INLAND WOODWORKERS
ASSOCIATION

Q-Bert 3D cutting board process

January 7, 2020

Photo 1 – finished board

Grain descriptions:

There are 3 types of cutting boards: end-grain, edge grain and face/flat grain. All three types of grain are present on any board. This example uses 8" wide by 3/4" thick by 24" long boards. On these boards the flat grain shows when you look down at the board lying flat on the 24"x8" side. The edge grain shows when the board is standing on the 24"x¾" edge with the 8" side up. The end grain shows when the board is standing on the 8"x¾"edge. Each type of board is made. Based on the amount of work required flat grain tend to be the least expensive, edge grain next and end grain the most expensive.

Number of glue joints and glue ups:

Flat grain board has the fewest glue joints with 1 joint per board with fewer boards needed with 2" to 3" strips with all glue joints in the same direction.

Edge grain has the most glue joints since ¾" strips are glued together to make the same width with all glue joints in the same direction.

End grain boards have the most glue joints since they start with an edge grain board with the then cut into strips of the desired thickness of the finished boards when are then turned on edge with the end grain up and glue together again.

This cube board has an additional glue up to create the strips used for the flat grain glue up.

Materials: This project requires 4 pieces of wood of 3 different species. Almost any closed/dense cored hardwood can be used. The most common are Cherry, Walnut and Maple (used here). This board requires 1 each of ¾"x8"x24" Walnut and Cherry and 4 of 3/8"x8" x24" Maple

Titebond 3 is recommended for the extended open time and for being water proof. Food grade mineral oil and a bee's wax mineral oil mix are needed for the finish on the boards.

Glue Up 1

Glue ups are made with 2 maple and 1 "color" strip. The "color" is sandwiched between the 2 maple strips.

Because the edges are cut at a 60 degree angle you could use 7 ½" maple stripes aligned to opposite edges of the "color" pieces, (this is shown in the photo below in a couple of locations).

The photo 1 below shows a glue of 4 sets to make 2 boards. There is a diagram of the glue and cutting layout at the end of this document.

The individual glue ups are number 1, 2, 3 and 4.

The Walnut is labeled "W" and the Cherry with "C".

The X's show where there is no glue applied

Photo 2 – Glue Up #1

The Angled cuts

True up one edge of each glue up so that the bottom maple and middle color are aligned. This will be the reference edge that is placed again the rip fence for the first angled cuts.

I made an offset short fence to allow clearance between the blade and the rip fence for safety and clearance since only the lower edge of the piece will be in contact with the fence and to allow the blade to actually touch the lower edge of the fence.

Set the blade angle to 60 degrees from the table or 30 degrees from vertical. If you have a digital angle gauge place it on the surface of the table saw and "zero" it out. Then place the angle gauge on the blade (it should read 90) and tilt the blade until the gauge reads 60 degrees. My saw tends to gain or lose .1" as the tilt angle lock is tightened so watch for this as you tighten the angel lock.

Photo 3 Fence ready to cut the strips

Photo 3 shows the fence positioned to cut the strips. For the first cut the fence is just touching the edge of the blade. Photo 4 shows the angled cut shows a red vertical line and 2 green angled lines. The fence is set so that the edge of the blade aligns with the red line.

Cut both blanks into strips. You should get 7 strips each out of the 8" blanks.

Squaring cuts

The next step is to square off the edges of the angled strips to prepare for the next glue up.

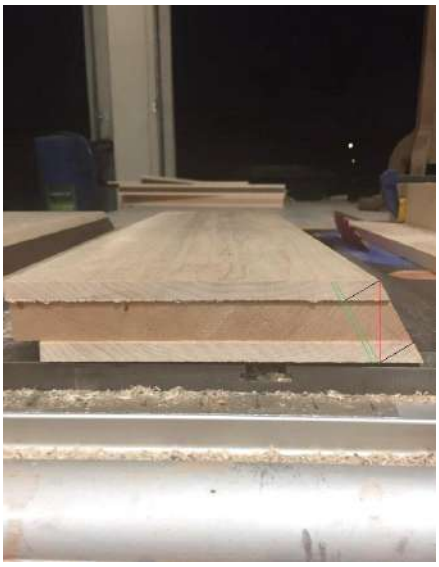


Photo 4 - First edge cut. *Notice the bottom maple piece does not align with the edge of the cherry*

Photo 5 – setup for initial squaring cut.

Return the saw blade to 90 degrees for all remaining cuts.

Reference the 2 black lines in Photo 3 to identify the location of the cuts.

For the first cut on each strip align the strip as shown with the angles point down and touching the fence (photo 5). Cut all strips with this initial set up (14 strips per board using the initial dimensions)

For the second cut set place a strip on the saw with the square edge against the fence and the wide angled edge down. Using this orientation, this cut is right at the color/maple joint.

Glue up 2

The arrangement of the strips for this glue up is critical.

There are 2 "rules" to follow:
Color touches the opposite color
The 2 outer strips must be opposite colors.

Photo 6 – strip arrangement for glue up 2

The easiest way to do this glue up is to use glue stand offs to support the strips to allow clamps to be added above and below the panel. These stand offs are just a vertical strip about 4" tall connected to a 4" wide strip in the middle to make a T shape (this is visible in Photo 7 below). Some videos I saw used large PVC pipe for these standoffs.

Lay the strips across the stands offs and the roll every strip except the first one on edge away from you. Push the strips (now on edge) together against the last strip. This will allow you to apply the glue to the strips in mass (or groups of 4 or 5 strips at a time). Once the glue is applied, rotate the strips forward and pull then to the front against the strip in front of them. Since there is only glue on one side of each joint rub the strips back and forth to spread the glue and help the glue to grab the "dry" side of the joint.

To help keep the panel flat, I added cross cauls to help keep the panel flat. Only very small amounts of material can be removed after glue without altering the final pattern of the board. Use whatever panel glue up techniques and squeeze out clean up you are familiar with.

Photo 7 – side view of glue up 2

Cut final strips

Once the glue has cured and the squeeze out taken care of, square up one end of the panel. You will now cross cut the panel across the strips into strips for the final glue up. The width of these strips will be the close to the final thickness of the board. I cut these at 1 ½" strong (+ 1/32 or so) to allow for some final clean up and maintain a 1 ½" final thickness.

Final Glue Up

Photo 8 – initial final strip arrangement

This is the most difficult step to create the pattern.

Arrange the strips on edge as shown in Photo 8.

Starting on either side take every 2nd strip and flip it end for end the long way and then rotate it the short way top to bottom. Make sure the "color" edges touch "color" edges of the other color. In the panel in Photo 9 the 4 strips on the left still need to the last top to bottom rotation. Double and triple check with process as the optical illusion really comes into play.

Photo 9 – final strip arrangement after strip flips. The 4 strips on the left are not arranged correctly

Photo 10 – Strips rotated for final glue up

As with Glue up 2, rotate the strips away from you starting at the back. This is another opportunity to verify the arrangement of the strips. The pattern should look like Photo 10. This will allow you to apply the glue to the strips in mass (or groups of 4 or 5 strips at a time). Once the glue is applied, rotate the strips forward and pull then to the front against the strip in front of them. Since there is only glue on one side of each joint rub the strips back and forth to spread the glue and help the glue to grab the "dry" side of the joint.

Finish prep

Once the glue squeeze out has been cleaned up the board should be smoothed and flattened. The ideal is a wide belt sander, but I don't have one of those and planed my boards. There is controversy about planning end-grain. But it can be done if you take very small passes no deeper that 1/64 of an inch or so and plane across the last glue lines.

Once the final surface clean-up was done, I sanded to 180 grit and used a 1/16" round over bit on all the edges and corners and then sanded with 220 grit.

Finish

I used a 3 step 2 product finish process on my boards.

Step 1 Rub food grade mineral oil on the boards and allow it to soak into the board. The board will look dry when it has soaked in the mineral coats. I repeated this twice per board.

Step 2 Repeat Step 1 after 24 hours have passed.

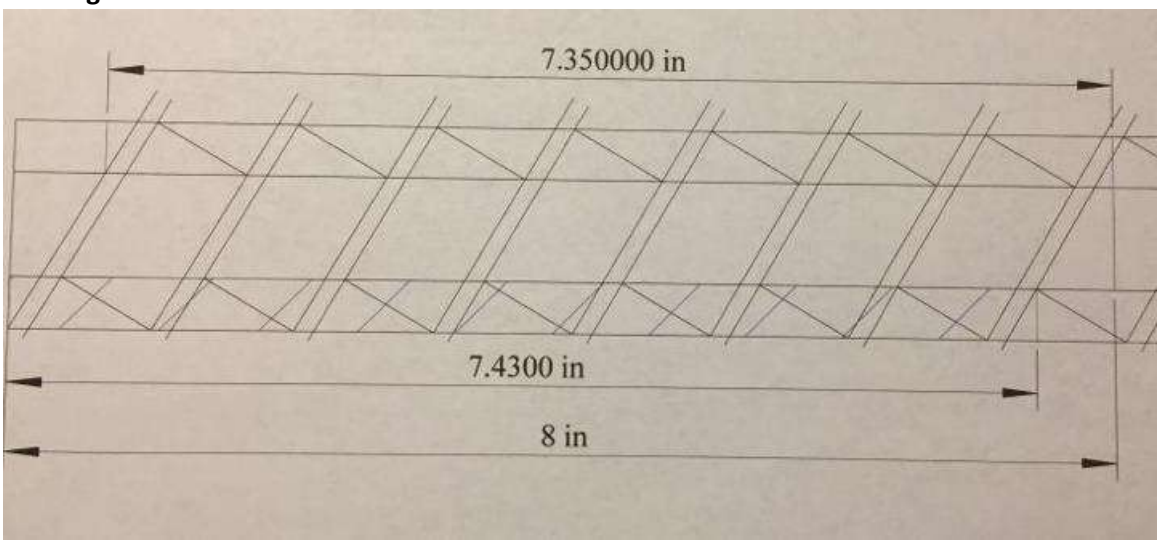
Step 3 Repeat Step 1 after 24 hours have passed

Step 4 Rub boards with a Beeswax Mineral oil blend 2 twice buffing after the second coat.

Video Resources

Many videos can be found on YouTube by searching '3D cutting boards' or 'MTM woodworking'. Many of the videos I found mentions something like, "I saw a video from MTM and had to try it for myself".

Drawing of the blank.



Building an Optical Illusion End Grain Cutting Board

by Bob Chambers and Keith Bryan

Building this cutting board is not hard, but it requires accuracy. The plan is freely downloadable from mtmwood.com, although you will need to register on the website in order to **download the plan**.

There are many other plans you can download as well. Some are free, others are not.

The plan is very detailed, and is an excellent instructional with all of the information you need to successfully build this board. As a bonus you can also download a Sketchup model of the cutting board. This is important because the plan is in metric dimensions, and Sketchup will let you convert to imperial measurements with whatever granularity you require. We converted to the nearest 1/16". If you want to work in millimeters then no conversion is necessary.

We built these boards with hard maple and black walnut, but you can use other woods as long as there is a distinctive color difference. Our stock was rough 8/4 so we planed all of it to 1 3/4". We also had to establish a clean edge using a jointer.

Once the stock was milled we cut 30" strips according to the plan on the table saw. 42 strips were cut, so there was a considerable amount of waste just due to the blade kerf. Plan to lose about 5" of board width when making these cuts. Oversize a little to allow planing of each strip. It's very critical that all strips of the same size be planed to exactly the same thickness. As we planed the strips we marked the thickness on each with pink chalk so that it would show up well on both the light and dark wood. Don't use a Sharpie because it will soak into the wood and may be visible later.

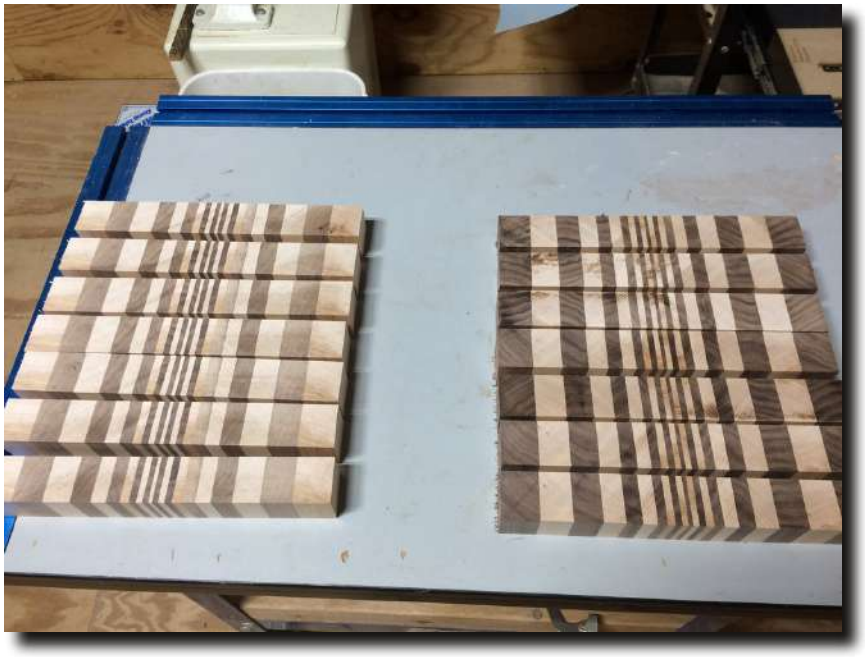
Once the strips are cut and planed we glued them up into panels (Figures 1 and 2) using Titebond III (waterproof). Note that these panels are color opposites of each other.

(Figure 1)

(Figure 2)

After the glue dried overnight we cleaned them up by planing each panel to the same thickness. This required a 13" planer.

We then cut a number of 1 3/4" strips from each of these panels (Figure 3). This dimension will determine the thickness of the cutting board.

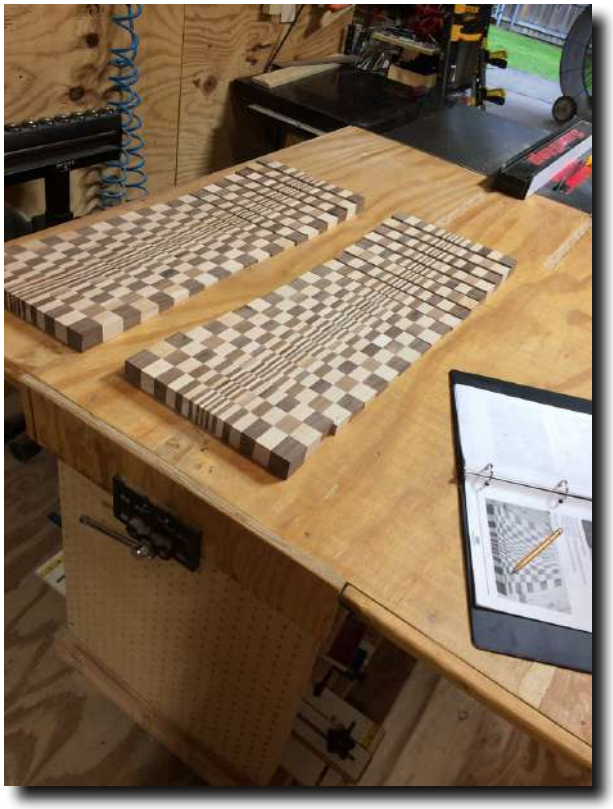


(Figure 3)

These strips are rotated 90 degrees so that the end grain is facing upward. Strips of varying thickness were cut from these blanks as per the plan. (Figure 4)

(Figure 4)

Here are the strips laid out for two boards (Figure 5). You can see the different thicknesses.

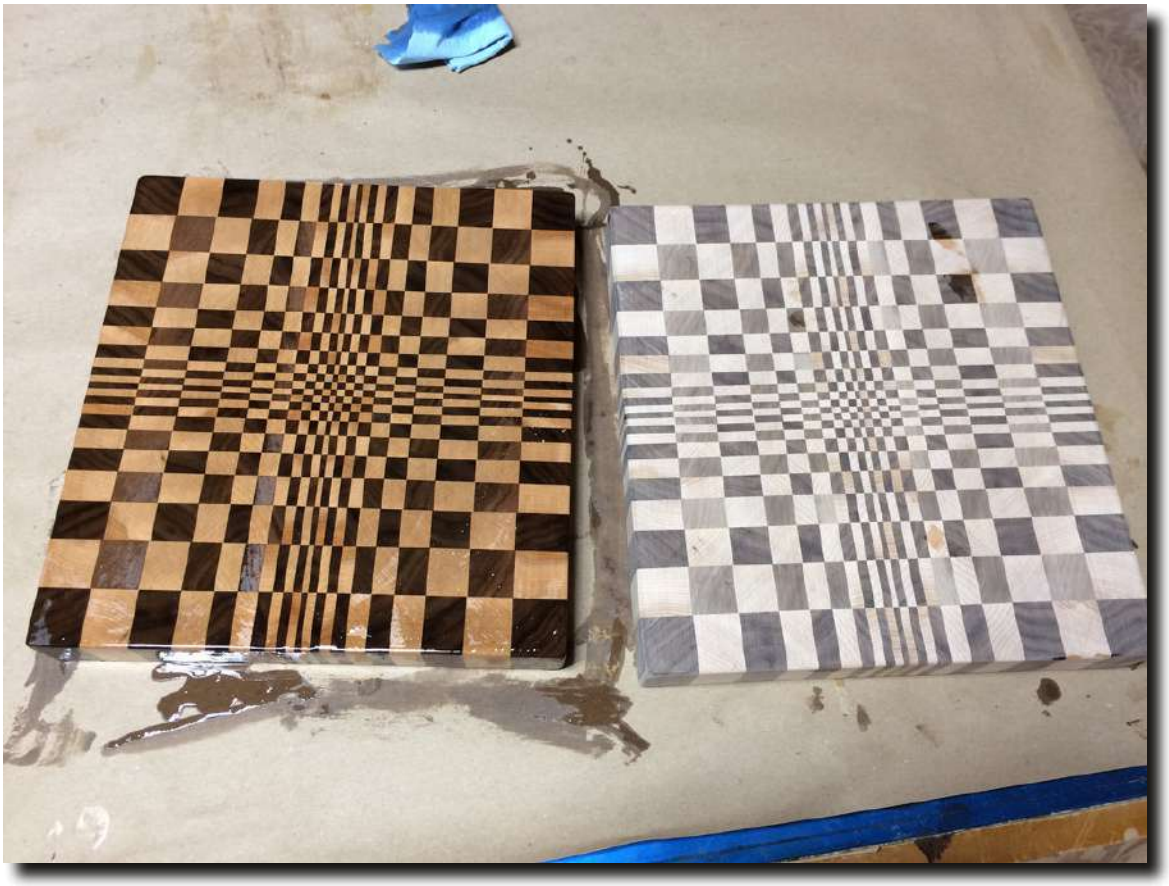


(Figure 5)

These strips were assembled in the proper order, glued, and clamped (Figure 6). Panel clamps help keep it flat.

(Figure 6)

After drying overnight the cutting boards were run through a drum sander, then sanded again with an orbital sander using 320 grit. Corners were eased with the orbital sander. After sanding the boards were finished with mineral oil, which is the traditional cutting board finish (Figure 7).



(Figure 7)

If you're interested in building a cutting board like this please go to mtmwood.com to get the plan. Again, it's excellent and very detailed.