ROLL YOUR OWN

Fabricating Brake and Gas Lines

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Renewing brake and fuel lines are typically required as part of restoration. It can also be required as a maintenance operation. These lines are typically made of steel and rust can occur on the inside (brakes) and outside (both) leading to leaks.

One way to accomplish this task is to order the needed replacement lines from vendors serving the collector car market. Sometimes this is not possible because these vendors do not have a pattern for your car. If you can remove the line and preserve its original shape, these vendors can copy it. Bending your own lines is also possible. Over the years, I have come to favor bending my own because what is provided by the vendors usually needs to be "adjusted" to fit properly and in some cases these pre-bent lines will not fit at all. Pre-bent lines are only as good as the pattern and if the pattern is not right, then the lines supplied are also at fault.

The Pattern

The existing line is the best pattern if it can be removed without altering its shape. If not, then a pattern needs to be made. I use 9-gauge utility wire which is available in most any hardware store (see Figure 1). This gauge of wire is strong enough to hold the shape into which it is bent and sufficiently malleable that it can be bent by hand. Making the pattern involves simply bending the wire to follow the desired route between the connection points.

Figure 1

Figure 1. Nine gauge utility wire is excellent for making patterns of lines to be fabricated. A pattern for a simple line is shown alongside/

Bending the Line

There are a variety of bending tools available. Figure 2 shows a sample of the types available. All involve a mandrel around which the tube is bent and a follower that forces the tubing to conform to the mandrel without kinking as the bend is formed. The mandrels on these tools are of varying radii. Select the mandrel that fits the radius of the bend you want to duplicate. Some have multiple sized mandrels to accommodate tubing of various diameters from 3/16 inch to 3/8 inch. The smaller radii are prone to kinking unless care in bending is exercised. It helps to lubricate the follower, but never the mandrel.

Figure 2

Figure 2. A sample of the many tubing benders available. The two on the left have rolling followers and can be mounted in a vise. The pliers-type bender in the center has two different mandrels to accommodate different sized tubes. The fourth from the left is a multi-size bender with a fixed mandrel and a shoe-type follower. The unit on the right also uses a shoe-type follower, but is for only one size tubing; the handle attached to the follower can swivel which is sometimes helpful in moving the handle out of the path of the tube as it is bent."

The first step is unrolling the tubing of the correct size from the bulk tubing roll. Tubing is typically sold in 25 foot coils (the most economical), although shorter lengths are available as straight sections (typically up to 6 feet). Unrolling is easily accomplished by carefully rolling the tubing out across the floor, straightening it as you proceed. Steel tubing is used for brake or gas lines, never copper as it lacks the necessary strength. Stainless steel can be used, but it is more difficult to bend.

When you have sufficient length of straight tubing, cut off the desired length and begin bending the tubing using the appropriate bending tool and following the pattern. I find the pliers-type bending tool shown in Figure 2 very helpful in making slight adjustments usually necessary when installing the completed tubing. The tubing bender mandrel must match minimum radius bend you intend to make. Larger radius bends can be made by moving the tubing along the mandrel; i.e., make part of the bend, move the tubing, bend some more and so on checking the pattern as you proceed.

Also, I always leave the ends a little longer at the ends to make sure that there is ample material at each connection. Generally, fittings are added after the bending is complete. However, if a bend is very near the connection, the fitting must be installed **before** making the bend; otherwise, there will not be a sufficient length of tubing to accommodate the fitting and the flaring tool.

Installing the Fittings

Gas and brake lines require a double flare which involves flaring the end of the tubing and then rolling part of the flared tubing back on itself producing a strong flare. Figure 3 shows two types of tooling capable of making a double flare. All flaring tools come with instructions that clearly explain the steps required.

Figure 3

Figure 3. Two types of double-flaring tools are shown. On the left (setting on the lid of the other), is a simple unit which will do the job and costs about $30 to $50, depending on the seller; I used this one for many years. On the right is the best available. Instead of using a turn screw to force the tubing to flare, this unit uses hydraulic pressure which is faster and requires less hand strength. This unit can also produce a bubble flare on lines, useful on lines connecting to rubber hoses. Unfortunately, this Master-Cool tool is expensive costing from $350 to $500, depending on the seller.

Begin by squarely cutting off the end of the tubing using a tubing cutter, not a hacksaw. Then, slightly ream the interior of the tubing to remove any burr left by

the cutting operation. **Install the fitting** and then the tool to the tube. Using the appropriate insert that simultaneously flares the tube and begins turning the end back on itself, make the first flare. Remove this insert and install the cone insert to complete the double flare.

Summary

Bending your own tubes insures that they will fit and you don't have to wait while someone else does it for you. I have found fabricating tubes needed for restorations to be most cost-effective. Even if you decide not to bend your own, some of the tools shown and tips provided will be very helpful when you install brake and gas lines in your restoration project.