HOW TO BUILD A TOP BAR HIVE

by P J Chandler

Supplement to ***The Barefoot Beekeeper***

available from www.biobees.com

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Author's note

The instructions contained herein are offered in good faith, on the understanding that anyone undertaking this or any other similar construction project is entirely responsible for ensuring that they follow appropriate safety procedures when handling sharp blades and especially powered tools, and that the author or publisher is in no way responsible for any damage, however caused, that may result from any person following or attempting to follow these instructions.
In other words – use common sense, make sure you are capable of using any tools you choose to use, and don't blame me if you hit your thumb with a nail or amputate a finger or two on a circular saw.

Dimensions

The author still thinks in feet and inches, despite all attempts to modernize him, so that is mostly what you will find used here. As a concession to people who insist on using metric measurements (a wholly artificial system, based on an erroneous calculation of the circumference of the Earth), if you convert using 1 inch = 25mm or 1 foot = 30cm you will be close enough. Anyone pedantic enough to convert using several decimal places will get the result they deserve.

INTRODUCTION

My woodworking skills are little more than basic and I have written these instructions with fellow amateurs in mind. I doubt if I could follow a 'proper' woodwork plan myself, so this is a combination of written instructions and photographs, which I hope will prove easy to understand. I suggest you scan through the following pages more than once before starting work.

Details of how to set up and manage the hive are to be found in ***The Barefoot Beekeeper***, available from the author's web site at **www.biobees.com**

MATERIALS

Traditionally, beehives are made from Western Red Cedar, which weathers pretty well without treatment. However, it is not easy to find and it is often quite expensive when you do, so Douglas Fir or any straight-grained, well-seasoned pine will do the job. It can be weather-proofed with a 20:1 mix of linseed oil + beeswax[1]

You will need a quantity of timber, about 1" thick and 12" wide (25mm x 300mm). If you cannot find 12" wide boards locally, you can glue up 6" boards, which is how I have done it in the photographs that follow. If you cannot get 1" wood, 3/4" will do, but thicker wood gives better insulation and lasts longer..

For a 36" hive, you will need three lengths of 12" x 36", with one cut into two 18" x 12" pieces for the ends. The floorboard (if you use one: I have illustrated a mesh floor) is 36" x 6" and the legs are the same, cut lengthwise to 3" wide. You will also need a board 11" x at least 25" for the follower boards, and for the top

1 1 oz of beeswax to 20 fl oz raw linseed oil, or 20ml per litre, melted together and well stirred. Apply while still warm.

bars, 30 feet of 1 1/4" x 3/4" straight timber (bars can be 32-35mm x 21-25mm). It is no bad thing if the bars are planed on the top and sides, but left rough on the face that the bees will build on.

For a 48" hive (recommended for more productive areas and vigorous bees), you obviously need an extra foot on each side and the floor, plus enough for another 8 or so top bars. If you plan on using plywood for the roof, which usually comes in 4' widths (even after metrication), it makes sense to make your sides 44" long, so when you add the ends you will still have a 1" overhang each end to help keep rain out of the exposed end-grain of the leg tops.

Of course, you can build a hive any length you choose, but these dimensions work well – certainly in temperate zones - and are convenient for both beekeepers and bees.

For the hive body, you will also need a dozen 2 1/2" (60mm) brass or stainless steel wood screws, eight 2" (50mm) stainless or galvanized bolts with nuts and washers and for a mesh floor (recommended in all but the coldest climates) a length (or several pieces) of plastic, galvanized or stainless mesh with about 8-10 holes to the inch and a handful of flat-headed pins to fix it with.

What size hive to build?

If you are a first-time beekeeper and currently have no ambitions to keep more than one or two hives, I suggest you start with a 36" long box. If you have some experience with conventional hives and want to start nucs and run four or five or more colonies, or if your area is known to be a good place to keep bees, then go for the more capacious 48" model.

See the end of this ebook for a detailed materials list.

You will need a flat bench somewhat longer and wider than the hive you are building, along with some basic tools: carpenter's saw; plane; screwdriver; drill; square; cramps. A hand-held or bench-mounted circular saw and a power drill are handy if you have them, but not essential.

Use a strong, waterproof, external grade glue for all permanent joints. You don't need to go as far as epoxy resin glues, but if in doubt, ask in your local hardware shop for advice.

Both long and short hives are built in exactly the same way - inside out and upside down - starting with the follower boards.

The reason for this will become clear and hinges on the relative ease of making the sides fit the followers and the near impossibility – for the amateur woodworker – of making the followers fit retrospectively to the sides.

You don't need a fully-equipped workshop: a flat surface and basic tools are the essentials. You can build the hive using only hand tools – and a circular saw is a bonus, whether hand-held or table mounted.

I would suggest that you spend some time studying the sequence of photographs and get a feel for how the hive looks and how it works. Please send me a message from my web site if you feel that I have missed anything or you have suggestions for improvements.

Some alternative top bar comb guides

MAKING THE TOP BARS

The one critical dimension in this whole design is the width of the top bar, which is, according to people who have been doing this longer than I have, 1 1/4" to 1 3/8" or 32-35mm for most bees. If local knowledge or your own experience say otherwise, then follow that. Otherwise, I suggest you start with these dimensions, watch how the bees build their comb and make your next set of bars accordingly, bearing in mind that bees building natural comb tend to make slightly smaller cells on average than foundation-raised bees.

You will get more even and predictable results if you provide the bees with a straight comb-building guide of some kind. There are a number of ways to do this, perhaps the simplest being a saw kerf down the centre of the bottom face of the bar, made with a circular saw. This does not have to extend to the ends, but it may be easier to cut longer lengths like this. The groove should be about 1/8" deep and the width of your saw blade. Fill (or slightly over-fill) it with molten beeswax and allow to cool.

If you do not have access to a circular saw, you can pin thin strips of wood, about 9" long, centrally onto the bars, as in the second diagram. Rubbing the bottom edge with beeswax is generally thought to be a good idea.

For this particular design, the top bars are 17" long, which seems to be a convenient length for both bees and beekeeper. Make them about 3/4" thick.

(By the way – I have nothing against metric units - other than the fact that they are based on a mistake - but I tend to think in feet and inches, so that is what I am comfortable with, and that's what I still specify when ordering timber. Luckily, my local timber yard still understands imperial units.)

***A note for readers in the USA**: I understand that it is traditional among timber merchants over there to supply timber planed from the size you specify, so if you order 12 inch boards they will actually measure closer to 11 1/2" or even 11" when you get them. You may need to make some allowance for this. However, it doesn't matter to the bees if their hive is slightly smaller than shown here. Don't show them the plans, though, just in case.*

ASSEMBLY

The first step is to assemble your materials and cut and glue the boards to their final sizes. Make up the sides (if you are using two boards edge-to-edge) and ends as shown and while the glue is setting, make the all-important follower boards.

Glue and screw or pin a standard 17" top bar to the top edge of each follower board. Placing thin strips of wood underneath ensures that it is laterally centred. Clamp it up and leave to set. The extra bits of scrap wood prevent the boards 'springing' while clamped.

This 11" board, here made up from three pieces, will become the follower boards. 1/2" timber is adequate for this job: mark 15" across the top edge and halfway at 7 1/2". You can cut followers from 12" wide boards if available.

The follower boards are integral to this design, and give you much greater flexibility in managing your bees than just a plain box with an end entrance. See The Barefoot Beekeeper for full details – available from www.biobees.com

Draw a centre line to the bottom edge

Mark 2.5 inches either side of centre on the bottom edge

Join up the dots to make the trapezoidal shape of the follower boards

Extend the geometry to make an identical shape upside down, saving time and timber.

Glue, pin (or screw) a top bar centred on the top edge of each follower board. Cramp and leave to set overnight. The odd-shaped pieces are there to stabilize the boards while the glue sets.

A GEOMETRICAL FOOTNOTE

(only for the mathematically inclined)

You may have noticed that the trapezoidal shape of the follower boards comprises a rectangle, 5” wide by 11” tall, with a point-down, right-angled triangle on each side.

The height of each triangle is 11” and the base (or top) is 5”, so from Pythagorus we can calculate the hypoteneuse (long side) as:

$$\sqrt{h} = 11^2 + 5^2 = 121 + 25 = \sqrt{146} = 12.08$$

In other words, A tiny bit over 12” (or 300+mm).

This means that, if your measuring and your sawing are accurate, you will need to shave a little wood off the bottom of the follower board so that it is a snug fit to the inner edge of the sides. Don't do this until you have the sides in place and you can see just how good your drawing and sawing really are!

LEGS

You will need to let the glue set overnight before you move on to the main assembly, but if you have time in hand today, you may as well cut and drill the legs.

You need four legs (obviously), each about 3" x 2" (75 x 50mm) and a length to suit your height. For example, man of average height will need the top of the hive to be around 30-31" for comfortable working, so the legs will need to be about 32-33" long. If you are a wheelchair user, you may want the top of the hive to be about 24" from the ground, so make the legs 26". The rule of thumb: decide a working height for the top of the hive and add 2" to arrive at the length of the legs. They will be trimmed a little to accommodate the roof – see below.

You do not have to use legs – you could put these hives on various types of stand as used by conventional hives – but this is a cheap and convenient way of achieving a stable, level, relatively rodent-proof and probably more-or-less raccoon-proof hive at the right working height.

The legs will be bolted to the end pieces, using galvanized or stainless steel nuts and 2" bolts. I advise you to put washers under the head of the bolts and the nuts to prevent them cutting into the wood. Do not be tempted to use wood screws to attach the legs: disaster will inevitably follow and you will regret not spending the extra few pennies.

The lower ends of the legs can be left cut square for maximum stability on a grassed site, or cut level if you intend to keep your hives on hard standing.

Begin the main assembly by inverting the follower boards and squaring them up on your bench about 18"-24" apart. They should be parallel.

The hive is built upside down and inside out. The follower boards represent the 'inside' and now you are about to add the outer skin.

A small nail tapped into the top bar prevents the side panel from slipping off.

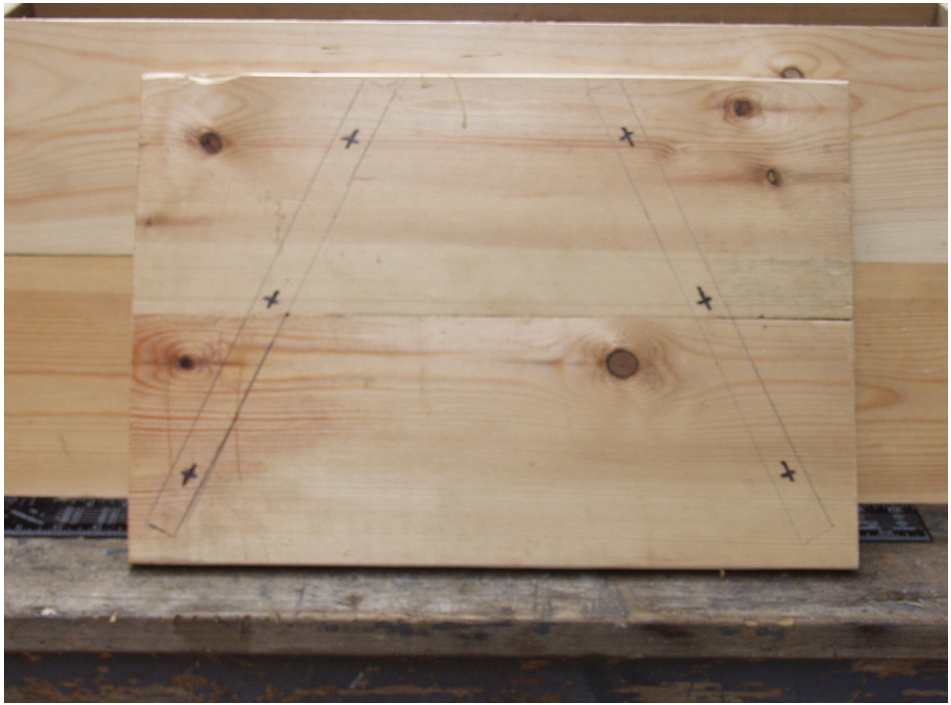
Position one of the side panels against the follower boards, resting on the top bars.

Place the other side in position and square up the structure, ready for the ends.

Position one of the end pieces centrally against one end. Its bottom edge rests on the bench, giving clearance for top bars. (The plane is not necessary - I used it as a prop as I was photographing single-handed)

Make a line where the end touches the sides, inside and out.

(A friendly ghost helped me with this one...)



Remove the end and mark three points each side for drilling clearance holes for screws. Actual positions are not as important as making them on the centre line and away from the ends.

Use a drill bit slightly bigger than the shank of the screw, which should be brass or stainless steel and at least 2 1/2" long. Drill both ends together, using the marked end as a pattern. (The nails are dropped into two drilled holes to ensure alignment.)

While you are drilling, you may as well make bolt holes in the legs and end pieces. Mark a point 5" in from the top corner of one of the ends and draw a line to the bottom corner, as shown. The outer edge of the leg will lie on this line. Drill the top hole at least 3" from the top edge, as the tops of the legs will soon be trimmed to accommodate the lid (see below). Ensure that the lower hole falls comfortably outside the line of the side wall.

The roof frame will rest on the tops of the legs, so they need to be trimmed parallel to the top edge. Lining up the holes you already drilled, mark a straight line across the width of one end, 2" from the top edge. Don't fit legs yet.

Plastic, galvanized or stainless steel mesh may be used to cover the base of the hive. This is heavy duty plastic garden mesh, which has the advantage of forming a flexible, convex curve inside the hive, enabling the follower boards to form a bee-proof and moth-proof seal. It must be cut carefully to fit the ends and held in place with flat-headed pins or tacks.

Glue and pin strips of thin wood inside at the ends, to ensure there are no gaps. Cut them to the shape of the lower ends of the follower boards.

Some people think a solid floor is a Good Thing, especially in colder climates. I no longer use them, but if you wish to add a length of 6" x 3/4" timber under your hive, it can be fixed in place using brass snap-locks or some other method of your own devising.

The bees will need an entrance! Drill three or more 1" (25mm) diameter holes, 2" from the floor, with one in the centre and the other two about 3" either side. Champagne corks or the type (shown here) for closing 1 gal. jars will allow you to regulate the openings.

Make another two entrances on the opposite side of the hive to the main entrances, about 4-5" from each end. This provides for making splits, nuclei and artificial swarming and is one of the unique features of this design.

This is what your hive should look like now. The follower boards are a good, sliding fit and the whole thing looks sturdy ad almost ready for bees!

You can see here how the roof frame is made - a simple, rectangular frame of 3" x 3/4" timber, glued and screwed at the corners. Be sure to leave about 1/4" slack in both directions to allow movement in the wood. Jamming roofs are a nuisance.

A simple roof using corrugated plastic, available from DIY stores. I think a gabled roof is better, though, as it allows space for top insulation.

Adding triangular gables makes a more elegant roof that will shed water quickly and be hard even for strong winds to lift, but easy for the beekeeper. You could use a number of materials here, including thatch, but make sure you keep it reasonably light.

A lapped cedar roof has a rustic appeal and is in many ways preferable to plastic.

Your last job is to coat the outer surface of the hive with something to keep the weather out. Creosote, Cuprinol and various paints and varnishes will be suggested by old beekeeping hands, but I prefer not to put anything onto or into the hive that I would not be willing to put on my skin, so I use a bee-friendly coating made as follows:

To 1 litre linseed oil (raw for preference) add 50 ml melted beeswax (use 1:20 ratio with whatever units suit you). Heat in a double boiler (*bain marie;* or one saucepan inside another – the larger one containing a couple of inches of water). Get it as hot as boiling water will allow and stir for 10 minutes. Allow to cool and while still on the hot side of warm, paint it on the outside of your hive, paying special attention to end grain, nail heads (underneath) and joints.

There is no need to coat the inside of the hive: the bees will do that for themselves with propolis.

Now you need some bees!

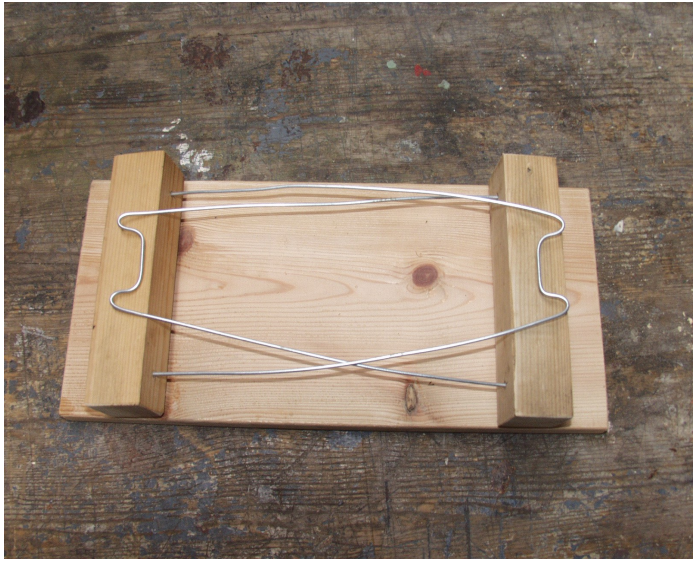
While you are waiting, join the Natural Beekeeping Network at www.naturalbeekeeping.org and say hello! You will find helpful people from all over the world willing to offer their experience and guidance. You may well find some in your area.

A TOP BAR STAND

This device is easy to build and a very useful 'third hand' for examining comb, especially when you need to do more than just look at it. I dreamed it up in bed one Sunday morning and built it before lunch out of odd bits and pieces lying around in my workshop. No doubt you can think of other ways of building such a gadget.

The base is the same width as a top bar – 17" - and about 6" wide. The wire is about the same guage used for coat hangers, bent to accommodate the width of a top bar. A slight inward 'spring' is an advantage, as this grips the comb and helps to keep the top bar in position.

Here is the top bar stand on the bench...



...and folded for transport

MATERIALS LIST

For a 4-foot hive (outside dimension), you will need:

Body panels: 12 in x 1 in sawn timber (Western Red Cedar for preference, but Douglas Fir is OK) - 2 x 44 in + 2 x 18 in
Followers: you can cut two followers from a 12 in x 3/4 in board, 25 in long
Legs: 3 in x 2 in pressure treated or creosoted timber, 4 lengths x 3 ft (a little more or less, depending on your chosen working height)
Roof frame: 3 in x 1 in straight-grained pine or cedar, 3 x 48 in + 2 x 20 in (add a couple of inches for safety and trim to finished size). The third long piece is to make a ridge along the top edge of the roof - you may also want to brace it to the sides at intervals, depending on what material you use to cover your roof.
Roof: simplest is external grade plywood, 1/2 in thick and 4 ft wide (the width will overhang the length of the hive if you cut your sides to 44 in, add two ends = 46 in, leaving a 1 in overhang each end).
Top bars: cut 25 of these to 17 in lengths from 3/4 in thick timber between 1 1/4 and 1 3/8 in wide.

REFINEMENTS AND ADDITIONS

If you are of an inventive turn of mind, you may already have thought of some improvements and extra bits for your hive. Don't let me stop you, but do bear in mind that the essence of 'barefoot beekeeping' is simplicity: resist the temptation to over-complicate.

Having said that, you might want to consider adding a 'landing board' for the bees, similar to those you may have seen on WBC hives. I suspect this idea originated with Victorian beekeepers, who were fond of designing hives that resembled Georgian buildings, sometimes even having Doric columns either side of the entrance, but some people like them, even if the bees couldn't care one way or the other. A landing board – say 6" wide by 2" deep and 3/4" thick – could be added just below the central entrance holes, using a thin piece of wood as a support.

Pollen collectors are a useful means of gathering surplus pollen, either for one's own use or for drying and storing for the bees in case of dearth. In my area (south west England) there is rarely any shortage of pollen in the spring when bees need it most, thanks to plentiful willow, hazel and dandelions, but in other areas this may not be the case. I am still working on a design for a simple pollen collector and this will appear on my web site when ready, as will other notes and developments.

Please keep an eye on www.biobees.com for updates.

Happy beekeeping!

Join us at www.naturalbeekeeping.org for free support

This ebook is published as a supplement to *The Barefoot Beekeeper*, which contains the philosophy and management techniques appropriate for this hive. You can download this and other information about sustainable beekeeping from **www.biobees.com**