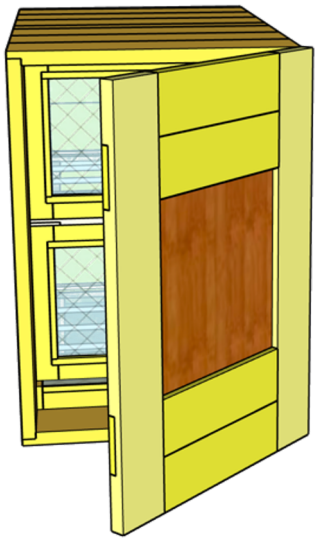
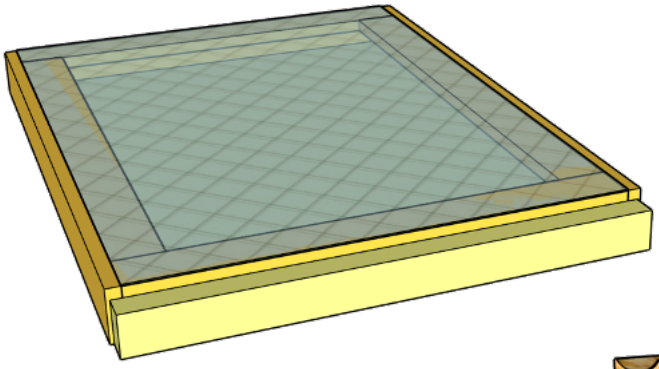
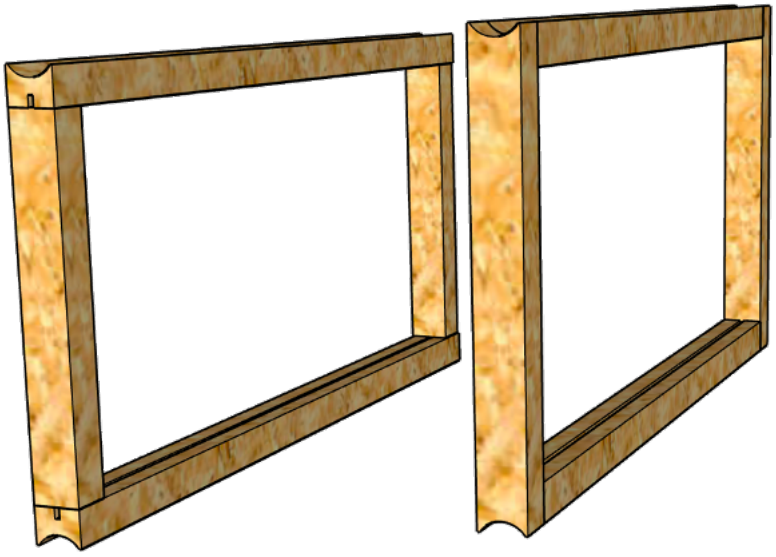
AZ-Hive

2-level







Preface

This document has been created with the best intentions to serve as a comprehensive guide for constructing an AZ beehive. As it stands, this is a theoretical outline, and some inaccuracies may exist. The ultimate goal is to manufacture all the parts described here and verify the measurements. To assist with this, I will also be producing a YouTube series documenting the build process and providing additional instructions for constructing this type of beehive.

Structure of the Document

The document is divided into two main sections:

1. **Common Parts**: Descriptions of components that are universal to all types of AZ beehives.
2. **Hive-Specific Parts**: Details and instructions unique to specific hive variations.

This structure aims to simplify navigation and make it easier to locate relevant information for your specific project.

Supporting This Project

If you find these plans useful and wish to support the effort, you are welcome to contribute a small amount via PayPal to **thomas.arnesen@tega.se**. However, please note that this document is entirely free to use, and contributions are not required.

Sharing and Updates

As the document is expected to evolve over time, please use and share the link to the original document to ensure you are accessing the latest version.

Updates

Date	What	
2024-12-29	A mixup of measurements for the size of the bars of the frames.	Thanks to M Walters

AZ Hive

Introduction

This document aims to help anyone build an AZ Hive in a home workshop. While advanced tools like a table saw and a planer/moulder can simplify the process, they are not mandatory. Precision is key—small errors early on can become significant issues later.

The AZ Hive is designed for easy management and maintenance, making it ideal for beginner beekeepers. Its design minimizes disturbance to the bees, promoting healthier and more productive colonies. The hive is meant to be placed in a bee house, helping regulate temperature and allowing inspections in almost any weather. There's no need for heavy lifting once the hive is installed, and if housed in a bee house, you only need to paint the front.

This guide walks you through building an AZ Hive using basic woodworking tools and materials. While Langstroth frame dimensions are used here for compatibility with common equipment like honey extractors, the hive can be adapted to other frame sizes.

Safety Precautions

Working with woodworking tools can be dangerous. Prioritize safety by following these precautions:

1. **Wear Protective Gear**: Use safety goggles, a dust mask, and gloves that fit properly to avoid injuries.
2. **Keep Your Workspace Clean**: An organized, clutter-free workspace reduces risks.
3. **Use Tools Correctly**: Read tool manuals and avoid bypassing safety features.
4. **Maintain Tools**: Keep tools sharp and well-maintained.
5. **Ensure Electrical Safety**: Use grounded outlets and check for frayed cords.
6. **Ventilate Properly**: Work in a well-ventilated area to avoid inhaling dust or fumes.
7. **Secure Your Workpiece**: Use clamps or vices to hold materials firmly.
8. **Take Breaks**: Rest regularly to stay alert.
9. **Keep a First Aid Kit Handy**: Be prepared for minor injuries.
10. **Stay Focused**: Avoid distractions and impaired work conditions.

Materials Needed

- Lumber
- Nails and screws
- Queen excluder net
- Net for inner doors
- Wood glue
- Hinges
- 8 mm metal rods
- Frame spacers

What We Will Build

- Four types of AZ Hives
- Queen excluder
- Level dividers
- Inner and outer doors
- AZ frames (Langstroth dimensions)
- AZ frames (400 mm high)
- Varroa bottom

Tools Needed

MINIMUM:

- Saw
- Router
- Drill
- Metal saw
- Hammer
- Speed square
- Screwdriver
- Measuring tape
- Sandpaper

GOOD TO HAVE:

- **Miter Saw**: For faster and more precise cuts.
- **Planer**: To avoid needing pre-planed lumber.
- **Jointer**: For perfect 90-degree joints.
- **Drill Press**: For precise drilling.

LUXURY:

- **2 or 4-Sided Moulder**: Invaluable for bee frame rabbets and dimensioning boards. However, it's unnecessary if only used for this project.

Frames

In this description, I adapt the frames to Langstroth size.

Why Adapt to Langstroth?

The reason is simple: many beekeepers already own equipment designed for Langstroth frames, so it makes sense to use the same dimensions. If you prefer a different frame size, you can adjust the measurements to fit your preferred frame size, as long as you adapt the AZ Hive dimensions accordingly.

Materials and Precision

To create the frames, I use planed lumber. This ensures precise measurements and gives a cleaner finish. However, using planed lumber is not strictly necessary if you have other tools to achieve accurate dimensions.

AZ Frame Dimensions and Assembly

An AZ frame has the following outer dimensions: **448 mm long** and **232 mm high**. You can choose between different assembly methods for the frames. I prefer the method shown on the left in **Figure 1**, as it simplifies the manufacturing of profiled boards.

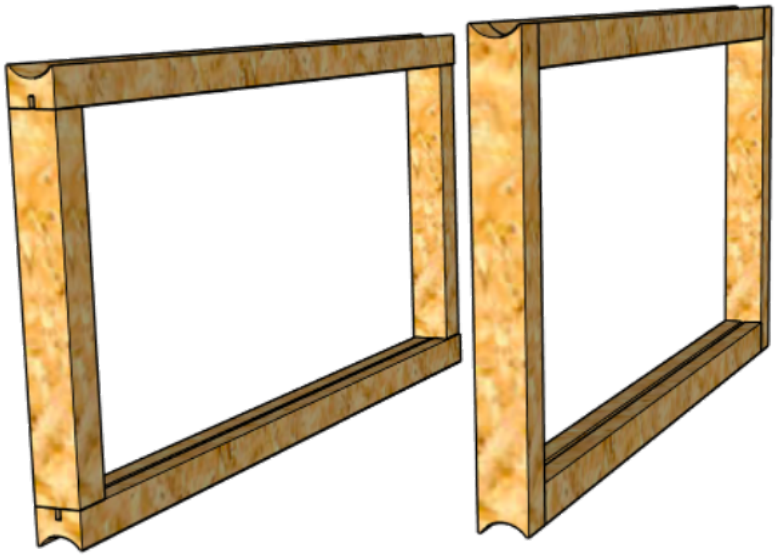


FIGURE 1

TOP AND BOTTOM BARS

- **Left Assembly**: For the assembly method on the left, the top and bottom bars should be:
    - **448 mm long**
    - **20 mm high**
    - **25 mm wide**
- **Right Assembly**: For the assembly method on the right, the top and bottom bars should be:
    - **408 mm long**
    - **20 mm high**
    - **25 mm wide**

The groove for the wax foundation is **3 mm wide** and **6 mm deep**. This groove can be made using a table saw, for example. The U-shaped groove on the top and bottom can be created

with a router. While I use a multi-headed planer to shape the top and bottom bars before cutting them to length with a miter saw, this method may not be accessible to everyone.

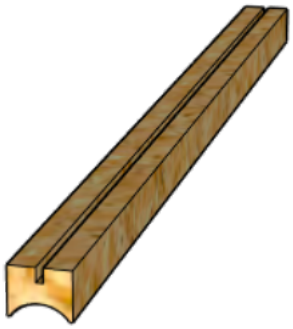


Figure 2

SIDE BARS

The side bars should always be:

- **25 mm wide**
- **20 mm thick**

Short Side Bars

If you mount the top bar **on the end** of the side bars, the side bars should be:

- **192 mm long**

Se **Figure 2.**

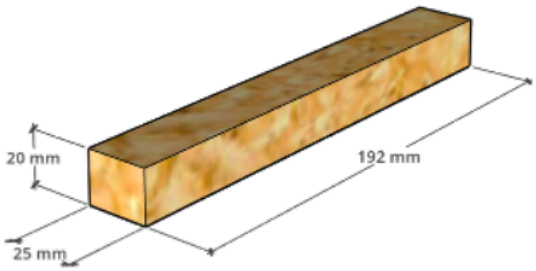


Figure 3

Long Side Bars

If you mount the top bar **on the side** of the side bars, the side bars should be:

- **232 mm long**

Se **Figure 3.**

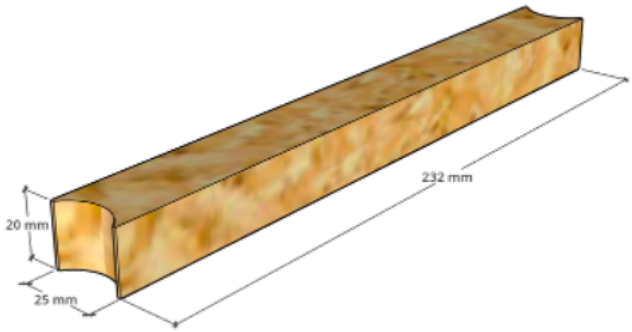


Figure 4

For the long side bar assembly, I recommend planing a board down to **25 mm**, cutting it to the appropriate length, creating the groove on the end with a router, and then cutting the boards into **20 mm wide** pieces.

Internal Separators

Queen Excluder

The queen excluder is a crucial component of the hive, as it prevents the queen from accessing specific areas while allowing worker bees to move freely. This is essential for managing brood and honey storage. For your hive, you will need both **queen excluders** and **bee space dividers**.

CHOOSING THE MATERIAL

Queen excluders are available in metal, plastic, or wood. While plastic and wood are cheaper, I prefer **metal excluders** due to their durability and the belief that they are better for the bees. This guide is tailored for metal queen excluders.

Building the Frame

To create the frame for the queen excluder, you will need the following boards:

- **2 pieces**: 10 mm x 45 mm x 372 mm
- **2 pieces**: 10 mm x 45 mm x 485 mm

*(See **Figure 5** for board dimensions.)*

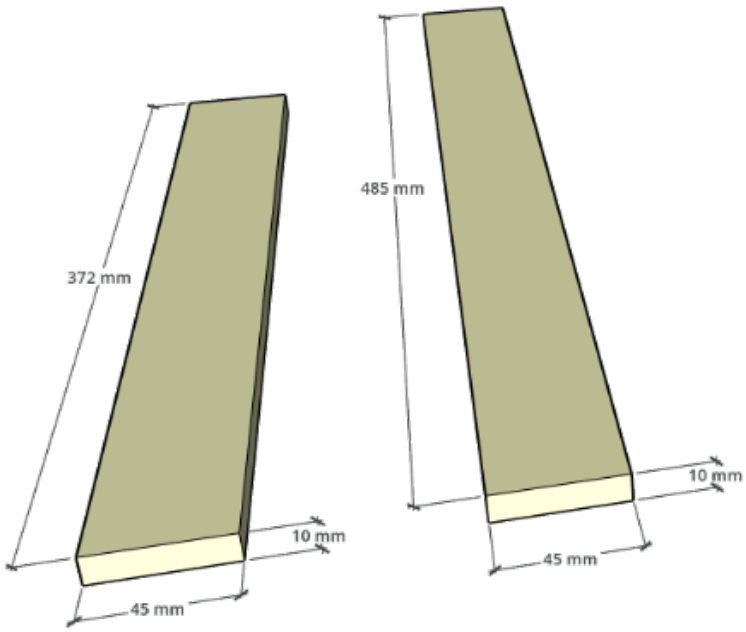


Figure 5

PREPARING THE BOARDS

At both ends of the boards, create a rabbet that is **5 mm deep** and **45 mm wide** using a router.

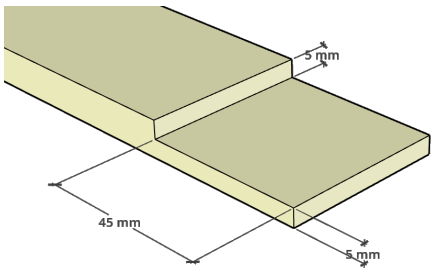


Figure 6

Create a groove along the inside, 10mm deep and 3mm wide to place the queen exclude

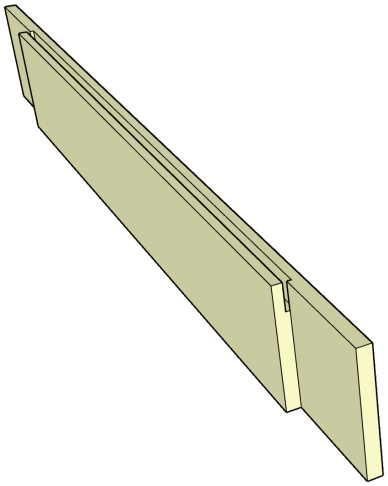


Figure 7

gitter.

ASSEMBLING THE FRAME

1. Glue the boards together to form the frame. Ensure that the rabbets align properly.
2. Fit a metal queen excluder into the assembled frame. You will need one queen excluder per hive.

Figure 8

*(See **Figure 8** for the assembled frame with the queen excluder.)*

Bee Space Divider

Purpose

The bee space divider is essential for maintaining the correct bee space between levels that do not have a queen excluder. It also provides a resting place for the inner door, preventing the bee space from becoming too large.

*(See **Figure 9** for an illustration of the bee space divider.)*

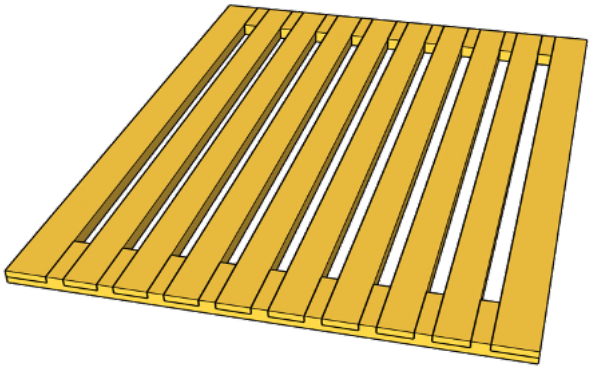


Figure 9

Materials

You will need the following components to construct the divider:

1. **Left and Right Long Boards** (2 pieces)

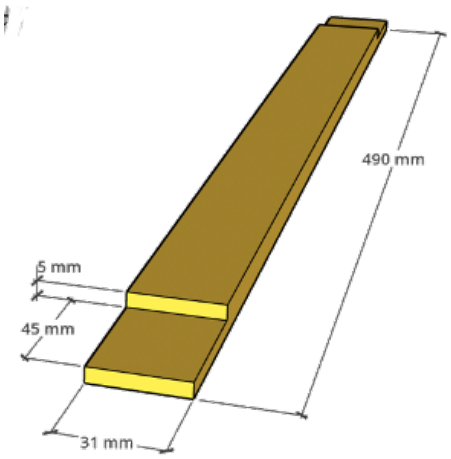


Figure 10

- These boards form the outer edges of the divider.

2. **Inner Long Boards** (8 pieces)

   - These boards are placed parallel to one another between the left and right long

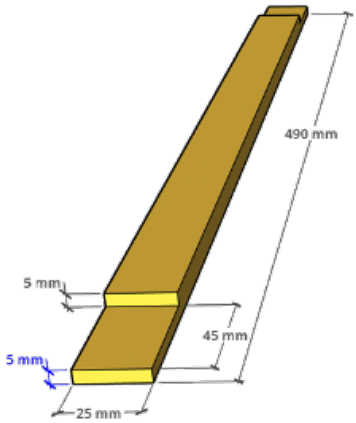


Figure 11

   boards.

3. **End Boards** (2 pieces)

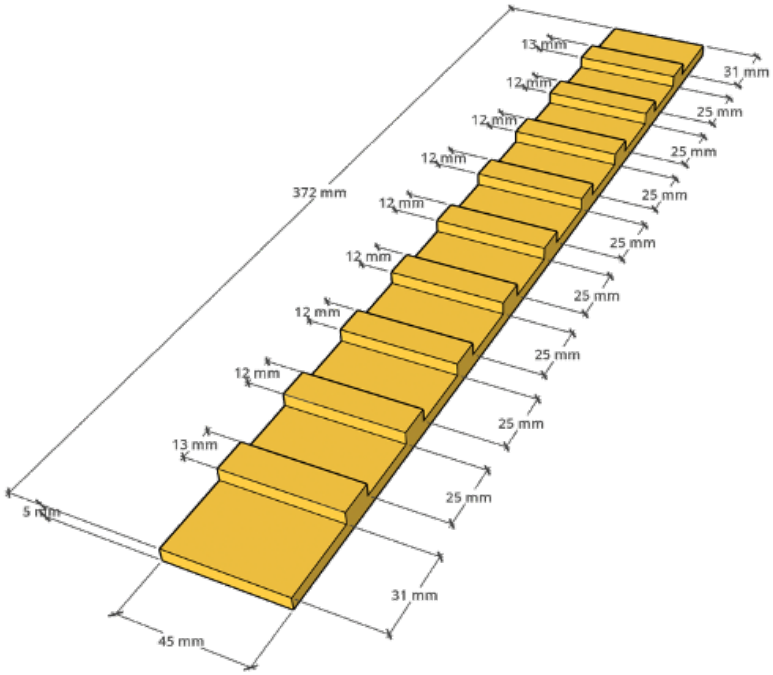


Figure 12

- These hold the entire structure together at both ends.

Assembly Instructions

PREPARING THE BOARDS

- Create slots in the long and end boards to hold the inner boards.
- Slots can be made using a router or a table saw equipped with a dado stack.
- **Safety Note**: These boards are thin, so exercise caution to avoid accidental contact with rotating tools.

ASSEMBLING THE DIVIDER

1. Apply wood glue to the slots in the left and right long boards.
2. Insert the inner boards into the slots, ensuring they are evenly spaced.
3. Attach the end boards to secure the structure.

4. Allow the glue to dry completely before using the divider.

Figure 13

Bottom inner floor

Varroa floor

Varroa, specifically *Varroa destructor*, is a parasitic mite that primarily affects honeybees (*Apis mellifera*). This tiny arachnid is a major threat to bee populations worldwide and is often referred to as the Varroa mite. The varroa floor is designed to help monitor and manage mite infestations by providing a way to observe the mite population within the hive, allowing timely treatment when necessary. To build the varroa floor, you will need the following components:

- Start by creating a planed sideboard that is 490 mm long, 38 mm wide, and 20 mm thick.

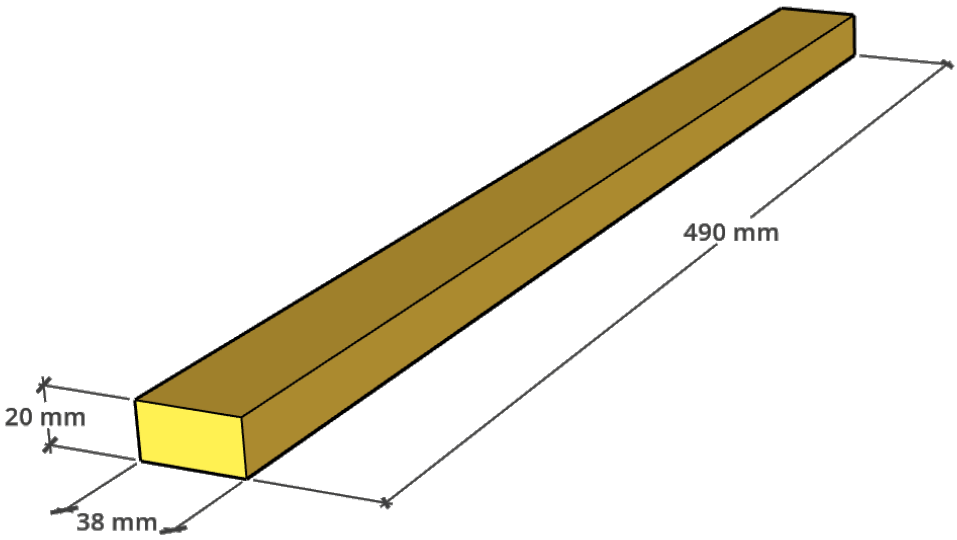


Figure 14 planed sideboard

- Make a 20 mm wide and 10 mm deep rabbet at one end of the sideboard.

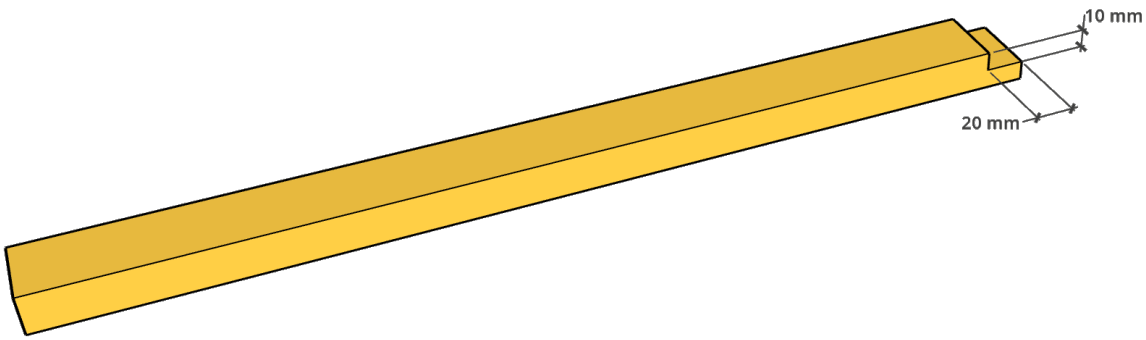


Figure 15 Side board with end rabbet

- On each side of the board, create 10 mm deep rabbets. One rabbet should be 10 mm wide and the other 12 mm wide. Note that these rabbets should be mirrored on on the left and right board.

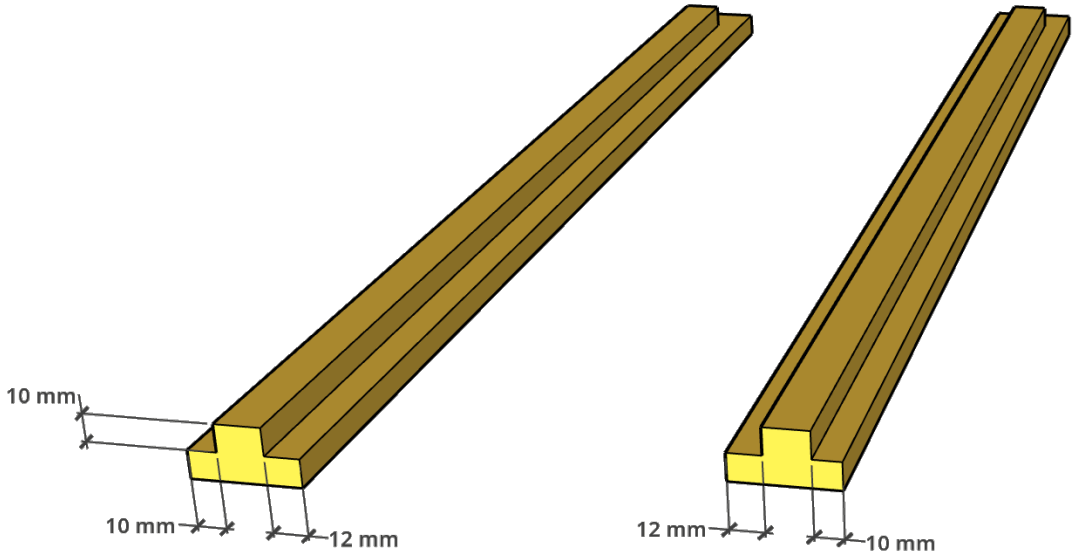


Figure 16 Side boards with rabbets for top and bottom boards

- Create a backend board that is 350 mm long, 28 mm wide, and 20 mm high.

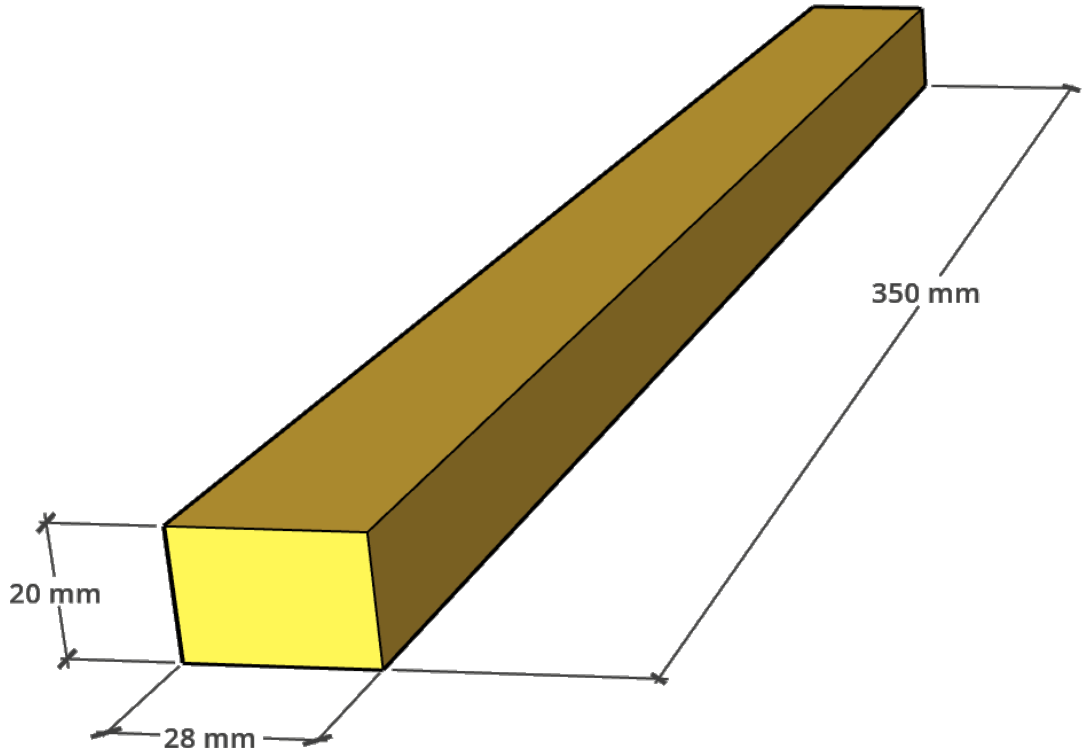


Figure 17 End board

- Prepare a short top board that is 350 mm long, 35 mm wide, and 10 mm high to help hold the varroa mesh.

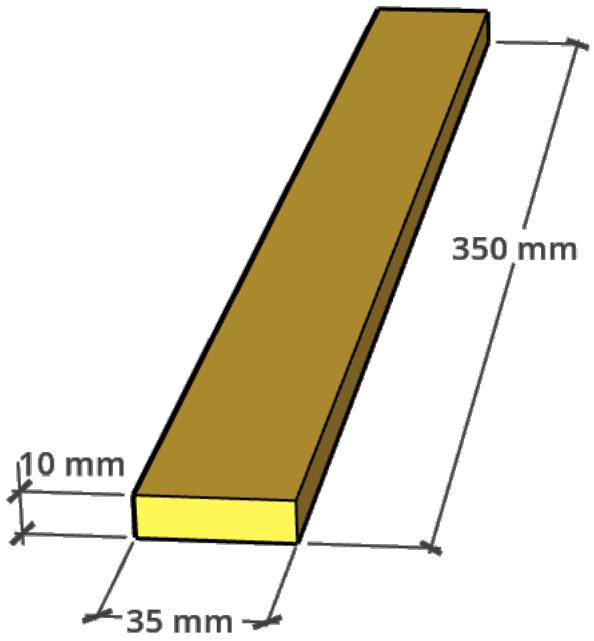


Figure 18 Short top board

- Prepare a long top board that is 420 mm long, 35 mm wide, and 10 mm high to hold the varroa mesh.

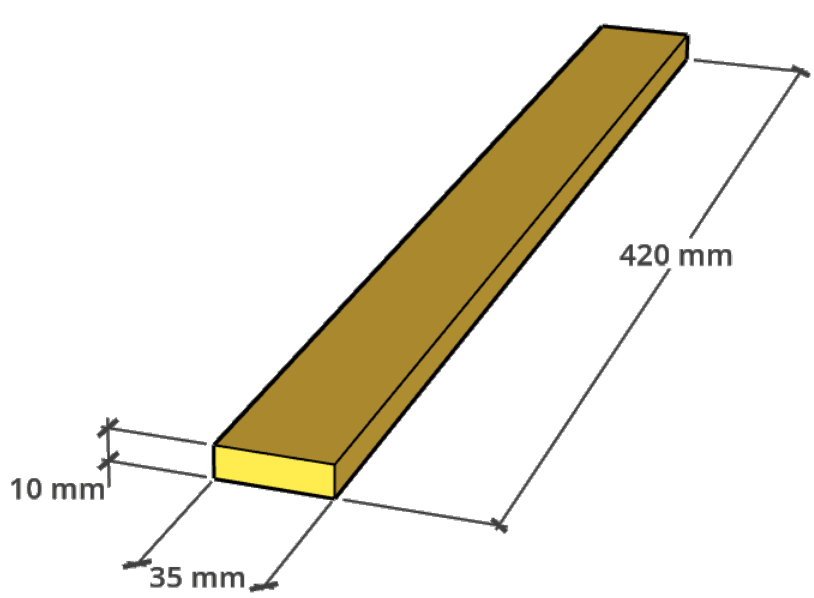


Figure 19 Long top board

- Purchase a mesh for the varroa board, with a mesh size of 3-4 mm. Cut it to approximately 390 mm x 530 mm.

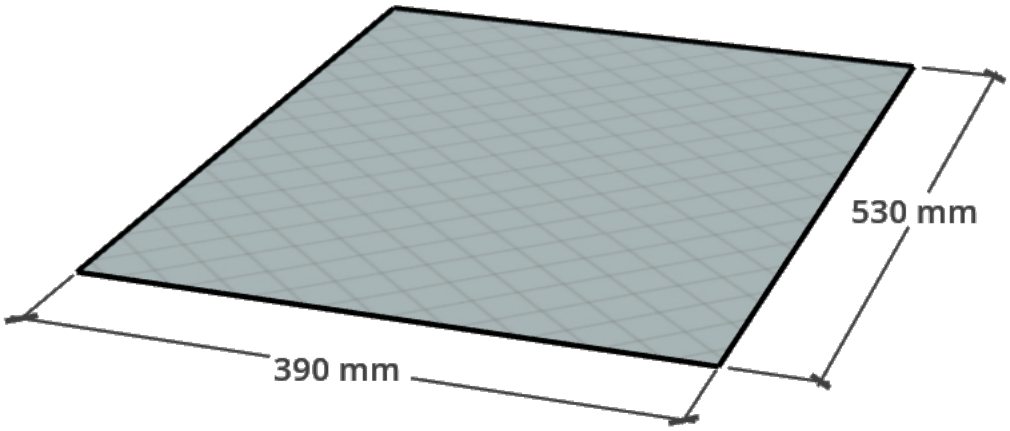


Figure 20 Mesh

- Glue and nail the backend board to the sideboards with the 12 mm rabbet positioned at the bottom.

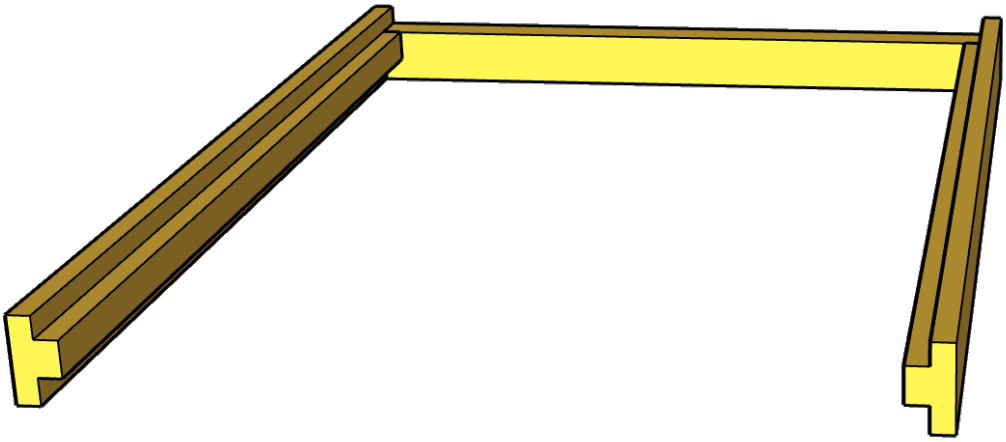


Figure 21 First assembly, sides and backend

- Dry fit the top boards without fastening them, as you will need to add the mesh first.

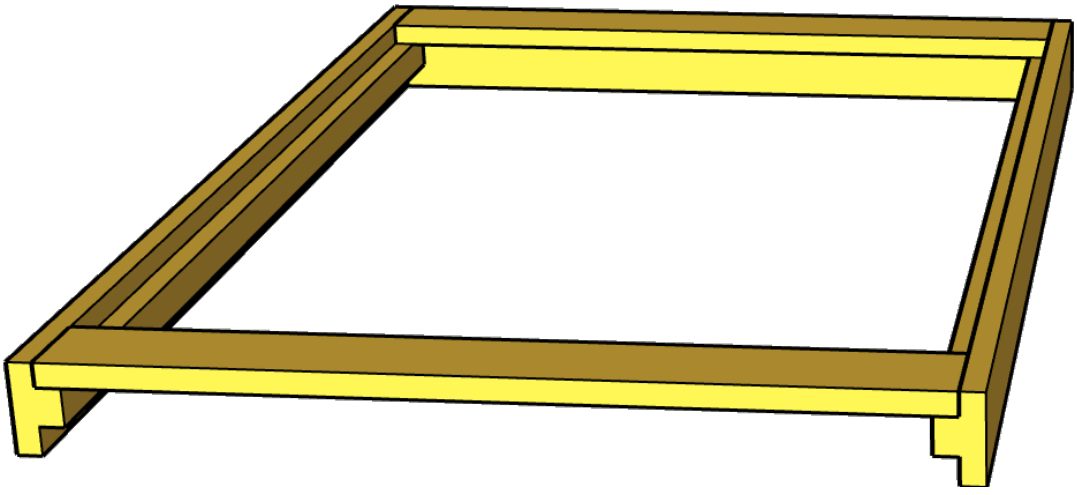


Figure 22 Dry fit the short top boards

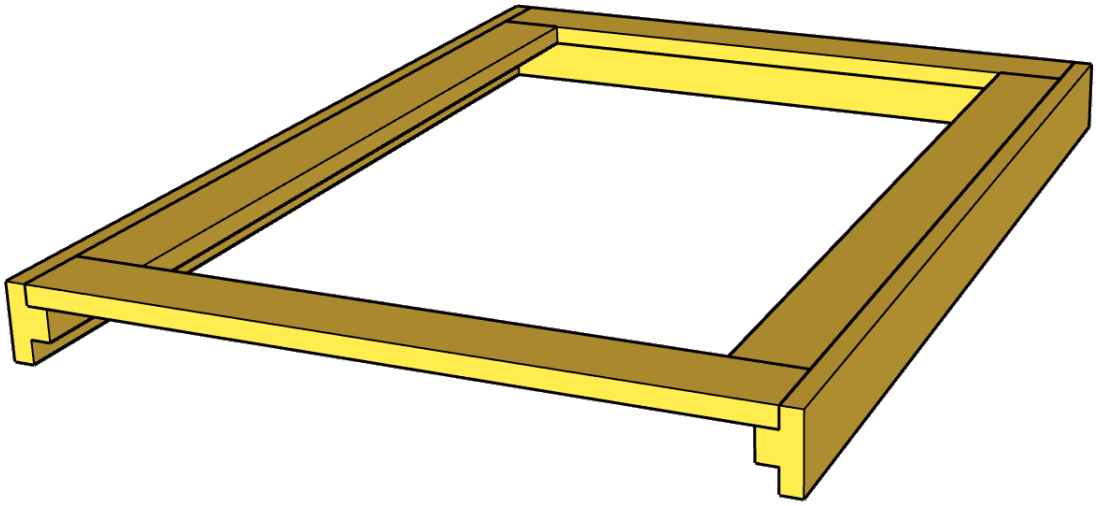


Figure 23 Dry fit the long top boards

- Attach the mesh with a 20 mm overlap around the top boards.
  Start by gluing and nailing one side to provide stability for the mesh.

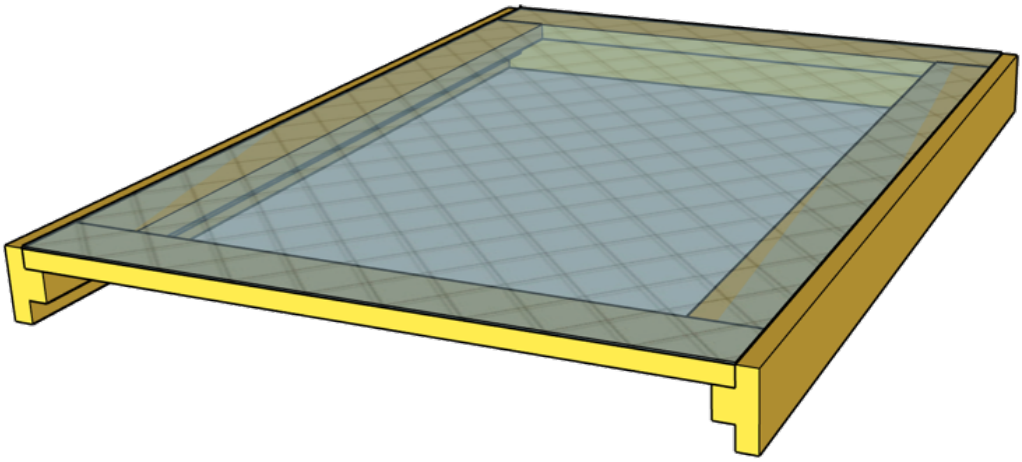


Figure 24 Varroa bottom with mesh

- Create the bottom board using 10 mm plywood.

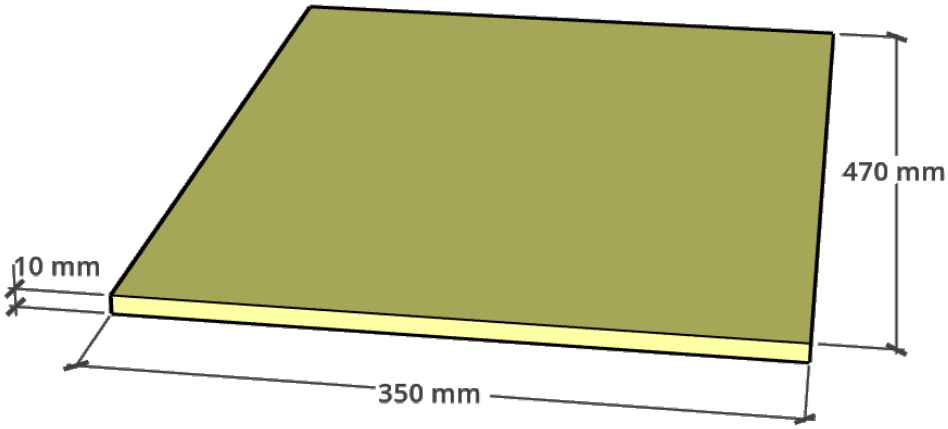


Figure 25 Bottom board

- Make a handle for the bottom board. If you prefer, you can add a groove to the handle for a better grip.

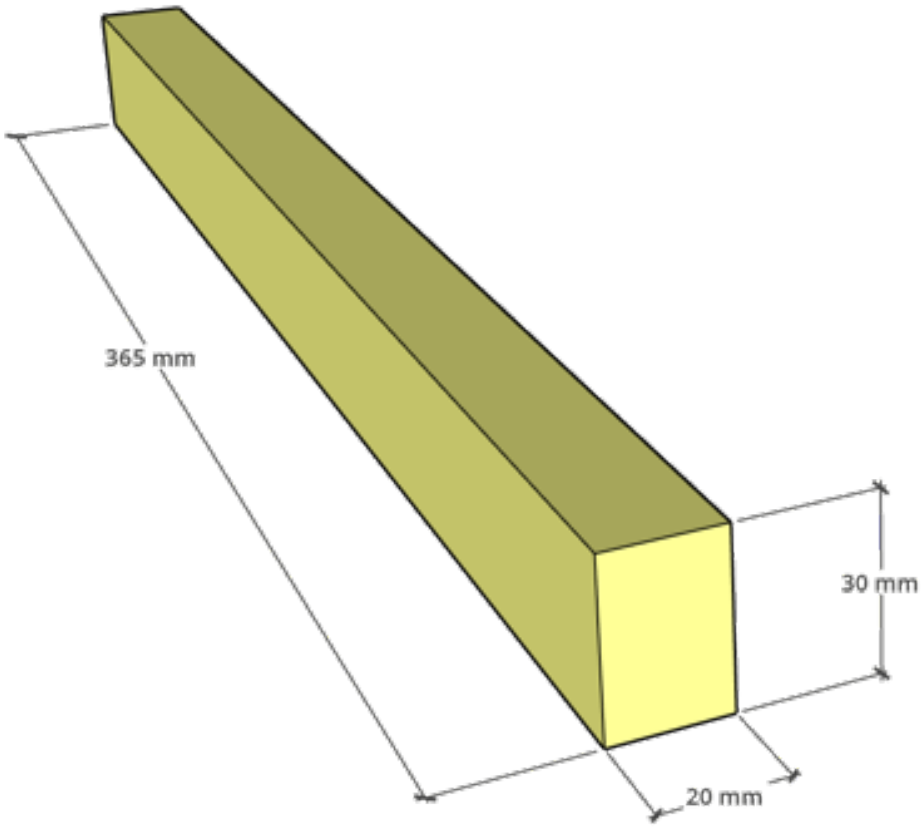


Figure 26 Handle

- Glue and screw the handle to the bottom board. Drill pilot holes for the screws to prevent the bottom board from splintering.

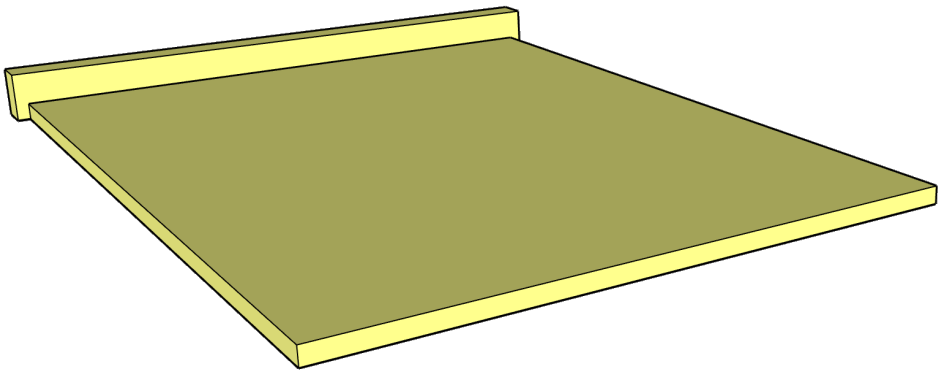


Figure 27 Bottom board with handle

The end result should look something like this.

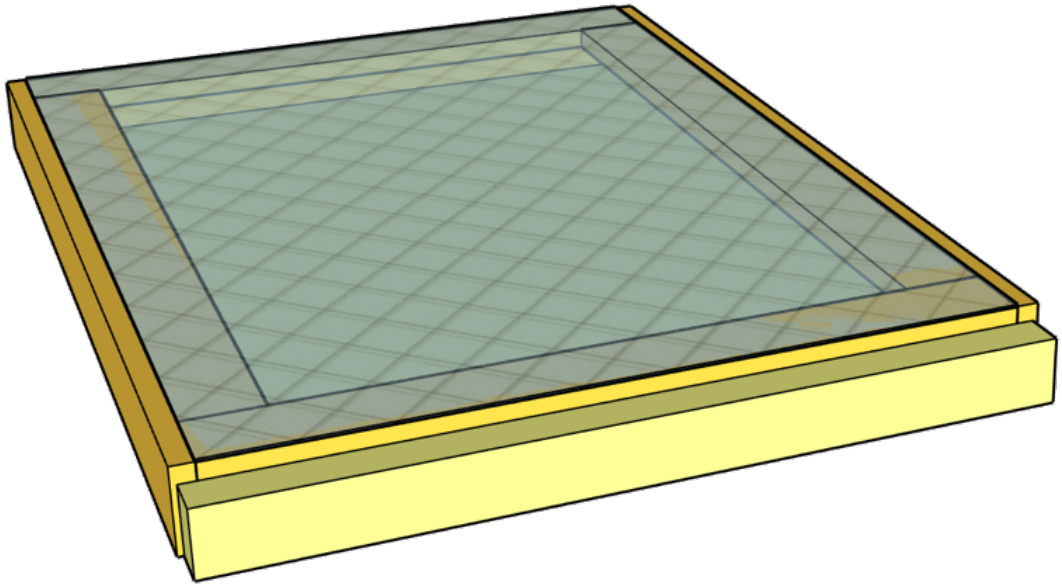


Figure 28 Varroa floor

Roof and bottom

The roof and bottom are identical for all hives described here. You will need six boards, each 100 mm wide, 20 mm thick, and 412 mm long, and one board that is 50 mm wide, 20 mm thick, and 412 mm long.

1. **Assemble the Panel**: Glue the seven boards together to form a panel measuring 412 mm x 650 mm..

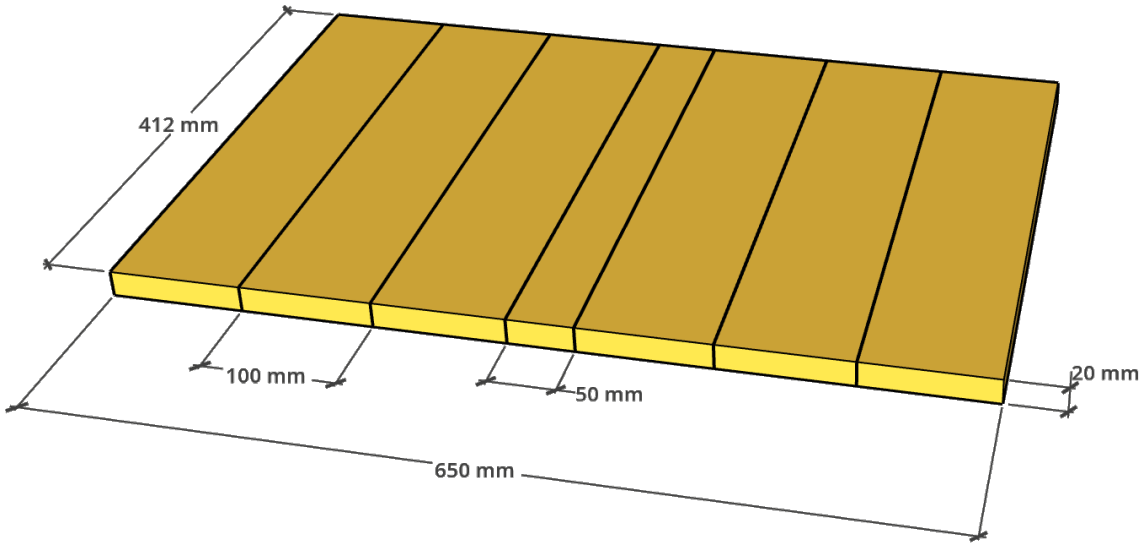


Figure 26 Roof and bottom

2. **Route the Rabbet on the Long Sides**: Using a router, create a rabbet (a recessed groove) that is 20 mm wide and 10 mm deep along both long sides of the panel.

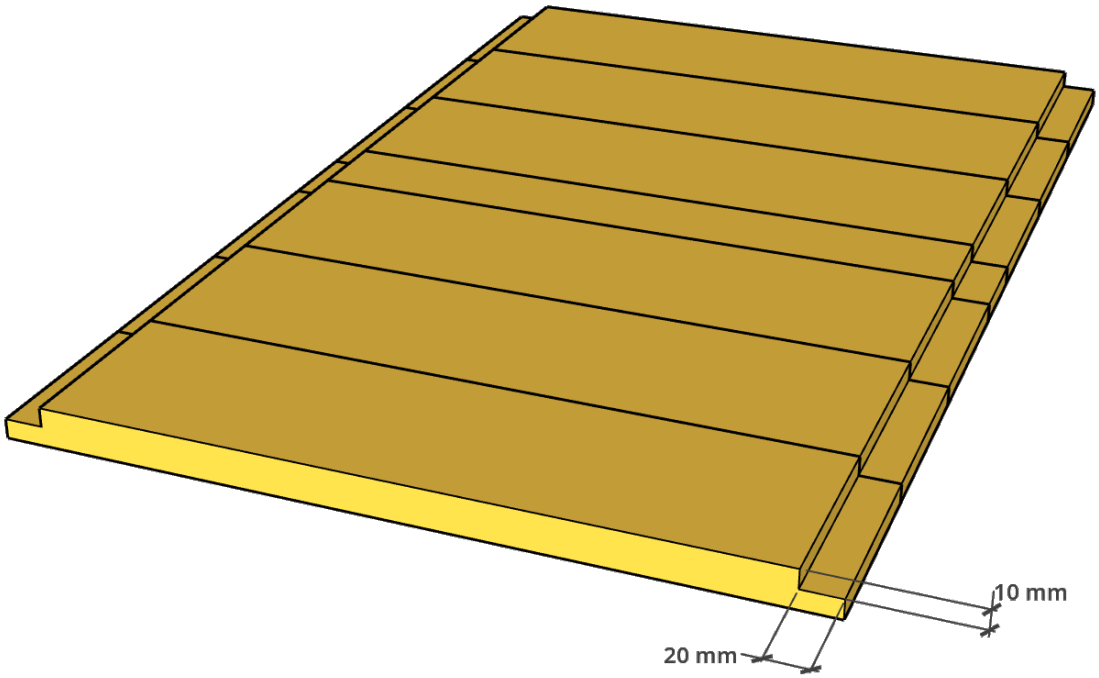


Figure 27 Roof and bottom with rabbet

1. **Create the Rabbet for the Inner Wall**: On one of the short sides, create a 20 mm wide rabbet, 10 mm deep, positioned 30 mm in from the edge. This rabbet will accommodate the inner wall of the hive.

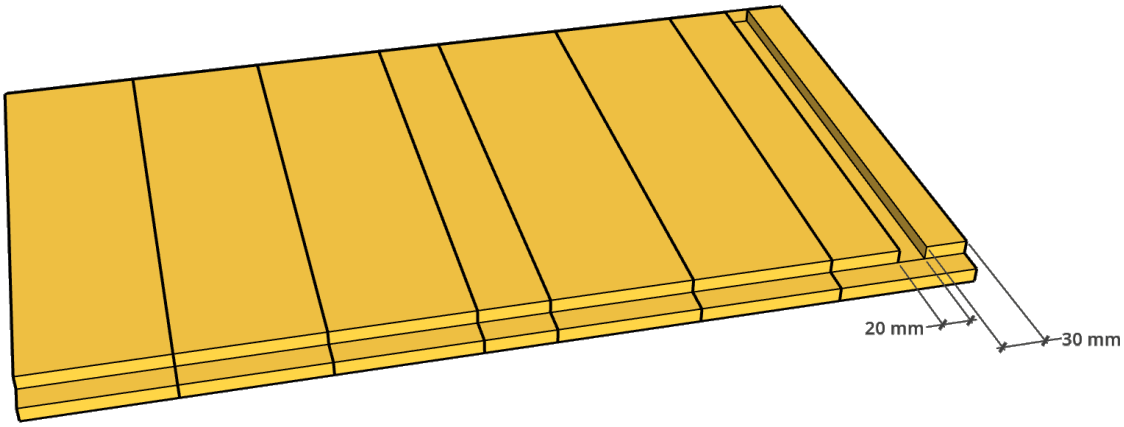


Figure 28 Rabbet for the inner wall

Inner door normal

Each level of the hive has an inner door with a screen, allowing you to access each level without significantly disturbing the other levels. This design also enables you to open the back door and inspect the hive without exposing the entire hive to the bees.

The height of each door is 250 mm, and the width is 372 mm. Since wood is a living material, you may need to adjust the size slightly to prevent the door from fitting too tightly and becoming stuck over time.

You can use contraprofiles with your router. If you decide to do so, remember to account for the profile depth when creating the door—I learned that the hard way! If you forget, you can hang it up in your workshop as a reminder not to make the same mistake again.

In this guide, we will use the simpler method of half-lap joinery, similar to what we used for the queen excluder.

Materials Needed:

- Two boards: 250 mm x 35 mm x 20 mm
- Two boards: 372 mm x 35 mm x 20 mm
- 1-3 mm metallic mesh

1. **Prepare the Boards**: Rip a board and plane it down to 35 mm x 20 mm, then cut it to the required lengths.

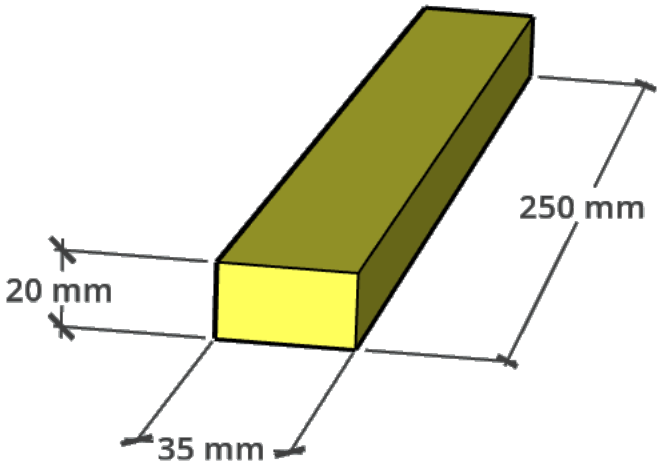


Figure 29 Side inner door board

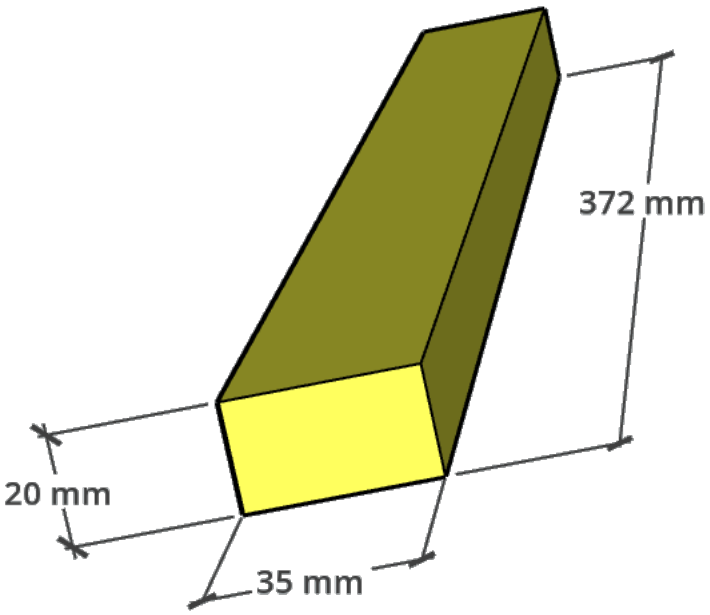


Figure 30 Top and bottom inner door board

2. **Create the Half-Lap Joints**: Route a rabbet on both ends of the short boards.

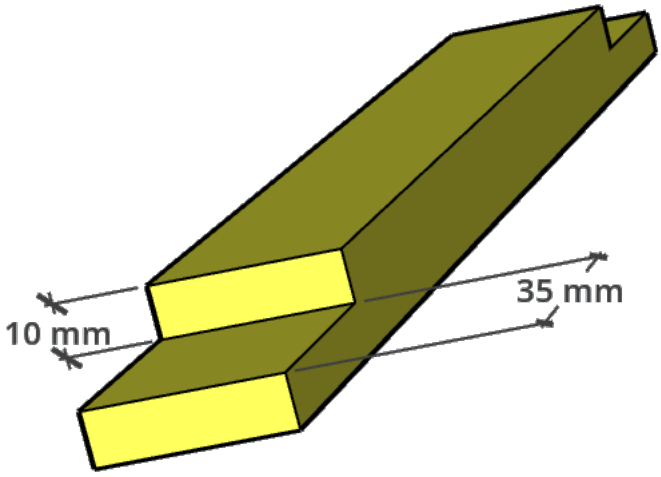


Figure 31 Side board with cut out for lap joint

Repeat the process for the long boards.

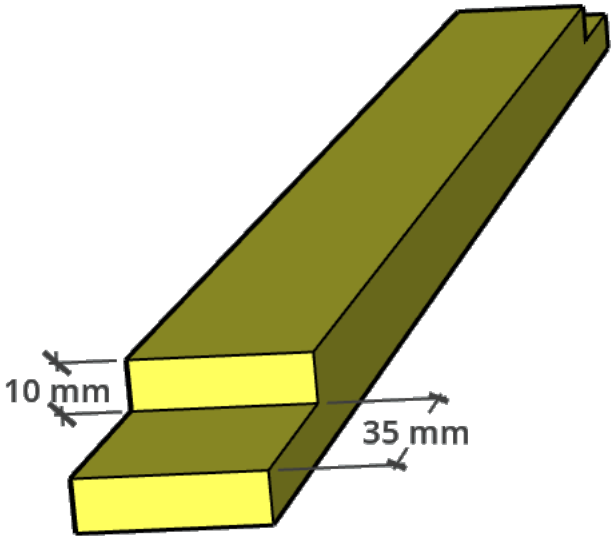


Figure 32 top and bottom bord with cut out for lap joint

3. **Assemble the Frame**: Use wood glue to attach the boards, forming a rectangular frame. Measure from corner to corner to ensure the frame is square.

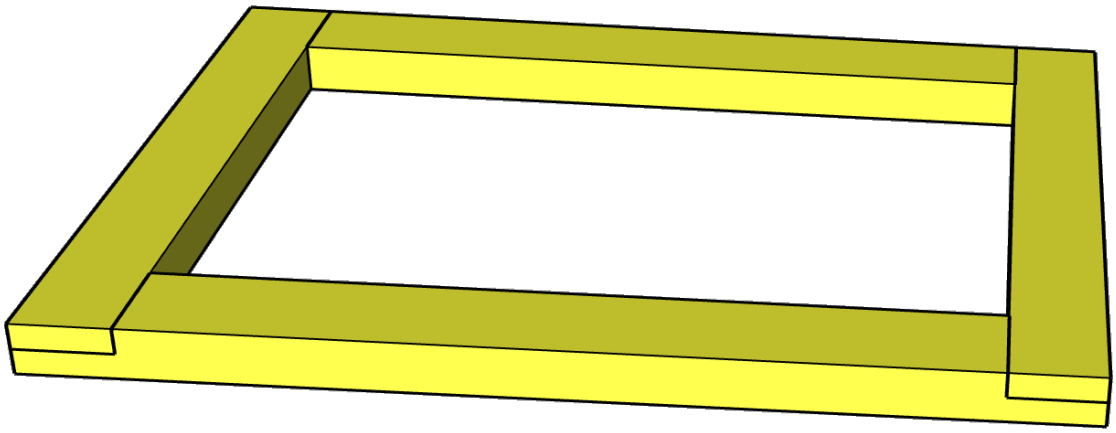


Figure 33 Assembled inner door frame

4. **Rout the Rabbet for the Mesh**: With a router, make a rabbet inside the frame that is 10 mm wide and 10 mm deep.

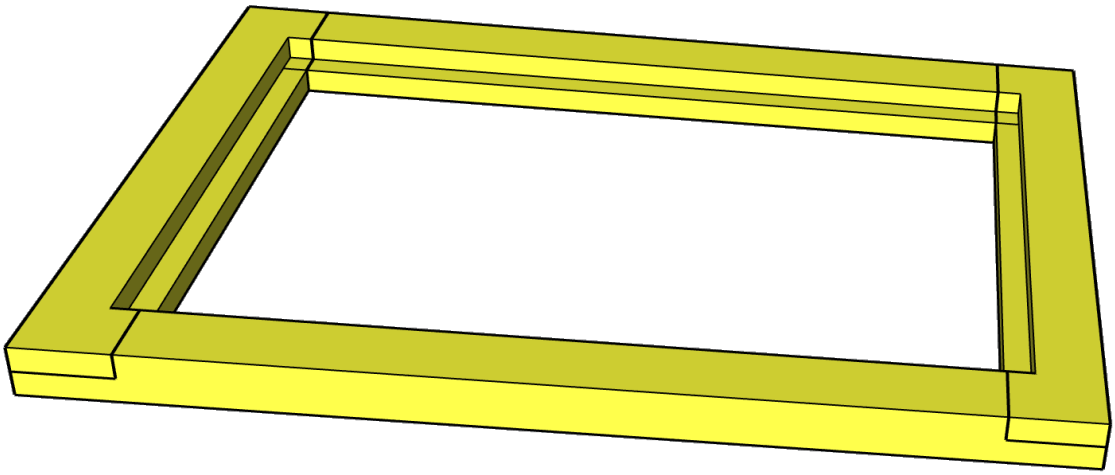


Figure 34 Rabbet routed for mesh

5. **Prepare the Mesh**: Cut a metallic mesh to approximately 220 mm x 340 mm, with 1-3 mm holes.

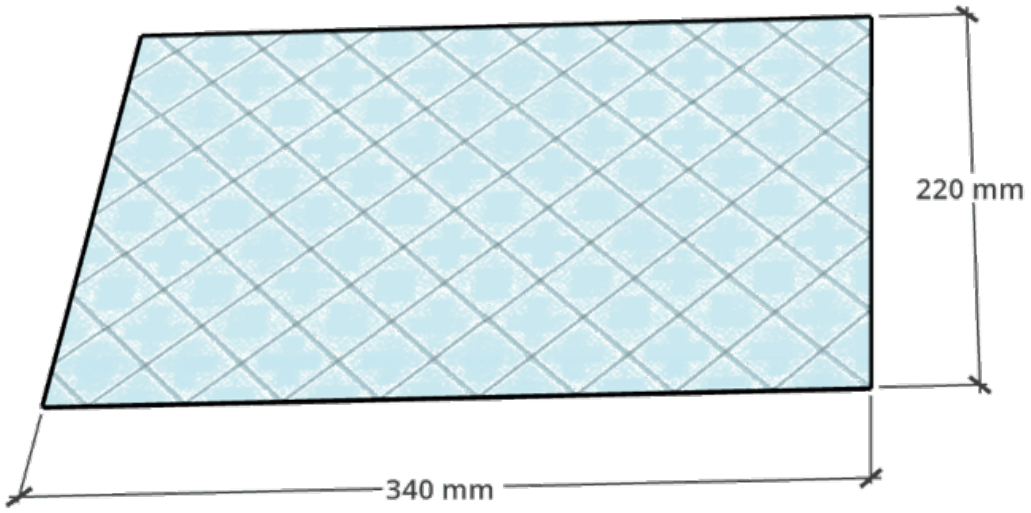


Figure 35 Mesh

6. **Attach the Mesh**: Place the mesh on the frame.

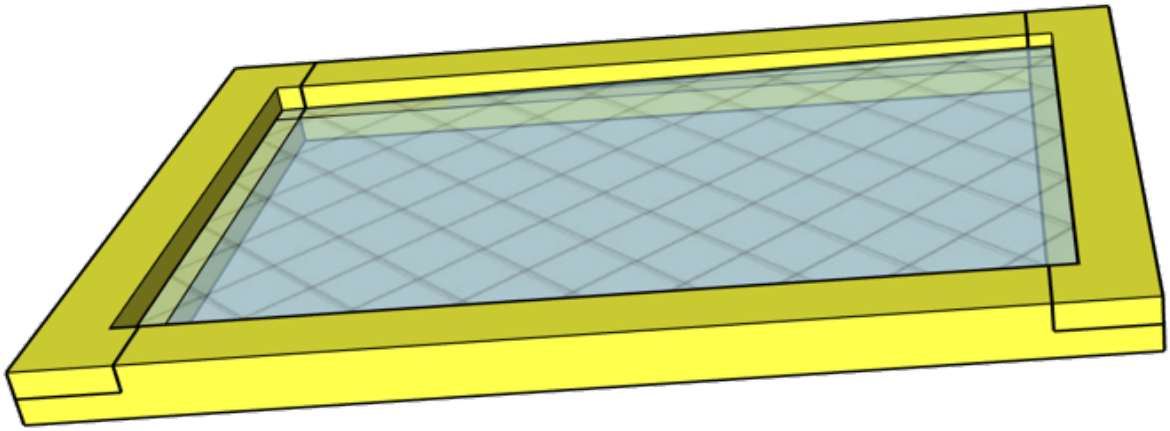


Figure 36 Mesh placed on the inner door

Make several 9 mm x 10 mm strips to secure the mesh.

Figure 37 Fastening board for the mesh

7. **Secure the Mesh**: Fasten the mesh using glue and the small boards.

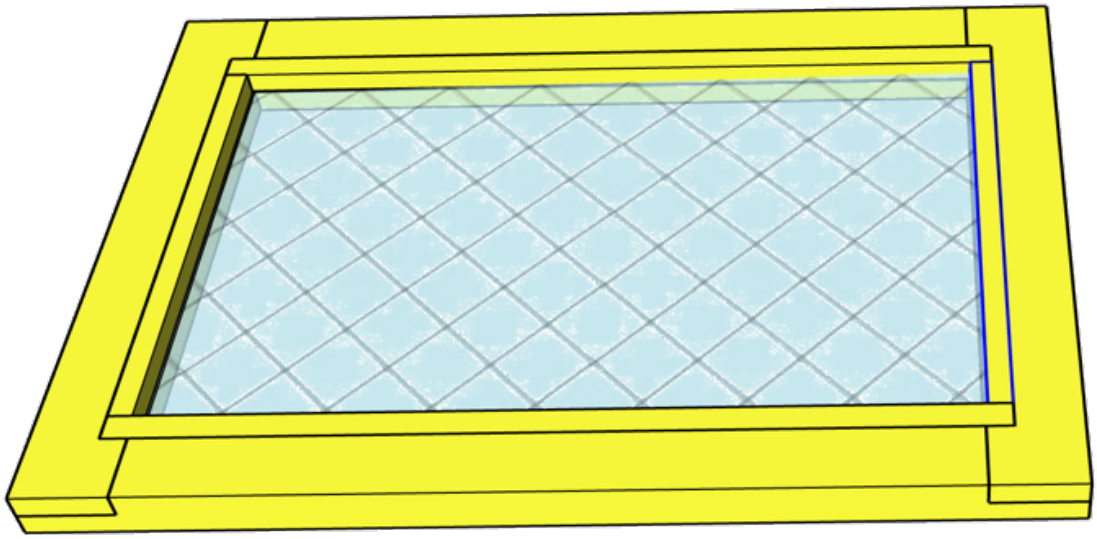


Figure 38 Inner door with fastened mesh

If you wish, you can add a door knob to the door for easier handling.

Inner wall

For the inner wall, use boards that are 388mm long, 100mm wide, and 20mm thick. These boards will fit into the 20mm x 20mm slots on the side walls.

1. Split some boards as needed to make them fit perfectly.

2. Depending on how exact the slots are and the exact thickness of the bord, you might need to trim the thickness fitting in to the slots a bit.

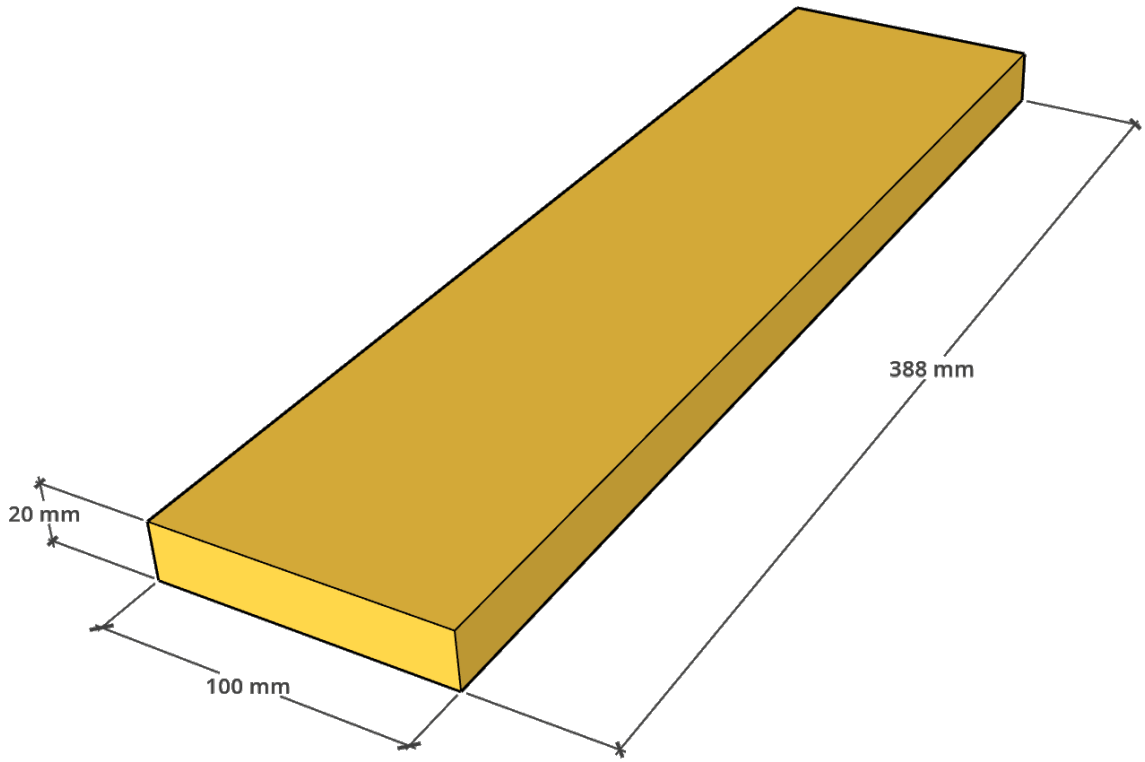


Figure 39 Inner wall board

Front wall

Use boards that are 412mm long, 100mm wide, and 20mm thick for the front wall.

1. Split some boards if necessary to ensure a snug fit.
2. The front wall will support the hive structure.

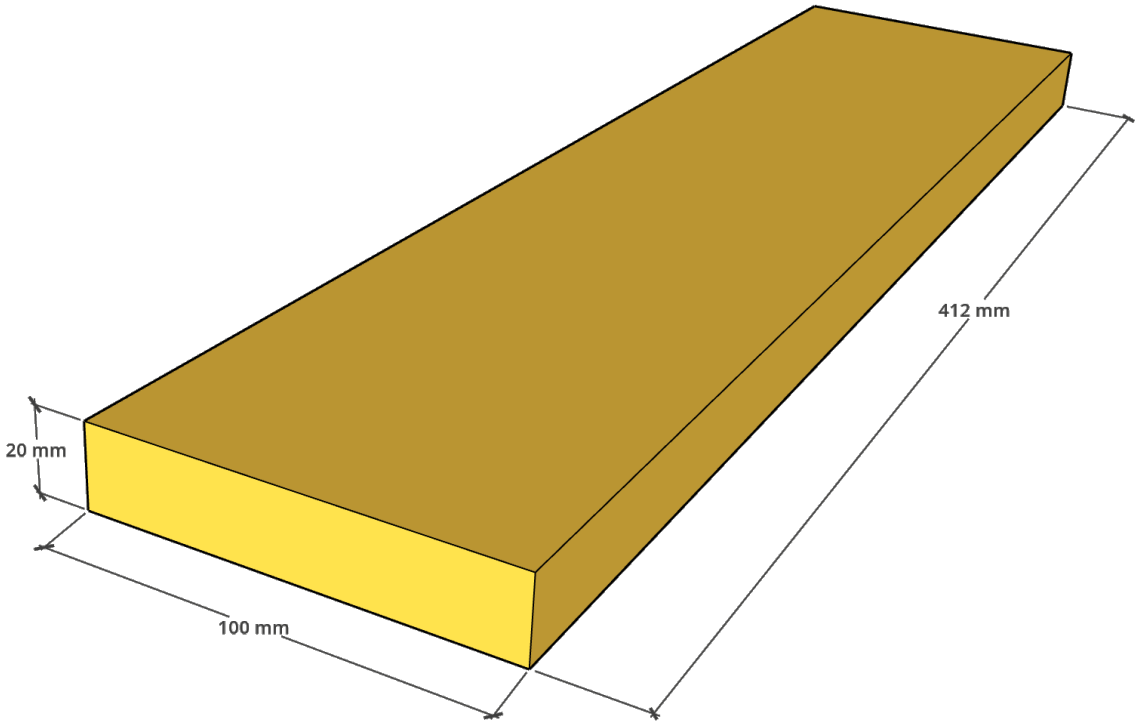


Figure 40 Front wall board

Isolation

For isolation between the inner and outer walls, use 30mm Stone Wool. This material is preferred because it deters ants and other pests.

1. Cut the Stone Wool to fit snugly between the walls.
2. Add wind protection paper inside the Stone Wool to provide additional insulation for the bees.

Figure 41 Stone Wool reenforced

Figure 42 Wind protection

AZ-Hive 2 levels

Side planks

The total height of the side is 568 mm, that includes 2x10 mm that the roof and bottom adds. The depth is approximately 670 mm including 20mm of the front boards and the thickness is 20 mm.
We use lumber that are 100 wide, 20 mm thick and 568 mm long. The last board we split in two so we get two equal boards that are aproximately 50 mm wide, probably 48mm.

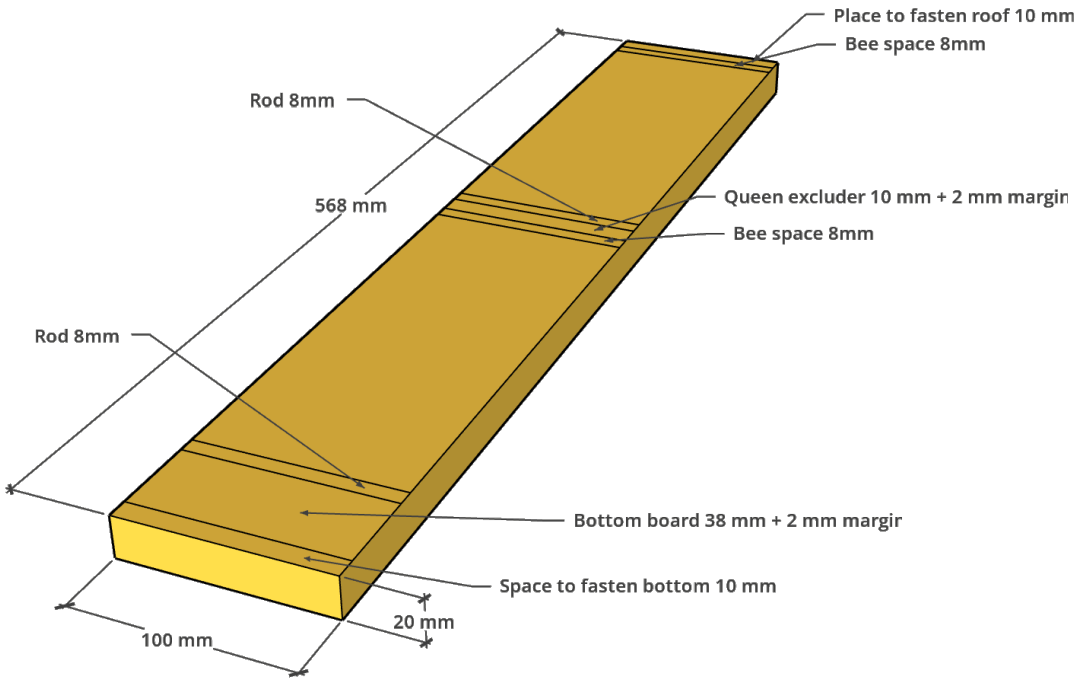


Figure 104 Calculating the side board, not showing the frame heights

FIRST FRONT BOARD

On the first side bord to the front we need to add a routed grove to add the inner wall. Between the inner wall and the outer wall we will later add 30 mm isolation.

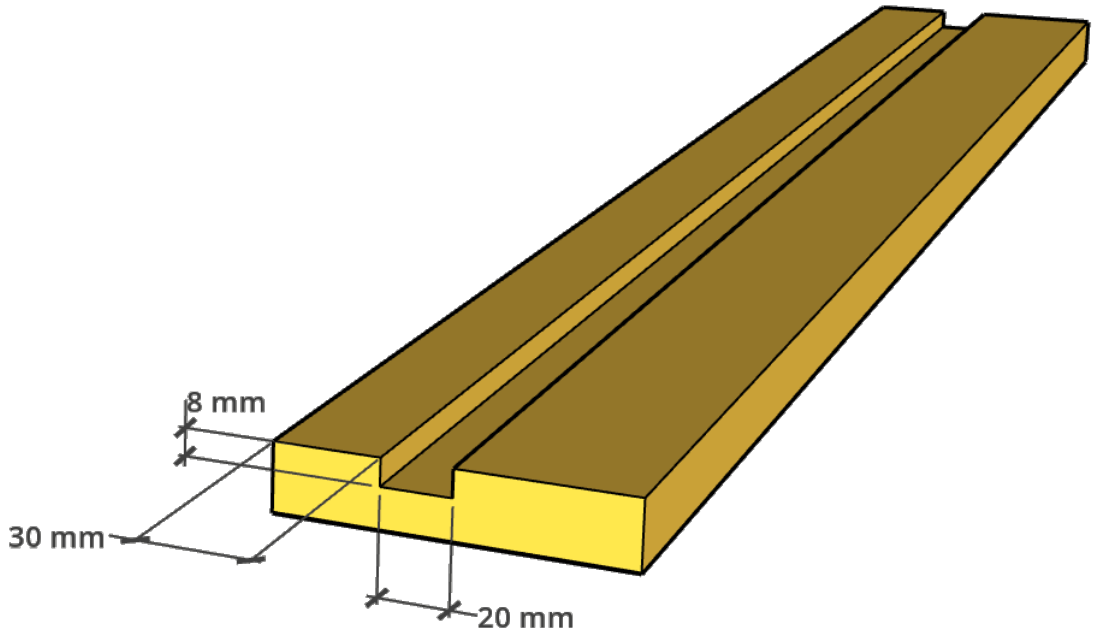
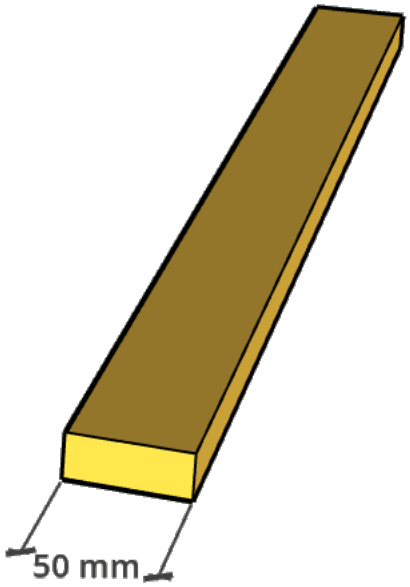


Figure 105 First side board to the front

SECOND BOARD

You need 2 of these and the easiest way is to take one of the 100mm board and cut it in half.



BOARD WITH SLOTS FOR THE RODS

We need 6 of these.
With a router, create slots for the rods. 10mm wide and 8 mm deep.
To be able to remove and add the rods, create the slots 100mm long.

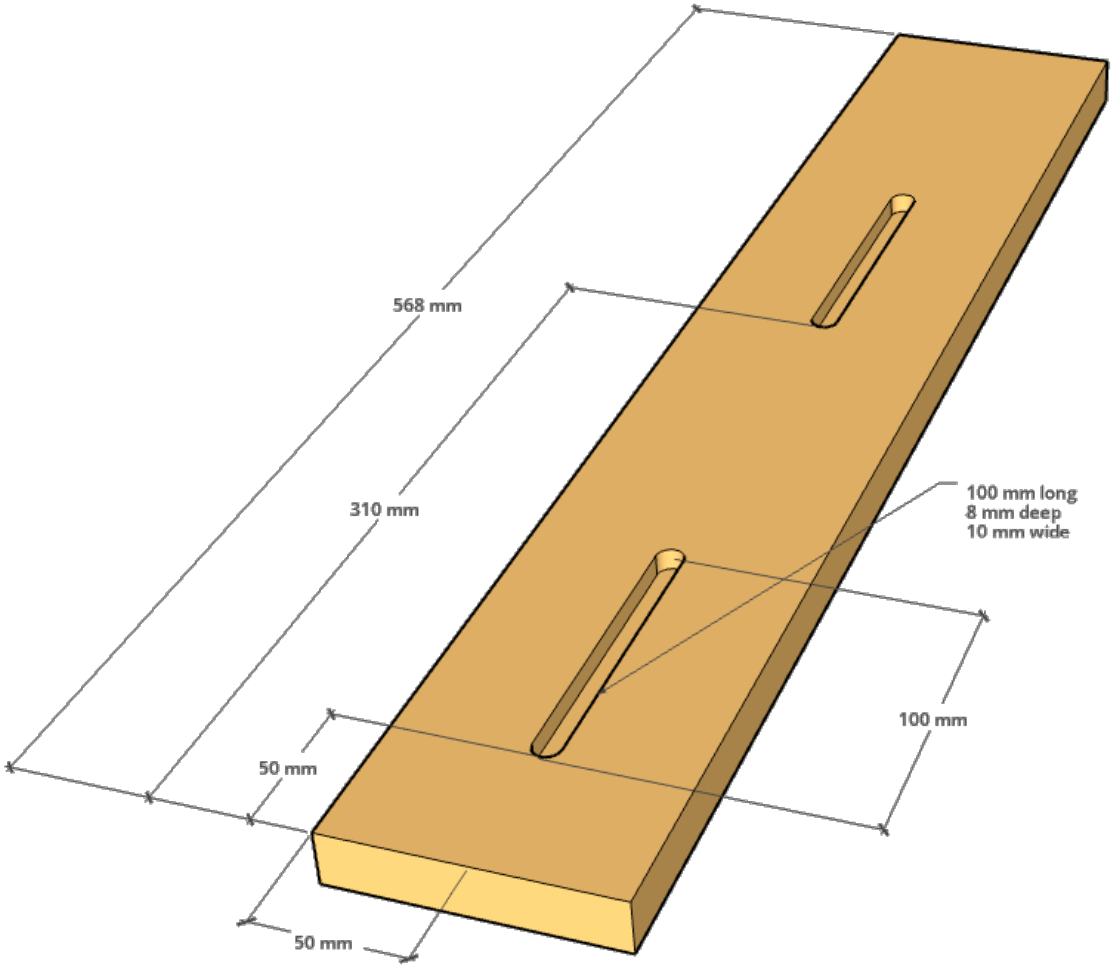


Figure 106 Board with slots

Back door

For the frame of the back door, I prefer to use hardwood like birch, and for the door panel (mirror), birch plywood. This method is simple and effective. While you could use hardwood for the entire door, the approach outlined here is easier and uses hardwood just for the frame.

MATERIALS FOR THE BACK DOOR FRAME:

- **Side Frames**: Two planed boards, each 588 mm x 80 mm x 20 mm
- **Top and Bottom Frames**: Two planed boards, each 412 mm x 80 mm x 20 mm

CREATING THE RABBETS:

- On each end of the short boards (top and bottom frames), create an 80 mm wide and 10 mm deep rabbet.
- On the long boards (side frames), create 80 mm wide rabbets, positioned 80 mm from the end.

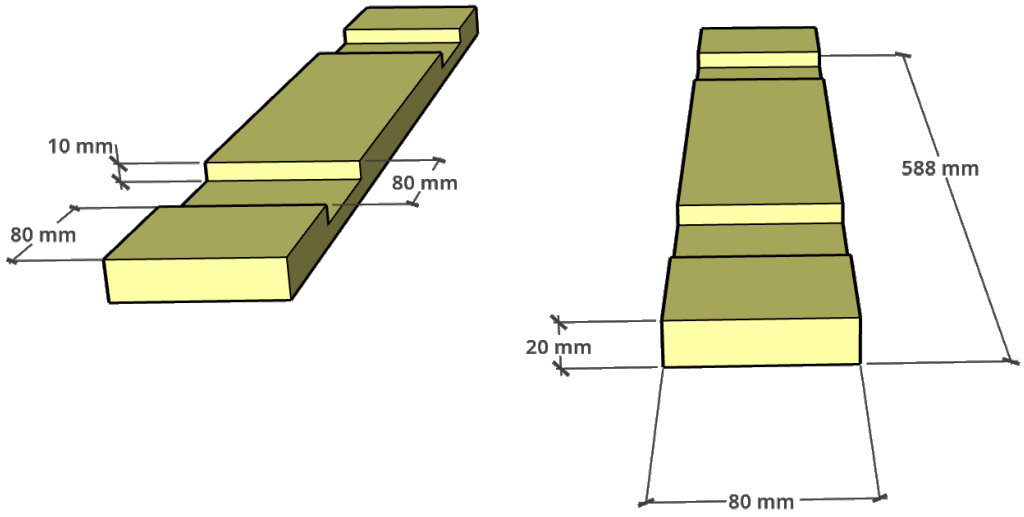


Figure 107 Long frame boards for back door sides

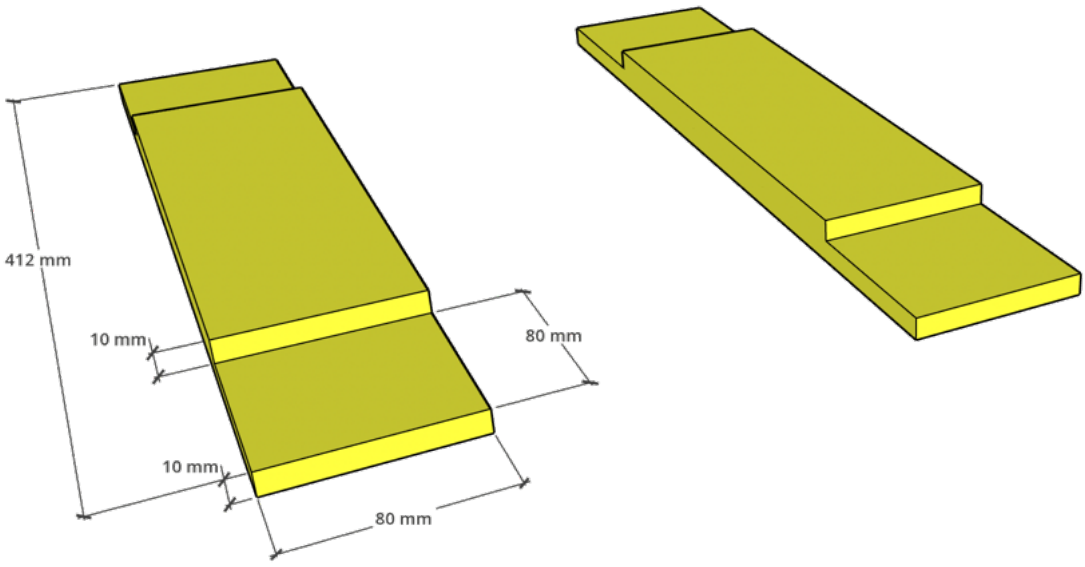


Figure 108 Short frame boards

ASSEMBLING THE FRAME:

- Glue the boards together to form the door frame.
- Measure the diagonals to ensure the frame is square. If the diagonals are the same, the frame is properly aligned.

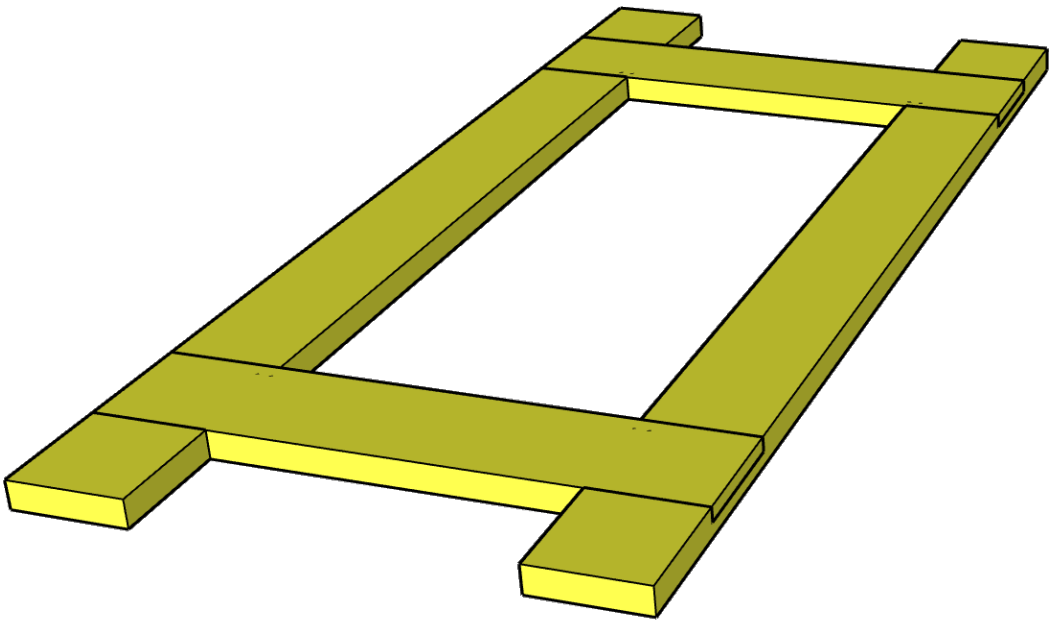


Figure 109 Frame assembled

ROUTING THE INNER RABBET:

- Route a 10 mm wide and 10 mm deep rabbet around the inner edge of the frame to hold the door panel

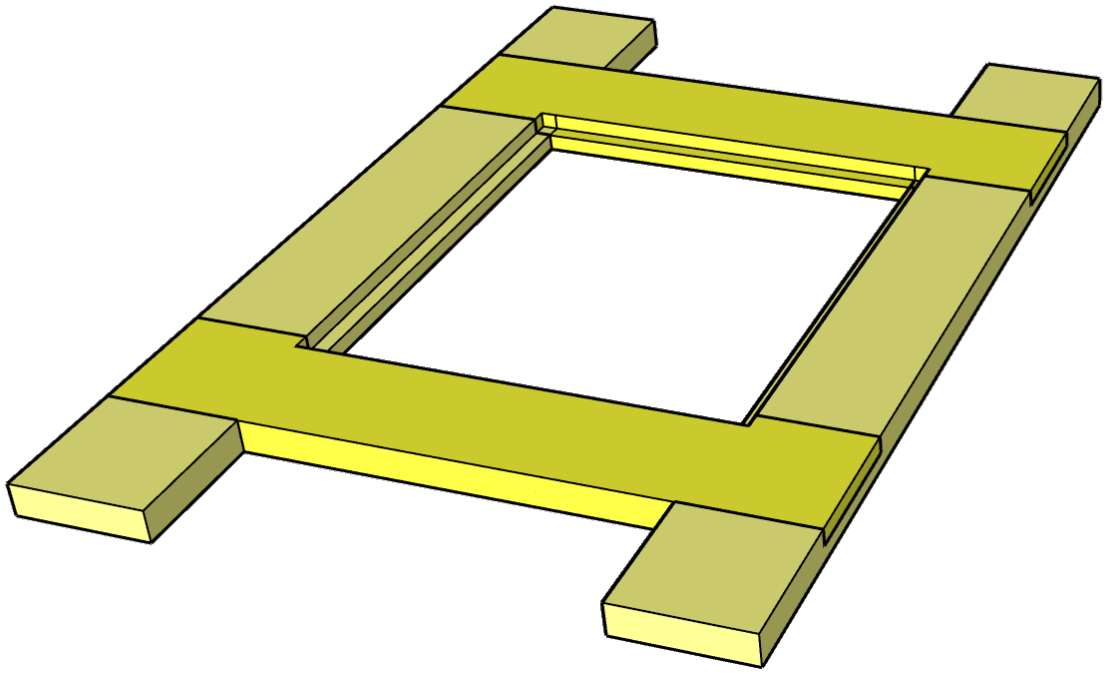


Figure 110 Frame with rabbet

CUTTING THE DOOR PANEL:

- Cut out the door panel (mirror) from 6-10 mm thick birch or any other type of plywood to fit within the frame's rabbet. Size 288 x 272 x 8 mm.

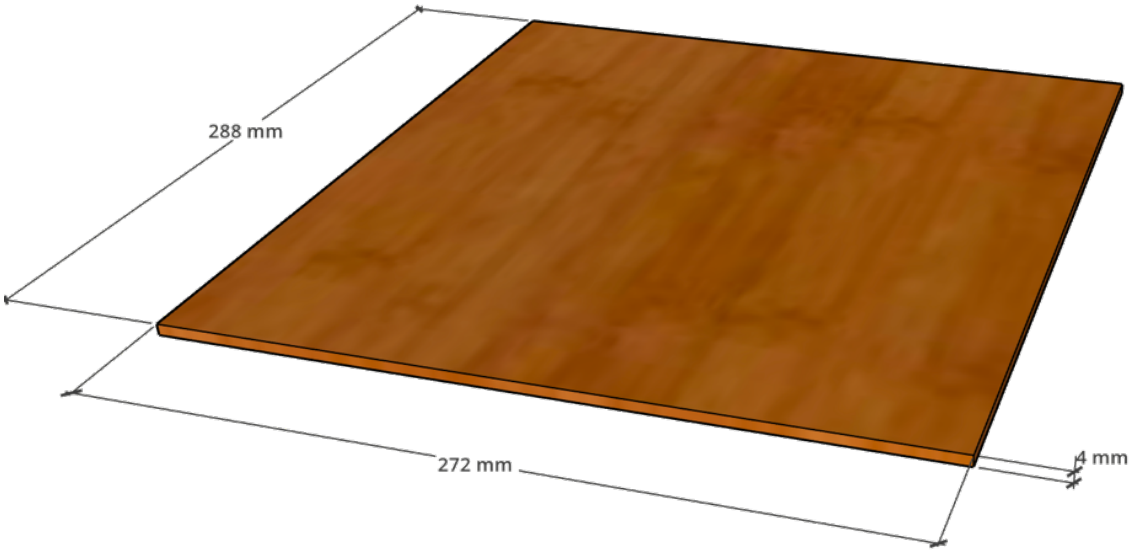
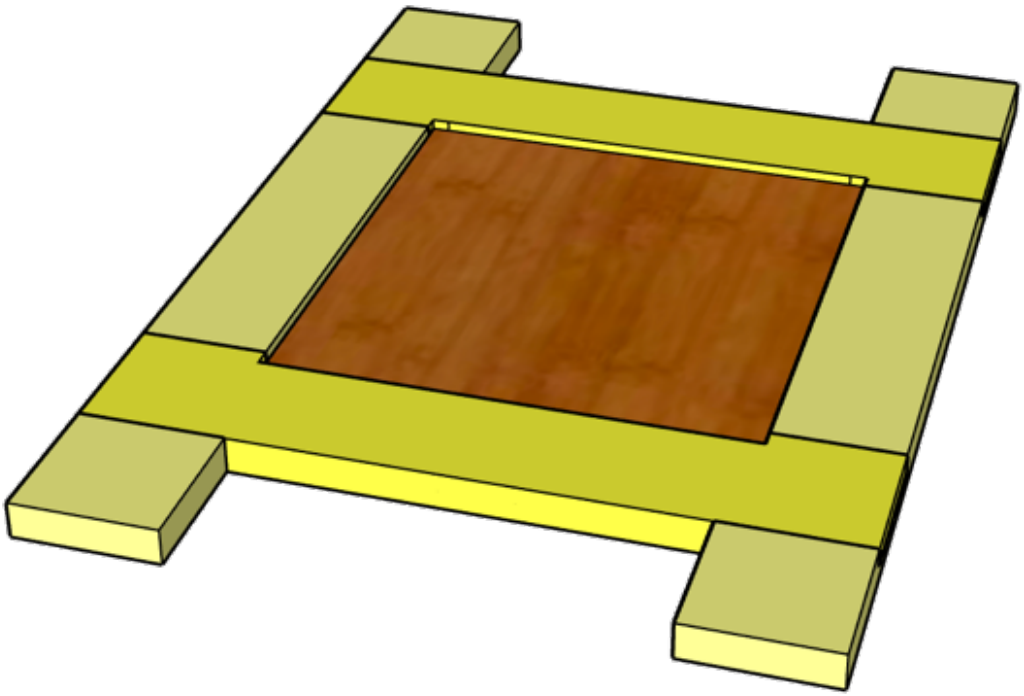


Figure 111 Plywood for mirror on the door

ATTACHING THE DOOR PANEL:

- Glue and nail the panel in place securely.



VENTILATION OPENINGS

For ventilation, you will need two boards, each 252 mm x 80 mm x 20 mm. These boards will create adjustable openings on the door.

1. **Creating Ventilation Boards**:
    - Cut two boards to the specified dimensions for the ventilation openings.

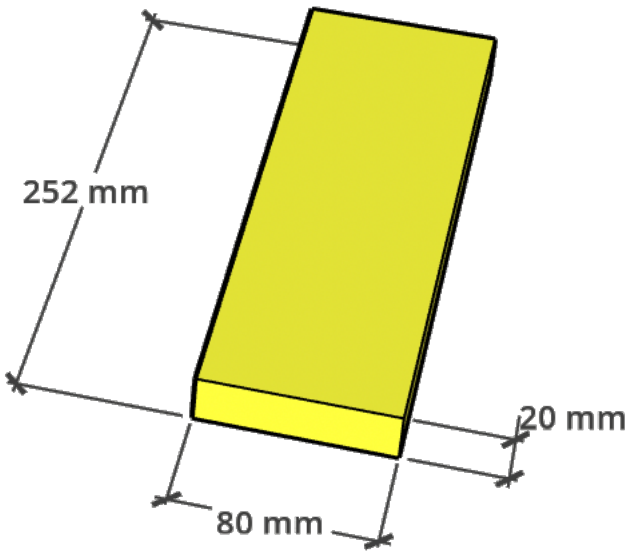


Figure 112 Ventilation board

ATTACHING THE VENTILATION BOARDS:

- Attach the ventilation boards to the door using hinges, allowing them to open and close.

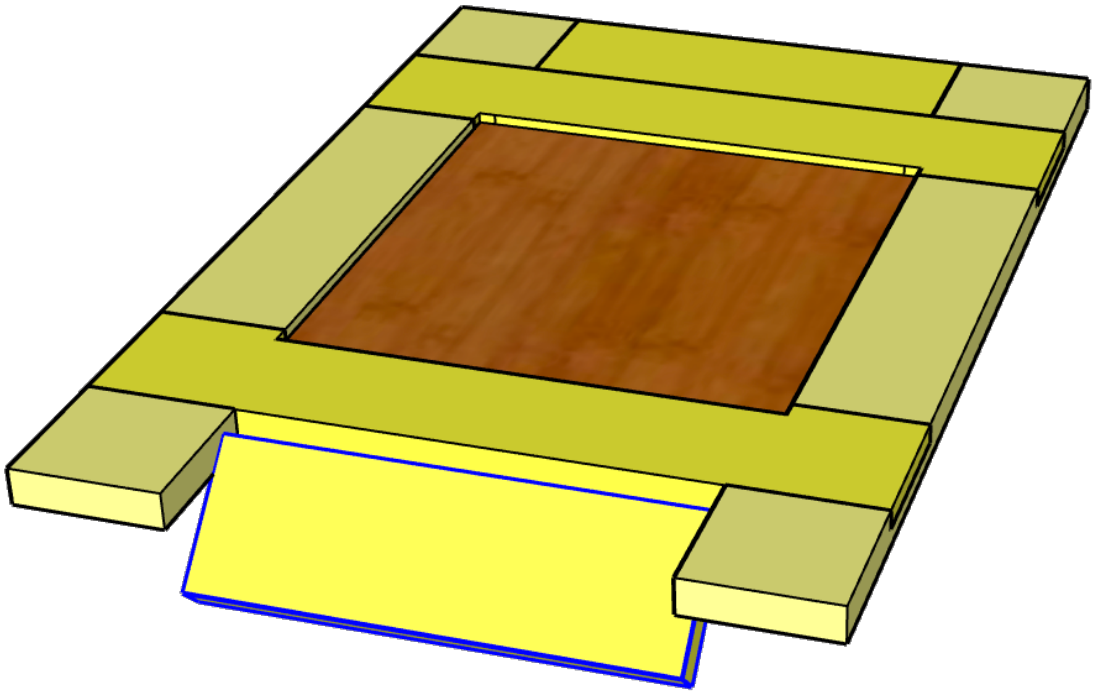


Figure 113 Door with ventilation boards.

OPTIONAL MAGNET MECHANISM:

- You can add magnets to the inside of the door to allow the lower ventilation board to open and close. The upper ventilation board will remain open by gravity.

Once the back door is assembled, install it onto the hive. Ensure the ventilation boards are correctly aligned and functional.

Assembly

SIDES

The sides are assembled like in the picture. The 50mm board are placed as the second board to get the rod slots in a good position.

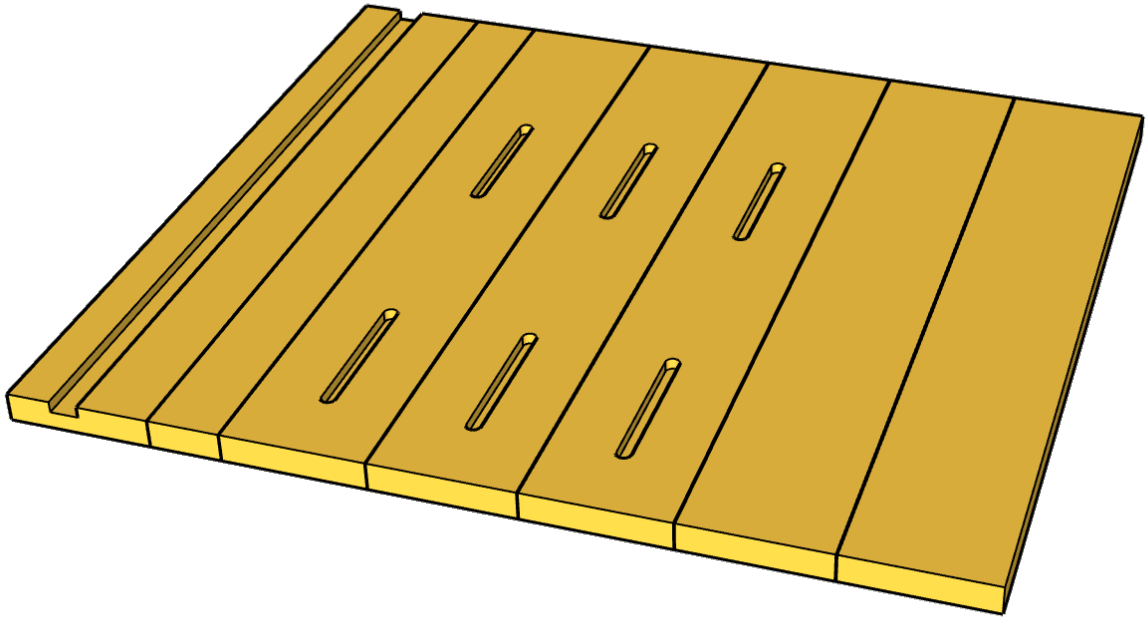


Figure 114 The first side

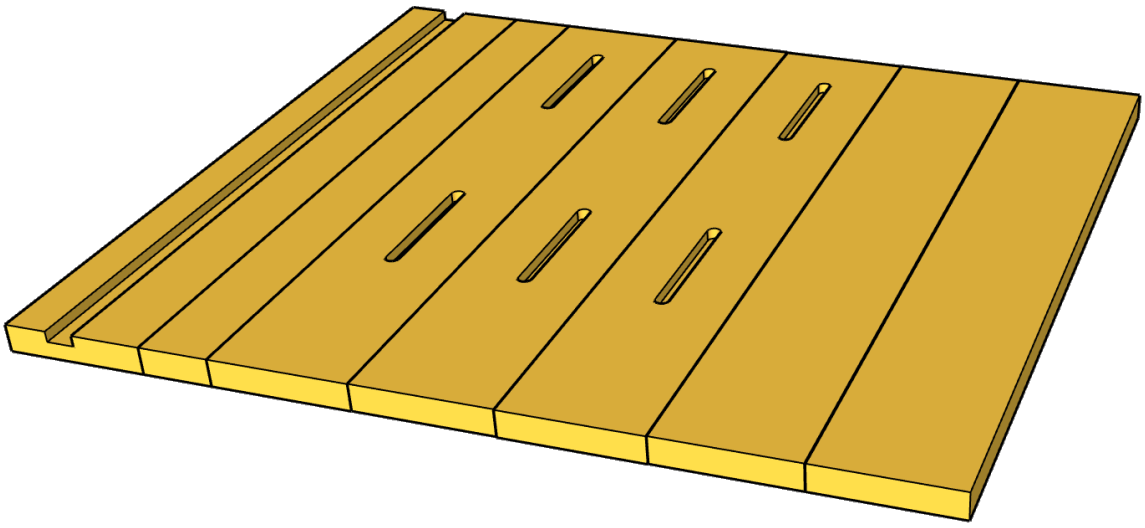


Figure 115 The second side, Note that it is mirrored compared to the first side

On both side panels, add shelves with angle irons 12 mm under the rod rest for queen excluders and false queen excluders. Not for the bottom row.

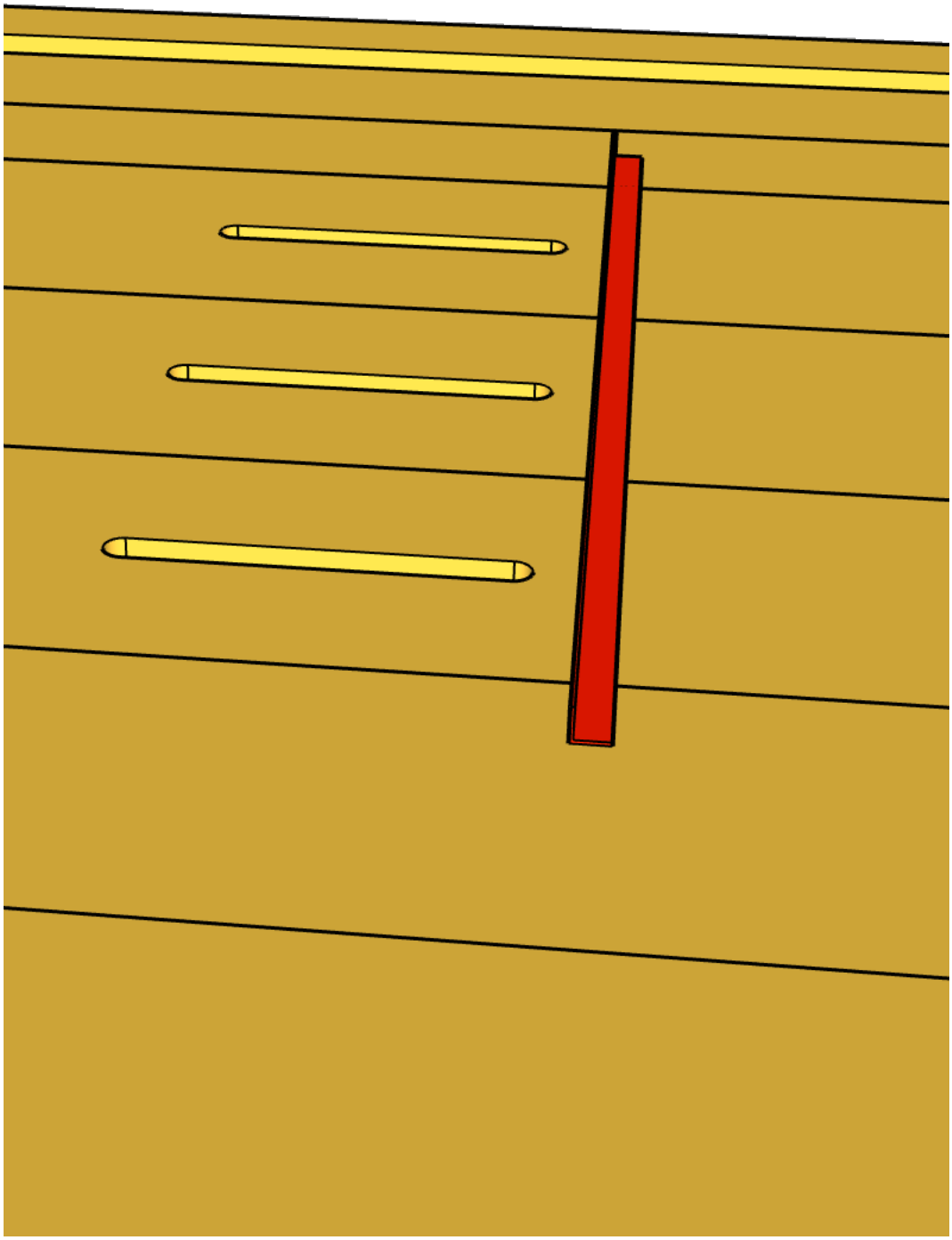


Figure 116 Side with shelf

ADD BOTTOM

Use nails and add the bottom.

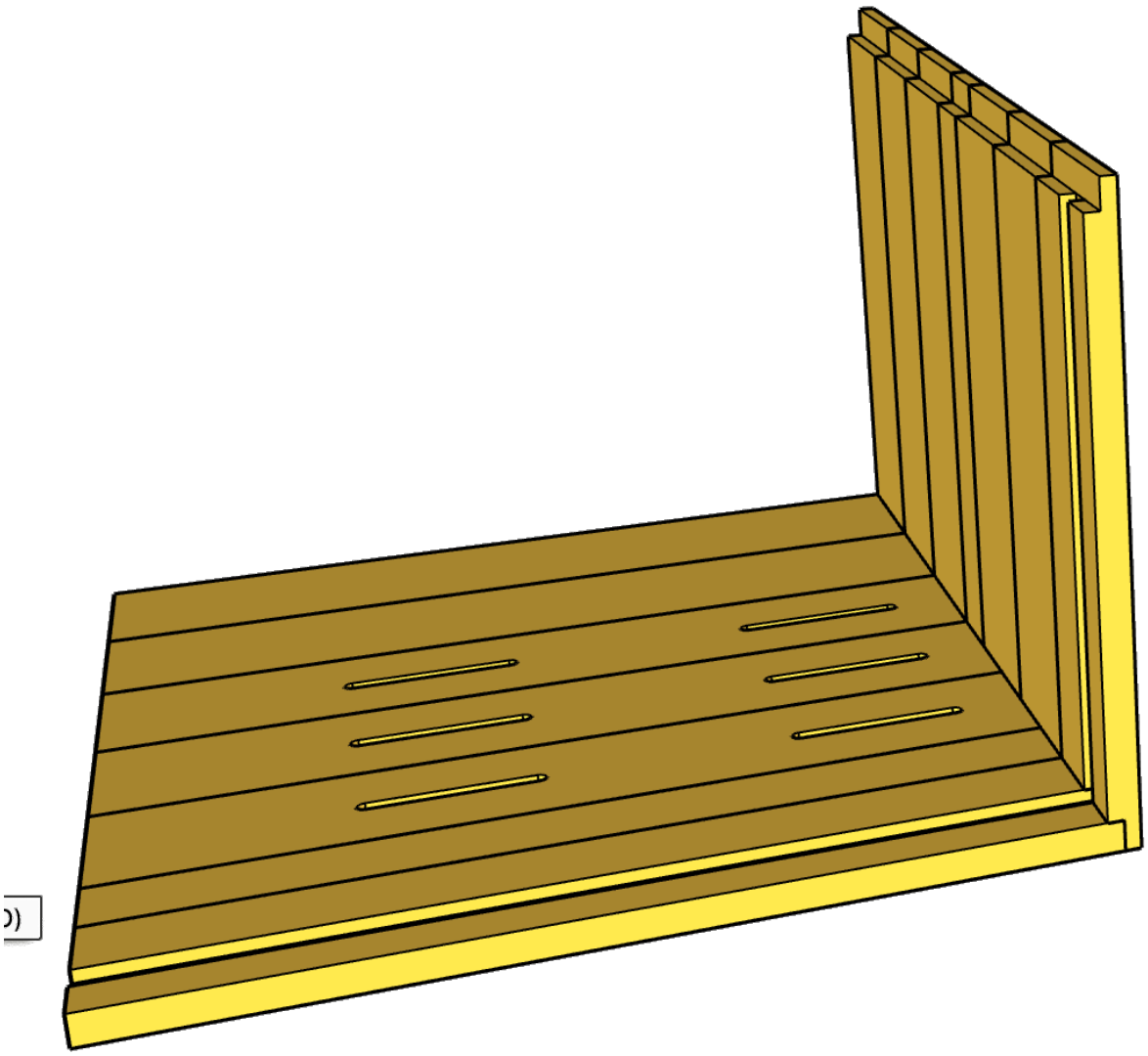


Figure 117 Bottom fastened

ADD FIRST BIT OF INNER WALL

Split a inner wall board so you get a 38 mm wide board and add it to the inner slot and fasten it with a couple of nails from the bottom. Nails are not absolutely neccesary but it might make it a bit more stable when you start assembley the box. If it works fine whitout then skip them.

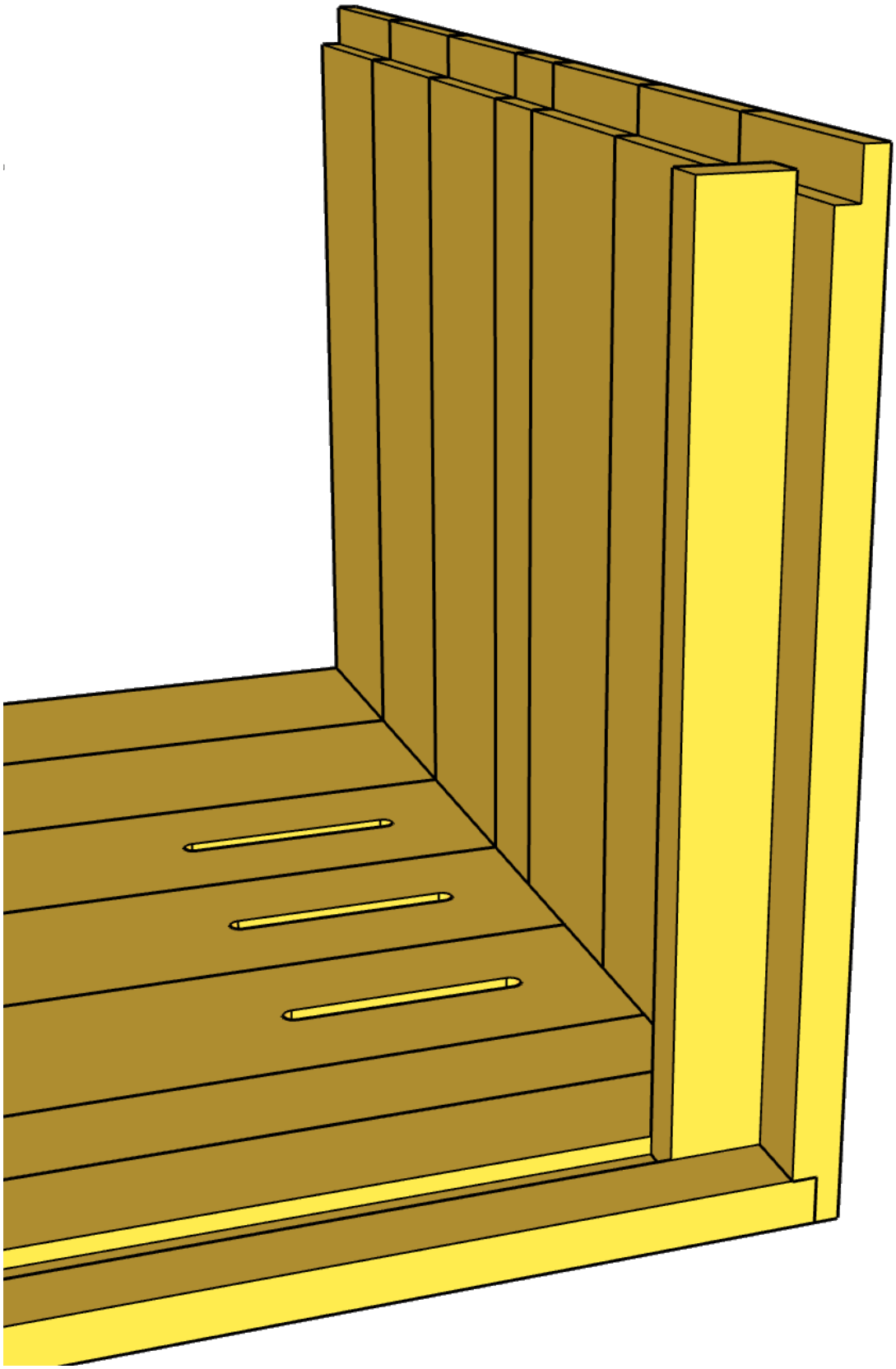


Figure 118 First inner wall board

ADD ENTRANCE BIT

Cut a board 38mm x 30mm x 372mm to use between the inner wall and the lowest entrance.
Nail or screw it to the first inner wall board. Predrill the hole for the fasteners.

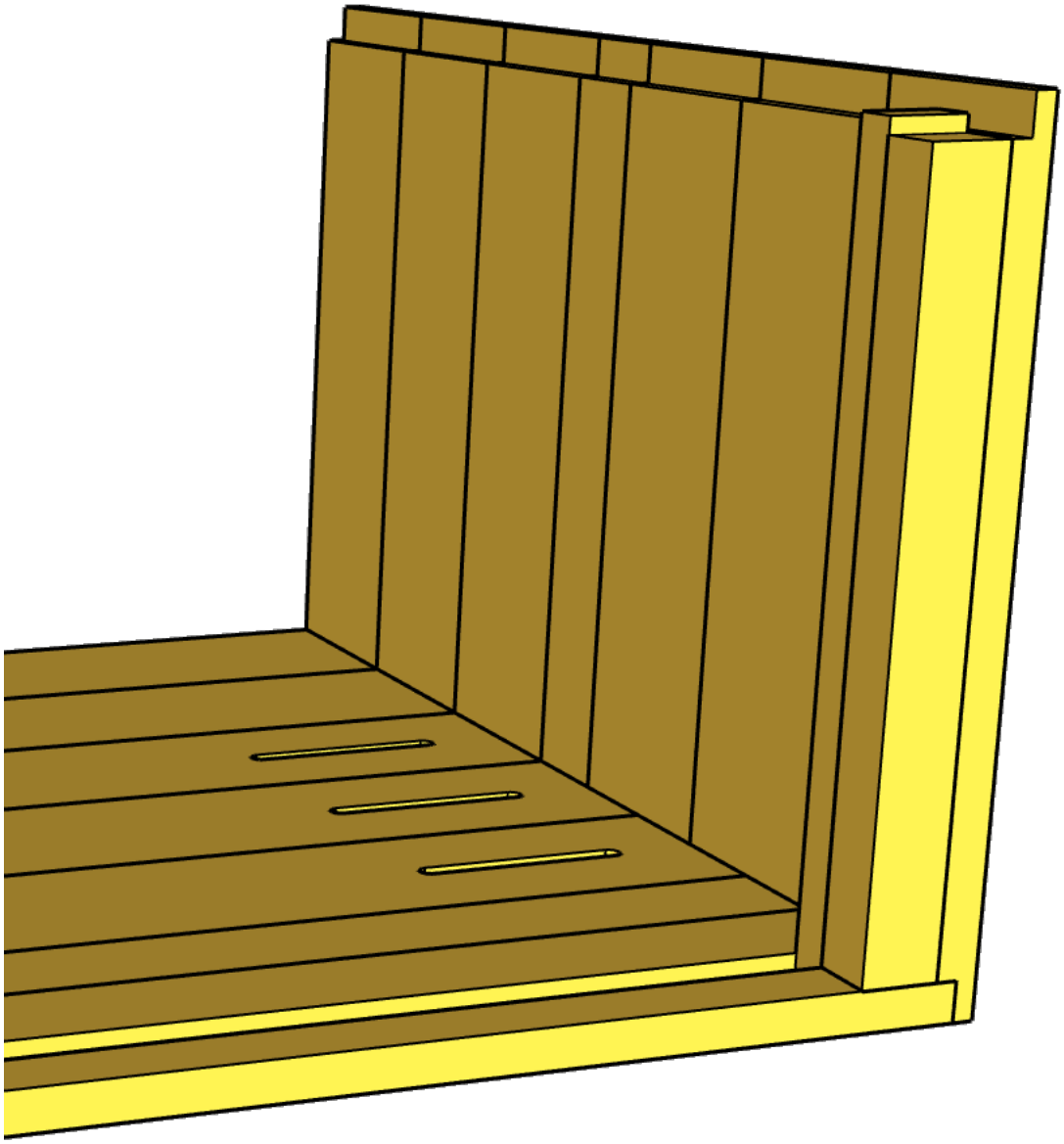


Figure 119 In between board for the entrance.

ADD MORE INNER WALLS BOARDS

Add a 12mm wooden spacer for the bee entrance before you add the next inner wall board. You can cut a 12 mm strip from a 20mm thick board and shorten it to 8mm or a bit longer. The beez wont mind if

the length of the entance is 372mm or 360mm but you sense of perfection might.
Then add inner wall boards up to the next entrance that should be about 2 mm under the thought line from the second levels rod slots.

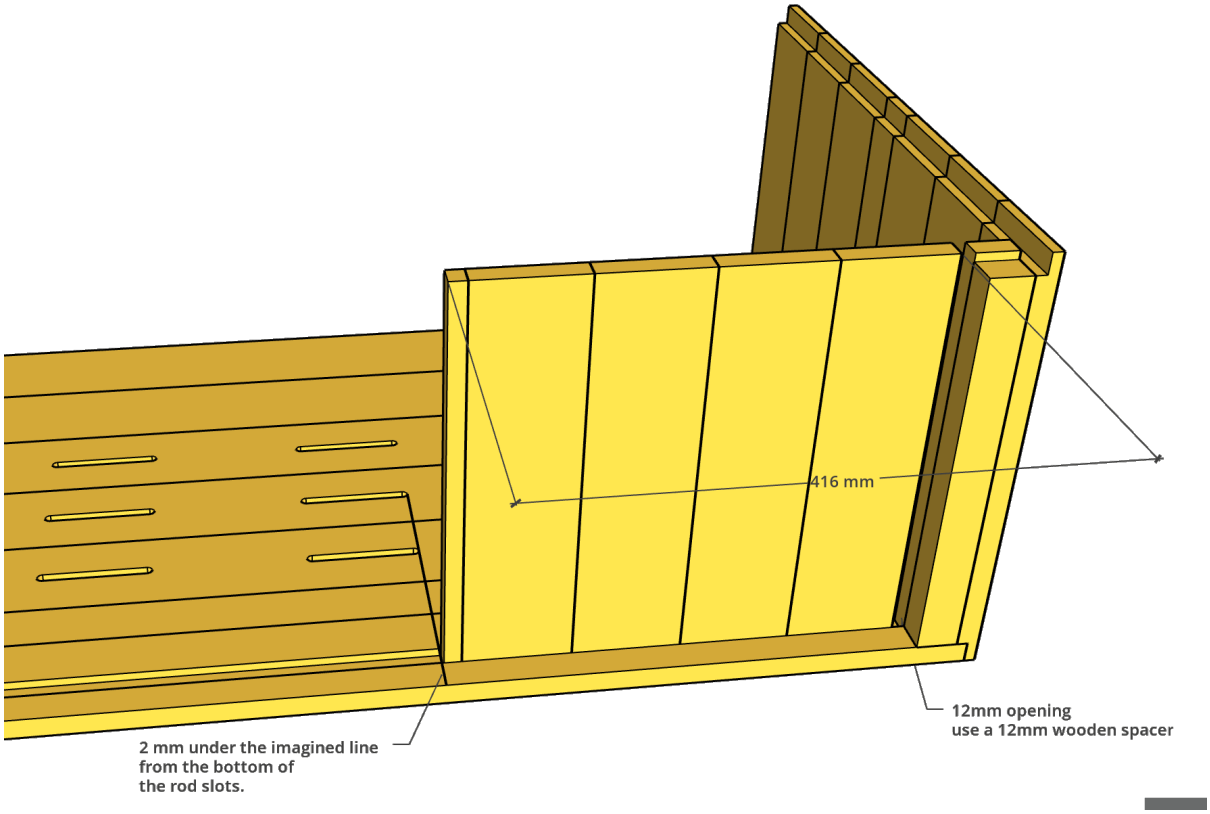


Figure 120 Add more inner wall boards

ADD THE REST OF THE INNER WALL

Add another 12 mm spacer and add the rest of the iner wall boards.
Note that you do not need to fasten the inner wall boards but put a nail on the board just above the entrances. This can be done when the second wall and roof is in place if it is easier.
The last inner board should be cut of 5 mm above the side board to fit in the roof rabbet.
Do not make it fit snugly into the entire 10mm rabbet, as wood move a bit depending on moisture.

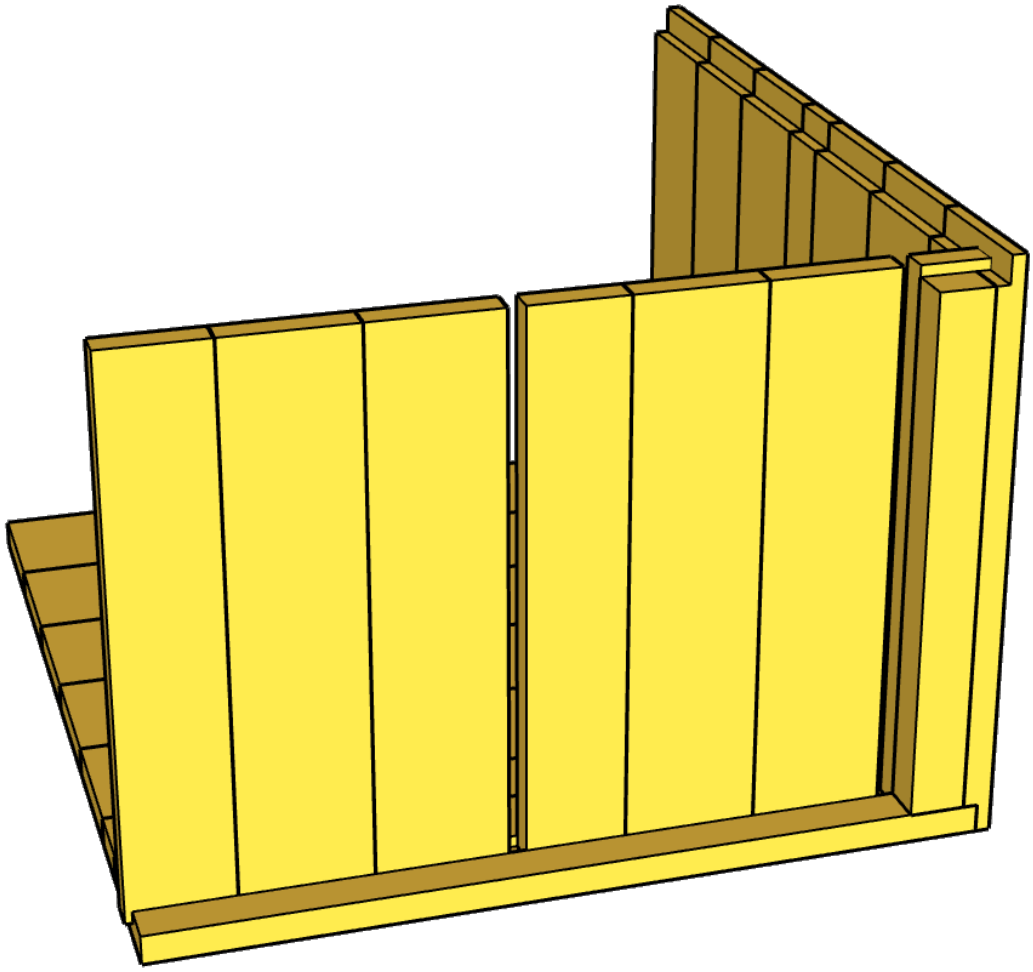


Figure 121 The rest of the inner wall

ADD THE OTHER SIDE WALL

Now that you have added the boards for the inner wall you can add the second side wall. Expect some issues getting the inner wall boards in the rabbet but after some tries it will work. Use nails from the bottom and one nail on the inner wall boards closest above the entrances.

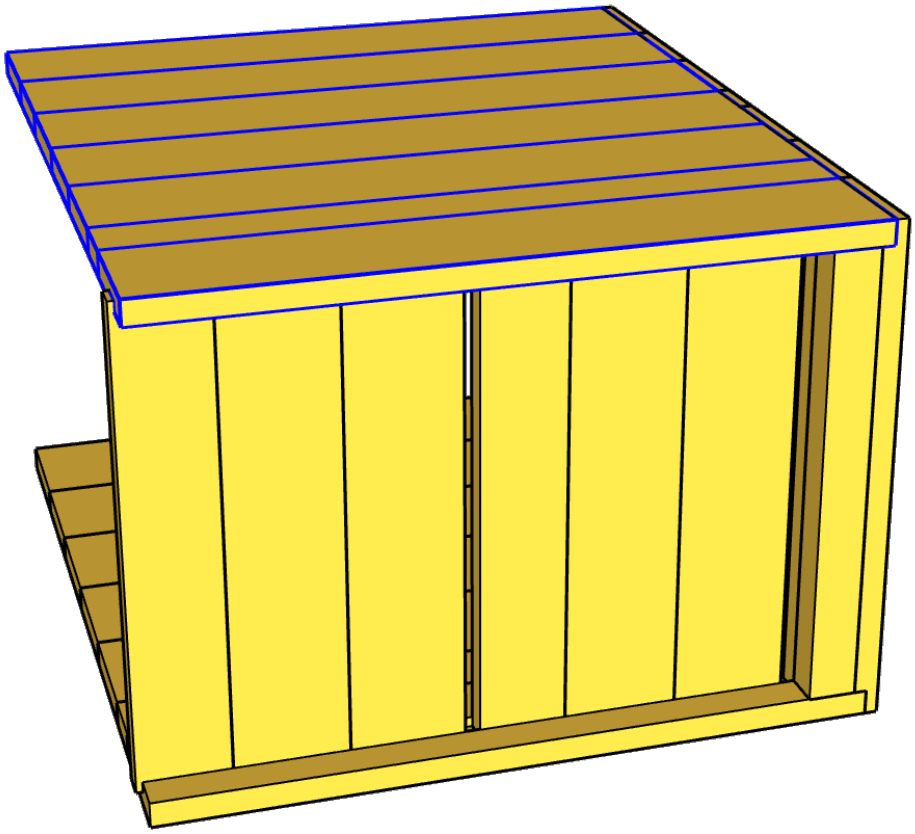


Figure 122 Second side wall added

ADD ROOF AND ISOLATION BOARDS

Add roof and bords to hold the isolation in place. The boards are also the bee entrances.

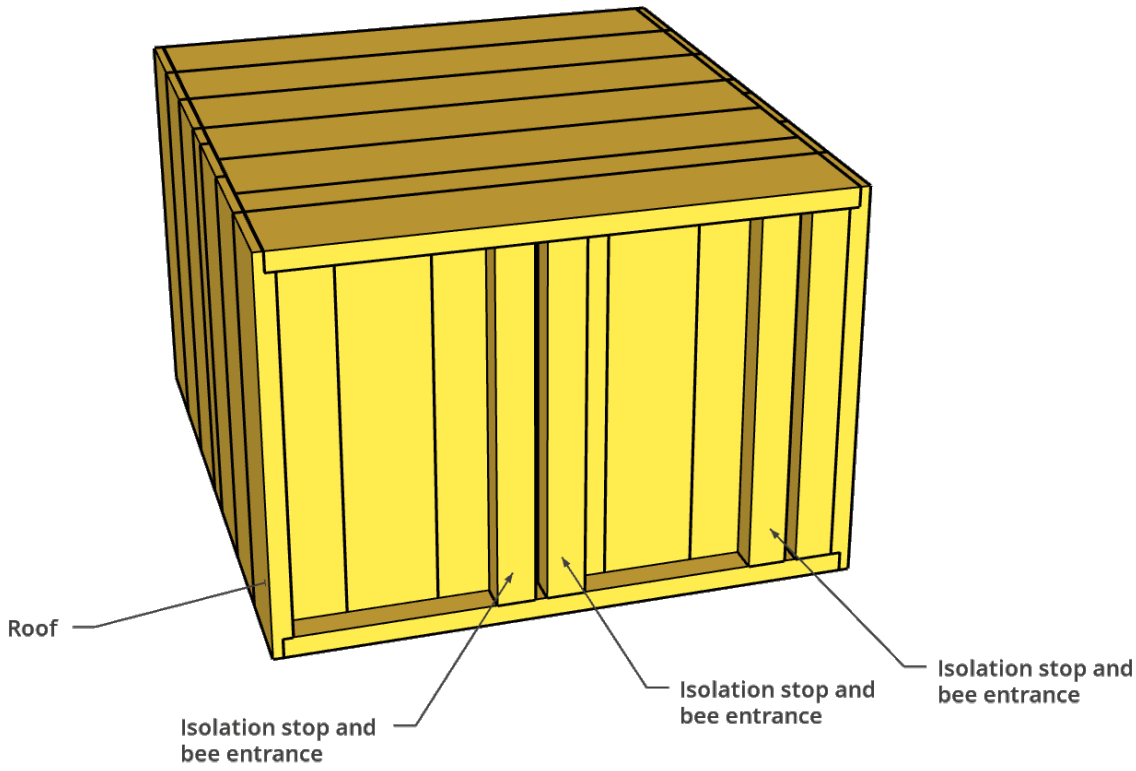


Figure 123 Roof and bee entrance.

ADD ISOLATION

Now when the inner wall is done we add wind protection and isolation.

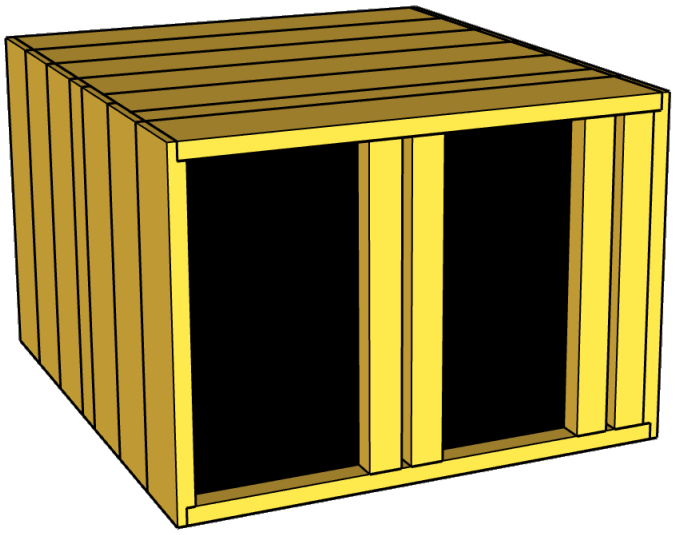


Figure 124 Added wind paper

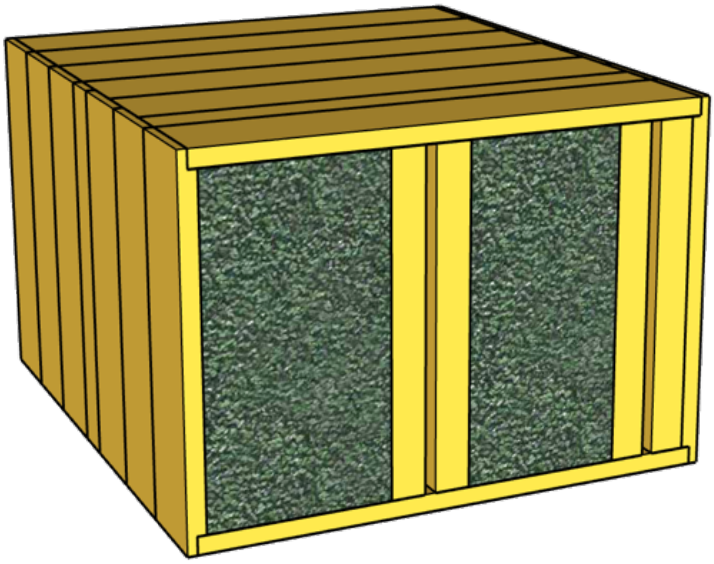


Figure 125 Stone Wool isolation

ADD FRONT WALL

Add the front wall boards.
Leave space 20mm under the front entrance and 60 mm up.

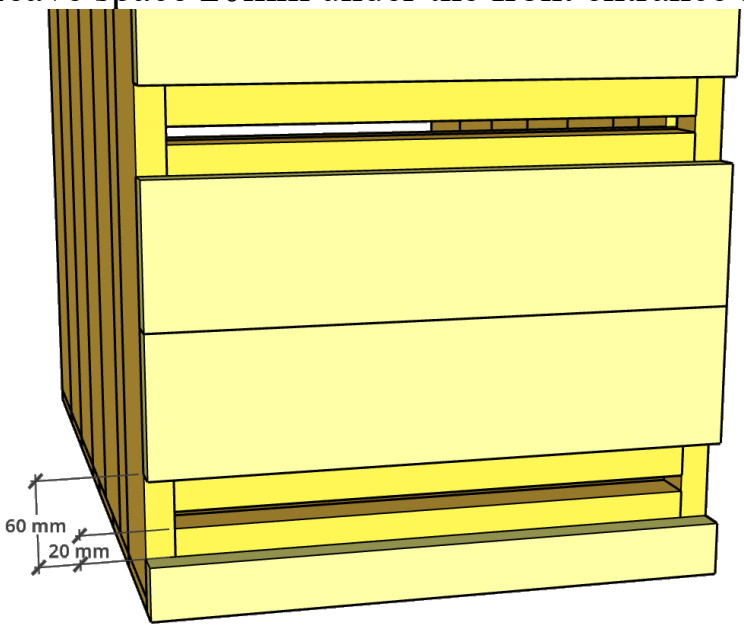


Figure 126 Front wall boards

ADD CLOSABLE ENTRANCE

Use a 412 mm x 40 mm x 20 mm board for the closable entrances. Attach them using hinges.

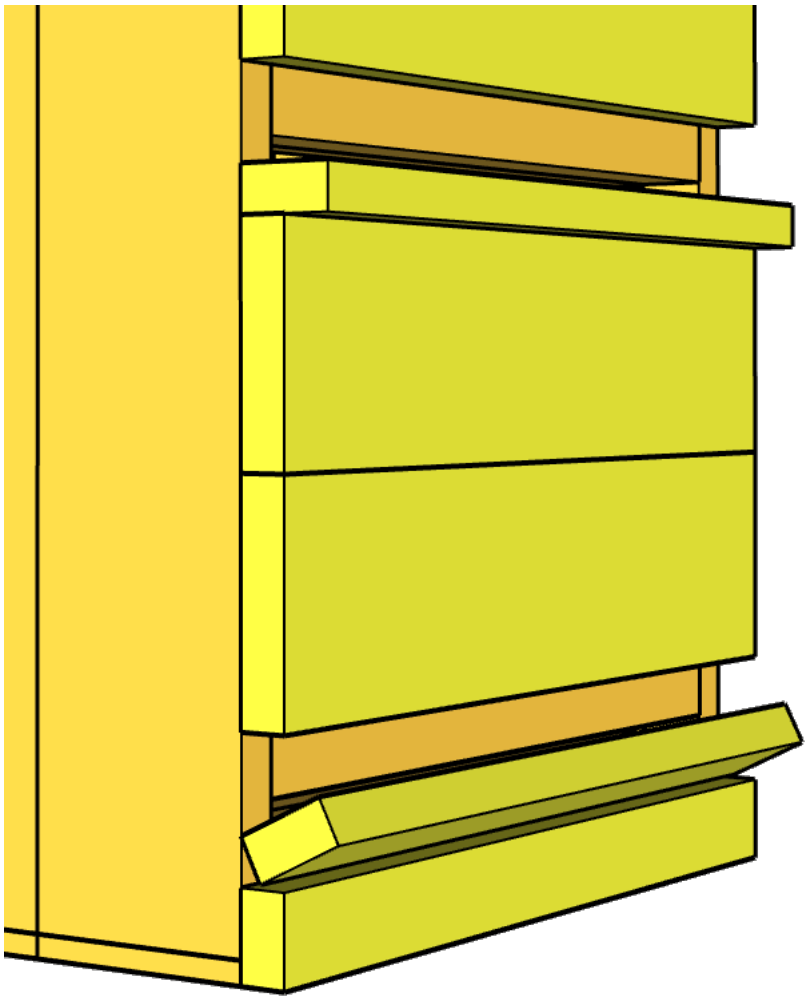


Figure 127 Closable entrances

Add a locking mechanism to secure the entrance during transportation. You can use either a metal lock or a wooden lock that rotates to lock the entrance.

- Place the queen excluders on the shelv.

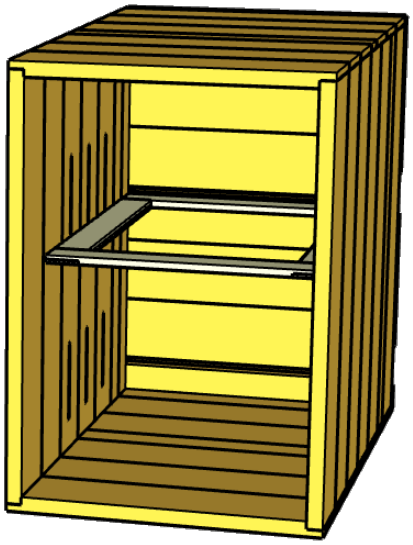


Figure 128 Box with queen excluder

Cut the rods to the correct length. If you made the slots for the rods 8 mm deep, the rods should be 388 mm long. Adjust the length slightly if necessary, depending on the depth of your slots. The main thing is to ensure that the rods are secure and cannot fall out on their own.

Insert the rods into place, ensuring they are secure and cannot fall out by themselves..

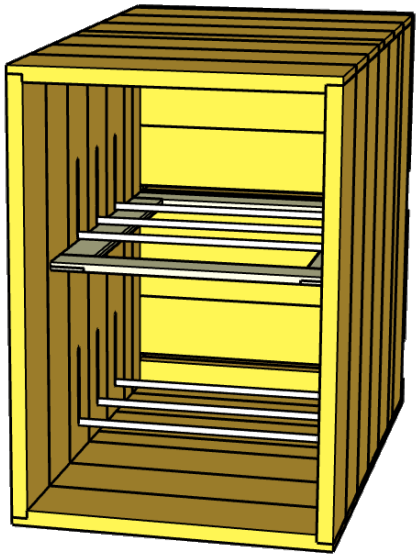


Figure 129 Rods added, check that they cant fall of by them selfs

ADD THE VARROA FLOOR

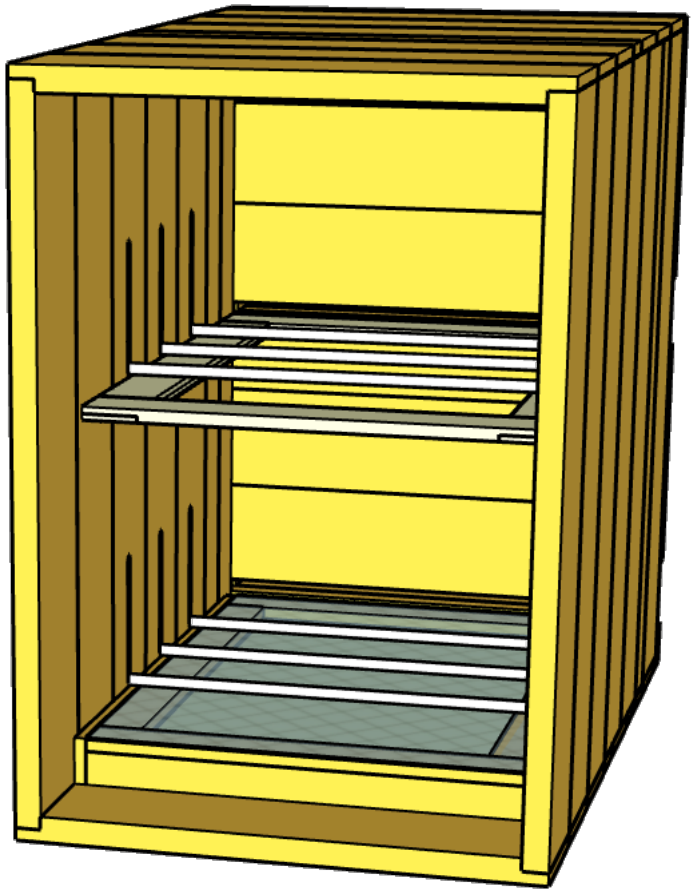


Figure 130 Varroa floor added

Add two bee frame spacers on the inner wall per level, along with corresponding spacers on the inner doors. Add the frames and dry-fit the inner doors. If the doors fit too tightly, you can plane down 1-2 mm on the sides to ensure easier handling later.

Mark where the door locks should be positioned.

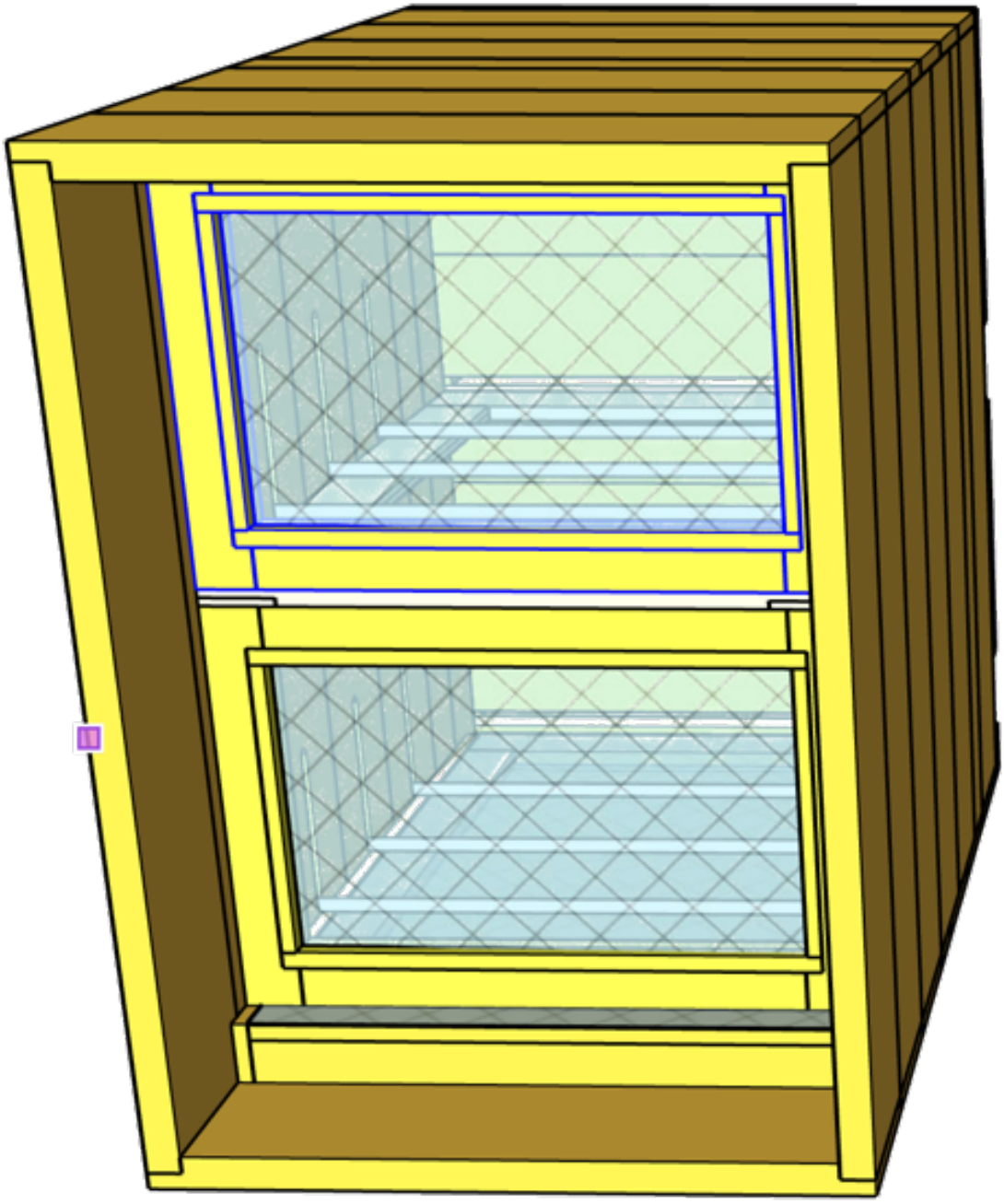


Figure 131 Inner doors added.

For the locks, you can use hatches or rods.

Add the locks and assembly the inner doors again.

ADDING THE OUTER DOOR

Lastly, add the outer door using **lift-off hinges**.

These hinges allow you to remove the door easily without the need to unscrew anything, making it more convenient for inspections or maintenance. Once the hinges are attached, ensure the door is aligned properly and test the lift-off functionality to ensure it operates smoothly.

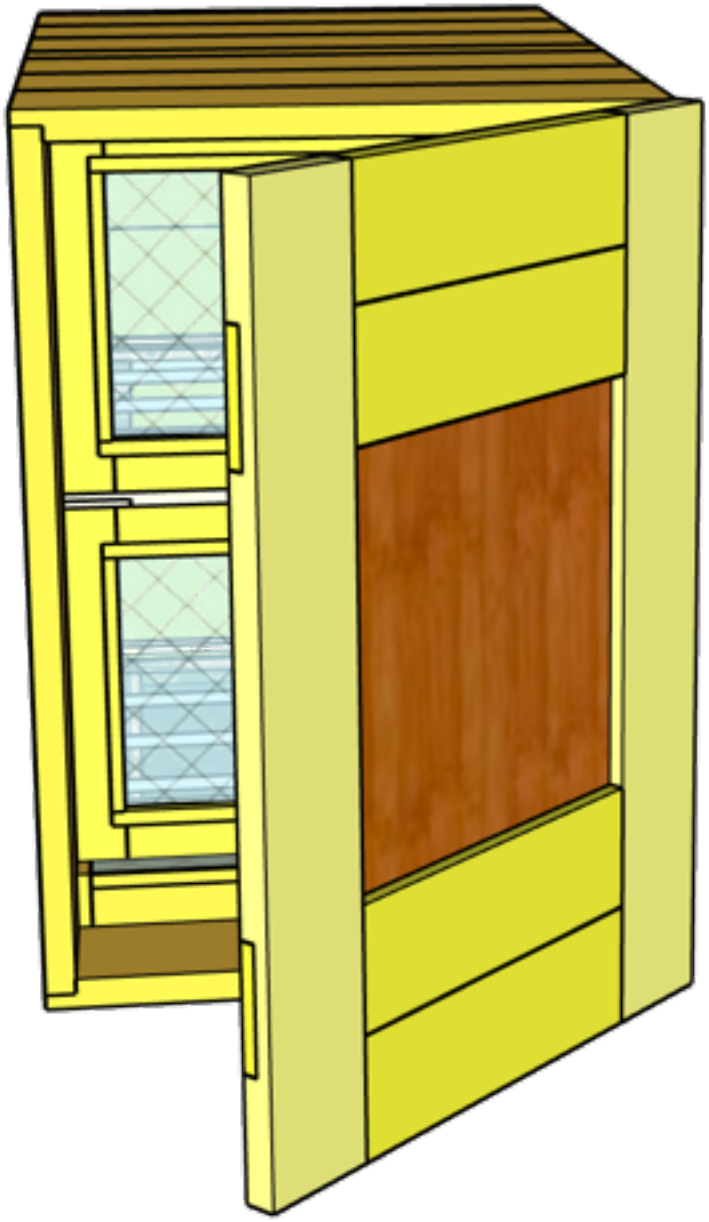


Figure 132 Finished hive

And the hive is finished.

Comprehensive Guide to Building a 2-Level AZ Hive

Preface

This document has been thoughtfully assembled to serve as a complete guide for constructing an AZ beehive. At present, it functions as a theoretical blueprint, and some measurements or instructions may be subject to change. The definitive objective is to produce all the components outlined here and thoroughly verify their accuracy in practice. To support this endeavor, a complementary YouTube series will be produced, documenting the entire build process and providing further instructions for assembling this type of beehive.

Structure of the Document

The guide is organized into two primary sections to enhance accessibility:

- Common Parts: Detailed descriptions of components that are consistent across all AZ beehive types.
- Hive-Specific Parts: Instructions and details specific to certain variations of the hive.

This structure is intended to streamline navigation and help you quickly locate the information pertinent to your specific project.

Supporting This Project

If you find value in these plans and wish to support further development, you are invited to contribute a small amount via PayPal to thomas.arnesen@tega.se. However, please note that this document is completely free to use, and contributions are entirely optional.

Sharing and Updates

The document will evolve over time. To ensure you always have access to the most current version, please utilize and share the link to the original document.

Updates

Date	What	Notes
2024-12-29	A mixup of measurements for the size of the bars of the frames.	Thanks to M Walters

AZ Hive

Introduction

This guide is intended for anyone interested in building an AZ Hive within a home workshop setting. While advanced woodworking tools such as a table saw and planer/moulder can make the process easier, they are not essential. The most crucial aspect is precision; even minor inaccuracies at the start can lead to significant complications during assembly.
The AZ Hive is engineered for straightforward management and maintenance, making it especially suitable for novice beekeepers. Its design reduces disturbances to the bees, fostering stronger and more productive colonies. The hive is intended for placement inside a bee house, which aids in temperature regulation and allows for inspections in almost any weather. Once installed, heavy lifting is minimized, and if kept in a bee house, only the front needs painting.
This guide provides step-by-step instructions for constructing an AZ Hive using basic tools and materials. For compatibility with widely used equipment like honey extractors, Langstroth frame dimensions are employed, though the hive can be modified to accommodate other frame sizes as needed.

Safety Precautions

Woodworking involves inherent risks. To ensure your safety, adhere to the following precautions:

- Wear Protective Gear: Use safety goggles, a dust mask, and properly fitting gloves to protect against injuries.
- Keep Your Workspace Clean: An organized area helps reduce hazards.
- Use Tools Correctly: Consult tool manuals and never bypass safety features.
- Maintain Tools: Ensure all tools are sharp and in good working order.
- Ensure Electrical Safety: Use grounded outlets and check for damaged cords.
- Ventilate Properly: Work in a well-ventilated space to avoid inhaling dust or fumes.
- Secure Your Workpiece: Utilize clamps or vices to hold materials firmly.
- Take Breaks: Rest regularly to maintain alertness.
- Keep a First Aid Kit Handy: Be prepared for minor injuries.
- Stay Focused: Avoid distractions or working under impaired conditions.

Materials Needed

- Lumber
- Nails and screws
- Queen excluder net
- Net for inner doors
- Wood glue
- Hinges
- 8 mm metal rods
- Frame spacers

What We Will Build

- Four types of AZ Hives

- Queen excluder
- Level dividers
- Inner and outer doors
- AZ frames (Langstroth dimensions)
- AZ frames (400 mm high)
- Varroa bottom

Tools Needed

- Minimum:
- Saw
- Router
- Drill
- Metal saw
- Hammer
- Speed square
- Screwdriver
- Measuring tape
- Sandpaper

Good to Have:
Miter Saw (for faster, more precise cuts)
Planer (to avoid needing pre-planed lumber)
Jointer (for perfect 90-degree joints)
Drill Press (for precise drilling)
Luxury:
2 or 4-Sided Moulder (useful for bee frame rabbets and dimensioning boards, but unnecessary if used only for this project)

Frames

Adapting to Langstroth Size

This guide uses Langstroth-sized frames because many beekeepers already possess equipment built for these dimensions. If you prefer a different frame size, you may adjust the measurements accordingly, provided you adapt the hive dimensions as well.

Materials and Precision

Planed lumber is used to achieve precise measurements and a clean finish. While not mandatory, planed lumber is recommended for accuracy. Alternative methods are acceptable provided the correct dimensions are achieved.

AZ Frame Dimensions and Assembly

The standard AZ frame features outer dimensions of 448 mm long and 232 mm high. There are two main assembly methods:

- Left Assembly: Top and bottom bars are each 448 mm long, 20 mm high, and 25 mm wide.

- Right Assembly: Top and bottom bars are each 408 mm long, 20 mm high, and 25 mm wide.

The groove for the wax foundation is 3 mm wide and 6 mm deep. This groove may be created using a table saw, while the U-shaped groove on the top and bottom bars can be made with a router. A multi-headed planer may be used for shaping before cutting to length with a miter saw, though other tools are acceptable.

Side Bars

- Width: 25 mm
- Thickness: 20 mm

If mounting the top bar on the end of the side bars, use a length of 192 mm for the side bars (see Figure 2). If mounting the top bar on the side of the side bars, use a length of 232 mm (see Figure 3).
For the long side bar version, plane a board down to 25 mm, cut to the appropriate length, create the groove on the end with a router, and then cut into 20 mm wide pieces.

Internal Separators

Queen Excluder

The queen excluder is a vital hive component, restricting the queen's movement while allowing worker bees to pass. This assists with brood management and honey storage. Both queen excluders and bee space dividers are required for the hive.
Queen excluders can be made of metal, plastic, or wood. While plastic and wood are more economical, metal excluders are preferable for their durability and perceived benefits to bee health. This guide is based on the use of metal queen excluders.

Building the Queen Excluder Frame

- 2 pieces: 10 mm x 45 mm x 372 mm
- 2 pieces: 10 mm x 45 mm x 485 mm

At both ends of each board, cut a rabbet 5 mm deep and 45 mm wide using a router. Cut a 10 mm deep, 3 mm wide groove along the inside edge to hold the queen excluder mesh.
Glue the boards together, aligning the rabbets accurately to form a square frame. Insert a metal queen excluder mesh into the frame. Each hive requires one queen excluder.

Bee Space Divider

Purpose

The bee space divider maintains the correct bee space between hive levels where a queen excluder is not present. It also provides a resting place for the inner door, preventing the bee space from becoming too large.

Materials

- Left and Right Long Boards (2 pieces): Form the outer edges of the divider
- Inner Long Boards (8 pieces): Placed parallel to one another between the edges
- End Boards (2 pieces): Secure the structure at both ends

Assembly Instructions

- Preparing the Boards: Cut slots in the long and end boards to hold the inner boards, using a router or a table saw with a dado stack. Take extra care as the boards are thin.

- Assembling the Divider: Apply wood glue to the slots of the long boards. Insert and evenly space the inner boards within the slots. Attach the end boards to secure the structure. Allow the glue to dry thoroughly before using.

Bottom Inner Floor and Varroa Floor

Varroa Floor

Varroa destructor mites are a major threat to honeybee colonies. The varroa floor is designed to monitor and manage infestations by enabling observation of mite populations and facilitating timely treatment.

Construction Steps

- Create a planed sideboard: 490 mm long, 38 mm wide, 20 mm thick.
- Make a 20 mm wide, 10 mm deep rabbet at one end of the sideboard.
- On each side, cut mirrored rabbets (one 10 mm wide, the other 12 mm wide, both 10 mm deep).
- Prepare a backend board: 350 mm long, 28 mm wide, 20 mm high.
- Prepare two top boards: one 350 mm x 35 mm x 10 mm, the other 420 mm x 35 mm x 10 mm, to support the varroa mesh.
- Purchase mesh (3–4 mm size), cut to around 390 mm x 530 mm.
- Glue and nail the backend board to the sideboards, positioning the 12 mm rabbet at the bottom.
- Dry fit the top boards, leaving them unfastened until the mesh is added.
- Attach the mesh with a 20 mm overlap around the top boards, gluing and nailing one side first for stability.
- Construct the bottom board from 10 mm plywood.
- Make a handle for the bottom board, optionally adding a groove for grip.
- Glue and screw the handle to the bottom board, predrilling holes to prevent splitting.

Once assembled, the varroa floor should provide a functional base for monitoring mite infestation.

Roof and Bottom

The roof and bottom construction is uniform across all hive types described. Gather six boards (each 100 mm wide, 20 mm thick, 412 mm long) and one board (50 mm wide, 20 mm thick, 412 mm long).

- Assemble the Panel: Glue the seven boards together to form a panel measuring 412 mm x 650 mm.
- Route the Rabbet on Long Sides: Use a router to create a 20 mm wide, 10 mm deep rabbet along both long sides of the panel.
- Create Rabbet for Inner Wall: On one short side, create a 20 mm wide rabbet, 10 mm deep, set 30 mm from the edge. This will accommodate the hive's inner wall.

Inner Door (Normal)

Each hive level includes an inner door with a screen, enabling access to individual levels without major disturbance to the rest of the hive. This design allows inspection via the back door without exposing the entire colony.

The door dimensions are 250 mm high and 372 mm wide. Adjust the size as needed to prevent the door from sticking due to wood expansion.
While router contraprofiles may be used, this guide employs the simpler half-lap joinery method as used for the queen excluder.

Materials Needed

- Two boards: 250 mm x 35 mm x 20 mm
- Two boards: 372 mm x 35 mm x 20 mm
- 1–3 mm metallic mesh
- Prepare the Boards: Rip and plane to 35 mm x 20 mm, then cut to length.
- Create Half-Lap Joints: Route a rabbet on each end of the short boards, then repeat for the long boards.
- Assemble the Frame: Glue the boards to form a rectangle, ensuring it is square by measuring diagonals.
- Rout Rabbet for Mesh: Use a router to create a 10 mm wide, 10 mm deep rabbet inside the frame.
- Prepare the Mesh: Cut a metallic mesh to approximately 220 mm x 340 mm with 1–3 mm holes.
- Attach the Mesh: Place the mesh on the frame and secure it using 9 mm x 10 mm strips glued in place.
- Optional: Add a knob for easier handling if desired.

Inner Wall

For the inner wall, use boards measuring 388 mm long, 100 mm wide, and 20 mm thick. These boards fit into 20 mm x 20 mm slots on the side walls. Trim the boards as needed for a perfect fit, adjusting the thickness if necessary to ensure a snug but not overly tight fit.

Front Wall

Use boards sized 412 mm long, 100 mm wide, and 20 mm thick for the front wall. Split boards where needed for a precise fit. The front wall supports the overall structure of the hive.

Isolation

For insulation between inner and outer walls, use 30 mm Stone Wool, which deters ants and pests. Cut the Stone Wool precisely to fit, and add wind protection paper inside for extra insulation.

AZ-Hive: 2 Levels

Side Planks

Each side is 568 mm high (including 2x10 mm for the roof and bottom), about 670 mm deep (including 20 mm for the front boards), and 20 mm thick. Use 100 mm wide, 20 mm thick boards cut to 568 mm. Split the last board in two for two equal pieces, approximately 50 mm wide.

On the first board adjacent to the front, rout a groove for the inner wall. Space for 30 mm insulation will be added between the inner and outer walls.
The second board is made by halving a 100 mm board.
Prepare six boards with 10 mm wide, 8 mm deep slots using a router. Slots should be 100 mm long to allow for the insertion and removal of rods.

Back Door

For the back door frame, use hardwood such as birch, and birch plywood for the panel.

- Side Frames: Two planed boards, each 588 mm x 80 mm x 20 mm
- Top and Bottom Frames: Two planed boards, each 412 mm x 80 mm x 20 mm

Cut 80 mm wide, 10 mm deep rabbets on each end of the short boards. On the long boards, create 80 mm wide rabbets, positioned 80 mm from the end.
Glue the boards to form the frame, checking diagonals to ensure squareness. Rout a 10 mm wide, 10 mm deep rabbet along the inner edge to hold the door panel. Cut a panel from 6–10 mm birch or other plywood to fit inside (288 x 272 x 8 mm), and glue and nail it in place.

Ventilation Openings

- Two boards, each 252 mm x 80 mm x 20 mm, for adjustable ventilation openings

Cut to size, attach with hinges for adjustability, and consider adding magnets to the lower ventilation board for easier operation. After assembly, mount the door onto the hive, ensuring correct alignment and functionality.

Assembly

Sides

Assemble the sides as shown in the accompanying diagrams. Place the 50 mm board as the second board to properly position the rod slots. Add shelves with angle irons 12 mm below the rod rest for queen excluders and false queen excluders (excluding the bottom row).

Add the Bottom

Nail the bottom to the assembly for a secure base.

Add the First Inner Wall Board

Split an inner wall board to 38 mm wide and attach it to the inner slot, fixing with a couple of nails from the bottom for added stability if necessary.

Add Entrance Bit

Cut a board to 38 mm x 30 mm x 372 mm and place it between the inner wall and the lowest entrance. Secure with nails or screws, predrilling holes for fasteners.

Add More Inner Wall Boards

Insert a 12 mm wooden spacer for the bee entrance before adding the next inner wall board. You can cut a 12 mm strip from a 20 mm thick board and shorten as needed. Continue adding inner wall boards up to the next entrance, positioning the entrance about 2 mm below the bottom edge of the second level’s rod slots.

Add the Rest of the Inner Wall
Add another 12 mm spacer and the remaining inner wall boards. Fasten the inner wall boards above the entrances with a nail. The last inner board should be cut 5 mm above the side board to fit into the roof rabbet, but should not fill the rabbet completely to accommodate wood movement.

Add the Other Side Wall
With the inner wall boards in place, attach the second side wall. Some adjustment may be needed to fit the boards into the rabbet. Secure with nails from the bottom and one nail above the entrances.

Add Roof and Isolation Boards
Attach the roof and boards that hold the insulation in place. These boards also function as bee entrances.

Add Isolation
Install wind protection and Stone Wool insulation once the inner wall is complete.

Add Front Wall
Install the front wall boards, leaving a 20 mm space under the front entrance and 60 mm above it.

Add Closable Entrance
Use a 412 mm x 40 mm x 20 mm board for the closable entrance, attaching it with hinges. Add a locking mechanism for secure transportation, using either a metal or wooden rotating lock.

Install Queen Excluders and Rods
Place the queen excluders on the shelf. Cut rods to the correct length (388 mm if slots are 8 mm deep, adjusting as needed). Insert rods, ensuring they are secure and cannot fall out on their own.

Add the Varroa Floor
Install the varroa floor in the bottom of the hive.

Add Frame Spacers and Inner Doors
Attach two bee frame spacers per level to the inner wall and corresponding spacers to the inner doors. Insert the frames and dry-fit the inner doors, planing down the sides if necessary for a proper fit. Mark and install door locks as needed.

Adding the Outer Door
Attach the outer door using lift-off hinges for easy removal during inspections or maintenance. Ensure proper alignment and test the lift-off function.

Once all components are assembled and properly aligned, your AZ Hive is complete and ready for use.