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Health in the Arts

LASER-CUTTING-SAFETY 3D PRINTING

Paint Removers



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Liquid paint and varnish removers are among the most toxic products used in homes and workshops.

The active ingredients in most common paint removers are organic solvents which may damage the skin, eyes, respiratory tract, nervous system, and internal organs. Special precautions must be taken in their use, especially if there are children present who might come in contact with either the material or its vapors. Paint stripper formulations in paste form are less hazardous than the liquid forms because they only contain around 50% solvents rather than 100% as found in the liquid forms.

Hazards

◦ Respiratory System Damage

◦ All solvents can irritate the sensitive membranes of the nose and throat to varying degrees. Solvent concentrations which can irritate nose and throat membranes also may be capable of damaging sensitive lung tissue. These inhaled substances commonly enter the blood stream where they can attack other internal organs and the nervous system.

◦ Skin Diseases All solvents can cause skin disease (dermatitis) by dissolving the skin's natural protective barrier of oils. If the skin experiences enough direct contact with a solvent, it can turn dry and white and become cracked and fissured. In case of skin or eye contact, wash immediately to avoid burns and other serious damage.

◦ Damage to Internal Organs

◦ Dermal contact with paint remover solvents, besides causing deterioration of the skin, can result in absorption through the skin. Damage to the skin may lead to greater penetration of the solvents, resulting in internal organ injury. Chronic exposure may damage the liver and kidneys, which are responsible for detoxification and elimination of toxic chemicals from the body. Certain solvents can cause heart damage. Benzene, an ingredient in paint removers up until 1978, can damage bone marrow, causing aplastic anemia and leukemia.

◦ Brain and Nervous System Damage

◦ The most commonly experienced symptom of acute solvent exposure is narcosis or intoxication resulting from the solvent causing depression of the central nervous system (CNS). Drinking or inhaling grain or ethyl alcohol produces similar results. CNS depression can produce varied symptoms including irritability, fatigue, headaches, dizziness, sleepiness, loss of coordination and reflexes, nausea, and a staggering gait. Although these acute effects are reversible if exposure to the solvent is discontinued, narcosis symptoms are an indication of overexposure to a solvent. Chronic exposure may cause permanent brain damage, including behavioral changes, loss of memory, decreased intellectual abilities, confusion, seizures, etc.

o Fire Hazards

o The fire-causing potential of solvents can be classified as "extremely flammable," "flammable," "combustible," or "non-flammable." Extremely flammable means that even in cold weather (below 20 F), the presence of a flame, spark, or even static electricity can cause the solvent vapors to ignite. Flammable solvents can cause a flash fire in the range of room temperature (below 100 F), while combustible solvents must be heated above room temperature to ignite into flame. Paint removers are a mixture of different solvents whose combined fire-causing potential is usually stated on product labels. To reduce the fire hazards of paint removers, choose the least flammable variety possible. Avoid storing more paint remover than is needed over a short period of time. If storage is necessary, keep in tightly closed glass, plastic or metal safety cans approved by the National Fire Protection Association.

Common Paint Remover Solvents and Their Hazards:

o Methylene Chloride: Methylene chloride is a non-flammable solvent whose hazards include irritation of the skin and upper respiratory tract, solvent narcosis, pulmonary edema (on inhalation of large amounts), and heart arrhythmias (irregular heart beats). Methylene chloride also can cause heart attacks because it is metabolized to carbon monoxide in the bloodstream. The carbon monoxide ties up the blood's oxygen-carrying hemoglobin, thus depriving the heart of sufficient oxygen. For this reason, people with heart problems and heavy smokers are especially at risk when using methylene chloride paint strippers. Perhaps the most serious hazard of methylene chloride is its link to cancer. Years of research has proven that methylene chloride does cause cancer in animals, and the Occupational Safety and Health Administration (OSHA) has declared it a suspected occupational carcinogen.

o Methylene chloride decomposes in the presence of flames, hot surfaces, or ultraviolet light to produce highly toxic phosgene gas. For this reason many paint stripper labels carry a warning against smoking while working, and direct users to turn off pilot lights on appliances and to keep vapors away from flames or hot surfaces such as those on stoves, water heaters, clothes dryers, furnaces and other electrical appliances.

o Toluene (toluol):

o Toluene is flammable and may cause dermatitis, muscular weakness, narcosis, irritation of the upper respiratory system, and heart arrhythmias at high levels. Chronic exposure can cause liver, kidney and brain damage. Internal organ injury can result from skin absorption, but the major concern is inhalation of the solvent vapors.

o Methanol (wood or methyl alcohol): Methanol is a flammable solvent known to enter the bloodstream through vapor inhalation or skin absorption. Once in the bloodstream it acts on the central nervous system causing blurred vision, optic nerve damage, and even blindness from sufficient exposure. It can be fatal if ingested.

o Ethanol (grain or ethyl alcohol):

o Ethanol, though flammable, is only slightly toxic; however, it is still capable of causing irritation of the eyes, nose and respiratory system, and can produce symptoms of narcosis when inhaled in sufficient quantities.

o Acetone: Acetone is extremely flammable and causes irritation of the skin and upper respiratory tract, narcosis and dermatitis with moderate exposure.

o Mineral Spirits: Mineral Spirits is a petroleum distillate (a product distilled from crude oil) and is combustible. Its primary effects are irritation and dermatitis, although in quantity it can be as hazardous as some of the more toxic solvents.

Precautions

During paint removal, the average person is exposed to the hazards of paint strippers for two to three hours at a time, making safety precautions crucial. The elderly or people in poor health should not use paint removers. Consult your physician if you suffer from heart trouble or a breathing ailment which can be aggravated by toxic vapors. Smokers should never smoke around paint removers or their vapors because of the fire hazards. Pregnant women should avoid exposure to all toxic solvents which can harm the mother and cause fetal damage. The risks do not vanish after birth, for toxic solvents have been found in breast milk. Children and pets should not be allowed in or near areas where paint removers are being used.

o Remove Sources of Heat or Flame

o Before starting a paint removal project, be sure to turn off all pilot lights and remove any sources of heat, ultraviolet light, or flame in areas where vapor might drift. In addition, any source of spark or static electricity should be eliminated during use of flammable paint strippers.

o Ventilation

o To determine ventilation needs, one must identify the amount and type of paint stripper used. It is recommended that paint stripping be done outside whenever possible. For example, chairs, frames, small furniture, and even doors can be carried outside. Therefore, it is suggested that this type of activity be planned in accordance with mild weather. Since

most households are not equipped to ventilate large indoor projects, big jobs should be done a bit at a time to reduce exposure. The amount of air needed to ventilate small projects can be calculated using formulas and dilution volumes found in CSA's Ventilation.

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- o For example, consider using 1 pint of a liquid methylene chloride paint stripper over one hour. The American Conference of Governmental Hygienists (ACGIH) sets the dilution volume for methylene chloride at 63,400 cubic feet/pint evaporated. In the 1987-1988 edition of Threshold Limit Values (TLVs) set by ACGIH, methylene chloride has a TLV of 100 ppm. This means that it would take 63,400 cubic feet of air to dilute each pint of methylene chloride to this TLV. Using the formula with the safety factor (K) set at 10:

cfm

= dilution volume/per pint x # pints x K/time in minutes = 63,400 x 1 x 10/60 minutes = 10,567 cfm A window exhaust fan removing contaminated air at 10,567 cubic feet per minute would be impractical. Projects should be done in sections and stages to reduce the ventilation requirements. Often, paint stripper formulations are combinations of different solvents. For combination calculations, one can assume an additive effect for similar chemicals.

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- o Air conditioners do not provide adequate ventilation for paint remover vapors because they recirculate air rather than exhausting it. Even when air conditioners are set on "exhaust" they recirculate about 95 per cent of the air. Open windows or doors will not provide sufficient ventilation either for any except the smallest projects.

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- o Respirators A National Institute of Occupational Safety and Health (NIOSH)-approved respirator with organic vapor cartridges can help minimize exposure to paint remover vapors if ventilation is not adequate. Sources for respirators and rules for selection and use of respirators are included in the Center for Safety in the Arts data sheet on Respirators (see CSA Publications List).

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- o Eye Protection To prevent eye irritation caused by splashing, one should wear light-weight plastic splash goggles while pouring or working with paint removers. Choose goggles which are approved by the American National Standards Institute (stamped with a "Z87"). These can be found in most chemistry supply houses and safety equipment stores and some hardware stores. Semi-paste strippers reduce the risk of splashing with liquid strippers and are easier to use. If paint remover is splashed in the eyes, flood the eyes with water for at least 15 minutes and call a physician. A source of water should be accessible for this purpose.

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- o Hand Protection
- o Gloves should be worn when using paint removers. Ordinary rubber dish washing gloves or surgical gloves will dissolve in paint remover. Neoprene/natural latex blend gloves can withstand most paint remover solvents. If you are going to use steel wool with the paint remover, use cotton gloves over the Neoprene/latex gloves to protect them from abrasion so they will last longer. To further decrease the risk of skin contact wear long pants, a long sleeve shirt and an apron.

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- o Disposal
- o Solvent-soaked rags should be stored in approved, self-closing oily waste cans, or immediately placed outside. Do not store inside in open wastepaper baskets. Disposal should be done in accordance with local city and fire regulations, and waste-disposal firm may be necessary for large quantities of solvent waste. Never pour solvents down the drain. Small quantities of solvents can be evaporated under a fume hood or outdoors.

Other Methods of Removing Paint

Torches

Portable torches are often used to burn and soften old paint making it easy to scrape away. This method can char and damage wood, making this a technique unsuitable for fine work. The torch is a fire hazard, so have a fire extinguisher handy. Inhalation of fumes and vapors from the partially burned paint is a severe hazard in this process, especially if the old paint contains lead. In general, using a torch to remove paint is not recommended.

Heat Guns

Heat guns or hot air guns, resembling heavy hand-held hair dryers, can be used to soften and raise paint, but heat won't work at all on many varnishes. These guns can be used for fine work if the softened paint is raised carefully with a spatula or knife and the residual paint left on the object is cleaned with steel wool dipped in alcohol or (if necessary) a small amount of paint remover.

Heat guns can operate on 14 amps of current and can generate very high temperatures; care should be taken to avoid burns. Some of the heat guns may reach high enough temperatures to vaporize lead and cadmium. Some actual cases

of lead poisoning have resulted from use of heat guns to remove lead-containing paint. Therefore, we would not advise using heat guns with paints containing lead, cadmium or other volatile, toxic chemicals. For information on removing lead-based paint see CSA data sheet on lead-based paint removal.

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Methylene Chlorine Cancer Risk

Paint Stripper Cancer Risk (Methylene Chloride)

The U.S. Consumer Product Safety Commission (CPSC) urges consumers to reduce their cancer risk when working with paint strippers and adhesive removers containing methylene chloride by using products outdoors or by ventilating the work area. Methylene chloride has been shown to cause cancer in certain laboratory animals.

To properly ventilate the work area, open all windows and doors and use a fan to exhaust the air outside. Since 1987, when warning labels were required for products containing methylene chloride, there has been a 55% reduction in the estimated number of cancers caused annually in the U.S. from these products. However, CPSC is still concerned about the potential risk to consumers who inhale high levels of fumes when using paint strippers and adhesive removers.

The CPSC staff is studying various substitutes for methylene chloride to evaluate the flammability and chronic hazards of those formulations. In addition, the Commission staff is studying current warning labels and consumer education materials and may propose revisions to them in the future, emphasizing the importance of ventilation when working with methylene chloride products. - Consumer Product SAFETY ALERT from the U.S. Consumer Product Safety Commission, Washington, D.C. 20207

(N.B. In general, CSA does not recommend methylene chloride paint strippers (see the accompanying article on N-methylpyrrolidone for safer substitutes). In particular, CSA does not recommend using these paint strippers in the basement, due to the difficulty of providing adequate ventilation. In addition to ventilation, we recommend gloves and goggles. For products containing just methylene chloride, NBR gloves are suggested, which are available from safety equipment distributors. - Ed.)

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