T-Folds

T-Folds represent an enormous number of starting points for investigation of form. The primary advantage of a T-fold is that two fold edges are formed at once, which immediately makes the forms more complex. They also offer a wide range of options, including the size, shape, and location of the three flanges or panels of the "T." Using a vise to pin the legs (or not) as the metal is hammered influences the outcome considerably.

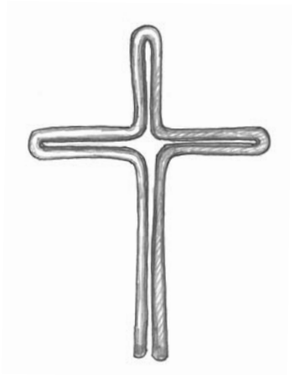
T-Folds. Primary variables are achieved by whether the fold edges are forged and how the sheet is unfolded.

In this cross section view of a T-fold the fold edges are marked with arrows. Most foldforms have fold edges.

Cross-Folds

While a T-fold has two fold edges, and is thus more efficient than a plain line-fold, if you are trying to make fold edges, a cross-fold will give you three at once. Cross-folds can be used to make three parallel line-folds much closer together than possible any other way.

Cross-folds are made by creating a structure with the cross section of a cross, or plus sign: +. In this example, two folds have been made, the second running at a right angle to the first.

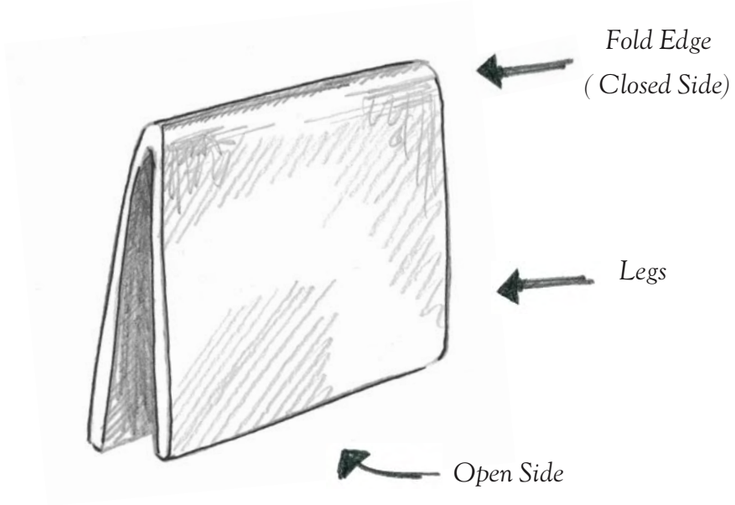


The cross section view of this fold shows where the name comes from.

This shape was made with a combination of forged line-folds, one section forged on the open side and the other on the closed sides. In addition to demonstrating what a big difference this simple variable can make, this piece shows the value of combining different types of foldforming.

Naming the Parts

It is useful to have some nomenclature for working with an object. When you describe the parts of something, and give them names, then you begin to understand what you are seeing and you can think about it differently. The names I'll be using as we discuss line-folds are shown in this drawing.



Making a Basic Line-Fold

FOLD
Fold a metal sheet so the fold edge is positioned where you want the line to appear.

TIGHTEN
Mallet the folded sheet flat. If this was a piece of paper you were folding, the work of the mallet is like pressing the crease with your fingertip. Now comes a fork in the path—to anneal or not to anneal before unfolding. I usually anneal, but there are specific cases when I choose to retain the work hardness created along the fold. Opening an unannealed line-fold will result in a very high, stiff line-fold that stands up from the surface. Unless you want this specific effect, anneal the metal before opening. Quench immediately in water; pickling is not necessary. It is important to dry all metal well before moving on to the next step because moisture will cause rust on tools.

OPEN
Unfold the sheet with your fingers, then press the unfolded metal against a flat surface.

CONFIRM
After opening, the fold edge stands up from the sheet as a rounded line. To convert this soft bulge into a proper line-fold, I pound it straight down in a process I call confirming the fold. This can be done with a hammer, a rolling mill, or a hydraulic press. This downward pressure creates three bands of work hardness—one along the top of the fold edge ridge and one each at the point where the legs touch the anvil surface underneath. A planishing hammer with a slightly crowned surface works well for this. Use gentle blows so you don't squash the line out of existence. As you hammer more, the work hardened bands within the sheet push against the still-annealed sections, collapsing them into the dense structure known as the basic line-fold. If the piece is small enough to fit into a rolling mill, that tool can be used to confirm the line, resulting in a very uniform line-fold.

FOLD

TIGHTEN

OPEN

CONFIRM

Examples of Chased T-Folds

Here are examples of a standard T-fold that have been chased.

Tool Modifications for T-folds

Most foldforming is done with the basic tools of metalsmithing—hammers, vises, anvils, stakes, and a rolling mill. There are, however, several special tools or alterations to tools that can make foldforming easier, or solve clamping problems. We will look at some of them in the next pages. These fall into four categories:

- Leg Inserts
- Table inserts
- Vise Jaw Inserts & Extensions
- Angled Punch

Leg Inserts

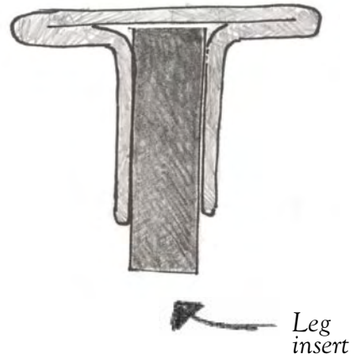
A T-fold has a fixed proportion of table width to table return width. The distance across the top of the table equals two table return widths. To change this proportion so the length of the return section is smaller, insert a piece of wood, nylon, metal, or any other rigid material between the legs when the T-fold is made. Because the usual proportions between returns and table have been altered, the resulting form will look different than the normal T-fold. The inside of the table will be struck down onto the top of the insert, which means that a texture here will show up on this inside section when the form is opened.

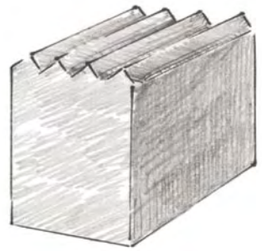
Table Inserts

Table inserts are another way to alter a T-fold. Make a normal loop (maybe a little bigger than usual) and slide a rigid object inside the loop. When the loop is malleted down, it will rest on the insert.

To trap it completely, set a slab of rubber or leather on top and strike it with a very heavy hammer. This will force the sheet metal intimately around the enclosed part, simultaneously forming the shape and printing whatever texture is on the insert into the metal. This lets you work with pattern, and reflected pattern in the table returns.

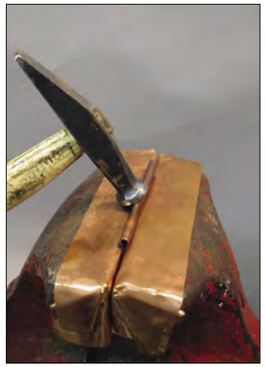
Using chasing tools to define and refine the top surface of the table around the embedded parts gives further options. When the fold is finished, it is annealed and opened, which releases the trapped parts. In the example pictured below a simple washer, a bolt, and a binding wire spiral were placed inside the loop.

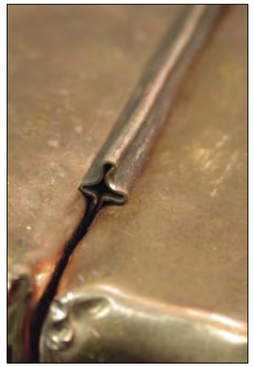




A texture on the top of the insert will appear on the underside of the table.

The same piece, front and back, showing the possibilities of trapping hard "tools" under the table returns.





3. Drive the sides of the loop in with a hammer or a chasing tool to create the cross shape. This is a miniature version of the process shown on the preceding page.

4. When annealed and unfolded, confirm the lines by pressing them down with a planishing hammer or rolling mill. This will make the lines crisp, as with the basic line-fold. The process can be repeated to make multiple sets of lines across a sheet.

Rauni Higson, Napkin Rings. *Sterling silver; 3 inches in diameter. Photo by the artist. These graceful pieces illustrate the use of a forged line-fold.*

Rolled-Folds

All rolled folds can be forged instead of, or in addition to, rolling. Forging followed by rolling, leaves hammer texture inside the folds and the outside smooth. Many pleated folds work well, as do a series of flattened T-folds of various types. In most cases, these folds depend on the contrast of stressing certain sections (the thick areas) against unstressed areas (the thin sections) which pass between the rollers. These two forces, one elongating and the other remaining unchanged, pull against each other. The braking effect of the unstretched area results in a curve away from the stressed side. Multiple layers in rolled-folds are what create the thickness that is stressed during rolling.

The use of a rolling mill has been mentioned previously, but only as an alternative to using a hammer. When confirming line folds, for instance, I've said you can use a hammer, a rolling mill, or a hydraulic press to flatten the metal down onto itself. This next category of folds depends on a rolling mill for the tremendous localized pressure it can achieve. The idea is easily seen with an accordion fold in a rectangular sample. When this is rolled through a mill, the folded stack is thicker than the legs, and therefore receives all the pressure. The layers of the fold will be thinned equally and simultaneously and will bend into an arc as the metal is displaced. After annealing and unfolding, the piece will reveal a dramatic form that belies its simple origins.

Rolled-folds are one of my favorite ways to introduce foldforming—I often have beginning students make a Heistad Cup as their first project. This easy project demonstrates both the plasticity of metal and the principle that multiple layers worked simultaneously, work evenly. It is also a bit magical to turn a flat square into a seamless cup in a matter of minutes.