

UNDERSTANDING & INTERPRETING MATERIAL SAFETY DATA SHEETS

Introduction to Understanding MSDS's

Material Safety Data Sheets contain all of the basic data needed to work safely with the chemicals they cover. They can be in any format as long as they contain the required information. Your employer serves as collector of MSDS's and has little control over the format and contents. Some MSDS's will be very complicated and thorough, others may not be. The key to using MSDS's is to learn how to separate the "wheat from the chaff" and concentrate on the information that affects your health or endangers coworkers or the general public.

The information required on MSDS's is listed in part one. For the balance of this guide, we will dissect and explain OSHA 174. A format that contains all of the required information. While other formats may be different the information will be pretty much the same.

Material Safety Data Sheet

May be used to comply with
OSHA's Hazard Communication Standard,
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor

Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)

Note: Blank spaces are not permitted, if any item is not applicable, or no information is available, the space must be marked to indicate that.

Identity

The first important piece of information found on the MSDS is the identity of the material for which the MSDS is created. This name ties back to the label and the chemical hazards list allowing us to keep track of the material through all the aspects of the Hazard Communications Program. It is also a way for us to access other information from other sources about the material. It can be the common name (Gasoline), trade name (Ultra Miracle Goop 6000) or a chemical name. Most likely it will be either a common or trade name.

Section I	
Manufacturer's Name	Emergency Telephone Number
Address (Number, Street, City and ZIP Code)	Telephone Number for Information
	Date Prepared

Section I

Section I contains information on the manufacturer (or importer) including name and address. Of major importance for employee protection are phone numbers for general information and emergencies. Should a problem arise these numbers can provide instant health, safety and spill control information to employers, employees and emergency rescue and health care professionals.

The date prepared is important since components in compounds change frequently. The date tells you whether the data sheet you have is the most current.

Section II -- Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity: Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)

Section 2

Section 2 carries information on chemicals contained in the substance covered by the MSDS. While it could be a single chemical most products are compounds. Each component should be listed by chemical identity and common name as Carbon Dioxide (chemical) and dry ice or Carbonic Acid (common name) or Calcium Oxide (chemical) and Lime, Burnt Lime, or Quicklime (common name). This information helps you and your employer reference other sources of information.

Following material names is the OSHA PEL which is short for the Permissible Exposure Level. A number here means that OSHA has established a PEL for the product. A PEL is a determination based on scientific evidence that long term exposure of 8 hours per day, 40 hours per week, for a working lifetime below this level is not considered harmful. PEL's are expressed in PPM, mg/M3 or f/cc.

PPM is short for parts per million and is generally used for gases. Oxygen is present in normal air at a concentration of 210,000 parts per millions. Carbon monoxide has a PEL of 50 parts per million.

mg/M3 stands for milligrams per cubit meter of air. One milligram is equal to .000035 ounce. A cubic meter equals about 1.3 cubic yards. F/cc stands for fibers per cubic centimeter of air. A cubic centimeter is equal to about .06 cubic inch.

Another abbreviation used is TLV which stands for Threshold Limit Values. TLV is similar in concept to PEL except it is established by a source outside OSHA regulations primarily the American Conference of Industrial Hygienists (ACIGH). Like a PEL it establishes a level below which long term working exposures are not currently considered harmful.

The manufacturer or importer has the ability to set any limits felt to be prudent.

The concentration of chemical in the air of any of these amounts is determined by monitoring the air and laboratory analysis of the routes.

On Form 174 manufacturers have the option of giving you the percentage each chemical is of the total. This can serve as a rough guide as to how much of any given substance could possibly be present in your work area.

Section III -- Physical/Chemical Characteristics		
Boiling Point		Specific Gravity (H ₂ O = 1)
Vapor Pressure (mm Hg.)		Melting Point
Vapor Density (AIR = 1)		Evaporation Rate (Butyl Acetate = 1)
Solubility in Water		

Appearance and Odor

Section 3

Section 3 is for Physical and Chemical Characteristics. Much of the information contained in this section is extremely important to your protection. Information found in Section 3 includes:

1. Boiling point: the temperature at which a liquid begins to turn into a gas. This information will help you determine effect of temperature on the item.
2. Vapor Pressure: the pressure exerted by gases in closed areas. It is effected by temperature.
3. Vapor density: the relationship of the density of a gas to air. Gases with vapor density greater than one are heavier than air. Those with densities less than one are lighter. This will tell you whether gases released will collect in high spots or low spots of a structure or excavation.
4. Specific Gravity: the relationship of a liquid to water. Liquids with specific gravities less than one float on water, those with values greater than one sink to the bottom.
5. Melting point: the temperature at which a solid turns into a liquid.
6. Evaporation rate: the ratio of the time it takes one liquid to evaporate when compared to a base of Butyl Acetate. Numbers greater than one evaporate slower, those less than one, faster.
7. Solubility in water tells you whether or not a substance will dissolve in water.
8. Appearance and odor: two keys in helping you recognize the presence of a chemical.

Section IV -- Fire and Explosion Hazard Data			
Flash Point (Method Used)	Flammable Limits	LEL	UEL
Extinguishing Media			
Special Fire Fighting Procedures			
Unusual Fire and Explosion Hazards			

Section 4

Not all hazardous chemicals present in our workplaces have effects related to their normal use. Many are effected by other possible conditions. For example, we need information on fires and explosions to properly handle some materials.

Flash Point is the lowest temperature at which a liquid will give off enough vapor to form an ignitable mixture in the presence of air and a source of ignition. Chemicals with lower flashpoints are more dangerous from a fire standpoint than those with higher flashpoints.

Whether or not liquids above the flash point give off vapors in ignitable contents depends on the presence of oxygen in proper portion to the flammable vapor. If there is too little vapor in the air a mixture will not ignite. This is known as the LEL (Lower Explosive Limit). If there is too much vapor, ignition will also not occur. This condition is the UEL (Upper Explosive Limit). Both these numbers represent % of vapor in the air.

Also included in this section is information on fighting fires. Water is not appropriate for all fires. Some chemicals require dry chemical or other methods to put out their fires safely. If there are any special ways of dealing with the chemical fire or any unusual hazards, they are defined here.

Section V - Reactivity Data			
Stability	Unstable		Conditions to Avoid
	Stable		
Incompatibility (<i>Materials to Avoid</i>)			
Hazardous Decomposition or Byproducts			
Hazardous Polymensation	May Occur		Conditions to Avoid
	Will Not Occur		

Section 5

Section 5 contains data on how the subject chemical reacts to other chemicals and conditions to avoid. Information contained in this section is key to your protection from chemical hazards.

Chemicals are classed as either stable or unstable depending on their ability to change form. Unstable chemicals require more handling care because of their changeability. Even relatively stable chemicals can change under certain conditions. The MSDS will tell you what conditions to avoid.

In addition certain materials are incompatible, that is, don't get along with each other. When one chemical contacts another and they are incompatible, severe health hazards can occur. What you are using may be totally harmless until mixed with another chemical. The MSDS will tell you what other chemicals to avoid.

Sometimes products (particularly unstable ones) decompose or produce hazardous byproducts under certain conditions. MSDS will tell you what materials are possible and under what conditions the change can occur.

Polymerization deals with different forms of the same basic product. Some chemicals are harmless in their basic form but can polymerize (change) into hazardous forms. MSDS tells you whether this can occur and provides advice on what to avoid.

Section VI - Health Hazard Data

Route(s) of Entry: Inhalation? Skin? Ingestion?

Health Hazards (Acute and Chronic)

Carcinogenicity: NTP? IARC Monographs? OSHA Regulated?

Signs and Symptoms of Exposure

Medical Conditions
Generally Aggravated by Exposure

Emergency and First Aid Procedures

Section 6

Health Hazard data tells us about effects of the chemicals we are exposed to. In order for chemicals to hurt us they must gain entrance to our body. This route of entry can be through the skin, by breathing or through the mouth into the digestive tract.

Knowing how a chemical gains entry to our system is a key to protecting ourselves from adverse effects. Respirators provide protection against inhalation. Special clothing provides protection for skin absorption. Good hygiene habits protect against ingestion.

Form 174 also tells us what health hazards can occur from overexposure. Health hazards are separated into acute effects: severe, which occur rapidly or chronic which are persistent and develop over time, generally with continued exposure.

Carcinogenicity is the potential of a chemical to cause cancer. Research into the possibility that any given chemical may cause cancer is conducted by a number of organizations. Two referenced agencies in Form 174 are NTP (National Toxicology Program) and IARC (International Agency for Research on Cancer). Some of the better known, common chemicals with the potential to cause cancer are already regulated by OSHA.

Every chemical has signs and health symptoms for exposure. Knowing what those are helps protect us from injury. Being able to recognize these signs is important in limiting exposure.

Exposure to chemicals can aggravate existing medical conditions. Chemicals that might not be harmful to a healthy person can make existing problems worse. This data sheet format tells you what existing health problems might be worsened by exposure to the substance.

Standard First Aid Courses are not designed to deal with specific chemical exposures. MSDS's contain information for emergency and first aid procedures for the specific chemical involved. Your knowledge of the information is vital to the protection of you and your co-workers should a hazardous exposure occur.

Section VII - Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

Waste Disposal Method

Precautions to Be Taken in Handling and Storing

Other Precautions

Section 7

Precautions for Safe Handling and Use are outlined in Section 7. MSDS's contain information on how to handle spills or other releases of covered materials. We all have a responsibility to protect the general public and the environment, as well as, ourselves. We cannot assume that spills are harmless. We must follow the cleanup steps outlined in the MSDS's including those for waste disposal, handling and storing.

Section VIII -- Control Measures

Respiratory Protection (Specify Type)

Ventilation	Local Exhaust	Special
	Mechanical (General)	Other

Protective Gloves

Eye Protection

Other Protective Clothing or Equipment

Work/Hygienic Practices

Section 8

Along with knowing conditions to avoid, control measures are extremely important to our protection. This section tells us whether or not we need respiratory protection and what kind is required. The wrong style or type can be worse than none at all. Control measures can also include exhaust systems and other ventilation techniques.

The kinds of personal protective equipment and protective clothing are also spelled out under control measures. Personal protective equipment protects our person but only if we use it. It is essential we use all the equipment and special clothing called for in the MSDS.

The last item on the MSDS lists work and hygiene practices to be followed.

MSDS's in General

MSDS's contain a lot of useful information. Three problem areas in their use face you and your employer.

The first is non standardization of format. Contractors do not have the ability and are not required to generate MSDS's. Manufacturers and importers must furnish them but can do so in any format they choose. The information must include the items outlined in part one of this document but it can be arranged in countless ways. Standardization would make our task easier. The bottom line is if there is anything you don't understand on an MSDS ask your supervisor for help!

The second problem area has to do with complexity. Manufacturers and importers are required to develop and provide the information. Some provide the bare minimum, others are overwhelming in detail. Each sheet must be carefully analyzed to separate "wheat from the chaff." Chemicals with long detailed sheets of information cannot automatically be assumed to be hazardous nor can chemicals with little information be assumed to be safe. A careful assessment of the data must be made no matter how or to what detail the information is presented.

The third problem area is trade screen. Manufacturers can legally refuse to furnish information by claiming trade secret status. As end users of chemicals contractors are more concerned about hazards than proprietary makeup. Information not available to you or your employer is still required to be furnished to medical professionals.

KEYS TO MSDS USE

1. If you don't understand - **ASK**.
2. Always know where they are kept for your work area.
3. Refer to them before using any product for the first time.
4. Review them anytime a question arises and you are not sure of the answer.
5. Always follow the instructions given on MSDS's for safe working with chemicals.