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MSDSs: Reading Between the Lines

For the past decade, and longer in some states, employers have been required by the Occupational Safety and Health Administration (OSHA) to train employees to use material safety data sheets (MSDSs). As a result, most conservators are familiar with MSDS terminology.

Many conservators, however, are dissatisfied with the quality of MSDSs. Here are some insights into a few MSDS problems, hidden meanings of terminology, and additional ways to use the data.

Whose MSDS is it?

Before reading any MSDS, consider who wrote it. MSDSs in conservation labs are primarily from three sources:

- *Large chemical manufacturers and suppliers.* MSDSs from these suppliers are almost always detailed and accurate. They usually list all ingredients and even trace impurities.
- *Industrial or consumer product manufacturers.* MSDSs from these producers vary widely in quality. They were written for use by either industrial workers or home consumers. Conservators often use these products in ways other than the manufacturer intended, and the MSDSs are not relevant for that use.
- *Suppliers to the conservation field.* Most of these small companies either distribute other manufacturers' products directly or repackage these products by affixing their own label to them. Sometimes they alter these products. MSDSs from these suppliers usually are modified from the original manufacturers' MSDSs. Sometimes the suppliers eliminate information, concealing the identity of the product's ingredients (see "Trade Secrets and Proprietary Ingredients," below).

Is Required Information Missing?

The OSHA hazard communication standard lists the data that OSHA requires on MSDSs (see Appendix). Missing information or unfilled blanks are forbidden. If no data exist or data are not applicable, the manufacturer must say so. If an MSDS is missing information listed in the Appendix, you can write the company and send a copy of your letter to the OSHA office in the region in which this company is located (see Bibliography).

Exemption for Articles

OSHA does not require MSDSs on "articles." A wooden chair is an example of an article. However, an MSDS is required on wood that is going to be made into a chair because toxic sawdust will be created. Products often mistaken for articles include wood, glass, plastics, grind wheels, welding rods and wire, solder, and brick. If you are refused an MSDS on such materials, tell the manufacturer that one is required because you will be exposed to dust or fumes from the product.

The Manufacturer's Name, Address, and Emergency Phone Number

The name and address on the MSDS must match the name and →

Highlights of This Issue

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The cost of advertising in Supplier's Corner is $100 for 100 words. The cost of display ads is: 1/6 page $185; 1/3 page $320; 1/2 page $395; 2/3 page $450; one full page $625. Deadlines for camera-ready copy are February 1, April 1, June 1, August 1, October 1, and December 1.

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address on the product's label. Some companies repackage other manufacturers' products under their own label but send out the MSDS from the original manufacturer. Instead, the law requires that the MSDS bear the repackager's name as the responsible party.

Some importers violate this law. Importers' names and addresses must be on the MSDS because they are considered the "manufacturer of record." In addition, they must produce an MSDS that meets U.S. requirements, is in English, and lists a 24-hour emergency number in this country.

Date of Preparation

The date the document was written or was revised must appear on the MSDS. In Canada, three-year-old MSDSs are automatically invalid. In the United States MSDSs should be reviewed frequently, and those that fail to incorporate up-to-date information are easy to fix. A letter to the company pointing out omissions can include a reminder that OSHA's Hazard Communication Standard, 29 CFR 1910.1200(g)(6) gives the manufacturer only three months to incorporate significant new hazard information.

Identity of Ingredients

Only the chemical and common names of the ingredients must be listed under the federal law. However, good MSDSs provide the chemical class, other synonyms, and the Chemical Abstract Service registration numbers (CAS RNs).

Many state OSHA MSDS laws require CAS RNs. If you encounter an MSDS that does not have the CAS RNs, have a friend in one of these states write for one. Especially worth cultivating are AIC members who work in California or who are public employees in New Jersey or Massachusetts.

Trade Secrets and Proprietary Ingredients

If the manufacturer can prove that certain ingredients provide an advantage over competitors who do not know of them or use them, the manufacturer can register these ingredients as trade secrets. Once registered, only the words "trade secret" or "proprietary" and the registration number are required on this section of the MSDS. Make sure there is a registration number; if none is listed, the ingredient is not a legitimate trade secret.

Less legitimate methods may be used by some companies to obscure the identity of ingredients. They might, for example, omit the name "acetone" and identify the chemical only by the synonym "dimethylformaldehyde" (not to be confused with dimethylformamide, DMF).

OSHA requires that trade secret information be disclosed to health professionals if they suspect their patients are affected adversely by the product. However, I have found that this transaction rarely occurs, because those who receive proprietary information must sign a confidentiality agreement. This agreement carries severe penalties if the information is revealed, even acci-

Contents

dentally, to anyone, including the patient. I find that doctors and other health professionals are reluctant to sign these binding agreements.

Sometimes telling the manufacturer that you plan to have the product analyzed gets results. In fact, if this threat upsets the manufacturer, it just might be that the substance is simple enough to actually be identified by analysis. Single substances and mixtures of common solvents are usually easy to analyze. Substances that are either too expensive or impossible to analyze include many complex organic chemicals such as pigments and dyes or complex mixtures such as paints, inks, polymer adhesives, and plastic resins.

Conservators simply should not use products whose ingredients are unknown. Every substance, including trace impurities, should be identified if good treatment records are to be created or if the research quality of an object or painting is to be preserved. No amount of hyperbole from manufacturers or from experts can substitute for knowing the composition of the product.

Occupational Limits

MSDSs must list workplace air quality limits including the OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV), and any other exposure limit used or recommended by the chemical manufacturer or importer. These other limits might include a manufacturer's recommended limit (MRL) or a National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL).

The limits are useful for selecting safer chemicals. The higher the chemical's TLV, the more is allowed in the workplace air, and the more can be inhaled before a healthy adult can expect adverse effects. If the chemical is a liquid, the evaporation rate also must be considered. The more slowly the chemical evaporates, the less vapor it creates, and the less hazardous it is to work with. In fact, some very toxic solvents that evaporate slowly may not be as hazardous to use as less toxic ones that evaporate quickly.

There are hundreds of thousands of chemicals used in the workplace, but only about 700 have limits. Many extraordinarily toxic chemicals do not have limits because they have never been studied in the detail needed to set them. Some people mistakenly interpret the lack of an OSHA PEL as an assurance of safety.

If there is no limit set for a chemical, check for acute and chronic effects listed in the MSDS's health hazard section, and consult other standard references to see if there are data that will provide better guidance.

EXAMPLES OF SOME EIGHT-HOUR, TIME-WEIGHTED AVERAGE (TWA) THRESHOLD LIMIT VALUES (TLV) IN PARTS PER MILLION (ppm)

TLV-TWA ppm	SUBSTANCES
5000	Carbon dioxide highest TLV
1000	Ethanol, some fluorocarbon propellants
100	Xylene, turpentine, mineral spirits, isoamyl alcohol
10	Carbon disulfide, chloroform, PDB, naphthalene
1	Ethylene oxide, fluorine, nitrobenzene
0.1	Dichlorvos, bromine, chlorine dioxide, chloropicrin
0.01	Demeton (Systox), hydrazine, mevinphos (Phosdrin)
0.001	Bis(chloromethyl) ether

Acute and Chronic Health Hazards

Short-term animal tests provide acute data on many chemicals. Chronic data, however, take years to develop. Most chemicals have never been studied for long-term effects. The lack of chronic data should never be interpreted as an indication of safety.

Carcinogenicity

The ratings of three agencies must be consulted when reporting carcinogens on MSDSs: the National Toxicology Program's (NTP) *Annual Report on Carcinogens* (latest edition); the International Agency for Research on Cancer (IARC) *Monographs* (latest edition); and OSHA's list in 29 CFR 1910, subpart Z. These agencies provide peer review for existing data. Deliberation can take years. Many substances for which there are cancer-positive studies are not listed because they have never been reviewed or because their reviews are unfinished.

In fact, the majority of the substances we use have never been studied for cancer effects at all. Worse, no warnings are required on these substances even when they are almost surely cancer-causing due to their chemical structure. This issue was finally addressed in 1996 when NTP changed its criteria to include substances that are structurally related to known carcinogens and can be reasonably anticipated to cause cancer. We will not see these changes reflected in MSDSs for several years, however.

Better sources of cancer information are the *New Jersey Fact Sheets* or *Sax's Dangerous Properties of Industrial Materials* (see Bibliography).

Releases and Spills

Manufacturer's directions for dealing with spills and releases are often vague or designed for factory or chemical laboratory use. Conservators without special training who try to follow these directions may risk overexposure and injuries.

People dealing with spills need special training because no MSDS can provide spill and release information to cover all contingencies. Procedures must be adapted to accommodate the

size of the spill, the type of surface it spills on, whether the spill can get into drains in violation of EPA rules, whether the ventilation will spread toxic vapors into other areas, whether there are reactive chemicals nearby, and much more.

While MSDSs may be used for guidance, the only way to deal with spills is to design procedures in advance that are appropriate for the facility. Large institutions should have staff members trained to handle most spills. For spills beyond their capabilities, local HazMat responders can be called.

Conservators in small institutions or private practice can call HazMat responders as well, but a better strategy would be to purchase and store chemicals only in quantities that would not constitute a significant spill. Both large and small operations must have emergency procedures planned and rehearsed, have all the equipment necessary for personal protection during cleanup, have ready access to eye wash and emergency showers, and have a supply of chemical sorbants such as Hazsorb™. While MSDSs may provide some guidance for these preparations, you will need additional technical advice as well.

Control Measures

Some MSDSs provide extremely overcautious advice about respiratory protection, gloves, and eye protection. I have seen MSDSs that advise wearing a full body suit and a self-contained breathing apparatus (SCBA) for chemicals intended for use on a Q Tip™. Actually, those were reasonable precautions when the primary manufacturer wrote them for workers wading in vats of the stuff. But when such precautions are on MSDSs for consumer or conservation products, they indicate that the secondary supplier was too ignorant or too unconcerned about our safety to tailor the control measures to the label-directed use.

On the other hand, some MSDSs provide too few precautions and rely on useless phrases such as "wear gloves and eye protection," "avoid inhalation," and "use respiratory protection." Good MSDSs should be specific about type of eye wear, and other equipment that may be needed, such as eye washes, showers, aprons, foot wear, and special ventilation. However, precise recommendations cannot be made for respirators and gloves.

To specify use of a particular respirator, it is necessary to know the airborne concentration to which the workers are exposed. There is no way to predict this concentration for all workplaces. However, it would be helpful if MSDSs indicated what type of cartridge or mask should be used if the airborne concentrations were consistent with the limitations of this equipment.

It is also impossible in most instances to specify the type of gloves that should be used. There are many different types of rubber and plastic glove materials that are formed into layers by different manufacturing methods and in varying thicknesses. All these factors influence permeability. The only reliable information is from tests done by the glove manufacturer. The MSDS, however, could warn workers about types of gloves repeatedly shown to be an ineffective barrier to that chemical.

Decomposition Products

The decomposition products listed on MSDSs usually are those that will be released during incineration at high temperatures (about 3000°F) and in oxidation. The chemicals given off during incineration are not at all like those emitted when the product burns under ordinary conditions.

For example, cellulose composed of carbon, hydrogen, and oxygen will give off only water and carbon dioxide in an incinerator. Looking at the MSDS, one might assume that burning cellulose does not release toxic substances. Cellulose burned under ordinary conditions, however, generates literally hundreds of substances. Included are carbon monoxide, carbon (in soot), many hydrocarbon gases and vapors, and tars.

Decomposition data, however, sometimes can be used to determine a product's composition. For example, if the product is an unidentified plastic resin that decomposes on incineration to carbon dioxide and water you know it is not a nitrogen-containing resin such as urethane or ureaformaldehyde, or a chlorine-containing polymer like polyvinyl chloride.

Summary

These are just some of the ways MSDS data can be used. Even seriously flawed MSDSs can be useful to document a company's lack of expertise and/or regulatory compliance. I sent one such MSDS to OSHA and got both a better MSDS and a change in the company's procedures. Every time we point out inadequacies, we strike a blow for better MSDSs. If you don't get a response to your letters or calls, ask Arts, Crafts and Theater Safety (ACTS) to help. As members of AIC, you can feel free to ask us to follow up for you.

Appendix

Required MSDS data complied from 29 CFR 1910.1200(g)(2)(i)-(xii) and the OSHA form 174:

1. *Identity of products.* Both chemical and common names if they are single substances or mixtures that have been studied for hazards as a whole. For all other products, MSDSs must supply chemical and common names(s) for all hazardous ingredients constituting 1.0 percent of the product, carcinogens constituting 0.1 percent, or less if smaller amounts are hazardous.
2. *Physical and chemical characteristics.* Boiling point, vapor pressure, vapor density, solubility in water, specific gravity, melting point, evaporation rate.
3. *Physical hazards.* Potential for fire, explosion, and reactivity, flash point, flammable limits, stability, incompatibility, hazardous decomposition products, hazardous polymerization.
4. *Health hazards.* Both acute and chronic, signs and symptoms of exposure, and medical conditions aggravated by exposure.
5. *Primary route(s) of entry.* Skin, inhalation, and ingestion.
6. *Exposure limits.* OSHA PELs, ACGIH TLVs, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer.
7. *Carcinogenicity.* Whether the chemical is listed as a carcinogen by NTP, IARC, or OSHA.
8. *Precautions for safe handling and use.*

Hygienic practices, protective measures during repair and maintenance, and procedures for cleanup of spills and leaks.

9. *Control measures.* Ventilation, respiratory protection, gloves, eye protection, protective clothing or equipment, hygienic practices.
10. *Emergency and first aid procedures and firefighting methods and hazards.*
11. *Date of preparation or last revision.*
12. *Name, address, and telephone number of responsible party.*

Bibliography

1. *The MSDS Pocket Dictionary.* A copy can be obtained from: Genium Publishing, 1145 Catalyn St., Schenectady, NY 12303–1836; (518) 377–8854.
2. New Jersey Department of Health's *Right to Know Hazardous Substances Fact Sheets.* These provide better information than you will find on MSDSs, including more detailed chronic data, whether the chemical has ever been formally studied for cancer effects, and odor thresholds when known. They are available for $1.00 each in hard copy. The whole database also is available on CD Rom and online services. Contact: New Jersey Department of Health, Right to Know Program, CN 368, Trenton, NJ 08625-0368; (609) 984–2202.
3. *Threshold Limit Values and Biological Exposure Indices, Hawley's Condensed Chemical Dictionary,* and *Sax's Dangerous Properties of Industrial Materials.* Copies can be obtained from: American Conference of Governmental Industrial Hygienists, 1330 Kemper Meadow Dr., Cincinnati, OH 45240; publications catalog: (513) 661–7881.
4. "Understanding the MSDS." Free data sheet that can be obtained from: Arts, Crafts and Theater Safety (ACTS), 181 Thompson St., # 23, New York, NY 10012-2586; (212) 777–0062.
5. A list of OSHA area offices and copies of individual standards such as the hazard communication standards can usually be obtained free from your own local area office. Look in your phone book's blue pages under either the U.S. or State Department of Labor. Otherwise, call the Government Printing Office at (202) 783–3238. Most of its materials are not free.

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From the President

Debbie Hess Norris

In late January I had the privilege of participating in the Kobe/Tokyo International Symposium on Risk Preparedness for Cultural Properties. During this meeting, specialists from Japan and abroad were invited to present extensive reports on emergency mitigation, response, and recovery efforts focused on both natural and man-made disasters.

This conference was held exactly two years following the devastating Great Hanshin-Awaji Earthquake that left more than 6,000 people dead, 35,000 injured, hundreds of thousands permanently displaced, and numerous irreplaceable cultural properties damaged and/or destroyed. This provocative forum reaffirmed the immediate need to increase resources for risk preparedness.

In adopting the resultant Kobe/Tokyo Declaration, all delegates vowed to strengthen the development, enhancement, and appropriate use of expert networks and to intensify risk preparedness and recovery training and educational programs for both cultural institutions and the public. The dire need to increase awareness and strengthen community, national, and international involvement in risk preparedness activities cannot be ignored. Inspiring and emotional presentations documenting cultural heritage at risk—heartbreaking lessons for all of us—in Kobe, Cambodia, Bosnia, Lebanon, Thailand, and Malaysia (just to name a few) further confirmed the magnitude of this challenge and the vital importance of these cooperative efforts. Action is needed to avert further losses.

The United Nations Decade for Natural Hazard Reduction is nearing completion. As conservators deeply committed to the care and preservation of our cultural heritage, our work will and must continue. In the future, effective emergency mitigation and disaster response activities will be best enhanced by our reliance on professional partnerships and collaborative efforts. For example, AIC must continue to actively support and contribute to the vital activities of the National Task Force on Emergency Response. Likewise, we must contribute as needed and possible to international efforts, specifically the work of the International Inter-Agency Task Force on Risk Preparedness and Cultural Heritage.

Working together, AIC members must promote conditions that encourage the collaboration of those responsible for cultural heritage with those dedicated to emergency preparedness. We must foster a climate in which the conservation of cultural heritage is linked to the incontrovertible concern for the security of human life. At our 1997 annual meeting, a workshop will be offered by the Red Cross Disaster Services. Skills and information gained here may increase our sensitivity to the requirements of risk preparedness and prove instrumental in our response to future emergency situations of all kinds. The AIC 1998 Annual Meeting will be dedicated to emergency response and recovery. Sessions featuring emergency personnel and staged disaster scenarios will help foster a systematic interchange of information.

Please give serious consideration to the call for papers (see page 13), and plan to attend this meeting. As conservation professionals and preservation advocates, we have no greater responsibility. Collectively we must ensure that we are well prepared for the worst.