Mount Sinai *Selikoff Centers for Occupational Health*

MEDIUM DENSITY FIBERBOARD: WORKPLACE HEALTH FOR CARPENTERS

Medium Density Fiberboard (MDF) is a type of composite wood product. It is produced from both hardwoods and softwoods broken down into fibers and combined with wax and a resin (glue). It is formed into panels using heat and pressure. Other composite wood products include particleboard and hardwood plywood.

What Is The Concern About MDF?

The biggest concern is exposure to formaldehyde gas that is emitted from the product. The glue used in MDF is usually urea formaldehyde (UF), a solid chemical made from a mixture of urea and formaldehyde. Extra formaldehyde may be added to the urea to make a stronger bond. The more extra formaldehyde there is, the more formaldehyde will be trapped in the wood and later emitted as a gas. MDF made with UF may emit formaldehyde gas for months or years after it is manufactured. Small amounts of formaldehyde also may be present in MDF wood dust. Throughout the last few years, it has become more common for manufacturers of MDF to:

- Lower the amount of added formaldehyde in the UF resin;
- Use alternate glues which emit less formaldehyde, such as melamine formaldehyde or phenolformaldehyde; and
- Use glues with no added formaldehyde, such as soy, polyvinyl acetate, or methylene diisocyanate

Formaldehyde: What Are The Health Effects?

Prolonged exposure to formaldehyde can result in cancer, including nasal and sinus cancer and leukemia. These cancers take several years or decades to develop (usually 10-15 years). Working eight hours daily for 40 years at the level of the government standard would give you a risk of about two in a thousand for getting cancer.* When formaldehyde is present in the air, some individuals may experience adverse effects such as watery eyes, burning sensations in the eyes, nose, and throat, coughing, wheezing, nausea, and skin irritation.

Repeated exposure to formaldehyde may cause bronchitis or a skin- and asthma-like allergy. Some people are very sensitive to formaldehyde, whereas others have no reaction to the same level of exposure. There is limited evidence that formaldehyde may damage the developing fetus and affect female fertility.

*Based on the OSHA standard of 0.75 ppm and 1991 USEPA estimates. The USEPA is in the process of revising their risk estimates.

Wood Dust: What Are The Health Effects?

Wood dust, especially from hardwood, has caused nasal and sinus cancer in woodworkers. Some of the species known to cause cancer include the hardwoods oak, mahogany, beech, walnut, birch, elm and ash. As with formaldehyde, these cancers take years to develop and generally require significant, ongoing exposure for a long period of time. Wood dust particles tend to settle mostly in the upper airways where they are trapped and can cause eye irritation, nasal dryness or irritation, prolonged colds, nose bleeding and obstruction, sneezing, sinusitis and headaches. Some particles may penetrate deep into the respiratory tract causing asthma, chronic bronchitis and hypersensitivity pneumonia.

Skin rash and irritation are the most common health hazards associated with wood dust. They can be caused by abrasion, chemical irritation, or by an allergic mechanism known as sensitization. Workers who become sensitized can get more and more sensitive to small amounts of dust over time.

Urea Formaldehyde And Other Resins: What Are The Health Effects?

Urea formaldehyde is a solid substance that has the potential to cause asthma and skin allergies. The dust from other glues also may have irritating or sensitizing properties. However, there is little documentation on whether sanding or cutting material made from these resins have actually resulted in health effects from the resins alone.

What Kind Of Formaldehyde Exposures Are Carpenters Expected To Get?

Exposure to formaldehyde gas from MDF will vary greatly depending on the amount and effectiveness of ventilation, personal protection (such as respirator use), process (sanding emits more dust than sawing), type of tools (power tools generate more dust than manual tools), type of adhesive (UF is much worse than melamine or phenol-formaldehyde), environmental conditions (high humidity and moisture cause UF to break down into formaldehyde gas), the amount of free formaldehyde in the product, and the amount and hours of the work performed.

Most studies on workers' exposure to formaldehyde from wood paneling have been done in manufacturing plants. We did not find studies of formaldehyde exposures of carpenters working with MDF in the field. Here are some numbers to put exposures in perspective. The effect of ventilation can be seen in a recent study of Federal Emergency Management Agency (FEMA) trailers that found average formaldehyde levels were 10 times higher when there was no ventilation: 1.04 (closed up), 0.39 (air conditioned) and 0.09 ppm (windows open).

Formaldehyde Levels (ppm)	Description
0.1	Level expected to cause symptoms in sensitive individuals
0.75	OSHA worker exposure limit
0.01-0.14	Sawing and sanding MDF in ventilated dust chamber
0.19-0.78	Sanding particleboard under laboratory conditions
0.035-0.45	Newly constructed, unoccupied home
0.48-5.31	Indoor air while cooking fish

What Regulations Are There On Formaldehyde Emissions From MDF?

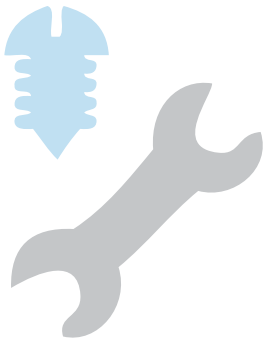
Despite rumors that MDF is banned in some countries, this is not the case. Japan and the European Union, however, have had MDF emission standards for years.

In 2007, the California Air Resources Board (CARB) issued regulations to cap formaldehyde emissions from composite wood panels used in finished consumer products. California phased in the requirements, and is now in the final phase (Phase 2). Like most emission standards, they are based on environmental concerns. Most U.S. and Canadian manufacturers and some offshore manufacturers are certifying their products sold nationally to comply with CARB. Lumber mills with this certification can be viewed on CARB's website located at **www.arb.ca.gov/toxics/compwood/compwood.htm.** Panel distributors should be able to provide you with bundle tags or statement of compliance information from the manufacturer.

In 2010, the Formaldehyde Standards for Composite Wood Products Act was signed into law, requiring the United States Environmental Protection Agency (EPA) to adopt the CARB regulations for products manufactured and sold nationally. The law establishes national standards for formaldehyde emissions from composite wood products, including hardwood plywood, MDF, and particleboard. The emission standards are the same as CARB's. There are also limits for other types of composite wood paneling, including paneling with no added formaldehyde (NAF) and ultra-low emitting formaldehyde (ULEF). EPA is developing rules to implement the law, which are expected to be issued in 2015 and go into effect a year later. These include rules on laminated products, testing, labeling, third party certification, exemptions, and enforcement. The law and proposed regulations can be found at **www2.epa.gov/formaldehyde/formaldehyde-emission-standards-composite-wood-products**

What Are The Best Practices For Reducing My Exposure To Dust And Formaldehyde From MDF?

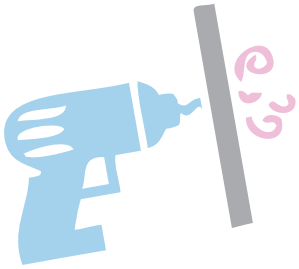
- If feasible, use a **safer product** such as solid wood, composite panels with no added formaldehyde, or products with low formaldehyde emissions. Look for CARB-certified MDF boards and molding with NAF, ULEF, Phase 2 on the label. Products designed for exterior use are likely to emit less formaldehyde, because they are made with moisture resistant phenolformaldehyde glue.
- Use proper **ventilation**. The best ventilation, known as local exhaust ventilation, extracts dust and gases at the point of generation. It consists of a hood, duct, fan, filter, and exhaust duct. It may be attached to the tool or table. Remember that filters designed to trap wood dust will not necessarily capture gases, like formaldehyde. There are exhaust systems that filter wood dust and vent the gas outside. If local exhaust is not available, then use good room ventilation.
- Keep dust levels down with good **housekeeping**. Keep the work area clean so you do not resuspend dust into the air while working. Never use compressed air to clean the work area or clothing, because it generates dust.
- Use a **respirator** with cartridges approved for dust and formaldehyde. Respirators should not be used without a full respirator program, which includes training on proper use and fit-testing.
- Good **hygiene** includes washing whenever you get dirty. Shower and launder clothes at the end of the day.
- **Quit smoking**. It causes cancer, lung and heart disease. Quitting, even late in life, will reduce your risk.



What Are My Rights With Regard To MDF?

The Occupational Safety and Health Administration (**OSHA**) Formaldehyde Standard requires employers to conduct air monitoring or have other documentation that shows exposure limits will not be exceeded. Workers' average daily and peak exposure must be below 0.75 parts per million (ppm) and the peak exposure must be below 2 ppm. If greater than 0.1 ppm in the air is expected, then the employer must enforce labeling, education and Safety Data Sheet (SDS) requirements of the **OSHA** Hazard Communications Standard.

OSHA does not have a wood dust or urea formaldehyde standard. **OSHA** may rely on the American Conference of Governmental and Industrial Hygienists (ACGIH) guidelines that say inhalable wood dust should be kept below certain levels. Employees have the right to copies of monitoring results and have the right to request an SDS from the employer.



Employees have the right to request from the National Institute for Occupational Safety and Health (NIOSH) a Health Hazard Evaluation of the workplace if people are exposed to substances that are not regulated by **OSHA** (such as MDF dust).

Are There Special Medical Recommendations For Exposed Workers?

In the rare instance when you may be exposed to very high concentrations of formaldehyde gas (which may occur if, for example, you enter a poorly ventilated space where MDF is stored), get fresh air and seek medical treatment. Flush exposed eyes or skin with water for 15 minutes. Oxygen may be needed if you are short of breath. Notify your doctor if you have a history of asthma or allergies. Very high exposures may require a referral to an emergency department for observation and periodic evaluation for six to eight hours.

For long-term effects of low level exposures, your doctor should monitor you for bronchitis and exacerbation of asthma.

If you think you may be suffering from overexposure to chemicals, construction dust, or any work-related illness or injury, contact an occupational health clinic in your area to request an evaluation.

The Mount Sinai Selikoff Centers for Occupational Health have locations throughout New York City and the Lower Hudson Valley, and are members of the New York State Occupational Health Clinic Network. For a list of all clinics throughout New York, visit the New York State Department of Health's website at **www.health.ny.gov/environmental/workplace/clinic**. The Association of Occupational and Environmental Clinics also maintains a national directory of clinics at **www.aoec.org/directory.**

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Additional Resources

OSHA Safety & Health Topics
- Wood Dust: https://www.osha.gov/SLTC/wooddust/
- Formaldehyde: https://www.osha.gov/SLTC/formaldehyde/

United Scenic Artists
- Fact Sheet on Wood Dust: https://www.usa829.org/Portals/0/Documents/Health-and-Safety/Safety-Library/Wood-Dust-Hazards-&-Precautions-12-2014.pdf

We wish to acknowledge the Fraternal Order of Woodworkers (http://www.fownyc.com) and the Job Steward Alliance (http://JSANYC.COM/) of the United Brotherhood of Carpenters and Joiners of America for initiating this fact sheet.

(Revised: 3/2015)