

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

©by Stephen E. Tilmann and Mike Risk

(Authors’ Note: These plans are all about mini-mating nucs. The format is somewhat different than others in the “*In the Beekeeper’s Work Shop*” family. The first section is a brief survey of mini-mating nucs, discussing the whats, whys and how tos. Our intention is to stimulate the curiosity of beekeep-

ers who may not be familiar with the concept. The second section deals with the shop plans for making a mini-mating nuc. A mini-nuc has all of the components of a standard hive but with a few features added on. In the plans that follow, we will only focus on the added steps. It is assumed that shop enthusiasts will obtain the base plans for each component.

## Mini-Mating Nucs - Part 1: Background

### Introduction

Isaac Asimov, one of our favorite authors, wrote a series of novels about a foundation of technocrats wherein a central theme is the drama of small versus big. In this future history, we are told a story of how small can flourish besides big; in fact, small can actually prevail over big.

It is not hard to see this same theme in the current human condition. We have the Apples, Facebooks, Microsofts and Cabelas (begun in garages, dorm rooms or with only a couple of people) which all started exceedingly small but prevailed and ironically are now the big. One cannot help but wonder what other “small” is out there right now; as of yet unseen and unknown by the “big”.

Consider the honey bee. A tiny insect, no bigger than your thumbnail. Yet the role of the honey bee in the natural world is huge... beyond big.

Also in the beekeeping world, we can see this same theme played out in the nucleus hive - or nuc. A nuc is a small hive, usually 4 or 5 frames, which has become an important tool for today’s beekeepers. There is ample literature, both on the web and in print, explaining the advantages and management of a nuc. Every major beekeeping supplies catalog carries a nuc and its associated gadgets; a testament as to just how “big” this small hive has become.

But if a nuc is an example of where the small can flourish along side the big, is there yet something that is even smaller with an equal - or perhaps even greater - “big” potential? We believe the answer is “yes” and it can be found in the mini-mating nuc.

### What is a Mini-Mating Nuc

A mini-nuc is a tiny version of a standard Langstroth-style hive. Whereas a nuc is half the size of a standard hive, the mini-nuc is yet again half the size of a nuc - or one fourth the size of the standard (photo, above right, a 4 chambered mini-nuc).

The frames of a mini-nuc are only half as long (at 9-1/4”) as the standard frame (at 19”). Like a nuc, the mini-nuc only has four or five frames (the standard hive has ten). The interi-



Working a mini-nuc

or of a mini-nuc is only about a fourth the volume of a standard hive, and therein lies the strength - and challenges - of working with a mini-nuc.

### Variations on the Theme

As so often the case with beekeeping, there is no single “right” way to manage or build a mini-nuc. Beekeepers are notorious tinkerers and the same can certainly be said of the mini-nuc movement. So keep this in mind as you read these plans.

The concept of a mini-nuc is not new. Indeed, Brother Adam of the Buckfast Abbey in England was writing about mini-nucs nearly 50 years ago. What is new is the internet and the global community which it spawns. Search the web for “mini-nuc” (or “mating nuc”) and you will find a wealth of information and discussions of what works, what doesn’t, the whys and how-tos of mini-nucs (see references at the end of these plans to get your started).

### What Are Mini-Nucs Used For?

Mini-nucs should be approached with the idea that these tiny hives are “starter” colonies. Eventually, the colony in a mini-

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### What Are Mini-Nucs Used For? (cont’d)

nuc will be moved to larger (permanent) equipment.

We read the words “mini-mating nuc” and the impression is that these are used strictly for getting a virgin queen mated. As we shall see, this is certainly not the case.

A number of beekeepers are exploring all kinds of uses for these tiny hives. Mini-nucs can certainly be used for mating a virgin queen, but they can also be used for making splits and divides, for replacing winter kill, for starter and finisher colonies when grafting queens, for raising queens from eggs, for splitting packaged bees and even for overwintering replacement colonies.

Indeed, it would appear that a mini-nuc can be used for all the purposes beekeepers have found for a regular nuc - and then some.

### Why Mini-Nucs?

Why do mini-nucs work? It is a fair question. If we had to sum it up in just a few words, then they would be that the small size of a mini-nuc translates into an equally small investment (relatively) on the part of the bees (and the beekeepers) to build and sustain a thriving colony.

It may all boil down to a question of geography. With a mini-nuc, or more specifically the mini-frame, there is simply less area that the bees have to work with. All of the activities that occur within a hive do so but in a more concentrated space. And within this smaller space, fewer bees are needed to do what needs to be done.

Of course, a mini-nuc is not the golden elixir of beekeeping; there are tradeoffs. One being mini-nucs require that the beekeeper keep a closer eye on things and perform the management tasks in a timely manner. More on this later.

### Deep vs. Mediums

Most mini-nucs use deep frames, albeit only half the length of standard frames.

There are, however, some beekeepers working with medium depth frames; these are truly tiny frames (compared to what most beekeepers are used to).

One of the authors (Tilmann) uses medium depth mini-frames in his min-nucs (see photo).



A medium-depth mini-frame.

Why? A number of years ago, this beekeeper began switching all of his equipment over to medium depth. This lightens the load on that beekeeper’s back and requires only one style of equipment for the entire operation. Using medium depth mini-nucs keeps true to this theme.

Do medium depth mini-nucs work? We think so, although these tiny hives do require a bit more timely manipulations than their “deep” cousins.

### Timing Is Important

Because of the smaller volume within a mini-nuc, space for the bees can quickly come into short supply when the colony begins to grow and thrive. The beekeeper needs to stay on top of this and be ready to deal with the situation.

There are options. One obvious step would be to move the mini-nuc into large equipment; after all, one of the main reasons why we are running a mini-nuc is to have a source of new or replacement colonies. Another is to move only a mini-frame or two of brood into other colonies to help with the build up of those. A third might be supering the mini-nuc in preparation for over-wintering.

Whatever strategy the beekeeper uses, timing will be important. Conditions within a mini-nuc can literally change from day to day. So have a plan in mind and be prepared to act in a timely manner.

### Transferring to Permanent Hive

Transferring a mini-nuc is relatively simple, the beekeeper simply moves the mini-frames, bees and all, into their permanent home. To do this, it is most convenient to move two mini-frames at a time (or in groups of two). In the target hive, a full length frame (or maybe two) is removed and replaced by two (or maybe four) mini-frames end-to-end. A clip is required in the middle to support then ends of the two mini-frame; refer to the plans for making this clip.



Two-mini frames being transferred to a full size hive. Note white transfer clip.

The transfer will probably be done when the mini-frames are nearly full of sealed brood and/or uncapped larva. After a couple of weeks, when the larva have emerged, the mini-frames can be moved back into the mini-nuc to begin the cycle

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again.

### The Importance of Feeding

When first starting up a mini-nuc, the beekeeper should be prepared to feed the colony. These plans include an inner cover in which a quart jar of syrup (1:1) with a perforated lid is used for feeding.

Feeding is important. First, the small colony needs the extra boost that feeding can provide. With a newly established mini-nuc, it will take a period of time until the foragers can provide adequate food for the colony.



Feeding a mini-nuc.

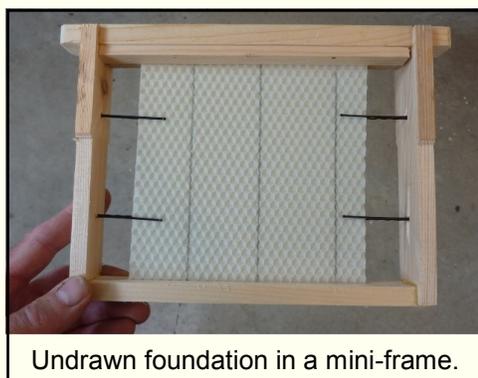
Second, feeding stimulates brood production and drawing of the comb (should that be required and it probably will).

Third, we find that feeding provides a simple visual clue as to how things are going inside the mini-nuc. If the amount of syrup in the jar is not declining (particular when compared to the other mini-nuc chambers), then this is an obvious sign that something unusual is going on and the mini-nuc needs attention.

### Drawing Foundation (Options & Techniques)

As with any style of hive, Langstroth, Top Bar, Warre or even a hollow tree, it always comes down to the fact that the honeycomb is where the action is. The same is true for a mini-nuc. And, of course, the comb in a mini-nuc is built on the mini-frame.

When you first build a mini-frame, you will be installing a (partial) sheet of wax foundation. This foundation, as in all hives, is pretty much useless until the bees draw it out. So how can we get the bees to draw out the comb in a mini-nuc?



Undrawn foundation in a mini-frame.

The answer is pretty much the same way it is done on any of the mini-nuc’s larger cousins.

We have found that a mini-nuc starting with undrawn comb in the mini-frames, a couple of handfuls of nurse bees and a virgin queen, will in fact draw out the comb. The key is to provide this new colony with all the sugar syrup they can take.

This is where the feeding jar provisions in the mini-nuc inner cover comes into play.

One of the authors (Tilmann) got started with mini-nucs in August, late in the season and a time of year not known for bees drawing out comb. Yet within the week, and in plenty of time

for the newly hatched queen to have her mating flights and begin to lay eggs, there was ample drawn comb. After a few days of being established, each mini-nuc was going through a quart of syrup per day. It wasn’t going into storage, it was being used to draw comb.

So, yes, the bees will draw out comb on new foundation in a mini-nuc if they have to... and if they have adequate feed.

Another option is to put several of the mini-frames in an established hive (if you have one) and let these bees draw out the comb. The best time of year for this is in early spring, when the bees are in comb-building mode. Even if you have no immediate need for these drawn out mini-frames, it is a good idea to do so and then put the drawn out mini-frames in storage. The day will soon arrive when you will need them.

A third option, though not necessarily the most readily available, is to put some mini-frames in a newly hived swarm. A swarm has its comb-drawing instinct in overdrive and you can take advantage of it by letting the swarm draw out a few mini-frames. The swarm will probably be none the worse and you will have some mini-frames with valuable, newly drawn comb.

Drawn comb on a mini-frame is like money in the bank. So we recommend that you not neglect this aspect in your planning.

### Populating a Mini-Nuc

So we have a mini-nuc ready to go. How do we get that initial population of bees in the darn thing? We aren’t talking about the queen, but the worker bees. Here are a couple of techniques that work.

The best place to get that initial population of bees for a



Drawn foundation in a mini-nuc

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### Populating a Mini-Nuc (cont’d)

mini-nuc is from an established hive, assuming you have one. You don’t need many, a couple of cups will do. And the best place to get these is from the brood chamber, where the nurse bees hang out.

Why nurse bees? First, these are the young bees. Many of them can be expected to live 5 or 6 weeks. It will take about 3 to 4 weeks for a virgin queen to get mated, lay eggs, and have these eggs begin to hatch. The older, foraging bees may not live long enough to see this cycle through.

Second, it is the young nurse bees that draw the comb, feed the larvae and generally run the hive; exactly the activity we want to go on inside a mini-nuc.

Third, the young nurse bees have not, by and large, left the parent colony and are more apt to stay in the mini-nuc once you transfer them to it. These young bees are not as likely to abscond from the mini-nuc back to the parent colony as are the older forager bees.

So when you open up a parent colony, go into the brood chamber and look for a frame full of young nurse bees. Make sure the queen is not on this frame. Then shake the frame into the mini-nuc. A full size frame covered in bees should be enough to fully populate two mini-nucs. Since these plans call for a four-chambered mini-nuc, you will need two such frames for all four chambers.

Spraying the bees with a light sugar syrup before you shake them into the mini-nuc may help keep them in place after you shake them.

You can also place a queen excluder over a mini-nuc and put an empty hive body on top of that. Shake the frames into the empty box. A little smoke will drive the bees down into the mini-nuc. If a queen is in the mix, she will remain behind on top of the excluder. You can then put her back into the parent colony. If necessary, equalize the bees in each of the mini-nucs before closing it back up.

### After Populating the Mini-Nuc With Bees

After the bees are in the mini-nuc, you may want to insert a small strip of queen pheromone. It doesn’t take much, about a half inch will do. Use a nylon zip tie around the pheromone strip, attach the other end to a small wood cross piece and place the strip down between the mini-frames. The pheromone strip helps to keep the newly transferred bees in place by simulating a queen-right colony.

Also, a small piece of a pollen patty placed on top of the frames will also help the new bees in drawing out the frame. This is particularly true if there is not much, if any, of a honey flow going on when you transfer the bees.

Then close up the mini-nuc overnight. Be sure to put a feed jar (1:1 sugar syrup) above the mini-nuc using the hole provided for this in the inner cover. The mini-nuc can be opened for business as usual the next day.

### Splitting a Package of Bees

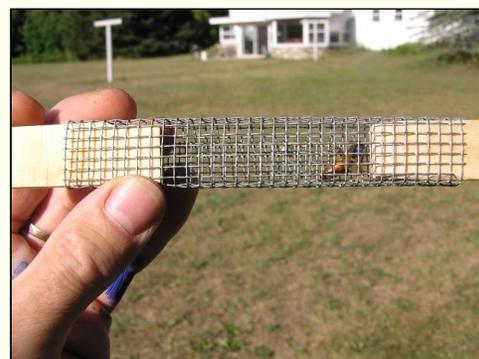
Another source of bees for that initial population could be a package of bees (eg. a 3 pound package). While we don’t find much discussion of this option in the forums, we are of the opinion that it will work. A 3 pound package of bees should be enough to populate three mini-nucs (using deep mini-frames) or maybe even four mini-nucs (using medium mini-frames)

At today’s cost of packaged bees (over \$100 in the spring of 2015), using a package of bees to start three or four mini-nucs certainly has some attraction. Even if only half of the mini-nucs from a package split make it, you are going to be ahead of the game.

A couple of points to keep in mind. First, packaged bees will have a wide age distribution: young, old and in between. You may have to keep an eye on the mini-nuc over the next several weeks to make sure the mini-nuc’s population doesn’t fall too low. Second, splitting a package of bees implies that you will have queens to start the mini-nucs. Since packages usually arrive in early spring, having a source of (preferably locally produced) queens may be an issue. You may have to order extra queens with the package or make arrangements with a local queen breeder. Even with the extra expense of purchased queens, you will still be money ahead if you can successfully make a three or four way split of packaged bees.

### Introducing a Queen

We will now turn the discussion to installing a queen in the mini-nuc. Beekeepers have several options: you can use a mated queen, a virgin queen or even a ripe queen cell. The techniques for a mini-nuc are not unlike those you would use for a regular nuc or even a standard hive.



Virgin queen in a butler cage prior to introducing into a mini-nuc

There is no reason to delay when introducing a queen. So introduce the queen immediately after populating the mini-nuc with bees. If the queen is emerged, it is probably best to keep

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### Introducing a Queen (cont’d)

the queen in a queen cage for a day (or so) before releasing her. If you are working with a ripe queen cell, hang the cell between the frames or on drawn comb (if you have any). This is no different than in a full-size nuc.

Mark the calendar on the day the queen is introduced. It takes about three days after the queen emerges for her integument to harden sufficiently so that she can fly. Allow another three or four days for her mating flights. After 10 days, you can inspect the mini-nuc for the queen and eggs, a sign of a successful introduction.

Not all queens survive; about 25% may not make it back from their mating flights (these are perilous times for a new queen). So for a four-chambered mini-nuc (like these plans) a failure in one would not be unexpected. So it goes.

After transferring a mini-nuc to a permanent hive (discussed earlier) and you are removing the mini-frames an opportunity is presented that you may want to be aware of. We have found that often the queen will have laid eggs in the mini-frames. Why not take this mini-frame(s) of eggs, setup a mini-nuc and see if the bees will be able to raise their own queen from one of these eggs?

You will have little invested and a lot to gain. You will only have a small quantity of bees in the mini-nuc, so the parent colony should not be adversely affected. You will know within a couple of days if the effort will work. If it does not, you can return the “borrowed” bees back to their parent colony and be none the worse for wear.

And if the bees do start a queen cell (or cells) then you will have a cherished opportunity to watch a fascinating aspect of honey bee biology from beginning to end. Raise your own queen and increase your hives. Not a bad bargain.

### Other Things to Explore

Thus far we written about some of the more common uses for mini-nucs. But beekeepers are beekeepers and are constantly trying out new things. In this section, we will throw out a few ideas which the mini-nuc community have been doing. Perhaps some of these ideas will be of interest to the reader. And, who knows, maybe you will be able to add a few new twists of your own.

**Overwintering in a Mini-Nuc.** Can you overwinter a mini-nuc? Yes, you can... and a lot of people are doing just that. In fact, Brother Adam, one of the pioneers in mini-nucs, routinely overwintered mini-nucs. The technique involves stacking two mini-nucs, with the top mini-nuc well provisioned with honey. If you (or rather the bees) are successful, then you will

have the following spring a young, vigorous colony to add to your apiary.

**Banking Queens.** There are times when a few (fortunate) beekeepers find themselves with an extra queen or two. Rather than trying to hold these queen in a queen cage, how about banking these queens in mini-nucs? The investment is small in both bees and your time. When the time arrives when you need that queen, she will already be laying and proven. Laying queens are rarely rejected which really simplifies the task of introducing a new queen to a colony.

**Mini-Nucs as Starter/Finisher Colonies.** A few intrepid souls out there have even used mini-nucs as starter and finisher colonies for queen rearing. While this may be pushing the envelope a bit, they report some success in doing so. Grafting your own queens has all kinds of benefits. Grafting will take your beekeeping journey to a new level and the diminutive aspects of a mini-nuc may be just what is needed as your first step. It is worth a try.

### Summary

Mini-mating nucs appear to be an idea whose time has come (again). They are easy to work with, open up new vistas and are... just plain fun to work with. You might want to check out some of the references and links provided at the end of these plans. Visit the forums on the web to stay current with the mini-nuc scene. And don’t sell yourself short; you may be able to contribute more than you think.

Hopefully we have your interest. Now lets move on to part 2 of these plans and go out to the workshop and build a mini-nuc.

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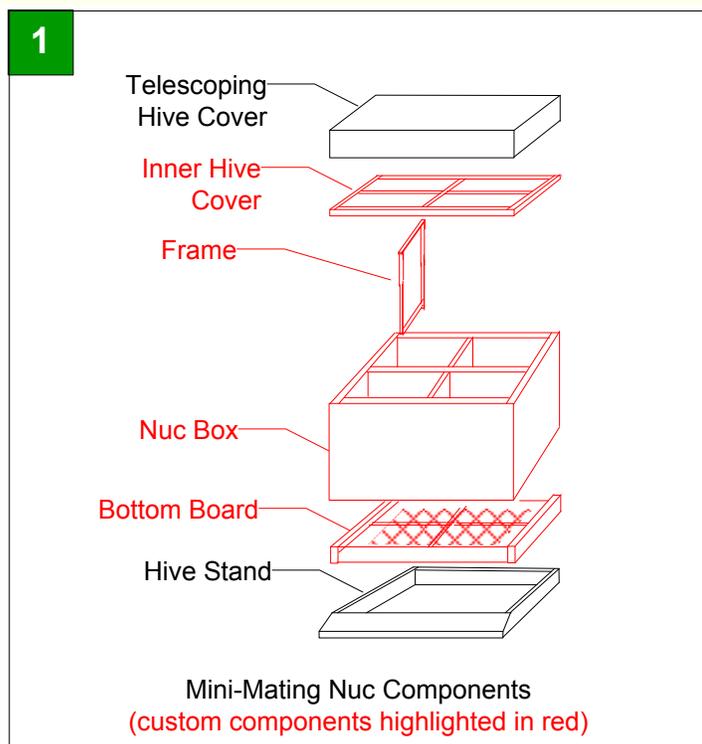
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## Mini-Mating Nucs - Part 2: Building Your Own

### Introduction

With just a little bit of research you will find that mini-nucs come in all sorts of sizes: singles, doubles and (as in these plans) four-chambered. We have elected to build a “4 chambered” mini-nuc (Figure 1), which is basically a standard hive body divided into four separate mini-nucs (or chambers).



The advantages of a 4-chambered mini-nuc are several. First, it is very helpful to have more than one mini-nuc going so that you can compare one to the others (just like having more than one colony in your bee yard). If you notice something a bit different with one, then it may be a clue that the one needs attention.

Second, you will be able to use other standard equipment, which you already have, for parts of the mini-nuc. The hive stand, telescoping top cover and maybe a queen excluder are three such items. Also a hive body to set over the inner cover when the feeding jars are being used.

Third, the old adage “if one is good then two are better” definitely applies to a mini-nuc. You are going to have fun doing this, so you might as well run four mini-nucs and have a really good time.

### Before You Begin...

To setup a mini-nuc you will use all of the components of a standard sized hive although most of them will be modified for use as a mini-nuc (Figure 1). Plans (and accompanying videos) are available for all of these components in the “In the Beekeeper’s Workshop” series (see the references at the end of this document).

We assume that you have downloaded these plans (and maybe viewed the videos) and will not repeat this information

when discussing a mini-mating nuc. Rather, we will just explain what extra steps are required in the workshop.

The components of the standard hive that need to be modified for a mini-nuc are the screened bottom board, the hive body (nuc box), the frames and the inner hive cover. In the plans that follow, each of these components are addressed separately.

Enjoy!

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### Construction Details: The Mini-Nuc Bottom Board<sup>(1)</sup>

#### Introduction

The bottom board for the mini-nuc has all of the elements of a standard screened bottom board with the substitution of a rail in front that closes off the entrance (see photo at right). In lieu of the front entrance, there are a series of gated openings on the top of the side rails and the front and back fillers reminiscent of a double screen board.

The mini-nuc bottom board also has two perpendicular fillers on the floor that rise flush to the top and divides the bottom board into four sections that match the four-chambered hive bodies (see Figure 2). These fillers seal the bottom of the hive space and prevent the bees moving from chamber to chamber.

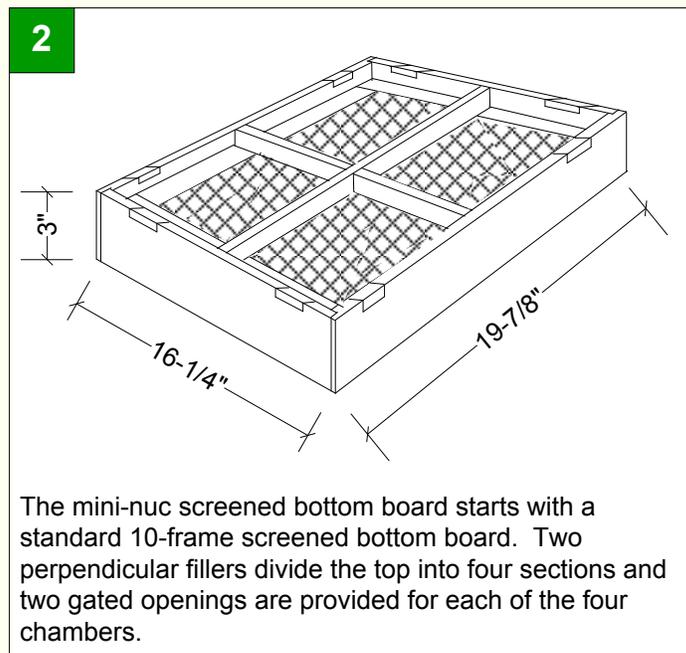
The benefits of a screened bottom board applies equally to a mini-nuc as they do to a standard hive. Namely, the mini-nuc will have improved ventilation, dislodged mites won't have the opportunity to hitch a ride back into the nest and you will be able to conduct sampling of mite fall.

Although the hive bodies will provide small diameter entrance holes for the bees to come and go, these plans also include two gated openings in each of the four sections of the bottom board. These additional openings allow you to control additional ingress and egress to each chamber by either opening or closing the gates in one, or both, of the openings.

#### Mini-Nuc Modifications

To construct the mini-nuc bottom board, we will basically follow steps 1 thru 7 for the standard, 10-frame screened bottom board but with a several modifications. Three changes are required. First, the overall length of the assembled bottom board will be  $19\text{-}\frac{7}{8}\text{'}$ . Second, the exposed interior frame will be narrowed to  $1\text{-}\frac{1}{4}\text{'}$ . Third, a front rail is used instead of the basic plan's filler.

At this point, the min-nuc bottom board will only lack two features: the two interior cross bars and the two gated openings for each chamber (eight openings in total).



(1) Plans for a standard screened bottom board can be found in “Building a Bee Hive: The Screened Bottom Board”.

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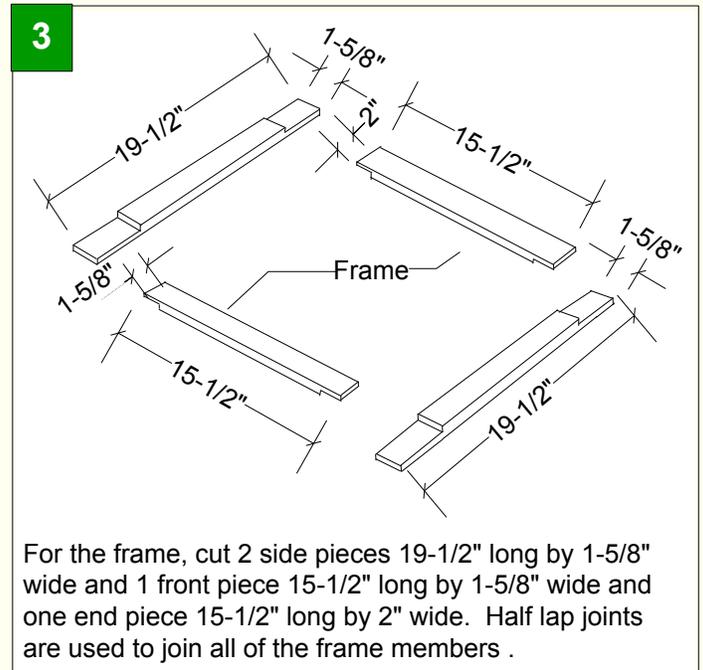
### Construction Details: The Mini-Nuc Bottom Board (cont’d)

#### Step 1. The Interior Frame

For the mini-nuc the interior frame is narrowed from the standard plans (step 1 in the standard) such that when assembled only 1-1/4" is exposed. Because we are using a rail in front and a filler in back, the width of these two frame members will be slightly different.

The following replaces Step 1 in the standard plans. From 1x4 pine, cut two pieces for the sides that are 19-1/2" long and 1-5/8" wide (Figure 3). For the front member, cut one piece 15-1/2" long and 1-5/8" wide. For the back member, cut one piece 15-1/2" long and 2" wide. Then cut two side pieces 19-1/2" long and 1-5/8" wide.

Use a half-lap joint to assemble the frame. Adjust the end notches to match the width of the member to which it is jointed.



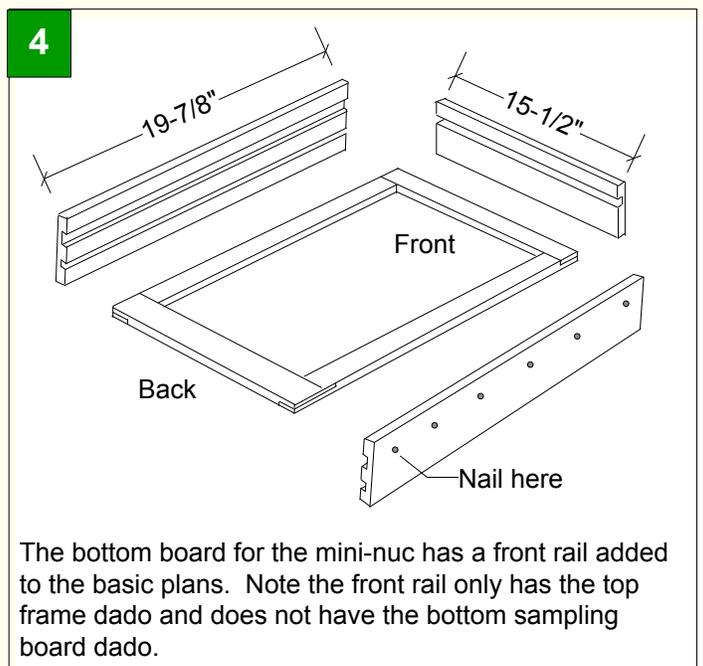
#### Step 2. Front and Side Rails

In the standard plans, the front of the bottom board has a filler on the bottom under the frame. It is a bit more elegant to replace this filler with a front rail (Figure 4) that is similar to the two side rails. The front rail does not have the lower dado for the sampling board as do the two side rails.

To make the front rail, cut a piece from a 1x4 that is 15-1/2" long then rip this piece to a width of 3". As in the two side rails, cut a 3/4" wide by 3/8" deep dado along the length. Locate this dado the same distance from the top edge as the two side rails (eg. 3/4").

Also note that the two side rails for the mini-nuc bottom board (at 19-7/8") are shorter than the standard (at 22").

We will use a rebate joint to assemble the rails to the interior frame. When assembled, the interior frame should be flush with the back end of the two side rails. The foot print of the assembled mini-nuc bottom board will be 16-1/4" wide and 19-7/8" long (the same as a hive body).



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### Construction Details: The Mini-Nuc Bottom Board (cont’d)

#### Step 3. Assemble the Frame

The easiest method to join the frame is a simple butt joint. But to minimize the amount of exposed end grain, we will use a rebate joint (Figure 5). This joint only has half the exposed end grain as does the butt joint. Since rot usually starts at the end grain, a rebate joint will prolong the life of the bottom board. Also, the rebate joint also has more glued surface, so this joint is a bit stronger than a simple butt joint. To make a rebate joint, cut a rabbet on the inside ends of the side pieces  $\frac{3}{8}$ " deep and  $\frac{3}{4}$ " wide.

The foot print of the assembled mini-nuc bottom board will be  $16\text{-}\frac{1}{4}$ " wide and  $19\text{-}\frac{7}{8}$ " long (the same as a hive body).

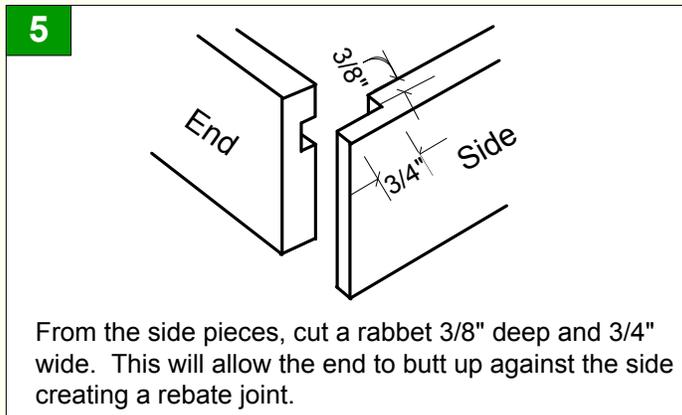
#### Step 4. Install Interior Dividers

From a 1x4 cut two dividers; one will be  $18\text{-}\frac{3}{8}$ " long (the length of the inside of the bottom board) and the other will be  $14\text{-}\frac{3}{4}$ " long (the width of the inside of the bottom board). Both will be  $\frac{3}{4}$ " high and 1" wide (Figure 6, top).

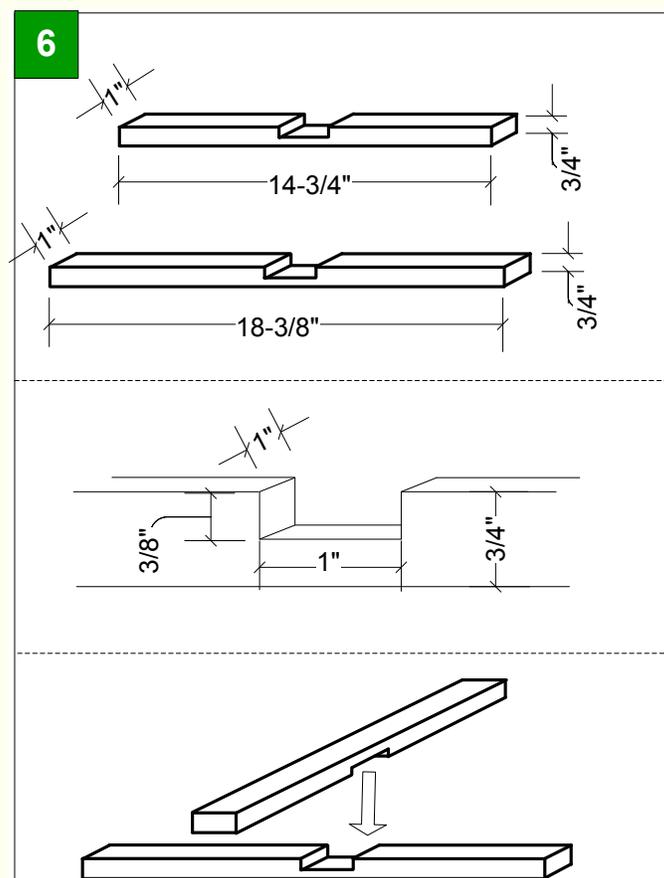
Then in each divider, cut a dado centered along the length that is  $\frac{3}{8}$ " deep and 1" wide (Figure 6, middle). These dados will allow you to install the dividers perpendicular to each other with the tops flush. Glue the dividers at the dados and assemble into a cross; the top of the dividers should be flush (Figure 6, bottom).

We prefer to hold off making and installing the dividers until the bottom board has been painted and the screen mesh installed. Note: the mesh may affect the height of the dividers. Which is why you may want to wait making the dividers until after the mesh is installed. It is likely that the height of the fillers may have to be somewhat less than the  $\frac{3}{4}$  inch shown in the diagrams to allow for the thickness of the wire mesh.

To install the dividers, place the assembled dividers on the top of the bottom board mesh (Figure 2) and nail through the sides into the ends of the dividers. Then turn the bottom board upside down and staple the mesh to the bottom of the dividers sufficiently so that the bees will not be able to crawl under the dividers into neighboring chambers.



From the side pieces, cut a rabbet  $\frac{3}{8}$ " deep and  $\frac{3}{4}$ " wide. This will allow the end to butt up against the side creating a rebate joint.



From a 1x4 cut a filler  $18\text{-}\frac{3}{8}$ " long and a second filler  $14\text{-}\frac{3}{4}$ " long (top). Both fillers are 1" wide.

In each of the cross pieces, cut a dado  $\frac{3}{8}$ " deep and 1" wide (middle). Center the dado along the length.

Assemble the fillers by matching the dados (bottom). The tops of the fillers should be flush.

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

©by Stephen E. Tilmann and Mike Risk

### Construction Details: The Mini-Nuc Bottom Board (cont’d)

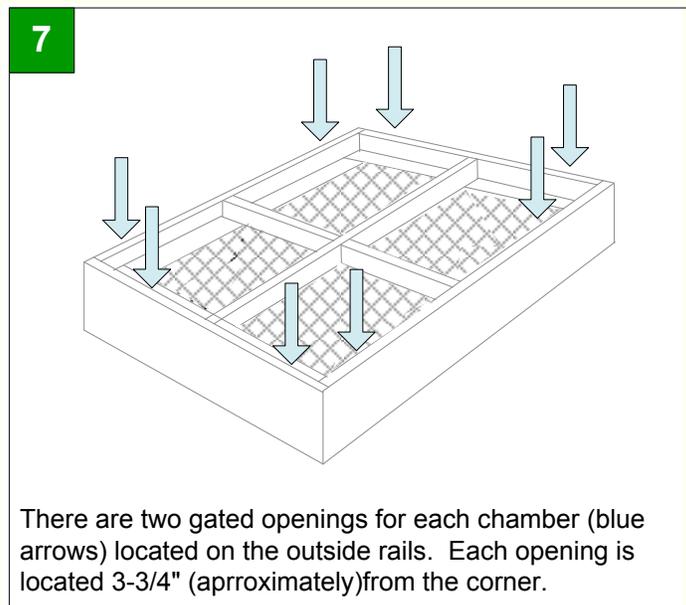
#### Step 5. Make the Gated Openings

Each of the four chambers has two gated openings, or entrances, on the top rails about 3-3/4” from the outside corner (Figure 7). These entrances have a rotating gate that which can be closed or opened depending on the needs at the time.

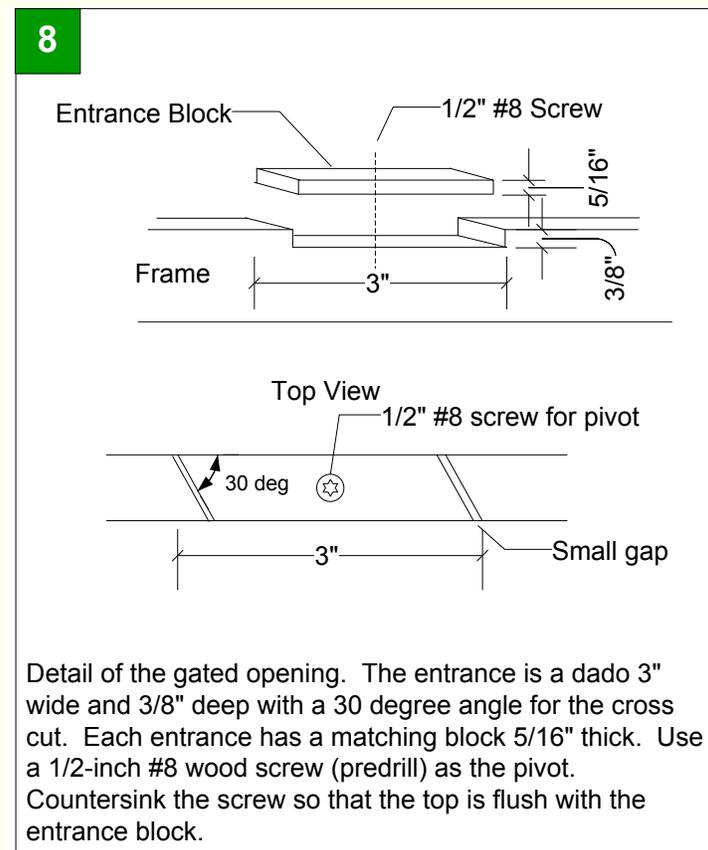
We recommend that you first make the entrance blocks. From a 1x4 rip a piece 5/16” wide and at least 36” long (you will need 8 blocks). Then cut each block at a 30 degree angle and 2-7/8” long on the edge (Figure 8). This length is slightly smaller than the entrance so the block will not bind and can be completely closed.

To make the entrance we use a radial arm saw with a stacked dado blade setup for 1/4-inch wide cut. With the arm of the saw rotated 30 degrees, we simply make a series of passes nibbling out the entrance opening. The opening is 3/8” deep and 3” long (Figure 8). Test the width of each entrance with one of the blocks you just made. There should be a small gap between the end of the block and the entrance opening.

Finally, predrill the entrance block for a 1/2” #8 wood screw. Countersink the screw so that the top of the screw is flush with the block.



There are two gated openings for each chamber (blue arrows) located on the outside rails. Each opening is located 3-3/4” (approximately) from the corner.



Detail of the gated opening. The entrance is a dado 3” wide and 3/8” deep with a 30 degree angle for the cross cut. Each entrance has a matching block 5/16” thick. Use a 1/2-inch #8 wood screw (predrill) as the pivot. Countersink the screw so that the top is flush with the entrance block.

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

©by Stephen E. Tilmann and Mike Risk

### Construction Details: The Mini-Nuc Hive Body<sup>(2)</sup>

#### Introduction

The hive body for the mini-nuc is basically a standard 10-frame hive body divided into four chambers (see photo at right and Figure 9). The cross-wise partition provides a standard 3/8” by 5/8” frame rest on both sides. The length-wise partition is not structural and serves merely to separate the chambers; it is made from thin plywood. All of the partitions are of the same height as the hive body.

In the lower outside corner of each chamber, a 1-inch entrance hole is provided. This is one (of several) means for the bees to come and go from each chamber. To control ingress and egress an entrance disc is installed over each hole.

Although the hive body depicted in Figure 8 is a deep (9-5/8”), you can also make a mini-nuc from a medium depth hive body (6-1/4”). Where appropriate, we will provide the dimensions for both in the plans that follow.

#### Mini-Nuc Modifications

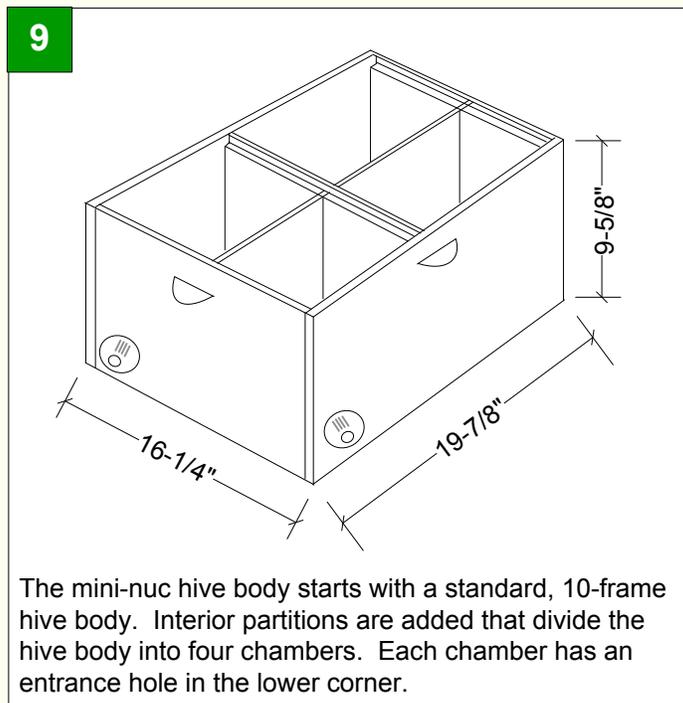
To construct the mini-nuc hive body, follow steps 1 thru 6 for the standard, 10-frame hive body. This takes you through to the point where all of the components are ready to assemble.

For the mini-nuc, the first step will be to create the cross-wise partition. We will laminate three pieces of 3/8” plywood. The two outer pieces of plywood are 5/8” lower than the center piece. This will give us the 5/8” by 3/8” frame rest on both sides of the partition.

Be sure the partitions are the same height as the hive body so that when everything is assemble, there will be no spaces through which the bees can visit the neighboring chambers.

Prior to assembly, we need to cut a shallow vertical dado centered on the inside of each board of the hive body. These dados (four in total) accept the cross-wise and length-wise partitions.

For the four entrance holes, only drill one hole per side per chamber (as shown in Figure 9). Isolating the entrance holes to one per side will help the bees find the correct entrance for their “home”. We also paint the entrance discs different colors for the same reason.



The mini-nuc hive body starts with a standard, 10-frame hive body. Interior partitions are added that divide the hive body into four chambers. Each chamber has an entrance hole in the lower corner.

(2) Plans for a standard hive body can be found in “Building a Bee Hive: The Hive Bodies”.

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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### Construction Details: The Mini-Nuc Hive Body (cont’d)

#### Step 1. Make the Cross-Wise Partition

The cross-wise partition is made from three pieces of 3/8" plywood laminated together (Figure 10). The center piece is 1/2" wider and 5/8" higher than the two outer pieces. When assembled, the 1/4" extension on both sides of the center piece will fit into a dado on the inside of the hive body. The extra 5/8" on top will form the back side of the frame rest.

The cross-wise partition spans the interior width of the hive body; the length-wise partition is actually in two sections (front and back). Therefore a shallow dado is cut down the middle of the two outer pieces of the cross-wise partition to accept these length-wise partitions (represented by the vertical gray line in Figure 10). Be sure to avoid placing any nails or staples where this vertical dado is located.

From a sheet of 3/8" plywood, cut one piece 15-1/4" by 9-5/8". Cut two pieces 14-3/4" by 9". Plywood sometimes has voids in the interior plies. Try to avoid having any of these voids on the top edge of the partition; this top edge needs to be strong since it will be used to pry out frames once the mini-nuc is placed in service.

Laminate all three sections together with glue, clamps and nails or staples. The bottom edge of all three pieces are flush. The middle piece will extend 1/4" beyond both sides of both outside pieces and 5/8" above.

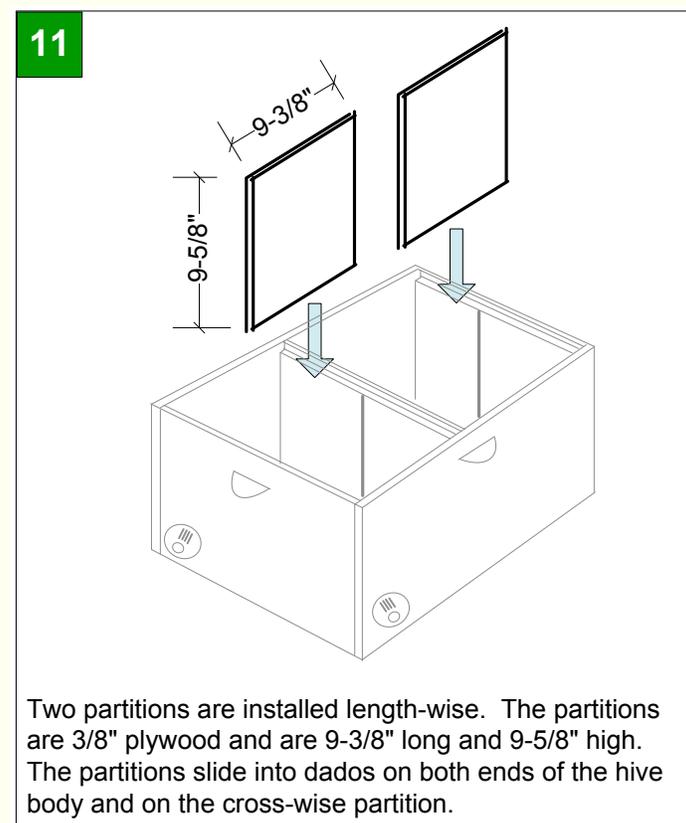
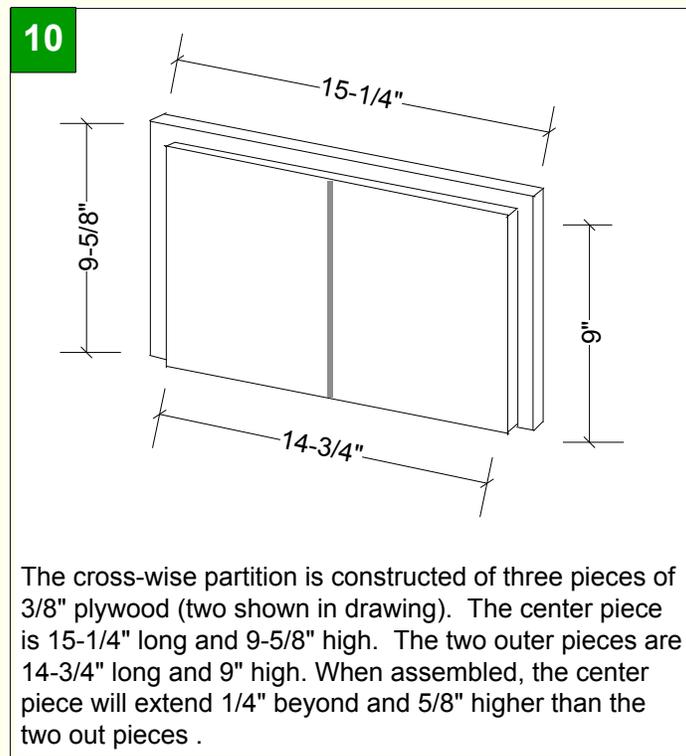
Finally, cut a 3/8" deep vertical dado centered on the two outside pieces. This dado is for the length-wise partitions. The width of the dado should match whatever material you use for the length-wise partitions; these plans call for 3/8" plywood.

#### Step 2. Make the Length-Wise Partitions

The two length-wise partitions are made from 3/8" plywood (thickness is not critical). Each partition is 9-3/8" long and 9-5/8" high (for a deep hive body or 6-5/8" for a medium). During assembly these partitions will slide into vertical dados on the interior of the hive body (Figure 11).

If the length-wise partition is made from plywood other than 3/8-inch, then be sure to make the appropriate adjustments when cutting the dados on the end of the hive body and on the cross-wise partition.

Note: we have made mini-nucs using 1/8" thick luan (a thin plywood) for the length-wise partitions. This thin material works just fine and is perfectly acceptable.



# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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### Construction Details: The Mini-Nuc Hive Body (cont’d)

#### Step 3. Cut Dado on Hive Body Ends

In step 1, we made two vertical dados 3/8” wide on either side of the cross-wise partition. We need corresponding dados on the inside of the two hive body end boards (Figure 12). These dados are also 3/8” wide (or match the thickness of the length-wise partition) and centered in the middle of the end boards. The dados are 3/8” deep and run the full height of the board.

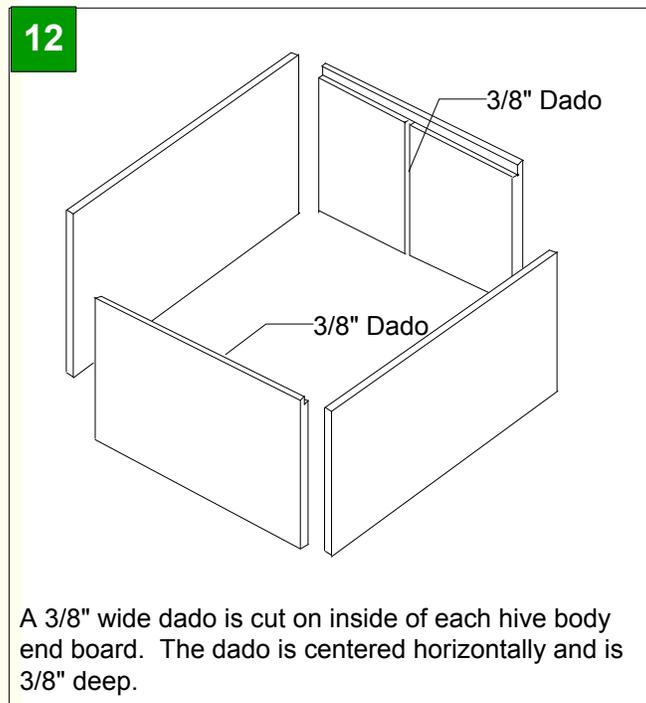
Note that a 3/8” deep dado will probably cut through the hand hold on the opposite side; perhaps an 1/8th inch or so. When the hive body is assembled, a small portion of the partition may extend into the hand hold. If this is objectionable, then you can either cut a shallower dado (and shorten the length of the partition) or carve out the exposed partition in the hand hold after the hive body is assembled. We generally leave the exposed partition alone; it does not seem to matter.

#### Step 4. Drill Entrance Holes in Each Chamber

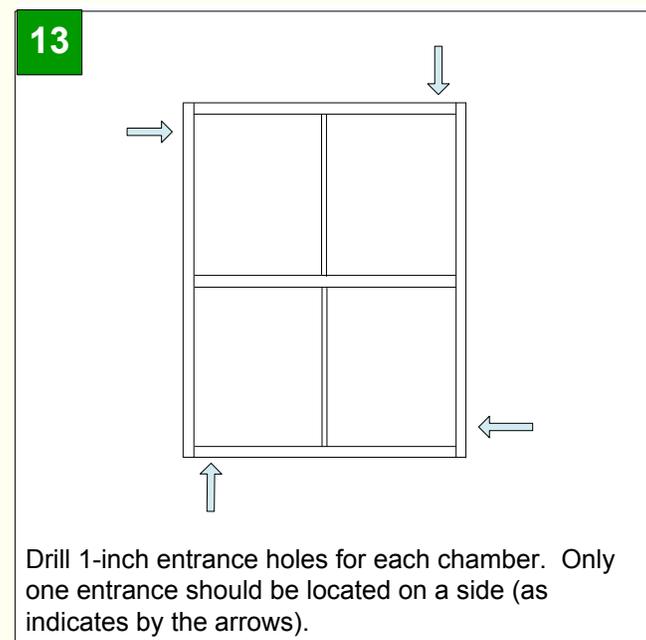
Each chamber is provided with a 1-inch diameter entrance hole. Locate the center of the entrance near the corner, about 1-1/2” above the bottom and about 2” in from the corner. The exact location is not particularly important.

We like to have only one entrance hole per side of the hive body (Figure 13). This will help the bees orient to their particular colony.

Install an entrance disc over each entrance hole. An entrance disc is a small plastic disc (see photo below) that can be rotated into one of several positions to control ingress and egress (open, workers only or closed). These discs can be purchased commercially; the one shown in the photo was printed on a 3-D printer. Paint each of the four discs a distinctive bright color. This will help the bees imprint on their “home” entrance.



A 3/8” wide dado is cut on inside of each hive body end board. The dado is centered horizontally and is 3/8” deep.



Drill 1-inch entrance holes for each chamber. Only one entrance should be located on a side (as indicates by the arrows).

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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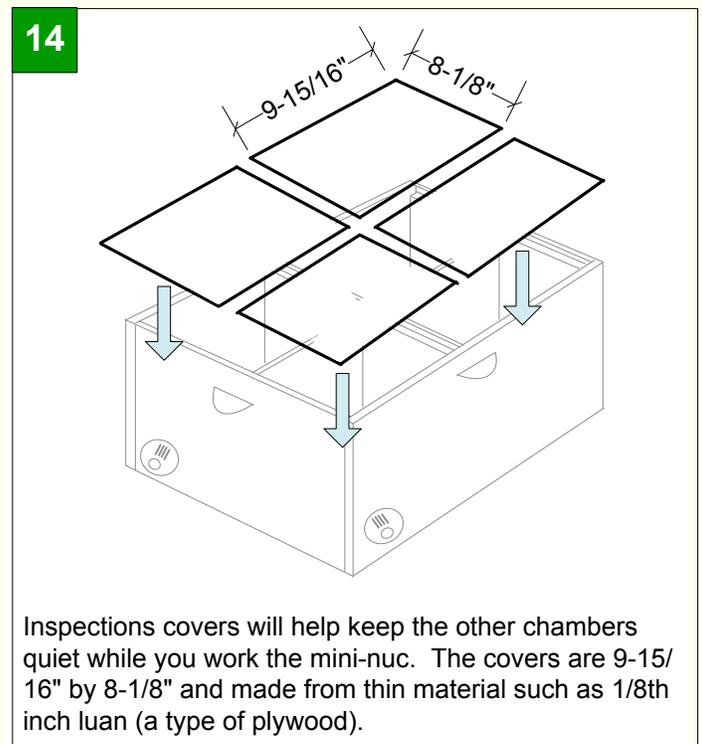
### Construction Details: The Mini-Nuc Hive Body (cont’d)

#### Step 5. Inspection Covers (Optional)

One unique aspect of a mini-nuc is that when you open it up you are really opening four colonies of bees at the same time. Inspection covers help keep the other chambers calm while you work the one (see photo right, note inspection covers on the mini-nuc).

Beekeepers often use fabric draped over the top of the beehive for this purpose. One side can be flipped back while working the hive. This is particularly common when working double nucs. However, fabric may not be the best choice for a four chambered mini-nuc.

Inspection covers can be made from any thin plywood material; we recommend 1/8th inch luan. The covers are 9-15/16” by 8-1/8” (Figure 14). You will need four inspections covers for the mini-nuc.



# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

©by Stephen E. Tilmann and Mike Risk

### Construction Details: The Mini-Nuc Frames<sup>(3)</sup>

#### Introduction

The frames for a mini-nuc have all of the features as standard frames except the mini-nuc frames are only about half as long (see photo at right; this is a medium mini-nuc frame). It is these mini-frames, perhaps, that makes working with mini-nucs so appealing. These tiny frames are... well, just cute.

These small frames are the essence of a mini-nuc and what makes the system work. The small frames concentrate the cluster and force the nurse bees to focus their attention to a comparatively small area. This smaller footprint requires fewer bees to provide all of the essential services to keep the colony going and to help it thrive.

#### Mini-Nuc Modifications

A standard frame is 19-1/8 inches long; the mini-nuc frame is 9-1/4 inch long (Figure 15). The height of the mini-nuc frame is the same as its standard equivalent; deeps are 9-1/8" and mediums are 6-1/4".

The shorter length of the mini-nuc frame is achieved by shortening three components of the standard frame. The top bar is 9-1/4" long (as opposed to 19" for the standard). The bottom bar is 8" long (as opposed to 17-3/4" for the standard). The tack strip is 7-1/4" long (as opposed to 17" for the standard).

To construct a mini-nuc frame, follow all of the steps provided in the standard frame plans. Just make the length adjustments stated above.

#### Mini-Nuc Foundation

For the mini-nuc frames, use a standard sheet of wax foundation (16-3/4" wide) cut into three equal width pieces. Each sheet of foundation for the mini-nuc will be slightly over 5-1/2" wide.

It should be noted that when the foundation is installed in a mini-frame, the sheet will not fill the entire width between the side bars; there will be about a 7/8" gap on each side. Our experience is that the bees will fill in this gap when they draw out the comb. This gap does not seem to be an issue.

#### Frame Transfer Clips

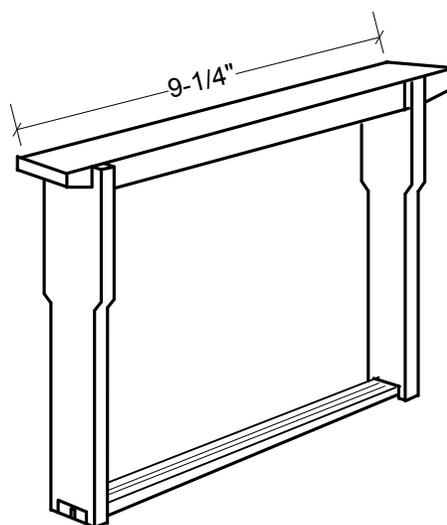
One unique aspect of working with mini-nucs is that you will, at some point, need to transfer the colony from a mini-nuc to standard size equipment. This transfer is done by placing two mini-frames end-to-end, bees and all, to a space normally oc-



cupied by one standard frame. Transfer clips are needed to support the two mini-frames where they meet in the middle.

In these plans, we provide two options for transfer clips. One style is used when transferring two mini-frames placed between two standard frames. The other style is used when transferring four mini-frames between two standard frames. We suggest that you have both styles on hand so as not to limit your options.

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The frame for the mini-nuc is 9-1/4" long, about half that of a standard frame. The height is the same as the standard frame at 9-1/8" for deeps and 6-1/4" for mediums.

(3) Plans for a standard frames can be found in “Building a Bee Hive: The Frames”.

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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### Construction Details: The Mini-Nuc Frames (cont’d)

#### Step 1. Make the Mini-Frame

There are three components of the standard frame that need to be modified (length is shortened) for the mini-nuc frame: the top bar, the bottom bar and the tack strip (Figure 16). The lengths shown in Figure 15 should be used when making frames for the mini-nucs.

#### Step 2. Make Transfer Clips

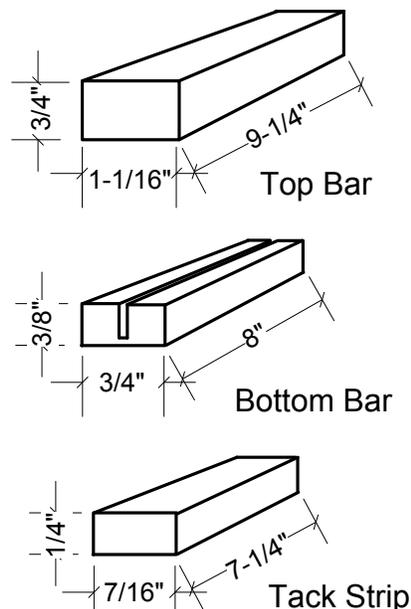
Transfer clips are used when moving the mini-frames to standard equipment (see photo below). The clips provide the support needed to hang the frames in the space that would otherwise be occupied by a standard frame. Sizes are provided for moving two mini-frames that would replace a single standard frame and for moving four mini-frames that would replace two standard frames that are side by side (Figure 17).

The single clip can be made from light aluminum stock (same material used when making a telescoping cover). The double clip needs to be a bit stronger so is best made from light steel strap.

When bending the clips, work from the inside out (see Figure 17 for the sequence). Use a hand seamer or a vise to hold the material when making the bends.

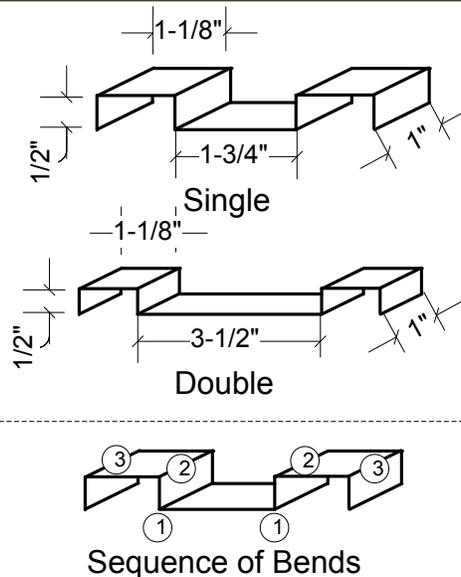


16



The three components of a min-nuc frame that need to be modified (length is shortened) from the plans for the standard frame.

17



Sizes for single wide (top) and double wide (middle) transfer clips. The clips are used when moving mini-frames to standard size equipment. The clips are made out of light metal (such as aluminum or thin steel bar stock). Use the sequence of bends (bottom) when making the clips.

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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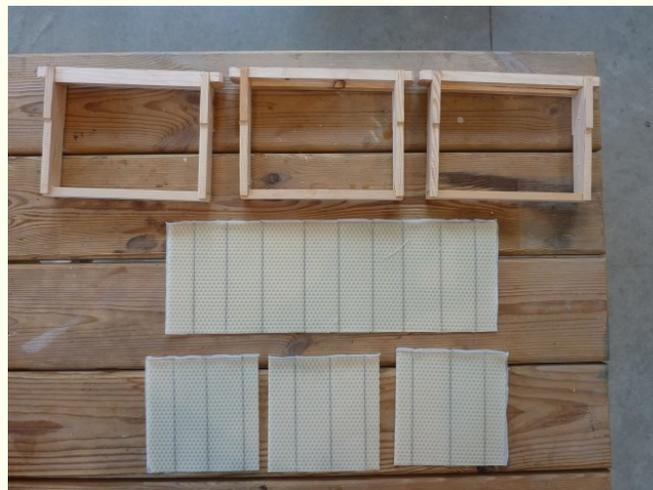
### Construction Details: The Mini-Nuc Frames (cont’d)

#### Step 3. Mounting the Foundation

We recommend standard wired wax foundation for the mini-frames. A single 16-3/4” wide sheet is cut vertically into three equal sizes (see photo, top right). When installed in the mini-frames, there will be a gap between the sides of the foundation and the side bars of the mini-frame (see photo, middle right). It is our experience that the bees will fill in this space when the foundation is drawn out.

Regular foundation pins will not work to hold the foundation because of this gap. A good substitute can be had by using bobby pins, which are inexpensive and readily available (see photo, middle right).

The mini-frames should be constructed as “wedge” style frames for mounting wax foundation. The cut sheet of foundation is slipped into the grooved bottom bar; the protruding wire of the foundation is placed against the top bar. The tack strip is then installed holding the top of the foundation firmly in place (see photo, bottom right). All of this is basically the same as installing standard size wax foundation in standard size frames.



# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

©by Stephen E. Tilmann and Mike Risk

### Construction Details: The Mini-Nuc Inner Cover<sup>(4)</sup>

#### Introduction

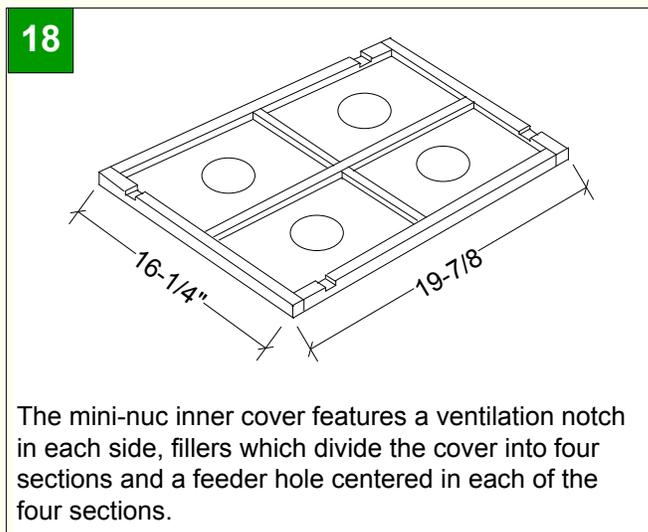
The inner hive cover for the mini-nuc has all of the features of a standard hive cover, plus three additional elements (Figure 18 and photo at right). A ventilation notch is provided in the outer frame for all four chambers. A circular feeder hole is centered in each of the four sections. The hole is sized to accept the punched feeder caps used for Boardman style entrance feeders. And, finally, fillers divide the bottom of the inner cover into four sections and provides a bee-tight fit against the partitions of the hive body.

#### Mini-Nuc Modifications

To construct the mini-nuc inner cover, follow all of the steps the standard 10-frame inner cover except skip step 6 (cut the vent opening). Prior to assembly, cut the dados on the bottom of the frame. The dados will provide top ventilation for each mini-nuc chamber. We like to position the ventilation dados above the hive body entrance holes, which implies that there will be a ventilation dado cut on each of the four frame members (see photo, at right).

You might also find it easier to cut the four feeding holes before assembling the inner cover. A template is provided in Appendix 1 of these plans to help with this task. The diameter of the holes is important; it should be large enough to hold the standard 70mm punched lids of the feeder jar but not too large such that the lids will go through.

The fillers that divide inner cover into four sections are installed after the inner cover is assembled. These fillers serve the same function as the interior dividers found in the mini-nuc screened bottom board. The fillers are flush with the frame and provide a bee-tight fit for the top of the four chambered mini-nuc hive body.



The mini-nuc inner cover features a ventilation notch in each side, fillers which divide the cover into four sections and a feeder hole centered in each of the four sections.

(4) Plans for a standard hive body can be found in “Building a Bee Hive: The Inner Hive Cover”.

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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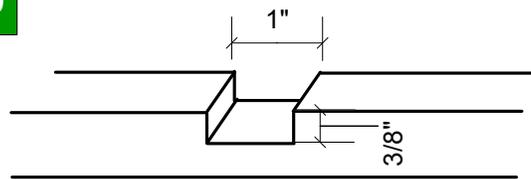
### Construction Details: The Mini-Nuc Inner Cover (con’td)

#### Step 1. Cut Ventilation Notches

Top ventilation for each mini-nuc chamber is important and is provided by cutting a 1” wide by 3/8” deep dado in the lower side of each inner cover frame member (Figure 19). The location of these dados is not particularly important, though we like to cut the dado above the entrance holes of each chamber. This keeps the coming and going of the bees for each chamber all on the same side.

It is easiest to cut these dados in the frames before assembling the inner cover (which is Step 4 in the standard inner cover plans). Be sure to cut these dados on the bottom of what will eventually be the assembled mini-nuc inner cover.

19



The ventilation notch is a dado 1” wide and 3/8” deep. There is one ventilation notch on each side of the mini-nuc inner cover.

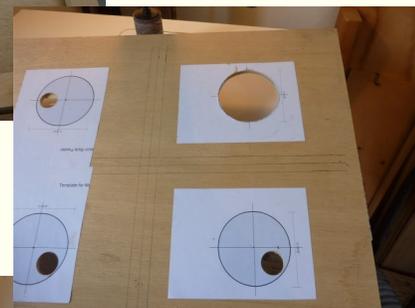
#### Step 2. Cut Feeder Holes

Feeding the mini-nucs will definitely be required and we provide for that by a cutting feeding hole centered in each of the four sections of the inner cover. The hole is 2-13/16” (70mm) in diameter and accepts a quart jar with a perforated lid. These are the same jars that are used in Boardman style entrance feeders.

A template is provided in Appendix 1 that can be used for cutting the feeder holes (photo, top right). Print the template page (at 100%) then cut the template on the dotted line provided into four pieces. Use a spray adhesive and stick the template to the inner cover centered over each of the four inner cover sections (photo, second from top). The center of each template hole will be about 3-1/8” from the side and 4” from the end of each of the four quadrants.

For each of the templates, drill a starter hole somewhere near the inner edge of the circle large enough for your jig saw blade (the three templates shown in photo, second from top). Then cut out the circle staying just inside the template’s circle outer line (the top right template shown in photo, second from top). At this point, the hole should be slightly smaller than the perforated lid (check it with a lid).

Then enlarge the hole by sanding. A drum sander attached to a drill press is easiest (photo, third from top). Continue to enlarge the opening until the perforated jar lid easily fits, but does not go through (photo, bottom right). Allow a small extra space for painting the inner cover (yes, the paint will tighten up the hole a noticeable amount)..



# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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### Construction Details: The Mini-Nuc Inner Cover (con’td)

#### Step 3. Install Fillers

Just as we installed fillers on the bottom board to prevent the bees from moving to adjacent chambers, we need to do the same thing for the mini-nuc inner cover. The inner cover fillers are made in the same way as those in the bottom board.

The length-wise filler is 16-7/8" long; the cross-wise filler is 13-1/4" long (Figure 20, top). The height depends on the thickness of the cover piece used for the inner cover. The plans call for a cover piece 1/4" thick, so the fillers will be 1/2" high. You will need to measure your assembled inner cover to get your exact measurement.

Then cut a dado exactly centered on each filler that is 1" wide and 1/4" deep (Figure 20, middle). Again, the depth may be different for you.

Assemble the fillers cross-wise (Figure 20, bottom). Glue and staple everything in place on the bottom of the inner cover (Figure 18).

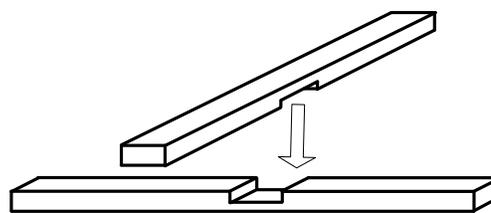
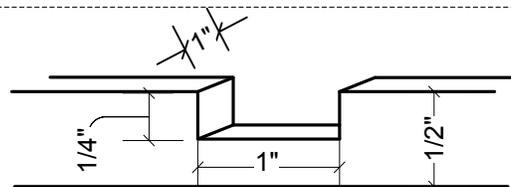
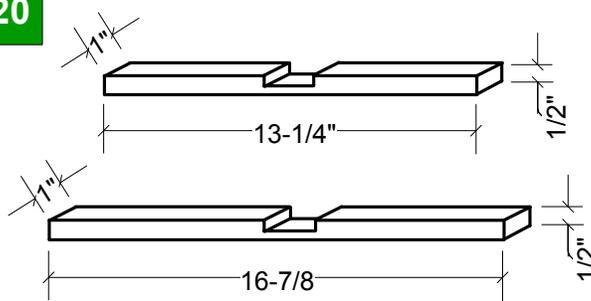
#### Step 4. Ventilation Notch Closure Clips

At some point, you will probably need to close a mini-nuc chamber to confine the bees. This may be the case, for example, when first introducing a queen. The gated openings on the bottom board and the entrance disc on the hive body deals with those openings. That leaves the ventilation notch we have made on the inner cover.

One option to close the ventilation notch is to make small “U” shaped clips out of a light material, such as aluminum roll stock (same material used to make the transfer clips) or #8 hardware cloth. These closure clips need not be fancy (Figure 21).

To make the clip, cut a piece of aluminum 1-1/4" wide and 2-3/4" long. Then make two bends 1 inch from each end.

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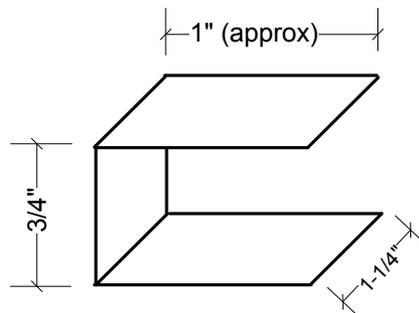


From a 1x4 cut a filler 16-7/8" long and a second filler 13-1/4" long (top). Both fillers are 1" wide.

In each of the cross pieces, cut a dado 3/8" deep and 1" wide (middle). Center the dado along the length.

Assemble the fillers by matching the dados (bottom). The tops of the fillers should be flush.

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A simple clip made from aluminum stock serves as a closure to the ventilation notches on the inner cover.

#### Revision History:

2/26/15: original version

6/22/15: correct dimension in Figure 4.

12/3/15: Page 16 - correct reference to Figure 17.

4/26/16: Page 12 - Step 2. Correct dimensions. Also Figure 11.

2/15/17: Page 10 - correct dimensional lines in Figure 8.

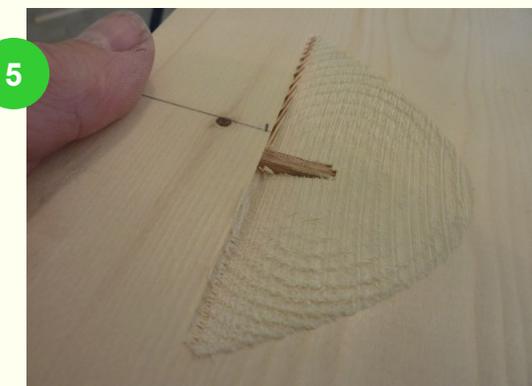
- correct dimension in Figure 11

# “In the Beekeeper’s Work Shop”

## Building a Mini-Mating Nuc

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### Photo Gallery...



#### Photo Captions:

1. Partially assembled bottom board for the mini-nuc.
2. Transferring a mini-frame to a standard hive.
3. A mini-nuc on the bench ready for the apiary.
4. Marked queen on mini-frame with honey, larvae and capped brood.
5. Hive body center partition extending into hand hold.
6. Mini-nuc with feeders installed.
7. Mini-frames transferred to standard hive body

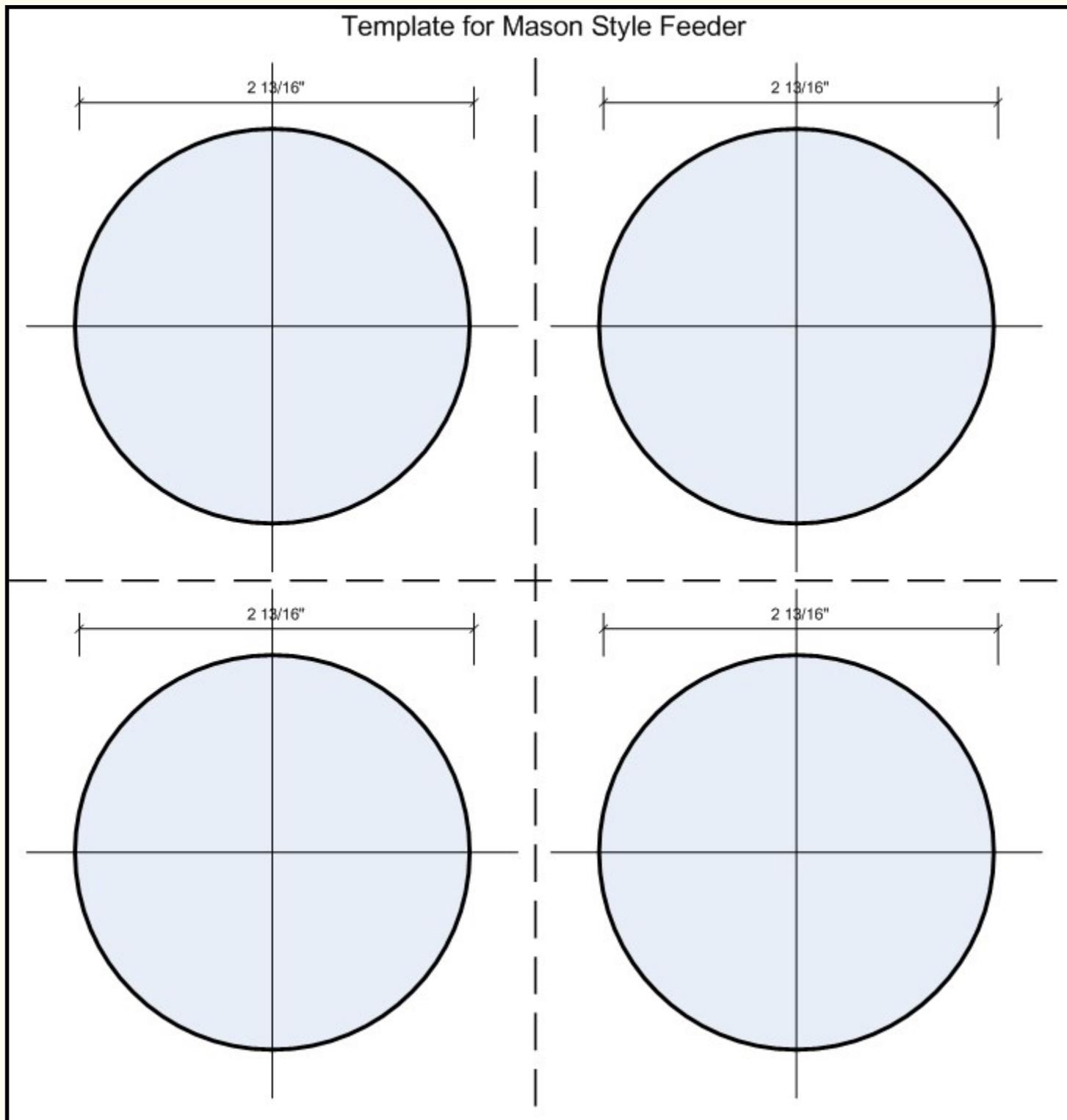


# "In the Beekeeper's Work Shop"

## Building a Mini-Mating Nuc

©by Stephen E. Tilmann and Mike Risk

### Appendix 1: Template for Cutting Feeder Holes In Inner Cover



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## *Building a Mini-Mating Nuc*

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### **Annotated References and Resources**

#### **Web Forums**

Topic: My plan on overwintering 200 queens on mini-frames. Original post: 11/12/2013 Last accessed: 2/13/15

<http://www.beesource.com/forums/showthread.php?290891-My-plan-on-overwintering-200-queens-on-mini-frames>

Topic: How I plan on overwintering 40 mating nucs on mini frames. Original post: 8/17/2013 Last accessed: 2/13/15

<http://www.beesource.com/forums/showthread.php?288103-How-I-plan-on-overwintering-40-mating-nucs-on-mini-frames>

Topic: Mini Mating Nuc. Original post: 11/02/213 Last accessed: 2/13/15

Comments: Discussion on setting up and management of mini nucs.

<http://www.beesource.com/forums/showthread.php?290656-Mini-Mating-Nuc&p=1016188#post1016188>

Topic: Did those northern nuc's overwinter? Original post: 04/11/2009 Last accessed: 2/13/15

Comments: A discussion on nucs in general surviving northern winters. Some discussion on mini-nuc survival.

<http://www.beesource.com/forums/showthread.php?227855-Did-those-northern-nuc-s-overwinter&highlight=mini+mating+nucs>

Topic: Volume of mini mating nucs Original post: 11/7/2007 Last accessed: 2/13/15

Comments: Discussion about the size of a mini-nucs, building of a mini-nuc and techniques of getting bees for the initial population.

<http://www.beesource.com/forums/showthread.php?214354-Volume-of-mini-mating-nucs&highlight=mini+mating+nucs>

Topic: Interesting way to combine 3 mating nuc's Original post: 10/5/2009 Last accessed: 2/13/15

Comments: Discussion about transferring mini-nucs to permanent hives, includes some management suggestions.

<http://www.beesource.com/forums/showthread.php?234562-interesting-way-to-combine-3-mating-nuc-s&highlight=mini+mating+nucs>

Topic: Over-wintered queens Original post 1/15/2001 Last accessed: 2/13/15

Comments: Discussion on keeping queens through the winter using mini-nucs.

<http://www.beesource.com/forums/showthread.php?249694-Over-wintered-Queens&highlight=mini+mating+nucs>

#### **Videos**

Topic: Mini nuc cell builder and finisher. Author: unknown. Length: 0:43 Last accessed: 2/13/15

Comments: Short video showing a mini-nuc being used as a starter colony for queen grafting

[http://s59.photobucket.com/user/vlwbee/media/20130818\\_112034.mp4.html](http://s59.photobucket.com/user/vlwbee/media/20130818_112034.mp4.html)

#### ***In the Beekeeper’s Workshop videos...***

Building a Hive Stand. [www.youtube.com/watch?v=oytJbpV8vwo](http://www.youtube.com/watch?v=oytJbpV8vwo) Length: 16:49

Building a Screened Bottom Board: [www.youtube.com/watch?v=DID8EywJes](http://www.youtube.com/watch?v=DID8EywJes) Length: 23:09

Building Hive Bodies. [www.youtube.com/watch?v=vV-7kmLwQ00](http://www.youtube.com/watch?v=vV-7kmLwQ00) Length: 21:41

Building an Inner Cover. [www.youtube.com/watch?v=rvH8u1yKTnY](http://www.youtube.com/watch?v=rvH8u1yKTnY) Length: 17:44

Making Hive Body Handholds. [www.youtube.com/watch?v=nyxfRMMD7SU](http://www.youtube.com/watch?v=nyxfRMMD7SU) Length: 14:59

Building Frames - Part 1. [www.youtube.com/watch?v=r8Zx4uRQx9k](http://www.youtube.com/watch?v=r8Zx4uRQx9k) Length: 20:47

Building Frames - Part 2 [www.youtube.com/watch?v=6ZoB6c-kuuc](http://www.youtube.com/watch?v=6ZoB6c-kuuc) Length: 17:51

Plans for these and other workshop projects available at: [www.michiganbees.org/beekeeping/in-the-beekeepers-workshop/](http://www.michiganbees.org/beekeeping/in-the-beekeepers-workshop/)