either eggs or developing larvae. Include sufficient bees to tend the brood and queen. Be sure the queen is laying and is conspicuously marked so that observers can readily identify her. It is useful to keep masking tape on hand for securing the metal slides (9 in Figure A) and for aligning the holders in positions 1 through 7 until the end cover is secured; if these holders are not in line, bees will escape.

Place the frames with bees, brood, or honey in the frame holders (Figure E) and cover them with sheet metal slides (9 in Figure A). Use masking tape to securely fasten the metal slide covers to the frame holder. Normally, bees can survive in the frame holder for two hours. For longer periods, use a screen in place of metal slides on one side to prevent suffocation. Be sure that this screen is firmly attached to the frame holder. Do not place the bees in direct sunlight while holding or transporting.

Installation

First, position the observation hive exactly where you want it and check that the opening to the outside is not blocked.

Place the frame (in a frame holder) with honey in position 7 (Figure A). Place another frame with sealed brood in position 6, and the frame containing eggs in position 5. While these positions are not absolutely essential, the bees tend to move the honey from position 7 upward. This will open cells for the queen to lay eggs. You will want to keep the queen and the brood in the lower portions of the observation hive. Normally honey is stored in the top of the hive. Place either comb or foundation in positions 4, 3, and 2. As the population increases, either bees will store honey or the queen will lay eggs in this area.

Once the frames containing bees are in position, remove the sheet metal slides (12 to 20 gauge) and secure the end cover (1 in Figure A) in place. Bees will mix and spread throughout the observation hive.

Starting from Packaged Bees

If you start from packaged bees, purchase a queen and about two pounds of bees. Do not attempt this unless you are willing to perform extra work or have had some experience working with bees. Be sure to study the techniques and procedures used in introducing packaged bees before choosing this method.

Procedure

Shake the engorged bees into one or two frames (in frame holders) and introduce the queen. It is essential to provide supplemental food, because packaged bees will not be able to accumulate enough stores to survive rainy or cold days in spring, which may occur at any time. Feed the bees either sugar syrup with pollen supplement or honey. If no drawn comb is available, you will have to provide a feeding device, such as an inverted bottle with sugar syrup or a division board feeder, which must fit inside one of the frame holders.

Installing packaged bees is described thoroughly in Extension publication A2083, *Honey: Guidelines for Efficient Production*. This publication is available at Wisconsin county Extension offices. Your local library should also have appropriate references, and some suppliers of packaged bees provide instructions.

Maintenance during Summer and Fall

Many variables determine the amount of honey stored in the summer. For example, long periods of drought or continuously wet weather result in honey depletion. In this case, you should feed sugar syrup.

If the hive becomes too crowded, remove one frame and destroy the bees or place them in another colony at least ½ mile away. If the colony becomes small, add additional bees or, if necessary, replace the queen.

As mentioned, you manipulate the hive in Figure A indoors without dismantling. If done properly, no bees will escape. Suppose you wish to remove the bees and frame in position 5 and replace it with an empty frame. The first step is to insert the metal slide (12 to 20 gauge) between positions 5 and 6 (9 in Figure A), closing the top of the frame holder in position 6. Secure this with masking tape. Insert a second metal slide between positions 5 and 6, this time covering the bottom of the frame holder in position 5. Secure this with masking tape. Similarly, insert two metal slides between positions 4 and 5, closing the top of the frame holder in position 5 and the bottom of the frame holder in position 4. This confines both the bees that are to remain in the hive and the bees that are to be removed with the frame holder in position 5. All that is now necessary is to slide out the frame holder in position 5. **It is important that you have someone assist you with this last step, or the frame holders in positions 2, 3, and 4 will drop out of place.** Your assistant must hold the frame holders in place until you can insert an empty frame holder into position 5.

Easily Removable Frames

One of the challenging and often frustrating operations associated with an observation beehive is adding and removing excess bees and honey from the hive. Traditional hives must be dismantled outdoors, preferably near an established beehive or in an apiary. Even the hive illustrated in Figure A, which can be manipulated indoors without losing bees, still requires two people to manipulate the frames and frame holders. With the modified hive discussed in this

section,¹ moving and removing bees and honey is surprisingly simple. The design and construction also allows you to perform interesting demonstrations and experiments.

Adding metal channels to the frame holders makes the holders easier to slide in and out once the hive is operating. Each frame holder requires four channels. The metal channels can be cut from aluminum storm window sash with a lip or from ½-inch cabinet drawer slides. The drip-edge metal used on roofing would also work, as would bending sheet metal as illustrated in Figure G.

The coupling slide (Figure H) fits into the channel as illustrated in Figure G, anchoring the two frame holders together. Note that the coupling slide has an oblong slit about ½ inch wide by 10 inches long. The slit allows bees to pass freely from one frame holder to the other. In place of the oblong slit, you could install a bee escape, a standard device available from beekeeping equipment suppliers. The bee escape allows bees to pass through in one direction only. You can also use the coupling device to install a standard zinc queen excluder, which allows worker bees to pass through while confining the queen to a specific part of the hive. You can change the coupling slides at any time to accommodate the specific conditions of the hive.

Any number of frame holders can be united into one operating observation beehive. At least one of the frame holders must have a suitable exit-entrance opening made of piping or tubing. You will need a stand or table to support the unit.

As with the hive in Figure A, solid metal and screen slides allow you to confine bees to a specific frame holder for transporting them to or from an apiary. Prepare about six of each type for a three-unit hive. The slides should be 2 inches by 20 inches in size. The metal slides can be of either aluminum or galvanized metal, 12 to 20 gauge stock, and the screening material should be about 5 mesh per inch. The metal gauge and mesh size are approximate; deviating from these suggestions is not critical. During warm weather, use the screen to prevent overheating. You can easily feed bees through the screen by using a small jar or bottle with small holes in the lid. Place this jar directly on the screen so bees can ingest the sugar syrup.

Reversible Observation Hive

The reversible observation hive shown in Figure J is constructed from acrylic plastic (Plexiglas) on a heavy wood base and support. It is designed to use three shallow standard frames. The frames should fit tightly or you should start the hive with frames in “normal” position as illustrated in Figure J. Once the hive is in operation, bees will build bridge and brace comb to stabilize the frames in position.

The top and bottom 1 ½-inch openings can be used to ventilate the hive and to feed sugar syrup when necessary. A narrow-mouthed bottle, with one or two small holes (⅛ inch) in the cap, works well when inverted into the top opening. To the upper inside opening, you can attach a pipe or tube leading outdoors.

When the hive becomes crowded with honey above the brood area, you can reverse it in place. Simply detach the entry pipe or tube, turn the plastic body 180° on its axis, and re-attach the entry pipe. The bees begin to transfer honey from the lower part of the hive to the space above the brood area. The queen will continue normal egg laying as if nothing happened.

Possible Experiments

Once installed and in operation, you can perform a number of observations, manipulations, and simple experiments with your hive. For example, at what temperature do bees begin outdoor flight? How early in the morning and how late in the evening do they fly? Can you tell what flowers are blooming by the color of pollen being carried in?

If you want an end view of the comb, cut several drawn combs into sections and install them perpendicular to the length of the frame holder. Space the sections about ½ to ¾ inch apart. In some cells, developing larvae may be visible through the transparent side. You might space one or two sections several inches apart to observe what bees do with that extra space.

To perform simple feeding experiments, place dishes of sugar syrup and honey outside the hive entrance. Do bees prefer sugar water or honey? How much water can you add to sugar syrup before they refuse to feed on it? Does adding food coloring interfere with feeding? Is colored sugar syrup carried back into the hive and if so, where is it stored? Do bees feed with equal

¹First built by T. Johansson and M. Johansson, and published in “A Better Box,” *Gleanings in Bee Culture* 118 (July 1990): 411–3.

intensity on such artificially placed food sources on warm sunny days when flowers are in full bloom as they do during periods when few flowers are in bloom?

Additional Information

Many books, magazines, and government publications deal with bee culture. A few are listed below. Public libraries usually have a collection of popular books on bees. Additionally, many libraries have an exchange system through which they can obtain books from other libraries.

Books about Beekeeping

Crane, E., ed. 1975. *Honey: A comprehensive survey*. New York: Crane, Russak & Co.
An encyclopedia covering the subject on a world-wide basis.

Gojmerac, W. L. 1980. *Bees, beekeeping, honey and pollination*. Westport, CT: AVI Publ. Co.
Textbook written for vocational-school students and hobbyists.

Grout, R. A., ed. 1975. *The hive and the honey bee*. Hamilton, IL: Dadant & Sons.
Comprehensive book written for the professional beekeeper.

Morse, R. A. 1975. *Bees and beekeeping*. Ithaca, NY: Cornell Univ. Press.
A college textbook.

Root, A. I. 1979. *The ABC and XYZ of bee culture*. Rev. by E. R. Root et al. Medina, OH: A. I. Root Co.
An encyclopedia for the professional beekeeper.

USDA. 1980. *Beekeeping in the United States*. USDA Handbook 335.
An overview of beekeeping in the United States; contains little specific information.

Journals

American Bee Journal, Hamilton, IL 62341
Gleanings in Bee Culture, Medina, OH 44256
Speedy Bee, Rt. 1, Box G27, Jessup, GA 31543

Extension Publications

Beekeeping Records (A2655)
Honey Bees and Pesticides—Understanding the Issues (A3357)
Honey—Guide to Efficient Production (A2083)
Protecting Honey Bees in Wisconsin from Pesticides and Other Toxic Chemicals (A3086)
Using Honey Bees to Pollinate Crops (A1549)

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Figure A: Perspective of Observation Hive

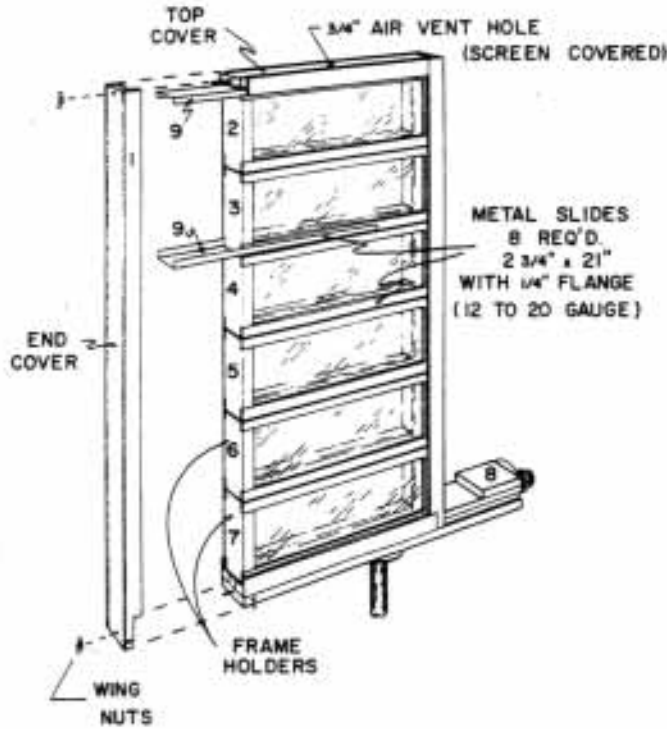


Figure C: Top view of hive base

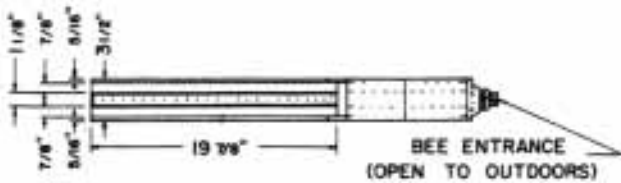


Figure D: Construction detail of bee passage-way

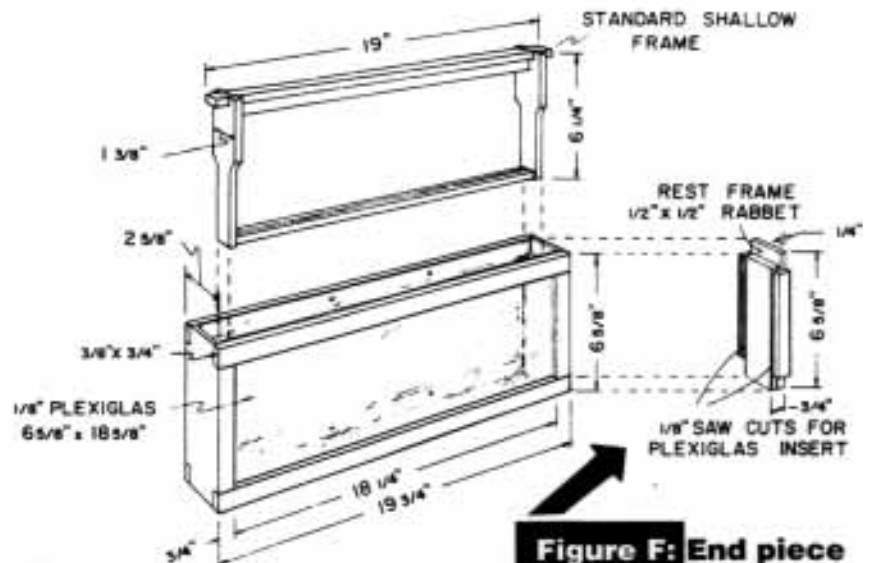
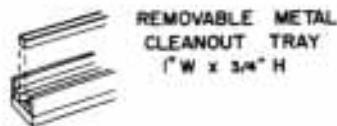


Figure F: End piece showing saw cuts

Figure B: Side view

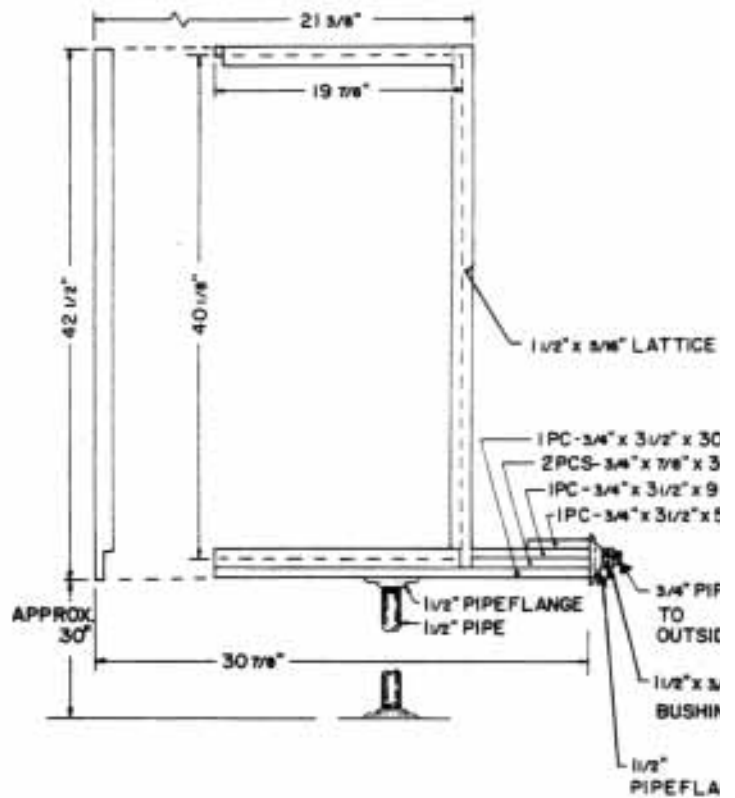


Figure E: Perspective of frame holder. 8 required.

Figure G: End view of 2 frame holders with coupling slide in place

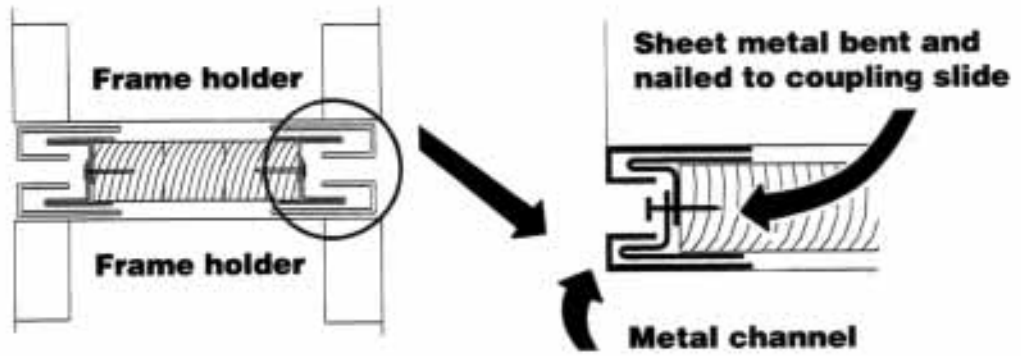


Figure H: Coupling slide
 $\frac{1}{2}$ " x 2" x 20" (slot $\frac{1}{2}$ " x 10")
 Bee escape or queen excluder

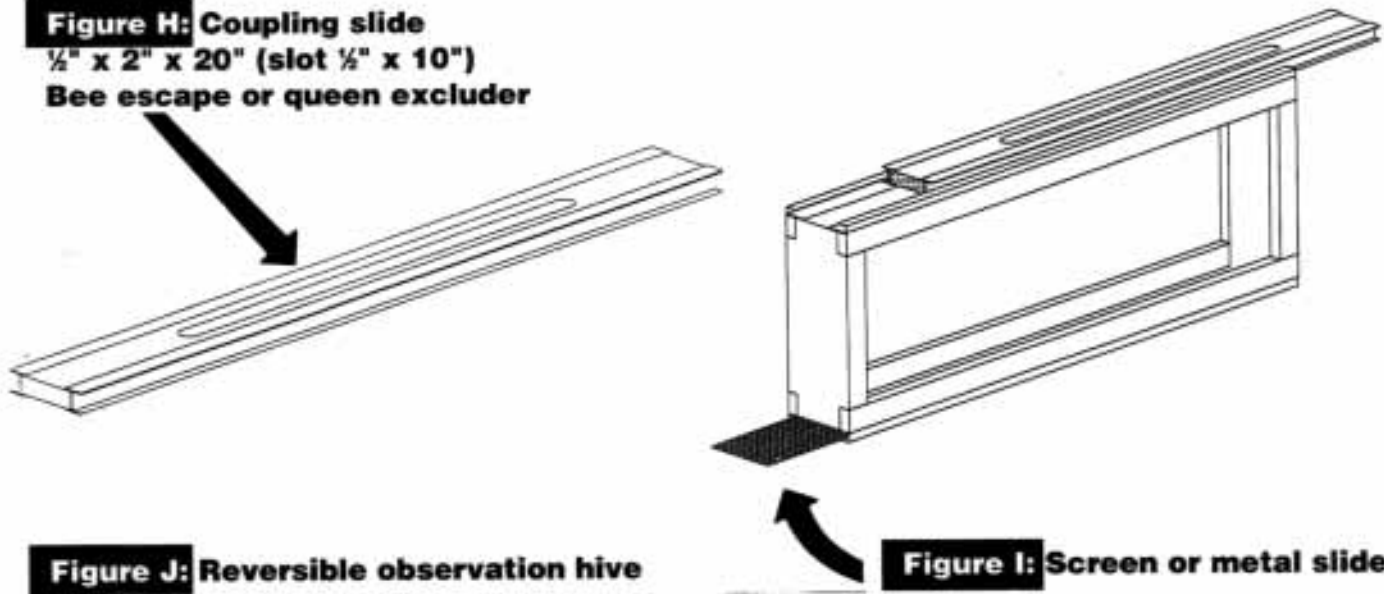
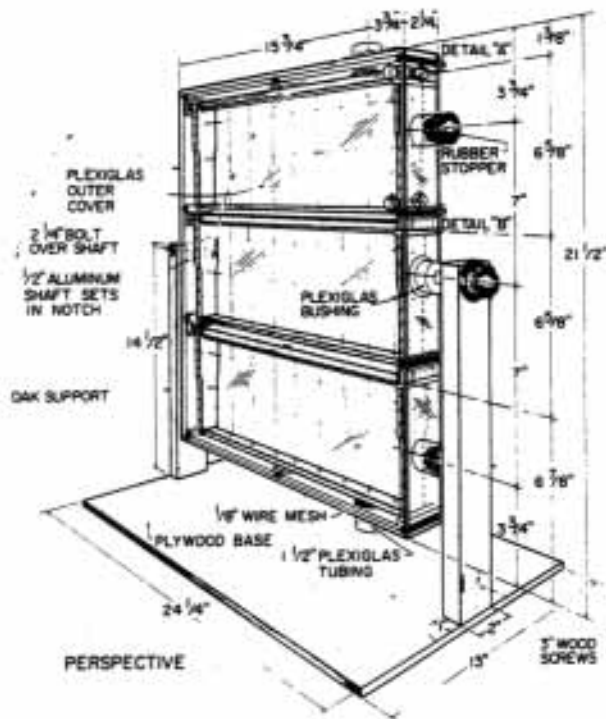
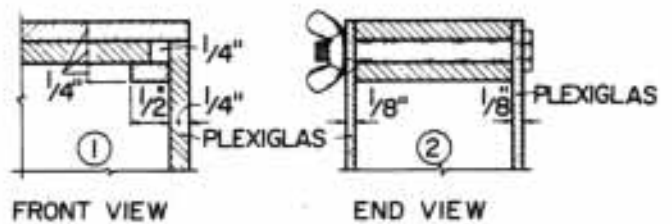


Figure J: Reversible observation hive



Detail "A" from figure J



Detail "B" from figure J

