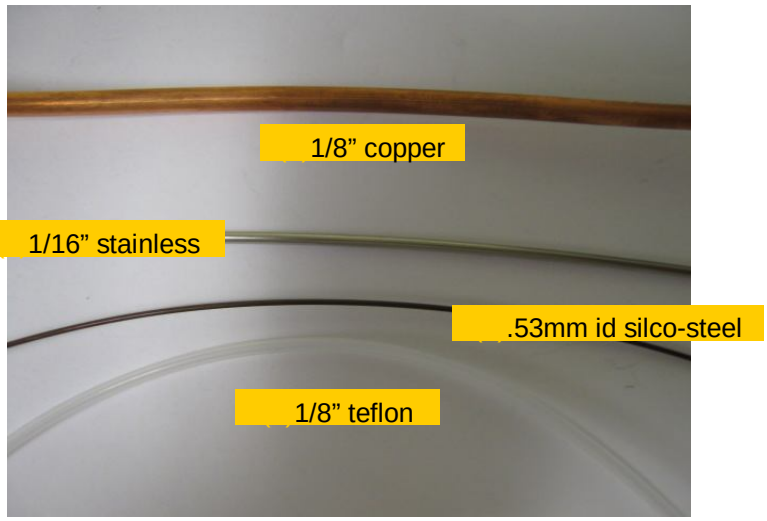
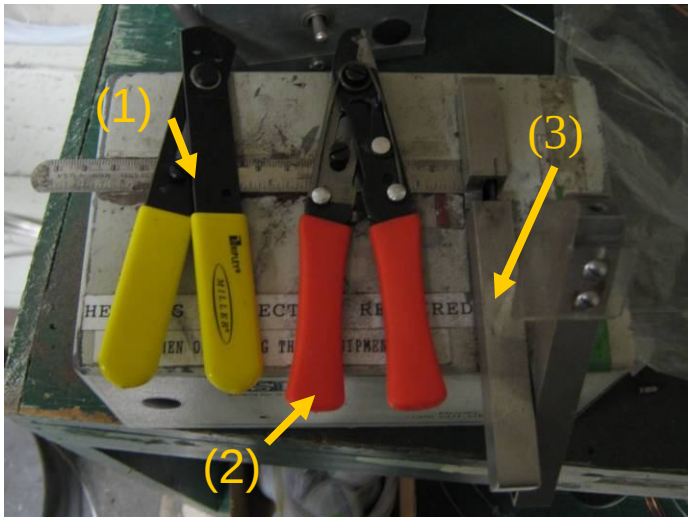
Cutting Tubing for SRI GCs

Gas tight seals on all tubing and connections are essential for good gas chromatography. In this document we will discuss how to properly cut the different kinds of tubing used with the GC.



It is recommended that 1/16” stainless steel or 1/8” copper tubing be used to connect the cylinders of carrier gas and detector gases like hydrogen and air to the GC. This tubing can be cut with **(1)** the standard tubing cutters that come free with SRI GCs, **(2)** plier-type tubing cutters (available from Grace/Alltech and other chromatography catalogs), or **(3)** a cutting wheel which is available for about $700 from SSI, When used properly, the standard tubing cutter from SRI is the best, most economical solution.



Place the 1/16” or 1/8” copper tubing in the notch of the tubing cutters. Make sure that the cutters are straight up and down and perpendicular to the copper tubing. Squeeze down firmly and quickly to produce an even cut in one quick movement. It is important that the cutters are perpendicular to the tubing so that the edge is square, the internal opening of the tubing is not closed, and the tool itself is not damaged. If you cut at an angle it will dull the cutter. Once the cutter is dulled is will not cut cleanly and a new cutter tool will be required.

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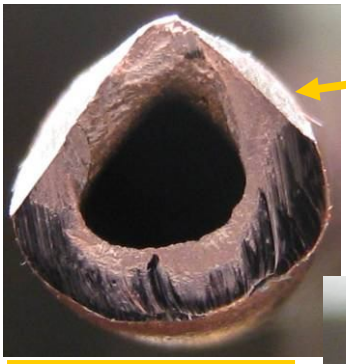
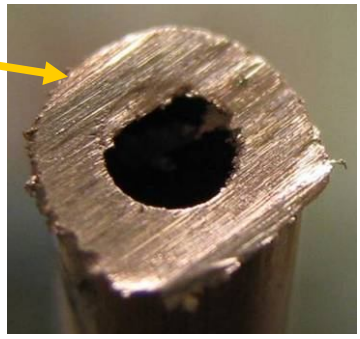
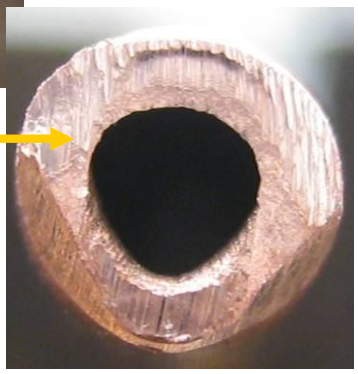


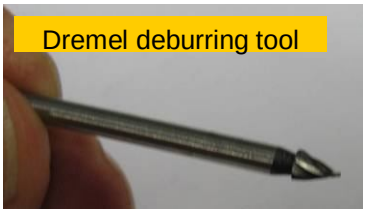
This tubing was cut with the free SRI tubing cutters. Notice the hole and tubing is flattened on two sides.

This tubing was cut with a cutting wheel. Notice the generally circular hole, but also the shards of copper created by the process.

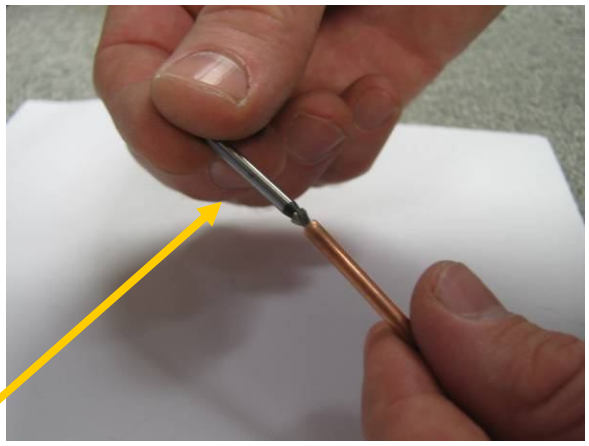


This tubing was cut with more expensive plier-type tubing cutters. Notice the hole is more circular, although still flattened somewhat on one side.



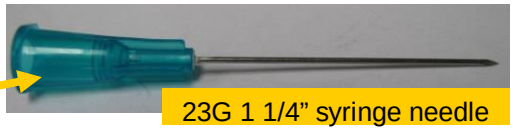


Dremel deburring tool

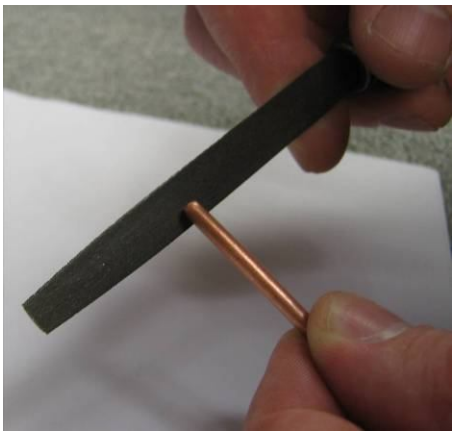


No deburring or filing is required for tubing cut with the SRI or pliers type cutter since a perfectly round hole is not absolutely necessary and the tubing is only deformed very close to the end where it does not matter. The guillotine cutting action makes a clean cut with no metal shards or dust which is an advantage to this type of cutter.

If the cutting wheel was used, a deburring tool must be used to get rid of the metal shards in the hole. A sturdy syringe needle will also work if no deburring tool is available. Be sure to hold the tubing so the metal particles fall out of the tubing. The edges should be filed with a metal file in order to remove copper shards and sharp edges. Try to get rid of the metal particles so they are not carried into the GC when you connect the tubing. Its also a good idea to flush the tubing with the gas before connecting to the GC to avoid depositing any particles in the GC's pressure regulators.



23G 1 1/4" syringe needle



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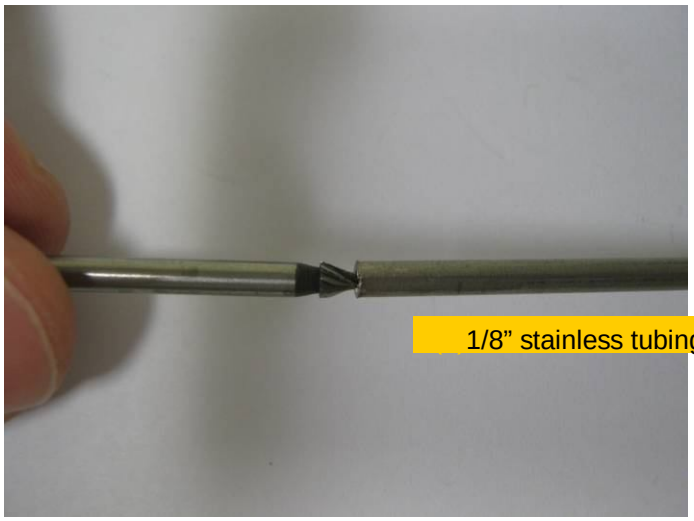
The shape of the hole for the carrier and detector (hydrogen, air, etc) gas tubing which runs from the gas cylinders to the GC is not as critical as it is for other tubing connections inside the GC. As long as the hole is open and generally circular it will not prevent good gas chromatography.

1/8" stainless steel tubing can also be used to connect carrier gas to the GC, but this is not recommended because it is so hard to work with. There is no advantage to using stainless steel and it is much more expensive than 1/8" copper. If you insist on using stainless steel tubing, you must use a cutting wheel to cut it. The SRI tubing cutter can not cut 1/8" stainless. Use a de-burring tool to open up the internal hole and a metal file to smooth any sharp edges or metal shards. Get rid of the particles so they don't enter the GC.

1/16" (.067) stainless steel tubing is used to plumb valves and connect columns in the column oven, and may also be used to connect gases to the GC. This type of tubing comes in various internal diameters. .040" (1mm) id is the most common size. Internal diameters smaller than .030" are too small to be used as supply gas tubing, but may be used inside the GC to connect columns and valves. When used inside the GC in areas where the sample passes through the tubing it is important to get the cleanest cut and roundest hole to avoid vortexes and dead volumes which might affect the peak shapes.



1/8" stainless tubing

1/16" stainless steel tubing cut well. Notice the round hole.

In this cut the hole is smashed into an oval. Ferrules may not even fit onto this tubing.

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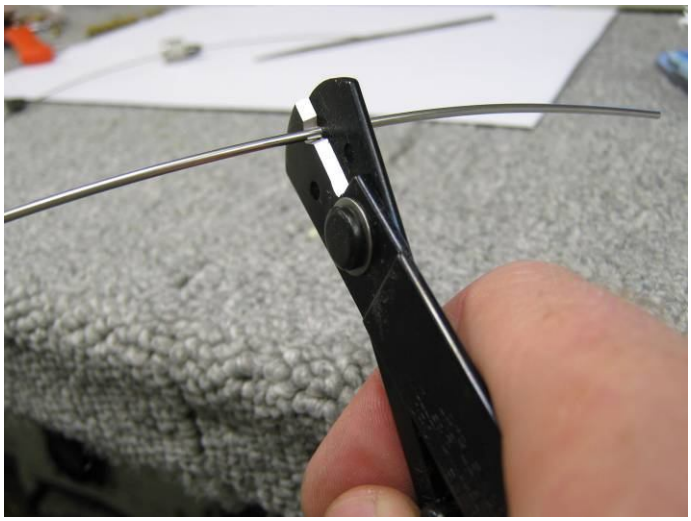
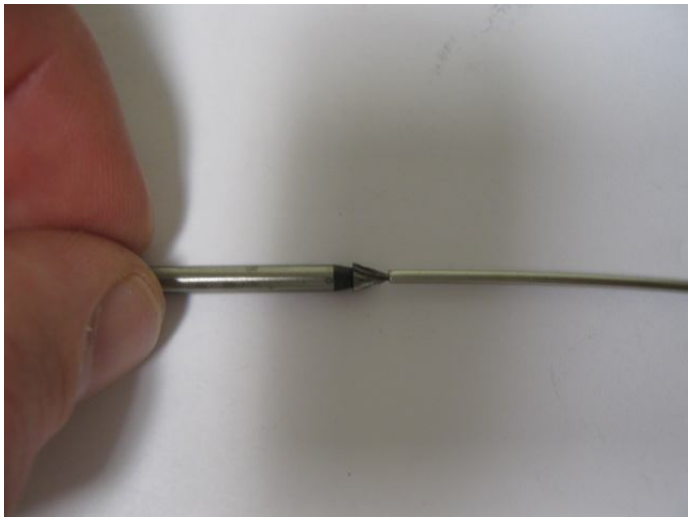
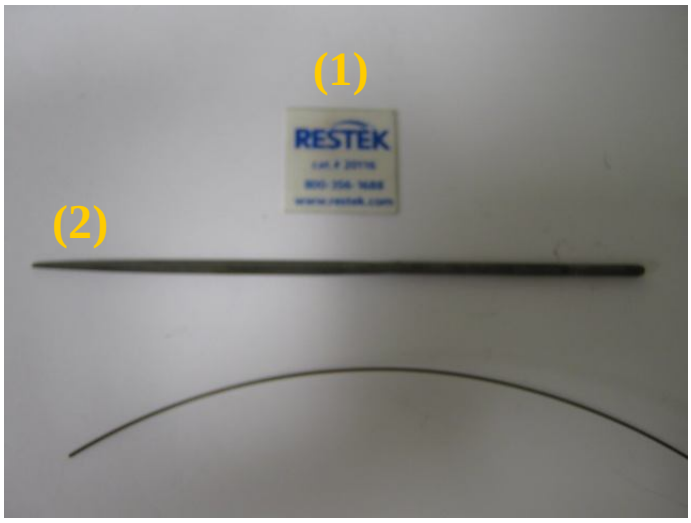
Use either the free tubing cutter or the plier-type tubing cutter to cut the 1/16” stainless tubing as you may not have access to a cutting wheel. Place the tubing into the notch, holding the cutters straight up and down so that it cuts perfectly perpendicular into the tubing. Cut firmly and quickly.



Use a de-burring tool or a syringe needle to clean up and round off the hole. Remember to hold the tool below the tubing so that any metal particles fall out of and not into the tubing. The more circular the hole and the straighter the cut the better the gas chromatography will be.



0.53 mm metal capillary column tubing is used in many SRI GC columns as well as heated transfer lines, and to connect from columns to valves inside the GC. This tubing is often coated on the inside to optimize its inertness since it is in contact with the sample. To cut this tubing you can use either (1) a scoring wafer, which is a thin square of hard ceramic, or (2) a small metal triangle file. In a pinch, a sharp knife can also work. The outside diameter of this tubing is actually .8mm but it is commonly referred to as 0.53mm tubing because that is its internal diameter.



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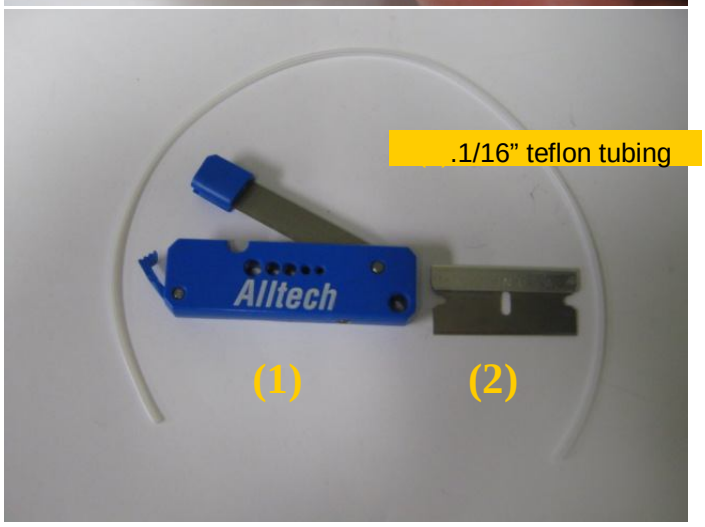
Place the end of the capillary column tubing across your pointer and middle finger. Use the seam running between your pointer and middle finger as a cutting guide and score the tubing with either the scoring wafer or the small metal file. Scoring the tubing means to make a scratch in it.

Place the scored portion of the capillary column tubing just over your thumb or pointer-finger fingernail and snap off the end. If scored properly the tubing will not bend but simply snap off. Most of the time no deburring is required, but a syringe needle or deburring tool can sometimes smooth the edges especially if the column will be connected to an injection port where a syringe will be inserted into the end of the tubing.

1/8" and 1/16" teflon tubing can be useful for certain analytes (like sulfur) that may stick to or be absorbed by other types of tubing. There are many ways to cut this tubing but we recommend using either (1) a Clean-cut Tubing Cutter (available from Grace/Alltech) or (2) a standard razor blade. Teflon tubing has the advantage of being chemically more inert than other tubing types, but is limited to areas where the temperature is less than 180C. Teflon tubing also tends to kink and develop leaks and can deform under pressure if the ferrule securing it is too tight.



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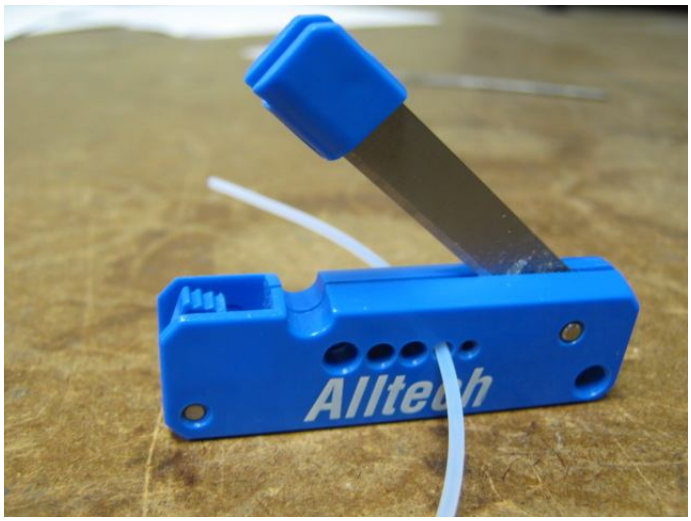
When using the Clean-cut Tubing Cutter release the cutting blade so that it pops up and place the tubing through the smallest size hole it will fit into. Press down quickly and firmly on the cutting blade to cut the teflon tubing. This cutting method is preferred because it will make a clean cut perpendicular to the tubing. A perfectly perpendicular cut is important so that the tube fits as tightly as possible into the bottom of the fitting, thus minimizing the "dead volume" which may cause peak shapes to be asymmetrical (tailing).



You can also use a razor blade. Simply lay the tubing onto a flat surface and place the razor blade straight up and down onto the tubing. Press down to cut the teflon tubing. Inspect the cut end of the tubing to ensure a clean cut and that the tubing hole is not blocked. Its hard to get a perfectly square cut with the razor blade.

This concludes the Cutting Tubing for SRI GCs document. It is recommended that the user go on to read the follow-on document: **Using Ferrules with SRI GCs** available on www.srigc.com