

# REGULATORY REQUIREMENT OF CHEMICAL HAZARDOUS TO HEALTH



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# SPEAKER'S BACKGROUND



- Mrs. Nursyazwani Binti Aznan
- MSc (Safety, Health & Environment), UTM. | 2016 – 2018.
- BSc (Biology) with Honours, UTM. | 2010 –2014.
- Science Officer | 2015 – Now.
  - Chemical Management Unit (CMU), UTM.
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  - Competency :
    - HQ/19/JHI/00/00040 Hygiene Tech 1 (Chemical Exposure Monitoring) (2019-2022)
    - Train The Trainer 1 & II, NIOSH Malaysia.
    - JH/23/OSHC/02/01585 OSH Coordinator.
    - Auditor – Occupational Safety & Health Award UTM



# CMU ORGANISATIONAL STRUCTURE




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# LEARNING OUTCOME

At the end of the session, the participants should be able:

- To identify the **legal requirement** related to chemical safety.
- To describe the **objectives** of the regulation.
- Explain the **CHtH** under FMA & OSHA.
- **Identify** CHtH in the workplace.



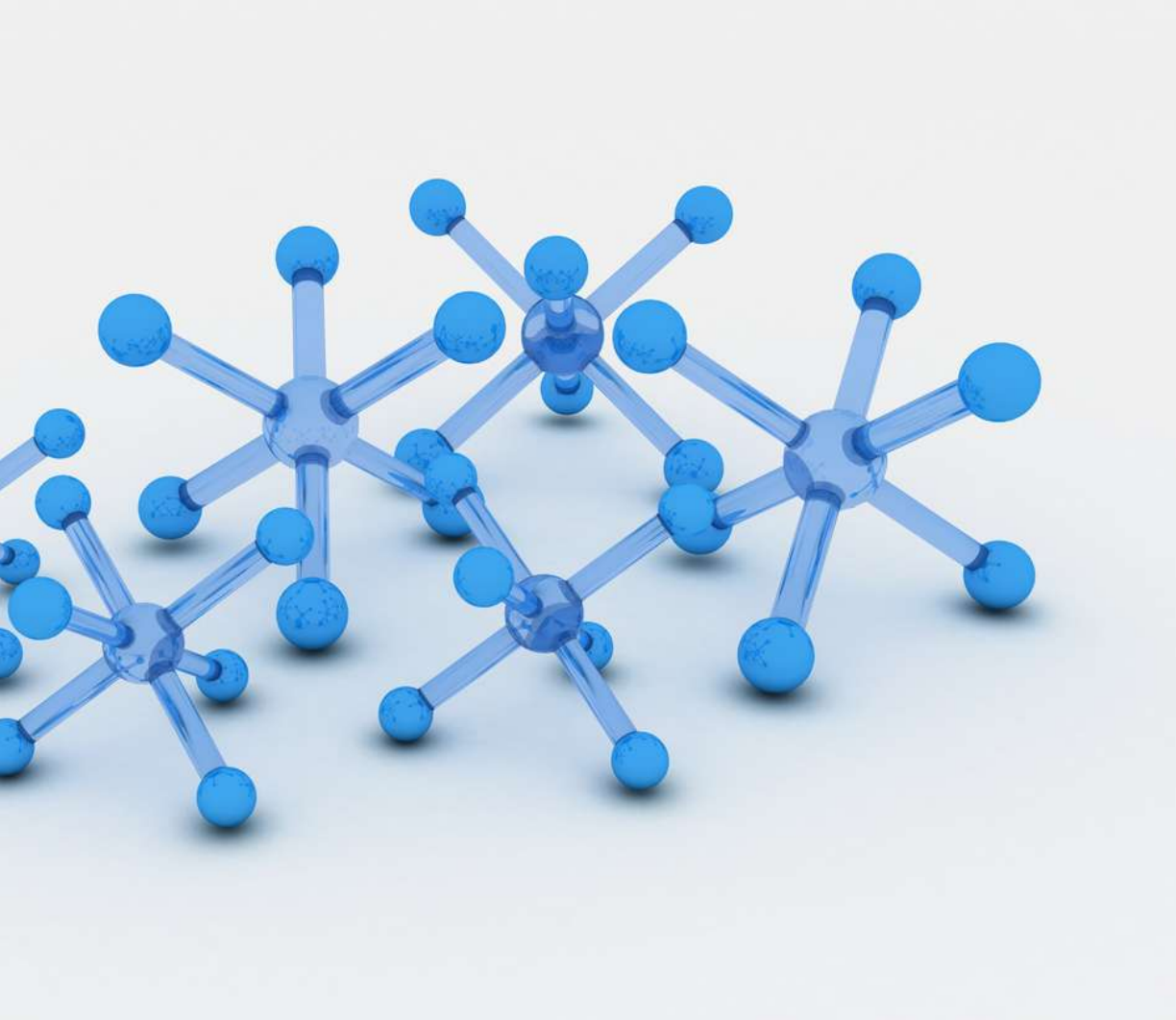


# SCOPE

- Case Study
- Introduction to Legislation
- Principle of Airborne Contaminant



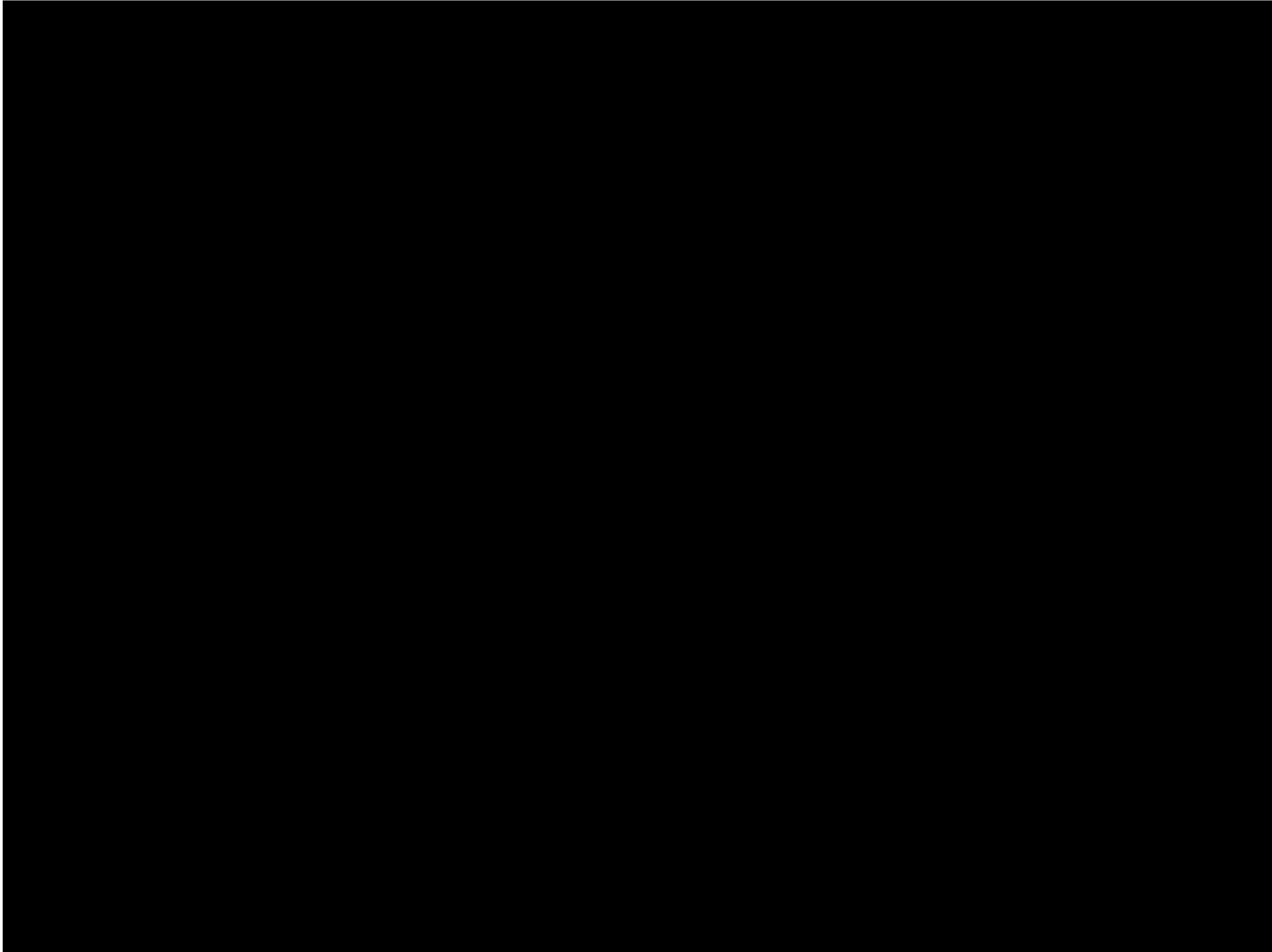




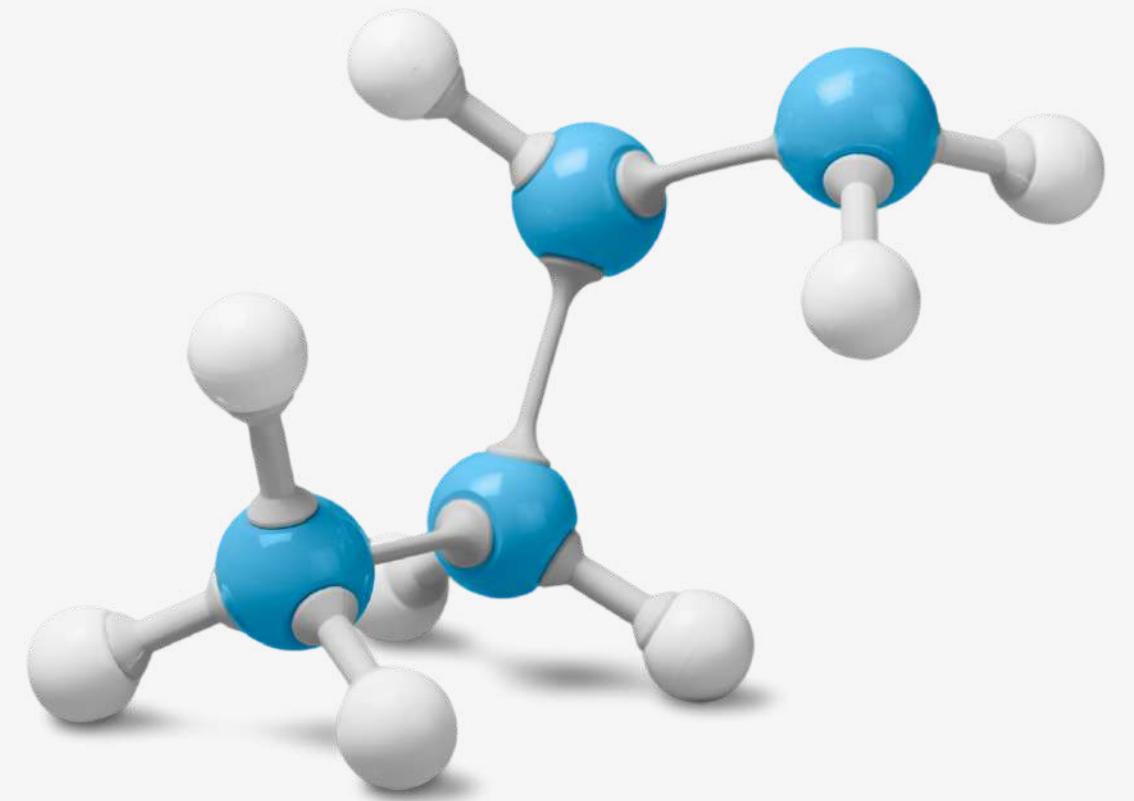
# ASSESSMENT

- Written Assessment
  - 20 questions will be distributed to participants.
  - 30 minutes to answer questions.
  - Passing marks : 10/20.





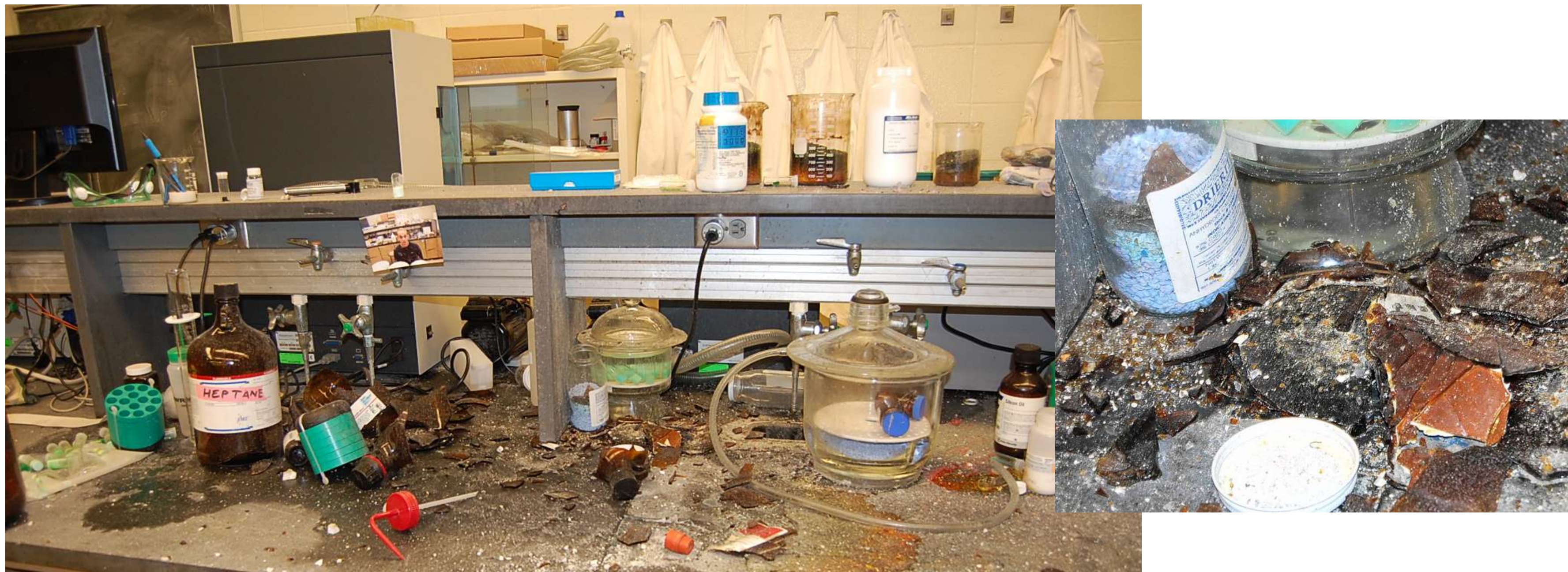
# Case Study



Accidents involving chemicals in the laboratories.



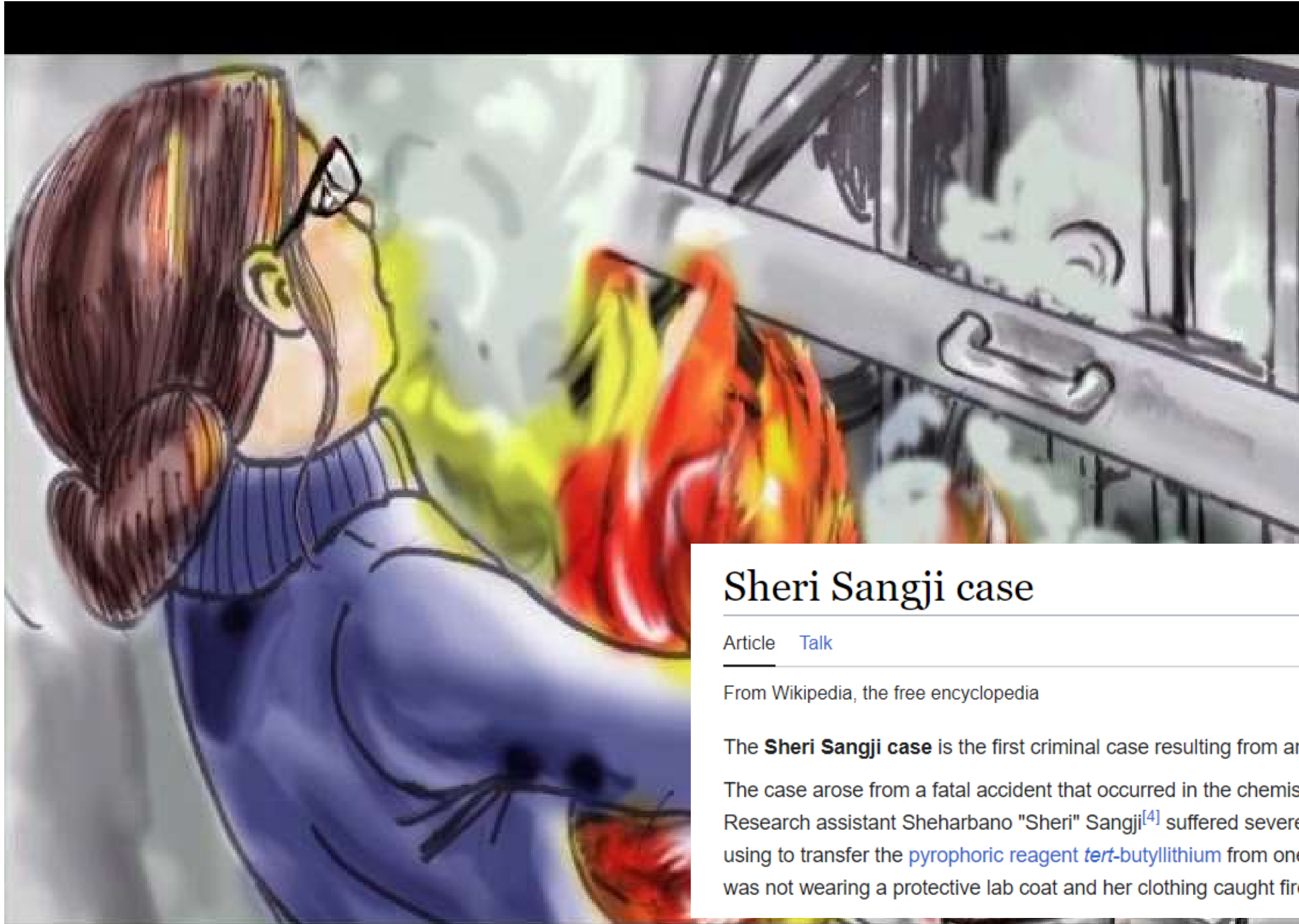
# CASE STUDY - 2010 Texas Tech Laboratory Accident



The accident occurred during the handling of explosive compounds and resulted in serious injuries to a graduate student. The case study – released today via webinar in Denver, Colorado, identifies systemic deficiencies in safety accountability and oversight by the principal investigators, the chemistry department, and the university administration at Texas Tech. Furthermore, according to investigators there were also important gaps beyond the university itself, gaps which are addressed in the CSB's safety recommendations.



# CASE STUDY - 2008 UCLA Sheri Sangji Case



## Sheri Sangji case

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From Wikipedia, the free encyclopedia

The **Sheri Sangji case** is the first criminal case resulting from an academic laboratory accident.<sup>[1][2][3]</sup>

The case arose from a fatal accident that occurred in the chemistry laboratory of [Patrick Harran](#) at the [University of California at Los Angeles](#) (UCLA). Research assistant Sheharbano "Sheri" Sangji<sup>[4]</sup> suffered severe burns from a fire that occurred on December 29, 2008 when a plastic syringe she was using to transfer the [pyrophoric reagent tert-butyllithium](#) from one sealed container to another came apart, spilling the chemical, and igniting a fire. Sangji was not wearing a protective lab coat and her clothing caught fire, resulting in severe burns that led to her death 18 days later.<sup>[5][6][7]</sup>

# CASE STUDY - OTHER ACCIDENTS IN UNIVERSITIES

## ACCIDENTS AT OTHER UNIVERSITIES



University of Hawai (2006) : Spark from pressure gauge caused explosion - steel tank ruptured which caused Postdoc researcher Thea Ekins-Coward lost an arm.

- [UCI Major Lab Fire](#)
- [UCLA Lab Fire Fatality](#)
- [New UCLA Center for Laboratory Safety](#)
- [UCLA settlement agreement w/ OSHA for lab fatality](#)
- [Fire Destroys OSU Lab](#)
- [Chemical stored on the floor causes UC Santa Cruz Lab Fire](#)
- [Lab Fire University of Texas-1996](#)
- [Professor Fired for Safety Violations](#)
- [Sodium Quenching Injury](#)
- [Working Alone in Lab- Incident](#)
- [Chemical Demonstration Injures Students](#)
- [Hawaii U fined 1.2 million for Hazardous Waste Violations](#)
- [Mercury Poisoning Fatality in Laboratory](#)
- [HF Poisoning Fatality](#)
- [Chemical Fume Hood Fire](#)
- [Other Lab Accidents Link](#)
- [Serious injuries in Texas Tech lab explosion](#)
- [Fatality in Yale Chemistry machine shop](#)
- [Professor barred from lab for dangerous experiments](#)



# CASE STUDY - 2013 Makmal UiTM Terbakar



# CASE STUDY - 2021 Tumpahan Asid Akrilik USM



GEORGETOWN: Sebanyak 50 mililiter asid akrilik tumpah di atas lantai dalam sebuah makmal di Pusat Pengajian Sains Kimia, Universiti Sains Malaysia (USM) di sini petang tadi.

Bagaimanapun kejadian yang berlaku pukul 3 petang itu tidak membabitkan sebarang kecederaan mangsa mahupun kemalangan jiwa.

Pegawai Operasi Balai Bomba dan Penyelamat Jalan Perak, Fairol Mahazi Malek berkata, pihaknya menerima panggilan berhubung kejadian pukul 3.28 petang.

Menurutnya, sebaik sahaja tiba di lokasi kejadian, satu bekas mengandungi asid akrilik tertumpah di atas lantai terbabit dan operasi tersebut turut mendapat bantuan anggota Pasukan Khas Bahan Kimia Berbahaya (Hazmat).

# Introduction to Legislation

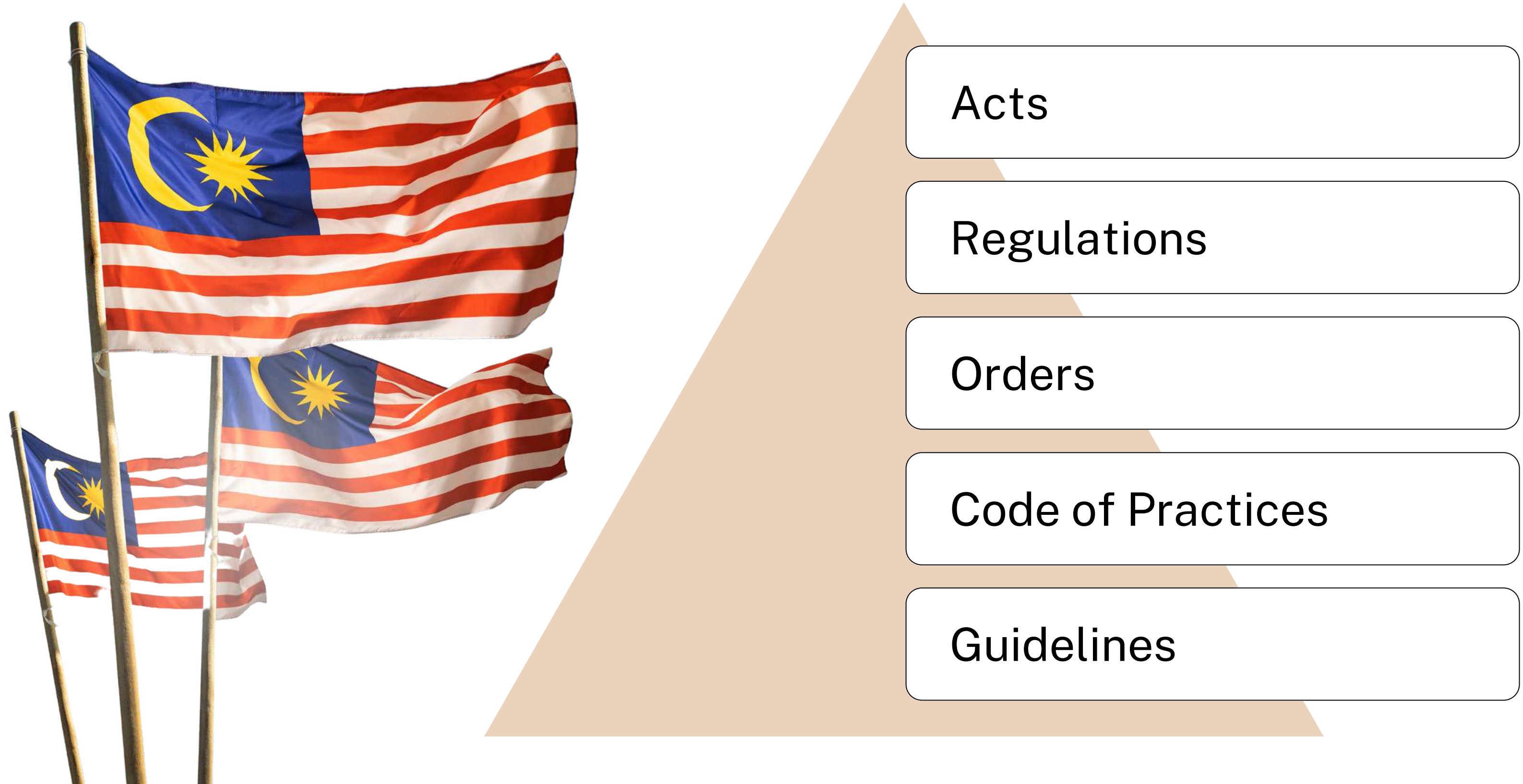


Chemicals are hazardous due to their potential to cause fire and explosion, health effects or damaging the environment.





# HIERARCHY OF LEGISLATION



# Management of Chemical in Malaysia

## Related Legislations & Agencies.

| Substance & Jurisdiction  | Ministry                                      | Agencies                         | Legislations  |
|---|---|----------------------------------|---|
| Import, export, sales & trades - Petroleum & petroleum products | Ministry of International Trade & industries. | -                                | Petroleum (Safety Measures) Act 1984                                  |
| Imports & exports   | Ministry of Finance                           | Royal Malaysian Customs          | Customs Act 1967  |
| Industrial chemicals  | Ministry of Human Resources                   | Department of Safety & Health    | Occupational Safety & Health Act 1994<br>Factory & Machinery Act 1967 |
| Pharmaceutical, drugs, some consumer products                   | Ministry of Health                            | Pharmaceutical Services Division | Poison Act 1952<br>Dangerous Drugs Act 1952<br>Food Act 1983          |

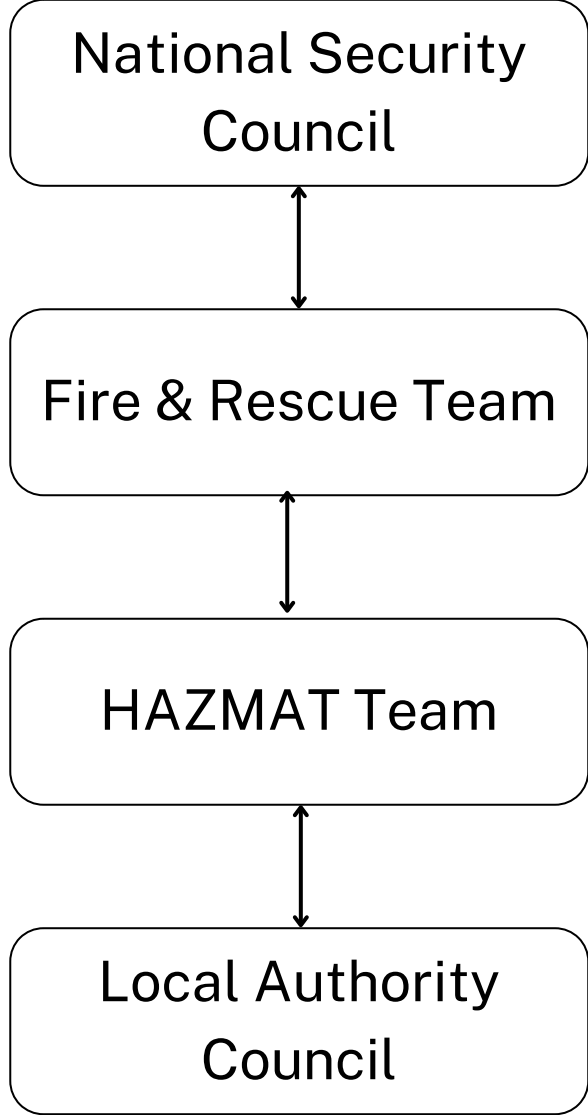


# Management of Chemical in Malaysia

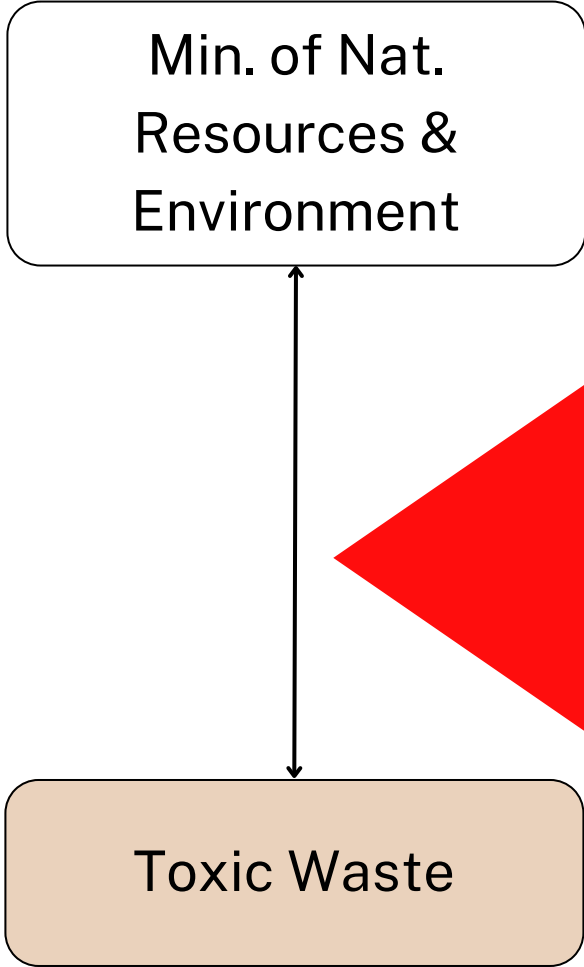
## Related Legislations & Agencies.

| Substance & Jurisdiction                     | Ministry   | Agencies                  | Legislations                                 |
|--|--|---------------------------|--|
| Pesticides                                   | Ministry of Agriculture                                  | Department of Agriculture | Pesticides Act 1974                          |
| Consumers Products                           | Ministry of Domestic Trade, Co-operative and Consumerism | -                         | Consumer Protection Act 1999 (Safety issues) |
| Chemical Weapon (Chemical Weapon Convention) | Ministry of Foreign Affairs                              | -                         | Chemical Weapon Convention Act 2005          |
| Hazardous Waste (Scheduled Wastes)           | Ministry of Natural Resources and Environment            | Department of Environment | Environmental Quality Act 1974               |

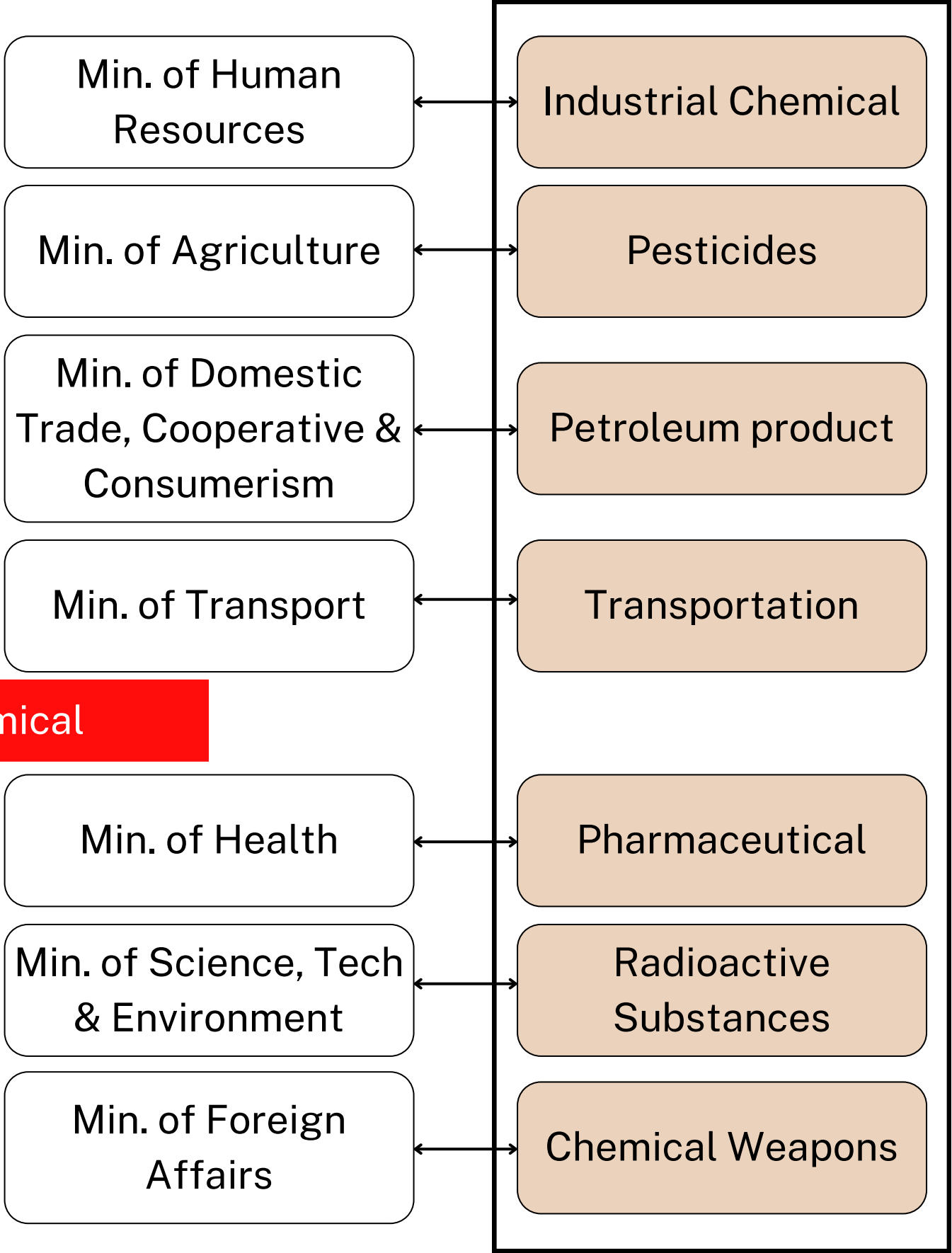
Emergency  
Response Plan (ERP)



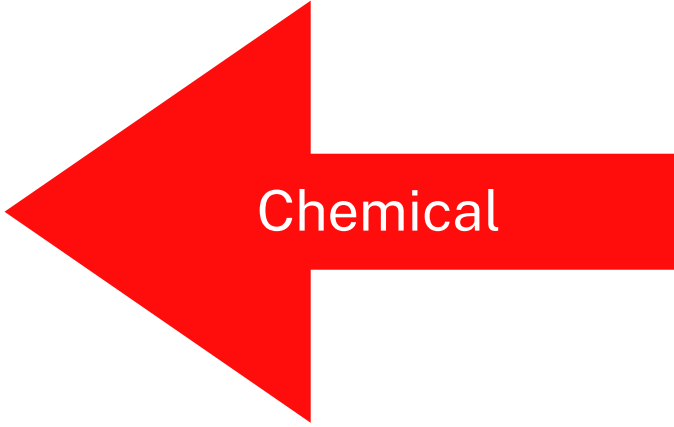
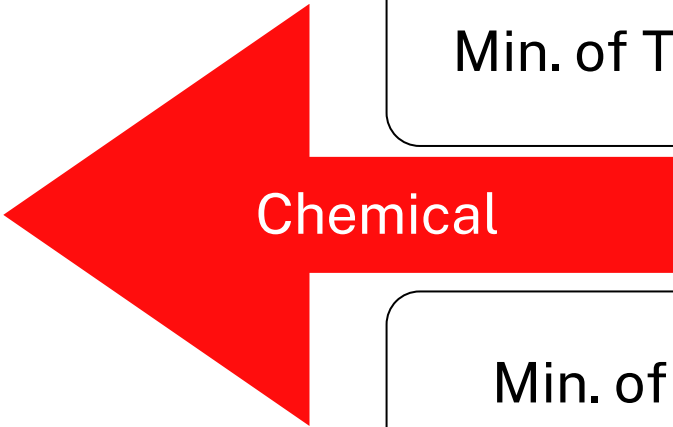
Disposal



Manufacturing/Supply/Handling



Import



# LEGISLATION RELATED TO CHtH



## Acts

- Occupational Safety & Health Acts (OSHA) 1994
- Factory & Machinery Act (FMA) 1967

## Regulations

- USECHH Regulation 2000
- CLASS Regulation 2013

## Orders

- Occupational Safety and Health (Prohibition of Use of Substances) Order 1999

## Code of Practices

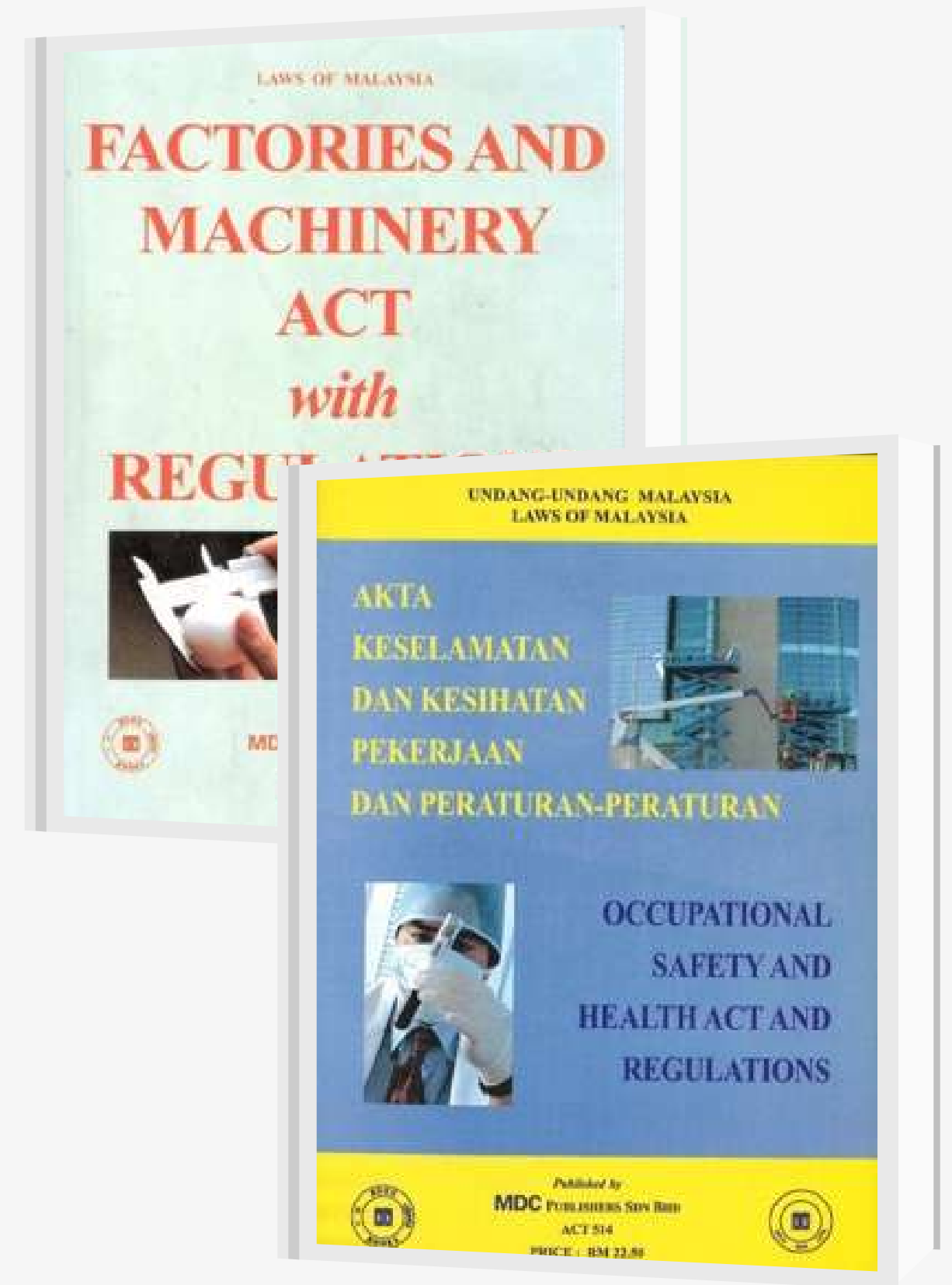
- Industry Code of Practice On Chemicals Classification And Hazard Communication, 2014

## Guidelines

- Guidelines on the Use of Personal Protective Equipment Against Chemicals Hazards, 2005
- Guidelines for the Preparation of a Chemical Register, 2000
- Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals, 2005



# Factory & Machinery Act 1967 & Occupational Safety & Health Act 1994



# Scope of CHtH Covered in FMA

- Definition
- Application
- Exposure Monitoring
- Permissible Exposure Limit
- Record keeping

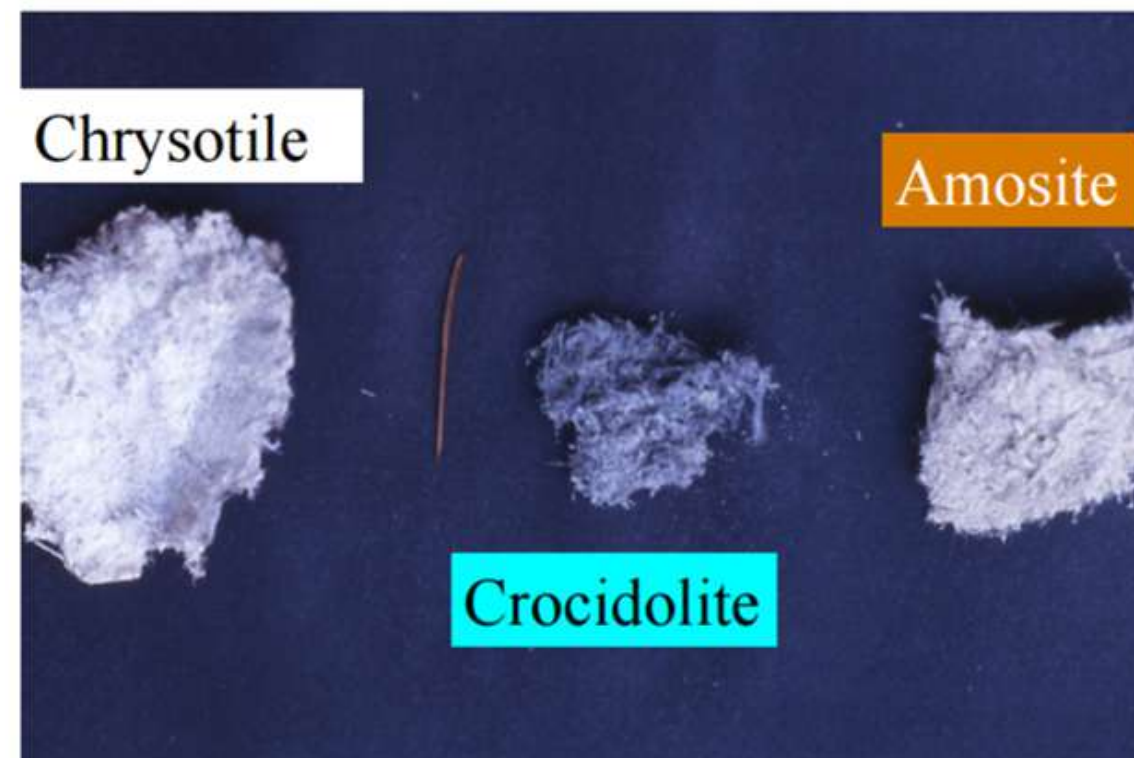
Lead Regulations 1984

Asbestos Process Regulations  
1986

Mineral Dust Regulations 1989

## Types of Lead

1. Non-organic Lead
  - a. Used as metallic compound, alloy & chemical mixtures.
2. Organic Lead
  - a. Used as additives for internal combustion



## Types of Mineral Dust

1. Mineral Dust
  - a. Silica, kaolin, quartz ect
2. Silica (Silicon dioxide)
  - a. Free form : quartz, cristobalite, tridymite
  - b. Mixture (silicate) : asbestos, kaolin

# Scope of CHtH Covered in OSHA 1994

| OCCUPATIONAL SAFETY AND HEALTH<br>ACT 1994 AND REGULATIONS  |    |    |    |    |                |
|---|----|----|----|----|----------------|
| KANDUNGAN/CONTENTS  |    |    |    |    | MUKASURAT/PAGE |
| Arrangements of Sections  | .. | .. | .. | .. | 184 – 187      |
| Occupational Safety And Health Act 1994   | .. | .. | .. | .. | 188 – 221      |
| Occupational Safety And Health (Employers' Safety And Health General Policy Statements) (Exception) Regulations 1995                              | .. | .. | .. | .. | 222            |
| Occupational Safety And Health (Control of Industrial Major Accident Hazards) Regulations 1996  | .. | .. | .. | .. | 223 – 248      |
| Occupational Safety And Health (Safety And Health Committee) Regulations 1996   | .. | .. | .. | .. | 249 – 261      |
| Occupational Safety And Health (Classification, Packaging and Labelling of Hazardous' Chemicals) Regulations 1997                                 | .. | .. | .. | .. | 262 – 282      |
| Occupational Safety And Health (Safety And Health Officer) Regulations 1997   | .. | .. | .. | .. | 283 – 294      |
| Occupational Safety And Health (Safety And Health Officer) Order 1997   | .. | .. | .. | .. | 295 – 296      |
| Occupational Safety And Health (Prohibition of Use of Substance) Order 1999   | .. | .. | .. | .. | 297            |
| Occupational Safety And Health (Use And Standards Of Exposure Of Chemicals Hazardous To Health) Regulations 2000                                  | .. | .. | .. | .. | 298 – 339      |
| Occupational Safety and Health (Notification of Accident, Dangerous Occurrence, Occupational Poisoning and Occupational Disease) Regulations 2004 | .. | .. | .. | .. | 340 – 362      |

CLASS Regulation 2013

USECHH Regulation 2000



- **Scope of Application :**

- All places of work within the purview of the OSH Act 1994 where chemicals hazardous to health are used.

- **Definition of use :**

- Production
- Processing
- Handling
- Transport
- Storage
- Disposal
- Treatment
- Removal



- **Exemption of chemicals:**

- Radioactive material
- Foodstuffs
- Pharmaceutical products
- Hazardous to health solely by virtue of their -explosive, - flammable properties & at a high or low temperatures.



USECHH  
Regulation  
2000

| No. | Regulation        | Arrangements of Regulations  |
|-----|-------------------|--|
| 1.  | 5                 | Identification of Chemical Hazardous to Health (Chemical Register) |
| 2.  | 6,7,8             | Comply Permissible Exposure Limit (PELs)                           |
| 3.  | 9,10,11,12,13     | Assessment of Risk to Health (CHRA)                                |
| 4.  | 14,15,16,17,18,19 | Action to Control Exposure   |
| 5.  | 20,21             | Labelling & relabelling  |
| 6.  | 22,23,24,25       | Information, Instruction & Training                                |
| 7.  | 26                | Monitoring of Exposure at the Place of Work                        |
| 8.  | 27                | Health Surveillance  |
| 9.  | 28                | Medical Removal Protection   |
| 10. | 29                | Warning Sign   |
| 11. | 30                | Record Keeping   |



**"chemicals"** means chemical elements, or compounds or mixtures thereof, whether natural or synthetic, but does not include micro-organisms;

**"chemicals hazardous to health"** means any chemical or preparation which -

- (a) is listed in Schedule I or II;
- (b) possesses any of the properties categorised in Part B of Schedule I of the Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997 [P. U. (A) 143/97];
- (c) comes within the definition of "pesticide" under the Pesticides Act 1974 [Act 149]; or
- (d) is listed in the First Schedule of the Environmental Quality (Schedule Wastes) Regulations 1989 [P. U. (A) 139/89];



- Schedule I

### SCHEDULE I

[Regulations 6 and 7]

#### LIST OF PERMISSIBLE EXPOSURE LIMITS

### SCHEDULE I

(Regulations 6 and 7)

#### LIST OF PERMISSIBLE EXPOSURE LIMITS

| CHEMICAL  | [CAS]      | Eight-hour time-weighted average airborne concentration |                   | Ceiling limit airborne concentration |                   |
|---|------------|---|-------------------|--------------------------------------|-------------------|
|   |            | ppm   | mg/m <sup>3</sup> | ppm                                  | mg/m <sup>3</sup> |
| Acetaldehyde                                    | [75-07-0]  |   |                   | 25                                   | 45                |
| Acetic acid                                     | [64-19-7]  | 10  | 25                |                                      |                   |
| Acetic anhydride                                | [108-24-7] | 5   | 21                |                                      |                   |
| Acetone   | [67-64-1]  | 500   | 1187              |                                      |                   |
| Aceton cyanohydrin<br>as CN- (skin)             | [75-86-5]  |   |                   | 4.7                                  | 5                 |
| Acetonitrile                                    | [75-05-8]  | 40  | 67                |                                      |                   |
| Acetophenone                                    | [98-66-2]  | 10  | 49                |                                      |                   |
| Acetylenedichloride, see 1, 2-Dichloroethylenes |            |   |                   |                                      |                   |
| Acetylene tetrabromide                          | [79-27-6]  | 1   | 14                |                                      |                   |
| Acetylsalicylic acid<br>(aspirin)               | [50-78-2]  | —   | 5                 |                                      |                   |
| Acrolein- (skin)                                | [107-02-8] | —   | —                 | 0.1                                  | 0.23              |
| Acrylamide- (skin)                              | [79-06-1]  | —   | 0.03              |                                      |                   |
| Acrylic acid- (skin)                            | [79-10-7]  | 2   | 5.9               |                                      |                   |
| Acrylonitrile- (skin)                           | [107-13-1] | 2   | 4.3               |                                      |                   |
| Adipic acid                                     | [124-04-9] | —   | 5                 |                                      |                   |
| Adiponitrile- (skin)                            | [111-69-3] | 2   | 8.8               |                                      |                   |
| Aldrin  | [309-00-2] | —   | 0.25              |                                      |                   |

| CHEMICAL   | [CAS]        | Eight-hour time-weighted average airborne concentration |                   | Ceiling limit airborne concentration |  |
|--|--------------|---|-------------------|--------------------------------------|--|
|  |              | ppm   | mg/m <sup>3</sup> | ppm                                  | mg/m <sup>3</sup>  |
| Allyl alcohol- (skin)  | [107-18-6]   | 0.5   | 1.2               |                                      |  |
| Allyl chloride   | [107-05-1]   | 1   | 3                 |                                      |  |
| Allyl glycidyl ether (AGE)   | [106-92-3]   | 1   | 4.6               |                                      |  |
| Allyl propyl disulfide   | [2179-59-1]  | 2   | 12                |                                      |  |
| α-Alumina, see Aluminium oxide                                     |              |   |                   |                                      |  |
| Aluminium  | [7429-90-5]  |   |                   |                                      |  |
| Metal dust   |              | —   | 10                |                                      |  |
| Pyro powders, as Al  |              | —   | 5                 |                                      |  |
| Welding fumes, as Al   |              | —   | 5                 |                                      |  |
| Soluble salts, as Al   |              | —   | 2                 |                                      |  |
| Alkyls (NOC), as Al  |              | —   | 2                 |                                      |  |
| Aluminium oxide  | [1344-28-1]  | —   | 10                |                                      | The value is for particulate matter containing no asbestos and <1% crystalline silica. |
| 4-Aminodiphenyl- (skin)  | [92-67-1]    | —   | —                 |                                      |  |
| 2-Aminoethanol, see Ethanolamine                                   |              |   |                   |                                      |  |
| 2-Aminopyridine  | [304-29-0]   | 0.5   | 1.9               |                                      |  |
| 3-Amino-1, 2, 4-triazole, see Amitrole                             |              |   |                   |                                      |  |
| Amitrole   | [61-82-5]    | —   | 0.2               |                                      |  |
| Ammonia  | [7664-41-7]  | 25  | 17                |                                      |  |
| Ammonium chloride fume   | [12125-02-9] | —   | 10                |                                      |  |
| Ammonium   | [3825-26-1]  | —   | 0.01              |                                      |  |
| perfluorooctanoate- (skin)   |              |   |                   |                                      |  |
| Ammonium sulfamate   | [7773-06-0]  | —   | 10                |                                      |  |
| Amosite, see Asbestos  |              |   |                   |                                      |  |
| n-Amyl acetate   | [628-63-7]   | 100   | 532               |                                      |  |
| sec-Amyl acetate   | [626-34-0]   | 125   | 665               |                                      |  |
| Aniline and homologues- (skin)                                     | [62-53-3]    | 2   | 7.6               |                                      |  |
| o-Anisidine- (skin)  | [90-04-0]    | 0.1   | 0.5               |                                      |  |
| p-Anisidine- (skin)  | [104-94-9]   | 0.1   | —                 |                                      |  |
| Antimony and compound, as Sb                                       | [7440-36-0]  | —   | 0.5               |                                      |  |
| Antimony trioxide production                                       | [1309-64-4]  | —   | —                 |                                      |  |
| ANTU   | [86-88-4]    | —   | 0.3               |                                      |  |
| Arsenic, elemental and inorganic compounds (except arsenic), as As | [7440-38-2]  | —   | 0.01              |                                      |  |
| Arsine   | [7784-42-1]  | 0.05  | 0.16              |                                      |  |
| Asbestos, all forms except crocidolite                             | [1332-21-4]  | —   | 0.1 fml           |                                      |  |
| Asphalt (petroleum) fumes  | [8052-42-4]  | —   | 5                 |                                      |  |
| Atrazine   | [1912-24-9]  | —   | 5                 |                                      |  |
| Azinphos-methyl- (skin)  | [86-50-0]    | —   | 0.2               |                                      |  |
| Barium, and soluble compounds, as Ba                               | [7440-39-3]  | —   | 0.5               |                                      |  |

- Schedule II

**SCHEDULE II**

[Subregulation 27(3)]

*Chemicals for which medical surveillance is appropriate*

1. 4-Aminodiphenyl
2. Arsenic and any of its compound
3. Asbestos (all forms except crocidolite)
4. Auramine, Magenta
5. Benzidine
6. Beryllium
7. Cadmium and any of its compound
8. Carbon disulphide
9. Disulphur dichloride
10. Benzene including benzol
11. Carbon tetrachloride
12. Trichloroethylene
13. n - Hexane
14. bis (Chloromethyl) ether
15. Chromic acid
16. Chromium, metal and inorganic compounds, e.g. Water-soluble Cr VI compounds, Insoluble Cr VI compounds
17. Free crystalline silica
18. Isocyanates
19. Lead (including organic lead compounds)
20. Manganese
21. Mercury
22. Mineral oil including paraffin
23. b-Naphthylamine

24. 1-Naphthylamine and its salts

25. Orthotolidine and its salts

26. Dianisidine and its salts

27. Dichlorobenzidine and its salts

28. 4-Nitrodiphenyl

29. Nitro or amino derivatives of phenol and of benzene or its homologues

30. Nitrous fumes. Chromate or dichromate of potassium, sodium, ammonium or zinc

31. Pesticides

32. Pitch

33. Tar, bitumen or creosote

34. Vinyl chloride monomer (VCM)



- Schedule III

### SCHEDULE III

[Paragraph 5(2) (b)]

#### *Information on Pesticides*

1. A statement of the common name of the pesticide, if available, its trade and chemical name, and structural formula, and of the name and concentration of every active ingredient of the pesticide.
2. The name and concentration of every other ingredient of the pesticide.
3. The toxicological information on every ingredient of the pesticide and on the pesticide as a whole.
4. The instructions for, and the precautionary measures to be taken in connexion with the use of the pesticide.
5. The name, address and telephone number of the supplier and manufacture of the pesticide.

Made 29 March 2000.

[KSM. PUU(S) 6/11 Jld. 1; PN(PU<sup>2</sup>) 541/IV]

DATUK DR FONG CHAN ONN  
*Minister of Human Resources*



# OCCUPATIONAL SAFETY AND HEALTH (PROHIBITION OF USE OF SUBSTANCE) ORDER 1999



## SCHEDULE

### PROHIBITION OF USE OF SUBSTANCE

| Item<br>No. | (1)<br>Description of substance   | (2)<br>Extent to which use of substance is<br>prohibited   |
|-------------|---|--|
|             |   |  |
| 1.          | 4-Aminodiphenyl;<br>Benzidine;<br>2-Naphthylamine;<br>4-Nitrodiphenyl;<br>Their salts; and<br>any substance containing any of their<br>compounds in any other substance in a<br>total concentration exceeding 0.1 percent | Manufacture and use of all purposes<br>including any manufacturing process in<br>which a substance described in column (1)<br>is formed, except for research or analytical<br>purposes |
| 2.          | Crocidolite   | All purposes except for research or<br>analytical purposes   |
| 3.          | Benzene;<br>Carbon disulphide;<br>Carbon tetrachloride and<br>n-Hexane  | Cleaning and degreasing  |
| 4.          | White phosphorus  | Use in the manufacture of matches  |



# AIRBORNE CONTAMINANT



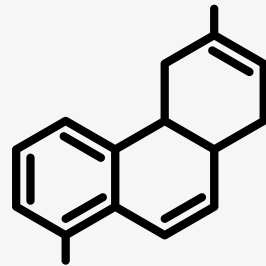


# Principle of Airborne Contaminant



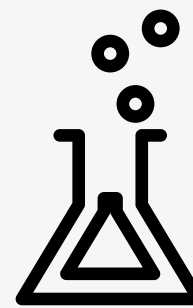
Airborne contaminant means a contaminant in the form of a fume, mist, gas, vapour or dust and includes microorganisms

# Classification of Chemicals



## BY CHEMICAL PROPERTIES

- Inorganic
  - Metals
  - Inorganic salts
- Organic
  - Aliphatic compounds
  - Alicyclic compounds
  - Aromatic compounds



## BY PHYSICAL PROPERTIES

- Solid
- Liquid
- Particulate
  - Dust
  - Fumes
  - Mist
- Vapour
- Gases



## BY USAGE

- Solvents
- Metals
- Acids
- Bases
- Pesticides



### **Solid**

- Usually non-hazardous unless small enough to enter the body.
- Metals may be when being heated hazardous up – produce fumes.



### **Liquid**

- Corrosive liquids, volatile liquids – hazardous.

## **BY PHYSICAL PROPERTIES**



### **Vapour**

- Gases form of a liquid at room temperature & pressure.
- Liquid emits vapour, quantity depends on volatility.
- Lower boiling point, more volatile.
- Higher vapour pressure, easier to vaporise.
- Liquids with low boiling points & high vapour pressure are more hazardous.



### **Gases**

- A state of matter that completely fills the region in which it is contained.
- Very low density & viscosity.
- Can expand & contract greatly in response to changes in temperature & pressure.
- Easily diffuse into other gases.





### **Dust**

- Suspension of solid particles in air.
- Generated from mechanical processes
- Eg : Handling, drilling, crushing operations.



### **Fumes**

- Solid particles formed from condensation of substances from the vapour state.
- Normally generated by metals
- Molten metals vaporised > vapour oxidised > condensation of oxide > forming fine solid particles .



### **Mist**

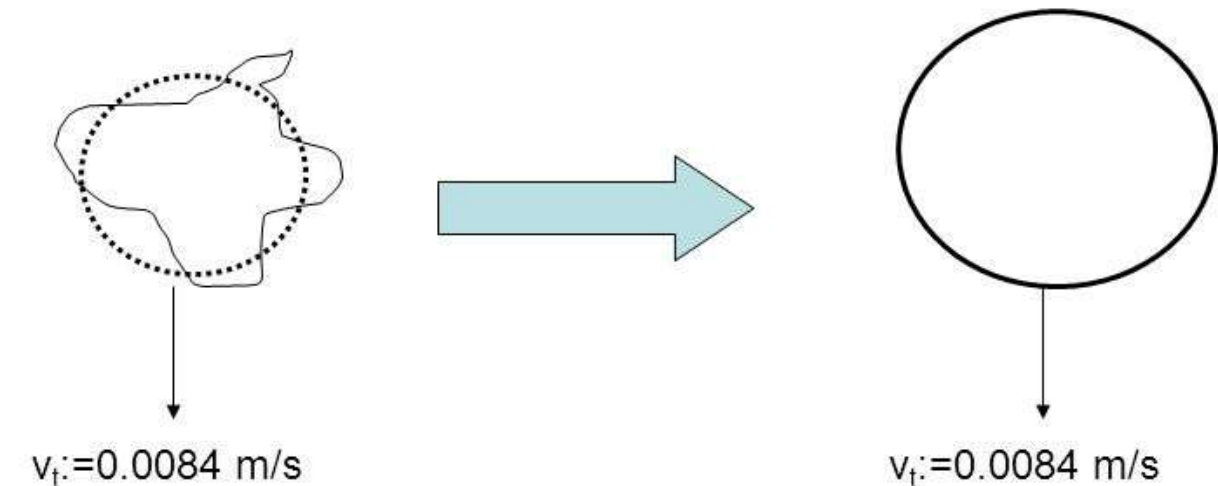
- Dispersion of liquid particles in air.
- Generated from
  - Electroplating, spraying, dipping (where liquids are atomised or foamed into fine particles.)

# Aerodynamic Equivalent Diameter (A.E.D)

- The diameter of a hypothetical sphere of unit density (i.e 1g/cm<sup>3</sup>) having the same terminal settling velocity in air as the actual airborne particle, regardless of it's geometric size, shape & true density.
- Relate to :
  - Inhalation risk
  - Ability of particle to penetrate the respiratory tract.

## Aerodynamic Diameter

- An irregular particle
- $d_e = 10 \mu\text{m}$
- $\rho_p = 3000 \text{ kg/m}^3$
- $\chi = 1.3$
- The aerodynamic equivalent sphere
- $d_a = 15.2 \mu\text{m}$
- $\rho_p = 1000 \text{ kg/m}^3$







**THANK YOU**