Brown University is required by the Occupational Safety and Health Administration (OSHA) to provide access to Material Safety Data Sheets (MSDS’s) to all affected employees as a result of the Hazard Communication Standard, 29 CFR 1910.1200, and the standard for Occupational Exposure to Hazardous Chemicals in Laboratories (a.k.a. Laboratory Standard), 29 CFR 1910.1450. Hence, Brown University prepared this MSDS User Guide to help employees understand the general format and content of an MSDS.

The purpose of an MSDS is to provide safety data about a specific hazardous substance. A typical MSDS provides physical data and other information as specified by OSHA. A manufacturer or importer must generate an MSDS for each hazardous substance covered by the OSHA Hazard Communication Standard. The following information is typically contained:

- Chemical and Product & Company Information
- Composition / Information on Ingredients
- Hazard Identification
- First Aid Measures
- Fire Fighting Measures
- Accident Release Measures
- Handling and Storage
- Exposure Controls / Personal Protection
- Physical and Chemical Properties
- Stability and Reactivity
- Toxicology Information
- Ecological Information
- Disposal Considerations
- Transportation Information
- Regulatory Information
- Other Information

The above listed information is typically organized into eight (8) sections as follows:

**Section I – Chemical/Product & Company Information**

The following information is contained within Section I of a typical MSDS:

- Trade name used on the product label and Brown University maintained inventory listing.
- Manufacturer's name, address, and emergency telephone number.
- Preparation and revision dates are provided so the product user can maintain the most up to date MSDS’s.

**Section II – Hazardous Ingredients/Identity Information**

For a hazardous chemical mixture that has been tested as a whole to determine its hazards, the chemical and common names of the ingredients that are associated with the hazards, and the common name of the mixture must be listed.

If the chemical is a mixture that has not been tested as a whole the chemical and common names of all ingredients determined to be health hazards and comprising 1 percent or greater of the composition must be listed.

Chemical and common names of carcinogens must be listed if they are present in the mixture at levels of 0.1 percent or greater.

All components of a mixture that have been determined to present a physical hazard must be listed.

Chemical and common names of all ingredients determined to be health hazards and comprising less than 1 percent (0.1 percent for carcinogens) of the mixture must also be listed if they can still exceed an established Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) or present a health risk to exposed employees in these concentrations.
Section III – Physical and Chemical Characteristics

The physical and chemical characteristics of the hazardous substance must be listed. These include items such as boiling and freezing points, density, vapor pressure, specific gravity, solubility, volatility, and the product's general appearance and odor. These characteristics provide important information for designing safe and healthful work practices.

The Office of Environmental Health & Safety considers these properties as well as how you work with a hazardous material to evaluate the risks, which vary greatly depending on how a material is used.

- **Boiling Point** – The temperature at which the vapor pressure of a liquid is equal to the applied pressure; also the condensation point
- **Freezing Point** – (a.k.a. Melting Point) is the temperature at which its crystals are in equilibrium with the liquid at atmospheric pressure.
- **Density** – Mass per unit Volume: \( D = \frac{M}{V} \)
- **Specific Gravity** – The ratio of the density of a substance to the density of water.
- **Solubility** – The tendency of one substance to blend uniformly with another.
- **Volatility** – The tendency of a solid or liquid material to pass into the vapor state at a given temperature.
- **Vapor Pressure** – a measure of a liquid's tendency to evaporate.
- **Vapor Density** – vapor or gas lighter or heavier than air.
- **Appearance and Odor** – depending upon your senses to detect or identify hazardous materials is like playing Russian roulette.

Section IV – Fire and Explosion Hazard Data

The compound's potential for fire and explosion must be described. Also, the fire hazards of the chemical and the conditions under which it could ignite or explode must be identified. Recommended extinguishing agents and fire-fighting methods must be described.

- **Flash Point** – is the lowest temperature at which a liquid gives off enough vapors, which when mixed with air, can be easily ignited by a spark. The lower the flash point, the greater the risk of fire or explosion. Remember it's the vapors that burn, not the liquid.

Section V – Reactivity

Reactivity, in this context, is the tendency for a material to chemically change or breakdown and to become more dangerous. This section presents information about other chemicals and substances with which it reacts. Information on any hazardous decomposition products, such as carbon monoxide, must be included. Precautions to be aware of include:

- Conditions to Avoid – such as light or heat
- Materials to Avoid – for example: sodium and water will react vigorously to generate hydrogen, creating a fire hazard

Section VI – Health Hazard Data

The acute and chronic health hazards of the chemical, together with signs and symptoms of exposure, must be listed. In addition, any medical conditions that are aggravated by exposure to the compound, must be included. The specific types of chemical health hazards defined in the standard include carcinogens, corrosives, toxins, irritants, sensitizers, mutagens, teratogens, and effects on target
organs (i.e., liver, kidney, nervous system, blood, lungs, mucous membranes, reproductive system, skin, eyes, etc.).

The route of entry section describes the primary pathway by which the chemical enters the body. There are three principal routes of entry: inhalation, skin, and ingestion.

This section of the MSDS supplies the OSHA PEL, the ACGIH TLV, and other exposure levels used or recommended by the chemical manufacturer.

If OSHA, the National Toxicology Program (NTP), or the International Agency for Research on Cancer (IARC) lists the compound as a carcinogen (cancer-causing agent) the following information must be indicated on the MSDS.

- **Routes of Entry** – How a hazardous material can enter your body. The four routes of entry are Inhalation, Skin Absorption, Injection and Ingestion.
- **Short-Term Health Effects (Acute)** – symptoms may be felt immediately after the first brief contact, like: burn, watery eyes, sore throat
- **Long-Term Health Effects (Chronic)** – symptoms may be felt after repeated contact with the same hazardous material over a long period of time
- References that list a chemical as a carcinogen or potential carcinogen

If you need health hazard information that is not on an MSDS, contact the Office of Environmental Health & Safety at (x3-3353).

**Section VII – Precautions for Safe Handling and Use**

The standard requires the preparer to describe the precautions for safe handling and use. These include recommended industrial hygiene practices, precautions to be taken during repair and maintenance of equipment, and procedures for cleaning up spills and leaks. Some manufacturers also use this section to include useful information not specifically required by the standard, such as EPA waste disposal methods and state and local requirements.

- **Spill and Leak Procedures** – The Office of Environmental Health & Safety can advise you on specific procedures and recommend protective equipment. For spills of 100 ml's or more of non-acute hazardous chemicals or any quantity of an acute hazard please contact EHS at x3-3353. If you are concerned about any spill clean-up procedures contact EHS immediately.
- **Waste Disposal** – Contact the Office of Environmental Health & Safety, at x3-1610 or x3-3353 for hazardous waste information.

**Section VIII – Control Measures**

The standard requires the preparer of the MSDS to list any generally applicable control measures. These include engineering controls, safe handling procedures, and personal protective equipment. Information is often included on the use of goggles, gloves, body suits, respirators, and face shields.

The Office of Environmental Health & Safety can answer specific questions regarding ventilation and personal protective equipment for normal working conditions and emergencies. Suitable control measures are based on how a material is used.