

"In the Beekeeper's Work Shop"

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

The Hive Bodies

The hive body is the heart of a managed bee hive colony (Figure 1). It is where the queen lays her eggs, the house bees raise the brood and the workers store the pollen and nectar (converted to honey). To the general public, these large, white (generally) boxes are the most recognizable component of a bee hive.

One of the most common questions we get from new beekeepers is what's the difference between brood chambers and supers? From a construction point of view, there is no difference; the terms refer to the use by the bees and what's going on inside the hive body. Brood chambers are hive bodies where the eggs are laid and the young larvae are raised. Supers are hive bodies where the bees store their resources. We use the general term "hive body" to refer to both.

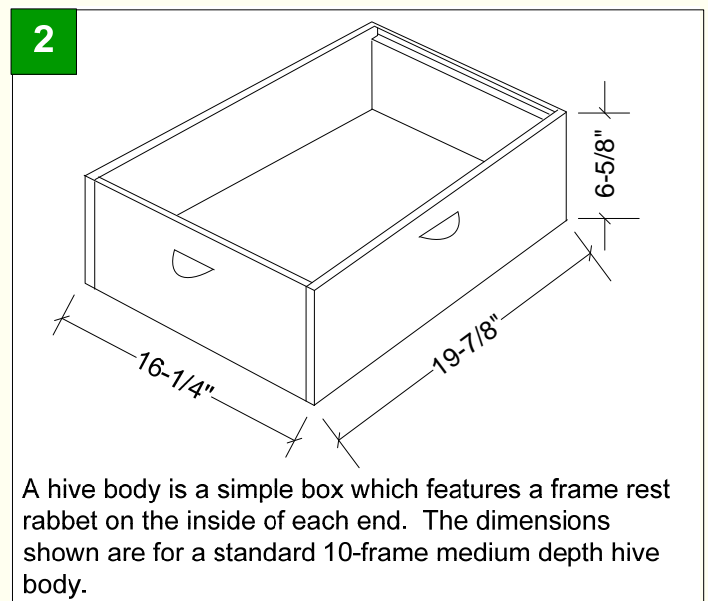
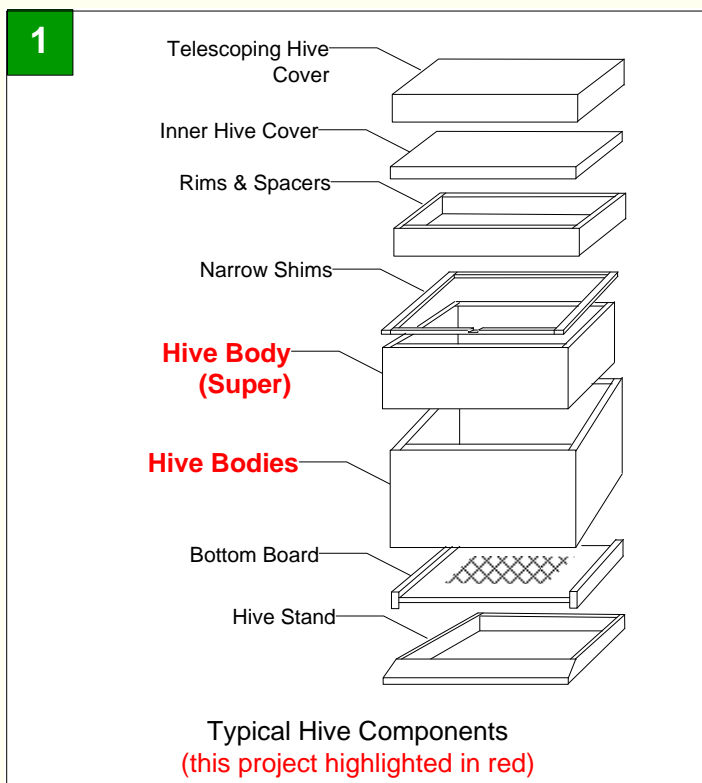
Hive bodies take a lot of abuse and need to be constructed accordingly. Not only do they have to bear a lot of weight (up to 70 pounds, or more) for a super, but the beekeeper will use their hive tool to twist and pry apart hive bodies after the bees glue everything together with propolis.

Of all the hive components, hive bodies have the most differences in size. There are four standard heights (referred to as "depth") for hive bodies: deep, medium, shallow and



comb honey. In addition there are three common widths: 10-frame, 8-frame and 5-frame.

We typically recommend to beekeepers just starting out to decide on one size hive body and then stick with it. That way, all equipment is interchangeable. Because a 10-frame deep super can be very heavy (70+ pounds), we suggest using 10-frame mediums (which usually top out around 35 pounds when full of honey). The plans presented in this article are for 10-frame medium hive bodies, though tables on the cut list page provide dimensions for the other sizes.



“In the Beekeeper’s Work Shop”

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

Basic Construction

A hive body is a simple box that features a rabbet which serves as a frame rest on the top inside of each end and hand holds on the outside of all four sides (Figure 2).

Though there are three different widths and four different heights of hive bodies, the joinery is the same for all. We recommend a spline joint for joining the boards. A spline joint is relatively easy to make, it is very strong and is self-squaring when assembling the boards.

For the hand holds, we will describe a technique to make “scalloped” hand holds seen on commercially made hive bodies. The technique uses a 10-inch radial arm saw, though it could be adapted for a table saw. Using a scalloped hand

hold will add a “professional” finishing touch to your work and is well worth the effort.

For a full sized “deep” hive body, you will need to work with 1x12 lumber. In these times, finding good quality 1x12s can be a challenge and you will pay the price.

For medium and shallow hive bodies, you will use 1x8 lumber. We can usually find very good quality 1x8s, even in #2 grade; it pays to shop around. We prefer to make hive bodies using full width lumber and then trim the bottoms to the final height. That way, any minor differences in board width will not be an issue. The trimmings are not wasted, as you can always use these as spacers and shims.

Before You Begin...

All of the dimensions shown in the drawings and cut list are for a standard 10-frame medium depth hive body. A table is provided at the back of this article with the sizes of the various components for an 8-frame hive and a 5-frame nuc in full, medium, shallow and comb honey depths.

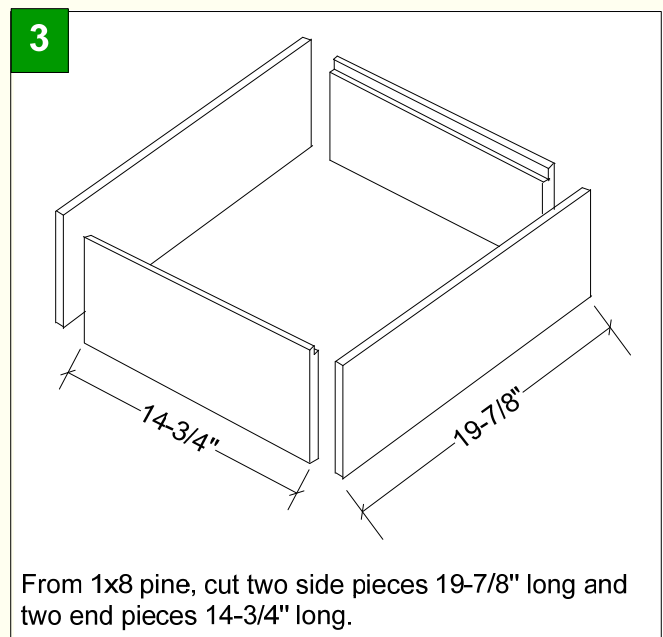
The 19-7/8” length of the hive bodies is industry standard. However, I find that some frames can be a bit short and slip down into the box. Plastic frames seem to be particularly notorious for this. You may want to experiment with a slightly shorter box - say 19-3/4” - if you have this problem.

Construction Details

(For a Standard 10-Frame Medium Depth Hive)

Step 1. Cut the Sides and Ends

From 1x8 pine, cut two side pieces 19-7/8” long and two end pieces 14-3/4” long.(Figure 3)



"In the Beekeeper's Work Shop"

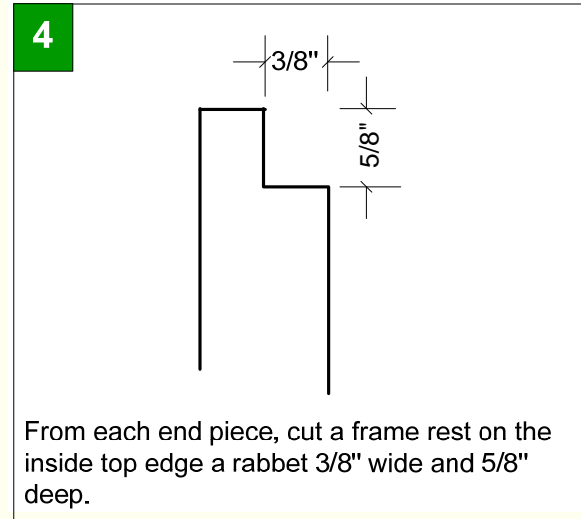
Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

Step 2. Cut a Rabbet For the Frame Rest

To make the frame rest at the top inside edge of each end, cut a rabbet $\frac{3}{8}$ " wide and $\frac{5}{8}$ " deep (Figure 4).

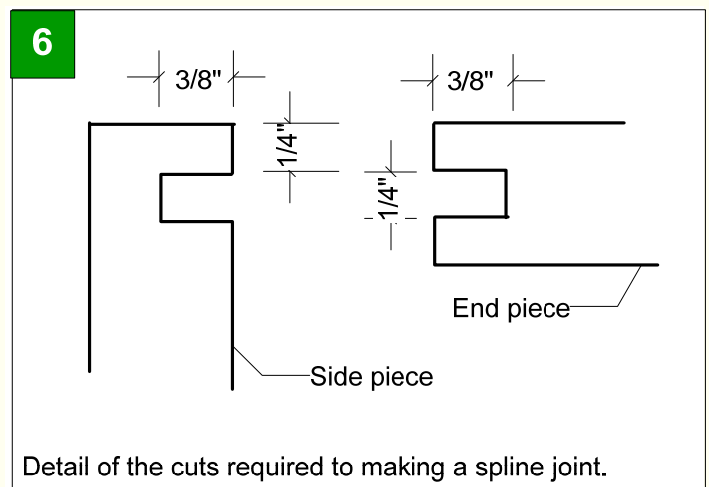
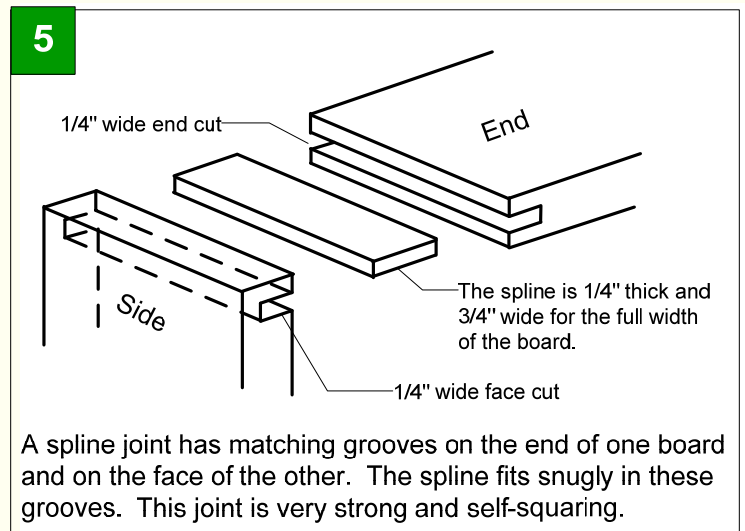
Note: hive bodies for cut comb may not require a frame rest (depends on the type of equipment used for the cut comb).



Step 3. Join the Sides With a Spline Joint

We use a spline joint (Figure 5) to join the ends to the sides, thus completing the box. A spline joint is very strong, self squaring and relatively easy to make, though accurate cuts are important.

A spline joint consists of $\frac{1}{4}$ " matching grooves $\frac{3}{8}$ " deep on each piece being joined (Figure 6). One the side, the groove is dado cut into the face of the board; on the end the groove is a tenon pocket cut into the end of the board.



"In the Beekeeper's Work Shop"

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

Step 4. Cutting the Grooves For a Spline Joint

Use a table saw to make the grooves. We recommend using a dado blade to make the grooves; the results will be much more precise and satisfying than making a series of cuts using a standard saw blade. However, since many shops may not have a dado blade, the following steps can be used.

There are three setups required: one for the inside cut, one for the outside cut and a third to remove any remaining waste in the middle of the groove. For each setup, you will cut both the side and end pieces, thus assuring that the grooves exactly match up.

To make sure the grooves match, mark the inside and outside of each of the boards. For the ends, which the board is vertical during the cut, keep the inside facing away from the fence. For the side, which the board is laying flat on the saw table, keep the inside facing down. If you flip the sides around, the grooves probably will not exactly line up.

To cut the tenons on the end pieces, we suggest you use a tenoning jig (see photos at right). Holding the board vertical against the fence while making a consistent cut is hard to do. A jig will insure that each cut is precisely the same. The jig fits snugly over the saw's fence and slides along with the board clamped in place.

To cut the dado on the sides, use the tenoning jig as a spacer against the fence (lower photo).

For the first setup, set the blade $\frac{3}{8}$ " high and adjust the fence so that there is a $\frac{1}{4}$ " space between the jig and the **inside** of the blade. Make this cut on both ends of all four boards of the hive body.

For the second setup, adjust the fence so that there is a $\frac{1}{2}$ " space to the **outside** of the blade. Make this cut on both ends of all four boards of the hive body.

For the third setup, adjust the fence to remove any waste remaining in the middle of the grooves. Make this cut on all four boards of the hive body.

Shop Tip

In order to allow for glue space, you may want to raise the blade for the tenon and face cuts about $\frac{1}{64}$ " higher than the $\frac{3}{8}$ " called for in the instructions.

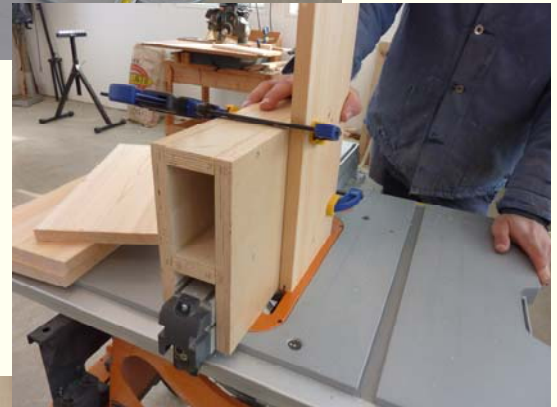
Photo Captions (top to bottom)

End board clamped to tenoning jig ready for first cut.

End board midway through the first cut.

Fence adjusted and making the second cut on the end piece.

Using the jig as a spacer for the first dado cut on the side.



"In the Beekeeper's Work Shop"

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

Step 5. Making the Splines

From 1x4 pine cut the splines which are 1/4" thick and 3/4" wide and the length of the boards being joined (Figure 5). When making the splines, cut along the length of the board (a rip cut) and not across the board (a cross cut).

You may need to cut a test spline or two making minute adjustments to the saw's fence each time. You want the spline to fit snugly into the grooves without having to be forced (which might split the joint). Also, dry fit the spline in an assembled joint to make sure that it is not too wide thus forcing the boards apart. If necessary, you can sand the splines with a coarse sandpaper to get the proper fit.

Step 6. Making the Scalloped Hand Holds

We now turn our attention to making the cutouts for the hand holds on the outside of all four boards. The technique we describe is best made with a 10-inch radial arm saw with the head rotated 90 degrees (like when you rip a board), though it could be adapted for a table saw.

The typical commercial hand hold is about 4-1/2" wide and 1/2" deep and located 1-3/4" down from the top. (Figure 7). From the beginning of the scallop cutout to the top of the hand hold is 2 inches.

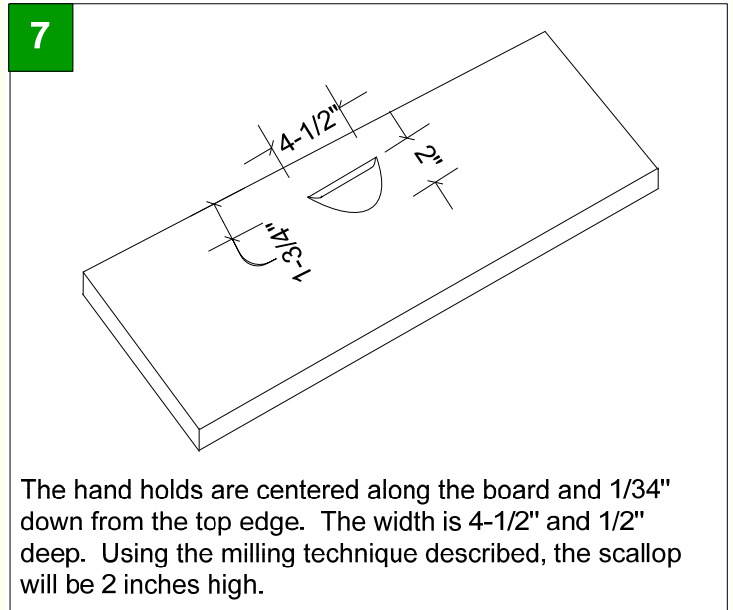
Prepare each of the four hive body boards by striking a line 1-3/4" from the top edge on the outside side and a second parallel line 3-3/4" from the top (Figure 8). For centering, strike a third line perpendicular to the top edge midway between the board's end.

To cut the hand hold, you will need to make an inclined cutting ramp 14" wide and 3-1/2" high at the back end. Secure the board you are milling to the ramp, with the top toward you (on the high side of the ramp).

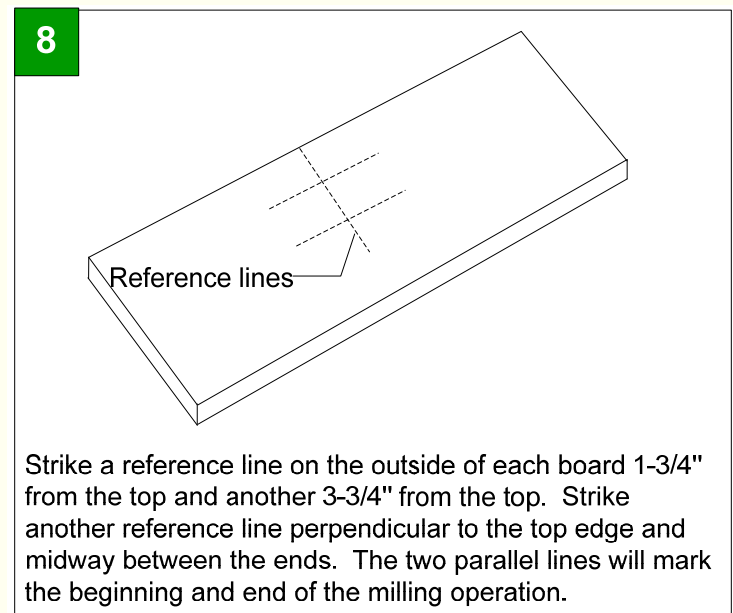
Rotate the saw head so that it is perpendicular to the board, which will be 15 degrees. To undercut the top of the hand hold, which really improves the "feel", rotate the head an additional 10 degrees. The total rotation will be 25 degrees.

Adjust the height of the saw so that the blade just touches the board midway between the parallel reference lines at the center mark. You are now ready to make the scalloped hand hold. As you pull the saw toward you, the blade will plow out the material creating the perfect "scalloped" shape. Lower the blade and repeat, this time starting at the lower reference line. When complete the hand hold will be 1/2 inch deep.

If you notice that the blade starts to labor as the cut gets deeper, then raise the blade and make a shallower scallop. Repeat these cuts until the hand hold is completed.



The hand holds are centered along the board and 1-3/4" down from the top edge. The width is 4-1/2" and 1/2" deep. Using the milling technique described, the scallop will be 2 inches high.



Strike a reference line on the outside of each board 1-3/4" from the top and another 3-3/4" from the top. Strike another reference line perpendicular to the top edge and midway between the ends. The two parallel lines will mark the beginning and end of the milling operation.

(Note: a pictorial guide for making the scalloped hand hold is on the following page.)

"In the Beekeeper's Work Shop"

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann



1. Make an inclined cutting ramp 14" wide and 3-1/2" high at the back end.



2. Secure the board to the ramp. A single 1-inch finish nail is easy to remove.



3. Rotate the saw until perpendicular to the blade (15 degrees).



4. To form an under cut at the top of the hand hold rotate the saw another 10 degrees (25 degrees in total).



5. Adjust blade height to just touch the board midway between the reference marks. Pull the saw toward you stopping at the top reference line making a shallow scalloped hand hold.



6. Lower the blade to just touch the board at the lower reference line. Complete the scalloped hand log, again stopping at the top reference line. The finished hand hold should look like that shown above.

“In the Beekeeper’s Workshop”

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

Step 7. Assemble the Hive Body

Dry assemble the hive body making sure the splines fit snugly and are not too thick or too wide (Figure 9). Check for square. Disassemble the hive body and then reassemble gluing each joint, groove and spline as you go. We recommend Franklin’s exterior Titebond® for the glue. Bar clamp the sides together then nail along the sides using 18 ga. 1-1/2-inch finish nails. If you use a heavier gauge nail, you may want to pre-drill to prevent splitting.

In our workshop, we assemble the hive bodies upside down (the top of the hive body on the shop table) in order to make sure the top of the boards are precisely even. We also work with full width 1x8 boards and then trim to the final height of 6-5/8 inches after the glue has set. That way, both the top and bottoms of the hive bodies are exactly even. Do not nail along the cut line if working with full width boards.

Step 8. Clean Out the Frame Rests

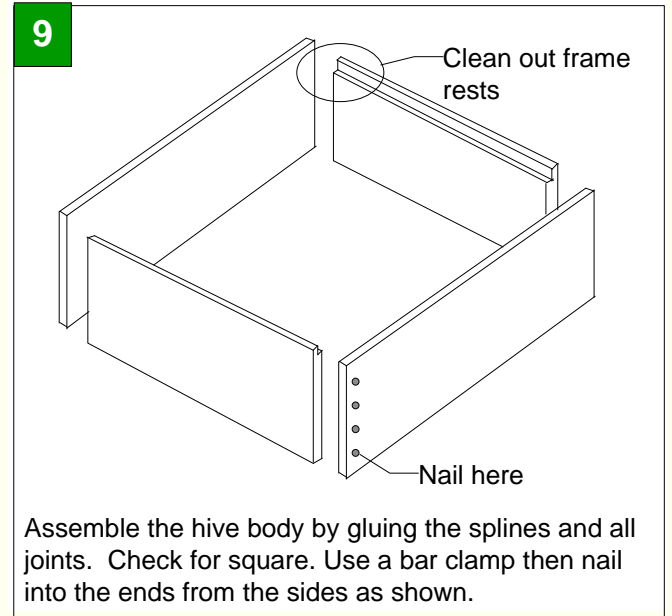
When the hive body is assembled, you will probably notice that a part of the spline protrudes into the frame rest rabbet (photo at right). Simply remove that part of the spline with a chisel or utility knife.

Step 9. Paint the Completed Hive Body

We suggest that you paint both the inside and outside of the hive bodies. We are often asked why paint the inside, as conventional wisdom in the bee world is to not to do so. Our response is “why wouldn’t you paint the inside”? Moisture is the enemy of wood and leaving the inside of the hive unpainted is just asking for trouble. To us, sealing all sides of the wooden ware just makes sense.

Use a quality latex primer and two top coats. Don’t skimp on the paint job since it will probably be the last time you paint the hive body. A good paint job will greatly prolong the life of your equipment.

For us, painting is the most tedious job in the workshop; we would much rather be building stuff than pushing a paint brush. For most paint jobs, using a 3-inch roller will greatly speed up the process and does a fine job.



Resources

Dadant & Sons (1997). *The Hive and the Honey Bee*. Chapter 12.

“Building a Bee Hive” series. Published on-line at www.michiganbees.org/beekeeping/in-the-beekeeper-s-workshop. For other beekeeper’s workshop project plans, search for “workshop”.

Video on making the scalloped hand holds available at... <http://www.youtube.com/user/beekeepersworkshop?feature=mhee>

"In the Beekeeper's Work Shop"

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

List of Materials: Hive Body

WOOD

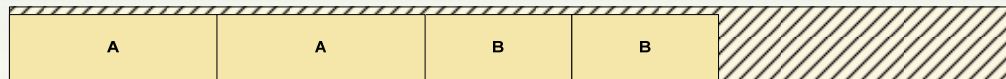
			Reference Figure
A	Hive Body Sides (2)	$3/4 \times 6-5/8 - 19-7/8$	3
B	Hive Body Ends (2)	$3/4 \times 6-5/8 - 14-3/4$	3

HARDWARE

1-3/4" nails for assembling frame
Franklin's Titebond® Glue
Paint

Cutting Diagram: Hive Body

3/4" x 7-1/4" - 96" (1X8 Pine)



Sizes for Hive Body Components

	Hive Body Foot Print Size (Assembled)		Board Length (in)	
	Width (in)	Length (in)	A	B
	5 - Frame	9-1/4	19-7/8	19-7/8
8 - Frame	13-3/4	19-7/8	19-7/8	12-1/4
10 - Frame	16-1/4	19-7/8	19-7/8	14-3/4

Hive Body Height (Assembled)

Hive Body Type	Height (in)
Deep	9-1/2
Medium	6-5/8
Shallow	5-11/16
Comb Honey	4-13/16

"In the Beekeeper's Work Shop"

Building a Bee Hive: The Hive Bodies

©by Stephen E. Tilmann

Photo Gallery...

1



2



3



4



5



Photo Captions:

1. Cutting the ledge of the frame rest rabbet.
2. Cutting the shoulder of the frame rest rabbet
3. Installing the spline when assembling the sides.
4. Partially assembled hive body.
5. Spline "chiseled out" from the frame rest