

Chemical Safety

29 CFR 1910.119



Chemical Safety

- Classification of chemical accidents
- Occurrence of Chemical Accidents
- Types of chemical intake
- List of hazardous chemicals
- Effects of chemicals in human body
- Labeling procedures & requirements
- Emergency Procedures
- Training
- MSDS

Classification of Chemical Accidents

Chemical Accidents can be classified into 2 types

- Spillage
- Leakage



Occurrence of Chemical Accidents

Chemical Accidents may occur during

- Handling
- Storage
- Transportation



Types of Chemical Intake

1. Injection
2. Inhalation
3. Swallowing
4. Skin Contact



Hazardous Chemicals

- Ammonia
- Argon
- Chlorine
- Hydrogen Sulfide
- Sulphuric Acid
- Nitric Acid
- Hydro Chloric Acid
- Carbon Monoxide
- Methyl Iso Cyanate
- Toluene

Effects of chemicals in human body

- Chemical effects in human body differ from the way they enter.
- Generally effects will be quicker if it enters through lungs.
- The exact information's regarding chemical effects can be found detail in MSDS.

Labeling Of Chemicals

Several types of chemicals are used in industries, such as *Flammable, Corrosive & Toxic chemicals*. It has to be clearly identified by proper labeling.

Labeling Of Chemicals

- Properly label all chemicals in *full English name*.
- *Don't* include any *chemical symbols or structures*.
- Always include *emergency planning & preparedness*.
- Include *Physical, Chemical & Reactivity hazards* associated with chemicals.
- Include *safe handling procedures*.
- *PPE's* required to handle the chemicals.



Emergency Procedures For Chemicals

1. Evacuate
2. First Aid
3. Isolate
4. Report
5. Secure
6. Response



Evacuate

- As you leave an area involved in a chemical spill, assist people exiting the area. Never enter a chemical spill area where you may place your health in risk - call ECN for assistance.
 - *Evacuate personnel from the spill area.*
 - *Shut off equipment as you leave the area.*
 - *Direct personnel to nearest fire exit. Do not use elevators.*
 - *Attend to victims.*
 - *Alert neighbouring laboratories.*
- DO NOT go back in to an area where a chemical spill has occurred! Untrained rescuers not wearing proper protective equipment have been overcome by toxic or asphyxiating fumes trying to rescue other victims, and died as a result.

First Aid

- *Remove victims* from spill area to fresh air (but do not endanger your own life by entering areas with toxic gases).
- Immediately *remove contaminated clothing*. Flush skin or eyes with *running water for 15 minutes*.
- Get *medical attention* for victims.

Isolate

- Isolate area.
- Open windows, if possible without exposing yourself to fumes.
- If vapours or gases are in room that is not vented to outside of building, close off room.

Report

- For spills that involve injury requiring medical treatment
- For spills that involve fire or explosion hazards
- For spills which are potentially life threatening
- For all chemical spills after work hours

Secure

- *Lock doors* leading to the chemical spill and post signs on doors warning of the spill.
- *Post staff* by commonly used entrances to the spill site, so they can warn people to use other routes.
- For large outdoor chemical spills, keep people *Crosswind* from the site.

Response

You may have to clean up low hazardous spills for which you have proper training and proper protective equipment.

Training

- Training on chemical safety must be targeted to First Responders, Emergency Response Team Members, Fire Fighters & Incident Controller.
- Training must include
 - How to read the MSDS?
 - What to do & what not to do incase of chemical emergency?
 - Activation of Emergency Response Plan
 - Evacuation & Rescue Operation
 - Rehabilitation

Exposure Limit

- Exposure limit for humans can be explained by following terms,

1. AEL – Annual Exposure Limit (or)
PEL – Permissible Exposure Limit
2. TLV – Threshold Limit Value
3. TWA – Time Weighted Average
4. STEL – Short Time Exposure Limit
5. C – Ceiling Limit
6. LC50 – Lethal Concentration 50
7. LD50 – Lethal Dosage 50

TLV

- The TLV for chemical substances is defined as a *concentration in air*, typically for inhalation or skin exposure.
- Its units are in *parts per million (PPM)* for gases and in *milligrams per cubic meter (mg/m³)* for particulates such as dust, smoke and mist.

TLV

- **TWA** – Average exposure on the basis of a *8h/day, 40h/week* work schedule
- **STEL** – Spot exposure for a duration of *15 minutes*, that cannot be repeated more than 4 times per day
- **C** – absolute exposure limit that should not be exceeded *at any time*

LC_{50} & LD_{50}

- LC stands for "*Lethal Concentration*".
- LC_{50} is the concentration of the chemical in air that kills 50% of the test animals in a given time (*usually four hours*) is the LC_{50} value.
- LD stands for "*Lethal Dose*".
- LD_{50} is the amount of a material, given *all at once*, which causes the death of 50% (one half) of a group of test animals.

TREM Card



SULPHURIC ACID

ICSC: 0362

CAS # 7664-93-9
 RTECS # WS5600000
 ICSC # 0362
 UN # 1830
 EC # 016-020-00-8

Oil of vitriol
 H_2SO_4
 Molecular mass: 98.1

HAZARD SYMBOLS
 Consult national legislation

TYPES OF HAZARD/ EXPOSURE	ACUTE HAZARDS/ SYMPTOMS	PREVENTION	FIRST AID/ FIRE FIGHTING
FIRE	Not combustible. Many reactions may cause fire or explosion.	NO contact with flammable substances.	NO water.
EXPLOSION			In case of fire: keep drums, etc., cool by spraying with water but NO direct contact with water.
EXPOSURE		AVOID ALL CONTACT!	IN ALL CASES CONSULT A DOCTOR!
☐ Inhalation	Sore throat, cough, laboured breathing.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest, half-upright position, artificial respiration if indicated, and refer for medical attention.
☐ Skin	Pain, serious skin burns.	Protective gloves, protective clothing.	Remove contaminated clothes, rinse skin with plenty of water or shower, and refer for medical attention.
☐ Eyes	Pain, severe deep burns.	Face shield or eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
☐ Ingestion	Severe pain, vomiting, shock.	Do not eat, drink, or smoke during work.	Rinse mouth, give plenty of water to drink, do NOT induce vomiting, and refer for medical attention.
SPILLAGE DISPOSAL		STORAGE	PACKAGING & LABELLING
Evacuate danger area, collect leaking liquid in sealable containers (extra personal protection: complete protective clothing including self-contained breathing apparatus).		Separated from other materials (see Notes), store in stainless steel containers.	Unbreakable packaging; put breakable packaging into closed unbreakable container. UN Haz Class: 8 UN Pack Group: II FURTHER INFORMATION ON LABELLING: <i>Consult national legislation</i>

Nitrogen Purging

Nitrogen purging is an industry standard technique for the replacement of a hazardous or undesirable atmosphere with an inert dry atmosphere.



Scrubber

Scrubber systems are a diverse group of air pollution control devices that can be used to remove some particulates and/or gases from industrial exhaust streams.

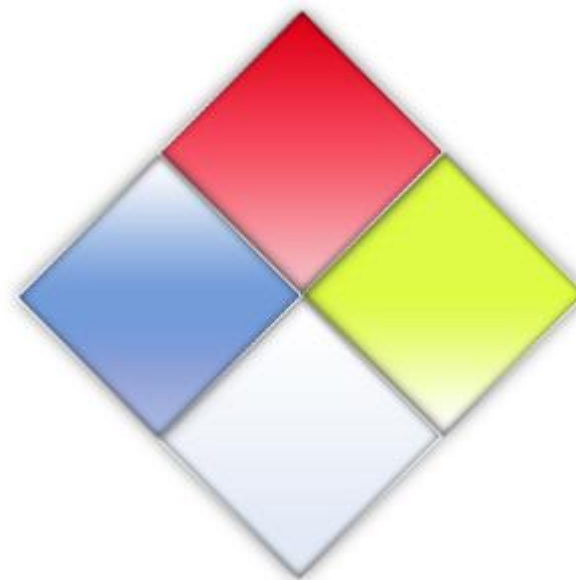


In case of Spillage



MSDS – Material Safety Data Sheet

- A ***Material Safety Data Sheet*** (MSDS) is a form with data regarding the properties of a particular substance.

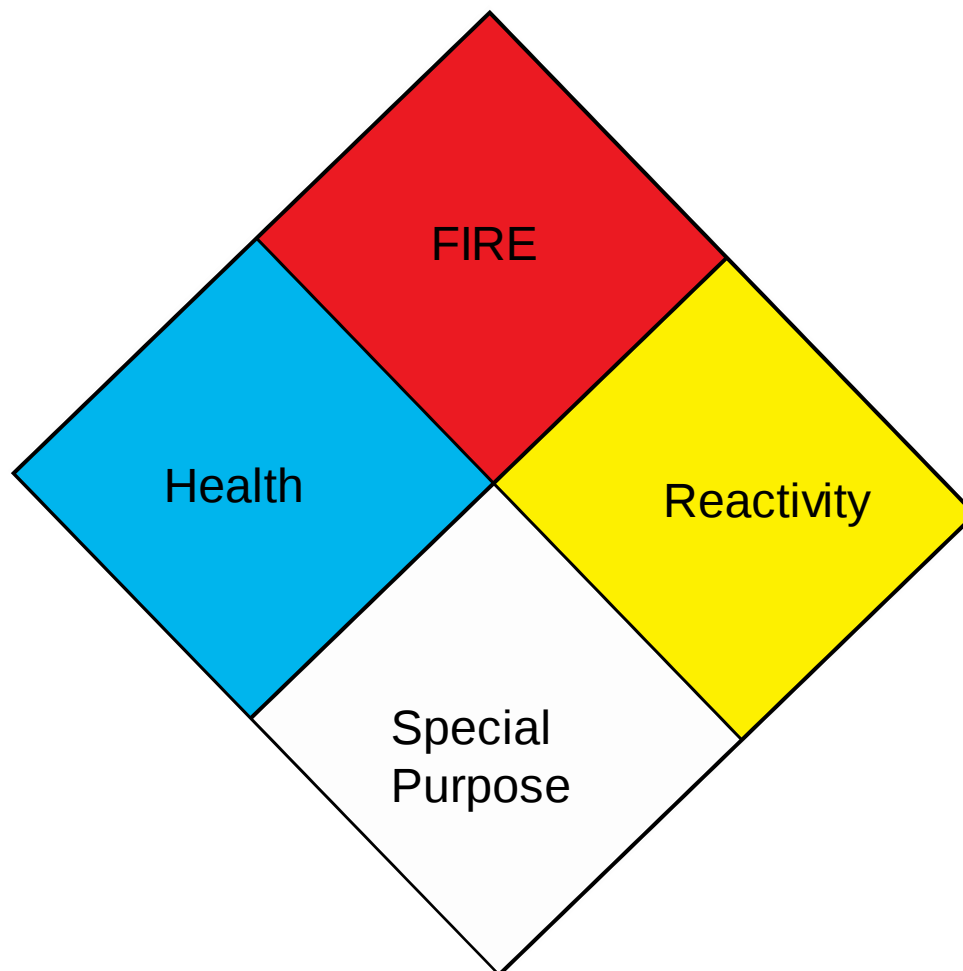


MSDS
Material Safety Data Sheets

MSDS

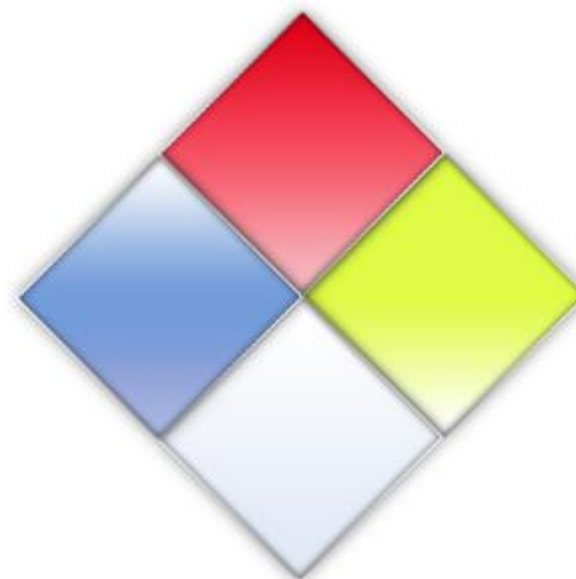
- A MSDS will have
 - Chemical composition
 - Physical properties
 - Boiling point & Freezing point
 - Vapor Density
 - pH Value
 - Auto Ignition Temperature, LEL & UEL
 - Fire diamond/Hazard diamond
 - Environmental data
 - Handling & storage
 - Fire fighting measures & First aid measures
 - Emergency response during spillage/leakage

MSDS – Hazard Diamond



MSDS

- **Health hazard** (blue section)
Denotes relative hazard to human life 0 - Normal material
 - 1 - Slightly Hazardous
 - 2 - Hazardous
 - 3 - Extreme Danger
 - 4 - Deadly



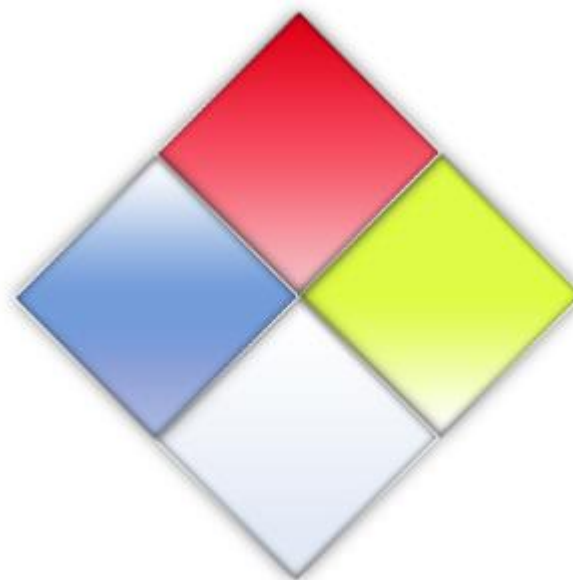
MSDS
Material Safety Data Sheets

MSDS

- **Flammability** (red section)

Denotes flash point of material

- 0 – Will not burn
- 1 – Above 200° F
- 2 – Between 200° F & 100°
- 3 – Between 100° F & 74 °
- 4 – Below 74° F



MSDS

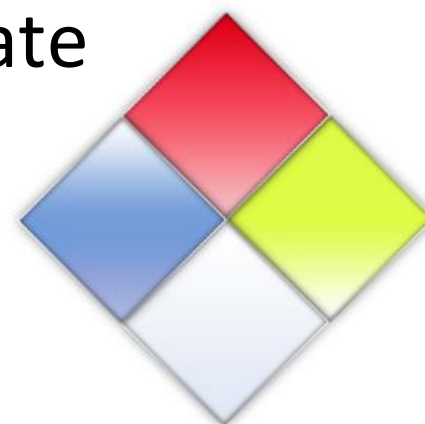
Material Safety Data Sheets

MSDS

- **Reactivity** (yellow section)

Denotes volatility and severity of reactive quality

- 0 - Stable
- 1 - Unstable if heated
- 2 - Violent chemical change
- 3 - Shock and heat may detonate
- 4 - May detonate

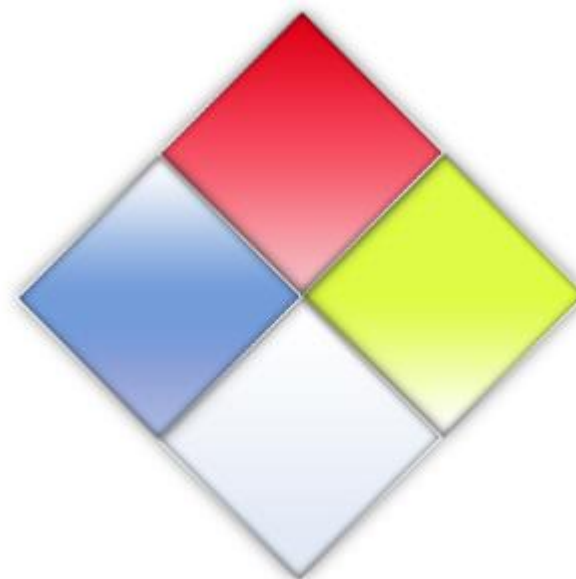


MSDS

- **Other hazard information** (white section)

Denotes symbol used to describe additional hazard warning

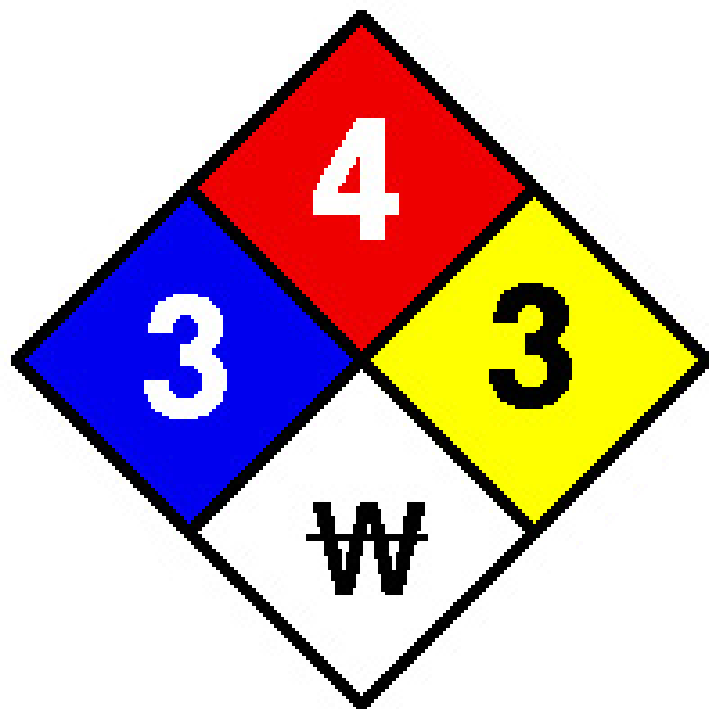
- Oxidizer (OXY)
- Acid (ACID)
- Corrosive (COR)
- Use NO WATER (~~W~~)
- Radiation hazard (☢)



MSDS

Material Safety Data Sheets

Sample MSDS



ANY QUERIES