



# **Embellished Bracelet Workshop**

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## Review of Tools

### Guidelines for All Rolling Mill Operations

All materials worked with in the rolling mill must be absolutely dry.

If the texture material is hard, i.e. steel texture plates, or rough, i.e. sandpaper, always place a thin sheet of copper or brass between the texture material and the roller to protect the roller.

Do not force the work through the rolling mill. You should be able to turn the handle without using excessive force. If you cannot turn the handle without excessive force, back out the work, open the rollers a bit, and try again.

Handle the rolling mill as if they were your own. The rollers are very expensive and any damage done to the rollers will show up on everyone's work from that time on.

At the end of the session clean the rollers with the supplied cleaning materials.

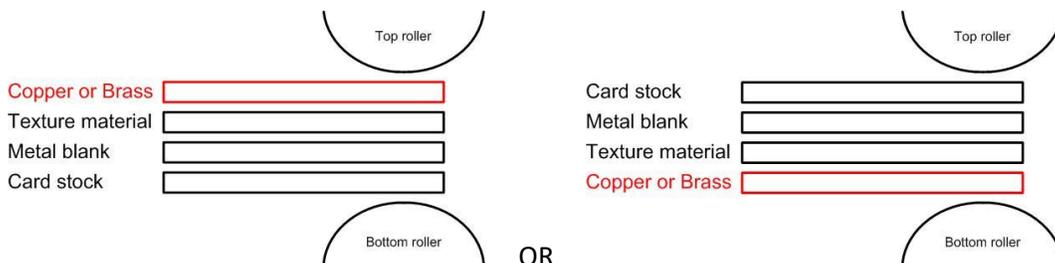
### Texturing with a Rolling Mill

A rolling mill is a very handy tool for adding texture to a soft metal such as copper, brass, or silver. Just remember, that adding texture using a rolling mill will elongate the metal blank, and therefore the blank needs to be textured before cutting to the final shape.

The patterning material will generally be damaged or destroyed by this process. One exception to this would be a steel texture plate, but even a steel plate will generally become curved after repeated use in a rolling mill.

In general, think of a rolling mill as being similar to a hydraulic press when assembling the package to run through the mill. **“Put the metal in the middle”** between the texturing material and the spacer.

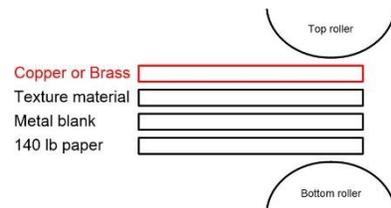
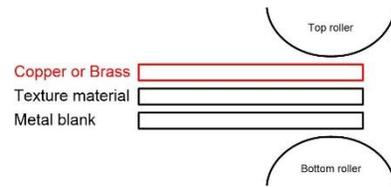
**Important: If the texture material is hard, or rough, place a piece of copper or brass between the texture material and the roller to protect the roller.**



It does not matter whether the texture material is on the bottom and the card stock spacer is on the top, or if the card stock spacer is on the bottom and the texture material on top. Just make sure to **put the metal in the middle.**

I have good results texturing copper and silver using the following procedure:

1. Anneal the metal blank.
2. Place the texture material on top of the metal blank.
3. Place the stack between the rollers and adjust the rollers together so that they are tight on the stack.
4. Remember the setting for the rollers, open the rollers and remove the stack and return the rollers to the remembered setting.
5. Place a piece of card stock, or 140 pound watercolor paper, under the stack.
6. Run the stack through the rolling mill.



## Guidelines for All Hydraulic Press Operations

Always wear safety glasses, or a face shield, when using, or near, the press.

Keep the area around the press clean. Put tools away that are not being used.

Copper, sterling silver, fine silver, niobium, pewter, and aluminum all form well in the Hydraulic press. Yellow gold and red brass will also work. Nickle, nickel silver, yellow brass, and bronze are not recommended because of their stiffness.

Anneal and pickle metal before using it in the press. If you are making multiple presses, anneal the metal every couple of presses.

The hydraulic jacks work best in the mid-range. Add spacers to avoid over extending the ram.

Handle the tools as if they were your own. Tool sets are very expensive for the hydraulic press, from hundreds to thousands of dollars for each tool set, and any damage done to a tool will show up on everyone's work from that time on.

Always keep tools over the table side of the press when they are being placed in, or removed from, the press.

Many of the tools are quite heavy, so always use both hands, and keep them on the table side of the press, when adding or removing tools.

Urethane does cut fairly easily, so make sure there are no sharp edges on the metal blanks.

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Do not press anything that is higher than it is wide. It is very possible for it to shoot out of the press when pressure is applied.

Before pressing, center and align the stack from the bottom up.

Pause before pressing and think about what is going to happen. Remember, metal always does what is easiest for the metal to do, not necessarily what you want it to do.

If something doesn't look, feel, or sound right, STOP and investigate.

Always lower the ram at the end of a session. Never leave the jack partially raised. Dirt will stick to the oil on the side of the ram and eventually compromise the integrity of the seals in the jack.

## Blanking Dies



A blanking die, sometimes called a pancake die, is used for cutting multiple identical blanks during production work. The metal is placed in the blanking die and pressed in the hydraulic press causing the die to cut out the metal blank.

Do NOT anneal the metal blank before cutting it with a blanking die.

In a proper blanking die the saw cut is at a slight angle which shears the metal with very little cleanup required. Detailed information on making blanking dies is available in "Hydraulic Die Forming for Jewelers and Metalsmiths" by Susan Kingsley, 20 Ton Press, 1993.

Custom cut blanking dies are available from Dar Shelton, at [www.sheltech.net](http://www.sheltech.net).

Kevin Potter, at [www.potterusa.com](http://www.potterusa.com), makes a fairly inexpensive line of laser cut blanking dies. Kevin's dies work best with 20 gauge, and thicker, because his dies are straight cut with a laser, and the cut metal blanks sometimes need a bit of cleanup.

## Anticlastic Forming Tools

### Anticlastic Split Delrin Rings Tool

The Split Delrin Rings Tool consists of a 2-1/2 inch cylinder of 80 durometer urethane, four sets of split rings of different widths (only two sets are shown in the picture), and restraining ring(s).



Detailed information is available in the “anti-clastic bracelets.pdf” file at [www.bonnydoonengineering.com/Instructions/instructions.html](http://www.bonnydoonengineering.com/Instructions/instructions.html).

#### **Using the Anticlastic Split Delrin Rings Tool**

1. Anneal, pickle, and dry the bracelet blank.
2. The shaped and sized bracelet blank is wound around the urethane cylinder, a pair of split rings of the correct width is placed over the blank, and the restraining ring(s) are placed around the split rings
3. The urethane cylinder is pressed in the hydraulic press. Stop pressing before reaching the anticlastic split ring tool.

#### **Notes:**

- Use an annealed metal blank that has been trimmed to the shape and length of the finished bracelet. It does not need to go all the way around the urethane cylinder.
- Pattern the blank before cutting and forming, but note that depending on the pattern, the pattern may be softened during the pressing.
- The metal blank should be no wider than the width of the Delrin rings being used. The rings available with this tool set are  $\frac{1}{2}$ ",  $\frac{3}{4}$ ", 1", and  $1\frac{1}{4}$ " inch wide.

- Use electrical tape to hold the blank in place in the center of the rings if needed, but note that the tape may emboss marks on the blank if it is on the die side of the blank.
- The split Delrin rings are individually tooled, and therefore not interchangeable between sets. At the Crafts Center, use the colored markings on the edge of the rings to match a pair of split rings.

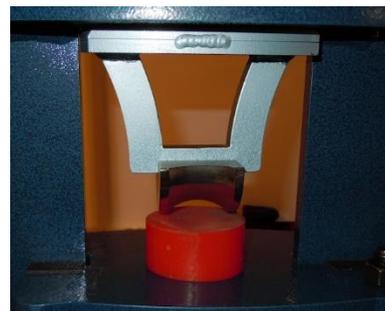
### Anticlastic Bracelet Forming Tool

The Anticlastic Bracelet Forming tool consists of a bracelet former frame, a small radius anticlastic bracelet former, a large radius anticlastic bracelet former, and a small piece of 95 durometer urethane.

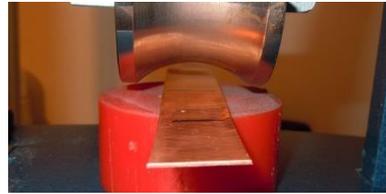


### Using the Anticlastic Bracelet Forming Tool

1. Attach the bracelet former frame to the top platen of the hydraulic press. Make sure it is centered on the platen. Attach the large radius anticlastic bracelet former to the bottom of the holder. Place the urethane directly under the bracelet former.
2. Anneal, pickle, and dry the bracelet blank.



3. Measure and mark the bracelet blank in the middle, and at about 20% in from each end. Place the bracelet blank face down on the center of the urethane, and centered with respect to the anticlastic bracelet former.



4. Press the bracelet blank until the edges of the anticlastic bracelet former have compressed the urethane about half way. Release the pressure, slide the bracelet blank about half an inch back, and press again. Repeat pressing until the 20% mark is reached. Turn the bracelet blank around and repeat pressing until the other 20% mark is reached.



5. Remove the large radius anticlastic bracelet former and attach the small radius anticlastic bracelet former. Insert one end of the bracelet blank and press from the 20% mark to the end of the bracelet. Turn the bracelet around and press from the other 20% mark to the other end of the bracelet.



#### Notes:

- Pattern the blank before cutting and forming, but note that depending on the pattern, the pattern may be softened during the pressing.
- Use an annealed metal blank that has been trimmed to the shape and length of the finished bracelet.

## Riveting

To have a successful rivet connection there are two factors that must be considered.

First, the rivet must be a snug fit in the hole. If the hole is too large the rivet will bend inside the hole and not give a good, solid connection.

Secondly, the length of the rivet must be long enough to secure the connection when it is set, but should not be any longer than is necessary for a proper setting. If the rivet is too long it may bend outside the hole and will likely result will be a sloppy looking connection.

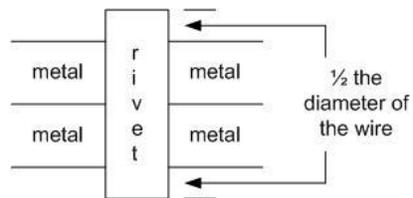
When multiple connection points are involved it is best to:

1. Mark and drill all the connection points on the top piece

2. Align the piece(s) and drill through all the pieces through one of the connection point holes in the top piece
3. Insert a rivet into this hole, through all the pieces, and set the rivet
4. Make sure the piece(s) are still aligned and drill a second hole through all the pieces at a second connection point hole well away from the first rivet.
5. Insert a rivet into this second hole, through all the pieces, and set the rivet.
6. One at a time, drill through the remaining connection points, insert rivets, and set them

### Solid Rivets

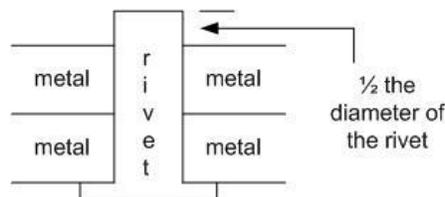
The basic wire rivet is simply a short length of wire placed through a hole of the same size. Cut off each end of the wire with a flush cutter so that it sticks out approximately half the diameter of the wire on each side. If a flush cutter is not available use a regular cutter and file the end of the wire flat.



Holding the rivet in this position, place the bottom end on a bench block, and using a riveting hammer gently start to flair the top side of the rivet. After a bit turn it over and start to flair the bottom of the rivet. Continue turning it over and working on both sides several times until the rivet is snugly set and nicely flared on both sides.

Rivets may also be purchased that already have a head on them. In this case just insert the rivet through the hole, cut it off with a flush cutter so that it sticks out approximately half the diameter of the rivet.

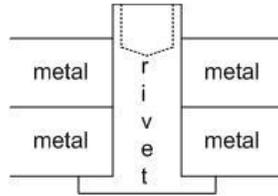
I use 0.050" diameter solid rivets in my classes and either a 1.25mm punch, or a #55 drill bit, to make the hole.



Place the bottom end on a bench block, and using a riveting hammer gently flair the top side of the rivet to set it.

## Hollow Rivets

Hollow rivets cannot simply be cut off to the proper length, but need to be selected with the proper length for the thickness of the project. As shown in the following diagram, the solid part of the rivet should fill as much of the hole as possible without extending above the project. If the solid part of the rivet extends above the project the rivet cannot be set properly.



Use the following table to determine the total thickness of the project by adding up the thickness for each layer.

AWG	inches	mm
18	0.0402	1.02
20	0.0320"	0.812
22	0.0253"	0.644
24	0.0201"	0.511
26	0.0159"	0.405
28	0.0126"	0.321

Using the total thickness of the project, look up the proper length of the hollow rivet to use in the following table.

Total project thickness		Rivet length
inches	mm	
0.020"-0.040"	0.5-1.0	1/16"
0.040"-0.066"	1.0-1.7	3/32"
0.066"-0.097"	1.7-2.5	1/8"
0.097"-0.128"	2.5-3.3	5/32"

I use a riveting tool, such as the Crafted Findings Riveting System, to set hollow rivets. I use either the punch on the riveting tool, or a #52 drill bit, to make the hole.

## Burnishing with a Tumbler

An easy way to polish small jewelry items is to burnish them in a small tumbler with stainless steel shot and a burnishing liquid. I have found that 30 minutes is usually adequate for most sterling silver, gold filled, copper, and brass items.

I use a Lortone Model 3-1.5B tumbler in my studio and a small tumble from Harbor Freight (manufactured by Chicago Electric Power Tools) in some of my classes and workshops.

I use the barrel from the Lortone tumbler (it is a little smaller than the Chicago Electric barrel), and 2 pounds of the Stainless Steel Mixed Shot (Rio Grande #339-097) with Super Sunsheen Burnishing Compound (Rio Grande #339-394). Make sure you get stainless steel shot or you will spend all your time trying to keep it from rusting.

In my studio, I leave the shot in the barrel, covered with fresh water and Super Sunsheen, between tumbling runs. After tumbling for 30-45 minutes I dump the contents of the barrel into a colander, remove the items I was burnishing, and rinse both the shot and the tumbling barrel thoroughly with water. I pour the shot back into the barrel and cover the shot with fresh water and Super Sunsheen and it is ready for next time.

I have heard people say that they have had trouble with “black gunk” appearing in their tumbler and on their finished pieces. I feel this is usually due to dirt from running the tumbler too long without changing the liquid, and not due to the rubber of the barrel breaking down. I have not had this problem for many years now, ever since I started changing the burnishing liquid after every use.

Students have asked about household products they can use instead of Super Sunsheen. I have tried several products recommended by others, but I have not found anything that will give me the results that I get from Super Sunsheen. Super Sunsheen is diluted 45 to 1 for use. A 1 quart bottle of Super Sunsheen will last me for over 200 tumbler runs, and only costs a couple of cents per run. I just don't think it is worthwhile spending the time or money to try anything else.

I use Goddard's Silver Polish liquid (#707184), or Goddard's Silver Polishing Cloth (#707684), to put the final shine on my finished silver pieces.

## Embellishments

Some options for embellishments include:

- Twisted pair of wires
- Corrugated strip
- Textured or patterned strip
- Textured wire
- Sculptured Wire
- Embossed strip

## Twisted Pair of Wires Embellishment



### Materials required:

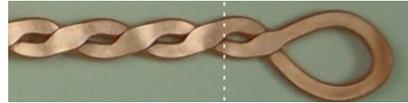
- Wire, 12 gauge

### Construction:

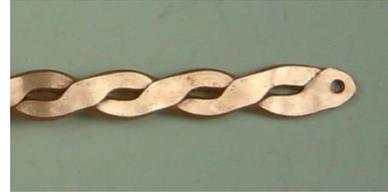
1. Cut a length of 12 gauge (AWG) wire at least twice as long as the desired length of the embellishment, and anneal it. Straighten the wire by clamping one end of the wire in a vise and pulling on the other end with a pliers.
2. Mark the middle of the length of wire and bend it in half around the shaft of a screwdriver. Anneal and pickle the wire.
3. Clamp the two ends securely in a vise and twist the wires together tightly using the screwdriver as the handle. Anneal and pickle the twisted wire.
4. Start the flattening process by hammering the twisted wire on a bench block with a forging hammer until it starting to flattened on both sides. Be careful to keep the wire from twisting as you are hammering it. Anneal and pickle the twisted wire.
5. Make sure the twisted wire is **completely dry** and continue the flattening process by running the twisted wire through a rolling mill until the desired thickness is reached. Hold the twisted wire flat while it is being rolled to keep it from twisting. Anneal, pickle, and **completely dry** the twisted wire if it gets too hard.



6. Cut one end of the twisted wire just beyond where the wires cross each other, as shown by the dotted line.



7. Mark the center of the area where the two wires cross each other with a center punch and drill a hole using a #55 drill bit. Use a file, a flex shaft with small grinding wheels, and/or sandpaper to clean up and round the end.



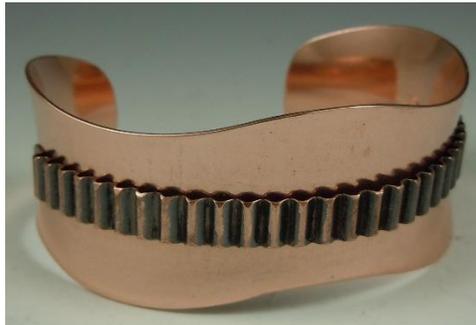
8. Cut the embellishment to the desired length, and prepare the second end following the directions in the previous step.



9. Form the embellishment to fit the bracelet.

10. Polish the embellishment in a tumbler before attaching to the bracelet.

## Corrugated Strip Embellishment



### Materials required:

- Copper sheet, 26 gauge

### Construction:

1. Cut a strip of copper at least a third longer than the desired length of the embellishment.
2. Run the copper strip through the corrugation device.



3. Flatten the last corrugation on the strip using a flat nose pliers.
4. Use a center punch to mark the center of the flattened area and drill a hole for the rivet using a #55 drill bit. Use a file, a flex shaft with small grinding wheels, and/or sand paper to clean up and round the end.
5. Cut the embellishment to the desired length, and prepare the second end following the directions in the previous step. Make sure that the flattened ends are on the same side of the corrugated strip.
6. Sand the outside edges of the embellishment to remove any sharp points on the corrugations.
7. Form the embellishment to fit the bracelet.
8. Polish the embellishment in a tumbler before attaching to the bracelet.



## Textured or Patterned Strip Embellishment



### Materials required:

- Patterned sheet, 26 gauge

### Construction:

1. Cut a strip of patterned material to the desired length, smooth the ends, and drill a hole of the proper size in each end.
2. Form the embellishment to fit the bracelet.
3. Polish the embellishment in a tumbler before attaching to the bracelet.

## Textured Wire Embellishment



### Materials required:

- Large gauge wire

### Construction:

1. Cut a length of a large gauge wire just a little longer than needed.
2. Texture the wire.
3. Cut the embellishment to the desired length, and prepare the ends by flattening the ends if necessary and drilling a hole of the proper size in each end.
4. Form the embellishment to fit the bracelet.
5. Polish the embellishment in a tumbler before attaching to the bracelet.

## Sculptured Wire Embellishment



### Materials required:

- Wire, 12 gauge

### Construction:

1. Cut a length of 12 gauge (AWG) wire a little longer than needed.
2. Anneal the wire, mark the middle, bend it in half around the shaft of a small mandrel or screwdriver, and close the fold in a vise or with gentle hammering.
3. Anneal the bend, pickle and clean it, and run it through the rolling mill several times to flatten it. You may have to anneal it again between passes through the mill.
4. Anneal it, open the legs of the sculptured wire, trim the legs to the desired length, and prepare the ends by flattening the ends if necessary and drilling a hole of the proper size in each end.
5. Form the embellishment to fit the bracelet.



6. Polish the embellishment in a tumbler before attaching to the bracelet.

## Embossed Strip Embellishment



### Materials required:

- Copper strip, 26 gauge

### Construction:

1. Emboss a strip of copper a little bit longer than needed using a pattern die in the hydraulic press.
2. Cut the strip to the desired length, smooth the ends, and drill a hole of the proper size in each end.
3. Form the embellishment to fit the bracelet.
4. Polish the embellishment in a tumbler before attaching to the bracelet.

## Construction of an Embellished Cuff Bracelets

The steps for constructing an embellished cuff bracelet are:

1. Form the final cuff bracelet base.
  - a. Optional: Anneal, pickle, and texture the strip of metal.
  - b. Cut the strip of metal to the final bracelet size and shape.
  - c. File and sand the edges of the bracelet blank.
  - d. Anneal and pickle the bracelet blank.

- e. Form the bracelet with the hydraulic press and one of the bracelet forming tools.
  - f. Tumble the bracelet to polish it. (I tumble mine for about half an hour.)
  - g. Optional: Apply a patina to the bracelet, and tumble it for an additional 5-10 minutes.
2. Prepare the embellishment. (See the following sections for suggestions.)
    - a. Anneal and pickle the embellishment.
    - b. Form the embellishment into the final shape.
    - c. Tumble the embellishment to polish it. (I tumble mine for about 15 minutes.)
    - d. Optional: Apply a patina to the embellishment, and tumble it for an additional 5-10 minutes.
  3. Attach the embellishment to the base bracelet.
    - a. Place the embellishment in the correct location on the formed bracelet
    - b. Mark and drill one (1) hole to attach the embellishment
    - c. Rivet the embellishment to the bracelet at this attachment point
    - d. Mark and drill a second hole on the other end of the embellishment
    - e. Rivet the embellishment through this second hole
    - f. One at a time, mark, drill, and rivet the remaining attachment points between the embellishment and the bracelet
  4. Tumble the finished bracelet for 5-10 minutes.

## References

Bonny Doon Engineering – [www.bonnydoonengineering.com](http://www.bonnydoonengineering.com)

Instructions – [www.bonnydoonengineering.com/Instructions/instructions.html](http://www.bonnydoonengineering.com/Instructions/instructions.html)

How-to – [www.bonnydoonengineering.com/HowTo/howto.html](http://www.bonnydoonengineering.com/HowTo/howto.html)

“Nonconforming Dies” by Susan Kingsley, in “Metals Technic”, Edited by Tim McCreight, Brynmorgen Press, 1992

“Hydraulic Die Forming for Jewelers and Metalsmiths” by Susan Kingsley, 20 Ton Press, 1993

## Suppliers

**Blanking dies, custom cut** – Dar Shelton - [www.sheltech.net](http://www.sheltech.net)

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[bijoux-de-terre.com](http://bijoux-de-terre.com)

**Bonny Doon hydraulic presses, etc.** – Rio Grande - <http://www.riogrande.com>

**Hydraulic presses, dies, etc.** – Potter USA - [www.potterusa.com](http://www.potterusa.com)

**Metals** –

- Metalliferous - [www.metalliferous.com](http://www.metalliferous.com)
- MonsterSlayer.com - [www.monsterslayer.com](http://www.monsterslayer.com)

**Patina Gel, Liver of Sulfur** – Cool Tools - [www.cooltools.us](http://www.cooltools.us)

**Rivets, riveting tool, etc.** – Rio Grande - <http://www.riogrande.com>

## **Thank you for attending my workshop.**

I hope you enjoyed the workshop and get many years of enjoyment using these techniques.

The latest version of this handout is available on my website at [www.bijoux-de-terre.com](http://www.bijoux-de-terre.com). Click on “For Our Students” in the lower left and on “Embellished Bracelets” near the top.

If you have any questions, please email me at [john@bijoux-de-terre.com](mailto:john@bijoux-de-terre.com).