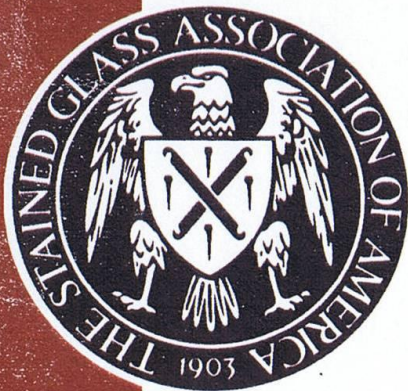


***SGAA Recommendations
for Safety in the
Stained Glass
Studio***



2012

STAINED GLASS ASSOCIATION OF AMERICA

Since 1903



SGAA Recommendations for Safety in the Stained Glass Studio

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SGAA Recommendations for Safety in the Stained Glass Studio

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Revised 2012

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review of this document.*

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Some of the regulatory agencies affecting stained glass studios' safety practices

Federal:

OSHA—Occupational Safety and Health Administration
www.osha.gov

U.S. Department of Labor
Occupational Safety & Health Administration
200 Constitution Avenue
Washington, D.C. 20210
1-800-321-OSHA

EPA—Environmental Protection Agency
www.epa.gov

Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460
202-272-0167

HUD—Department of Housing and Urban Development
www.hud.gov

U.S. Department of Housing and Urban Development
451 7th Street S.W.
Washington, DC 20410
202-708-1112

CDC—Center for Disease Control and Prevention
www.cdc.gov

1600 Clifton Rd.
Atlanta, GA 30333
800-311-3435

State Agencies:

- DNR—Department of Natural Resources
- DILHR—Department of Industry Labor and Human Relations
- DHSS—Department of Health and Social Services

Local Agencies:

- Sewerage District
- Department of City Development
- Department of Building Inspection
- Health Department

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August 19, 2004

www.osha.gov November 2003-August 2004

www.epa.gov November 2003-August 2004

www.pdca.org (Many relevant construction safety standards and practices are addressed in PDCA publications available in the online store.)

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Top 20 Precautions for the Home Studio

Stained glass hobbyists enjoy some of the same rewards as professionals, and they must be equally aware of the necessary safety precautions. Hobbyists are encouraged to read and consider all of the recommendations published here and by government regulatory agencies. At the same time, there are some special caveats for the home studio. This brief list of critical safety measures may serve as an introduction:

1. Limit activities to what you can safely accommodate. Making small copperfoil or leaded windows with no painting would be the safest projects on which to work. Advanced processes, such as de-leading, increase safety challenges.
2. Pregnant women, children and pets are the most susceptible to the harmful effects of lead poisoning. They should stay outside the work area and not be exposed to lead.
3. Establish a well-ventilated work area that is separated from your living space. Take care that your workspace does not contain air returns that might contaminate the home ventilation system.
4. If possible, have a separate entrance for the work area and/or a changing room between the living and work spaces. At the very least, the studio must be closed off from the rest of the living quarters. Adhesive walk mats in the doorways may assist in collecting lead. Nevertheless, separate shoes should be worn in the studio and the home.
5. Provide separate hand-washing facilities and a telephone in the studio. Artists must not enter the home in work clothes to wash up or answer the phone.
6. Obtain a high efficiency particulate air (HEPA) vacuum and use it for clean-up. Take time to properly change the filters and properly dispose of them.
7. Choose easy-to-clean surfaces and wet-mop them regularly with tri-sodium phosphate (TSP) or another lead-cleansing cleaner.
8. Store scrap lead to be recycled in containers that have tight-fitting lids. Also provide sealed storage for glass paints.
9. If you are de-leading existing windows, do so underwater to contain the dust. The water from this process must be treated as hazardous waste.
10. Do not eat, drink or smoke in the work area. Lead dust can be easily ingested or inhaled.

11. Wear protective clothing such as coveralls and gloves to keep lead dust from settling on the skin. Change clothing and shoes before leaving the work area to prevent tracking lead into the home. Wash work clothes in a machine used only for lead-contaminated items. Most washers do not fully expel water from the previous load and can contaminate clothes in later washings.
12. Wear safety glasses to protect your eyes.
13. Wear a properly fitted respirator equipped with HEPA filters when working with lead—or use a HEPA-filtered table air drawing duct. Always wear a properly fitted HEPA-equipped respirator when working with paint.
14. Always wash your hands with a soap formulated for metal removal such as Clean All—Heavy Metals Hand and Body Soap (Sasha's International, Inc.) or Shepherd's Hand Soap before eating, drinking or smoking after lead exposure.
15. After working with substances that produce lead dust, you are advised to use a HEPA-equipped vacuum to remove lead from your clothing and hair. You should also shower in a facility separate from the living area of the home to rid the body and hair of lead dust.
16. Monitor your blood-lead level with regular blood tests.
17. Take a class in lead abatement and awareness.
18. Try the new lead-free came offered through Fry Metals and other suppliers.
19. Perform air monitoring. The SGAA offers rental of air-monitoring equipment and a video guide to members at a modest cost. Your state may also provide air-monitoring services.
20. Join the SGAA. They regularly print updates on safety and have videos and pamphlets on safety available.

It is also essential to dispose of lead waste safely. This is further addressed on page 18. Contact your state Environmental Protection Agency (and/or other regulatory agencies previously listed) for information regarding disposal requirements.

Safety-Mindedness, Education & OSHA

The joy of working with stained glass is enhanced by a studio environment that promotes safety. A safe environment and safe work practices are also essential to studio survival, since it is the studio's responsibility to protect its employees. The Occupational Safety and Health Administration (OSHA) regulations require employers to determine what administrative controls, engineering controls and protective equipment are needed to protect their employees from harm; to provide these controls; to train employees in how to use them and to ensure that they do so. Weekly safety meetings can be very helpful in advancing safety in the studio.

Numerous OSHA regulations apply to the stained glass studio with one or more employees. One is the "general duty" requirement contained in Section 5(a)(1) of the Occupational Safety and Health Act, which states that each employer "shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees." There are also specific OSHA mandates and regulations codified in the Code of Federal Regulations (CFR). Copies of specific OSHA standards are available at the local OSHA office or online (www.osha.gov).

Some helpful compilations of standards and regulations are produced by private publishers, including the Commerce Clearing House's (CCH) *OSHA Standards for the Construction Industry*, which contains the specific standards relevant to the stained glass field. It is critical for every studio to be familiar with the relevant OSHA regulations, which may be updated more frequently than these recommendations. What is put forth here is not exhaustive; it is meant only to sketch an overall picture of studio safety issues and illustrate a general approach to safety.

Fostering safety-mindedness in the studio is key in protecting employees and their families from harm. Safety instruction is grounded in on-the-job training, signage and the studio's safety manual, which should incorporate all relevant OSHA and Environmental Protection Agency (EPA) documents. These address protecting the employee and protecting the environment, respectively.

Today's studio typically contains many potentially hazardous substances, including cyanide, formaldehyde, silver nitrate, aluminum chloride, petroleum distillates and more. It is essential that these and all other tools and supplies are identified, stored properly in compliance with applicable guidelines and regulations and are used in accordance with manufacturer's instructions.

Lead is present in most studios. It is the one issue that most profoundly influences safety practices. Because lead has been identified as a toxin that accumulates in the human body, it is a hazard to human health and is also a hazardous waste

product. Lead's primary routes into the body are through inhalation and ingestion, so many lead-safety practices are particularly directed at preventing both of these. **It is worth noting that studies have shown inhalation to produce up to ten times the poisonous effects of ingestion.**

Worker protection, as specified in OSHA LEAD 1926.62, includes:

- establishment of a hazardous materials communication program
- providing specific, separate areas for eating and changing of clothes
- a high level of cleanliness for the studio's surfaces, air quality and individual hygiene
- medical surveillance
- written safety programs (for studios with 10 or more employees)
- legal waste disposal

Of particular concern is the fact that the hazards of lead exposure will enter the home if proper precautions are not taken to decontaminate — especially hands and hair — and to change clothes and shoes at the end of the day. Children and pets are the most susceptible to lead intoxication, which can cause learning disabilities and even death.

If you are not confident that your studio complies with the lead or other safety standards, you may be able to have the studio evaluated without penalty or notification to OSHA by your state Consultative Service. An independent industrial hygienist (American Industrial Hygiene Association, www.aiha.org, 703-849-8888) can also be of assistance in helping you develop a safer work environment.

Safety Basics

Emergency Preparedness

As important as it is to prevent accidents and injuries, it is also essential that emergency plans and resources to handle emergencies are in place both in the studio and on a jobsite in case of emergency. Telephone numbers of hospitals and ambulances should be clearly posted.

It is wise to appoint a safety officer who is responsible for keeping current with safety issues; providing and posting emergency contact numbers; maintaining first aid supplies, including an eyewash station; having fire extinguishers checked regularly; etc. For studios with more than 10 employees, recording injuries and illnesses is also required. Forms for this purpose are available from OSHA (see contact information on page 4).

An emergency action plan and fire prevention plan are also required (OSHA 29 CFR 1910.38).

Flammables

Flammables must be properly labeled and should be stored in a flammable materials cabinet away from heat or spark sources. Storage and transportation must be under the proper conditions specified in the OSHA Construction Standard (29 CFR 1926.152).

Organization and Layout

Aisles must be kept clear at all times so that employees have “free and unobstructed means of egress” (OSHA 29 CFR 1924.34) in case of emergency.

A well-organized, uncluttered studio promotes safety in every way. There are fewer opportunities to trip, drop or tip things that may cause injury. It also reduces frustration, which can sabotage safety-mindedness.

The organization of items should include safety considerations such as not storing heavy or awkward objects or glass sheets above shoulder level. This will reduce the risk of injury.

Uncluttered Surfaces

The uncluttered surfaces of a well-organized studio are easier to clean, which is essential in controlling lead exposure. Lead is hazardous when inhaled or ingested, which means that work surfaces and all surfaces of a studio should be wet-mopped regularly to reduce lead dust. Also, the more items that are stored in cabinets or under tables, the less accumulation they will have of this nearly invisible but hazardous toxin.

MSDS and Operating Instructions

The OSHA Hazardous Communications Standard (OSHA 29CFR 1910.1200 HazCom Plan and Training) requires that every user receives Manufacturers' Safety Data Sheets (MSDS) for every product they utilize. These sheets should be provided by the manufacturer of each product; many are also available online. Every user must read these as well as manufacturers' instructions for all products. All products must be labeled.

Lighting

Good illumination helps prevent accidents, and it is mandated by OSHA, along with other "General Safety and Health Provisions" in OSHA 29 CFR 1926.20-35. If task lighting and extension cords are used, special precautions must be taken to insure that they're in good working condition and to prevent tripping hazards. Please review the above-listed CFR section for details.

Equipment Safety

All tools and equipment must be kept in good working condition. Safety mechanisms must always be in working condition and cannot be disabled or removed.

Workers must be familiar with operating and safety instructions for use of each tool and machine. Protective clothing or equipment such as goggles and earplugs must be worn to prevent or reduce injury. Protective eye and face equipment must be provided when there is a likelihood that it can prevent or reduce possible injury by the equipment (OSHA Construction Standard 29 CFR 1926.301;1926.102).

Electrical Safety

Electrical mandates for safety are specific, and licensed electricians should be familiar with them as they are delineated in the National Electrical Code, OSHA 1910.301-308 and by local electrical codes available through the Environmental, Safety & Health Department.

In general, the requirements include circuit-overload protection, with each breaker or fuse clearly marked with the appliance(s) served by it. Breaker boxes must be accessible at all times.

Even electrical devices such as lights, vacuum cleaners, drills, heaters and radios must be inspected regularly for damage, proper grounding and integrity of insulation. All electrically operated appliances must be effectively grounded unless they are protected by double insulation.

Portable electric tools must be equipped with a three-wire cord having a ground wire permanently fixed to the tool frame. Extension cords may be used only for temporary purposes and not be used in lieu of installing an outlet where one is needed.

Take care not to damage extension cords, and inspect them regularly. They must not be run through doors or windows and must not create a tripping hazard.

All equipment should be used as recommended by the manufacturer and must be inspected and tested on a regular basis.

Kilns

Kilns must be properly installed per manufacturer's instructions on a stand that is at least two feet away from a finished wall. If the floor is wooden, there must be fire brick under the kiln.

The kiln must be operated, maintained and tested according to the manufacturer's instructions.

Avoid having combustible material near the kiln.

Kiln fumes, as well as carbon monoxide produced by gas kilns, are hazards that can also be addressed by using exhaust ventilation. Gas kilns must be fitted with a flame-failure device and vented to the outside of the building. The emissions from kilns must be tested, and local permitting may be required.

Another kiln-related hazard is exposure to kiln wash/shelf primer and mold materials. Most of these contain sources of free silica. This dust is hazardous when removing or adding wash/primer as well as after firing.

Glass Handling and Storage

Care must be taken in the storage and handling of glass to minimize the chance of being hurt. Besides the hands and arms, injuries to the eyes and feet are a risk. Taking the following precautions will help avoid injury.

- **Never store glass above head height.** Even experienced glaziers have incurred head injuries due to this mistake.
- Storage racks should be built so as to eliminate the risk of glass falling from the racks (i.e., adequately secured, strong enough to bear the load, etc.).
- Minimize glass handling by locating glass-storage areas conveniently near to workstations.

- Store glass vertically.
- Ensure that the work table is clean and free of tools before moving glass.
- Check floor for slipping or tripping hazards before carrying glass.
- Wearing gloves, goggles, coveralls and reinforced shoes or boots will provide added protection.
- Prior to picking up a sheet of glass, check it for cracks.
- Always carry glass in a vertical position. A sheet of glass should be picked up and carried by grasping it with both hands along the top edge. However, for heavier sheets, one hand on the top edge and one supporting the bottom edge or side may be necessary.
- Do not slide your hand along the edge of a piece of glass, even with gloves on. If you need to move a hand, let go and then reposition it.
- Carefully watch clearance between the edge of the table and the glass you are carrying.
- To safely place a sheet of glass on your work table, continue to hold it with one hand on the top. Move the other to the bottom edge, and rest the center of the glass against the edge of the table vertically; then tilt up horizontally and ease the glass onto the table.
- Work tables should be large enough to avoid having glass hang over the edges.
- Prior to putting cut-offs in scrap bins, it is a good idea to remove acute points for safer retrieval. Scrap glass should be placed, not tossed, into its bin.

Standing Mats

Specially designed cushioned mats contribute to the health and comfort of stained glass artisans by preventing back fatigue.

Lead: The Threat that Changes Everything

Lead Intoxication, Symptoms and Treatment

Lead is a naturally occurring substance and has been put to many applications, including plumbing pipes, batteries, as a paint and gasoline additive, and, of course, in the came and putty in stained glass windows. It is popular for a variety of reasons, including the fact that it is extremely durable and flexible, does not corrode and does not easily crack.

Unfortunately, lead is a human health hazard that accumulates in and harms the human body, so exposure to it must be minimized whenever possible. This applies to two types of exposure: acute exposure to a high level of lead, as well as cumulative accretion of small amounts over a period of time.

The significant avenues of entry for lead into the body are ingestion and inhalation, so continual cleaning of the workspace, the individual and the air are all important in preventing lead intoxication. Medical surveillance, including monitoring lead levels of those working with lead through simple blood tests, must be conducted to insure that harmful accumulation is prevented.

Lead intoxication can affect multiple areas of human health, including the nervous, reproductive and cardiovascular systems; blood production; and the kidneys. However, in the early stages, the symptoms are difficult to identify as having been caused by lead. Symptoms of lead intoxication include: headaches, abdominal pain, decreased appetite, dizziness, fatigue, decreased visual acuity and/or fine motor skills, tremors, loss of feeling, muscular aches and pains. A worker experiencing any of these symptoms must undergo medical examination.

Chelation is one type of treatment for individuals whose blood levels of lead, mercury, or other toxic heavy metals are dangerously high. It is a process in which molecules of ethylene diamine tetra-acetic acid are put into the blood stream, where they bind with (chelate) certain minerals that are present in the bloodstream and then are removed from the body, usually via the urinary system.

Lead Exposure and Protection

Lead, which is the primary ingredient in lead came as well as lead solder, has been classified by both OSHA and the EPA as toxic. Lead-awareness training (and, even better, certified lead-abatement training) provides a good basis for understanding the necessary lead precautions.

Lead-free came and solder are now being marketed by a few manufacturers, and using these would greatly reduce a studio's safety issues, provided they do not perform restoration services with it.

When using lead, it is important for all individuals to keep lead exposure to a minimum for their health and for that of those around them. It is also essential to properly dispose of lead waste for the health of the planet.

Employers must address lead issues properly or be at risk for serious citations and possible jail time.

During the stained-glass-making process, the handling and soldering of lead comes create a risk of ingestion and inhalation. These safety recommendations regarding lead are aimed at reducing or eliminating these hazards.

The OSHA lead standard mandates that an initial determination be made of all operations in the studio to see if any employee may be exposed to lead at or above the action level. This means that air monitoring must be performed. The SGAA offers rental of air monitoring equipment and a video guide at a modest cost (headquarters@sgaaonline.com). Your state may also provide air-monitoring services.

Subsequent testing is then mandated by the standard based on the results of air monitoring. This will help determine what areas, if any, exceed the permissible exposure limit (PEL).

Procedures for starting an assessment can be found in OSHA Standard 29 CFR 1910.1025. Lead and in the OSHA Construction Industry Standard 29 CFR 1926.62. No exposure assessment means that respirators must be worn for all activities.

A proactive approach to lead safety includes air monitoring for each task, worker protection and training, pre-employment and bi-annual blood tests and medical surveillance. Regardless of assessment results, minimizing lead exposure is the conscientious thing to do to protect workers' health.

The presence of lead makes having a Hazardous Communications Program in place (29 CFR 1910.1200) all the more essential. Monetary safety incentive programs by employers to reward safety-conscious employee behavior are becoming more common as well. Some bid documents even require them.

It is important to note that in every area where lead exposure exceeds OSHA's Permissible Exposure Limit (PEL), specific signs must be posted (See OSHA Lead - 1910.1025 or 1926.62), and employees must be protected. Also, OSHA makes it clear that every effort should be made to achieve permanent solutions, like ventilation controls, rather than relying on respirators: "administrative or engineering controls must first be implemented whenever feasible" OSHA 1926.55 (b).

Administrative controls are written policies prepared before work begins. These are required even if the PEL is below the action level. Removing an exposure before it becomes a hazard is an engineering control. (In the case of lead, this primarily refers to ventilation systems.) If respirators must be used, a Respiratory Protection program is required as delineated in OSHA 1926.103. Respirators should be cleaned and inspected frequently and stored in a sealed bag. The standard mandates that when such controls are not feasible to achieve full compliance, protective equipment or other protective measures shall be used to keep the exposure of employees to air contaminants within the prescribed limits.

All MSDS must be reviewed to determine when respirators or ventilation are required. If respirators are to be used, employers must provide appropriate fit testing and training, as well as scheduled checks and maintenance of respirators. A double-cartridge, high-efficiency particulate air (HEPA) respirator should be worn when soldering or working in any operation that produces dust or fumes, including glass painting or panel dismantling.

Respirators should be professionally specified and fitted, and the filter should be effective to .3 microns or as specified by the MSDS. The units must meet the National Institute for Occupational Safety & Health (NIOSH) criteria, and the employer must have a written respiratory protection program. Any employee experiencing difficulty wearing a respirator must have a medical examination.

The presence of lead at unsafe levels means that specific education and communication for employees as well as written plans are mandated through OSHA's *Toxic and Hazardous Substances Regulations, 1926 Subpart Z - Toxic and Hazardous Substances: 1926.1100*. Because every studio has a different set-up and different equipment, some of the specifics regarding safety will vary.

Signage

In any area where the PEL is exceeded, signs must be posted stating:

**WARNING: LEAD WORK AREA, POISON, NO SMOKING
OR EATING.**

These would serve well in every area of lead work. The addition of an advisory for pregnant women, such as

**PREGNANCY MAY BE AFFECTED BY EXPOSURE TO LEAD.
ENTRANCE INTO THIS WORK AREA IS AT YOUR OWN RISK**

is advisable.

Separate Eating Area

The presence of lead in the studio requires that no eating, drinking, smoking or applying makeup take place in work areas. OSHA calls for a separate eating area that remains uncontaminated, further stating that work clothing or coveralls must not be worn in the lunchroom.

Proper Ventilation

To reduce lead dust in the air using the engineering controls mandated by OSHA, negative air exhaust systems should be installed in areas where lead contamination exceeds the PEL. Some systems that are used are flexible duct exhaust systems, slot hoods, chemistry fume hoods and downdraft tables. These systems exhaust air to the outside.

Further ventilation recommendations can be found in the reference, *Industrial Ventilation: A Manual of Recommended Practice* published by the American Conference of Governmental Industrial Hygienists.

Vacuuuming and Wet-Mopping

No sweeping should take place in areas of lead contamination. Vacuuming with a HEPA filtered vacuum or wet-mopping are the preferred method.

HEPA filters should be changed frequently and disposed of properly as hazardous waste, with manifests kept to track amounts and disposal. Wet-washing and mopping of surfaces should take place as frequently as necessary to reduce or eliminate exposure.

Smooth Surfaces

Smooth surfaces are easily cleaned and maintained. Smooth, sealed walls, floors and work surfaces are easiest to maintain. Painting surfaces white provides a good indicator of cleanliness. Bench tops should be repainted, replaced or smoothed regularly because they are often punctured with glazing nails.

OSHA Recordkeeping

When an employer has 10 or more employees, he/she is required to maintain records of injuries and illnesses that occur. Part of this is Worker's Comp accident reports. Another part is maintenance of a *Log and Summary of Occupational Illnesses and Injuries—OSHA Log 300*. These forms are available from OSHA.

Fatality and Hospitalization

All employers covered by the OSHA Act must report any workplace incident resulting in a fatality or the hospitalization of three or more employees within eight hours to the OSHA office near the incident site or via the toll-free number: 1-800-321-6742.

Personal Protective Equipment

1. Steel-toed shoes
2. Safety goggles
3. Face shields
4. Gloves
5. Smocks or coveralls
6. Respirators
7. Hard hats (with scaffolding)
8. Harnesses or lanyard
9. Ear protection

Numbers 1-7 above require a written program for proper use of the equipment.

Respirators

Employers are required by OSHA to institute and administer a written respiratory protection program which details the shop's procedures for fit testing, employee training, storage and maintenance of equipment and other requirements. Employers are also required to determine if employees are physically able to wear a respirator. Refer to OSHA 1910.34 Appendix C — Medical Evaluation Questionnaire.

The proper air-purifying respirator cartridge or mask for protection against lead dust and fume is NIOSH-approved for "dust or fume having TLV-TWA of 0.05 milligrams per cubic meter or less (this wording will be found on the equipment).

For protection against products releasing solvent vapors, an organic vapor cartridge should be used in the air-purifying respirator. There are also cartridges approved for ammonia, acid gases and other substances which may be encountered in the studio. For information on protection against specific contaminants and for fit testing, it is important to develop a working relationship with a reputable supplier of respiratory protection equipment.

Personal Hygiene Practices

- Do not work in a lead environment if pregnant or in the process of conceiving. Lead exposure increases the risk of miscarriage, stillbirth and birth defects.

- Wear protective clothing such as coveralls and gloves to keep lead dust from settling on the body and skin. Change clothing and work boots in a designated change area before leaving the work area to prevent the tracking of lead.
- Wear safety glasses to protect eyes.
- Wear a properly fitted respirator equipped with the appropriate filter as required by MSDS.
- Do not eat, drink or smoke in the work area because lead dust can be easily ingested.
- Always wash hands, ideally with a soap formulated for metal removal such as Clean All—Heavy Metals Hand and Body Soap (Sasha’s International, Inc.) or Shepherd’s Hand Soap before eating, drinking or smoking after lead exposure.
- After working with lead, shower to rid the body and hair of lead dust.
- Monitor blood lead with regular blood tests.

Safety in Specific Tasks

Note: It is advisable to wear a double-cartridge HEPA respirator when soldering or working in any operation that produces dust or dust fumes, including glass painting or dismantling. Again, refer to MSDS.

- Dismantling panels: If you are de-leading existing windows, do so with the panel underwater to contain the dust. This has the added advantage of softening the putty. Wear eye protection.
- Glass cutting: Follow manufacturer's instructions for equipment use. With a traditional glass cutter, safety glasses should be worn, and the surface should be HEPA-vacuumed of any scrap glass. Extra care should be taken in handling and cutting textured glass.
- For cutting and faceting glass *dalles*, special care must be taken to avoid injury from flying chips of glass. Faceted glass projects also bring exposure to epoxy resin, which may produce allergic reactions in some people.
- Glass grinding: Follow manufacturer's instructions for use. Have a face shield affixed to the grinder to protect the face and eyes. The grinder should be equipped with local exhaust due to the millions of particles of powdered glass that are hazardous as glass dust and also may contain arsenic, cadmium, selenium and other colorants. Always keep water in the grinder as directed by the instructions, but do not allow the grinder to sit in water, as it is an electrical appliance. Users must wear safety goggles.
- Glass painting: Vitreous paints contain hazardous materials, usually metal compounds. They typically contain large amounts of lead and their use can result in an exposure that elevates the blood-lead level to greater than the PEL limit, thus requiring an exhaust system or respirators.
- Firing: Thermal gloves should be worn when handling hot glass. Special protective goggles are available to resist the heat. Wear natural-fiber or flame-retardant clothing, which is less hazardous in case of fire. As previously mentioned, the kiln must be properly vented due to hazardous emissions.
- Fitting: In fitting lead came, caution must be taken in cutting, fitting and in brushing. Gloves should be worn to protect the skin. If an electric saw or brush is used, this may require use of a respirator or local exhaust system.
- Soldering/Fluxing: Read the MSDS and follow manufacturer's instructions for use, because most fluxes contain toxic materials such as zinc chloride. Flux and soldering fumes should be vented, or respirators should be worn. Zinc

chloride also harms the eyes and skin, so eye protection is advisable as are long sleeves and cotton gloves if you touch the piece. Do not touch the eyes or skin with flux or solder on your hands. Wash hands after use.

- **Cementing:** Read the MSDS. A respirator should be worn while cementing, as well as eye protection due to the use of whiting (calcium carbonate). Panels should be cleaned with a HEPA vacuum, and an exhaust fan with a HEPA filter is also advisable. Latex gloves are recommended.
- **Applying patina:** Again, it is important to read the MSDS and instructions. Patina should not be used with steel wool, which can create a chemical reaction and burn. Rubber gloves and an apron should be worn when applying patina. Both copper and black patina contain chemicals that will dissolve sponges and clothing.

On the Jobsite

Emergency Procedures Tips

Before beginning work outside of the studio, provisions should be made for prompt medical attention in case of serious injury. Someone trained in basic first aid should always be on the project. Telephone numbers of hospitals and ambulances should be clearly posted at the site.

Lead/Asbestos Putty Analysis

Prior to window removal, interior and exterior window putty should be tested by a laboratory for lead and/or asbestos content. For asbestos above the PEL, an asbestos abatement contractor should be hired. State and local regulatory requirements for notification, disposal, etc., should be consulted.

Supervisory lead-abatement training is recommended for all studios and hobbyists. Instructions typically include awareness, safety, worker protection; worksite preparation; containment; daily-cleanup procedures; controlling off-site contamination; final cleanup procedure.

General Instructions

(This is not comprehensive. Formal training and certification should be undertaken.)

- Provide proper signage to warn all who enter the site that lead abatement is occurring and that access is restricted — no eating, drinking, or smoking.
- Contain lead in the work area with plastic sheeting.

- Provide adequate ventilation if needed, such as a negative air machine. Otherwise, respirators are required.
- Designate a clean area for eating, drinking and smoking.
- Be on guard against electrocution hazards such as improper grounding. Supplying temporary power is addressed in the aforementioned *Assured Equipment Grounding Program* (OSHA 29 CFR 1926.404(b)(1)).
- Consider height of the work, equipment in use and any trip hazards. Take precautions against these.
- Inspect tools, ladders and scaffolding for condition. Ensure railings are adequate on scaffolds.
- Use care around air lines and electrical cords.
- Suspend or secure electrical lines and cords when possible.
- Keep floors free of debris.
- Pick up tools.

Scaffolding for Window Removal/Installation

Since 1996, OSHA has required that anyone who sets up or uses scaffolding have specific training (OSHA 29 CFR 1926.454 and 1926.451 (f)(7)) and certification.

Ladder and Scaffolding standards (OSHA 29 CFR 1910.28; 1926.450-.503) work hand-in-hand with Fall Protection, another OSHA regulation (OSHA 29 CFR 1926.501).

Scaffolding requirements are so extensive and so specific that they cannot be adequately addressed here. For further information, please refer to the SGAA publication *SGAA Recommendations for the Safe Use of Aerial Lifts, Scaffolding, Ladders, & Ladder-Jack Scaffolds*.

If your project is photographed with non-compliant scaffolding, OSHA may simply send a copy of the photo and a hefty citation to you in the mail... or seek a sentence of jail time.

Pigeon Droppings

Pigeon droppings are sometimes present on jobsites, and they are a health hazard. When droppings from pigeons, bats, birds and other animals are disturbed, parti-

cles become airborne that may contain fungi that cause histoplasmosis and cryptococcosis. Both typically produce mild infections but do nevertheless have the potential to cause serious illness or death. In an Illinois investigation, cryptococcosis fungus was found in as many as 84% of samples taken from old roosts.

Clean-up recommendations from the Illinois Department of Public Health include:

- Sealing heating and cooling air ducts or shutting the system down during removal.
- Allow only authorized personnel who are healthy individuals to be present during cleanup.
- Wear a respirator that filters to .3 microns.
- Wear disposable protective gloves, hat, coveralls and shoe coverings.
- Wet the droppings with a mist of water to keep spores from becoming airborne.
- Droppings should go into sealed, gooseneck-tied plastic garbage bags. The outside of the bags should be rinsed off before they are placed in a disposal container.
- After cleanup, still wearing the respirator, remove protective clothing and put it in a plastic bag.
- Wash up or shower.
- Dispose of waste through standard trash pickup only if local government agencies verify that it is permissible.

Protection from Mold

If mold is found on sills, frames, walls or anywhere else, worker protection should be undertaken by those exposed (respirator, protective clothing, latex gloves). The client should also be informed of the situation so that they can plan for professional mold remediation.

This is a newer field of concern and may require certification. Keep abreast of current information, and possibly attend seminars (some paint trade shows may have them).

Sandblasting Safety For Etching

Sandblasting presents its own unique safety challenges. Due to the high velocity at which the sand is propelled for etching, millions of tiny silica particles are released into the air in the process. It is most important that the lungs be protected from silica dust, which can cause chronic respiratory disease or even death. Sandblasting with quartz can cause a special kind of deadly, acute silicosis after as little as two weeks of exposure.

The safety equipment needed will vary, depending on whether etching is done in a self-contained blasting cabinet or not. In either case, follow the manufacturer's instructions, and read the MSDS for your materials.

With a blasting cabinet, the built-in dust collector will contain the dust. However, proper maintenance of the dust collector (per manufacturer's instructions) is essential for it to function effectively. If not using a cabinet, wear a respirator appropriate for the silica concentration in the air (NIOSH allows an air-purifying respirator with high-efficiency particulate filter(s) for concentrations of 0.5 mg/m³ or less. Higher concentrations require more advanced respirators) anytime that you are exposed to the dust. This includes refilling the blaster, emptying the dust collector, cleaning the floor and opening and closing the door of the blast cabinet.

A blast room creates concentrated levels of dust that are beyond the capacity of a cartridge respirator. A separate air-supplied hood and air pump certified for breathing air must be used in a blast room.

Whenever blasting, the eyes and skin must be protected from the abrasive particles. A blasting cabinet contains particles within it, and gloves are incorporated into the unit to protect the hands and arms. Without a blasting cabinet, even outside, one must wear gloves and a blasting hood.

If the noise from the machinery is high, or when blasting at higher pressures, it is advisable to wear ear plugs or other hearing protectors.

The Dangers of Hydrofluoric Acid

Sandblasting is a safer alternative for glass etching than hydrofluoric acid. Hydrofluoric acid is extremely dangerous and should not be touched without instruction in use of the chemical, a posted material safety data sheet and full knowledge of the dangers and equipment for emergency response.

If you must use hydrofluoric acid, understand that it is a potentially deadly chemical that can lull people into a false sense of security because of its latency period for injury. When the acid comes into contact with human skin, it immediately penetrates the skin and moves past the epidermis, leaving no signs of burn marks on the skin surface—while the hydrogen and fluoride begin a much more damaging attack at the cellular level. Even solutions of less than two percent can cause burns, including the pastes, and inhalation of hydrofluoric acid fumes may cause swelling in the respiratory tract for up to 24 hours after exposure, and even death.

Users must be compliant with all federal, state and local regulations pertaining to the concentration of acid used.

Not every hospital is readily prepared to treat injuries from hydrofluoric acid, so it is best to contact them about it in advance of use. A good resource for information about hydrofluoric acid is the Honeywell site, www.hfacid.com.

Learn about the uniquely harmful properties of this acid before using it, and never use it when you are alone. Safety precautions cannot be overemphasized. The Immediately Dangerous to Life and Health (IDLH) amount set by OSHA for hydrofluoric acid is not to exceed 30 ppm.

An acid work area should be equipped with a negative exhaust air system or fume hood to prevent inhalation injuries. A safety shower, eyewash and calcium gluconate in both gel and eye drop form (check expiration often) must also be available.

According to a chart by Oregon OSHA regarding personal protective equipment, anything above .2% (two-tenths of a percent) hydrofluoric acid also requires gloves and an apron. Concentrations from 2% to 20% require a face shield, goggles, gloves, aprons, boots and rubber sleeves; and anything above 20% requires an acid suit in addition to the rest. Protective material should be neoprene, Nitrile-NBR or polyethylene.

A neutralizing tank is needed for the acid, and sodium hydroxide to neutralize the acid. Polyethylene is one of the only acceptable storage materials for hydrofluoric acid, as it will eat through metal, concrete and glass.

OSHA also has numerous standards that apply to the use of hydrofluoric acid. It is advisable to consult with OSHA before undertaking acid etching.

Hydrofluoric acid is a hazardous waste product and must be disposed of accordingly.

If you must use hydrofluoric acid, understand that it is a potentially deadly chemical that can kill people and a large source of serious damage to the human body. When the acid comes into contact with human skin, it immediately penetrates the skin and moves past the epidermis, leaving no signs of pain during the early stages—while the hydrogen and fluoride begin a much more dangerous attack in the deeper layers. Even exposure of less than two percent can cause harm, including the perforation and inhibition of hydrofluoric acid fumes may cause swelling in the respiratory tract for up to 24 hours after exposure, and even death.

Users must be completely familiar with all federal, state, and local regulations pertaining to the transportation of acid.

Not every hospital is readily prepared to treat injuries from hydrofluoric acid, so it is best to contact them ahead of time to arrange for admission to a hospital that has the necessary equipment and staff.

Learn about the unique handling properties of this acid before using it, and never use it when you are alone. Safety precautions cannot be overemphasized. The immediate response to this acid is to call OSHA (800) 455-4644 for hydrofluoric acid is not to exceed 30 ppm.

An acid work area should be equipped with a negative exhaust air system or local hood to prevent inhalation injuries. A safety shower, eyewash and cabinet (check expiration dates) must also be available.

According to a chart by OSHA regarding personal protective equipment, anything above 7.5% (weight) hydrofluoric acid also requires gloves and an apron. Concentrations from 2% to 7.5% require a face shield, eye, face, gloves, apron, boots and rubber gloves and anything above 20% requires an acid suit in addition to the rest. Protective materials should be impervious to HF or hydrofluoric acid.

A neutralizing tank is needed for the acid, and sodium hydroxide is normally the best polymerizable acid of the only noncorrosive materials for hydrofluoric acid, as it will eat through metal, concrete and glass.

Environmental Protection

Recycling

Metallic lead should be recycled. This benefits the environment and allows it to be transported without a Hazardous Waste Manifest (see below). Recycled lead also does not count toward your hazardous waste generator quantity.

Hazardous Waste

Hazardous Waste falls under the jurisdiction of the EPA, and their rules should be monitored and followed.

Under the EPA's Resource Conservation and Recovery Act (RCRA), all hazardous waste shipments should be accompanied by a document called the Uniform Hazardous Waste Manifest. This is a shipping document that is signed by the generator, the transporter and the waste treatment/disposal facility. This tracks the hazardous waste from the point of generation to the point of permanent disposal. Very small quantities may be exempt as a conditionally exempt small generator. All containers must be properly labeled, marked or tagged with the identity of what's inside. If it is hazardous, the container must display the mandated hazard warning for that particular material.

It is also essential to safely contain and dispose of lead waste and wastewater, if produced. The volume of waste will determine the disposal method required. You can contact your state Environmental Protection Agency and local sewage district for information regarding disposal requirements.

Toxic Release Inventory (TRI) Reporting

TRI reporting depends on the (Standard Industrial Classification) SIC code used by a studio; some may be exempt. Otherwise, the current reporting threshold for lead users is 100 pounds per year. Businesses with 10 or more employees who exceed this threshold must submit an annual report to the state and to the federal EPA.

The TRI program was established under section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) of 1986. Copies of the rule should be obtained from the EPA TRI homepage at www.epa.gov/tri.

Conclusion

Concern for safety in the studio can often take a back seat to other issues. It is important to change that for the health of employees and for the reputation and solvency of the studio. Most OSHA inspections are triggered by reports from employees or their families because of unsafe conditions.

As mentioned earlier, in addition to all of the specific standards, the OSHA "general duty clause" Section 5(a)(1) is a catchall provision that can be applied where there is no specific applicable OSHA standard. What this means is that an employer can be held responsible for virtually any hazard or injury in the workplace, so it truly is essential to be proactive regarding every aspect of safety.

State OSHA and Health Departments will work with you in assessing worker safety and compliance. Often free compliance-training programs and advice are available. If an assessment is initiated by the studio, OSHA tends not to write fines for being out of compliance. Taking advantage of these and other resources, a safer, healthier workplace can be yours.

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