

## Open Segmented Woodturnings – Colin Delory ©



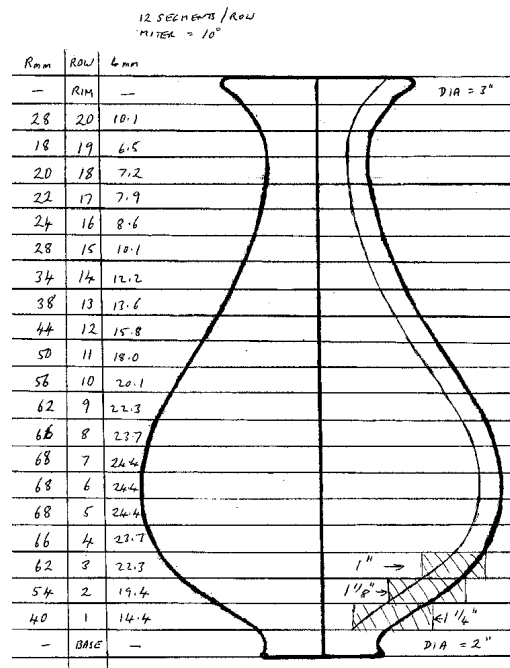
There are four distinct steps to making open segmented turnings like the one in the photo above and those displayed on my web site [www3.telus.net/delory](http://www3.telus.net/delory). The design phase encompasses defining the shape and pattern, determining the number of rows and the number of segments per row, calculating the segment length for each row and determining the wood requirements. This is followed by the material preparation which includes selecting the wood species and cutting all the segments. The third phase is the actual assembly of the turning blank using jigs to position the segments. And finally the vessel can be turned and finished. The following expands on each of these four steps.

### Design

The selection of a shape and pattern is a personal choice but one must keep in mind that the pattern selected is a factor in determining both the number of segments per row and the number of rows so it is best not to get too fancy.

The number of segments per row is selected such that it will work with the pattern and no segment is less than 1/4" long as anything less is unmanageable. The number of rows on the other hand is arbitrary except for satisfying the pattern requirements.

And now comes the fun part. Draw a full size outline of the vessel. Then draw in the rows and measure and record the maximum radius of each row rounding up to the next 2mm. See figure.



To achieve a 2/3 overlap, which seems to be optimum, the segment length “L” is determined as follows where “N” is the number of segments per row and “r” is the radius of each row.

Segment angle             $A = 360/N$   
 Segment length          $L = 2 r \sin(1/2 \times 2/3 \times A)$   
 And the miter angle is half of  $(2/3 \times A)$  or  $120/N$  degrees



However these formulas are presented here for reference only as it is much easier to use a table such as shown below.

<b>SIDE LENGTH VS RADIUS - OPEN SEGMENTS - 1/3 gap (mm)</b>				
<b>Segments/row</b>	<b>12</b>	<b>15</b>	<b>16</b>	<b>18</b>
<b>Miter Angle (degrees)</b>	10	8	7.5	6.7
<b>Radius (mm)</b>				
30	10.4	8.4	7.8	7.0
32	11.1	8.9	8.4	7.4
34	11.8	9.5	8.9	7.9
36	12.5	10.0	9.4	8.4
38	13.2	10.6	9.9	8.8
40	13.9	11.1	10.5	9.3
42	14.6	11.7	11.0	9.8
44	15.3	12.3	11.5	10.2
46	16.0	12.8	12.0	10.7
48	16.6	13.4	12.5	11.2
50	17.3	13.9	13.1	11.6
52	18.0	14.5	13.6	12.1
54	18.7	15.0	14.1	12.6
56	19.4	15.6	14.6	13.0
58	20.1	16.2	15.2	13.5
60	20.8	16.7	15.7	14.0
62	21.5	17.3	16.2	14.4
64	22.2	17.8	16.7	14.9
66	22.9	18.4	17.3	15.4
68	23.6	18.9	17.8	15.8
70	24.3	19.5	18.3	16.3

## Material Preparation

There is nothing magical about selecting and cutting the materials although the number of pieces can make the process somewhat tedious. Wood species are selected to satisfy the pattern color requirements but should be close grained to minimize failures when the time comes to actually do the turning. I cut the wood into  $\frac{3}{4}$ " wide strips except where the shape requires extra width. These are then planed to a uniform thickness and finally cut into segments on a miter saw.

## Assembly

Assembly is done on the lathe and starts by truing up a solid piece of wood for the base and then gluing the segments into position using the jigs. It is best to use a glue with a good initial tack such as Titebond I or Probond Professional wood glue.

Two jigs are needed for positioning the segments, an indexing system and a segment positioning jig.

The indexing system I use consists of a Plexiglas disk with the required number of divisions marked on it that mounts behind the chuck, a pointer mounted on the lathe bed and a spring clamp. Since each row is offset from the preceding one in brick fashion you require twice the number of divisions on your index ring as segments required per row.

The positioning jig is a piece of 1" by 1" angle supported above the lathe bed such that its end is at the center of rotation and the stop is set to the radius of each row. The segments are then positioned by setting the using the index marks on the disk and placing the segment against the stop on the positioning jig.. The segments are then glued into position one at a time.

After allowing 15 to 20 minutes for the glue to set the row can be sanded with a sanding board or trued up with a gouge and the next row glued on.

A picture is worth a thousand words so here is a picture of my setup in action.



## Turning and Finishing

The actual turning is quite straight forward using normal turning tools and techniques. However one must make very light cuts with very sharp tools as it is very easy to destroy the piece at this stage. I also use a steady rest made with roller blade wheels to provide extra support on many of my pieces.

It is also a good idea to use shaped pieces of polystyrene foam as sanding pads to help keep the edges if the segments crisp.

As for a finish, I use a spray lacquer as the overspray seals the segment edges and the inside.