**HOW TO MAKE A STAVE BOX**

There are several different ways to make a stave box. I will cover several of those ways. First, we need to make several decisions;

 1. what diameter box do we want to make

 2. how tall do we want the box

 3. how many staves do we want to use

 4. how thick do we want the box to end up

For our purposes, I will assume we will be making a box 6 ½” tall, 6 ½” diameter and about ¼” thick. This should give us a finishes box about 6”x6”x1/2 to1/4” thick. How many staves??? This will depend on what method you produce the staves as well as personal preference.

Let’s talk about methods of stave production. Basically, there are 2 methods of making staves; one is the table saw, the other is using a router, preferrably in a router table.

How many staves do we want? This depend on the method of fabrication and your personal preference. If you are using the table saw to make the staves, you can make the number of staves any number you like, within the bounds of the angle your saw blade will tilt to make the stave angle. If you are using the router you are limited to the angle of available bits. LEE VALLEY sells bird mouth router bits that will make staves for 6,8,12 and 16 sides. MLCS sells a lock miter router bit at 22 ½ degree which will make an 8 sided box. I’m sure others make similar products, but these are the ones I am familiar with.

So, let’s do the math to see what size staves we will need. If you are a segmented turner, you probably have a program that you plug in numbers and it spits out the dimensions you need. Those of us without the program can use pretty simple math. If you are using the table saw or one of the router bits, you will still need to figure the width of the stave. We have already determined the length of the stave to be 6 ½”. To calculate the width of the stave, here is the formula:

Width of stave = diameter x Pi (3.1416) /number of staves

EXAMPLE: width = 6.5” x 3.1416= 20.42/ 6 = 3.4”

STAVE WIDTH ASSUMING A 6 ½” DIAMETER BOX

 6 SIDED=3.4” 8 SIDED=2.5” 12 SIDED=1.7” 16 SIDED=1.27”

Now we have cut all the staves to the desired with, we must calculate the angle to cut on the staves, IF YOU ARE USING THE TABLE SAW. If you are using the router, the bit you choose is the given angle you will use and will determine the number of staves. To calculate the angle use this formula:

Miter angle= 360/ 2 x the number of staves

EXAMPLE: miter angle = 360/ 2 x 6=360/12=30 degree angle

SUMMARY: 6 sides = 30 8 sides= 22.5 degrees 12 sides= 15 degrees

 16 sides= 11.25 degrees

THE REASON YOU MULTIPLE THE # OF SIDES X 2 IS YOU ARE CUTTING THE ANGLE ON BOTH SIDES OF THE BLANK.

TO GET AN ACCURATE ANGLE, I USE A WIXEY DIGITAL ANGLE GAUGE.

ALWAYS MAKE A FEW EXTRA STAVES FOR TEST CUTS ON THE SET UP FOR EITHER TABLE SAW OR ROUTER TABLE!!!

THICKNESS OF STAVES: this depends on your personal likes as to how you are going to finish the box. If you are not going to round the outside or inside, you can use much thinner material. If rounding only the outside, thinner material than if rounding both the inside and outside. Here is a general formula from the Lee Valley directions for bird mouth bits:

 6 sided: thickness=diameter/ 6.3 6.5”/6.3=1”

 8 sided: thickness=diameter/10.1 6.5/10.1=0.64”= 5/8”

 12 sided: thickness=diameter/20. 6.5/20.9=0.31” = 5/16”

 16 sided: thickness=diameter/36 6.5/36=0.18”= 3/16”

What I have been using is a common 2x4. I rip it on the bandsaw to ¾” thickness, then run it thru the planer to about 5/8” thickness. I have used this thickness for the 8 sided table saw cuts and the lock miter router and the 16 sided staves. I imagine most of you will use common ¾” stock of whatever you have around.

FOR TABLE SAW CUTS: set the blade at the proper angle. Set the fence so the blade cuts just a hair below the top of the blank. You don’t want to cut into the top of the blank because that will shorten the width and when you run the blank to cut the other side, the cut will be well below the top and you will have uneven glue joints. I color the edge of the blank with pencil lead or sharpie to see the height of the test cut and sneak up on the blank to just below the top surface. That small flat will be turned off when you round the box.

FOR ROUTER CUTS: follow the directions that come with the router bit.

WHICH METHOD IS THE BEST/EASIEST/CHEAPEST/MOST ACCURATE???????

Here are a few Pros and Cons:

TABLE SAW: Pros: 1. most everyone has one or access to one 2. Number of sides is your choice 3. Set-up pretty easy 4. Can cut tapered staves/cones. CONS: 1. Must be very aware of potential for kick-back 2. If cutting narrow staves, best to use a sled. 3. Angle accuracy may be more difficult.

BIRD MOUTH ROUTER BIT: Pros: 1. Choice of 4 bits/4 different # of sides. 2. Easy set-up. 3. Less time cutting staves-only cut one side of blank 4. Good glue joint. 5. Easy to assemble. 6. Can make tapered staves/cones. 7. Angles very accurate. CONS: 1. Cost to buy bit(s). 2. Must have router table

22 ½ DEGREE LOCK MITER ROUTER BIT: Pros: 1. Strongest glue joint. 2. Easy to assemble. 3. Easy set-up. 4. Angles very accurate. CONS: 1. Cost of bits. 2. Must have router table. 3. Makes only straight staves. 3. Limited to 8 sides.

THE CHOICE IS YOURS !!!!!

**GLUE-UP**

Materials needed; staves, 2 hose clamps(4 1/8”-7”), 2” tape, glue, glue brush, paper towels, paper, dead blow hammer, board with “fence” (optional ).

1.lay out 2 strips of tape about 1” from the top and bottom of the length of the staves on the “fence” board. Make the strips about 2” longer that the total width of the staves. Place stave starting at the end of the tape on the tape with end of stave on the fence and as close to perpendicular to the fence as possible; press into tape firmly. Place each successive stave on tape making sure it is tight to the preceeding stave and to the fence. When all the staves are placed, use a dead blow hammer and tap them each over the tape to secure them tightly to the tape.

2. apply an adequate amout of glue to each side of the stave. DO NOT STARVE THE JOINT!!!

3. ROLL UP THE ROW OF STAVES, PLACE THE BUNDLE ON IT’S END, TAPE AS TIGHT AS POSSIBLE, PLACE HOSE CLAMP ABOUT 1” FROM TOP AND BOTTOM ON THE TAPE AND TIGHTEN. IF NEEDED, USE THE DEAD BLOW HAMMER TO EVEN OUT STAVES ON THE END AND HAND PRESSURE ON THE SIDES. IT SHOULD FORM ALMOST A PERFECT CIRCLE.

3. CLEAN UP THE EXCESS GLUE, MOST OF WHICH SHOULD BE ON THE INSIDE. Let dry overnight.

**MOUNTING ON THE LATHE**

**OPTIONS:**

1. **Cole jaws**, jumbo jaws, longworth chuck-safest to use long buttons. Can dovetail outside to give short buttons a little more grip. Quick and easy to mount.

2. **Face plate** with blank trimmed to fit inside . The tenon should be about ½” long with a shoulder which is a little wider than the outside of the box. This can be glued in place or screws driven from the outside on at least 4 sides. If you use screws, plan ahead and make the staves long enough so you can cut off this end of the box, or plan on using the screw hole in the design of the finish.

3. **Chuck** opened on the inside as in a recess/mortise. Leave the hose clamp on the outside to prevent splitting the glue joints of the staves. Do not put much pressure in the direction of the chuck/headstock during rounding the inside or outside of the other end of the box, as this may displace the box toward the headstock and cause a flying object.

4. **Worm screw/chuck**

Once the box is mounted, trim the tailstock end flat and square. Round the bottom half of the box on the outside and inside to the thickness you wish to finish. Sand both the inside and outside.

Turn a bottom blank with a tenon or mortise to fit your chuck. Mount this in your chuck and turn a tenon to fit into the bottom of the box with a shoulder a little wider than the outside of the box. Glue into the bottom. Alternate method; mount a blank on a face plate using a glue block; turn a tenon or mortise to fit your chuck, or, use the face plate to turn the tenon and shoulder to fit into the box, glue into the box. When box is finished, remove the face plate/glue block; if screw holes are present, repair them as desired.

Once the bottom is glued into the box and the glue is cured, mount it on the headstock and turn the inside and outside to the shape and thickness desired. Sand.

**MAKE A LID**

Make a blank for the lid and turn it anyway you prefer using a cole jaw, chuck, face plate or between centers. Make a tenon to fit a little loosely into the box. When the lid fits the inside of the box, finish sanding the inside.

Mount the box back on the headstock and hold the lid on using the tail stock. Finish the lid to fit the outside of the box as desired. Finish the top of the lid as desired, placing a Bead of Courage bead in the lid. Make a handle/knob/grip to be able to remove the lid. Finish the lid.

Remove the lid and remount the box to finish the bottom on a cole jaw or whatever means you desire to finish the bottom.

Sand, decorate as desired and apply finish!