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WOOD DUST: HAZARDS & PRECAUTIONS

Many wood workers still do not know what the experts know: that wood dusts can be sensitizing, toxic, and some (maybe all) can cause cancer. Many also do not know that exposure to wood dust in the workplace is regulated by the Occupational Safety and Health Administration (OSHA) and there are additional wood dust standards that have been developed by the American Conference of Governmental Industrial Hygienists (ACGIH).

ACGIH WOOD DUST STANDARDS. Beginning as early as 1970, ACGIH has set various Threshold Limit Values (eight hour time weighted averages) for wood dust. In their recommendations ACGIH notes that the "principal health effects reported from exposure to wood dust are dermatitis and increased risk of upper respiratory tract disease. Epidemiologic studies of furniture workers have indicated an excess of lung, tongue, pharynx, and nasal cancer. ... Certain exotic woods...contain alkaloids that can cause headache, anorexia, nausea, bradycardia, and dyspnea on inhalation" (*Documentation of TLVs and BEIs*, 1997, pp. 1728-31).

As a result, ACGIH has standards for various types of wood dust.

TABLE - ACGIH WOOD DUST STANDARDS*

TYPE OF DUST	TLV-TWA mg/m^3**	CANCER STATUS***	EFFECTS
Western red cedar	0.5(SEN)	A4 -not classifiable	asthma
All other hard woods	1	---	pulmonary function
CARCINOGENICITY:			
Beech and Oak		A1-confirmed human	
Birch, Mahogany, Teak, Walnut		A2-suspected human	
All other wood dusts		A4-not classifiable	

* These standards are the ACGIH's values in 2014. All standards are for inhalable wood dust (meaning the standard is not restricted to only the fine respirable particles).

** Threshold Limit Value-time weighted averages in milligrams/cubic meter.

*** Note that the National Toxicology Program (NTP), the National Institute for Occupational Safety & Health (NIOSH) and the International Agency for Research on Cancer (IARC) list all wood dusts as human carcinogens.

OSHA REGULATIONS. In 1989, OSHA set Permissible Exposure Limits for wood dust of 5 mg/m^3 and 2.5 mg/m^3 for western red cedar. These limits and hundreds of others were vacated by the courts over a legal issue related to economic impact and risk assessment statements, not due to disagreements about the toxicity of wood dust. Currently, the major wood industries have entered into agreements with OSHA to adhere to the 5 mg/m^3 limit.

Then on April 13, 1994, OSHA published in the Federal Register (59 FR 17478-9) some technical amendments to their Hazard Communication Standard. These amendments clearly state that the law applies to wood products which are to be processed in a manner which creates wood dust or which results in exposure to hazardous wood treatment chemicals. Previously, the wood industry did not

accept this interpretation of the OSHA rule and did not label or supply material safety data sheets (MSDSs) for all wood and wood products. To allow more time for the industry to prepare labels and MSDSs, OSHA stayed the requirements until August 11, 1994. But today, employers and wood workers have a right to an MSDS on all wood products.

OSHA explained that MSDSs are not needed if the "manufacturer or importer can establish that the only hazard [the wood products] pose to employees is the potential for flammability or combustibility" because these hazards are common knowledge. However, this would take testing on the part of the wood producers and is not likely to occur. Now 29 CFR 1910.1200(b)(6)(iv) is amended to reflect this change.

Materials exempt from the MSDS rule would include pre-cut products intended to be glued or nailed into place. But if wood is to be sawed or sanded, workers must be warned that wood dust causes dermatitis, respiratory diseases, and is associated with cancer. And if the wood is toxic or chemically treated, these hazards also must be addressed.

It is also well-known that the finer dust is more toxic. This is because the fine dusts can be inhaled deeper into the lungs and have more surface area to contact lung tissue. This fact is relevant to the Academy's wood dust cyclone which recirculates fine wood dust back into the shop.

FIRE AND EXPLOSION HAZARDS. Wood dust is also explosive when suspended in significant quantities in the air. This explosive mixture exists inside dust collectors, bag houses, and cyclones while they are working. Improperly installed cyclone dust collectors used in woodworking are potential fire and explosion hazards, according to the 1997 OSHA bulletin, *Improper Installation of Wood Dust Collectors in the Woodworking Industry*. The bulletin warns that cyclone dust collectors usually should not be installed inside woodworking shops. OSHA points out that the 1994 Uniform Building Code and the 1994 Uniform Mechanical Code (or official interpretations of these codes) call for dust collection systems to be located outside shops. Many local U.S. building codes reference these national codes.

RECOMMENDATIONS

* Provide local exhausts for all dust-producing woodworking processes including cutting, sanding and routing.

* Locate cyclones and bag house dust collectors outside buildings except for small collectors under 1500 cubic feet per minute (cfm) exhaust rate.

* Do not recirculate air from cyclones and bag houses back into the workplace. Dust collector filters cannot remove the fine toxic dusts or gases like formaldehyde.

* Anyone working with wood must be trained to understand the hazards of the dust.

* Material Safety Data Sheets (MSDSs) must be obtained when wood is ordered and they must be filed in the facilities HAZCOM file.

* Use no added-formaldehyde composite panels such as MDF when possible (see Appendix).

APPENDIX: USING MDF

The following is a position paper on the use of MDF (medium-density fiber board) in scene and prop shops, and on film locations from the International Alliance of Theatrical Stage Employees (IATSE), locals USA829 and 52.

WHAT IS MDF? Most MDF is made of wood fibers derived from defibrated (ground) wood chips or other cellulosic materials and urea-formaldehyde or phenol-formaldehyde resins. MDF is commonly composed of 85-100% softwood (e.g., pine), and 0-15% hardwood (e.g., beech, oak).

Most MDF contains 8-18% urea formaldehyde resin, which is 2-3 times more resin than normal particle board. As a result, MDF releases more formaldehyde than particle board or plywood because it contains more formaldehyde resins.

CALIFORNIA RULES ON WOOD PANELS. In 2007, the California Air Resources Board (CARB) adopted a regulation to limit formaldehyde emissions from composite wood panels and finished goods containing composite wood panels. The regulation specifically focuses on three composite wood products: medium density fiberboard (MDF), particleboard and hardwood plywood. Like most emission standards, they are based on environmental concerns.

Composite wood panels sold in California must meet their current level of testing (Phase 2) by third party certifying laboratories. Exempt from testing are panels made with no-added formaldehyde (NAF) or ultra-low emitting formaldehyde (ULEF). CARB's regulation applies only to products sold or supplied to California. However, most U.S., Canadian, and some offshore manufacturers are certifying their products sold nationally to comply with CARB's Phase 2 emission standard.

US REGULATIONS. In 2010, the Formaldehyde Standards for Composite Wood Products Act was signed into law, requiring the United States Environmental Protection Agency (U.S. EPA) to adopt emission standards for products offered for sale or use nationally that are the same as the California emission standards. The U.S. EPA has been developing the rules which are projected to be finalized in 2015 and in effect a year later. But currently, there are no federal formaldehyde regulations for MDF and other composite wood panels.

Even when the new rules are in place, they only reduce the formaldehyde in composite panels. Wood workers still will be exposed unless they use MDF that is not made with formaldehyde.

WHY REGULATE FORMALDEHYDE? In support of the new California rule, state regulated and public health groups cited studies linking formaldehyde to workplace asthma, increased numbers of cases of asthma and allergies in children exposed at home, and cancer.

In 2004, the International Agency for Research on Cancer formally linked formaldehyde to throat cancer in humans. Other agencies that consider formaldehyde a carcinogen include the Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the National Toxicology Program, the National Institute for Occupational Safety and Health (NIOSH), the American Conference of Governmental Industrial Hygienists (ACGIH), and the various European health agencies. So it is generally accepted that formaldehyde is a carcinogen.

STUDIES OF WORKERS. Dust generated by machining MDF is known to cause eye, nose, throat and skin irritation. In one 1991 Swedish study, 94% of the workers machining MDF complained of nasal irritation.[1] Then in 2004, a Finnish study compared data from 3 small furniture factories that used beech hardwood MDF with data from two factories that used mainly natural wood (birch

and pine).[2] Eye, nose, throat, and skin symptoms were common in both exposed groups, but the MDF group had significantly more nasal and eye symptoms than the natural wood dust groups.

The authors of the Finnish study also noted that, unlike wood dust, the fine MDF dust particles are inhaled into the respiratory tract and release formaldehyde directly to the tissues there. The authors suggest that the occupational limits for both the dust and the formaldehyde gas should be tightened. It is also notable that these studies were done in Scandinavian countries. There don't appear to be a lot of studies here in the United States. Searching the internet for studies also is confusing because many papers which look like studies are actually promotional material from manufacturers.

Another Finish study published in 2009,[3] looked at the ultrafine or "nanoparticles" that are released during the sanding of MDF. There particles are less than 100 nanometers or 0.1 micrometers in size. This is an important size because HEPA filters are only tested for capture of 0.3 micron-sized particles. The authors concluded that "the dust content in extraction systems must be monitored continuously." Obviously, exhausting the air 100% to the outside would be the best solution.

WORKPLACE REGULATIONS. There are already OSHA permissible exposure limits (PELs) and ACGIH threshold limit values (TLVs) which limit the amount of formaldehyde which should be in the air in the workplace.

The federal OSHA standards are the highest levels allowed in the Western World and generally considered unprotective. The other standards (see table) are all better for workers. In order to comply with any of these standards, employers must test the workplace air repeatedly to insure the levels are within the limits. This doesn't usually happen in our business.

AGENCY- STANDARD	8 hour limit (ppm)*	ceiling limit ** (ppm)*
OSHA - PEL	0.75	2.0
ACGIH - TLV		0.3
NIOSH - REL	0.016	0.1
EUROPEAN - MAK	0.3	2.0

* ppm = parts per million ** instantaneous limit not to be exceeded at any time

USA829 WORKPLACE OPTIONS. Unless employers on film locations or in local shops want to hire industrial hygienists to do air monitoring for formaldehyde and wood dust during production as OSHA requires, it is our position that formaldehyde resin MDF should not be used.

If employers or designers insist on using MDF, then formaldehyde-free MDF can be purchased at a somewhat higher cost (e.g., Medex and Medite II,[4] made with polyurea resin). But since workers have clearly observed that all types of MDF release more and finer dusts during machining than other wood products, employers must provide an OSHA-compliant respiratory protection program with medical certification, fit-testing and training and provide local exhaust dust control.

FOOTNOTES

1. Holmström, M., *et. al.*: Symptoms, Airway physiology and histology of workers exposed to medium-density fiber board. *Scand. J. Work Environ. Health* 17:409-413 (1991)

2. Eero Priha, *et. al.*: Exposure to and Acute Effects of Medium-Density Fiber Board Dust. *Jour. Occup. & Envir. Hygiene*, 1:738-744 (2004)

3. Welling, Irma, *et al:* Wood Dust Particle and Mass Concentrations and Filtration Efficiency in Sanding of Wood Materials, Journal of Occupational and Environmental Hygiene, 6:90-98, 23:08, (February 2009)

4. Google "Medite Corporation" and find local distributors.