Grocery crate bee hive

Version 2 – 10 June 2013

Introduction

I'm a beginner beekeeper in Gelderland in the Netherlands.

After I bought a foldable grocery crate from the C1000 supermarket to store my beekeeping equipment in, I was surprised to discover two things: 1. the crate that is currently on sale is smaller than the one I bought last year, and 2. this new smaller sized crate is almost exactly the same size as a Dutch simplex-sized brood chamber frame.

The newer size foldable crate from C1000 supermarket, with a single Dutch simplex-size brood chamber frame

This made me wonder whether one can easily and cheaply modify the crate for use as a brood chamber. I calculated the sizes and materials necessary to do that, and asked for opinions on two beekeeping forums on the internet (one in Holland and one in the UK).

I'm not particularly good at handicraft, and I don't own the equipment capable of sawing pieces of wood to precise measurements. So if this crate hive is to succeed, it would have to be made from materials that can be sawn by the hardware store, or cut by myself using low-tech but reasonably precise methods.

In the first version of this document I proposed using a combination of hardboard and polystyrene (styrofoam). I chose hardboard simply because it comes in various thicknesses that can be combined to fill up the spaces in the crate. However, it later occurred to me that one can cut styrofoam sheets using a hot wire quite easily and precisely, and so my current proposal is for using only styrofoam inside the crate, and hardboard only for such elements as the bottom board and the lid.

Comparison between frame and crate

The simplex frame is 435 mm long, and the crate's inner length is 450 mm. This means that there is 7.5 mm of room on either side of the frame, when placed in the crate.

The simplex frame is 220 mm high, and the crate's inner height is a tad more than 235 mm. This means that there is about 15 mm of total play above or below the frame (e.g. 9 mm at the bottom and 6 mm at the top).

The simplex frame is 22 mm wide, but the frame distance used in most hives that use these frames is 35 mm. Beespace is assumed 9 mm. This means that one can fit 8 frames into the crate, with 15 mm of space on either side to be filled with filling material.

The simplex frame is made of 10 mm thick wood, and the frame ears are 40 mm long. If the frame is centred in the crate, then the frame sides are about 45 mm from the crate wall. If we subtract bee space of 9 mm, it means that 36 mm of space must be filled with filling material.

The inner dimensions of the crate are 450 mm (w) x 320 mm (d) x 235 mm (h). The outside dimensions are 480 mm x 350 mm. The crates can be stacked.

Available materials

At the local hardware store (Gamma), the following products are available:

* Styrofoam ("polystyreen isolatieplaat"), 20 mm: 1000 mm x 500 mm x 12 sheets = EUR 8.00
* Styrofoam ("polystyreen isolatieplaat"), 40 mm: 1000 mm x 500 mm x 6 sheets = EUR 8.00
* Styrofoam ("polystyreen isolatieplaat"), 50 mm: 1000 mm x 500 mm x 5 sheets = EUR 8.00

* Hardboard ("MDF plaat"), 8 mm: 1220 x 610 mm = EUR 5.50; 2440 x 1220 mm = EUR 11.00
* Hardboard ("MDF plaat"), 12 mm: 1220 x 610 mm = EUR 6.50; 2440 x 1220 mm = EUR 14.50
* Hardboard ("MDF plaat"), 18 mm: 1220 x 610 mm = EUR 9.00; 2440 x 1220 mm = EUR 21.00

The crate itself costs EUR 7.00 at the grocery store.

Description of design

Boxes:

The space between the crate wall and the frames can be filled with styrofoam that has been cut to size using a home-made hot wire. To protect the bees from the styrofoam, and vice versa, the styrofoam can be wrapped in tablecloth plastic. One would essentially need four "blocks" of styrofoam on the inside of the crate. Some of the holes in the crate would be extended through the styrofoam to act as flying holes for the bees.

Roof:

A piece of styrofoam as large as the crate's inner dimensions can be laid on top of the top crate, followed by a roof made from hardboard. Alternatively, it has been suggested to make the roof from aluminium sheeting.

Tray:

If more than one crate is used, and if all crates are converted in the same way, then one would need to build a separate bottom board with wire mesh to protect the bees from below. My idea for a tray is that it is made from a hardboard bottom, with walls of styrofoam on three sides, on which the crates come to rest. Wire mesh can be stretched across the top of the tray.

Possible issues with this design

1. With this design, there is no extra materials between the tips of the ears of the frames and the crate wall, but it may be an idea to attach a thin strip of styrofoam or wood at the height of the frame ears against the crate wall, to keep the bees away from the crate wall and to give the frames a more snug fit.)

2. A potential problem is that the space between the frames in two stacked boxes would be 16 mm, which is quite a bit more than beespace, though one solution to this would be to attach strips of wood on top of the frames themselves to increase their height.

3. It may also be prudent to glue the holes of the crate flush to the styrofoam, to prevent little critters from making the cavities their home.

4. If one wants to stack crates, one must also make sure that the "feet" of the top crate can actually fit into the bottom crate. This shouldn't be a problem if only styrofoam is used inside the crate, because the styrofoam would "give way" a bit.

Dimensions of individual pieces

Inner wall, long side
2 x 235 mm (h) x 450 mm (w) x 15 mm (d) (styrofoam)

Inner wall, short side
2 x 216 mm (h) x 290 mm (w) x 36 mm (d) (styrofoam)

Optional strip next to frame ears
2 x 19 mm (h) x 290 mm (w) x 7.5 mm (d) (styrofoam, wood, plastic etc)

Lid (e.g. 8 mm hardboard)
Flat portion: 490 mm x 360 mm
Long sides (x2): 490 mm x 50 mm
Short sides (x2): 360 mm x 50 mm

Top board (e.g. 20 mm styrofoam)
Flat portion: 480 mm x 350 mm
Optionally strip of styrofoam all around, to create space between it and the lid

Tray
Flat portion: 490 mm x 360 mm (hardboard)
Long sides (x2): 490 mm x 50 mm (styrofoam, e.g. 20 mm)
Front side (x1): 360 mm x 50 mm (styrofoam, e.g. 20 mm)
Rear side (x1): 360 mm x 40 mm (styrofoam, e.g. 20 mm)
Wire mesh to cover it: 490 mm x 360 mm

Other
Paint, glue, plastic sheeting, etc.

Possible cost

1 x hardboard, 8 mm: 1220 x 610 mm = 1 x EUR 5.50
1 x styrofoam, 20 mm: 1000 mm x 500 mm x 12 sheets = EUR 8.00
optional: 1 x styrofoam, 40 mm: 1000 mm x 500 mm x 6 sheets = EUR 8.00
1 x crate = EUR 7.00
Total excluding other: EUR 20.50

Samuel Murray, June 2013