

## Ventilation

Whether your need is to exhaust fumes from soldering, or from torching, it's important to have enough ventilation to remove noxious fumes.

### **Control the air flow**

You don't need a fan so powerful it can vacuum the tools off your work table. You just need to control where the air moves. Air that is moving slowly in a controlled direction produces better exhaust than a high speed exhaust. A large slow moving fan is more effective at moving air than a small fast moving one that can create air turbulence. To control the air flow requires ensuring the air flows only in from the replacement air intake and out the exhaust exit. Any other places air comes in (like an open window or door) will interfere with that controlled air flow and reduce the effectiveness of your exhaust system. Sealing all air entry to your work area, other than the replacement air intake, might seem excessive - but it will help control air flow.

### **What size hood?**

A bigger hood will collect trap more fumes but a small hood placed close to your work station might work better than a large one farther away

### **Build a booth**

Your exhaust system will work better if you work in a booth than in an open space. If you have an overhead hood, install partition walls from the hood down to your work table to create a 3 sided booth. This will force the air to vent up and out and prevent it from escaping left or right.

### **What size fan?**

What size fan you need will depend on how close you place your exhaust hood to where you work. A 200 cfm fan will be adequate if your hood is placed less than a foot away but an overhead hood several feet away would require more than 400 cfm in an enclosed booth and 800 cfm in an open work area. You might be tempted to just install the biggest fan you think you might need, but the larger the fan you use, the more replacement air you must provide.

### **Calculating fan size requirement**

A rough guideline is to assume your fan should draw 125 times the surface area of your hood or work area. For example – for a 24" x 30" exhaust hood installed in a 3 sided closed booth above your work table, you would calculate having a 5 sq ft work area.  $5 \text{ times } 125 = 625$ . To effectively vent fumes, you would need a fan capable of drawing 625 cubic feet per minute. If you didn't have closed sides, you would need a larger capacity fan. If you had the exhaust hood mounted immediately beside or over the torch work area, you could use a smaller capacity fan. It is NOT sufficient to consider only the hood size in calculating fan size. If you use a 2 square foot hood over a 5 square foot work area, you still must exhaust from 5 square feet.

### **Fume exhaust test**

You can use a burning incense stick, lit candle, or lit cigarette to test to see if your exhaust system is removing all fumes. Move it to all the places on your work table you

might be working. Watch the fumes and see if they are all being pulled out the exhaust. Is there some place where the fumes do not totally exhaust?

### **What kind of fan?**

You need a fan that actually draws air as opposed to a duct fan that is designed only to boost air that has already been pushed into the duct. Squirrel cage type fans (as used for furnace blowers) or centrifugal in-line fans are preferred. In-line fans are more affected by the heat from torches and should be installed at least 3 feet from the flame. The longer the duct line, the more restriction is created. Booster fans are inexpensive and, if you have to have a relatively long exhaust ducting, it's a very good idea to install one to help boost air flow along. They are especially helpful in helping reduce air flow restrictions created by elbows.

### **Replacement air**

It's essential you have a fresh air intake that brings in fresh air to replace the air being exhausted. The fresh air intake should be the same size as the exhaust and should be at least 10 feet away from the exhaust to ensure it isn't interfering with the exhaust flow. DO NOT have more replacement air than exhaust air. This will create air turbulence that reduces the effectiveness of your exhaust system.

### **What size duct?**

Using undersized duct will restrict air flow. Be sure you use duct large enough for your fan to work to full capacity. Too big is better than too small. It's okay to go from small duct to large duct but NEVER okay to go from large to small (except for the hood).

### **Duct design**

Bends and curves in your ducts will slow down the flow of air traveling through the ducts. The more gentle the bends and curves, the less they'll restrict flow. If you must install a 90° bend, you create less restriction if instead of using a 90° elbow, you use two 45° elbows connected together to create the bend. It'll work even better if you use flexible ducting on a long gentle bend. Avoid using corrugated ducting. It creates turbulence that restricts flow.

### **Variable speed**

There are times when high speed air movement is needed and other times when it creates problems. If possible, install a fan with variable speed controls.

### **Sound**

Low cost fans make more noise than more expensive ones. You don't need a completely silent fan, but a noisy one can be a problem. Not only will it be constantly irritating, it can be detrimental to your work. The importance of sound is frequently overlooked or ignored. Hearing something that "doesn't sound right" is very often the early alert that something is malfunctioning or not working properly. A small inexpensive fan will work as well as a very expensive but, if you can afford it, you'll be a lot happier if you have one that's relatively quiet. You can also help reduce noise if you take care to tape all duct joints and firmly secure the fan and ducting so they won't vibrate.