Integrating Design with a Twist:

Designing and Turning a Twisted Segmented Bowl

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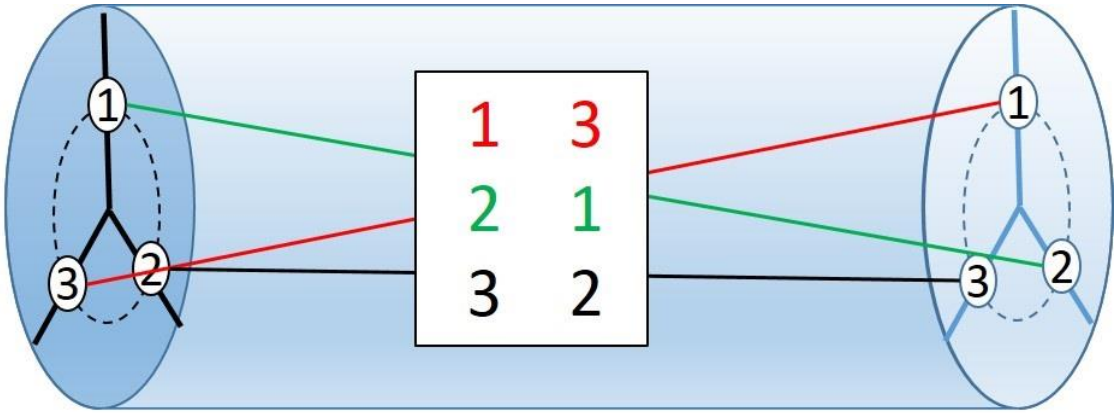
Overview

- The following charts provide a visual ‘walkthrough’ of the design process for fabricating a twisted, segmented bowl with an integrated design
- A three-point off-axis turning method is used to provide the twist
- The process for developing a segmented design to align with the twist is then described
- Images of the fabrication process complete the ‘walkthrough’

Examples

Additional Examples

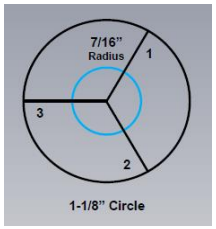
Off-axis Turning

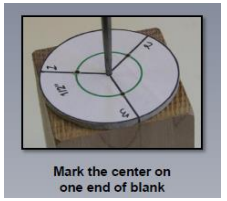


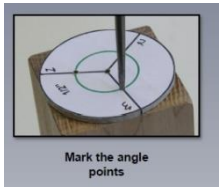
A few charts are provided here on this topic but a more complete description of this method is available in a separate presentation

Making the Three Axis Turning

- Turn the spindle round first, with tenons on each end (for later holding)
- For three-axis, mark off 120 degree lines from center
- Determine the off-axis separation (~1/3 R to 1/2 R) and mark the off-axis points with a punch
- Number the axis on each end to be turned – be consistent and careful to maintain your numbering scheme
- Use a small sharp four prong drive center (5/8” is good)
- Use higher speeds (stop before vibration) and sharp tools
- Sand arc cuts by hand with the lathe off
- Make sample pieces and careful notes to define shapes

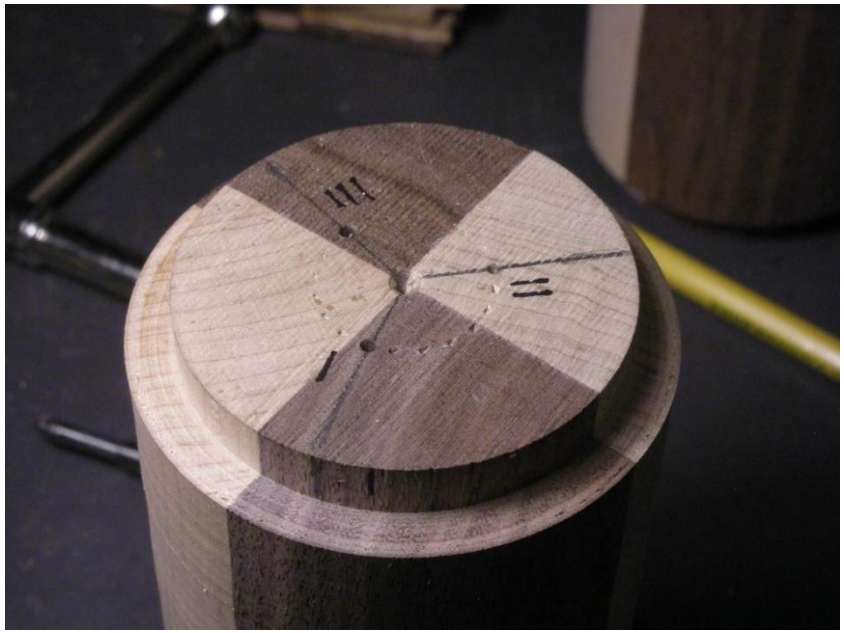






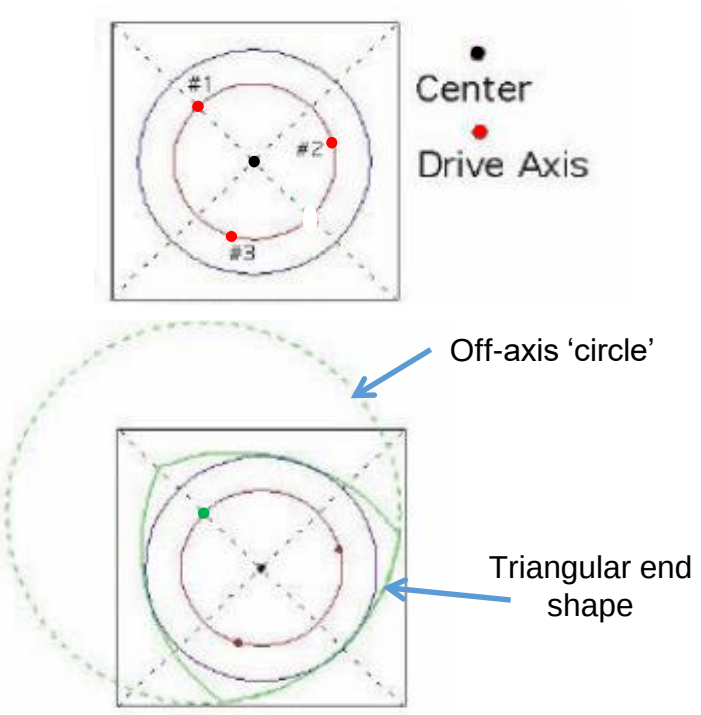
Draw a line to the other end of the blank and repeat the marking and numbering

Marking the Offsets

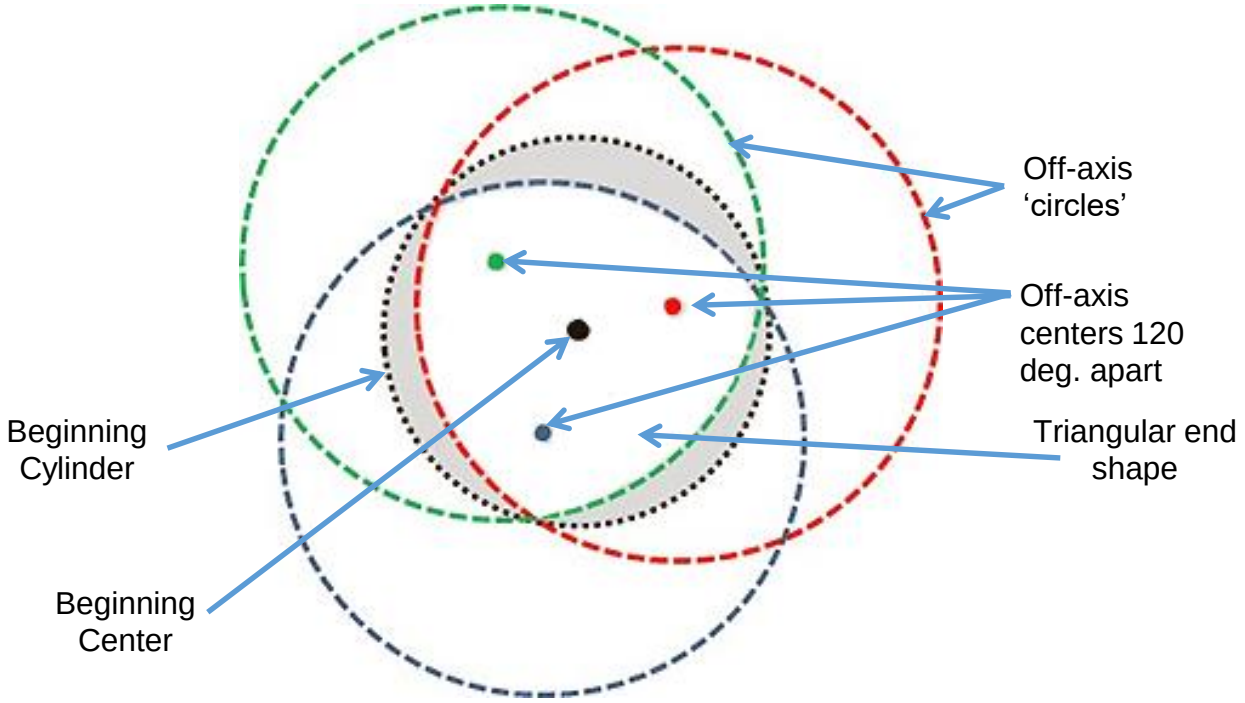


3-axis offset yields triangular end shape

- Using a 3-axis offset scheme, with 120 degree separation yields a triangular end shape for the twisted section

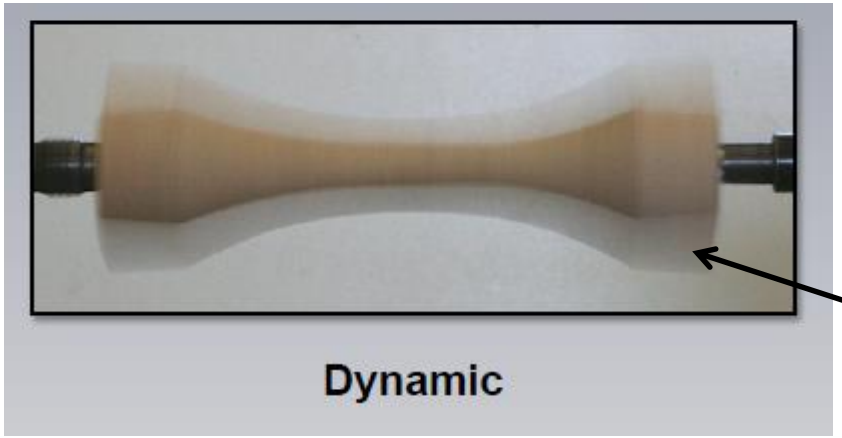


Making a Triangle from Circles

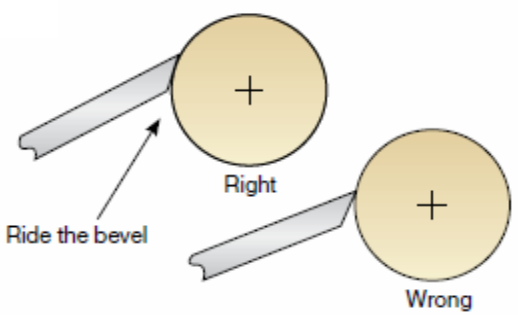


- The three offset intersecting circles yield a triangular end section
- Using a 120 degree offset on centers yields the twist

A Simple Twisted Turning



'ride the bevel' of your tool when turning



Turning sequence for the end points:

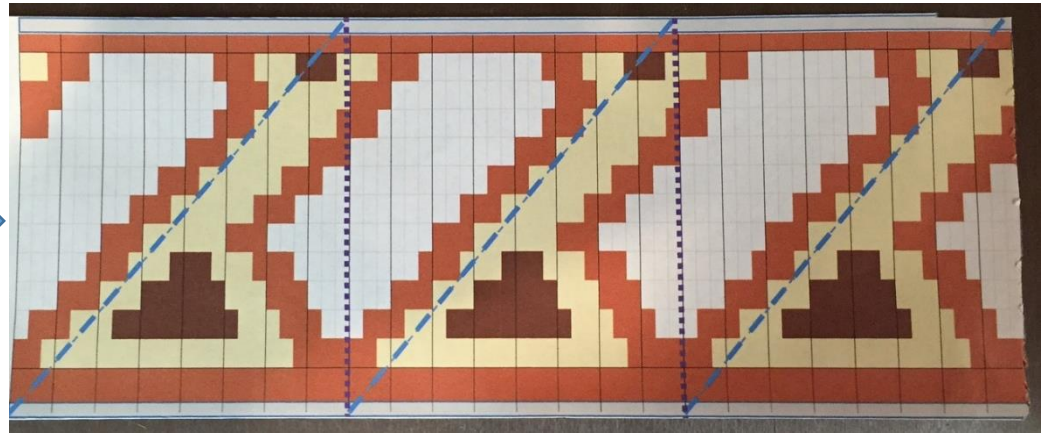
Head	Tail
1	2
2	3
3	1

This is the region where you are 'turning air'

Translating 3-D to 2-D

- The twisted shape used repeats every 120 degrees
  - 3 times per circumference
- Laying out a repeating design with the desired number of segments is the basic building block
  - Repeating this design 3 times yields the circumference

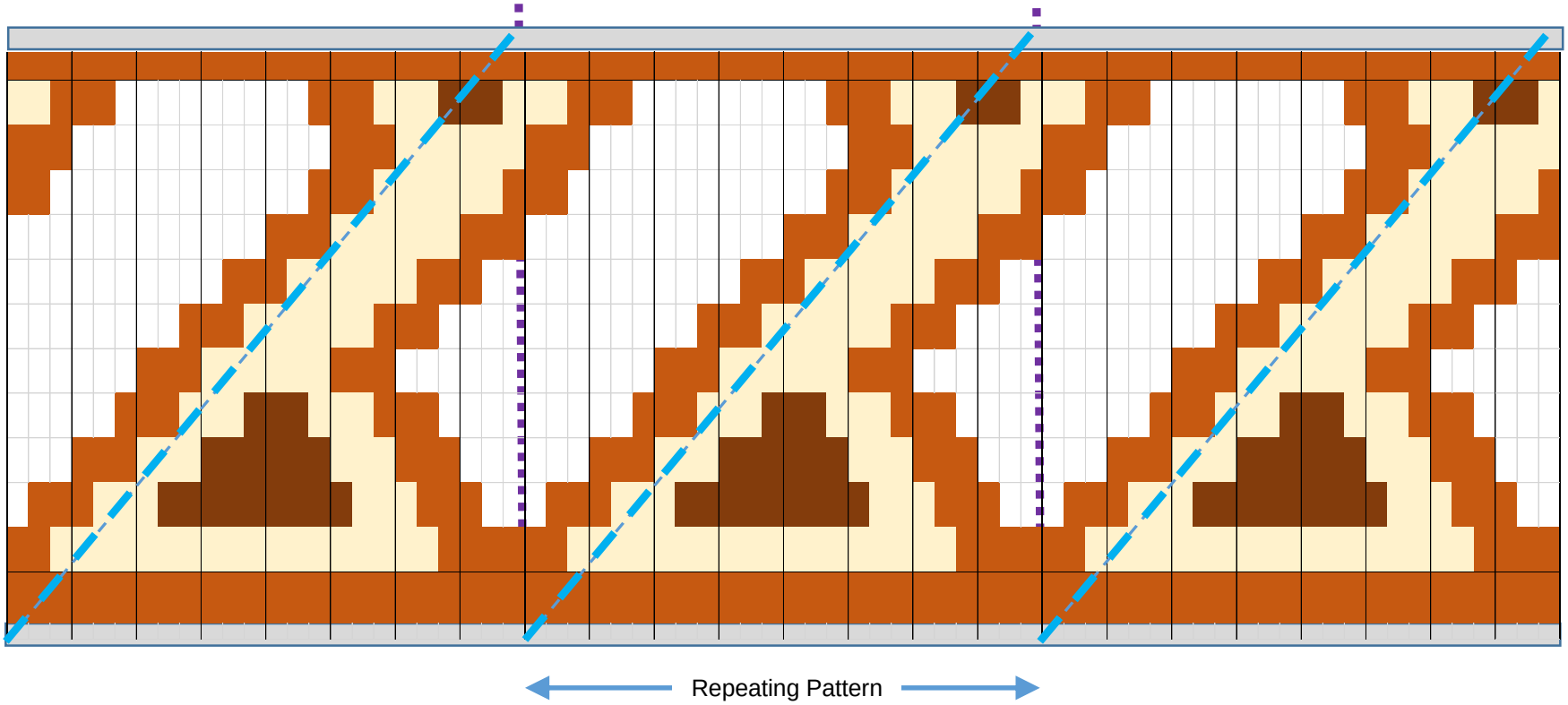
3-D



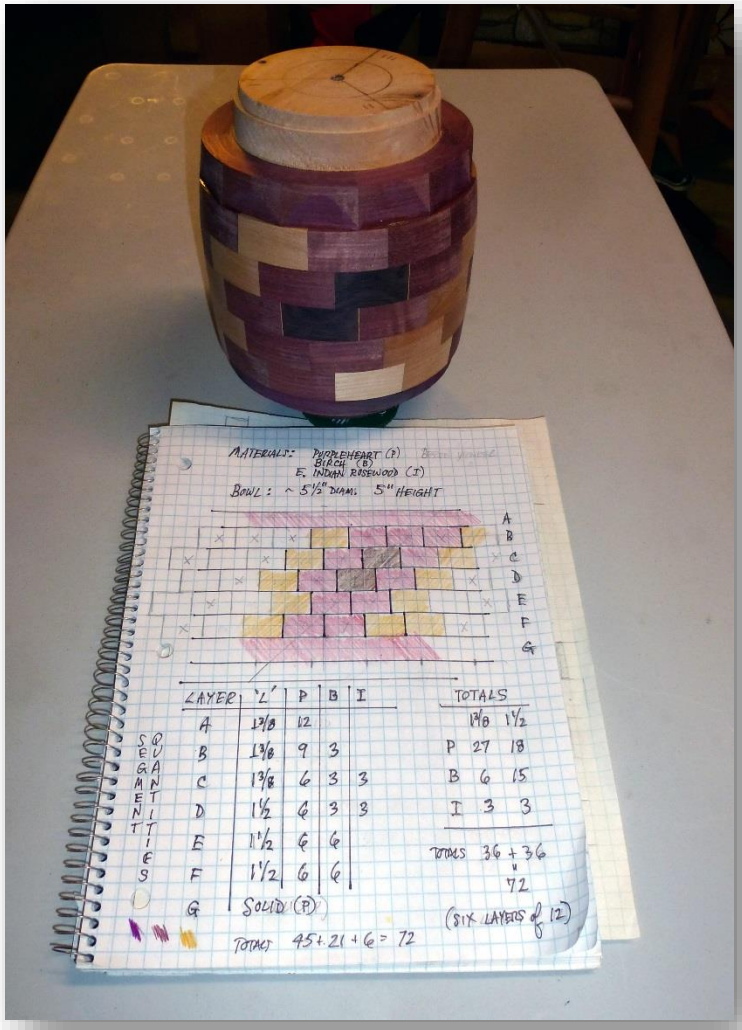
2-D

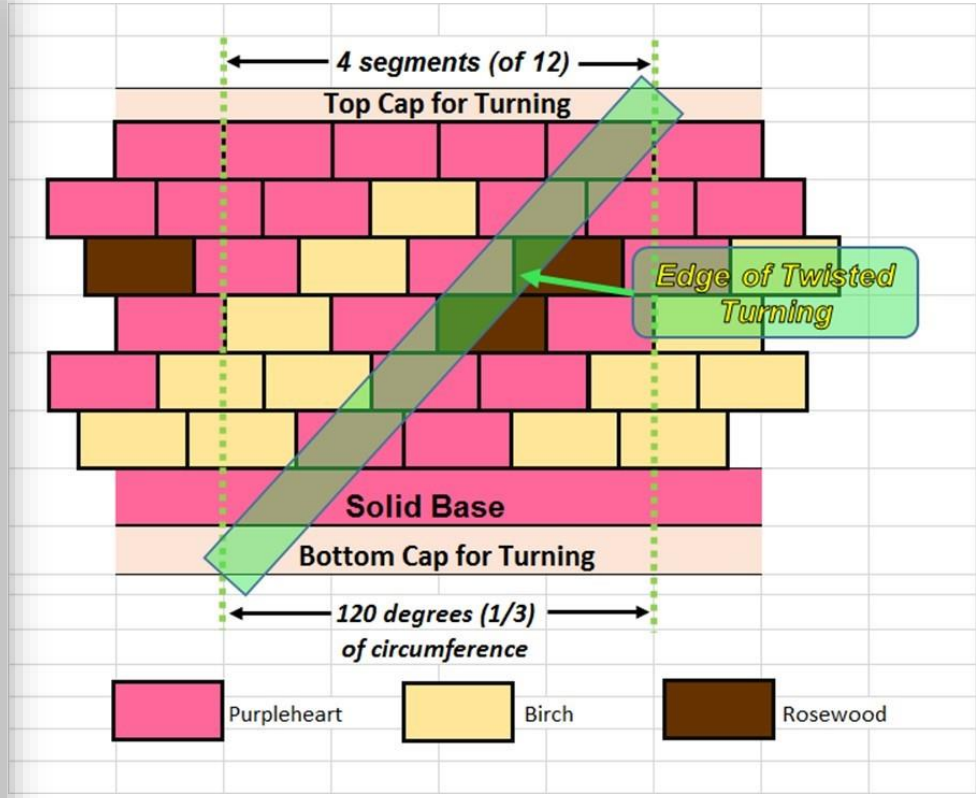
Spreadsheet Designing

- Using 24 segments per ring provides more design ‘space’
- Pattern repeats every 8 segments *(multiples of 3 and 2 needed)*
- Top and bottom (grey areas) are sacrificial holding blocks



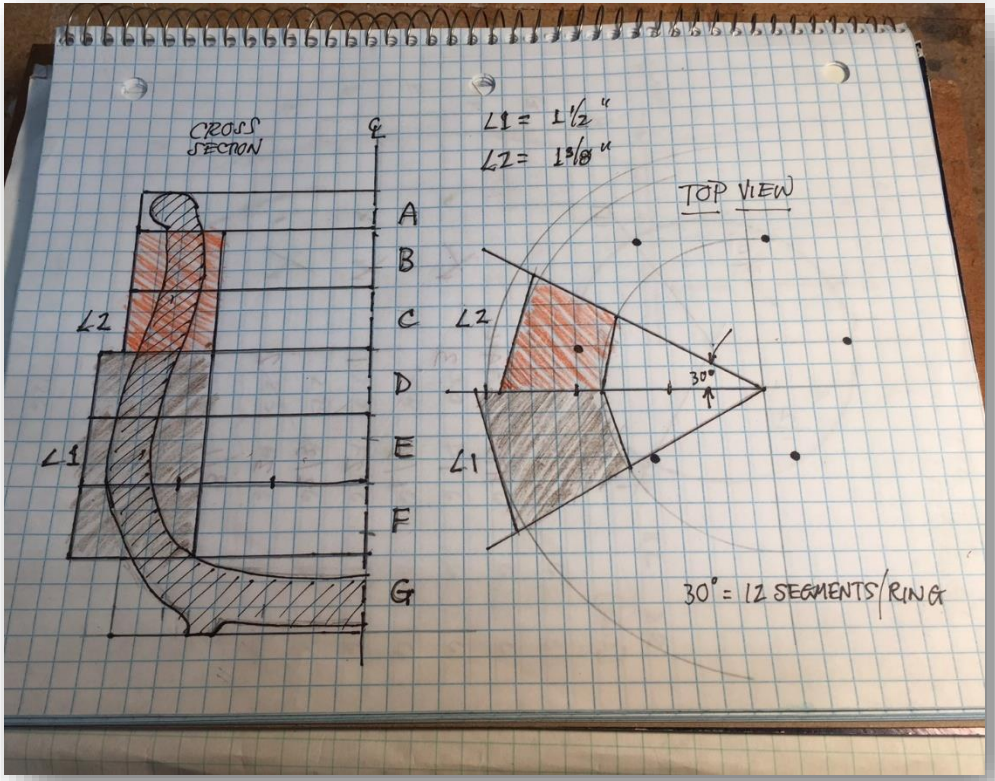
Designing the Segmented Twist



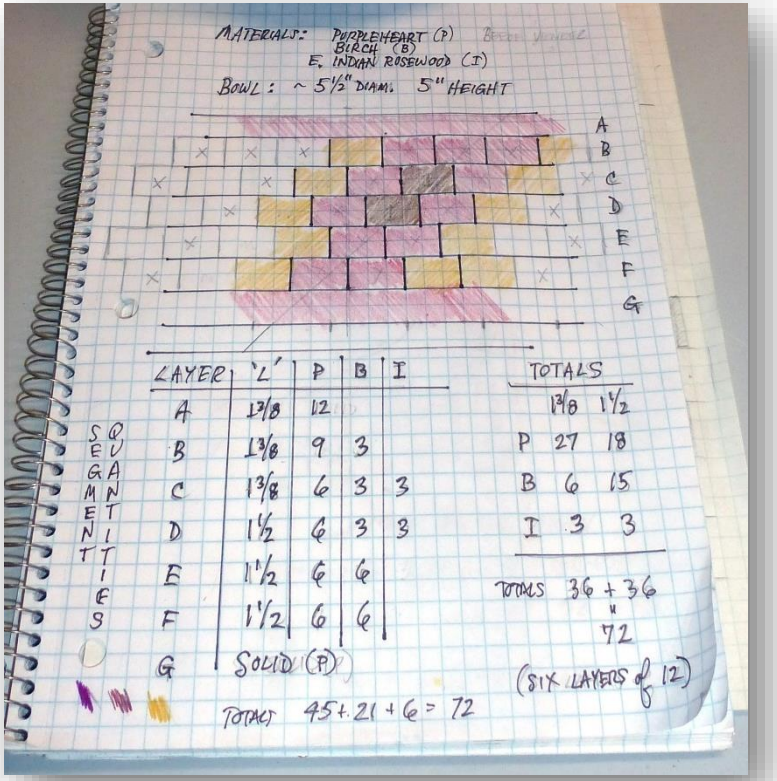


For demo purposes, a simpler 12 segment design was chosen

Identifying the Segments

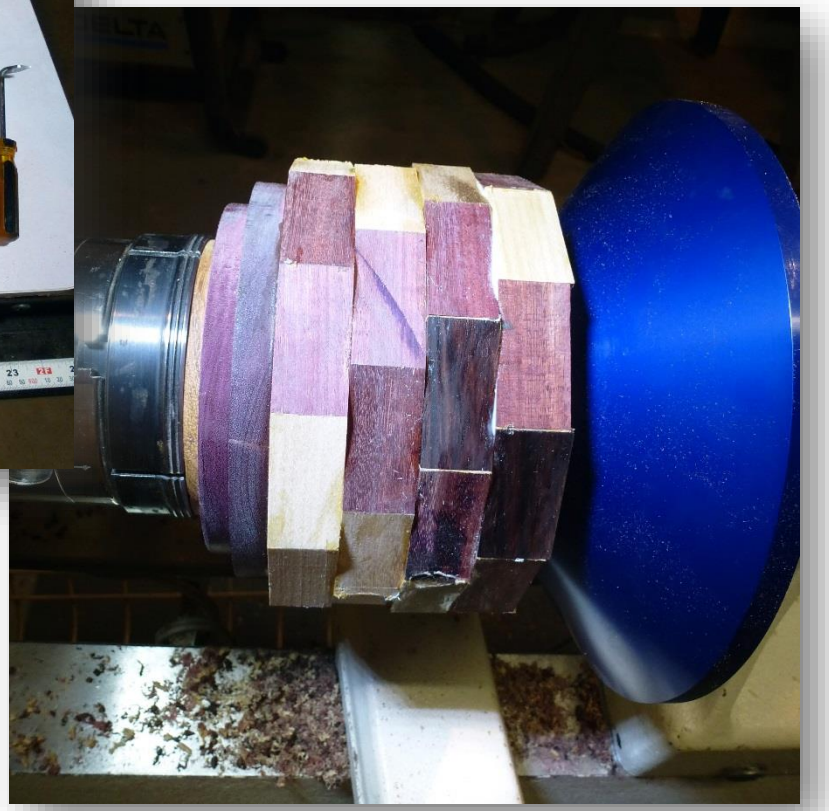


Cross Section and Top View



Totals of Segments per Ring

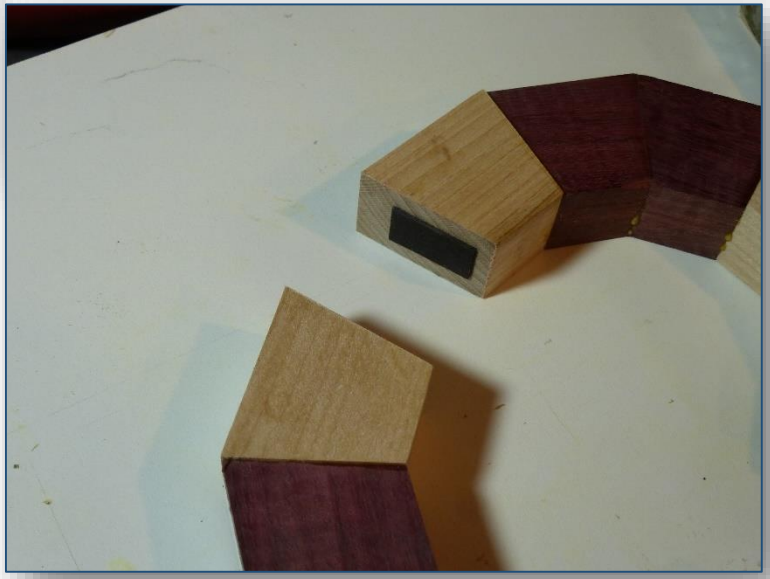
Cutting and Gluing the Segments



Assembling the Rings

Hose Clamps

No-Glue Standoffs at
Halfway Sections

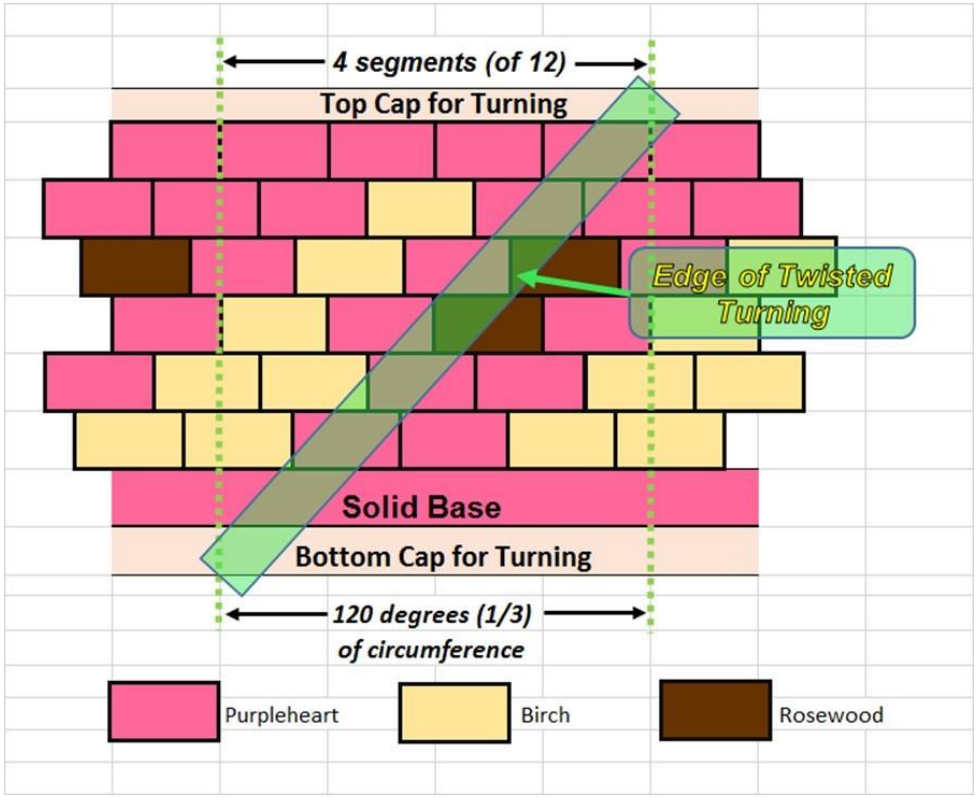


Turning the Shape

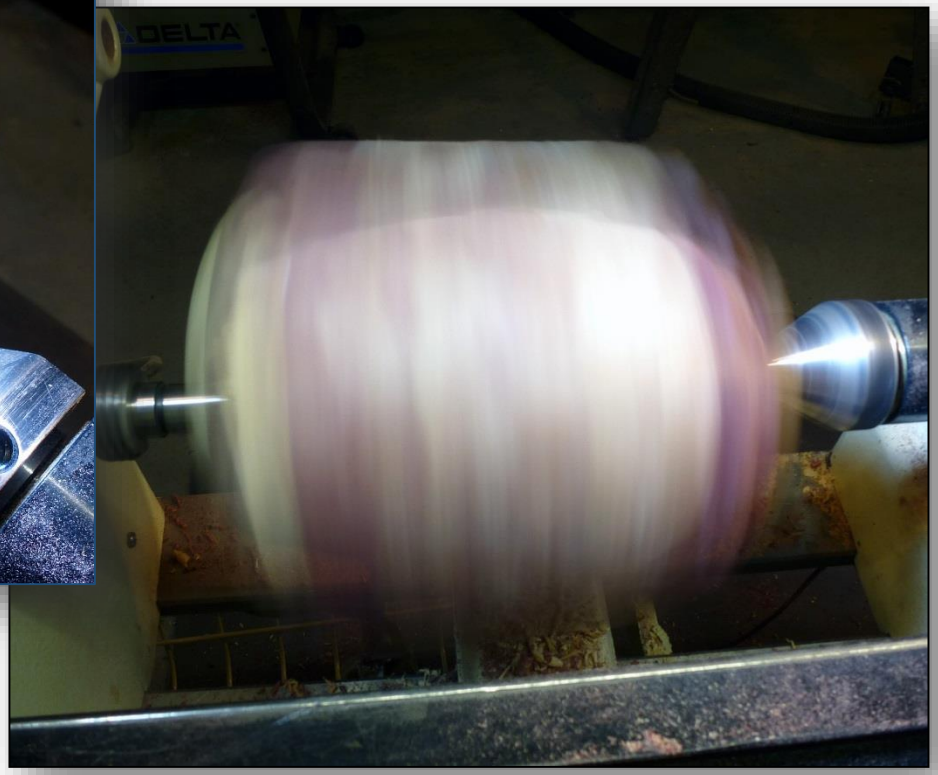
Making it round on-axis

Turning the twist off-axis

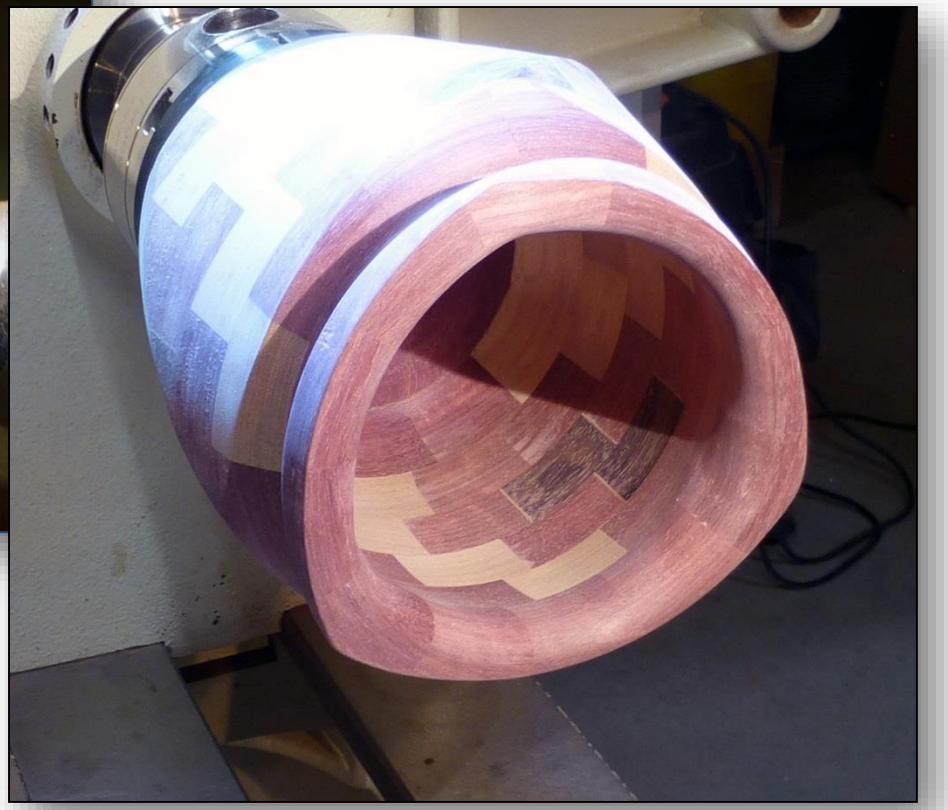
Design versus Actual



Off Axis Mounting and Wobble



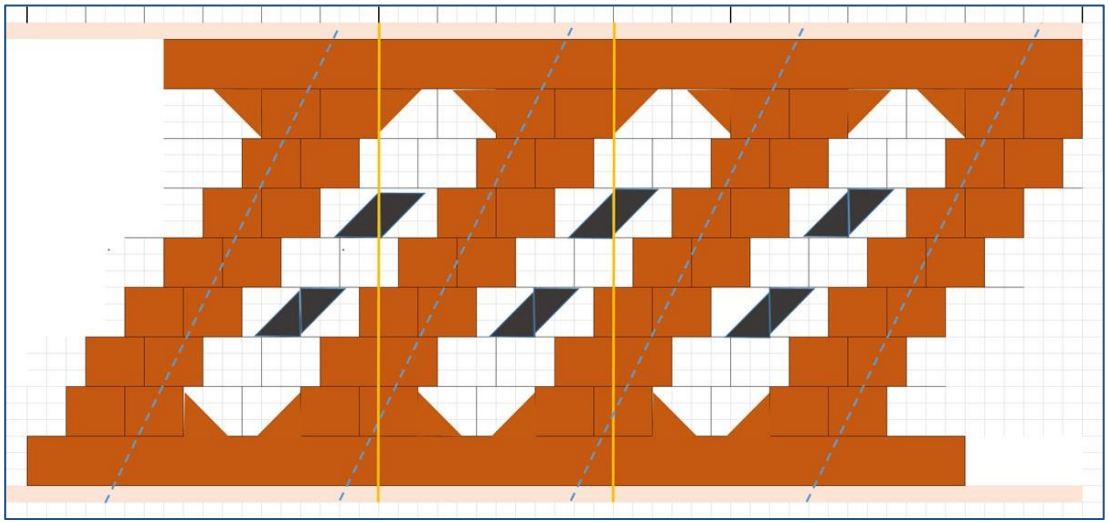
Finishing the Top



The Finished Bowl

Additional Designs

- This vase was designed with 12 segments per ring and nine layers

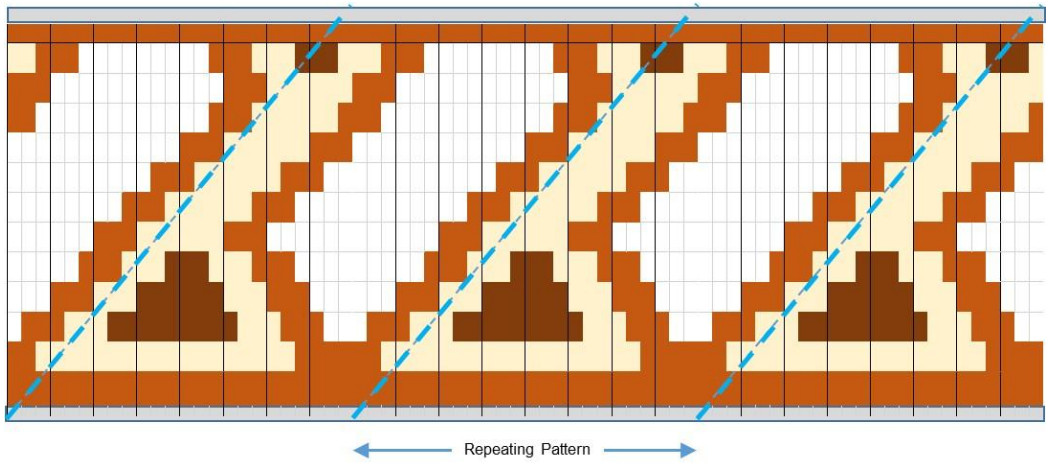


…from design

to finished product

Additional Designs

- This vase was designed with 24 segments per ring and thirteen layers



…from design

to finished product

A Variation: Twisted Slats

More Examples

Additional Information

Additional materials on twisted and twisted/segmented turning can be found at:

- Brian Horais website:
  - https://sites.google.com/site/cabriturn/home
- Barbara Dill (off-axis turning):
  - www.barbaradill.com
- Segmented turning:
  - https://www.woodturningonline.com/articles.php