


Protecting Ears, Eyes, and Lungs

**Don't wait until the damage is done
to think about safety and health**

By Steven Bliss

Construction accidents strike quickly and without warning. Other job-related health problems such as hearing loss or respiratory damage develop slowly over time, but both can change a life irrevocably. And both share this in common: At some level, they are due to human error and are preventable.

Unfortunately we often wait until it is too late before we wake up and pay attention to safety. We wait until someone loses part of a finger in a jointer or until we are half deaf from noise exposure—a steep price to pay for safety education.

Despite advances on many fronts, construction remains one of the most dangerous jobs in the U.S. As of 1983, the six percent of the nation's workforce involved in construction accounted for 20 percent of all work-related deaths—almost two per day. OSHA reported in that year that construction workers had a rate of accidents and illness nearly double the average for private industry.

More grim statistics: Each year over 200 construction deaths are from falls from heights. And each year 16,000 people lose fingers in unguarded machinery.

The traumatic injuries capture our attention, as they should. But the slower, more insidious hazards probably take a larger health toll in total. This article focuses on some of these everyday hazards that many of us take for granted as part of the job. To guard against them, we need a little specialized knowledge and a few small pieces of safety gear. Hopefully, the knowhow and equipment will become a regular part of your company's safety program.

Hearing Loss

Nearly one woodshop worker in four suffers hearing loss from exposure to loud noise, according to a study cited by the National Institute for Occupational Safety and Health (NIOSH). This type of hearing loss is permanent and irreversible.

The prevalence of hearing damage is not surprising, given that noise levels in a typical mid-sized woodworking shop in full operation average about 110 decibels (dB). The Occupational Safety and Health Administration (OSHA) requires that noise levels not exceed 85 dB averaged over an eight-hour workday without hearing protection. The higher the noise level, the lower is the permissible daily exposure. For example, noise should not exceed 100 dB for more than two hours per day, says OSHA. And noise levels may rise to 115 dB for no more than 15 minutes per day. Yet many large power tools—often run for extended periods—produce as much as 105 to 110 dB (see table, next page). Circular saws alone can produce up to 108 dB.

What can be done? The first approach recommended by industrial hygienists is to reduce noise levels through engineering: damping machines with mufflers and rubber mountings, and designing spaces to isolate and absorb sound. (See references at end of article.)

For many situations, however, the only practical measure is to use personal protection equipment—either earmuffs or earplugs. In fact, health authorities recommend that workers use hearing protection whenever noise



Bearded workers have few options for dust protection. One possibility is 3M's Airhat system (W-316), which uses a built-in fan to blow filtered air into the helmet. Because of the pressurized air, a tight fit to the face is less critical, but the beard must still fit inside the face seal says 3M.

levels exceed about 85 dB (roughly speaking, when you need to shout to speak to someone 3 feet away). OSHA guidelines are intended only as minimum standards.

Hearing protection-devices are rated by how much noise they block out—called the noise-reduction rating (NRR). The highest ratings (30 to 36) typically go to foam earplugs—the type you roll between your fingers and insert in your ear. Next most effective are earmuffs—the type you often see worn by ground crews at airports. Beyond that, there are several types of pre-formed and custom earplugs, some connected to cords to help the user keep track of them. One type of device, called canal caps, holds the plugs in place with a lightweight plastic band slung under the chin.

In selecting a device for moderate noise exposure, don't pay too much attention to the specific NRR number, which like an automobile mileage rating is valid only in the laboratory. One NIOSH study found that protection from various types of earplugs averaged 15 dB less than their published ratings. More important than the specific rating is how well the device fits and whether it is worn correctly. The best advice is to choose a rated device that fits well, is comfortable to wear, and is likely to be used.

Although the foam plugs provide the best protection, they are not practical for intermittent use since they'll pick up dirt from the user's fingers each time they are reinserted. So for work that needs occasional protection only, earmuffs or canal caps are often the best choice. Of these two choices, canal caps are the more convenient (they are lightweight and hang nicely around your neck when not in use), but the bulkier muffs provide much better sound reduction. Some companies offer belt clips to hold the muffs when not in use.

Tool	Noise Level (dB)
planer	105-115
pneumatic hammer-concrete	103-115
chainsaw	101-114
sanders	90-110
circular saw	102-106
spray painting	105
cutoff saw	95-100
portable electric drill	90-97
dieel air compressor	90

**Decibels (dB) are measured on a logarithmic scale. Each increase of 3 on the scale represents a doubling of sound intensity.*

Source: Carpenter

Wood Dust

Woodworking is relatively clean compared to other manufacturing industries, but it's not clean enough for comfort. The two main hazards are wood dust from machinery and solvents from finishes and adhesives.

While most people consider wood dust to be pretty safe, prolonged exposure can cause a variety of serious respiratory problems, including occupational asthma and impaired lung capacity. In addition, several studies link long-term exposure to wood dust with a rare form of nasal cancer (though only one in about 1,400 woodworkers will get the cancer after 40 years exposure, according to estimates).

Both the respiratory problems and cancers appear to be more linked with hardwood dust than softwood. Also, certain species are known to cause allergic reactions in a small number of workers: redwood, mahogany,



Take your pick of hearing protection (clockwise from top left): Earmuffs provide good, convenient protection, but are bulky. Moldable foam earplugs provide excellent protection, but are inconvenient for intermittent use. Canal caps, which fit over the head or under the chin are lightweight and convenient and offer modest protection. Pre-molded plugs (also available attached to cords) can work well if you get a good fit.

teak, ebony, and rosewood are some that have been singled out. Symptoms include asthma symptoms, runny noses, skin rash, and "pink eye" (conjunctivitis).

Red cedar is commonly linked to similar problems. But here the problems are due to volatile oils as well as dust, and the oils may evade dust-collection equipment.

Another hazard is presented by breathing the dust of any type of preserved wood—whether using creosote, water-borne arsenicals, or penta. Each is dangerous and should be avoided at all costs.

While efforts are underway to regulate wood dust as a hazardous substance, at this time it is still treated by OSHA as a simple nuisance dust. Standards aside, it's best to breathe as little as possible. The best approach, as with any airborne pollutant, is to get rid of it at the source with ventilation equipment. Also use good house-keeping around the shop so dust does not pile up.

Where dust levels can't be controlled, wear a mask. The typical un-rated nuisance-dust mask is okay.



Use a rated dust-mist respirator, such as this 3M 8710, for protection from hazardous dusts and mists (but not for asbestos or spray paint). Note also the side shields on the safety glasses.

But given the strong suspicions about wood toxicity, an upgraded model would be better.

The best choice is a NIOSH- and Mine Safety and Health Administration (MSHA)-approved "dust and mist" respirator—either the disposable type or one with replaceable filters. These provide more protection than un-rated masks due to heavier filters and multiple straps. They protect against particles as small as silica (used in sandblasting) and some acid mists. However, they do not protect against asbestos fibers.

One caution: If you have a beard, most masks will not fit well and will be less effective. In some cases, a fuller mask that fits around the beard might do the job (with a little trimming of the sideburns). The only sure alternative, however, is a positive-pressure respirator that blows outside or filtered air over your face. One such "air helmet" (3M's model W316) eliminates the need for a compressor by using an on-board battery-powered fan. Unfortunately, the device weighs over three pounds and costs over \$400. And 3M cautions that the beard still must lie within the face seal.

Toxic Vapors

Most carpenters, woodworkers, and painters breathe more than their share of solvents, epoxy fumes, paint spray, and a host of other organic vapors. Some particularly noxious but common fumes include: methylene chloride (paint remover), toluene and xylene (solvent in contact cement, mineral spirits, and lacquer thinner), methyl alcohol (called "wood" alcohol), and isocyanates (in expanding foam and polyurethane sealants).

To some extent, you can choose less toxic materials to work with. For example, use "odorless" mineral spirits, which have less toluene and xylene than the cheaper variety. Use denatured ethyl alcohol rather than methyl alcohol as a solvent for shellac. And, where possible, substitute acetone for other solvents, most of which are more toxic.

The maximum safe threshold levels for most of the common organic chemicals are published along with recommendations for protective equipment (see resource listing). But even if you could monitor and maintain "safe" levels through ventilation, a steady diet of organic vapors at any concentration

is not healthy. And the safe levels for many are not known. The long-term health effects of solvents include lung damage, liver and kidney problems, and for some solvents (benzene, perchloroethylene, trichloroethane) blood diseases and leukemia. Short-term problems include dizziness, headaches, and other central-nervous system problems, and eye, nose, and throat irritation.

So if you value your organs, outfit yourself with a NIOSH-rated "organic-vapor" mask. These look somewhat like World-War I gas masks and use replaceable activated-charcoal cartridges good for 4 to 16 hours of average use depending on the type and concentration of vapor. These will filter out most common vapors in a woodshop, with the exception of methyl alcohol and methylene chloride. Methyl alcohol will go right through the filter, and methylene chloride will overload it quickly.

Other chemicals such as isocyanates are not safe to use with this type of mask because they are hazardous at concentrations you cannot smell.

When used for spray painting or spray finishing, you need to add a paint pre-filter to the organic-vapor mask. For dusty environments, you can add a dust pre-filter.

These chemical-cartridge respirators are only recommended for vapors that can be smelled before they reach hazardous levels. When you smell them through the mask, it's time to replace the cartridge. Do not use them with gases that have poor warning characteristics, and gases that are "immediately dangerous to life and health." These require more sophisticated equipment with external supplied air. For any respirator, choose equipment that's rated for the specific type and concentration of vapors you'll be working with. Contact NIOSH or the respirator manufacturer for technical assistance in choosing the right product.

Even more than dust masks, organic-vapor respirators must fit well to do their job. They do not work over beards. You can test the fit of a respirator by breathing in (with your hands over the filter cartridges) or breathing out (with your hand over the exhale port). If the mask pulls tight while breathing in and puffs up while breathing out, you've got a good fit. A more reliable approach is to use test capsules with a scented gas, such as banana oil (isoamyl acetate). Test capsules are available from Siebe-North, Inc.

A final note about organic compounds: In addition to protecting your lungs, protect your eyes and skin from contact with these chemicals. Many are readily absorbed through the skin. Be particularly careful with isocyanates and epoxies. Both are sensitizers. This means that repeated contact can make a worker highly allergic to the material, permanently.

The only safe route is to know the individual toxicology of the materials you're working with. Consult NIOSH, OSHA, or an industrial hygienist (at your state's occupational safety department) for the information you need.

Protect Your Eyes

Eye injuries are very common among trades workers. They represent close to 40 percent of the estimated 1,000 eye injuries that occur daily on the job.

In most cases, according to a U.S. Department of Labor study, workers who suffer injuries are not wearing eye protection or are wearing equipment

with no side shields. Most of the injuries, the study found, are caused by tiny flying objects. Without full protection, these can get around or under the protector.

To be safe, workers using machinery that produces chips should min-

corrective lenses, or safety spectacles with special frames.

Finally, be extra careful when working overhead and when working with corrosive materials. A common corrosive material is lye, found in plaster and portland-cement products. Just a



An organic-vapors respirator protects against most solvents and organic vapors found in woodworking and light construction. This is the North 7700 half mask.

imally use safety glasses with side shields. For dust-producing work such as demolition, a cover goggle is recommended. Look for the type with fog-free lenses. Some also have baffled and screened ports to allow dust-free air in for increased comfort. As with other safety equipment, the more comfortable and convenient it is, the more likely it is to be used.

For people who wear glasses, OSHA recommends one of the following: goggles worn over corrective spectacles, goggles that incorporate

speck of this can cause serious and long-lasting burns to the tender cornea.

Construction work will never be entirely free of hazards. But if you value your ears, eyes, and lungs, use common sense, get educated, and—when necessary—use protective equipment. Learn the smart way and make safety a part of your business—so you don't have to learn the hard way. ■

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For More Information:

General information:

National Institute of Occupational Safety and Health (NIOSH): 800/356-4674.

Or contact the NIOSH Division of Safety Research at 304/291-4595.

Manufacturers:

Some manufacturers of safety equipment are listed below. (Also look under "safety equipment" in your Yellow Pages.)

Hearing protection

David Clark Company, Inc., 360 Franklin St., P.O. Box 155, Worcester, MA 01613; 617/756-6216.

E-A-R Division of Cabot Corp., 7911 Zionsville Road, Indianapolis, IN 46268; 317/872-1111.

MSA, 600 Penn Center Blvd., Pittsburgh, PA 15235; 412/273-5000.

Tasco Corp., 37 Tripps Lane, East Providence, RI 02915; 401/438-9200.

Respirators

3M Occupational Health & Safety Products Div., 220-3E, 3M Center, St. Paul, MN 55144; 612/733-5454 or 800/243-4630 (tech services).

American Optical Corp., Safety Products Div., P.O. Box 1979, 14 Mechanic St. Southbridge, MA 01550; 617/765-9711.

Moldex, Metric, Inc., 4671 Leahy St., Culver City, CA 90230; 800/421-0668. (Also hearing protection.)

North Safety Equipment, Div. of Siebe North Inc., 2000 Plainfield Pike, Cranston, RI 02920; 401/943-4400.

Safety Glasses

H.L. Bouton Company, Inc., P.O. Box G, Buzzards Bay, MA 02532; 617/746-5502.

Useful Publications:

A Guide to Respiratory Protection: free from 3M Occupational Health & Safety Products Div., 220-3E, 3M Center, St. Paul, MN 55144; 612/733-5454.

Fine Woodworking on The Small Workshop: \$7.95 from the Taunton Press, 63 S. Main St. Box 355, Newtown, CT 06470. (Contains several good articles on health and safety.)

NIOSH Pocket Guide to Chemical Hazards: free from NIOSH Publications R-6, 4676 Columbia Parkway, Cincinnati, OH 45226; 513/841-4287.

Noise Control: A Guide for Workers and Employees: \$15 (for non-members) from the American Society of Safety Engineers, 1800 E. Oakton, Des Plaines, IL 60018; 312/692-4121.