

## Free Computer Design Tools For The Richard Joyner Offset Pendant Chucks

By: Bill Kloepping, February 2018

*Free Excel spreadsheets allow you to quickly see how different chuck set-up combinations look when using either of the Richard Joyner Offset Pendant Chucks. One spreadsheet supports the original 8-Hole Joyner chuck and a separate spreadsheet supports the new 10-Hole Joyner chuck. Both spreadsheet versions provide the same features.*

*This write-up provides useful information for both versions of the spreadsheet and also provides a few example designs for each chuck.*

### **About The Richard Joyner Offset Pendant Chucks:**

The Richard Joyner Offset Pendant Chucks are inexpensive, lightweight, eccentric offset turning chucks consisting of a base offset plate and a mating indexing plate. Two versions of the chuck, shown in **Figure 1**, are currently available; one version has 8 offset mounting holes and one has offset 10 mounting holes. The indexing plate for both chucks each have 24 indexing holes (15 degrees apart). The indexing plates and 4 index plate mounting screws are interchangeable between the chucks. The chucks are typically mounted to the lathe using a threaded mandrel (3/8"x16TPI, not shown). The index plates have holes that can be used to attach a blank or a waste/glue block.



**Figure 1** – The Richard Joyner Pendant Chucks – the original 8-Hole version on the left, the newer 10-Hole version on the right, with an index plate between them.

### **General Information About The Spreadsheet Tools:**

I created an Excel spreadsheet in 2012 to prototype designs for the original (8-hole) Richard Joyner Pendant chuck. The spreadsheet made it easy for people to create designs without time intensive trial and error effort in the shop. Updates were made to the spreadsheet over the years to improve its overall functionality.

Richard Joyner updated the design of the chuck in 2017. The new design added 2 more offset holes and changed the layout where all the offset holes were placed. This meant that designs made using the original spreadsheet would not work with the new chuck. I was asked to update the spreadsheet, which I have done.

The updated spreadsheet for the new chuck is virtually identical to the one for the original chuck. The only significant difference is the number (and placement) of the offset holes available (10 vs. 8). All other features of the spreadsheet for the original chuck have been retained and work the same in both spreadsheets.

The names of the updated spreadsheets now reflect which chuck the spreadsheet is designed to work with:

- a) The “8-Hole Joyner Chuck Design Tool” is used for the original 8-hole chuck
- b) The “10-Hole Joyner Chuck Design Tool” is used for the newer 10-hole chuck

Both spreadsheets provide the following functions/features:

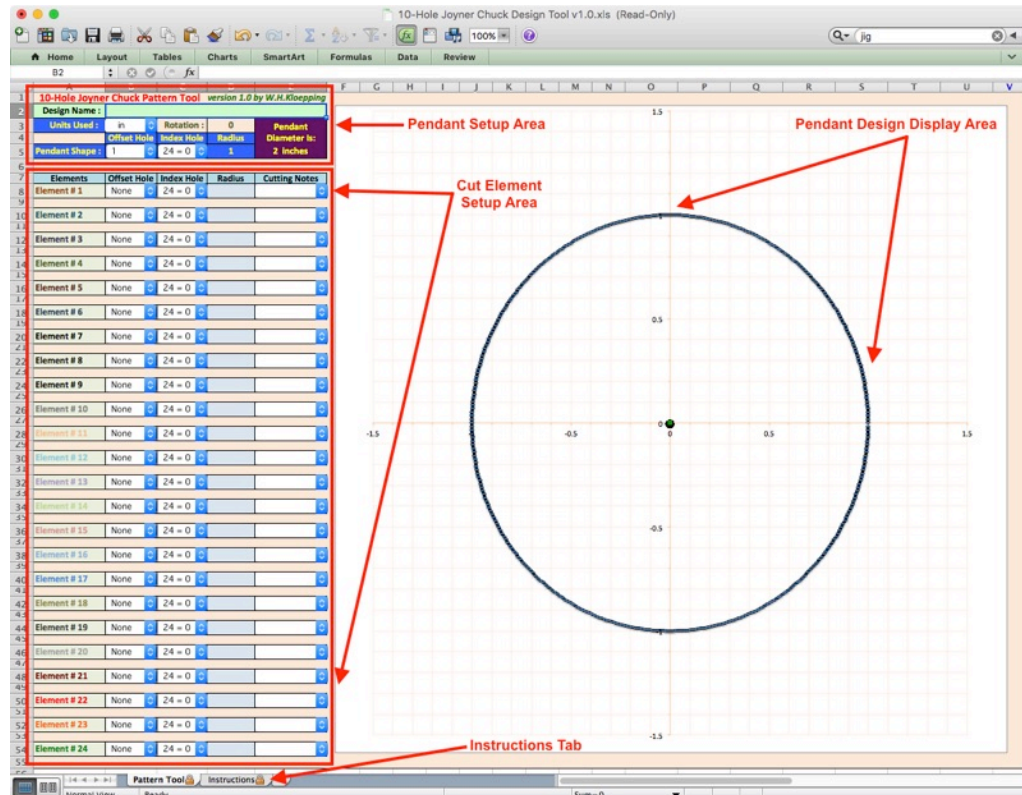
- a) specify the distance units to be used (inches, centimeters, millimeters)
- b) specify the overall pendant size
- c) use any offset hole/index position for the pendant outline
- d) define up to 24 individual design cut elements
- e) use any offset hole/index position for any design cut element
- f) specify the distance from the turning axis for a design cut to be made
- g) select from a list of cutting notes to remind you how to make a cut
- h) rotate the displayed design for better visualization of the design
- i) provide a name/title to designs
- j) save designs for later reuse
- k) print designs (including all design element details) for use at the lathe

The spreadsheets are around 2 MB in size and are saved in the “Excel 97-2004 Workbook (.xls)” format so they should be usable by anyone with a reasonably recent version of Excel. The spreadsheets utilize only basic Excel formulas and features (no macros) and can be migrated to other Excel-friendly programs (e.g. Numbers).

A copy of the latest versions (including this instructions file) can be obtained for free by going to [www.huntcountywoodturners.org](http://www.huntcountywoodturners.org) and clicking on “In The Shop” - “How To” - “Pendant Jig” link which will bring up the download page.

## The Parts Of The Spreadsheet:

A screenshot of the spreadsheet tool is shown in **Figure 2** with some red boxes and descriptions and arrows pointing to the major areas of the spreadsheet. The figure shows the 10-Hole Joyner Chuck Design Tool spreadsheet. The 8-Hole Joyner Chuck Design Tool spreadsheet looks identical except for the name.

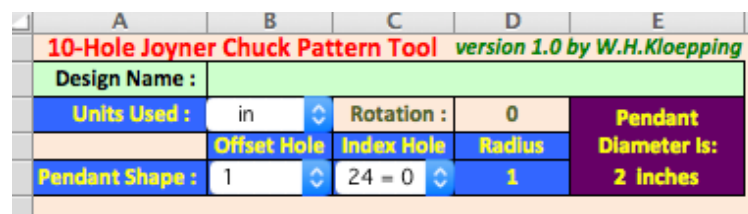


**Figure 2** – The basic areas of the Joyner Chuck Design Tool Spreadsheet

The spreadsheet is laid out with all of the controls on the left side of the panel and the Pendant Design Display Area occupying the remainder of the sheet. A separate Instructions tab provides some basic information about the spreadsheet. Each of the noted areas of the spreadsheet are described in more detail below.

## The Pendant Setup Area:

**Figure 3** shows a screen shot of the Pendant Setup Area of the spreadsheet.

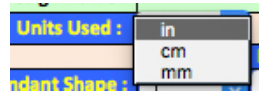


**Figure 3** – The Pendant Setup Area

At the top of the Pendant Setup Area is the name of the spreadsheet, indicating which chuck style (8-hole or 10-hole) the spreadsheet tool is for, along with which version of the spreadsheet you have.

Below the spreadsheet name is the Design Name field (wide light green colored box) where you can enter anything you want to identify the design for later reference.

Below the Design Name Field is the Units Used pull-down widget. Clicking on the Units Used widget will pop up the pull-down menu selector shown in **Figure 4**.



**Figure 4** – The Units Used Pull Down Menu Selector

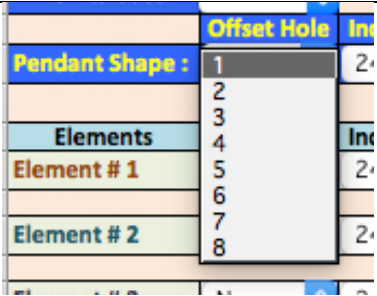
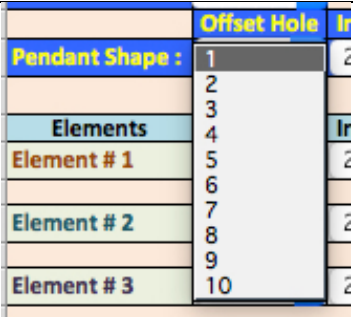
You can select to use Inches (in), Centimeters (cm) or Millimeters (mm) for all distance measurements (the default is inches). When you select the units to use, the spreadsheet automatically converts all physical offset hole measurements of the chuck into the selected units and assumes that all distance values specified in the spreadsheet are in the selected units (it will not convert measurements you have already entered into the new units). The design display area will automatically scale to use the units selected. Note that changing the units used will drastically affect a design and mixing units is not supported by this spreadsheet. All measurements must be made using the selected units or the resultant pendant will not look like the design.

To the right of the Units Used widget is the Rotation field (peach colored box with olive colored text). Entering any value, positive or negative, at any time into the Rotation field will result in the displayed design being rotated by the entered number of degrees. This rotation is just a display feature to orient the displayed design for better viewing (e.g. for orienting a lanyard hole to be at the top of the design, etc.). Changing the Rotation value will not affect the design in any way, only the angle you see it on the display. Rotating the design is optional and can be done at any time.

Below the Units Used/Rotation fields are the three Pendant Shape selectors. The Pendant Shape selectors are the Pendant Shape Offset Hole widget, the Pendant Shape Index Hole widget, and the Pendant Shape Radius field. These three selectors are used to define the shape of the pendant you are designing. You can use any offset hole and index position to form the pendant outline. Note that only using the center hole (hole #1) for pendant outlines seriously reduces the variety of designs you can make.

Clicking on the Pendant Shape Offset Hole selector widget will pop up a pull-down menu selector allowing you to select which Offset Hole (in the 8-Hole or 10-Hole offset base plate) that you wish to use to make the pendant round. The selections vary depending on which version of the spreadsheet you are using (8-Hole vs. 10-Hole).

**Figure 5** shows the Pendant Shape Offset Hole selections for the 8-Hole Joyner Chuck spreadsheet version and **Figure 6** shows the Pendant Shape Offset Hole selections for the 10-Hole Joyner Chuck spreadsheet version.

|  |  |
|--|--|
|   |    |
| <p><b>Figure 5</b> – Pendant Shape Offset Hole Pull Down Menu Selections for the 8-Hole Joyner Chuck Design Tool spreadsheet</p> | <p><b>Figure 6</b> –Pendant Shape Offset Hole Pull Down Menu Selections for the 10-Hole Joyner Chuck Design Tool spreadsheet</p> |

Clicking on the Pendant Shape Index Hole selector widget will pop up a pull-down menu selector allowing you to select which Index Plate Position you wish to use to make the pendant round. The widget selections are the same for both versions of the spreadsheet. **Figure 7** shows the Pendant Shape Index Hole selections. Note that position 0 and position 24 are the same hole position (“0” position) on the index plate.

|                 | Offset Hole | Index Hole |
|-----------------|-------------|------------|
| Pendant Shape : | 1           | 1          |
|                 |             | 2          |
|                 |             | 3          |
| Elements        | Offset Hole | 4          |
| Element # 1     | None        | 5          |
|                 |             | 6          |
| Element # 2     | None        | 7          |
|                 |             | 8          |
|                 |             | 9          |
| Element # 3     | None        | 10         |
|                 |             | 11         |
| Element # 4     | None        | 12         |
|                 |             | 13         |
| Element # 5     | None        | 14         |
|                 |             | 15         |
| Element # 6     | None        | 16         |
|                 |             | 17         |
| Element # 7     | None        | 18         |
|                 |             | 19         |
| Element # 8     | None        | 20         |
|                 |             | 21         |
| Element # 9     | None        | 22         |
|                 |             | 23         |
|                 |             | 24 = 0     |
|                 |             | 24 = 0     |

**Figure 7** – Pendant Shape Index Hole Pull Down Menu Selections

When you change the Pendant Shape Offset and/or Index Hole selection the Pendant Design Display Area will automatically update to show the current pendant shape. The display scale (x and y axis distance values) may change and the position of the pendant will move around in the display area depending on which offset hole you select. This is normal (it is a result of how the display is scaled/plotted by Excel).

The default pendant radius is set to 1 and can be changed at any time. Click in the (blue) Pendant Shape Radius field box to enter the desired Radius of the pendant (1/2 the desired diameter of the pendant). The Pendant Design Display Area will automatically update to show the current pendant shape/size. The radius entered is the distance you will measure from the center of rotation of the blank (using the selected Pendant Shape Offset and Index Hole selections) to make the pendant round. The Pendant Design Display Area display scale (x and y axis distance values) may change to accommodate the new size of the pendant.

Each time you change the Pendant Shape Radius the Pendant Diameter Indicator Box (purple box with yellow letters to the right of the Pendant Shape Radius field) will automatically update to display the Diameter of the resultant pendant (the diameter is twice the radius). The Pendant Diameter box is only an informational display to let you know the final diameter of the pendant that will be produced.

Note that you can enter any value for the pendant radius and the spreadsheet will work correctly, however, design flexibility is reduced as pendants get larger because the small physical size of the chuck limits the maximum offset distance you can obtain.

### **The Cut Element Setup Area:**

Below the Pendant Setup Area is the Cut Element Setup Area where you can define up to 24 different design elements (cuts) to make on the pendant. The Cut Element Setup Area looks the same for both versions of the spreadsheet (8-hole and 10-hole versions). **Figure 8** shows the Cut Element Setup Area.

The 24 element selector sets, labeled 'Element #1' through 'Element #24', are identical except for the color of the Element #x designator. The color of the Element #x designator name roughly coordinates with the color of the corresponding element that will be displayed in the Pendant Design Display Area, though it can sometimes be difficult to distinguish between some of the colors.



| Elements     | Offset Hole | Index Hole | Radius | Cutting Notes |
|--------------|-------------|------------|--------|---------------|
| Element # 1  | None        | 24 = 0     |        |               |
| Element # 2  | None        | 24 = 0     |        |               |
| Element # 3  | None        | 24 = 0     |        |               |
| Element # 4  | None        | 24 = 0     |        |               |
| Element # 5  | None        | 24 = 0     |        |               |
| Element # 6  | None        | 24 = 0     |        |               |
| Element # 7  | None        | 24 = 0     |        |               |
| Element # 8  | None        | 24 = 0     |        |               |
| Element # 9  | None        | 24 = 0     |        |               |
| Element # 10 | None        | 24 = 0     |        |               |
| Element # 11 | None        | 24 = 0     |        |               |
| Element # 12 | None        | 24 = 0     |        |               |
| Element # 13 | None        | 24 = 0     |        |               |
| Element # 14 | None        | 24 = 0     |        |               |
| Element # 15 | None        | 24 = 0     |        |               |
| Element # 16 | None        | 24 = 0     |        |               |
| Element # 17 | None        | 24 = 0     |        |               |
| Element # 18 | None        | 24 = 0     |        |               |
| Element # 19 | None        | 24 = 0     |        |               |
| Element # 20 | None        | 24 = 0     |        |               |
| Element # 21 | None        | 24 = 0     |        |               |
| Element # 22 | None        | 24 = 0     |        |               |
| Element # 23 | None        | 24 = 0     |        |               |
| Element # 24 | None        | 24 = 0     |        |               |

**Figure 8** – The Cut Element Setup Area

Each element selector set consists of an Element Offset Hole selector widget, an Element Index hole selector widget, an Element Radius entry field and an Element Cutting Notes selector widget.

Clicking on an Element Offset Hole selector widget will pop up a pull down menu selector that allows you to select which Offset Hole in the offset base plate that you wish to use to make that element cut. The selections vary depending on which version of the spreadsheet you're using (8-Hole vs. 10-Hole). **Figure 9** shows the Element Offset Hole selections for the 8-Hole Joyner Chuck spreadsheet version and **Figure 10** shows the Element Offset Hole Selections for the 10-Hole Joyner Chuck spreadsheet version. Selecting 'None' specifies that the element is not to be used and that element will NOT be plotted in the pendant design display area.

| <table> <tr> <th>Elements</th><th>Offset Hole</th></tr> <tr><td>Element # 1</td><td>1</td></tr> <tr><td></td><td>2</td></tr> <tr><td>Element # 2</td><td>3</td></tr> <tr><td></td><td>4</td></tr> <tr><td>Element # 3</td><td>5</td></tr> <tr><td></td><td>6</td></tr> <tr><td>Element # 4</td><td>7</td></tr> <tr><td></td><td>8</td></tr> <tr><td></td><td>None</td></tr> </table> | Elements  | Offset Hole | Element # 1 | 1 |  | 2 | Element # 2 | 3 |  | 4 | Element # 3 | 5 |  | 6 | Element # 4 | 7 |  | 8 |  | None | <table> <tr> <th>Elements</th><th>Offset Hole</th></tr> <tr><td>Element # 1</td><td>1</td></tr> <tr><td></td><td>2</td></tr> <tr><td>Element # 2</td><td>3</td></tr> <tr><td></td><td>4</td></tr> <tr><td>Element # 3</td><td>5</td></tr> <tr><td></td><td>6</td></tr> <tr><td>Element # 4</td><td>7</td></tr> <tr><td></td><td>8</td></tr> <tr><td></td><td>9</td></tr> <tr><td>Element # 5</td><td>10</td></tr> <tr><td></td><td>None</td></tr> </table> | Elements | Offset Hole | Element # 1 | 1 |  | 2 | Element # 2 | 3 |  | 4 | Element # 3 | 5 |  | 6 | Element # 4 | 7 |  | 8 |  | 9 | Element # 5 | 10 |  | None |
|--|---|-------------|-------------|---|--|---|-------------|---|--|---|-------------|---|--|---|-------------|---|--|---|--|------|--|----------|-------------|-------------|---|--|---|-------------|---|--|---|-------------|---|--|---|-------------|---|--|---|--|---|-------------|----|--|------|
| Elements   | Offset Hole   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 1  | 1   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 2   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 2  | 3   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 4   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 3  | 5   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 6   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 4  | 7   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 8   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | None  |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Elements   | Offset Hole   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 1  | 1   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 2   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 2  | 3   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 4   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 3  | 5   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 6   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 4  | 7   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 8   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | 9   |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| Element # 5  | 10  |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
|  | None  |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |
| <b>Figure 9</b> – Element Offset Hole Pull Down Menu Selections for the 8-Hole Joyner Chuck Design Tool spreadsheet  | <b>Figure 10</b> – Element Offset Hole Pull Down Menu Selections for the 10-Hole Joyner Chuck Design Tool spreadsheet |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |      |  |          |             |             |   |  |   |             |   |  |   |             |   |  |   |             |   |  |   |  |   |             |    |  |      |

Clicking on the Element Index Hole selector widget will pop up a pull-down menu selector allowing you to select which Index Plate Position you wish to use to make that element cut. The Element Index Hole widget selections are the same for both versions of the spreadsheet. **Figure 11** shows the Element Index Hole selections. Note that position 0 and position 24 are the same index plate position (the “0” position).

| Elements     | Offset Hole | Index Hole |
|--------------|-------------|------------|
| Element # 1  | 1           | 1          |
| Element # 2  | None        | 2          |
| Element # 3  | None        | 3          |
| Element # 4  | None        | 4          |
| Element # 5  | None        | 5          |
| Element # 6  | None        | 6          |
| Element # 7  | None        | 7          |
| Element # 8  | None        | 8          |
| Element # 9  | None        | 9          |
| Element # 10 | None        | 10         |
| Element # 11 | None        | 11         |
| Element # 12 | None        | 12         |
| Element # 13 | None        | 13         |
| Element # 14 | None        | 14         |
| Element # 15 | None        | 15         |
| Element # 16 | None        | 16         |
| Element # 17 | None        | 17         |
| Element # 18 | None        | 18         |
| Element # 19 | None        | 19         |
| Element # 20 | None        | 20         |
| Element # 21 | None        | 21         |
| Element # 22 | None        | 22         |
| Element # 23 | None        | 23         |
| Element # 24 | None        | 24 = 0     |

**Figure 11** – Element Index Hole Pull Down Menu Selections

The default Element Radius is 0 (blank) and can be changed at any time. Click in the (blue) element Radius field box for the element being defined and enter the desired Radius of the cut you wish to make for that element. The radius is the distance from the center of rotation of the blank (using the selected Element Offset and Index hole positions) that you will measure to make that element cut.

Once an Element Offset Hole (other than ‘None’), Element Index Hole and Element Radius is specified or changed for an element the result of that element cut setup will automatically be updated in the Pendant Design Display Area.

Clicking on the Element Cutting Notes selector widget for an element will pop up a pull down menu selector allowing you to select from a number of cutting techniques. **Figure 12** shows the Element Cutting Notes selections. Using the Cutting Notes widget is optional for any element and will not affect the design or display in any way. The Cutting Notes widget is provided to help you note how you planned the design to be implemented (e.g. a ‘Through Hole’ to cut all the way through for a lanyard, etc.)

| Elements     | Offset Hole | Index Hole | Radius | Cutting Notes  |
|--------------|-------------|------------|--------|----------------|
| Element # 1  | 1           | 1          |        | Through Hole   |
| Element # 2  | None        | 24 = 0     |        | Through Cut    |
| Element # 3  | None        | 24 = 0     |        | Shallow Cut    |
| Element # 4  | None        | 24 = 0     |        | Deep Cut       |
| Element # 5  | None        | 24 = 0     |        | Wide Cut       |
| Element # 6  | None        | 24 = 0     |        | Narrow Cut     |
| Element # 7  | None        | 24 = 0     |        | Shallow+Wide   |
| Element # 8  | None        | 24 = 0     |        | Shallow+Narrow |
| Element # 9  | None        | 24 = 0     |        | Deep+Wide      |
| Element # 10 | None        | 24 = 0     |        | Deep+Narrow    |

**Figure 12** – Element Cutting Notes Pull Down Menu Selections



### **The Pendant Design Display Area:**

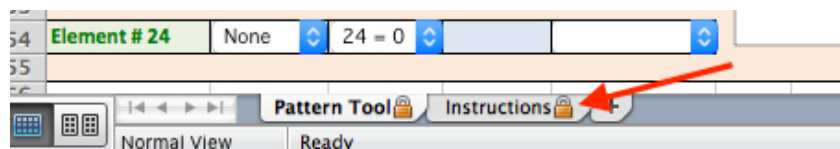
The Pendant Design Display Area has no controls in it. It is a display only area that automatically displays the results of any selections made or changed in the Pendant Setup and Cut Element Setup areas.

Note that you can enter any value for an element radius and the spreadsheet will work correctly, however, if the radius value specified results in the cut element being outside of the pendant outline then you will not see any change in the Pendant Design Display Area. Only those portions of an element cut that falls inside of the current pendant shape outline will be plotted on the display, portions of an element cut that fall outside of the pendant shape outline will not be displayed.

If you specify or change an element parameters but don't see any change in the display you should reduce (or, in some situations, increase) the radius value until you see some portion of the element show up on the pendant display; after which you can tweak the element parameters to get the effect you are looking for.

### **The Instructions Tab:**

A separate "Instructions" spreadsheet tab can be viewed by clicking on the "Instructions" icon located in the bottom left hand side of the spreadsheet window below the element setup area. **Figure 13** shows the location of the Instructions tab.



**Figure 13** – The Instructions Tab

Clicking on the Instructions tab will change the spreadsheet window to display a scrollable worksheet that provides some basic information about the spreadsheet along with some terse instructions about how to use the spreadsheet. The Instructions Tab provides information only; there are no controls available within this tab. The Instructions tab is provided as a quick tutorial on the spreadsheet and does not replace the more detailed instructions in the file you are reading now.

Clicking on the 'Pattern Tool' tab will switch the display back to the pattern tool spreadsheet. Clicking between the Instructions and Pattern Tool will not affect any design you are in the process of creating.

### **Using The Spreadsheet Tool:**

The spreadsheet tool is relatively easy to use, although coming up with a pleasing design may take some time. A quick list of the basic steps to prototype a pendant design is as follows:

1. Select the Units you want to use for all measurements
2. Select the Offset Hole to use for the pendant shape outline
3. Select the Index Hole to use for the pendant shape outline
4. Enter the Radius to use for the pendant shape outline

You will see a circular pendant outline displayed in the Pendant Design Display Area.

For each cut element you want to add to the pendant:

- A. Select the Offset Hole to use for the element. Note: Selecting “None” will turn off (i.e. not display) an element.
- B. Select the Index Hole to use for the element
- C. Enter the Radius of the cut to use for the element

You will see the resultant portions of the cut element that are inside the pendant outline show up in the display area.

Optional Actions:

- You can select a Cutting Note for any cut element
- You can type any information you want into the Design Name box
- You can enter an angle into the Rotation box to orient the displayed design
- You can Print a copy of the design (includes all settings) to take to the lathe
- You can Save a copy of the design to your computer

### **A Few Notes About Using The Spreadsheet Tool:**

No tool is perfect; especially when you rely on another application as the basis for the tool. The Joyner Chuck Pattern Tool spreadsheet is no exception. There are a few Excel “features” to be noted. Additionally, there are a number of general notes about using the spreadsheet tool that may not be intuitively obvious to everyone.

When you open the spreadsheet you will get a notice telling you that it should be opened as read-only. The spreadsheet was saved as a protected, read-only file to help reduce the possibility of people accidentally overwriting the original spreadsheet. Clicking “Yes” (recommended) in the dialog box will open the spreadsheet as a read-only file (requiring you to save any changes to a new file). Clicking “No” in the dialog box will open the spreadsheet normally which could lead to accidentally overwriting the initial settings of the original spreadsheet.

When you open the spreadsheet, and from time to time during use, the pull-down widgets (the buttons with the blue up/down arrows) may not be displayed. This is an Excel “feature” that I haven’t figured out how to correct. The widgets will reappear if you click on the cell where the widget should be. You can get all the widgets to appear if you click on a tool on the Excel toolbar at the top – e.g. the “Bold” button (“B” box).

Selecting different Offset and/or Index Holes for the Pendant Shape may cause the displayed pendant outline to change size and move around in the Pendant Design Display Area. This is due to the auto-formatting features of the Excel plot functions that were used. The changing sizes and position of the displayed design do not affect the design itself, only how it’s displayed in the Pendant Design Display Area.

All radius values must be entered as decimal numbers, not fractions (e.g. enter 0.75, not 3/4). If you attempt to enter fractions into the Radius fields (with or without using an equals sign) Excel will interpret the fraction as a date and your design will not work well (ex: entering ½ will be interpreted by Excel as 2-Jan, ¾ as 4-Mar, etc.).

The physical chuck dimensions are used in all calculations and are converted into the units selected (from the Units Used widget) so you need to make sure that you are entering measurements using the selected units. Entering metric values when Inches is selected (and visa-versa) will result in your design not matching the final pendant.

The spreadsheet tool works with radius values for all measurements (not diameter values). If you want a pendant to be 3 inches in diameter you will need to enter 1.5 for the Pendant Shape Radius (the radius is always half of the diameter).

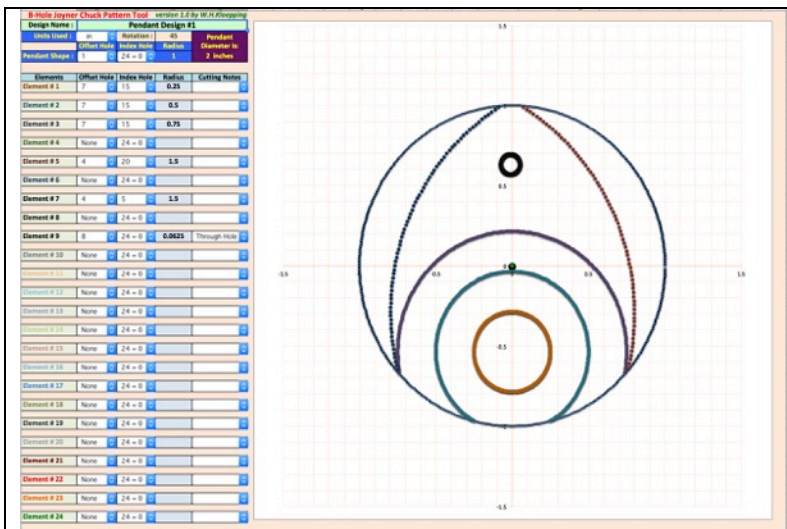
The spreadsheet allows up to 24 different cut elements in a design. You can use any of the element control lines in any order - you do not have to use sequential lines (e.g. you can use Elements #5, #9 and #22 and leave the others unused). Leaving a blank line (Offset Hole = None with no Radius value) between elements or groups of related elements can help make the design easier to follow when at the lathe.

Once you specify an Offset Hole, Index Hole, and a Radius for a given cut element the result of that cut will automatically be displayed on the Pendant Design Display Area. Only the portion of the cut element that will actually be on the pendant (inside the pendant outline) is displayed on the plot. Any portion of the cut element that falls outside of the pendant outline (i.e. where you are “turning air”) will not be displayed.

Entering a number into the Rotation box will rotate the design around the center of the display. This is a visual orientation aid and does not affect the design in any way. You can change the rotation of the display at any time to view the pendant design from different orientation angles. Setting the rotation value so the lanyard hole is at the top of the display often helps visualizing what the final pendant will look like.

You can save a copy of a design to your computers storage device. Read-only files must be saved to a new file using a different file name. If you use “File-Save” from the Excel pull-down menu you will be prompted that the file is read-only and you will need to use a new file name and the “File-Save As” dialog will be displayed. The saved file is a ‘full-up’ copy of the spreadsheet tool and can be opened later and modified without having to recreate all the elements from scratch.

You can print a copy of a pendant design to use at the lathe. Printouts show the display plot of the pendant along with all of the Pendant Shape and Element settings (everything you see in the spreadsheet when creating designs). You can use the File-Print selection from the Excel pull-down menus or use the Excel toolbar ‘Print’ button to print a copy of the design. The print area of the spreadsheet has been set to print only the important parts of the spreadsheet so the printout will be on a single sheet of paper in landscape layout. **Figure 14** shows an example printout of a completed pendant design. **Figure 15** shows a picture of the resultant pendant from that design. Note how closely the pendant matches the design. See the **Appendix** for a detailed list of the setup parameters for all designs in this document (plus some not shown).



**Figure 14** – Example Printout of a Completed Design (Pendant Design #1)



**Figure 15** – Picture of the turned Pendant Design #1

### **At The Lathe:**

A complete discussion about how to use the pendant chuck at the lathe is not provided here (it's assumed that if you have one of these chucks you should be familiar with, or can figure out, how to select the different offset hole and index hole combinations). There are, however, a few items worth noting about turning a pendant from a design that you prototyped using the spreadsheet tool.

Except for when you're using the center Offset Hole (Hole #1 on the offset base), EACH time you change to use a different Offset Hole and/or Index Hole position the location of the turning axis on the face of the blank will change to a different location.

Distance measurements are critically important in order for the prototyped design to match the final piece. For example, if a cut is specified to be at a radius of 0.75" from the center of rotation and you make the cut at 0.8" from the center of rotation or 0.75" from a point that is not at the precise center of rotation the cut element will be too big and the resultant pendant will not match the design very well.

There are two basic ways to ensure that you are getting precise distance measurements from the center of rotation:

1. EACH TIME you change any of the chuck settings (by changing either an offset hole or an index hole position) turn the lathe on and make a light pencil mark where the center of rotation is on the blank (at the turning axis) and make all distance measurements for that chuck setup directly onto the face of the blank from that new center of rotation mark  
OR:
2. Set the tool rest so that it is far enough away from the chuck (with the pendant blank attached) so that you can remove the chuck from the lathe without moving the tool rest, adjust the tool rest so that the top of the tool rest is level with the turning axis of the lathe and parallel to the pendant blank, and then make a mark on the tool rest exactly at the turning axis point and make all measurements for all chuck setups from that mark.

There are good and bad points for using either method.

Remarking the center of rotation on the blank each time you change the chuck settings is fairly easy to do (albeit a little time consuming to do each time you change the chuck settings), however, the center mark may sometimes be at the bottom or on the side of a prior cut, making it extremely difficult to locate precisely, making distance measurements much less accurate when this happens.

If you can stand some occasional imprecision in a pendant design then remarking the center of rotation on the blank each time the chuck settings are changed is definitely easy to do. If your designs require precise distance measurements for the cut elements to flow together nicely you may want to use the fixed tool rest approach.

Fixing the tool rest and making all measurements from a fixed point on the tool rest can result in consistently more precise distance measurements if implemented correctly. Proper implementation of this technique, however, is a bit more tedious than simply remarking the center each time you change the settings.

I prefer to use the fixed tool rest technique most (almost all) of the time. Although the initial set up takes a little bit more time at the start, it can actually save time overall if you're planning on making multiple pendants in one session as you are not constantly having to remark the center turning point on the blank each time you change the chuck settings; all measurements are quickly made from a mark on the tool rest that is established at the initial setup (as long as the tool rest is not moved).

My preferred 'fixed tool rest' measuring technique uses a small flat, rectangular platform tool rest (also called a box tool rest), a small ruler, a small square, and a small skew. A 'normal' tool rest can be used but requires more care when making cuts.

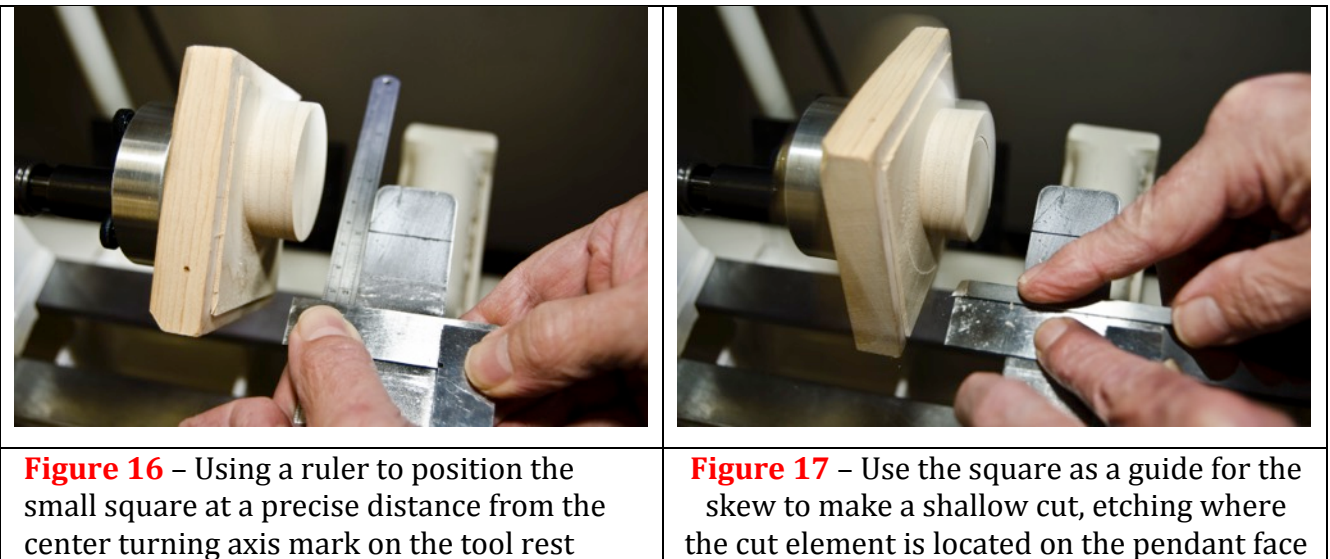
I begin by setting the tool rest height so the tip of the cutting tool (a small skew) will cut precisely on center when the tool is laying flat on the tool rest (i.e. the tip of the skew can touch the rotation/center axis point). I then set the banjo so the edge of the tool rest is parallel to the face of the chuck (with pendant blank attached) and far enough away from the chuck/pendant blank so I can easily remove the chuck from the lathe (i.e. unscrew it from the mandrel) without having to move the tool rest and also far enough away so the square can be held firmly against the platform edge and not get in the way of the spinning chuck/pendant when the lathe is on.

I then turn the lathe on and carefully mark the location of the turning axis point on the face of the blank (a light pencil mark will do). I then position the square firmly on the edge of the platform rest and place the skew against it so the skew is held perpendicular to the rest (pointing squarely at the blank) and then move the square and skew together until the tip of the skew is pointed directly at (and can touch) the rotation/center axis point. Holding the square fixed on the rest at that point I mark a thin dark line on the tool rest.



The dark line marks where the turning axis is located on the tool rest and will not change no matter how many times I adjust the chuck as long as I do not move the tool rest position. I can now quickly make all distance measurements from that mark and know that they will be measured precisely from the turning axis (at least as precisely as my ruler allows). If you move the tool rest at some point you will have to repeat the setup process to re-mark the turning axis location on the tool rest.

Once the setup is done, to make a cut, simply use the ruler to measure from the turning axis mark to set the square at the precise radius distance for the cut (see **Figure 16**) then, with the lathe on, hold the square firmly on the tool rest at the measured location and run the tip of the small skew along the edge of the square to make a shallow cut to lightly etch where the cut element will be on the face of the blank (see **Figure 17**). With the location of the cut etched on the blank, the square can be removed and any tool can be used to finish the cut to the desired profile.



Note: If you choose to use the ‘fixed tool rest’ technique using a normal (not flat) tool rest you must be careful that your tool always cuts on the horizontal line that passes through the center turning axis. If the tool is angled up or down to cut above or below the (on center) horizontal line the cut will be larger than the design calls for (even if you measured correctly) and the pendant will not match the design very well.

**Figures 16 and 17** also illustrates one method (out of many) that you can use to mount a pendant blank to the chuck. Here, a waste block is screwed to the index plate (and turned flat). The pendant blank is an oversized square blank that is attached to

the waste block using double-sided tape. Using this method, multiple pendants may be created and parted off of the same pendant blank. The oversized pendant blank is turned down to about 1/16" from the waste block. Leaving a larger contact area between the waste block and the pendant blank provides for better holding power during turning (and less likelihood the pendant may be knocked off the waste block).

Side note: I use a thin, inexpensive double sided vinyl flooring tape available from my local home improvement store; I find using thicker tape allows the blank to wiggle around too much during turning which results in the pendant design not looking very crisp and often does not look very accurate when compared to the prototyped design.

### **Some Additional Notes About Using The Spreadsheet Tool:**

The spreadsheet doesn't take everything into account for you.

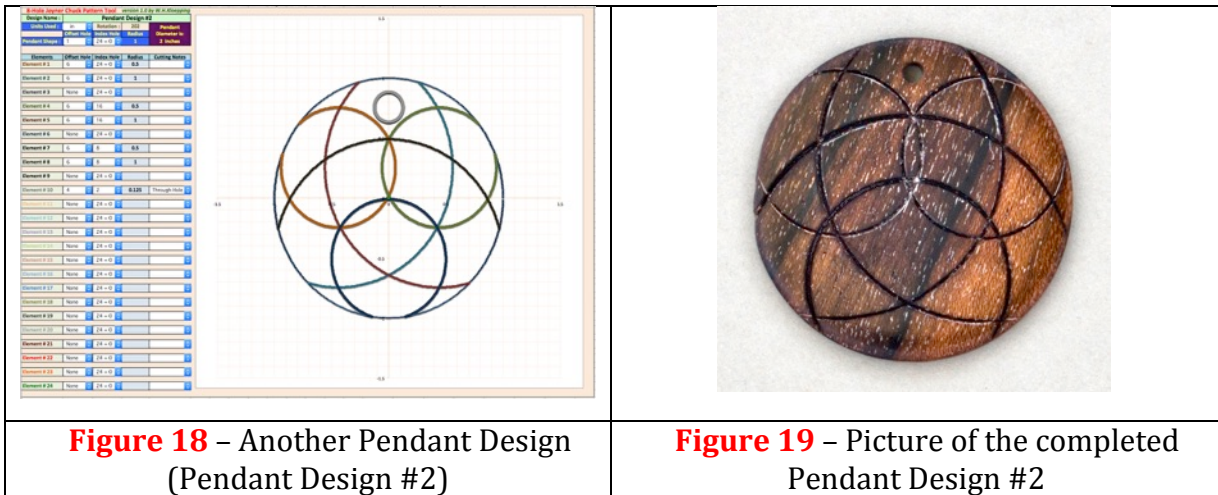
The spreadsheet doesn't take into account the width of the cuts you intend to make. All cut lines are displayed in the Pendant Design Display Area with the same width. Using the Cutting Notes widget can help you document the intended design to help you remember what a particular cut was supposed to be for when at the lathe.

The spreadsheet assumes that a pendant face is flat, not rounded off at the edges. The Pendant Design Display Area shows all cuts extending all the way to the pendant edge with the same thickness. If a pendant is rounded off at the edge, a cut can 'thin out', get shallower and/or disappear entirely towards the edge of a non-flat pendant.

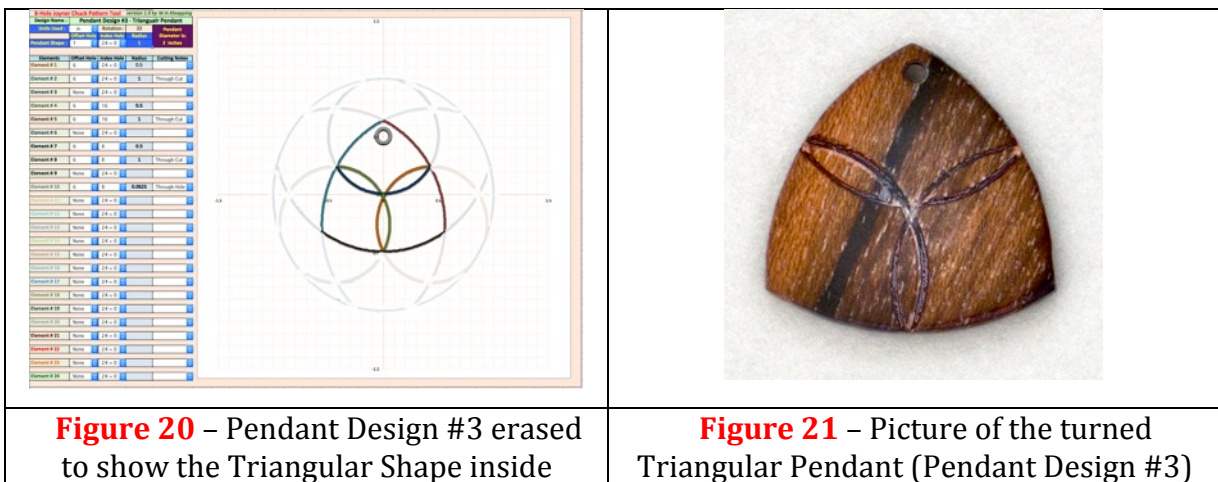
The Pendant Design Display Area doesn't distinguish between a shallow circular cut vs. a hole you intend to drill through to the back of the pendant (e.g. to string a lanyard through). Again, using the Cutting Notes widget can help you document the intended design so you know which element is a Through Hole vs. a Shallow Cut.

The Pendant Design Display Area also doesn't distinguish between a shallow cut vs. cutting all the way through the pendant to lop off the edge(s) of a pendant to create non-circular pendants. Use the 'Through Cut' Cutting Notes selection to indicate when you intend a cut element to cut off the edge of the pendant.

As an example of this, **Figure 18** shows a reasonably elaborate pendant design and **Figure 19** shows the resultant pendant turned from that design. Note that the central portion of the design is a rounded triangular shape that might make an interesting pendant on it's own.



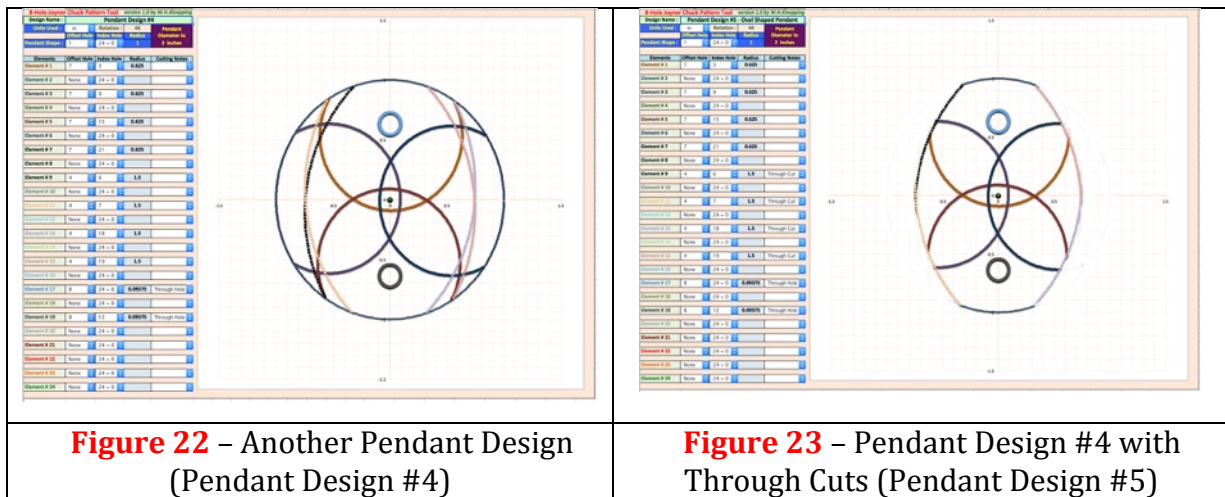
Except for a different lanyard through-hole position and a different plot rotation value, **Figure 20** is the same basic pendant design as the one in **Figure 18**, however, I've 'faded out' (erased) everything outside of the central rounded triangular shape area to show all that will be left after cutting off the edges of the pendant. I've used the Cutting Notes widget to note which of the cuts should be Through Cuts to result in the triangular shaped pendant shown in **Figure 21**.



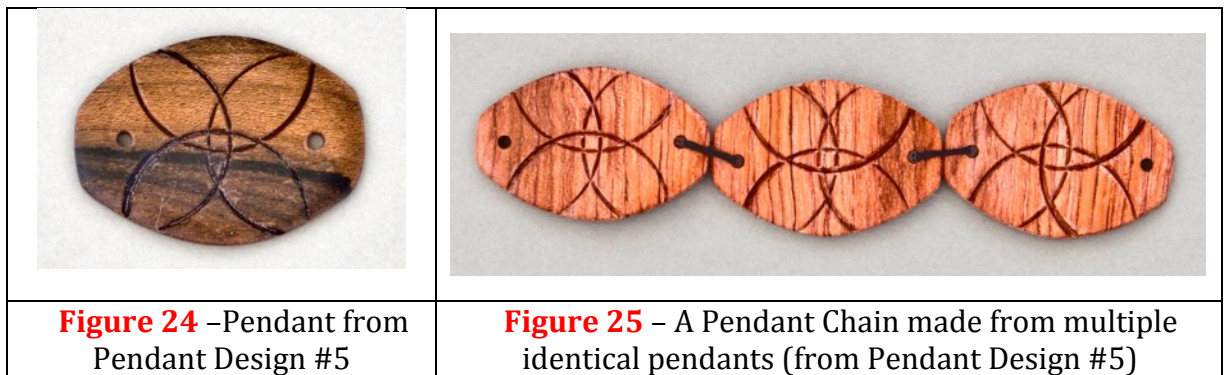
Crescent shapes and other non-circular shaped pendants can be similarly created with a little bit of imagination.

**Figure 22** shows a pendant design that probably won't make a very pretty circular pendant, however, **Figure 23** shows the same design as **Figure 22** with the edges erased outside of where through cuts can be made instead of shallow cuts to turn off the edges of the pendant. This will result in a non-circular oval shaped pendant with lanyard holes on each end.

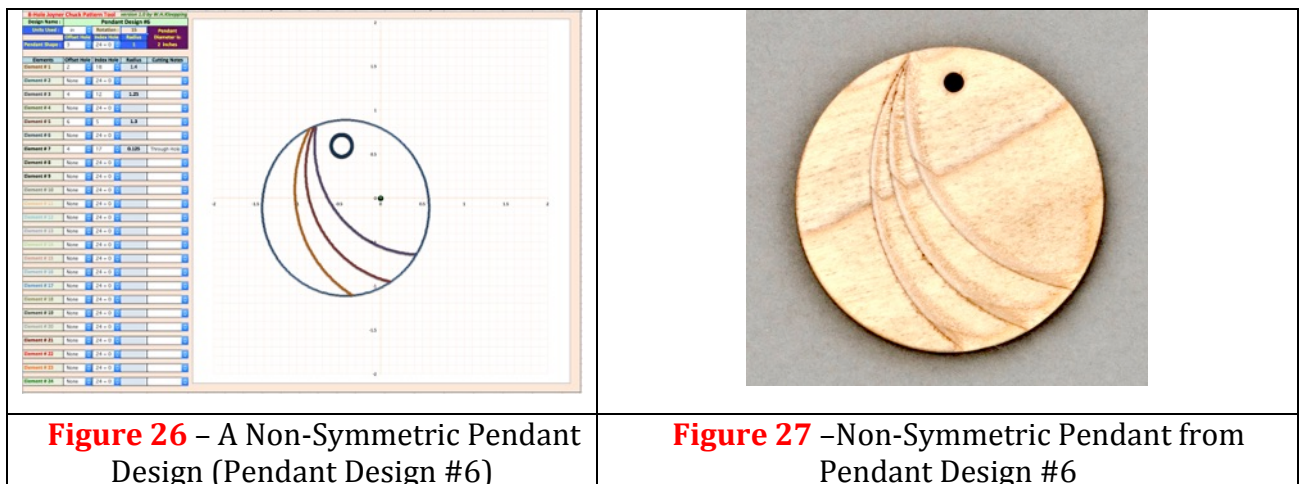




The resulting pendant from Pendant Design #5 is seen in **Figure 24**. **Figure 25** shows a pendant chain made by stringing together a number of identical pendants.



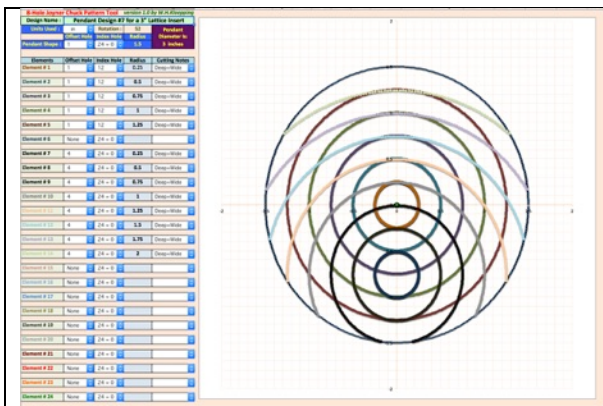
The designs illustrated so far have utilized symmetric designs. Non-symmetric designs can also make for good looking pendants; indeed, many good looking pendant designs will not be symmetric. **Figure 26** shows a simple, non-symmetric design. **Figure 27** shows the resultant pendant from that design.



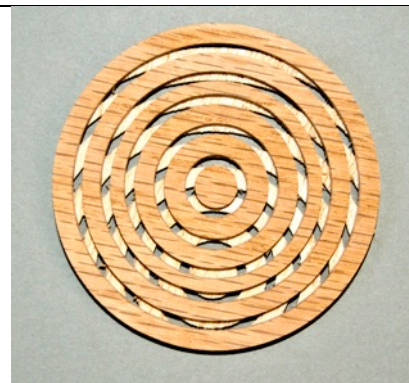
A different, non-pendant use for the pendant chuck and spreadsheet tool is for making lattice insert patterns. Here, a pattern is cut half way through a blank from one side, then the blank is turned over and a different pattern is cut half way through the blank from the other side resulting in a see-through lattice like pattern.

The spreadsheet can be used to help design a lattice pattern simply by superimposing a design for the front face of the lattice onto a design for the back face.

**Figure 28** shows a pattern that can be used for a lattice insert. The design has a simple concentric circle pattern around the center offset Hole #1 for the front face pattern and an offset concentric circle pattern around offset Hole #4 for the pattern on the back side. **Figure 29** shows a picture of the resultant turned lattice. One item to note is that when the blank is flipped over you need to be careful where you attach the blank to the index plate. If you don't orient the lattice properly on the index plate the resultant lattice may not look like the prototyped design. Further discussion on making lattice designs with the Joyner Chucks is outside the scope of this article.



**Figure 28** – A Lattice Insert Design  
(Pendant Design #7)



**Figure 29** – Turned Lattice Insert from  
Pendant Design #7

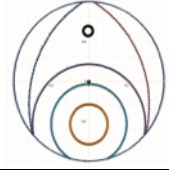
Note that sometimes, things may not always go as planned or look quite as good as a design might have suggested. Being careful with measuring distances and making the depth and/or width of all cuts uniformly and consistently can improve results.


In closing, using the Joyner Chuck Design Tool spreadsheet can help you explore many possible designs that can be created using the Richard Joyner Pendant Chucks without wasting a lot of time or wood.

**End Of Article**

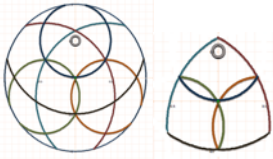
### **APPENDIX OF EXAMPLE DESIGNS**



The following lists the parameter settings (including cutting notes and design plot) for each of the pendant designs in the article. All of the article designs were created using the 8-Hole Joyner Chuck Pattern Tool. Some additional designs made using the 10-Hole Joyner Chuck Pattern Tool are included after the article designs.

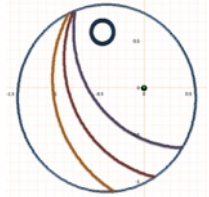
| Design Name   | Pendant Design #1 |            |        | For 8-Hole Chuck  |
|---------------|-------------------|------------|--------|---|
| Units Used    | Inches            | Rotation   | 45     |  |
|               | Offset Hole       | Index Hole | Radius |   |
| Pendant Shape | 1                 | 24         | 1      |   |
|               | Offset Hole       | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 7                 | 15         | 0.25   |   |
| Element # 2   | 7                 | 15         | 0.5    |   |
| Element # 3   | 7                 | 15         | 0.75   |   |
| Element # 5   | 4                 | 20         | 1.5    |   |
| Element # 7   | 4                 | 5          | 1.5    |   |
| Element # 9   | 8                 | 24         | 0.0625 | Through Hole  |

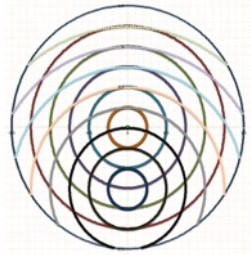
| Design Name   | Pendant Design #2 |            |        | For 8-Hole Chuck  |
|---------------|-------------------|------------|--------|---|
| Units Used    | Inches            | Rotation   | 202    |  |
|               | Offset Hole       | Index Hole | Radius |   |
| Pendant Shape | 1                 | 24         | 1      |   |
|               | Offset Hole       | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 6                 | 24         | 0.5    |   |
| Element # 2   | 6                 | 24         | 1      |   |
| Element # 4   | 6                 | 16         | 0.5    |   |
| Element # 5   | 6                 | 16         | 1      |   |
| Element # 7   | 6                 | 8          | 0.5    |   |
| Element # 8   | 6                 | 8          | 1      |   |
| Element # 10  | 4                 | 2          | 0.125  | Through Hole  |




| Design Name   | Pendant Design #3 – Triangular Pendant |            |        | For 8-Hole Chuck  |
|---------------|--|------------|--------|---|
| Units Used    | Inches                                 | Rotation   | 22     |  |
|               | Offset Hole                            | Index Hole | Radius |   |
| Pendant Shape | 1                                      | 24         | 1      |   |
|               | Offset Hole                            | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 6                                      | 24         | 0.5    |   |
| Element # 2   | 6                                      | 24         | 1      | Through cut   |
| Element # 4   | 6                                      | 16         | 0.5    |   |
| Element # 5   | 6                                      | 16         | 1      | Through cut   |
| Element # 7   | 6                                      | 8          | 0.5    |   |
| Element # 8   | 6                                      | 8          | 1      | Through cut   |
| Element # 10  | 6                                      | 8          | 0.0625 | Through Hole  |

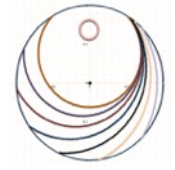
| Design Name   | Pendant Design #4 (without through cuts)<br>Pendant Design #5 (with through cuts) |            |         | For 8-Hole Chuck  |
|---------------|---|------------|---------|---|
| Units Used    | Inches  | Rotation   | 44      | <br> |
|               | Offset Hole   | Index Hole | Radius  |   |
| Pendant Shape | 1   | 24         | 1       |   |
|               | Offset Hole   | Index Hole | Radius  | Cutting Notes   |
| Element # 1   | 7   | 3          | 0.625   |   |
| Element # 3   | 7   | 9          | 0.625   |   |
| Element # 5   | 7   | 15         | 0.625   |   |
| Element # 7   | 7   | 21         | 0.625   |   |
| Element # 9   | 4   | 6          | 1.5     | Through cut (#5)  |
| Element # 11  | 4   | 7          | 1.5     | Through cut (#5)  |
| Element # 13  | 4   | 18         | 1.5     | Through cut (#5)  |
| Element # 15  | 4   | 19         | 1.5     | Through cut (#5)  |
| Element # 17  | 8   | 24         | 0.09375 | Through Hole  |
| Element # 19  | 8   | 12         | 0.09375 | Through Hole  |

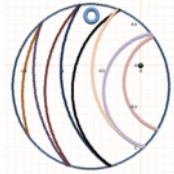
| Design Name   | Pendant Design #6 |            |        | For 8-Hole Chuck  |
|---------------|-------------------|------------|--------|---|
| Units Used    | Inches            | Rotation   | 15     |  |
|               | Offset Hole       | Index Hole | Radius |   |
| Pendant Shape | 3                 | 24         | 1      |   |
|               | Offset Hole       | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 2                 | 18         | 1.4    |   |
| Element # 3   | 4                 | 12         | 1.25   |   |
| Element # 5   | 6                 | 5          | 1.3    |   |
| Element # 7   | 4                 | 17         | 0.125  | Through Hole  |

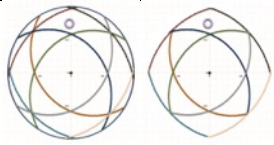
| Design Name   | Pendant Design #7 – 3" Lattice Insert<br>Offset: 1=Front side cuts, 4=Back side cuts |            |        | For 8-Hole Chuck   |
|---------------|--|------------|--------|--|
| Units Used    | Inches   | Rotation   | 52     |  |
|               | Offset Hole  | Index Hole | Radius |  |
| Pendant Shape | 1  | 24         | 1.5    |  |
|               | Offset Hole  | Index Hole | Radius | Cutting Notes  |
| Element # 1   | 1  | 12         | 0.25   | Deep + Wide  |
| Element # 2   | 1  | 12         | 0.5    | Deep + Wide  |
| Element # 3   | 1  | 12         | 0.75   | Deep + Wide  |
| Element # 4   | 1  | 12         | 1      | Deep + Wide  |
| Element # 5   | 1  | 12         | 1.25   | Deep + Wide  |
| Element # 7   | 4  | 24         | 0.25   | Deep + Wide  |
| Element # 8   | 4  | 24         | 0.5    | Deep + Wide  |
| Element # 9   | 4  | 24         | 0.75   | Deep + Wide  |
| Element # 10  | 4  | 24         | 1      | Deep + Wide  |
| Element # 11  | 4  | 24         | 1.25   | Deep + Wide  |
| Element # 12  | 4  | 24         | 1.5    | Deep + Wide  |
| Element # 13  | 4  | 24         | 1.75   | Deep + Wide  |
| Element # 14  | 4  | 24         | 2      | Deep + Wide  |

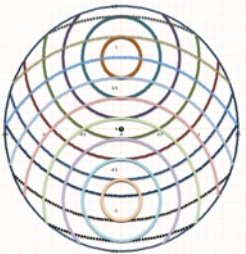
The following pendant designs were created using the 10-Hole Joyner Chuck Pattern Tool spreadsheet for those who own the 10-Hole Joyner Chuck.

| Design Name   | Pendant Design #8 |            |        | For 10-Hole Chuck   |
|---------------|-------------------|------------|--------|---|
| Units Used    | Inches            | Rotation   | 45     |  |
|               | Offset Hole       | Index Hole | Radius |   |
| Pendant Shape | 1                 | 24         | 1      |   |
|               | Offset Hole       | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 2                 | 6          | 0.75   |   |
| Element # 2   | 2                 | 12         | 0.75   |   |
| Element # 3   | 2                 | 18         | 0.75   |   |
| Element # 4   | 2                 | 24         | 0.75   |   |
| Element # 6   | 7                 | 5          | 0.1875 | Through Hole  |

| Design Name   | Pendant Design #9 |            |        | For 10-Hole Chuck   |
|---------------|-------------------|------------|--------|---|
| Units Used    | Inches            | Rotation   | 45     |  |
|               | Offset Hole       | Index Hole | Radius |   |
| Pendant Shape | 1                 | 24         | 1      |   |
|               | Offset Hole       | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 4                 | 24         | 0.01   |   |
| Element # 3   | 4                 | 24         | 0.25   |   |
| Element # 5   | 4                 | 24         | 0.5    |   |
| Element # 7   | 4                 | 24         | 0.75   |   |
| Element # 9   | 4                 | 24         | 1      |   |
| Element # 11  | 4                 | 24         | 1.25   |   |
| Element # 13  | 4                 | 24         | 1.5    |   |
| Element # 15  | 7                 | 5          | 0.125  | Through Hole  |

| Design Name   | Pendant Design #10 |            |        | For 10-Hole Chuck   |
|---------------|--------------------|------------|--------|---|
| Units Used    | Inches             | Rotation   | 231    |  |
|               | Offset Hole        | Index Hole | Radius |   |
| Pendant Shape | 7                  | 24         | 1      |   |
|               | Offset Hole        | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 2                  | 22         | 1.65   |   |
| Element # 3   | 2                  | 2          | 1.75   |   |
| Element # 5   | 2                  | 23         | 1.45   |   |
| Element # 7   | 2                  | 2          | 1.4    |   |
| Element # 9   | 2                  | 23         | 1.1    |   |
| Element # 11  | 2                  | 2          | 1      |   |
| Element # 13  | 2                  | 23         | 0.7    |   |
| Element # 15  | 3                  | 21         | 0.6    |   |
| Element # 17  | 10                 | 13         | 0.08   | Through Hole  |

| Design Name   | Pendant Design #11 – Square Pendant |            |        | For 10-Hole Chuck   |
|---------------|-------------------------------------|------------|--------|---|
| Units Used    | Inches                              | Rotation   | 205    |  |
|               | Offset Hole                         | Index Hole | Radius |   |
| Pendant Shape | 1                                   | 24         | 1      |   |
|               | Offset Hole                         | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 4                                   | 24         | 1      |   |
| Element # 2   | 4                                   | 24         | 1.375  | Through Cut   |
| Element # 4   | 4                                   | 18         | 1      |   |
| Element # 5   | 4                                   | 18         | 1.375  | Through Cut   |
| Element # 7   | 4                                   | 12         | 1      |   |
| Element # 8   | 4                                   | 12         | 1.375  | Through Cut   |
| Element # 10  | 4                                   | 6          | 1      |   |
| Element # 11  | 4                                   | 6          | 1.375  | Through Cut   |
| Element # 13  | 8                                   | 16         | 0.0625 | Through Hole  |

| Design Name   | Pendant Design #12 – 3” Lattice Insert |            |        | For 10-Hole Chuck   |
|---------------|--|------------|--------|---|
| Units Used    | Inches                                 | Rotation   | 20     |  |
|               | Offset Hole                            | Index Hole | Radius |   |
| Pendant Shape | 1                                      | 24         | 1.5    |   |
|               | Offset Hole                            | Index Hole | Radius | Cutting Notes   |
| Element # 1   | 10                                     | 24         | 0.25   | Deep+Wide   |
| Element # 2   | 10                                     | 24         | 0.5    | Deep+Wide   |
| Element # 3   | 10                                     | 24         | 0.75   | Deep+Wide   |
| Element # 4   | 10                                     | 24         | 1      | Deep+Wide   |
| Element # 5   | 10                                     | 24         | 1.25   | Deep+Wide   |
| Element # 6   | 10                                     | 24         | 1.5    | Deep+Wide   |
| Element # 7   | 10                                     | 24         | 1.75   | Deep+Wide   |
| Element # 8   | 10                                     | 24         | 2      | Deep+Wide   |
| Element # 9   | 10                                     | 24         | 2.25   | Deep+Wide   |
| Element # 11  | 10                                     | 12         | 0.25   | Deep+Wide   |
| Element # 12  | 10                                     | 12         | 0.5    | Deep+Wide   |
| Element # 13  | 10                                     | 12         | 0.75   | Deep+Wide   |
| Element # 14  | 10                                     | 12         | 1      | Deep+Wide   |
| Element # 15  | 10                                     | 12         | 1.25   | Deep+Wide   |
| Element # 16  | 10                                     | 12         | 1.5    | Deep+Wide   |
| Element # 17  | 10                                     | 12         | 1.75   | Deep+Wide   |
| Element # 18  | 10                                     | 12         | 2      | Deep+Wide   |
| Element # 19  | 10                                     | 12         | 2.25   | Deep+Wide   |

You should make the front side cuts (cuts with Index Hole = 24) a little deeper than  $\frac{1}{2}$  way through the blank. When you turn the lattice over to make the cuts for the back side (cuts with Index Hole = 12) be careful how you orient the blank when you stick it back on the chuck. You may need to adjust the index hole to use a different index hole position for the back side cuts if you don't get the blank attached squarely to the index plate (or glue/waste block). The back side cuts should also be cut a little deeper than  $\frac{1}{2}$  way through the blank so as to cut into the front side cuts to achieve a lattice effect.

***End Of Appendix of Example Design Parameters***