

A BREATH OF FRESH AIR

Not all air pollution is outside.

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One of the worst hazards in a jewellery-making shop is air pollution. Buffing spins particles of polishing compounds into the air. Sawing and sanding spawn particles of zinc, nickel and copper that jewellers inhale. (We assume you are not using an asbestos soldering pad with its carcinogenic risk. If you are, contact local authorities for proper disposal methods.) Shops are full of fumes given off by soldering, hot alloys, flux, burning wax, vulcanizing rubber and plating solutions. Glues, epoxy, solvents, alcohol, ultrasonic cleaning solutions and lye all add their gases to the air. They can all harm your health, immediately or over time. Cadmium-based solders can damage the brain, nervous system, kidneys and lungs. Fumes from fluoride-based fluxes can convert to hydrofluoric acid in the lungs. Sulfuric acid and sodium bisulfate (the pickling solution Sparex) can irritate both skin and lungs.

"Even materials like rubber cement and some permanent markers demand adequate ventilation over and above the dilution type – their solvents can be very toxic," writes Calgary, Alberta jeweller Charles Lewton-Brain in his book, "The Jewellery Workshop Safety Report."

"Ventilation is incredibly important in having a safe studio. Any time you can smell a material, solvent or chemical, you should take it as a warning. If a smell bothers you, then it is considered irritating, and you should reduce your exposure to it by changing your procedure or by using local ventilation." While open windows and cross-ventilation help dilute pollutants in your workshop, they are just as likely to pull or blow

fumes and dust past your face.

Overhead cooking-type ventilation hoods, located too far from the source of the fumes or dust, don't generate enough pull to remove fume-contaminated air. Worse, they "simply pull the fumes you want to avoid right past your face," says jeweller Linda Weiss, who was one of the first to write about jewellery industry health hazards in her ground-breaking paper for the Society of North American Goldsmiths (SNAG), "Goldsmithing Health Hazards."

So how do you keep the air clean and your health intact? Lewton-Brain and other jewellers have these suggestions:

1. Use a downdraft or tabletop exhaust, with the vent opening at the level of your hands and about six to eight inches (15 to 20 cm) from the source of the contaminants. Downdraft ventilation immediately pulls fumes away from your hands and face and vents them outside.
2. Match ventilation suction strength to pollutant type. According to Lewton-Brain, to remove vapours and mists from plating, degreasing and the evaporation of chemical solutions, your system should remove 50 to 100 cubic feet (1.5 to 3 cubic metres) of air per minute; to remove the fumes from welding, increase that to 100 to 200 cubic feet (3 to 6 cubic metres) of air per minute. Heavy particles produced by grinding and abrasives require 500 cubic feet (15 cubic metres) per minute. Always test your system before you depend on it. Don't trust your health to a system that may not be working properly.

3. Think low volume, high speed. In winter, ventilation systems exhaust heated air along with fumes. Reduce heating costs by using local ventilation only when it is necessary for a specific task: don't vent the whole shop outside when you're running the pickle pot. Use a low-volume, high-air speed hood, with a slit opening. The narrow vent mouth creates high-speed suction but removes less air than a larger vent mouth would.
4. Make ventilation site/task-specific. Create a specialty booth, apart from your workbench, where you do all soldering, pickling and casting. Vent only that area. If possible, create a separate, closed room for polishing, to contain dirt and dust that otherwise fly around the whole shop. Connect your polishing machine to a strong shop-vac to trap fibres and buffing compound dust that escape the filters. Locate a hood and fan directly over your kiln to actively draw off burnout fumes.
5. Be careful with air exhaust and intake. Don't vent fumes into neighbouring homes or businesses, children's play areas or pedestrian walkways. Pay attention to incoming air quality as well. Be sure your air intake is not downwind from a chimney venting smoke or fumes from other sources, close to the exhaust of your own system, or near streets or driveways.
6. Choose a quiet, easy-to-maintain system. You have to use a safety system to be protected, but if it's noisy, chances are good you won't turn it on. So before installing a system, check the amount of noise it makes. Also consider the ease of cleaning. If you can't easily maintain a system, you won't clean it as often as necessary. If that happens, you'll think you're protected when the system is actually not working well.
7. Work wet. Good ventilation eliminates much shop air pollution, but Lewton-Brain recommends using wet belt sanders for metals to further reduce dust. Using a beeswax lubricant with silicon carbide separating disks binds the dust into a paste.
8. Choose the right vacuum. Simple vacuuming raises dust particles into the air; even a wet vac can exacerbate the problem if the filters are not discriminating enough. The best vacuum is one that traps all particles down to half a micron or so.
9. Wet mop. Instead of vacuuming, wipe surfaces with damp cloths to pick up visible dust and microscopic metal particles that have precipitated out of mists, fumes and vapours. Damp mop the floors at the end of every working session, to avoid kicking up these dusts before you start work next time.
10. Use substitutes whenever possible, such as cadmium-free solder and cyanide-free plating solution. If you use the more traditional, more toxic options, do everything necessary to reduce your risk.
11. Use a respirator. It's a good idea to wear a respirator, not a dust mask, when buffing to protect you from the metal and oxide debris given off by polishing. And you should always wear a respirator when investing and quenching, two of the most dangerous jewellery-making procedures. Handling dry investment powder sends clouds of tiny silica particles into the air. Quenching hot flasks is even worse, when investment-

laden steam can push silica deep into your lungs.

"Investment contains 40 to 60 percent cristobalite, a form of quartz that is many times more likely to cause silicosis than standard quartz is," writes Lewton-Brain. Silicosis is irreversible lung damage that occurs when tiny particles of silica go deep in the lungs and scar them. Breathing becomes difficult and death often results.

Even good ventilation is not enough. Although Lewton-Brain insisted on proper ventilation at the school where he was teaching in Alberta, "after a week we discovered a crust of investment a millimetre or so thick on the mesh over the suction slits," he says. "This was without seeing any dust in the air while investing." And the most damaging particles are the microscopic ones you can't see. After that, Lewton-Brain insisted that everyone use respirators as well as the local ventilation whenever investing.

12. Make sure respirators fit. First, ill-fitting equipment is uncomfortable, so the chances you'll use it diminish. Second, ill-fitting equipment doesn't protect you fully; it just gives you the illusion you are protected. Respirators come in different sizes for both men and women. They are available through jewellery supply houses such as Rio Grande or Stuller, and through local welding or medical supply houses.

13. Use the correct respirator filter for the work. Jewellers doing diverse work will require three types of filters: one for fine powders for investing, one for acids and one for organic solvents. Talk to the supplier about correctly caring for and storing the respirator and the filters.

14. Make safety gear your last resort. Use respirators whenever necessary, says Lewton-Brain. But consider that, if you need a respirator, there is a good chance you're doing something wrong. Safety gear tempts you to work in hazardous ways under hazardous conditions because you feel invulnerable, says Lewton-Brain. It's better to minimize the risk first, by using safer procedures, using less toxic materials, cleaning the shop consistently, and installing excellent ventilation and maintaining and testing it frequently. Use the safety equipment to protect yourself from situations that are unavoidable (as when investing and quenching).

Take the environment personally this month. Reduce air pollution in your shop and enjoy your work for many years to come. [CJ]

For further information on ventilation and shop safety in general, read Charles Lewton-Brain's book, "The Jewellery Industry Safety Report." Brain also recommends "Ventilation: A Practical Guide for Artists, Craftspeople, and Others in the Arts" by Clark, Cutter and McGrane as a guide for those who want to build their own ventilation system. For general information, and government publications and agencies that can help provide answers to safety questions, see the Canadian Centre for Occupational Health and Safety website (ccohs.ca), and Canada's National Occupational Health and Safety website (canoshweb.org).