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| Trent University |
| Hazardous Materials Identification |
| A guide to hazardous materials nomenclature, vocabulary and what they mean. |
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| **TrentEmployee** |
| **4/2/2013** |

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| This is a guide to understanding nomenclature and vocabulary use in hazardous materials information systems (like MSDS sheets, toxicological information). This guide should be used in conjunction with the Science Safety Program Core Principles document and the Chemical Use, Storage, Spills and Waste document |

**Preamble**

The Hazardous Material Identificiation Guide is a guidance document to help supervisors and workers identify hazardous materials in a science setting. While many materials are obvious and well known hazards, many are not, and often the hazards can be subtle on the surface but have the potential for catastrophic results. The guide should provide a tool to help everyone identify hazardous material as part of the Science Safety Program.

This guide forms an integral part of the Science Health and Safety Program as outlined in the Science Health and Safety Program core document. It should be reviewed be anyone who has responsibility for laboratory health and safety. This is not an exhaustive review of WHMIS or MSDS, but the information offered can assist supervisors in identify hazardous material and interpreting information in a MSDS. Supervisors are responsible for ensuring that Hazardous material are identified for their personnel, and proper safety controls are in place to mitigate the risk of injury.

**1.0 Hazardous Material Identification Guide**

**1.1 Identifying Potential Hazards**

**1.1.a Workplace Hazardous Materials Information System**

Identifying the potential hazards can often be difficult and especially with chemicals can be time consuming. The Workplace Hazardous Materials Information System (WHMIS) is a legislated program that is applicable to all Trent University employees and students who work in areas where hazardous materials are used. The purpose of this legislation is to ensure that everyone in a workplace is provided with the information needed to identify hazardous materials and to take the appropriate precautions when working with these materials. WHMIS accomplishes this through the use of warning labels, Material Safety Data Sheets (MSDSs) and training on how to use the information provided.

**Labels**

The label is the primary source of hazard information. The requirements for label content are dependent upon whether the container is from a supplier or a workplace, and whether the hazardous material is a laboratory product, a sample for analysis or neither.

**Supplier Labels**

A supplier label is required for containers from the supplier containing 100 mL or more of the material. Supplier labels must contain the following information in both English and French and be enclosed by a distinctive border coloured to contrast with the background of the label:

Product identifier or name

Supplier identifier (supplier’s name)

Reference to the MSDS

Hazard symbol(s)

Risk phrase(s) (description of the main hazards of the product)

Precautionary measures

First aid measures

Supplier labels for materials sold in a container with less than 100 mL do not require risk phrases, precautionary measures or first aid measures to be included.

**Laboratory Labels**

Laboratory supplies transferred to a container other than the original, and for use only in the laboratory where the transfer took place, need to be labelled with the product identifier only.

Laboratory samples being submitted for analysis outside of the university community where the container holds less than 10 kg, require a label and may require Transportation Dangerous Goods documentation. At the very least the following information should be provided on the container itself.

Product identifier

Chemical or generic name of any hazardous ingredient

Name of the person submitting the sample

Emergency telephone number of the submitter

The statement "Hazardous Laboratory Sample. For hazard information call ........"

Samples prepared for analysis in the laboratory where the analysis will take place, that remain under the control of the researcher producing the sample, and that will remain within the laboratory where produced, need to be labelled with the product identifier only.

**Material Safety Data Sheets**

MSDSs (Material Safety Data Sheets) provide detailed information about physical, chemical and toxicological properties and hazards, as well as recommended handling and emergency procedures. Material Safety Data Sheets must be reviewed and/or revised by the supplier at least every three years. Unexpired MSDSs are to be readily available for all controlled products on site. Up-to-date, electronic MSDSs are available from Vendor websites. Supervisors are to ensure that laboratory personnel are aware of and able to readily access. Laboratory personnel are strongly encouraged to regularly review MSDSs for all hazardous materials being used.

**Training**

Training is required to provide detailed instruction on the job specific procedures necessary to carry out the work safely, as well as provide the basis for proper interpretation of hazard information provided on labels and MSDSs. Generic WHMIS training is provided via in-class and online formats through the Risk Management Office.

**Understanding hazard warning information**

 **WHMIS Symbols**

The classes of controlled chemical products and their corresponding symbols or pictograms, as well as general characteristics and handling precautions are outlined in Table 1.

Table 1 Summary of WHMIS classes, their associated characteristics and proper handling and storage procedures

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| Symbol | Name and Class | Risks | Precautions |
|  | Compressed GasesClass A | Materials which are normally gaseous kept in a pressurized container-could explode due to pressure-could explode if heated or dropped-possible hazard from both the force of explosion and the release of contents | Ensure Container is always secured-store in appropriate designated areas-do not drop or allow to fall |
|  | Flammable andCombustible Class B | Materials which will continue to burn after being exposed to a flame or other ignition source-may ignite spontaneously-may be a material which will release flammable products if allowed to degrade or when exposed to water | Store in properly designated areasWork in well ventilated areas-avoid heating-avoid sources of sparks/flames-ensure electrical sources are safe |
|  | Oxidizing MaterialClass C | Materials which can cause other materials to burn or support combustion-can cause skin or eye burns-increase fire and explosion hazard-may cause combustibles to explode or react violently | Store in areas away from combustiblesWear body, hand, face and eye protection- store in proper containers which will not rust or oxidize |
|  | Toxic Immediate and SevereClass D, division 1 | Poisons/Potentially fatal materials which cause immediate and severe harm-may be fatal if ingested or inhaled-may be absorbed through the skin-small volumes have toxic effect | Avoid breathing dust or vapoursAvoid contact with skin or eyes-wear protective clothing which is effective against fumes and vapours-wear face and eye protection-work in well ventilated areas and wear breathing protection |
|  | ToxicLong TermConcealedClass D, division 2 | Materials which have harmful effects after repeated exposures or over long periods of time-may cause death or permanent injury-may cause birth defects or sterility-may cause cancer-maybe sensitizer causing allergies | Wear appropriate PPEWork in a well ventilated area-Store in appropriate designated areas- avoid direct contact-use hand, body, face and eye protection-Ensure respiratory and body protection is appropriate for the specific hazard |
|  | BiohazardousInfectiousClass D, divisioin 3 | Infectious agent or a biological toxin causing a serious disease or death-may cause anaphylactic shock-includes viruses, yeasts. Moulds, bacteria and parasites which affect humans-includes fluids containing toxic products-includes cellular components | Special training required work in designated biological areas with appropriate engineering controls-avoid forming aerosols-avoid breathing vapours-avoid contamination of people/areas-store only in special designated areas |
|  | CorrosiveMaterialsClass E | Materials which react with metals and living tissue-eye and skin irritation on exposure-severe burns/tissue damage on longer exposures-lung damage if inhaled-environmental damage from fumes | Wear body, face, and eye protectionUse breathing apparatus-ensure protective equipment is appropriate-work in well ventilated area-avoid all direct body contact-use appropriate storage containers and ensure proper non-venting closures |
|  | Dangerously ReactiveClass F | Materials which may have unexpected reactions-may react with water-may be chemically unstable-may explode if exposed to shock or heat-may release toxic or flammable vapours-may vigorously polymerize-may burn unexpectedly | Handle with care avoiding vibrationShocks and sudden temperature changes -Store in appropriate containers-ensure storage containers are sealed-store and work in designated areas |

Other commonly used Hazard symbols

Laser Radiation

**Toxicological properties: LD50 AND LC50**

Exposure to hazardous materials can occur by:

absorption;

ingestion;

inhalation; or

injection/subcutaneous.

LD50 and LC50 values are commonly used measurements for the toxicity of a substance.

LD50 (Lethal Dose50) is the amount of a substance that, when administered by a defined route of entry (e.g. oral or dermal) over a specified period of time, is expected to cause the death of 50% of a population. The LD50 is usually expressed as weight of test substance per kilogram of body weight (mg/kg or g/kg).

LC50 (Lethal Concentration50) is the concentration of a substance in air or water (depending on the test population) that, when administered by inhalation over a specified period of time, is expected to cause death in 50% of a population. The LC50 is usually expressed as parts of test substance per million parts of air/water (ppm) for gases and vapours, or as milligrams per litre or cubic metre of air (mg/L or mg/m3) for dusts, mists and fumes. Note that the lower the LD50 or LC50, the more toxic the material. For example sodium chloride (table salt) has an LD50 (oral, rat) of 3000 mg/kg and sodium cyanide has an LD50 (oral, rat) of 6.4 mg/kg.

**1.1.b Exposure values (TWAEV, STEV, CEV) Occupational Health and Safety Act**

Exposure values are established concentrations that, if not exceeded, will not generally cause adverse health effects to the person exposed. Exposure values can be expressed as the following:

***TWAEV (8-hour Time-Weighted Average Exposure Value)***: average concentration to which most workers can be exposed during an 8-hour workday, day after day, without adverse effects

***STEV (Short-Term Exposure Value)***: maximum average concentration to which most workers can be exposed over a 15 minute period, day after day, without adverse effects

***CEV (Ceiling Exposure Value)***: the concentration that must never be exceeded (applies to many chemicals with acute toxic effects)

**1.1.c Flammability and Stability**

**Flash point**

Flash point is the lowest temperature at which a liquid produces enough vapour to ignite *in the presence* of an ignition source. The lower the flash point of a substance, the greater the fire hazard. Common laboratory solvents such as acetone, toluene, acetonitrile and methanol all have flash points that are below room temperature.

**Auto-ignition temperature**

Auto-ignition temperature is the temperature at which a material will ignite, *in the absence* of an ignition source. The lower the autoignition temperature of a substance, the greater the fire hazard.

**1.1.d Flammable limits**

Flammable or explosive limits are the range of concentrations of a material in air that will burn or explode in the presence of an ignition source. Explosive limits are usually expressed as the percent by volume of the material in air:

***LEL (lower explosive limit) or LFL (lower flammable limit)***: lowest vapour concentration that will burn or explode if ignited. Below this limit the concentration of fuel is too "lean" for ignition, i.e., the mixture is oxygen rich but contains insufficient fuel.

***UEL (upper explosive limit) or UFL (upper flammable limit)***: highest vapour concentration that will ignite. Above this limit, the mixture is too "rich" for ignition i.e. the mixture contains enough fuel, but insufficient oxygen.

The flammable range consists of concentrations between the LEL and the UEL.

Table 2 Flashpoints, lower explosive limts, autoignition temperatures and exposure limits of several flammable or combustible laboratory solvents.

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| --- | --- | --- | --- | --- |
| Solvent | Flash Point \* (°C)  | LEL \* (% by volume)  | Autoignition temp\*\* (°C)  | TWAEV \* (ppm)  |
| acetic acid, glacial  | 39  | 4.0  | 427  | 10  |
| Acetone  | -18  | 2.5  | 465  | 250  |
| acetonitrile  | 5.6  | 3.0  | 524  | 20  |
| diethyl ether  | -45  | 1.9  | 160  | 400  |
| ethanol, absolute  | 13  | 3.3  | 363  | 1000  |
| ethyl acetate  | -4.4  | 2.0  | 426  | 400  |
| methanol  | 11  | 6.0  | 464  | 200  |
| n-pentane  | -49  | 1.5  | 260  | 120  |
| TWAEV – 8 Hour Time Weighted Average Exposure Value LEL – Lower Explosive Limit \*NIOSH Pocket Guide to Chemical Hazards, NIOSH publication number 2005-151 \*\* Corresponding MSDS  |