Institute for Plasma Research

Laboratory Safety – A Matter of Attitude

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Compiled by: **SAFETY COMMITTEE, IPR**

Case:1

Two research students killed in BARC lab fire

Fire in N-hub: 2 researchers burnt alive in BARC lab

- A fire broke out in a modular laboratory in India's top nuclear zone, the Bhabha Atomic Research Centre (BARC), at Trombay on 29th December 2009 afternoon, killing two PhD students who were at work.

- The laboratory usually houses over 60 research students and assistants of whom only two were present at the time of the incident.

Government's Statement on 3rd January 2010:

- ✓ The fire at one of BARC's chemistry labs was an unfortunate accident. We have not yet been able to pinpoint what caused it.

- **Government's Statement on 3rd January 2010:**

✓The two people who witnessed the event are no longer with us. Also, it was just an instrumentation lab, which doesn't store any chemicals, except for small quantities required to test the spectrophotometer.

✓All our scientific establishments will have to reinforce their safety standards and work procedures; **people cannot take things for granted.**

- **BARC's Statement on 2nd November 2010:**

✓Stop storage of chemicals in the lab.

✓Start the process of scientifically disposing of all the old chemicals stored in the lab.

BARC's Statement on 2nd November 2010:

✓Dr. R.K.Sinha, BARC Director, said the incident was very unfortunate and that the **country cannot afford to lose young talent due to such irresponsibility**.

✓He said interns will be taken in, but in smaller numbers and along with other scientists they too will be given instructions and training for the safe usage of these chemicals.

Case:2

A death in the lab.

- At Yale University's Sterling Chemistry Laboratory in the lab's machine shop, a 22-year-old undergraduate student died as her hair tangled in a lathe. She had apparently died of asphyxiation in an accident .

- In late 2008, 23-year-old research assistant sustained horrific burns in a lab fire at the University of California, Los Angeles (UCLA), and died of her injuries 18 days later.

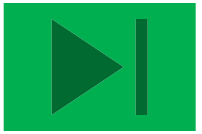
- Health and safety experts say that they have not seen a significant shift in the behaviour of bench scientists or the attitudes of lab heads, who are in the best position to improve safety culture.

- "It's very difficult to change principal investigators' attitudes," says James Gibson, UCLA's director of environmental health and safety.

- All too often, researchers in laboratories around the country still work alone, and without proper supervision or protection.

- "In many cases, academic freedom is more important than safety," says Jim Kaufman, president of the Laboratory Safety Institute in Natick, Massachusetts.

Clip on *"Importance of Chemical Safety"*



HAZARDS

Normally, we may consider hazard of chemicals as Fire & Explosion.

Clip on *"Fire & Explosion Hazard"*

But, hazards associated with Chemicals handling and storage depends on:

1. Physical State of the Chemicals,

2. Chemical Nature of the Chemicals,

HAZARDS (Contd…)

Chemical Nature of the chemicals:

a. Flammable/Combustible Chemical,

b. Explosive Chemical,

c. Toxic Chemical,

d. Corrosive Chemical,

e. Oxidizing Chemical,

f. Water Reactive Chemical,

HAZARDS ANALYSIS

Hazard Analysis before working with chemicals,

- Know how to perform experiments,
- Know chemical properties,
- Know how to clean up spills,
- Know emergency procedures,
- Know risks to community,

CONTROL MEASURES

- Eliminating flames, static electricity, & sparks from electrical circuits., ()
- Temperature,
- Proper Ventilation,
- Grounding/Bonding,
- Spill Control/Emergency Response,
- Proper disposal of spent fuels,

CONTROL MEASURES

Golden Rule:

Minimise

EXPOSURE

and reduce the

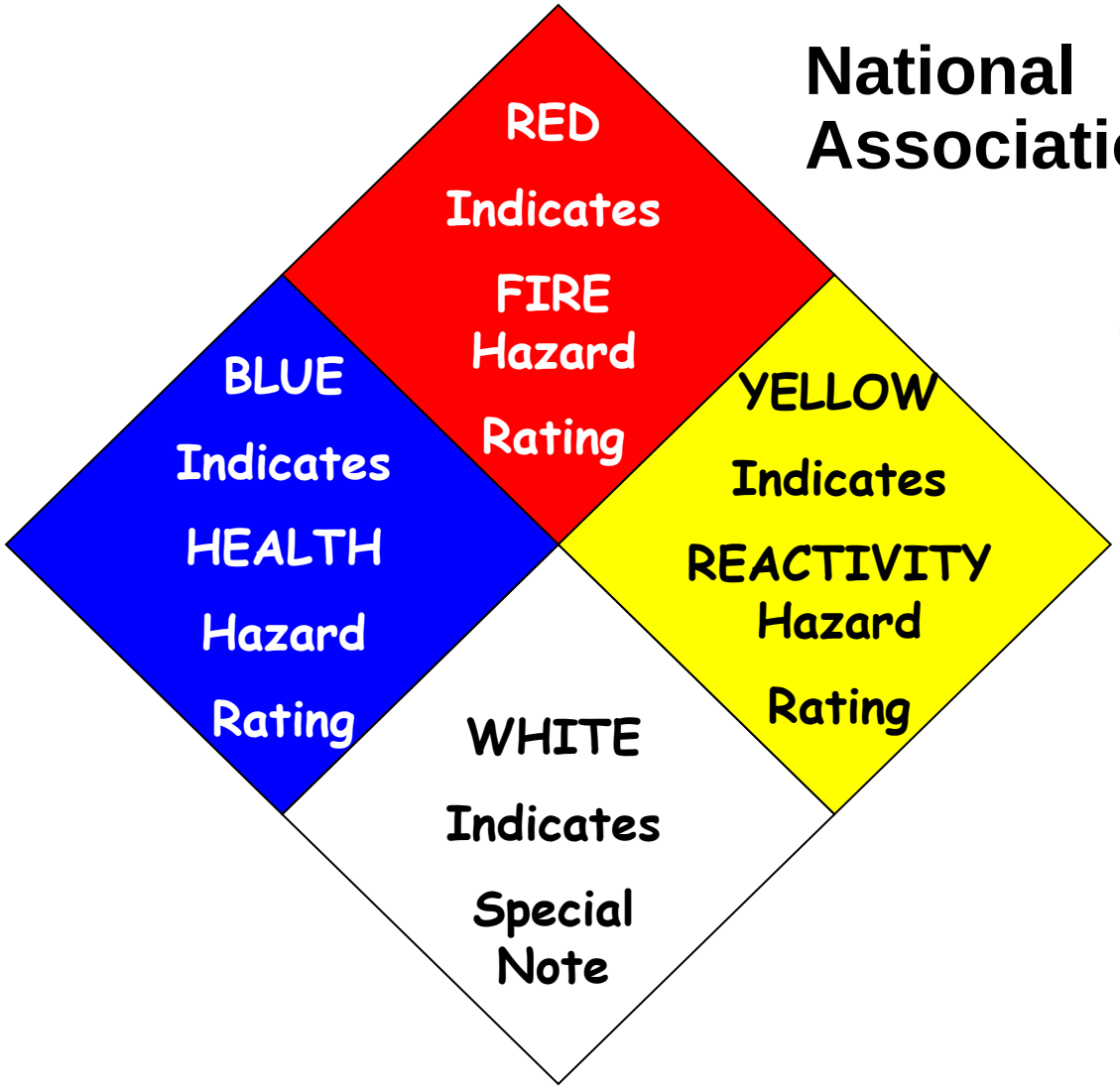
RISK!

FLAMMABLE/COMBUSTIBLE CHEMICALS

Few examples of Flammable/Combustible chemicals handled at IPR

1. Acetone
2. Carbon Tetrachloride
3. Methanol
4. Iso-Propyl Alcohol
5. Petroleum Ether
6. Hydrogen
7. Mineral Oil
8. Distilled Oil

NFPA HAZARD RATING DIAMOND



National Fire Protection Association (NFPA) Label

Rating of hazards

4= Deadly Hazard

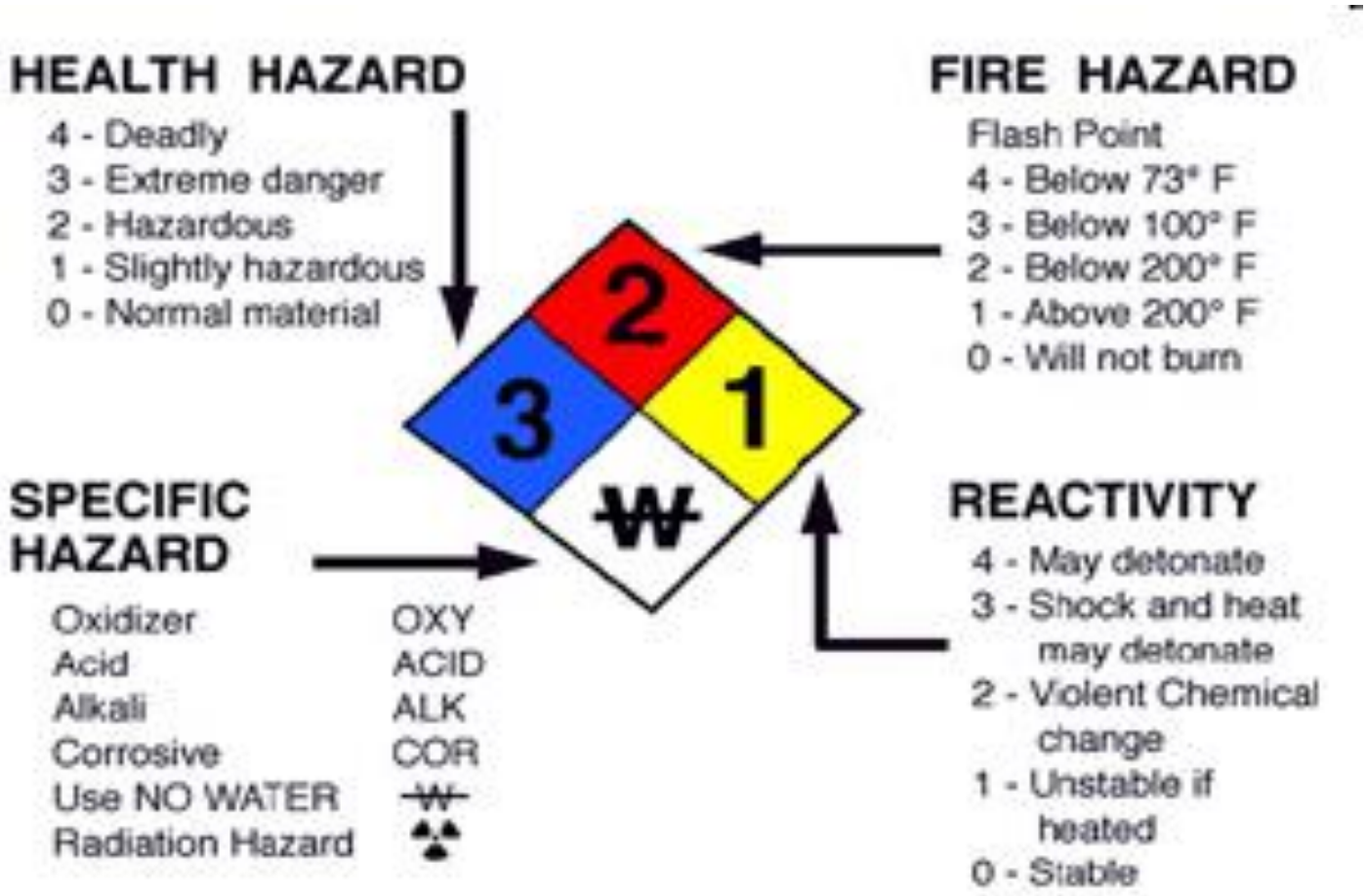
3= Severe Hazard

2= Moderate Hazard

1= Slight Hazard

0= No Hazard

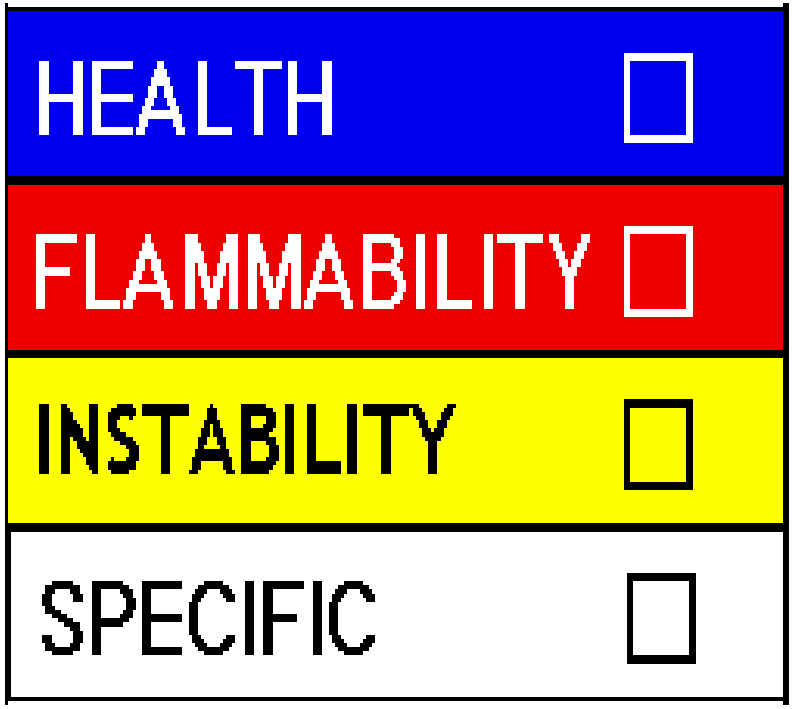
NFPA HAZARD RECOGNITION



HMIS LABLES

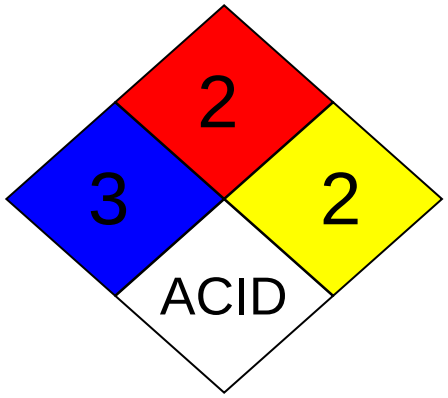
- Hazardous Material Information System (HMIS) Labels
- Same colour code/numerical rating system as the NFPA diamond,

  - **Blue = Health**
  - **Red = Flammability**
  - **Yellow = Instability**
  - **White = Personal Protective Equipment or special protection information**
  - **Numerical Rating of 0-4**

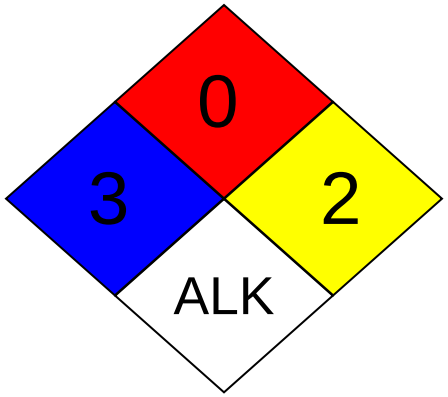


EXAMPLES - HAZARDS

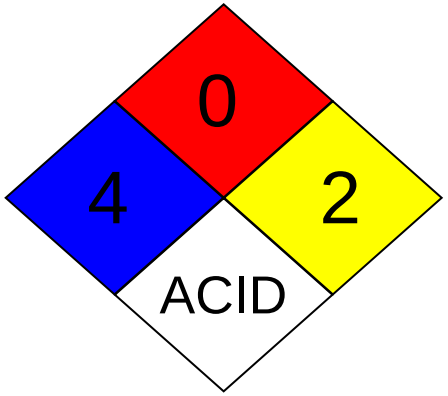
Glacial Acetic Acid



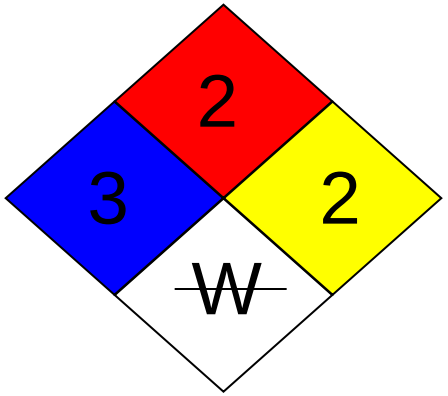
Sodium Hydroxide



Hydrofluoric Acid

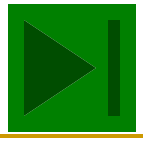


Lithium

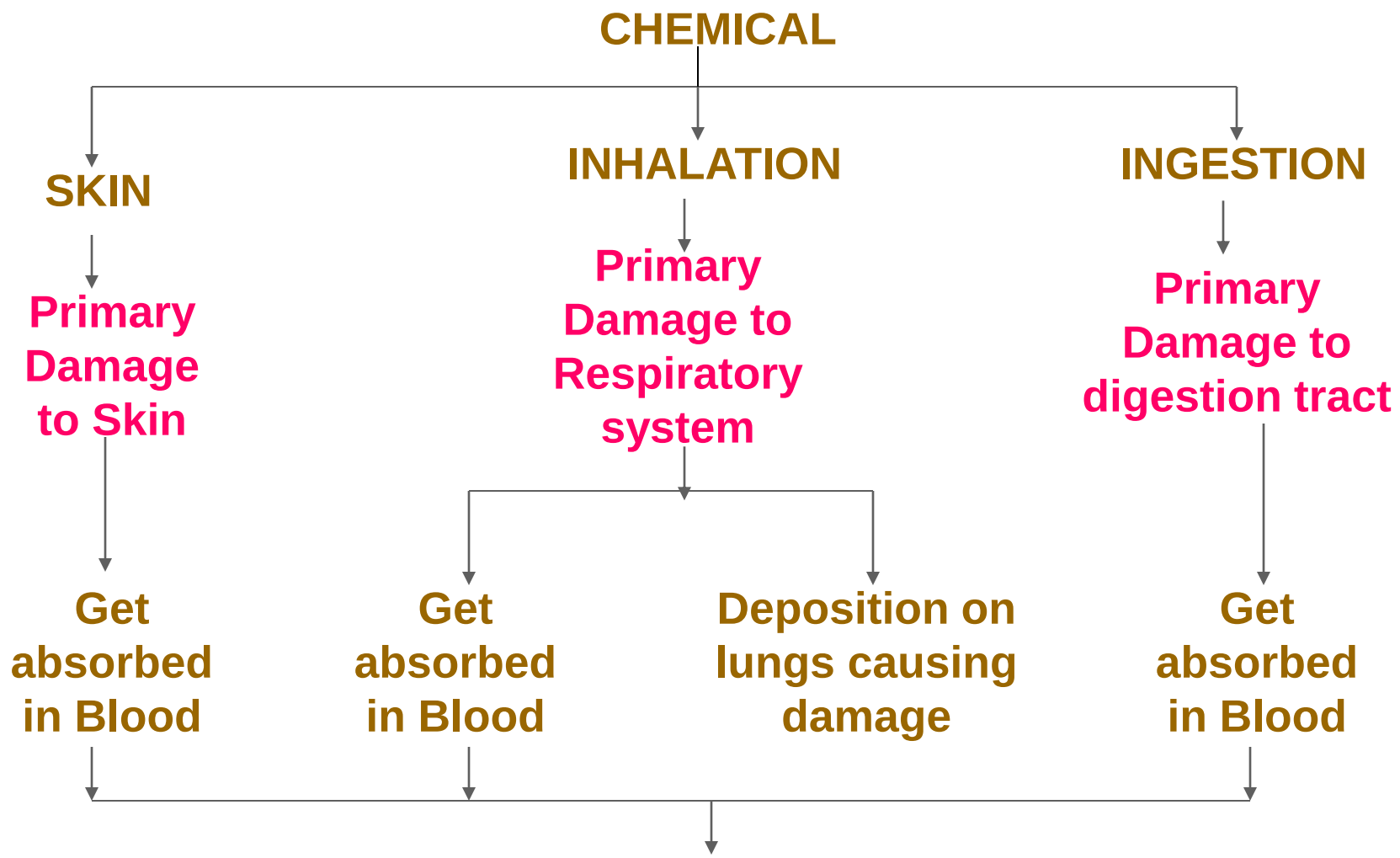


MATERIAL SAFETY DATA SHEET(MSDS)

- **MSDS shall be readily available for all flammable, toxic and caustic materials utilized within the facility.**
- MSDS is used by chemical manufacturers and vendors to convey hazard information to users.
- MSDSs should be obtained when a chemical is purchased.
- **A chemical inventory list and MSDS, for each chemical is required to be maintained by users.**
- READING OF MSDS – 16 SECTIONS,



HEALTH EFFECT OF CHEMICALS ON PERSON



HEALTH EFFECT OF CHEMICALS ON PERSON

Clip on *"Irritant-Health Effect"*

TOXIC CHEMICAL SAFETY

Health Effect of any toxic chemical depends on –

1. **Dose:** The amount of a substance to which one is exposed,
2. **Time:** How often and for how long exposure occurs,
3. **Route of Exposure:** Inhalation, Ingestion, Absorption.

Many other factors such as gender, age, physical fitness, etc.

TOXIC CHEMICAL SAFETY (Contd..)

4. Toxicity of chemicals:

TLV (Threshold Limit Value)

STEL (Short Term Exposure Limit)

THANK YOU