PDHonline Course G187 (1 PDH)

Material Safety Data Sheets - Sources and More

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Material Safety Data Sheets – Sources and More

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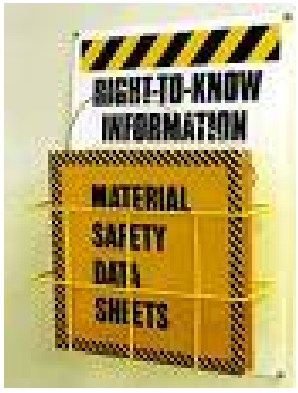
COURSE CONTENT

Protecting workers from exposure to chemicals is a multi-faceted process, including chemical selection, process and product design, training, personal protection equipment, and more. Many of these steps require design, guidance, and direction from highly trained health and safety professionals. But one key element of worker protection should be readily available to all involved, including the workers themselves – the Material Safety Data Sheet.



This course focuses on Material Safety Data Sheets (MSDSs) as required by the U.S. Occupational Safety and Health Administration (OSHA) for U.S. workers. Many other countries also have standards.

This course provides guidance on how to acquire MSDSs, describes what information they contain, and shows how to use some of that information to protect workers and others from chemical exposure. This course provides general information intended to increase awareness. It should not be construed as health and safety advice. For information on controlling specific chemical hazards in your work place, contact your supervisor or your health and safety representative.

1. Sources of MSDSs

OSHA requires that all employers with hazardous chemicals in their workplaces make available an MSDS for each hazardous chemical to which workers could be exposed. So where does a person find an MSDS for a chemical of interest? Suppliers are required to send a copy of the MSDS with the first shipment of a chemical to a company. But it can sometimes be a challenge to find MSDSs for chemicals that you have used for years, or to get MSDSs from some chemical manufacturers or distributors.

The following are all possible sources of MSDSs:

- Your workplace's MSDS collection;

- Your chemical distributor or a store that sells the product;
- Manufacturer of the product of interest;
- Universities;
- Free Internet sources; and
- Purchased software and Internet subscription services.

If you work with chemicals or work near an area where chemicals are used, the first place to check for an MSDS is with your supervisor and/or the person responsible for health and safety issues at your facility. Your organization might have a collection of MSDSs available in a central location and/or might post them in the areas were the chemicals are used.

Another source is your chemical supplier. Ask distributors for MSDSs for each chemical that they supply to your facility. Even if they sent one with the first shipment to you, you can request a copy more frequently, or ask to have a copy accompany each shipment. Or if you need to make preparations to manage the risks before the chemicals arrive on-site, ask the distributor or chemical manufacturer for MSDSs then.

Chemical manufacturers often have MSDSs for their products readily available from their website or have a fax-back type of service. Others either don't post MSDSs on their websites, or make you work hard to find them, or require user identification to access. Making a request to the manufacturers' customer service department should result in an MSDS being sent to you or provide you with information on how to acquire it.

Many universities have MSDS collections that can be accessed by the public. A few examples will be provided here, but many more are available. New Mexico State University has a website with links to manufacturers, suppliers, and other sites that provide MSDSs via the Internet. Purdue University has a publicly accessible MSDS database. Each of these websites is listed in the Related Links section.

Besides manufacturers and universities, other free Internet sources of MSDSs are also available. A number of Internet sites offer access to large databases of MSDS information. The sites are generally searchable by chemical name, manufacturer name, and/or Chemical Abstracts Service (CAS) number. As examples, in the Related Links section are links to MSDS Search and SIRI MSDS Index. For many more Internet sources of MSDSs, see the Interactive Learning Paradigms Inc. website (See Related

Links section), which has links and information to many free and for-fee websites, as well as lots of other related information.

Purchased software and Internet subscription services are available for a wide range of fees. The number of MSDSs that you have access to and the consumer/technical support provided varies widely as well. This course focuses on the no-cost options for acquiring MSDSs, but there are many good reasons to select a commercial option if they will better meet your needs.

Before continuing this course, you are requested to obtain a copy of two or three MSDSs for the chemicals of your choice. In addition to the example excerpts provided in Section 3, referring to your selected MSDSs during the discussions on MSDS contents and using MSDS information will help to reinforce the messages, as well as show you the variety of formats from different sources. You can obtain MSDSs from one or more of the websites mentioned, or you can obtain them from the collection at your place of work.

2. Summary of MSDS Contents

MSDSs are developed for specific hazardous chemical products and include information on the chemical, its hazards, as well as procedures for safe handling. MSDSs contain a wealth of information, but they are filled with technical information, which sometimes makes it difficult to understand and/or find the bits of information that you need. Plus, there is no single prescribed format, which adds to the challenge.

OSHA requires that MSDSs include twelve categories of information. On the two or three MSDSs that you chose, see if you can find each of these:

- Identity (name of product or substance) as it appears on the product label, and the common names of hazardous constituents;
- Physical and chemical characteristics (e.g., vapor pressure, flash point, and pH);
- Physical hazards, including the potential for fire, explosion, and reactivity;
- Health hazards, including signs and symptoms of exposure and any medical conditions that are generally recognized as being aggravated by exposure to the chemical;
- Primary routes of entry into the body (e.g., inhalation, skin absorption, ingestion, or injection through a break in the skin);

- The OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other exposure limits used or recommended by the manufacturer (which are limits of the chemical concentration in the air that workers can safely be exposed to for specified periods of time);
- Whether the chemical is a listed carcinogen or has been found to be a potential carcinogen;
- Safe handling procedures and precautions, including spill clean-up;
- Control measures, including personal protective equipment, appropriate engineering controls, and work practices;
- Emergency and first aid procedures;
- Date of MSDS preparation or its last change; and
- Contact information for the chemical manufacture, importer, or preparer of the MSDS.

Were your selected MSDSs complete? Was each information item easy to find? Did they each have the same format?

3. Using MSDS Information

MSDSs can be helpful sources of information for many decisions related to safe chemical handling, use, and disposal. However, since OSHA does not prescribe a format for MSDSs, it can sometimes be a challenge to find the information that you need. In this section of the course, we will investigate some of the places on MSDSs to look for information to help you make decisions on chemical storage, personal protection equipment, and emergency/incident response procedures.

Chemical Storage Considerations

When designing chemical storage areas and other aspects of chemical use, consideration for the compatibility of chemicals is important. Storing incompatible chemicals together can result in violent reactions, creation of toxic gases, and/or fires.

Information on incompatible chemicals can usually be found in MSDS sections titled Stability and Reactivity Data, Control Measures, or Handling

and Storage. If you find information on incompatible chemicals or conditions in one area of the MSDS, don't stop there. Sometimes information needed to fully assess incompatibilities will be found in more than one section. Look for phases like Conditions to Avoid, Materials to Avoid, Conditions for Safe Storage, and Incompatibility.

Here are examples of sections of three different MSDS for three different hydrochloric acid solutions from three different manufacturers.

```
==========================================================
Reactivity Data
==========================================================
Stability Indicator: YES
Stability Condition To Avoid: HYDROCHLORIC ACID IS
     EXTREMELY REACTIVE. AVOID CONTACT WITH METAL
     SURFACES & OXIDIZING AGENTS.
Hazardous Decomposition Products: EXTREME HEAT MAY
     CAUSE THE PRODUCT TO DECOMPOSE, PRODUCING TOXIC
     FUMES WHICH MAY INCLUDE CHLORINE COMPOUNDS.
Hazardous Polymerization Indicator: NO
Conditions To Avoid Polymerization: EXTREME HEAT AND
     CONTACT WITH INCOMPATIBLE MATERIALS.
```

```
==========================================================
Reactivity Data
==========================================================
Stability Indicator: YES
Stability Condition To Avoid: STABLE UNDER CONDITIONS
     OF USE AND STORAGE.  CONTAINERS MAY BURST WHEN
     HEATED.
Materials To Avoid: HIGHTLY REACTIVE WITH STRONG BASES,
     METALS, METAL OXIDES, HYDROXIDES, AMINES,
     CARBONATES & OTHER ALKALINE MATERIALS.
     INCOMPATIBLE WITH CYANIDES, SULFIDES, SULFITES,
     AND FORMALDEHYDE.
```

```
==========  Stability and Reactivity Data  ==========
Stability Indicator/Materials to Avoid: YES
     BASES, POWDERED METALS, ALKALIES AND AMINES.
Stability Condition to Avoid: HEAT.
```

Note the similarities and differences in the list of types of chemicals to avoid close association with:

- First hydrochloric acid MSDS – Avoid metal surfaces and oxidizing agents.

- Second hydrochloric acid MSDS – Avoid strong bases, metals, metal oxides, hydroxides, amines, carbonates, and other alkaline materials, cyanides, sulfides, sulfites, and formaldehyde.
- Third hydrochloric acid MSDS – Avoid bases, powdered metals, alkalies, and amines.

They all seem to agree, however, that avoiding heat is a good idea.

The three MSDSs are not the same, reminding us to be sure to use the MSDS for the specific solution that we have, not just something that is "close."

And take time to understand the definitions of the terms used in the cautionary statements. To help you with this, in the Related Links section are links to three websites that contain glossaries of MSDS-related terms. Most importantly, be sure to solicit the advice and guidance of the health and safety representative for your facility.

Personal Protection Equipment Considerations

A critical means of controlling worker exposure is the proper selection and use of personal protection equipment (e.g., gloves, face shield, chemical aprons, safety glasses, and respiratory protection). Information on appropriate personal protection equipment (PPE) for handling chemicals can usually be found in the MSDS sections titled Control Measures, Exposure Controls, or Personal Protective Equipment. Also, be sure to check the Fire Fighting Procedures and Accidental Releases sections for additional considerations related to PPE for emergency situations.

Following are excerpts of PPE guidance from the MSDSs for three different hazardous chemical products.

A hydrochloric acid solution:

```
==========================================================
Control Measures
==========================================================
Respiratory Protection: NONE NEEDED IN NORMAL
     LABORATORY HANDLING. IN MISTY CONDITIONS WORK IN
     VENTILATION HOOD OR WEAR NIOSH-APPROVED
     RESPIRATOR.
Ventilation: LOCAL EXHAUST: NONE NEEDED. MECHANICAL
     (GENERAL): NONE NEEDED.
  SPECIAL: NO. OTHER: NO.
Protective Gloves: RUBBER.
Eye Protection: CHEMICAL SAFETY GLASSES.
Other Protective Equipment: SMOCK, APRON, EYE WASH
     STATION, GOGGLES, VENTILATION HOOD, PROPER GLOVES.
```

Xylene:

Section 8 - Exposure Controls & Personal Protection
XYLENE

Respiratory Protection:
USE NIOSH APPROVED RESPIRATOR XYLENE, IF IN EXCESS OF TLV.
Ventilation:
PROVIDE MECHAN (GEN/LOCAL EXHAUST) VENT TO MAINTN
Protective Gloves: IMPERVIOUS
Eye Protection: SAFETY/CHEM GOGGLES
Other Protective Equipment: FULL PROTECTIVE CLOTHING, SAFETY SHOWER, EYE WASH STATION

Hydrofluoric acid:

```
==========================================================
Control Measures
==========================================================
Respiratory Protection: IF VENTILATION DOES NOT
     MAINTAIN INHALATION EXPOSURES BELOW PEL(TLV), USE
     NIOSH APPROVED FULL FACEPIECE CHEMICAL CARTRIDGE
     RESPIRATOR OR A SUPPLIED AIR FULL FACEPIECE
     RESPIRATOR.
Ventilation: LOCAL EXHAUST IS RECOMMENDED TO KEEP
     EMPLOYEE EXPOSURES BELOW TLV.
Protective Gloves: NEOPRENE OR PVC GLOVES
Eye Protection: CHEMICAL SAFETY GOGGLES WITH FACE
     SHIELD
Other Protective Equipment: EYE WASH STATION AND SAFETY
     SHOWER. IMPERVIOUS BOOTS, APRON, AND COVERALLS.
Work Hygienic Practices: OBSERVE GOOD PERSONAL HYGIENE
     PRACTICES AND RECOMMENDED PROCEDURES. DO NOT WEAR
     CONTAMINATED CLOTHING OR FOOTWEAR.
Supplemental Safety and Health: AVOID ANY EXPOSURE. DO
     NOT GET ON SKIN OR IN EYES. DO NOT BREATHE VAPORS
     OR MISTS.
```

Notice that each of the MSDSs specified that appropriate respiratory protection was to be worn if specific thresholds were exceeded. Air monitoring equipment and the guidance from your health and safety representative would be needed to make that determination.

Also, each MSDS prescribed the use of safety glasses or goggles and protective gloves. It's a good bet that you'll find eye protection and appropriate chemical-resistant gloves indicated on most MSDSs. Be sure to look closely at the MSDS to identify ALL of the indicated PPE, such as impervious boots, face shields, aprons, and coveralls. Also pay close attention to the emergency first aid equipment included in the PPE section – like eye wash stations and emergency showers for hydrofluoric acid.

Selection of PPE is critical to minimizing the chance of exposure. The MSDS is a good tool to provide PPE information to workers. Be sure to consult with the health and safety representative for your facility for PPE selection decisions. Have all needed equipment on hand. And train workers on its proper use.

Incident Response Considerations

MSDSs contain information about how to respond to exposures, spills, and other incidents or emergencies related to the hazardous chemical. This information can usually be found in sections titled Fire Fighting Measures, Fire and Explosion Hazard Information, Accidental Release Measures, Precautions for Safe Handling, Handling and Disposal, and/or First Aid.

Following are excerpts of emergency/incident response information from two MSDSs, one for acetone and one for phosphoric acid.

Acetone:

Section 4 - First Aid Measures
ACETONE

First Aid:
FLUSH WITH WATER AND REMOVE FROM EXPOSURE. IF SWALLOWED, GIVE TWO GLASSES OF WATER, INDUCE VOMITING BY STICKING FINGER DOWN THROAT. CALL PHYSICIAN. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONCIOUS PERSON.

Section 5 - Fire Fighting Measures
ACETONE

Fire Fighting Procedures:
SCBA WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND MODE
Unusual Fire or Explosion Hazard:
HIGHLY VOLATILE VAPORS COULD GET IGNITED BY PILOT LIGHTS, HEATERS, WELDING OR CUTTING T.EXPLOSIVES.
Extinguishing Media:
FOAM, DRY CHEMICAL, CARBON DIOXIDE
Flash Point: Flash Point Text: -4F(-20C) ASTMD
Autoignition Temperature:
Autoignition Temperature Text: N/A
Lower Limit(s): 2.6
Upper Limit(s): UNKN

Section 6 - Accidental Release Measures
ACETONE

Spill Release Procedures:
KEEP HEAT OR IGNITION SOURCES AWAY. SMALL SPILLS MAY BE TAKEN UP USING FLOOR ABSORBENTS AND EVAPORATED IN HOOD. LARGE SPILLS MAY BE PUMPED INTO SALVAGE TANK.

Phosphoric acid:

```
==========================================================
Health Hazards Data
==========================================================
Route Of Entry Inds - Inhalation: YES
Skin: YES
Ingestion: YES
Carcinogenicity Inds - NTP: NO
IARC: NO
OSHA: NO
Effects of Exposure: . . .

Explanation Of Carcinogenicity: . . .

Signs And Symptoms Of Overexposure: . . .

First Aid: EYES-IMMEDIATELY FLUSH WITH PLENTY OF WATER
     FOR 15 MINS, OCCASIONALLY LIFTING UPPER/LOWER
     LIDS. GET MEDICAL AID IMMEDIATELY. SKIN-GET
     MEDICAL AID IMMEDIATELY. FLUSH SKIN WITH PLENTY OF
     SOAP & WATER F OR 15 MINS WHILE REMOVING
     CONTAMINATED CLOTHES/SHOES. DISCARD CONTAMINATED
     CLOTHES.  INGESTION-DO NOT INDUCE VOMITING.  IF
     VICTIM IS CONSCIOUS & ALERT, GIVE 2-4 CUPS OF
     MILK/WATER. GET MEDICAL AID IMMED IATELY.
     INHALATION-GET MEDICAL AID IMMEDIATELY.  REMOVE
     FROM EXPOSURE IMMEDIATELY. IF NOT BREATHING GIVE
     ARTIFICIAL RESPIRATION.  IF BREATHING IS
     DIFFICULT, GIVE OXYGEN. NOTE TO PHYSICIAN-TREAT
     SYMPTOMATICALLY & SUPPORTIVELY.
==========================================================
Handling and Disposal
==========================================================
Spill Release Procedures: USE PROPER PERSONAL
     PRORECTIVE EQUIPMENT. COVER WITH SAND, DRY LIME OR
     SODA ASH AND PLACE IN A CLOSED CONTAINER FOR
     DISPOSAL.  FLUSH SPILL AREA WITH WATER.  IN CASE
     OF LARGE SPILLS, EVACUATE AREA AND NOTIFY PROPER
     LOCAL EMERGENCY RESPONSE ACTIVITY.
     . . .
==========================================================
Fire and Explosion Hazard Information
==========================================================
Extinguishing Media: FOR SMALL FIRES: USE WATER SPRAY,
     DRY CHEMCIAL, CARBON DIOXIDE OR CHEMICAL FOAM.
Fire Fighting Procedures: WEAR APPROPRIATE PROTECTIVE
     CLOTHING TO PREVENT CONTACT WITH SKIN AND EYES.
     WEAR A SELF-CONTAINED BREATHING APPARATUS TO
     PREVENT CONTACT WITH THERMAL DECOMPOSTION
     PRODUCTS.
```

The MSDS excerpt from an acetone MSDS has procedures for first aid if acetone were to be swallowed, fire fighting procedures, and response to a small or a large spill of acetone.

Notice that in the phosphoric acid MSDS excerpt above, the First Aid information was deep within the Health Hazards Data section, as opposed to in a section titled First Aid. Also notice that there are some PPE recommendations in the Fire Fighting Procedures section.

Take time to become familiar with the MSDSs of most concern for your work area. Different companies use different formats and you'll find the same type of information in different locations on different sheets.

When you have well-established control measures (e.g., engineered controls, effective procedures, PPE), the likelihood of an incident is lower. However, be sure to adequately train workers on emergency response procedures as well, and ensure that all of the equipment, PPE, and supplies needed to deal with emergency situations are available, accessible, and in working order. Your facility's collection of MSDSs for the chemicals used is a good place to start to identify those procedures, equipment, and supplies.

Course Summary

One of the key elements of programs to protect workers from exposure to chemicals is the use of MSDSs, which provide information on the chemical hazards and how to control them. In order to reduce the risk of exposure, managers, line supervisors, engineers, workers who use chemicals, and those who work near chemical use areas all must have access to MSDSs, have a fundamental understanding of their contents, and know how to locate and use the information.

Acronyms

CAS - Chemical Abstracts Service number
MSDS – Material Safety Data Sheet
OSHA - U.S. Occupational Safety and Health Administration
PPE – Personal protection equipment

References

OSHA homepage
Code of Federal Regulations, Title 29, Part 1910.1200