Choosing the Right Dust Mask

by Clayton DeKorne

Match the mask to the hazard — and find one comfortable enough that your employees will wear it

Dust is everywhere in a builder's life, and it is the bane of every remodeler. Wood, gypsum, lime, and concrete are all contributors to the dusty job site. Add fiberglass, cellulose, and rockwool fibers, with a sprinkling of arsenic salts and lead, and you have a witches' brew of noxious inhalants floating around the worker's world.

Choosing the right mask to protect you and your employees depends on the particular hazard you're facing, how well the mask fits, and whether or not it's comfortable enough to actually wear. This article will take a look at some common dust hazards, and the least expensive and least cumbersome respirators you can use. But first, here are a few definitions that will help clarify the numbers and acronyms in dust mask specifications.

Reading the Specs

When selecting a mask, you'll need to know the exposure limits for the dust you're concerned with. Most safety product catalogs will indicate a certain exposure-limit value for each mask, specified as a threshold-limit value (TLV), a permissible exposure limit (PEL), or a time-weighted average (TWA). All these values are measured in milligrams (mg) of dust per cubic meter (m^3) of air, and all indicate the average concentration level of a particular hazard that a worker can safely be exposed to over an eight-hour period.

TLV's are established by the American Conference of Governmental Industrial Hygienists (ACGIH), and serve as the basis for PELs, which is the designation OSHA uses. TWA is a generic term, and is used most often in safety catalogs.

Every hazardous material has an exposure limit, which you can find in any of several documents (see "Sources of Supply," at the end of the article). However, these booklets list the hazards by chemical name, which you may not recognize. So perhaps the best place to find the exposure limits is on the Material Safety Data Sheets for the products you are working with. These are available upon request from the manufacturer, and list either a PEL or TLV if one exists, and specify what type of protection you need.

For low-cost dust protection there are two basic types of disposable respirators available: "nuisance dust masks" and masks rated and approved by the National Institute of Occupational Safety and Health (NIOSH). Nuisance dust is any dust that isn't likely to cause scar tissue in the lungs. OSHA has set the PEL for nuisance dust at 15 mg/m^3. Most off-the-shelf, unrated masks provide this level of protection.

NIOSH doesn't approve any nuisance dust masks. Its rating system begins at the next level of protection, commonly called "dust/mist" masks. The rating is indicated right on the mask as TC-21C, followed by a three-digit number which is different for each model of respirator. Disposable dust/mist masks are commonly rated for exposure limits of .05 mg/m^3. This covers a wide range of hazards, but not all. Here's a look at some of the most common hazards encountered on the job site.

Dust Hazards

Wood dust. Considering all the dust hazards in the air, you'd think wood dust was relatively harmless. But not everyone agrees. Christopher Coffey of NIOSH claims that inhaled wood particles can cause abrasion of the lungs, which can in turn create scar tissue that restricts the absorption of oxygen. Even if the particles don't reach the lungs, they can irritate nasal passages, increasing the risk of nasal cancer. If this weren't bad enough, the dust of some woods — western red cedar, in particular — is allergenic, and can cause numbness, dizziness, and long-term shortness of breath in some individuals.

In response to these known hazards, OSHA stepped up the General Industry Standard two years ago by setting a PEL on wood dust of 5 mg/m^3. For red cedar, the limit is 2.5 mg/m^3. As yet, this requirement only effects wood shops and furniture factories. But a recent proposal to adopt the law into the OSHA Construction Standard could affect builders and remodelers within the first half of 1991.

Under current OSHA regs, nuisance dust masks are considered adequate protection for wood dust on site. If OSHA adopts the new dust standard, NIOSH-approved dust/mist respirators will be required. Masks that will meet the new standard include: 3M 8560, 8710, and 9900; AOSafety 1010 and R 1050; Gerson 1710 and 1725, Glendale GR-555; Moldex 2200 and 2300; Net 0401; North 7170; and Willson 1410 (see Figure 1, next page, for examples).

Drywall and concrete dust. Sanding drywall joints presents a hazard because of the high concentration of dust typically present. Joint compound itself isn't especially noxious. The dust is generally classified as a nuisance dust, which suggests that a simple nuisance dust mask is acceptable. But the exposure limit is expected to be lowered to 10 mg/m^3, so a respirator similar to those specified for wood dust may be required.

Concrete dust is similar to gypsum: It is generally considered "inert" but can be unpleasant, so a nuisance dust mask is useful. Here too the exposure limit may soon be lowered to 10 mg/m^3.

Insulation fibers. There is some controversy surrounding the hazardous effects of inhaled fiberglass. The International Agency for Research on Cancer has classified

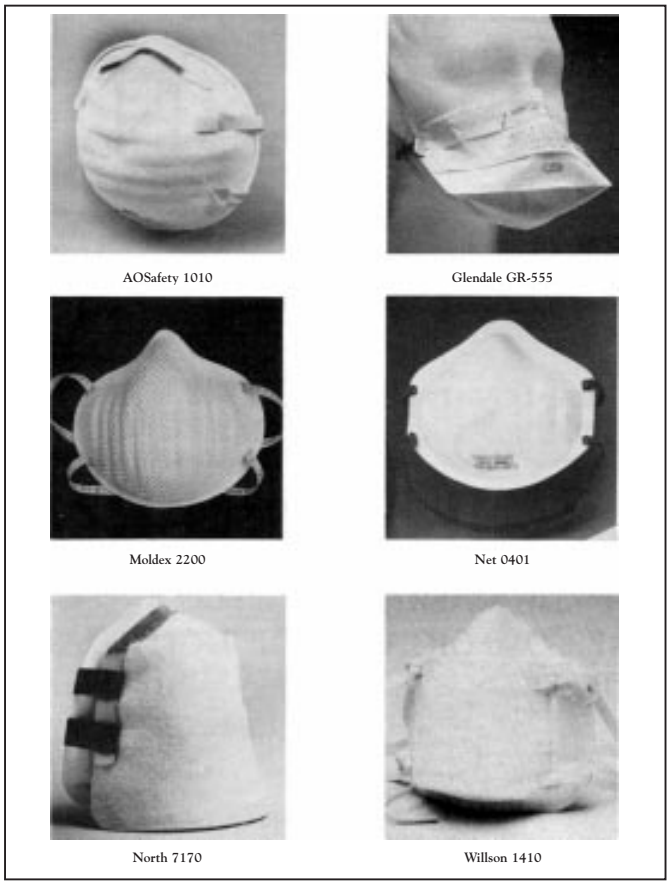


Figure 1. *These disposable dust/mist respirators are NIOSH-approved for wood, drywall, and concrete dust, as well as fiberglass, rockwool, and cellulose insulation. Choose a style that is comfortable and provides a good fit.*

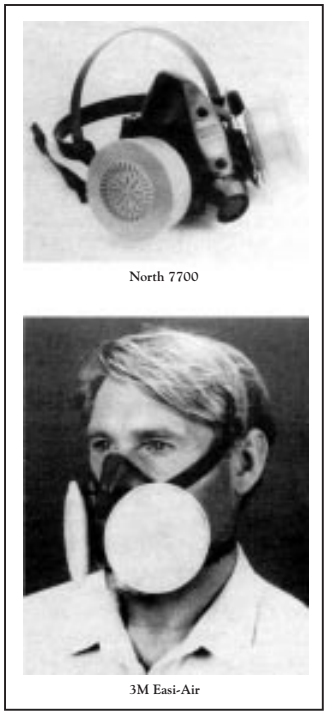


Figure 2. *Half-face respirators with replaceable HEPA filter cartridges are recommended by most respirator manufacturers for working with any asbestos-containing dusts. You're likely to encounter asbestos on many demolition jobs, such as tearing out old plaster.*

fiberglass insulation as a possible cancer-causing agent. Spokespersons from Owens-Corning Fiberglas and Manville Corporation are quick to point out that the studies behind this classification were based primarily on experiments with animals artificially exposed to fibers by implantation or injection into lung tissue, and that studies in which animals were exposed to high concentrations of airborne fiberglass have not resulted in a positive link between the insulation and lung cancer.

Still, most fiberglass manufacturers recommend the use of a NIOSH-approved respirator, especially when the concentration levels are high, such as when blowing wool or installing batts in a confined space without ventilation. Both Manville and Owens-Corning recommend a mask equivalent to those shown in Figure 1.

Much less is known about the hazardous effects of inhaled mineral wool insulation. The TLV is set at 10 mg/m^3, and American Rockwool recommends a NIOSH-approved respirator similar to those for wood dust.

Cellulose is probably the least harmful insulation. Made mostly of recycled paper, the fibers are large and soluble, so pose little threat to the lungs. Most cellulose is treated with either boric acid or ammonium sulfamate as a fire preventative, which in large doses can cause a burning sensation in lung and nasal passages. Several insulation manufacturers and contractors said a simple nuisance dust mask is sufficient for cellulose, but since the TLV is set at 10 mg/m^3, most respirator manufacturers recommend a dust/mist respirator.

Demolition. Choosing a dust mask for demolition depends on the age of the materials you are working with. Even if you avoid old heating duct insulation, there is a good chance you'll encounter asbestos, which was used in drywall, joint compound, plaster, and vinyl floor coverings up until the 1970s. Because asbestos is a known carcinogen, few respirator manufacturers recommended disposable masks for demolition work. Most call for a half-face respirator with a *high-efficiency particulate accumulator* (HEPA) filter cartridge, even when you are just cutting an opening for a new window or stripping an old floor.

Some half-face respirators that are relatively comfortable are the North 7700, 3M Easi-Air, and the Glendale MX PF 9500. All these masks use two cartridges which vary in type with different hazards. They have silicone rubber seals that are softer than organic rubber and conform well to the face (rather than the other way around).

The Glendale mask, designed specifically for asbestos abatement, is light and comfortable, yet tight-fitting. In addition to the rolled rubber lip on the perimeter of the mask, it has two inner flaps to provide multiple contact points.

The North and 3M versions have a smaller cup that covers only the nose and mouth, and are sold in small, medium, and large sizes to fit different faces (see Figure 2). 3M also offers a "low profile" cartridge (3M 2040) which is less expensive and lighter than conventional cartridges, and is approved for asbestos-containing dusts.

Only two disposable respirators are recommended for use with asbestos-containing dusts and mists. These are Willson's new 2000 series and 3M's 5000 series (see Figure 3, page 28). The 3M mask is only approved for asbestos with an adaptor which allows the use of the 2040 cartridge mentioned above. Both the Willson and 3M masks look much like conventional half-face respirators and have similar face seals, but they have permanently fixed cartridges and are reportedly much lighter.

Lead paint. On remodeling jobs where you are sanding existing painted surfaces, there is a good chance of encountering lead dust. In many states, OSHA regulations supersede the Federal standard and require a HEPA respirator. If such regs don't apply, then you can use a disposable "dust/mist/fume" respirator. These masks are rated for a similar exposure limit as dust/mist masks, but filter the finer particles of a fume. Generally these are sold as "welding masks" and can also be used for burning off old paint. Examples include Moldex's 3400; 3M's 9925 and 9920; and North's 7190.

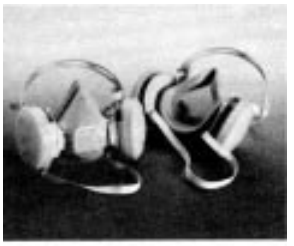
Pressure-treated wood dust. For years, the treating industry has claimed that the copper chromated arsenate (CCA) used in pressure-treated wood is chemically bound to the wood, so the dust is no more toxic than ordinary wood dust. But the MSDS for "Wolmanized" wood (Hickson Corporation) states, "When sawing or machining treated wood, wear a NIOSH-approved dust high-efficiency filter respirator." OSHA doesn't specify an exposure limit for pressure-treated wood, but does recommend turning to manufacturer recommendations found in the MSDS.

Steve Smulski of the University of Massachusetts Building Materials Program suggests that proper selection of treated wood may be your best protection. Sometimes excess treating chemicals can precipitate on the surface. If you see a white powder or "bloom" on pressure-treated lumber, the wood dust will probably not be as inert as ordinary wood dust and should be avoided.

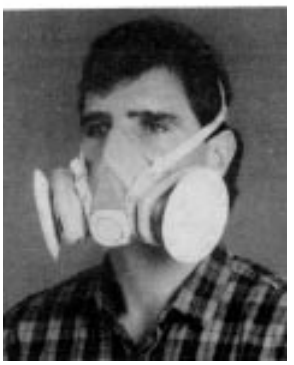
A Final Note On Fit and Comfort

How well a mask fits is as important as the filter medium in determining performance. In order to get a tight fit, however, comfort is often sacrificed, so the mask winds up hanging on a nail. As Bill Kennedy of Kenco Safety Supply in West Hurley, N.Y., points out, "Some contractors are lucky if they can persuade their employees to wear any mask." Kennedy recommends a few features to look for in disposable respirators that might improve the comfort and likelihood of use:

- ***A molded shell.*** Kennedy says that many of his customers prefer a molded shell, such as the Moldex 2200 or the Net 0401, rather than a mask with a metal clasp. The molded masks reportedly fit better and are "smile-proof." Metal clasps, on the other hand, often open up and require constant pinching.
- ***Added support.*** In most "paper" masks, the filter medium, typically a non-woven fiber, has no additional support. Such masks are prone to sag when they get damp, either from humidity or from the moisture in your breath. A few masks have reinforcement to help them hold up longer. Examples include the Moldex 2200, which has a rubber mesh over it for support, and the 3M 9900, which has a moisture-resistant outer shell.
- ***Exhaust valve.*** Though you'll probably pay twice as much for a disposable mask with an exhaust valve, the valve will help relieve some of the heat and moisture buildup on your face. This can also help prevent moist air from rising up through the top of the mask and fogging up glasses and safety goggles. Examples include the Gerson 1725 and the Moldex 2300.
- ***Rectangular masks for beards.*** According to OSHA, anyone with a beard must wear a hooded supplied-air respirator when a rated mask is called for. As a practical matter, such a respirator is often not feasible. Kenco's Kennedy has heard



Willson 2000



3M 5000

Figure 3. *Two lightweight, disposable respirators are available with high-efficiency filters, suitable for asbestos — Willson's 2000 and 3M's 5000.*

of cases where a successful fit has been achieved on workers with beards using rectangular respirators, such as the AOSafety R 1050 and Glendale GR-555 (see Figure 1), or by smearing Vaseline around the perimeter of the mask.

Finally, it should be mentioned that both paper dust masks and cartridge filters are "mechanical filters" that physically trap particulates in a fibrous filter material (as opposed to chemical filters that use carbon to absorb gases and vapors). Because a dust filter traps particles, it will eventually get full. But a visible buildup of dust on the outer shell doesn't always mean that a mask is used up. In fact, there is some evidence that suggests that the loading of dust on the filter *increases* its efficiency. A mask isn't used up until it becomes noticeably difficult to breath through.

Nevertheless, most respirator manufacturers recommend that you change your mask at least once a day, and even between meals and breaks. Once the mask is taken off, it can collect ambient dust *on the inside*, increasing your exposure when you put it back on. ■

Clayton DeKorne is an associate editor with The Journal of Light Construction.

Sources of Supply

Publications

NIOSH publishes a *Pocket Guide to Chemical Hazards* which lists both TLVs and PELs for most hazardous substances. Single copies are available from: National Institute of Safety and Health, Publications Dept., 4676 Columbia Parkway, Cincinnati, OH 45226; 800/356-4674.

Each year the ACGIH publishes an update of *Threshold Limit Values for Chemical Substances*. Single copies are available from: American Conference of Governmental Industrial Hygienists, Publications Office, 6500 Glenway Ave., Bldg. D-7, Cincinnati, OH 45211-4438; 513/661-7881.

Multiple copies of these and other safety publications are available from: Lab Safety Supply, Inc., P.O. Box 1368, Janesville, WI 53547-9979; 800/356-0722.

Respirator Manufacturers

AOSafety
Cabot Safety Products
90 Mechanic St.
Southbridge, MA 01550
800/225-9038

Louis M. Gerson, Inc.
15 Sproat St.
Middleboro, MA 02346
800/225-8623

Glendale Protective Technologies, Inc.
130 Crossways Park Drive
Woodbury, NY 11797
800/645-7530

Moldex Metric, Inc.
4671 Leahy St.
Culver City, CA 90230
213/870-9121

New England Thermoplastics, Inc.
P.O. Box 490
Lawrence, MA 01842-1090
800/638-6275

North Safety Equipment
2000 Plainfield Pike
Cranston, RI 02921
401/943-4400

3M Occupational Health and Environmental Safety Div.
3M Center-Bldg. 220-3E-04
St. Paul, MN 55144-1000
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