

AN INTRODUCTION TO SEGMENTED WOODTURNING PART 2

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FIRSTSTATEWOODTURNERS.ORG

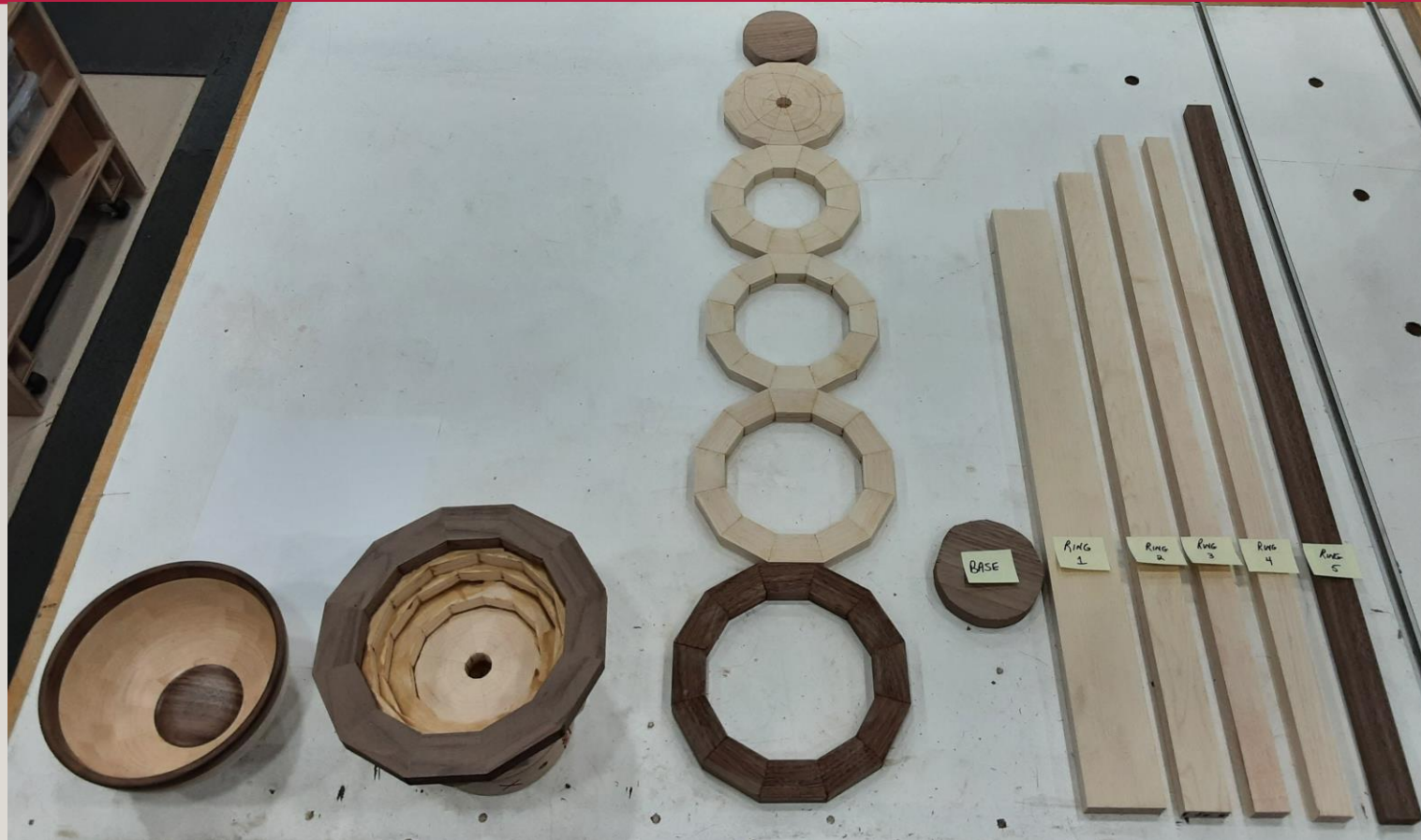


BUILDING ON SKILLS FROM PART 1

- We learned in Part 1 of this presentation how to design and construct a single segmented ring, and then learned how to glue, clamp, sand, and install it as an accent ring on a solid wood bowl.
- The next phase of our segmenting journey will be to build on the skills learned in Part 1 (top photo at right) by designing and constructing a fully segmented bowl (bottom photo at right). We opted for a very simple footed bowl design that illustrates the variations in ring widths caused by the curvature of the chosen profile.
- As we noted in Part 1, the tips and techniques in this presentation are in no way intended to be the best way to perform basic segmented turning, but rather are simply the techniques that have worked for me. We encourage you to explore the recommended techniques of other segmenters and find the ones that work best for you.



QUICK PREVIEW OF THE STAGES OF OUR PROJECT



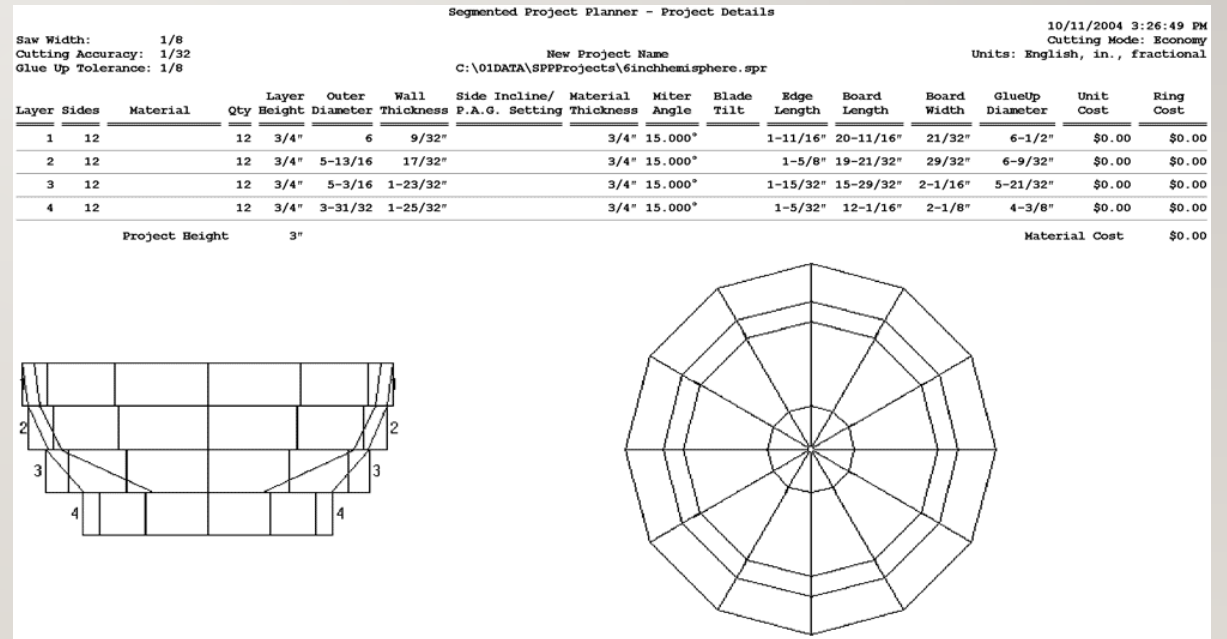
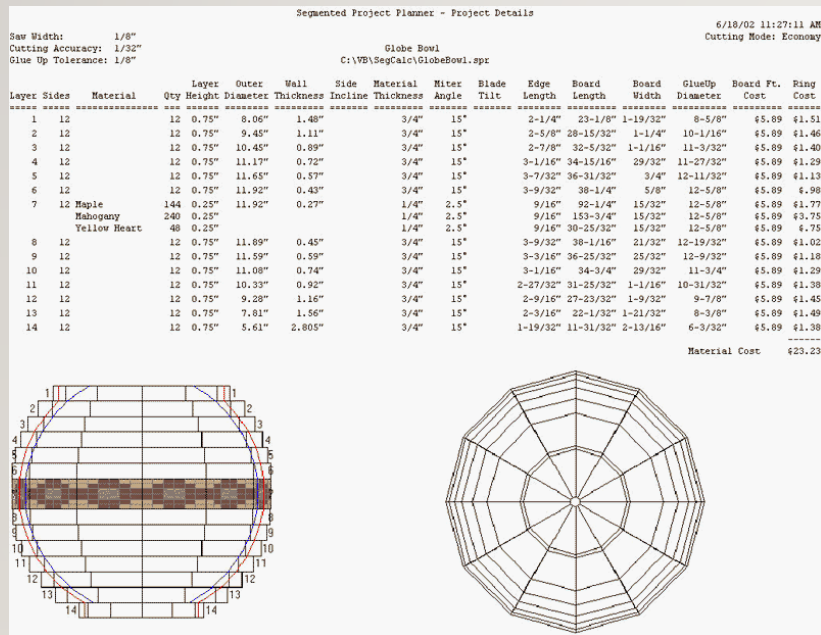
DESIGNING YOUR FIRST SEGMENTED BOWL

- There are numerous ways to design your first segmented bowl; for example, you can:
 - Use a design available on the internet – these usually include cutting lists, etc.
 - Use a computer program in order to design your bowl – but these cost money and usually involve a learning curve to achieve familiarity with the program
 - One type would be a program specifically designed to create segmented pieces – and these will typically also include cutting lists and other appropriate design instructions; or
 - Another type would be a program like Sketchup, AutoCad, etc. – however, these usually will not include cutting lists or any other instructions
 - Draw your own design on graph paper – and with this option you will have to prepare your own cutting list.



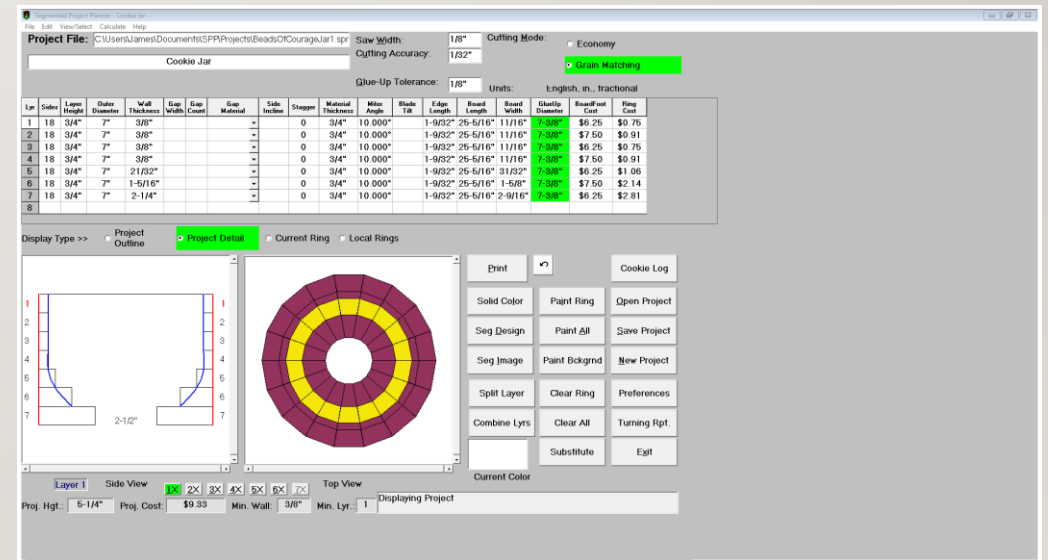
USING A DESIGN AVAILABLE ON THE INTERNET

- There are not a wide array of free segmenting designs available on the internet, but here are some examples from segmentedturning.com:



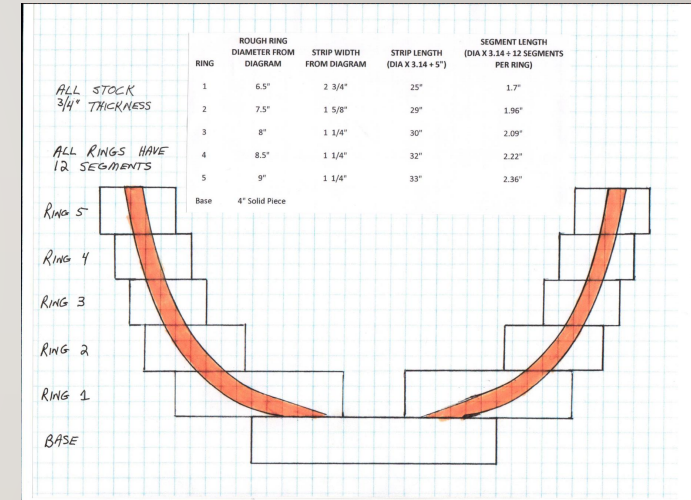
USE OF COMPUTER PROGRAMS FOR DESIGNING SEGMENTED PIECES

- There are several computer programs used by many segmenters that provide detailed printouts listing exact ring diameters, segment lengths, widths and lengths of wood strips to use, etc. These include:
 - Segmented Project Planner
 - SegTurn
 - Woodturner Pro
 - Segment Calculator 2 (Android)



SKETCHING YOUR OWN DESIGN

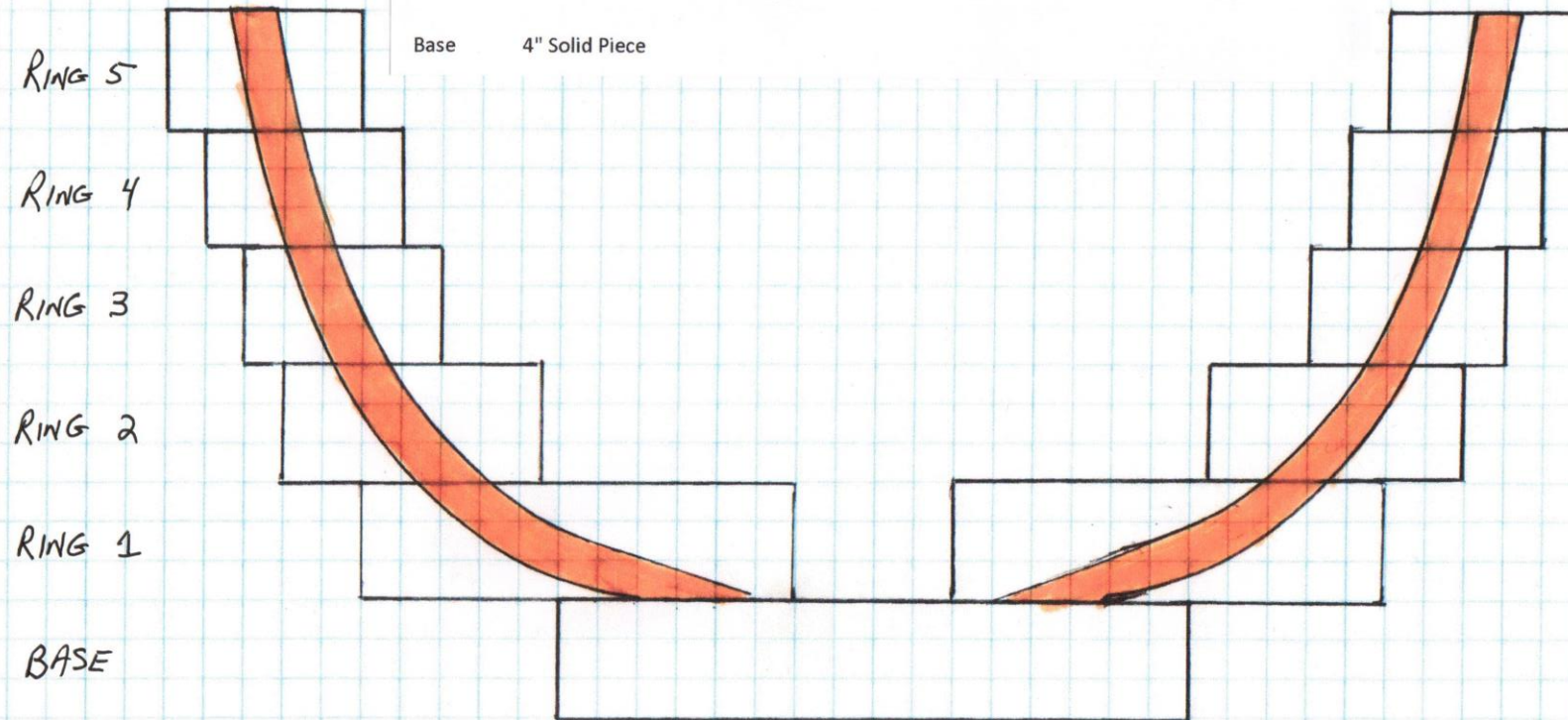
- But since this presentation is focused on those turners new to segmenting, it will be assumed that you do not yet wish to learn – or invest in – such programs but would rather just like to understand the basic principles of segmenting to see if it is a type of turning that you might want to pursue further.
- So this presentation will focus on a very simple sketch that anyone can draw by hand on $\frac{1}{4}$ " block graph paper (see photo at right – full size version on following slide)
 - To make this project as simple as possible, we will use only $\frac{3}{4}$ " thick stock for all rings and will use 12 segments in each ring so that the miter angle for all cuts will remain a consistent 15 degrees.
 - Using graph paper like this results in our ability to measure the exact ring diameters we will need for our project. In addition to listing the diameters of each ring, the sketch we have provided also contains a full material cut list that includes the width and length of the wood strip necessary to cut each ring, as well as the segment length necessary to achieve each of the listed ring diameters.



ALL STOCK
3/4" THICKNESS

ALL RINGS HAVE
12 SEGMENTS

RING	ROUGH RING DIAMETER FROM DIAGRAM	STRIP WIDTH FROM DIAGRAM	STRIP LENGTH (DIA X 3.14 + 5")	SEGMENT LENGTH (DIA X 3.14 ÷ 12 SEGMENTS PER RING)
1	6.5"	2 3/4"	25"	1.7"
2	7.5"	1 5/8"	29"	1.96"
3	8"	1 1/4"	30"	2.09"
4	8.5"	1 1/4"	32"	2.22"
5	9"	1 1/4"	33"	2.36"
Base	4" Solid Piece			



SELECTING THE TYPE OF BASE

- You will typically want to start the assembly of your piece from its bottom and work your way to its top. The diameter of the base will, of course, depend upon your design, especially in relation to the size of the first ring.
- So, first you need to decide on the type of base to be used. Bases on segmented pieces take several forms, including segmented, tapered, floating and solid.
 - Pie-shaped segmented base – not many segmenters use this type of base since it is prone to develop defects as a result of wood movement, even if you are using a segmented ring with a plug. They can also be somewhat tricky to cut in order to ensure that the center points match up sufficiently tightly so that there is no hole in the center.
 - Tapered plug – a more complicated version best left for more experienced segmenters. See Malcom Tibbetts' excellent explanation of this type of base in his outstanding work entitled "The Art of Segmented Woodturning."
 - Floating base – this is a base constructed of segmented rings assembled with a fairly thin disc that "floats" in a recess between the rings. This is the preferred method to use with vessels that have large bases. Again, however, this is a type of base best left for more experienced segmenters. See Tibbetts' work noted above for further details on this technique.
 - Solid base – Not surprisingly, this is the most common type of base used by segmenters, especially on pieces with smaller bases. The general consensus (from segmenting experts like Malcolm Tibbetts, Curt Theobald, Bill Smith and Jim Rodgers) seems to be that, in order to minimize problems caused by wood movement, such bases should be:
 - of a small diameter (about 4-5" or less) (larger diameters mean more susceptibility to wood movement)
 - 3/8" or less in thickness (although many segmenters tend to use 3/4" or thicker to start with, but dish the center out from above and below so that the center thickness ends up being about 3/8")
 - cut from kiln-dried quartersawn boards
- Regardless of the base type you use, it is generally advisable to create a thin wall thickness where the base and the first ring meet, since wood moves as a percentage of dimension – i.e., "less wood equals less movement."



MOUNTING THE BASE

- Based on the size of our bowl and the ease of using a solid base for new segmenters, we will use that type of base for our project. Our design calls for a 4" round piece of walnut, which was cut on the bandsaw.
- Then you need to decide how you will mount the base on your lathe. Mounting options include:
 - If your base is really thick, you can mount it directly to a faceplate or screw chuck (not usually a good idea due to the screw holes, however, since you will waste a lot of wood doing it this way)
 - Turn a recess or tenon on the base and then use a chuck to hold it.
 - Glue it to a waste block that is held in a chuck, or is attached to a faceplate (upper picture at right), or to a waste block that is already tapped and threaded (lower picture at right). You can glue it directly to the waste block if you don't mind turning away a small portion of the waste block or the base when separating your piece after turning is completed.
- Again, since we are looking for the simplest option for new segmenters, we will glue the base to a waste block and build our rings on to that.

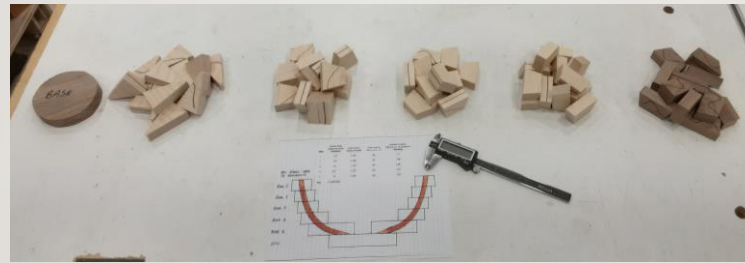
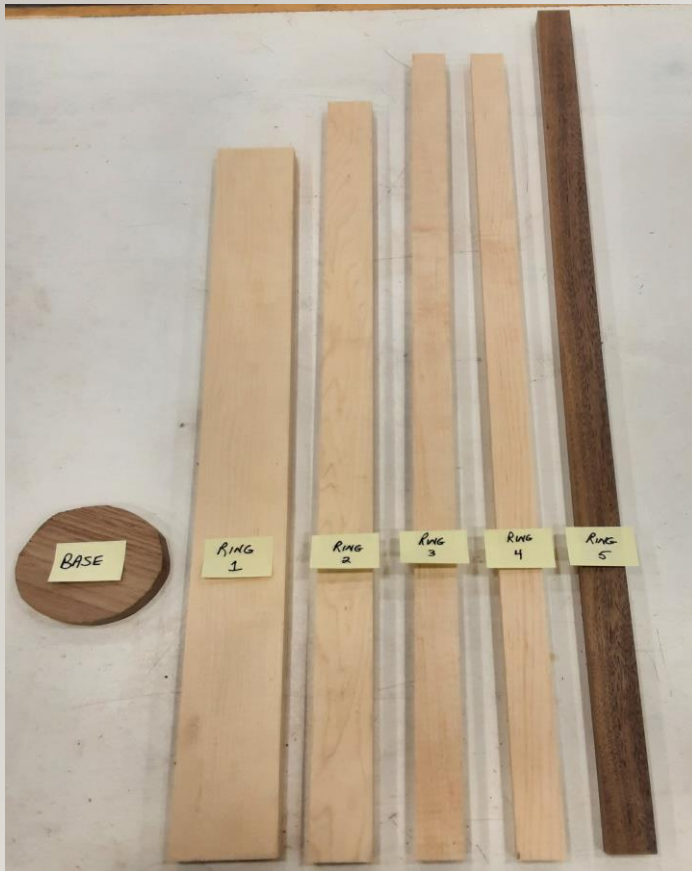


FLATTENING THE BASE

- Once your base is glued to your waste block, you need to ensure its outward facing surface is as close to perfectly flat as possible. Typically, you would use your bowl gouge and a large flat sanding plate to accomplish this. When done, check for flatness with a straightedge. If it isn't almost perfectly flat, you should keep working on it until it is flat, since you do not want to start gluing rings onto an uneven surface. Shine a light from under the straightedge to highlight any areas that might need additional work.



WOOD SELECTION



- The diagram we sketched of our project (Slide 8) tells us the length and width of each of the 5 strips we will need to create the rings for our bowl (picture at far left). We chose walnut and hard maple since those are reasonably priced tight-grained hardwoods commonly available in many shops. Although not essential, it is best to try to cut all the strips for all rings of the same wood that will be adjacent to each other from the same board to ensure that the color and grain match as much as possible.
- Once the strips are cut, we then need to cut each one into 12 segments of the proper segment length to give us the ring sizes that we need (upper right picture)
- We then need to sand off the fuzzies, test fit each ring, then glue and clamp them as we discussed in Part 1 of this presentation, resulting in the 5 completed rings shown in the lower right picture.

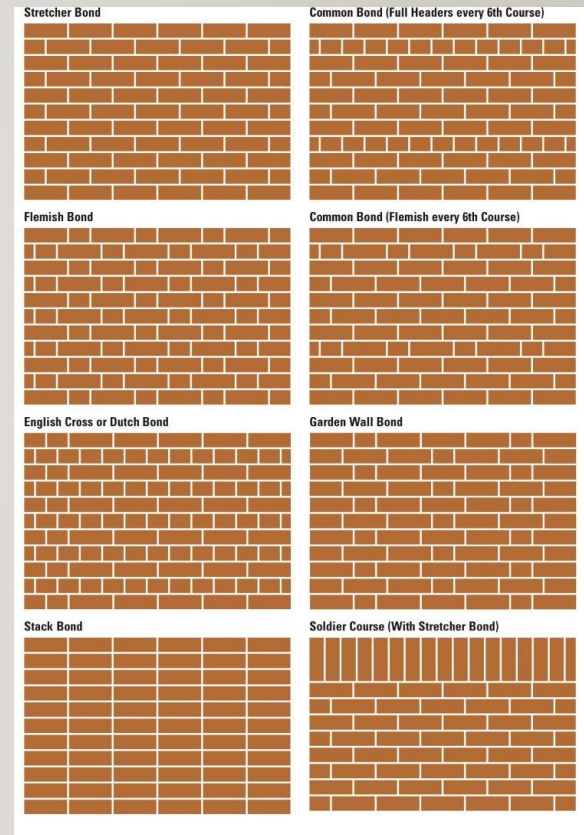
SANDING ONE SIDE OF EACH RING

- Now that the base is glued onto the waste block and the outer surface is properly flattened and is ready to accept the first ring, the next step is to sand one side of each of the 5 completed rings. We are assuming here that you do not have a drum sander in your shop, so you will need to do this either on a disk sander or on a sanding disk that you have created for your lathe, as we demonstrated in Part 1 of this presentation.
- The other (unsanded) side of each ring will be turned and sanded flat once the ring is glued onto the assembly.



BEFORE GLUING THE RINGS TO THE BASE

- Before gluing the rings to the base, you need to decide what kind of pattern you intend to use in aligning your rings. This becomes more of an issue if using multiple colors of wood in a single ring, since the alignment and design possibilities with multi-color rings are almost endless. In our case, however, since all rings contain only a single color of wood, alignment is more straightforward.
 - One possibility would be to use a stacked bond pattern – with the joints of each ring aligned right on top of the joints in the ring below.
 - The more common pattern is to use what is called a running or stretcher bond, where each joint is placed in the middle of the segment above it. This provides a pleasing appearance as well as significant structural integrity and is the pattern we will use in our project.
 - As your segmenting skills increase, you may want to incorporate rings with varying numbers of segments, colors and rings thicknesses that mimic other common brick patterns – see chart at right. And even a brief tour of social media sites dealing with segmented turnings will reveal an almost limitless array of other outstanding patterns you might want to use.



A FEW EXAMPLES OF BASIC RING PATTERNS



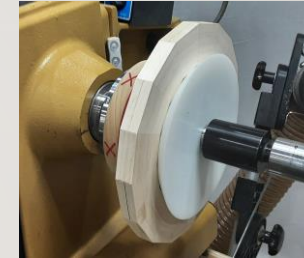
HOW TO ACHIEVE ACCURATE RING ALIGNMENT

- Segmenters use a variety of techniques to align a stack of rings to make a bowl – some try to do it by eye, others try to do it with cone centers, or chuck-mounted Cole jaws or Longworth chucks on the tailstock. While those techniques work fine for mounting the first ring to the base (since perfect accuracy is less critical in that case – see Slide 17), none of them provide great accuracy for mounting successive rings.
- The most accurate way to ensure that your joints line up correctly all the way up your bowl is to mark the center of opposite segments on each ring (picture at top right), and then, during the gluing process, align the joint on the ring above it (or below it in the upside down stack as shown at bottom right) with those center marks. And to ensure that each ring is centered on the ring above it, I dry fit each ring to the one that will be above it so that there is equal spacing all the way around, then draw a line along the segment length of opposing segments on either side of that ring as shown in the dry-stack picture at bottom right. This facilitates rapid centering during the gluing process. I have found that it is best to mark all rings in these fashions prior to mounting any of them on the base.



GLUING THE FIRST RING TO THE BASE ASSEMBLY

- Now that the base has been flattened and your rings are sanded on one side and marked for joint alignment, the next step is to glue the first ring onto the base. Depending on the size of the center hole in the first ring, this can be done in several different ways:
 - on the lathe, using one of the following on the tailstock:
 - if there is a large center hole in the first ring, use a centering cone like the ones from Advanced Lathe Tools (top left photo), or
 - if there is a small center hole in the first ring (such as in our project), use a live center with a short nose that will not protrude all the way through the center hole, or
 - for any size center hole, use a standard chuck with Cole jaws (bottom left photo) or a Longworth chuck
 - taking the waste block (or chuck) and base off the lathe and:
 - using a clamping press device (top right photo) or
 - just stacking the assembly on a worktable:
 - with weight on top - but be sure to use sufficient weight to ensure proper joint closure
 - or using a clamp (in spreader configuration) against the ceiling (bottom right photo from Malcolm Tibbetts' book).



BEFORE INSTALLING THE SECOND RING

- Before installing the second ring, we'll need to flatten the outer surface of the first ring so it can accept the pre-sanded side of the second ring. You can do this in a couple different ways:
 - With a quick pass from a bowl gouge followed by a light touch with a sanding block (upper photo at right) – preferably one not too much larger than the ring diameter to avoid unintentionally rounding over the outside edges - or
 - With a disk sanding plate (middle photo at right)

Always remember to check the flatness of the surface you have just sanded prior to installing the next ring (lower photo at right)

- Prior to gluing the second ring, use the alignment marks you made on the first ring to see if whatever technique you are using to mount the second ring will result in accurate joint alignment. If the mounting technique you have chosen (e.g., Cole jaws) will not result in proper joint alignment all the way around the ring, take the piece off the lathe, apply glue to both surfaces, and align the marks on ring 1 with the joints on ring 2; apply firm hand pressure then let the glue “tack up” for several minutes until there is no slippage in the alignment, and then apply weights to the assembly or insert the assembly in the clamping press or other off-lathe clamping or applied weight method, or re-install the assembly on the lathe and apply clamping pressure from the tailstock. WARNING: Do not let the glue “tack up” too long or the clamping pressure may not fully close up the joint between the two rings. Some segmenters use salt in the glue joint – or even hot melt glued stop blocks on each side - to try to stop such movement and then clamp right away. Feel free to use whatever method works best for you.



INSTALLATION OF SUCCESSIVE RINGS

- Some turners try to glue multiple rings together at the same time. I do not recommend doing that since there is too great a possibility that the rings will shift out of alignment using that technique. Instead, I recommend gluing only a single ring at a time, using the alignment process described on Slide 16.
- Once the second ring has been glued and the glue has thoroughly dried, this is when some segmenters rough-turn the inside of the base and first two rings of the bowl since it is at this point that this critical area is most accessible. But it is not essential to do so at this stage for our project, as this is a fairly shallow bowl that can be adequately turned even after full assembly.



FINAL STEPS PRIOR TO SANDING AND FINISHING

- Once all the rings are glued in place and the glue has properly cured, it is time to turn the outside of the bowl. I always use tailstock support while turning the outside (photo at upper right).
- Once the outside is completed, turn the inside to the desired wall thickness. For this project, I left the walls at roughly $\frac{1}{4}$ " thickness. Consider using a bowl steady at this stage to reduce the vibration (and resulting chatter) that you may encounter when turning in this situation.



SANDING AND FINISHING



- When this turning stage is completed, sand as desired – upper photo at left (always the fun part.....)
- Then use whatever technique you are comfortable with to complete the bottom of the bowl. Lots of choices here, of course – here are just a couple:
 - You can part off the bowl and reverse mount it in your Cole jaws, Longworth chuck, or a jam chuck and then finish turning the bottom as desired
 - Or, using an appropriate adapter, reverse mount the bowl and waste block on a live center in your tailstock and use that to center the assembly on a vacuum plate – then cut off the waste block (lower photo at left) and finish turning and sanding the bottom as desired.
- Once this final turning step is completed, apply whatever finish you like (again, another fun part.....).



THE FINISHED PROJECT

