OCCUPATIONAL HEALTH AND SAFETY

POWDERS

These are the particles with a grain size of 0.5 - 150 microns and suspended in air.

✓If the grain size of powder is 0-0.5 micron : this powder enters the lungs and goes out.

✓**If the grain size of powder is 0,5-5 micron : it enters to the lungs and stays there.**

Asbestos-silica: pneumoconiosis

(FIBROGENESIS –Asbestos POWDER)

Examples/ Asbestos, arsenic, Silica powder, Ni, Cr powders

✓If the grain size of powder is >5 micron: it doesn't reach the lungs.

ASBESTOS

★ Permissible Exposure Limit (PEL) for asbestos is **0.1 fiber per cubic centimeter** of air as an eight-hour time-weighted average (TWA). ★

Sınır Değer

İşveren, işçilerin maruz kaldığı havadaki asbest konsantrasyonunun, sekiz saatlik zaman ağırlıklı ortalama (twa) değerinin 0,1 lif/cm³'ü geçmemesini sağlayacaktır.

Radioactive Powders

U, Th

The ionized rays emitted by them cause damage-deformation in the tissues of the human body.

Allergic Powders

varies from person to person

Flower powder etc..

Inert powders

Coal, iron, Mg component powders, limestone, marble etc.

These powders accumulate in the body, but they do not have any fibrogenic-toxic effects.

LEAD powders

It enters the human body through breathing and digestion.

«**Medical surveillance**» is carried out in the following cases:

- If the lead level in the blood of any employee is more than **40 µg Pb / 100 ml blood**.

(1 mg: 1000 µg)

- If the lead level in the blood of any employee is more than **70 µg Pb / 100 ml blood**, this is the biological limitation!

Stop working with LEAD.

Biological limitation of Pb is: 70 µg Pb/100 ml

GASES

CO_2 - CO - CH_4 (Methane)

Non-combustible
Boğucu

Combustible
Explosive

Combustible
Explosive

Simple
Asphyxiant

Chemical
Asphyxiant

Simple
Asphyxiant

Methane reduces the oxygen concentration in the air, creating a simple aspyxiant property.

Non-poisonous

Akciğere gitmez

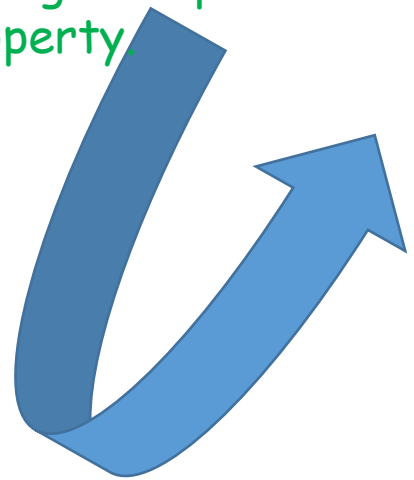
POISINOUS

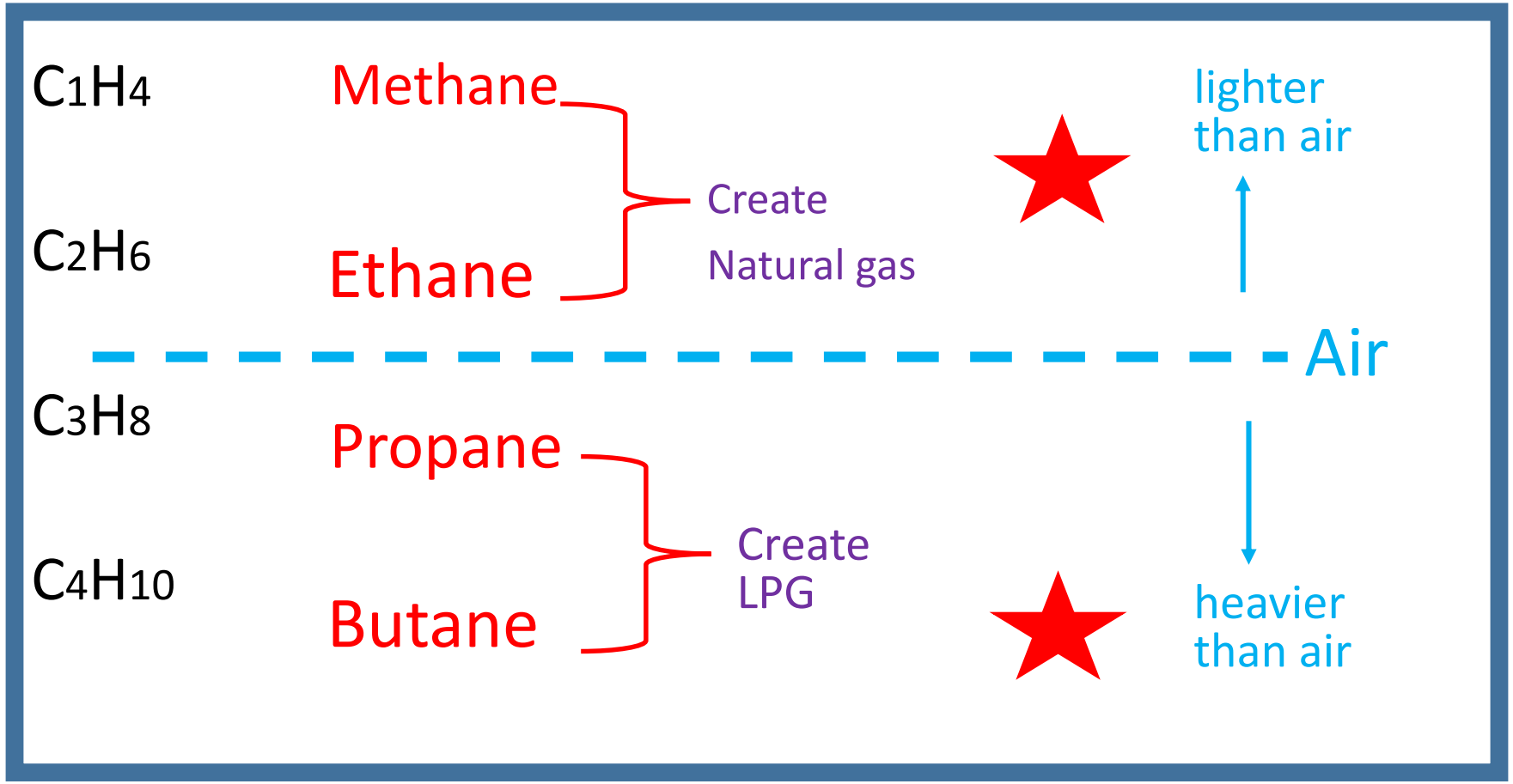
Circulate in the blood, blocking the oxygen-carrying blood.

100 ppm: Headache

500 ppm: Severe headache, fainting

2000 ppm: Unconsciousness, pulse weakness, and death





All OF Them

Simple asphyxiant,

Combustible,

Explosive

LPG : Liqufied petroleum gas

If there is a gas-leak here, it accumulates on the ground because it is heavier than air.

So;

The floor should be ventilated.

Similarly,

LNG : Liqufied natural gas

If there is a gas-leak here, it accumulates on the ceiling, because it is lighter than air.

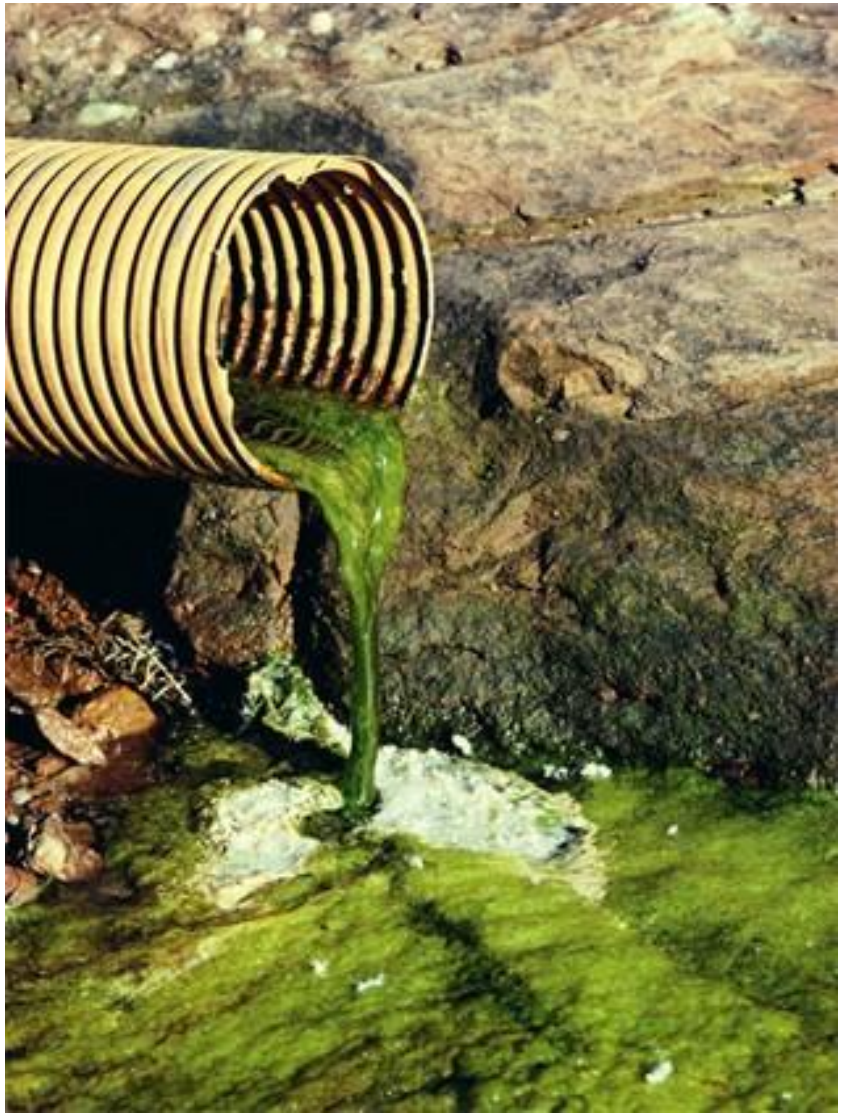
So;

The ceiling should be ventilated.

The effects of chemicals on our health

- **Respiratory irritation;**
- **Allergic reactions**
- **Central Nervous System Destruction**
- **Pneumoconiosis:** Silica and Asbestos Powders,
- **Cancer**
- **Fertility Diseases**

Environmental Hazard (N) :



potential to threaten the surrounding natural **environment** / or adversely affect people's health, including pollution and natural disasters.

Hazardous to the ozone layer

Some examples of Safety Symbols and Signs

Safety symbols and signs help you by saying how you have to behave in a laboratory for a safe operation. Some examples of these signs are given here.

Material Safety Data Sheet (MSDS)

It is a **technical document** which provides detailed and comprehensive information for each hazardous chemical related to:

-health effects of exposure to the product
-hazard evaluation related to the product's handling, storage or use
-measure to protect workers at risk of exposure
-emergency procedures.

Malzeme Güvenlik Bilgi Formu (GBF)

Material Safety Data Sheet (MSDS)

Who are responsible for?

1) Suppliers
2) Employer
3) Worker
4) Delivery person

Delivery of MSDS

Distribution can be;
- as written text,
- must be free.

Delivery time;
- On the first delivery (at the latest),
- **In case of udating ; Considering the update date, to the user who was given the hazardous chemical until 12 months ago, you have to delivery the new MSDS within 3 months at the latest.**

Minimum information that must be included in MSDS:

- Identification of material and company (producer)
- Composition / Information of Ingredients
- Hazards
- Firefighting measures
- First aid measures
- Precautions against accidental scattering
- Transport, use, storage measures

- **Exposure controls / Personal protection**
- **Physical and chemical properties**
- **Stability and reactivity**
- **Toxicological information**
- **Ecological measures**
- **Information about disposal**
- **Transport measures**

Legislation informations

ABOUT MSDS

These are the rules while preparing a MSDS

Language

- The language used in MSDSs should be clear, simple, understandable and short.
- Warnings such as "Should be kept in any environment" are not acceptable
- MSDSs can be prepared in the native language or translated to other languages.

Information

- If the information is not available, it should be stated as "Information is not available"

Abbreviations

- If an abbreviation is used, it should be stated what the abbreviation means in the notes section.

Page numbers

- All pages of the MSDS should be numbered and the total number of pages must be specified on each page.
- Example: Page 1/8

Published Date

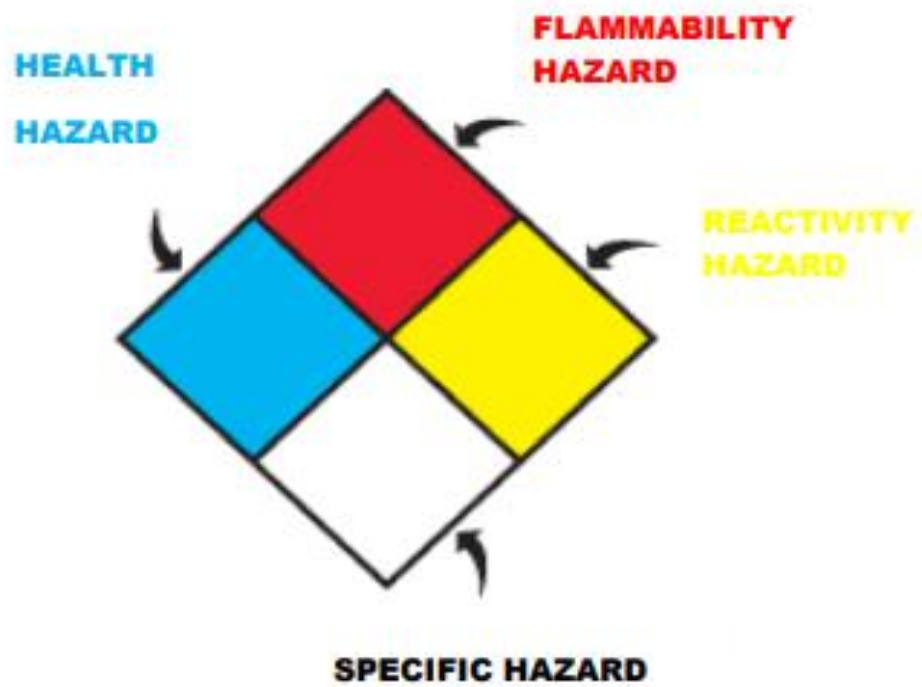
- The date when the MSDS was published must be specified.

Measure Units

- SI units should be used wherever possible.

And,

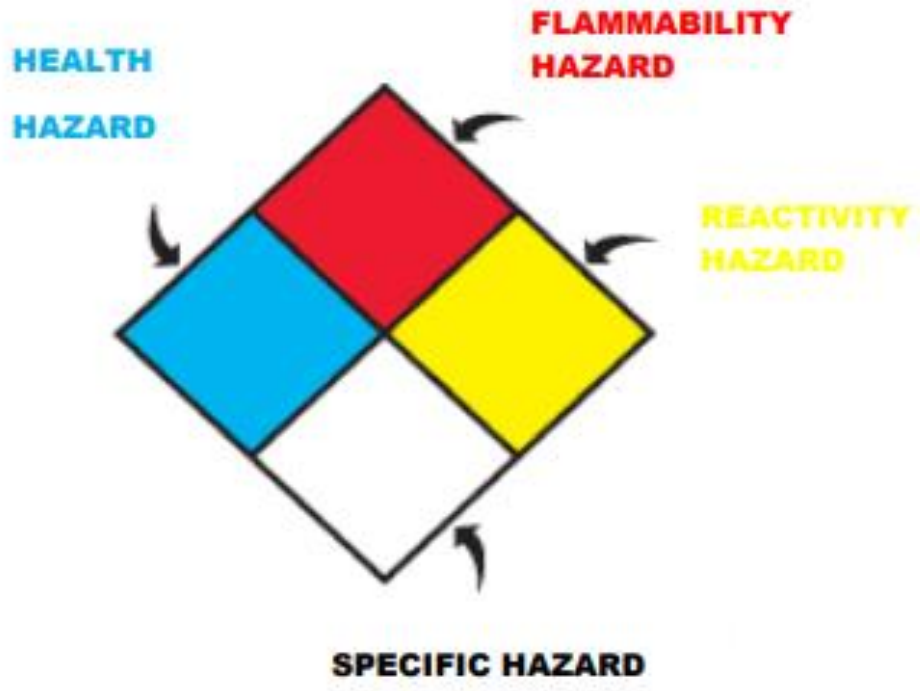
NFPA (National Fire Protection Agency of the United States) is abbreviated in the MSDS sheets and is also placed on the chemical bottles.



The NFPA Diamond

Among several standards to label chemicals, one very common labelling standard is NFPA diamond (National Fire Protection Agency of the United States).

NFPA diamond contains four major categories:
Health, Flammability, Reactivity and Specific Hazards.



NFPA Diamond symbol & the meaning of each color

The 4 major categories are rated from 0 (very low) to 4 (extreme) in each category. Each number represents the level of the hazard.

HEALTH HAZARD	FLAMMABILITY HAZARD
The classification of hazard on health is assigned as follows: **4-EXTREME**-Highly Toxic- May be fatal on short-term exposure. **3-SERIOUS**-Toxic-Full protective suit and breathing apparatus should be worn. **2-MODERATE**- Breathing apparatus and face mask should be worn. **1-SLIGHT**- Breathing apparatus should be worn. **0-MINIMAL**-No precautions necessary.	Susceptibility to burning is criteria for assigning degrees. **4-EXTREME**-Extremely flammable gas or liquid. Flash point below 22.8 °C (73°F). **3-SERIOUS**-Flammable. Flash point: 22.8 °C (73°F) to 37.8 °C (100°F). **2-MODERATE**-Combustible. Requires moderate heating to ignite. Flash point below 93.3 °C (200°F). **1-SLIGHT**-Slightly combustible. Requires strong heating to ignite. **0-MINIMAL**-Will not burn under normal conditions.
SPECIFIC HAZARD	**REACTIVITY HAZARD**
It indicates the classification of hazardous materials **OXIDIZING-(OX) -** Any substance that gives up oxygen easily **ACIDIC-(ACID)**- pH < 7 **ALKALINE-(ALK)-** Any base that dissolves in water **CORROSIVE–(COR)-** Any substance with pH ≤ 2.5 or pH ≥ 12.5 **WATER REACTIVE-(~~W~~)** -Any substance that may react with water **RADIOACTIVE-(☢)**- Any substance that produces radiation	Susceptibility of materials to release energy is criteria for assigning degrees. **4-EXTREME**-Explosive at room temperature. **3-SERIOUS**-May detonate if shocked or heated under confinement or mixed with water. **2-MODERATE**- Unstable. May react with water. **1-SLIGHT**- May react if heated or mixed with water. **0-MINIMAL**-Normally stable. Does not react with water.

Retrieved from http://www.enggcyclopedia.com/2012/02/nfpa-diamond-label/

Which color represents Which hazard?

an EXAMPLE

NFPA Diamond Symbol for Na

HEALTH HAZARD	FLAMMABILITY HAZARD
The classification of hazard on health is assigned as follows: **4-EXTREME**-Highly Toxic- May be fatal on short-term exposure. **3-SERIOUS**-Toxic-Full protective suit and breathing apparatus should be worn. **2-MODERATE**- Breathing apparatus and face mask should be worn. **1-SLIGHT**- Breathing apparatus should be worn. **0-MINIMAL**-No precautions necessary.	Susceptibility to burning is criteria for assigning degrees. **4-EXTREME**-Extremely flammable gas or liquid. Flash point below 22.8 °C (73°F). **3-SERIOUS**-Flammable. Flash point: 22.8 °C (73°F) to 37.8 °C (100°F). **2-MODERATE**-Combustible. Requires moderate heating to ignite. Flash point below 93.3 °C (200°F). **1-SLIGHT**-Slightly combustible. Requires strong heating to ignite. **0-MINIMAL**-Will not burn under normal conditions.
SPECIFIC HAZARD	**REACTIVITY HAZARD**
It indicates the classification of hazardous materials **OXIDIZING-(OX) -** Any substance that gives up oxygen easily **ACIDIC-(ACID)**- pH < 7 **ALKALINE-(ALK)-** Any base that dissolves in water **CORROSIVE–(COR)-** Any substance with pH ≤ 2.5 or pH ≥ 12.5 **WATER REACTIVE-(~~W~~)** -Any substance that may react with water **RADIOACTIVE-(☢)**- Any substance that produces radiation	Susceptibility of materials to release energy is criteria for assigning degrees. **4-EXTREME**-Explosive at room temperature. **3-SERIOUS**-May detonate if shocked or heated under confinement or mixed with water. **2-MODERATE**- Unstable. May react with water. **1-SLIGHT**- May react if heated or mixed with water. **0-MINIMAL**-Normally stable. Does not react with water.

Retrieved from http://www.enggcyclopedia.com/2012/02/nfpa-diamond-label/

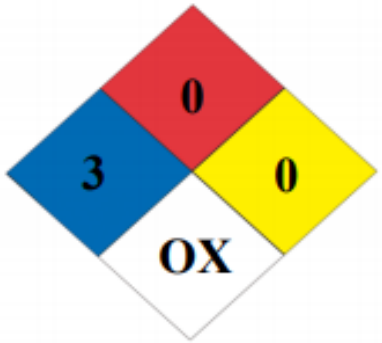
Na is a **flammable**, **toxic** and **unstable** material. Moreover, it is a element.

another EXAMPLE

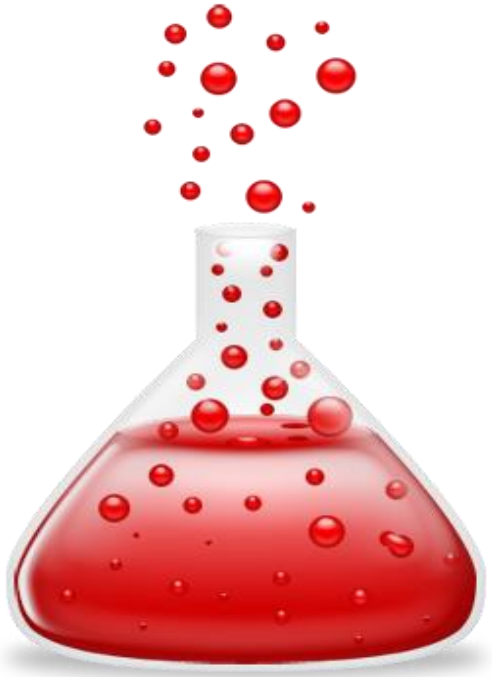
NFPA Diamond Symbol for Bromine (Br)

HEALTH HAZARD	FLAMMABILITY HAZARD
The classification of hazard on health is assigned as follows: **4-EXTREME**-Highly Toxic- May be fatal on short-term exposure. **3-SERIOUS**-Toxic-Full protective suit and breathing apparatus should be worn. **2-MODERATE**- Breathing apparatus and face mask should be worn. **1-SLIGHT**- Breathing apparatus should be worn. **0-MINIMAL**-No precautions necessary.	Susceptibility to burning is criteria for assigning degrees. **4-EXTREME**-Extremely flammable gas or liquid. Flash point below 22.8 °C (73°F). **3-SERIOUS**-Flammable. Flash point: 22.8 °C (73°F) to 37.8 °C (100°F). **2-MODERATE**-Combustible. Requires moderate heating to ignite. Flash point below 93.3 °C (200°F). **1-SLIGHT**-Slightly combustible. Requires strong heating to ignite. **0-MINIMAL**-Will not burn under normal conditions.
SPECIFIC HAZARD	**REACTIVITY HAZARD**
It indicates the classification of hazardous materials **OXIDIZING-(OX)** - Any substance that gives up oxygen easily **ACIDIC-(ACID)**- pH < 7 **ALKALINE-(ALK)-** Any base that dissolves in water **CORROSIVE–(COR)-** Any substance with pH ≤ 2.5 or pH ≥ 12.5 **WATER REACTIVE-(~~W~~)** -Any substance that may react with water **RADIOACTIVE-(☢)**- Any substance that produces radiation	Susceptibility of materials to release energy is criteria for assigning degrees. **4-EXTREME**-Explosive at room temperature. **3-SERIOUS**-May detonate if shocked or heated under confinement or mixed with water. **2-MODERATE**- Unstable. May react with water. **1-SLIGHT**- May react if heated or mixed with water. **0-MINIMAL**-Normally stable. Does not react with water.

Retrieved from http://www.enggcyclopedia.com/2012/02/nfpa-diamond-label/



Bromine **will not burn under normal conditions** and it is **toxic** and **stable** material. Moreover, it is an agent



Labelling of Chemical Bottles

The label should include

- The name of the chemical(s) with the concentration/composition of each ingredient.
- Date of preparation/packaging.
- Information on potential hazards and precautions to take
- Expiration dates and shelf lives.
- Label language should be in Turkish

LABELLING

name and concentration of the chemical

EC No (Avrupa kodu)

Diphenylamine
100 kg
EC No: 204-539-4

Hazard Symbols

T

Toxic

N

Environmental hazard

- Toxic when inhaled, in contact with skin and swallowed

Risk Sentences

- Keep locked up and out of the reach of children.
- Use with PPE
- In case of accident, contact a doctor immediately (show this label if possible)

Security Sentences

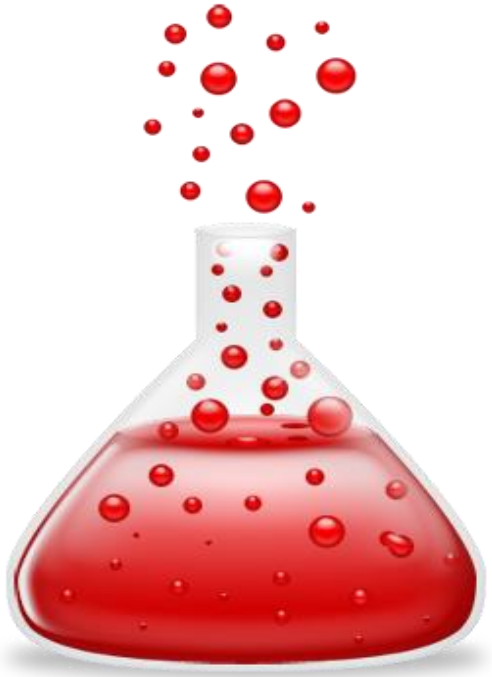
ABC Kimya Sanayi A.Ş., istanbul yolu...,Tel:0312...

name and address of the producing company

LABEL SIZE

Bottle	Etiket Boyutu (mm)
X < 3 liters *(less than)*	Min. 52 x 74 (a8 paper size)
3 liters > X < 50 liters	Min. 74 x 105 (a7 paper size)
50 litre > X < 500 litre	Min. 105 x 148 (a6 paper size)
X > 500 liters	**Min. 148 x 210 (a5 paper size)**


Riedel-de Haën
Riedel-de Haën
Riedel-de Haën
Riedel-de Haën
Riedel-de Haën
18174
SOOOSIL ® RA 21
UN-No 1903
a5 paper size
X > 500 liters



In laboratories, there are various types of chemicals used and stored. These chemicals can be classified according to their physical and chemical properties.

Storage and Handling of Chemicals

Storage must be in:

- closed metal containers inside a storage cabinet
- safety cans, or an inside storage room
- an inside storage room

Metal Containers for Corrosive materials

Metal Containers for Flammable materials

			 Xi				 Xn	
	+	-	0	-	-	-	-	-
	-	+	+	-	-	-	-	-
 Xi	0	+	+	-	0	0	+	+
	-	-	-	+	-	-	-	-
	-	-	0	-	+	-	-	-
	-	-	0	-	-	+	-	-
 Xn	-	-	+	-	-	-	+	+
	-	-	+	-	-	-	+	+

+ can be stored together

- can not be stored together

0 can be stored together by taking special precautions

References

[1] UCLA Laboratory Safety Manual. (2011). Office of Environment and Safety.

[2] Handbook of Occupational Hazards and Controls for Pharmacy Workers. (pp. 0–57) (2011). Government of Alberta.

[3] M. Rausand. (2005). Hazard Checklist (pp. 1–10). Department of Production and Quality Engineering. Norwegian University of Science and Technology.

[4] How to identify hazards requiring risk management? (2006). The Victorian WorkCover Authority. [5] Study Materials for the Certificate of Fitness Examination for Supervising Chemical Laboratories (C-14). (1999). New York City Fire Department.

[6] Prudent practices in the laboratory. [Electronic resource]: handling and disposal of chemicals. (1995). Washington, D.C.: National Academy Press.

[7] Compressed Gas Cylinders. UCLA Environment Health and Safety

[8] Hazardous waste disposal guide. (2015). Northwestern University Office for Research Safety

[9] Safety in academic chemistry laboratories Volume 1. (2003). Washington, DC: American Chemical Society.

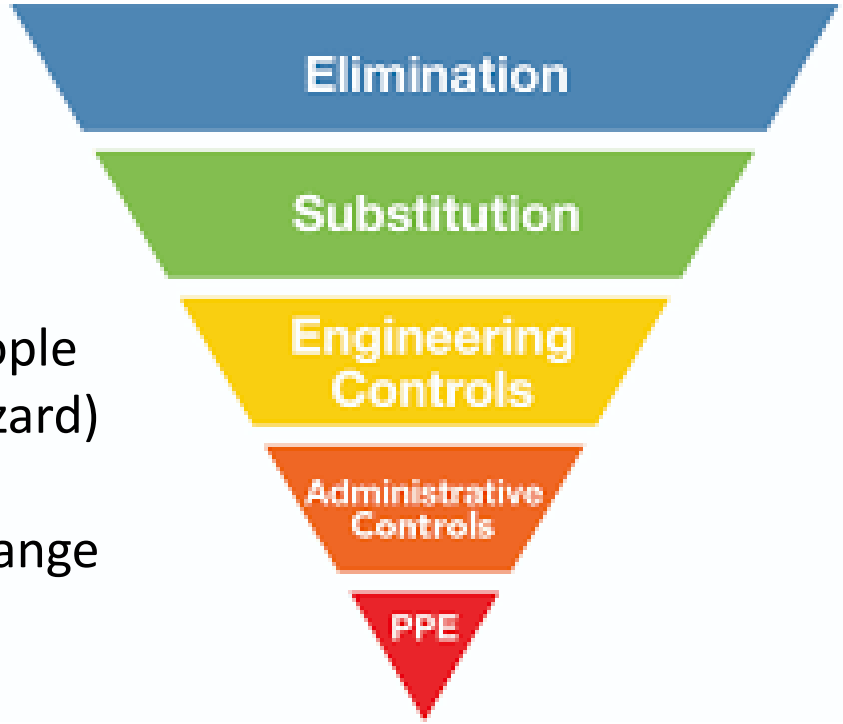
[10] Safety in academic chemistry laboratories Volume 2. (2003). Washington, DC: American Chemical Society.

For more information, suggested readings are; Furr, A.K. (2000). CRC handbook of laboratory safety. Boca Raton: CRC Press. Hall, S.K. (1994). Chemical safety in the laboratory. Boca Raton: Lewis Publishers. Do not forget to look at the MSDS’s of chemicals.

Control Hierarchy :

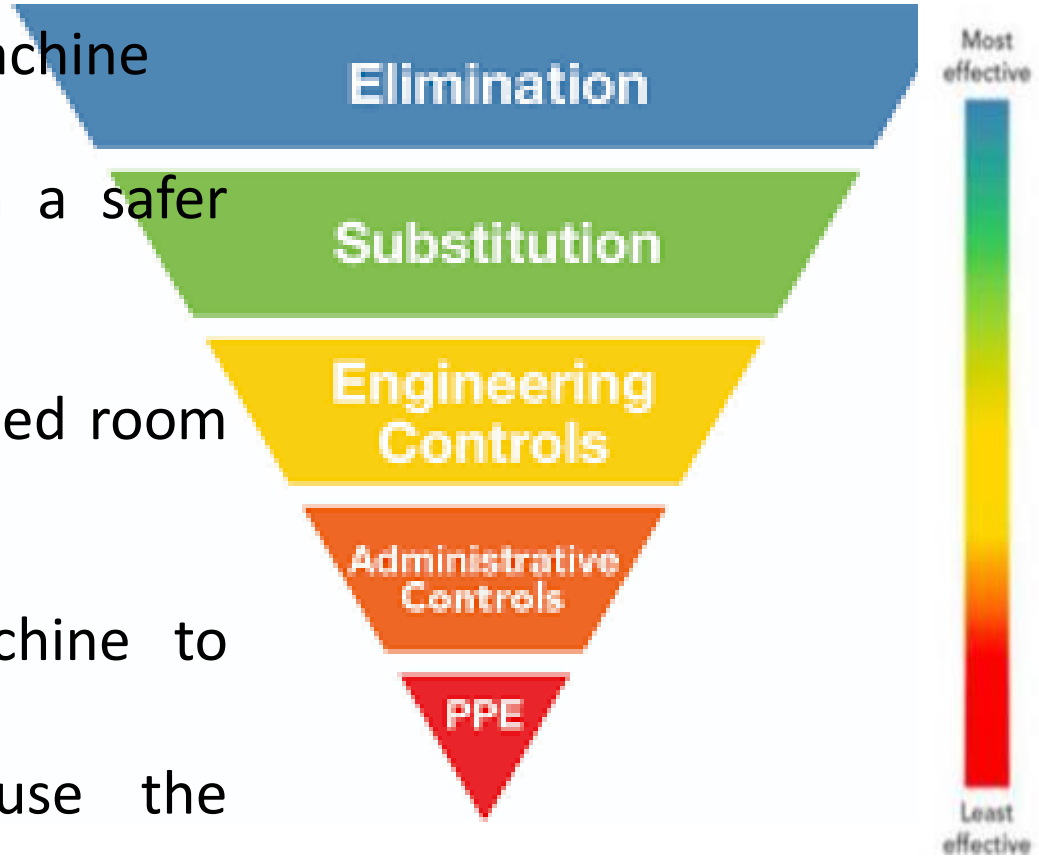
The risk is reduced by taking the following measures according to the results of the risk assessment and **in order of priority**;

- ELIMINATION (remove the hazard)
- SUBSTITUTION (replace the hazard)
- ENGINEERING CONTROLS (Isolate people From the hazard)
- ADMINISTRATIVE CONTROLS (Change behavior)
- PERSONAL PROTECTION EQUIPMENTS



Example; for a machine

- Get rid of the dangerous machine
- Replace the machine with a safer version.
- Keep the machine in a closed room and operate it remotely.
- Attach guard to the machine to protect users &
  Train workers how to use the machine safely.
- wear gloves and safety eyewear when using the machine.



How often should you perform risk assessments?

Workplaces are classified as;

1) Less Hazardous..... **Every 6 years**
2) Hazardous .....**Every 4 years**
3) Very Hazardous.....**Every 2 years**

Further information:
https://www.hse.gov.uk/pubns/raindex.htm