

“Hazardous materials – design considerations”

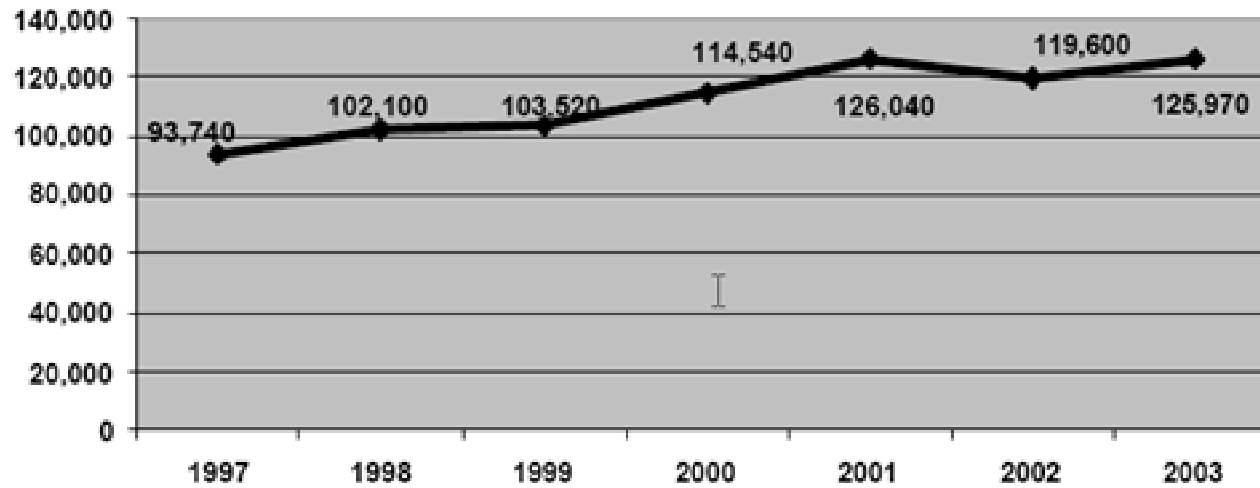
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<http://www.science.uottawa.ca/>



Figure 1: Estimated Emergency Room Treated Injuries Associated with Home Communications, Entertainment, and Hobby, 1997 - 2003



Source: National Electronic Injury Surveillance System (NEISS), 1997 - 2003



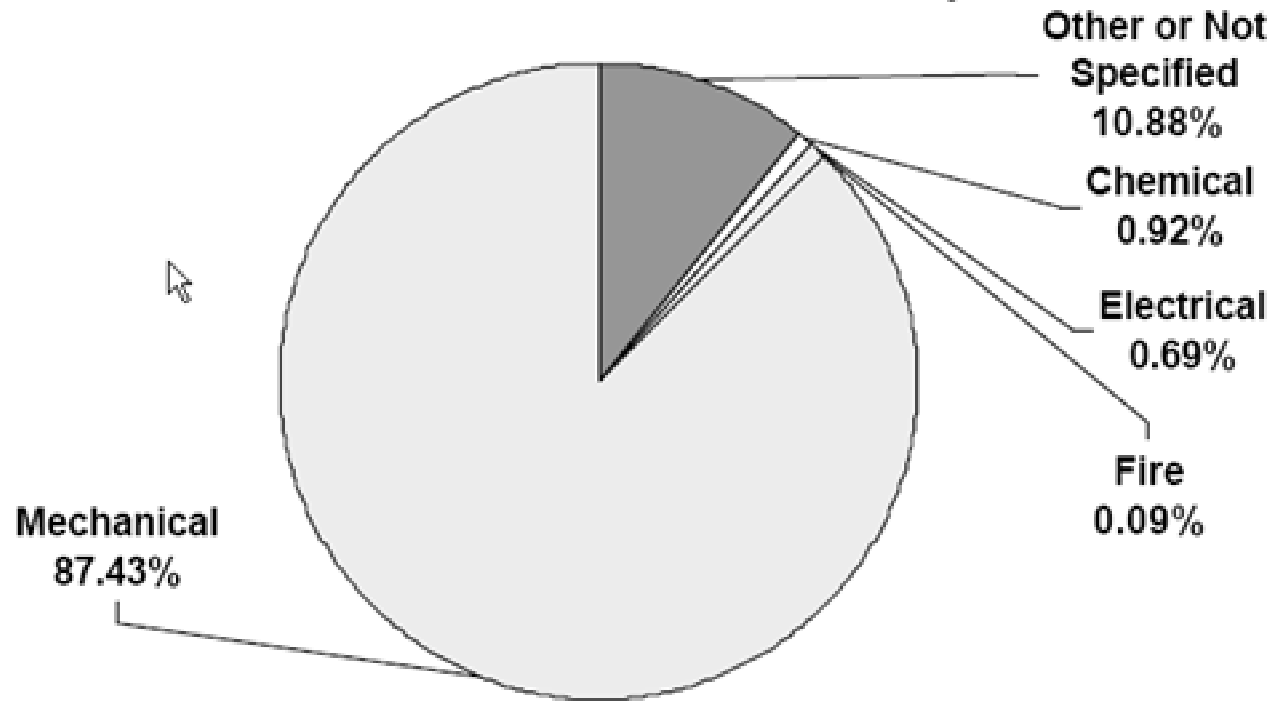
Home Communications, Entertainment, and Hobby Products

- **Individual Product Categories**

- Arts and Crafts
- Music Receiving and Playing
- Antennas
- Musical Instruments
- Office Machines
- Television Equipment
- Telephones and Optical



Figure 2. Distribution of Emergency Room-Treated Injuries by Energy Source of the Hazard for Home Communications, Entertainment, and Hobby, 2003



Source: National Electronic Injury Surveillance System (NEISS), 2003



Product Safety Programme

Health Canada

The Product Safety Programme (PSP) assists in the protection of Canadians by researching, assessing and collaborating in the management of the health risks and safety hazards associated with issues such as:

- children's products
- household products (including household chemical products)
- cosmetics (including personal care products)
- new chemical substances
- products of biotechnology
- workplace chemicals
- radiation-emitting devices
- noise
- Ultraviolet (UV) radiation
- Globally Harmonized System of Classification (GHS)



Advisories, Warnings & Recalls

Information for Canadians Travelling Outside of Canada

Letters, Notices, and Information for Industry

Report an Incident Involving a Consumer Product or a Cosmetic

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Completed Access to Information Requests

Proactive Disclosure

Consumer Product Safety

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Advisories, Warnings and Recalls

Health Canada helps protect the Canadian public from potential health hazards by posting advisories, warnings and recalls from industry concerning consumer products.

Health Canada does not endorse products or companies. Any questions regarding product information should be discussed directly with the manufacturer.

The Recalls and Safety Alerts Database provides easy access to a comprehensive list of recalls, advisories, and safety alerts. This database includes recalls from Health Canada, the Canadian Food Inspection Agency, and Transport Canada.

Navigation buttons: Consumer product, Vehicle, Food, Health product

Search input field with Search button and Advanced search link

Latest recalls and safety alerts

- List of recalls including: Canning Jar Lifter (2013-02-06), Furniture top-overs (2013-02-05), Arbonne Men's Facial Moisturizer (2013-01-30), Thymes LLC fragrances (2013-01-30), John Deere R6X850i (2013-01-29)

Subscribe | Access all

Want to report an incident?



Workplace Hazardous Materials Information System

soon Global Harmonization System

- **To provide information on hazardous materials used in the workplace (GHS will add home, transport)**
- **To facilitate the process of hazard identification**
- **To ensure consistency of hazard information for all Canadian**



Why?

- **Requirement of the Occupational Health and Safety Act**
- **Awareness of risk and hazards in Workplace**
- **“Due Diligence”**



Due Diligence

- **The law requires that we act with due diligence, which means that we must demonstrate that we took all reasonable care in carrying out our activities, e.g., in laboratories**



Other legal requirements

- **Transportation of Dangerous Goods Act**
- **Environmental Protection acts**
 - **Federal**
 - **Provincial**



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Key Elements of WHMIS

- **Labels:**
 - **Supplier**
 - **Workplace**
- **Material Safety Data Sheets (MSDSs)**
- **Training**



What is a Hazardous Material?



- **A: Compressed Gases**



- **B: Flammable and Combustible**



- **D1: Immediate effects**



- **D2: Other toxic effects**



- **E: Corrosives**



- **D3: Biohazardous agents**



- **C: Oxidizers**



- **F: Dangerously reactive**



Compressed Gas Definition



- **Gas at room temperature**
- **Compressed gases**
- **Dissolved gases**
- **Gases liquefied by compression**
- **Refrigerated gases**





10,...9,...8,...7,...”Houston, we have launch!

The Incident....

An operator was supposed to remove one of the two FM-200 fire suppression cylinders from service, but things didn't go exactly according to plan. As you can see in the first picture, there's only one of them. During removal of its twin, the cylinder managed to

The cylinder that got away

How'd that happen?

Compressed gas cylinders have an enormous amount of stored energy just waiting to be mishandled, dropped, or vigorously abused. If this energy is released suddenly, they act like a jet engine; not just like - they pretty much are a jet without the combustion process. Exhaust vapor from a broken valve creates a force that moves the jet, or cylinder here, in an opposite direction of the exiting vapor. It was fortunate that this cylinder selected to travel up instead of across the room. The pictures speak for themselves – the forces involved are significant, and major damages to property and people are potential outcomes when this energy is released suddenly.



Flammable and Combustible Flammable Liquids



Flashpoint

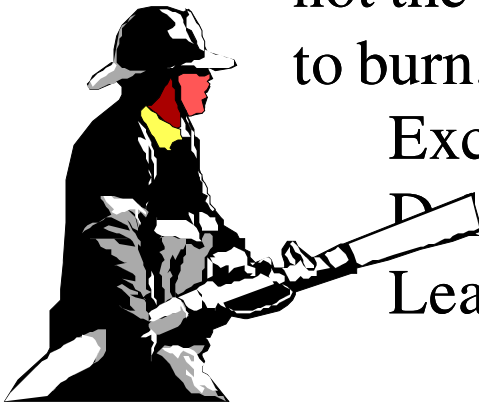
< 37.8 °C

- **Ethanol**
- **THF**
- **Toluene**
- **Acetone**
- **Methanol**
- **Hexane**



Flash point

A substance that can be ignited in the air is said to be flammable (or inflammable). The flash point of a flammable liquid is lower than its ignition point. The flash point is the temperature at which it gives off sufficient vapor to flash, or flame suddenly, in the air. It is not the temperature at which the substance will continue to burn.



Excerpted from Compton's Interactive Encyclopedia
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Flammable Materials

LEDROIT

December 22, 1997

La région

LEDROIT, OTTAWA MAIL, 1^{ER} FOLIO, 22 DÉCEMBRE, 1997 3

On a craint un déversement toxique

Flammes dans un laboratoire de l'U. d'O.



Les pompiers de l'unité de combat des produits toxiques n'ont rien trouvé d'autre que de l'eau au troisième et au deuxième étages du pavillon d'Iorio, où un incendie s'est déclaré, hier, dans un laboratoire de chimie.

PATRICK LAGACÉ
L'Édito

Craignant un déversement toxique dans un laboratoire de l'Université d'Ottawa, les pompiers sont intervenus en force dans un édifice abritant plusieurs salles de cours de chimie, hier après-midi, sur le campus.

La cause de l'incendie n'est pas claire. Mais on sait que des flammes sont apparues dans un laboratoire du troisième étage du pavillon d'Iorio et que les gileurs ont rapidement éteint l'incendie, qui a fait peu de dommages.

Cependant, comme l'incendie s'est déclaré dans un laboratoire scientifique, où toutes sortes d'expériences sont menées avec des produits potentiellement dange-

reux, les pompiers ont fait appel à une unité spécialisée dans les produits toxiques.

«Quand on doit combattre un feu dans un laboratoire scientifique, on double les précautions, car on ne sait jamais quelles sortes de produits on va y trouver. Ça nous prend donc plus de temps à débalker notre équipement et à intervenir», explique le chef Richard Renaud, du service des incendies d'Ottawa.

Finalement, les pompiers de l'unité de combat des produits toxiques n'ont rien trouvé d'autre que de l'eau au troisième et au deuxième étages du pavillon.

Le pavillon a été évacué pendant une heure et demie et moins d'une dizaine de personnes ont dû patienter dans le froid.

Votre C.A.

avec lui, vos affaires sont entre bonnes mains

Comptabilité, vérification, fiscalité, gestion, informatique...

votre C.A. peut faire tout ça



Serge Lavallée, c.a.
André Loyer, c.a.

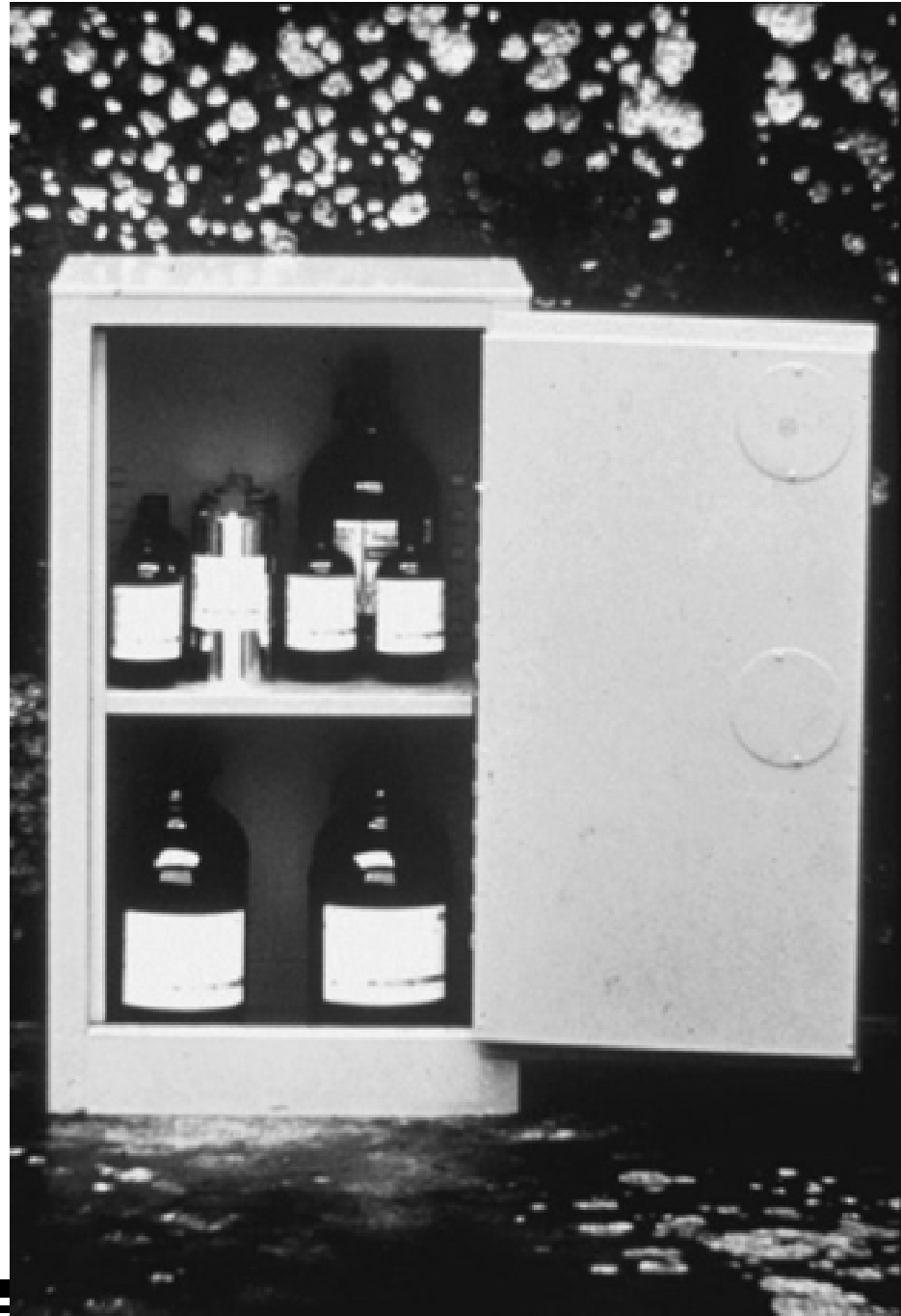
Josanne Chénail-Trépanier, c.a.
Lionel Nolet, c.a.

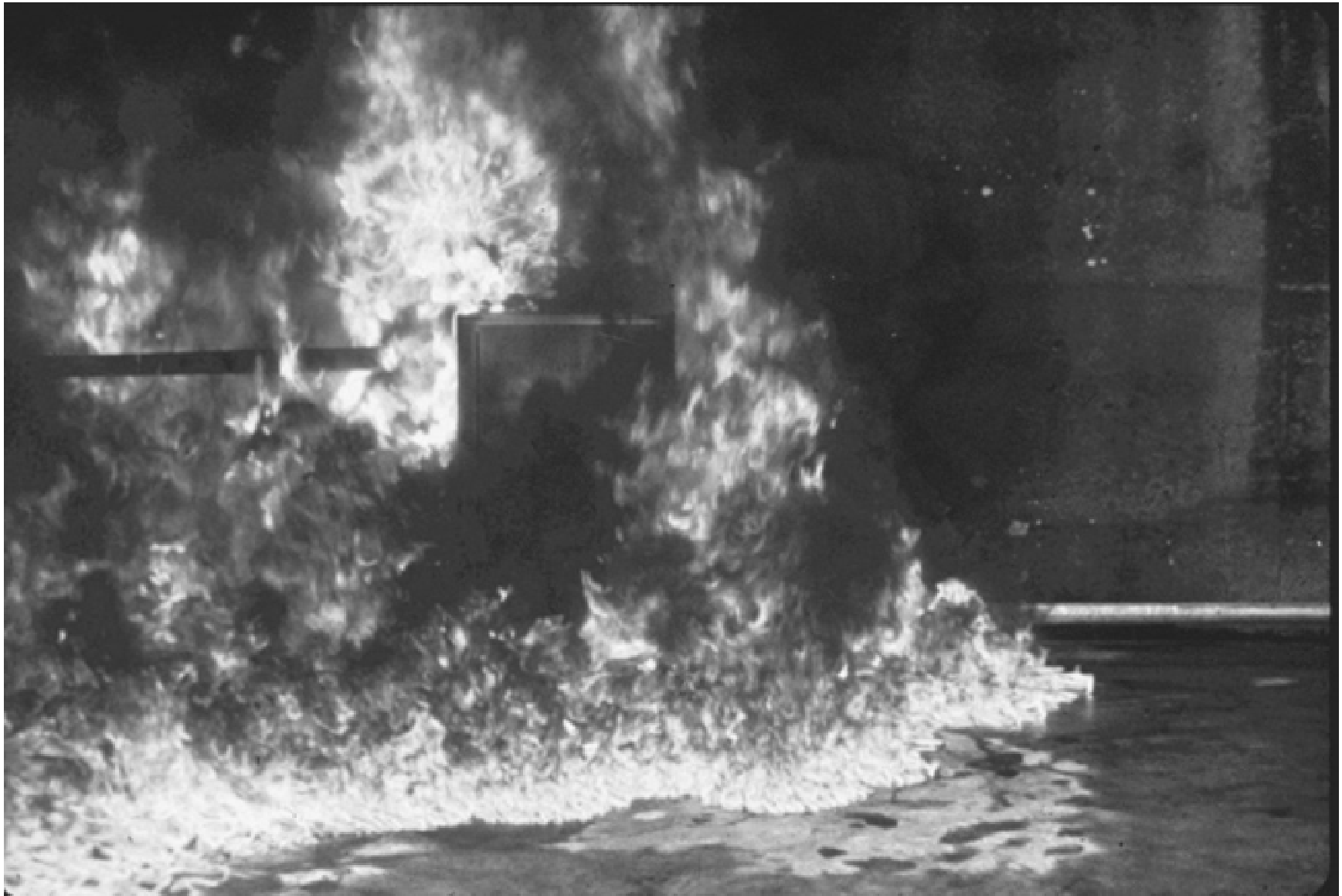


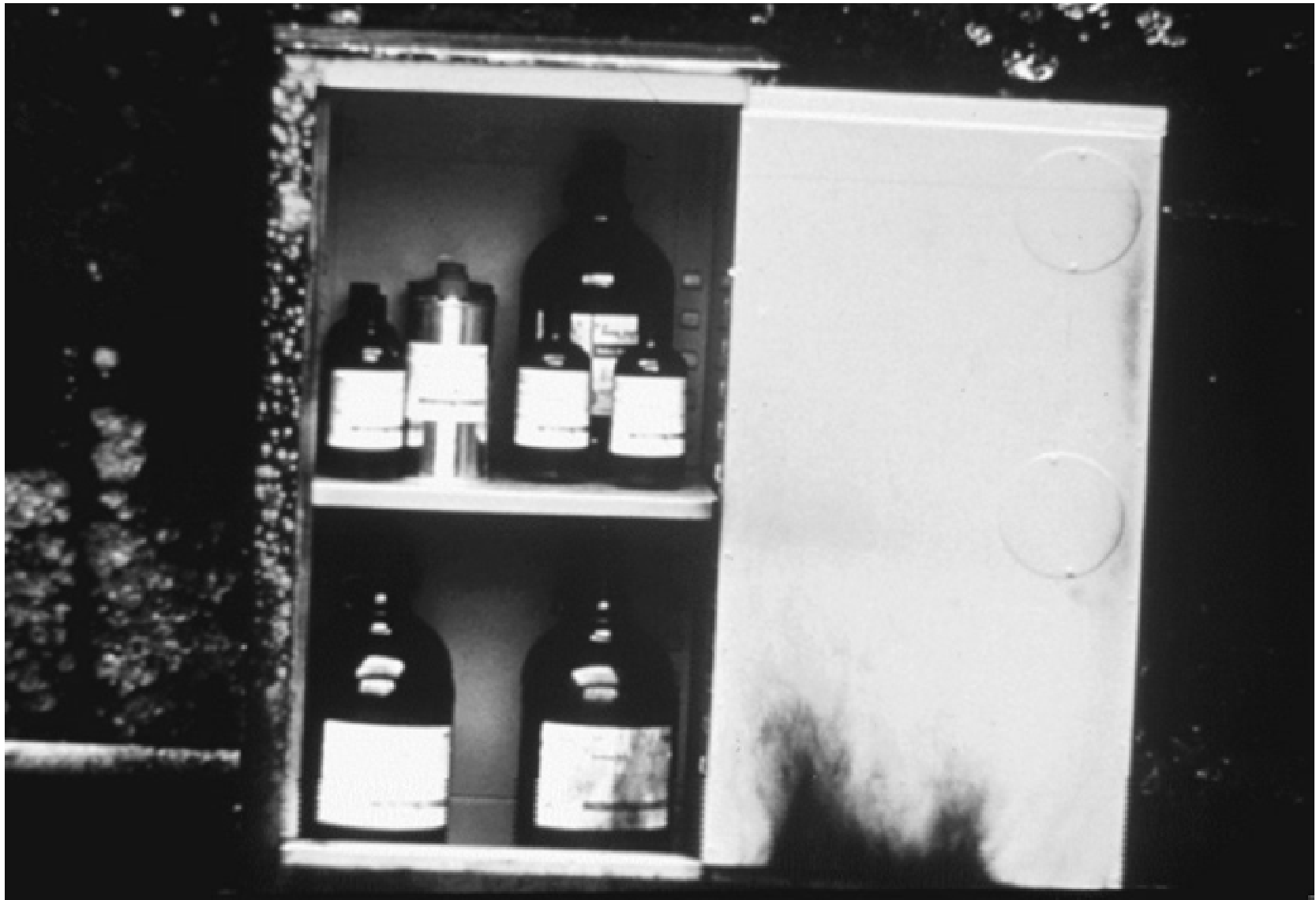


An Ottawa University hazardous materials specialist pauses before entering the Marie Curie Building on campus Sunday after a mysterious fire in a chemical lab started, October 19, 2008. Firefighters used water, dry chemicals and CO₂, but nothing would stop the small fire. The fire eventually burned itself out but university officials were called in to help determine which chemicals were burning. The fire originated where the chemicals were being stored.













Oxidizing Materials

Oxidizers



- Causes or contributes to the combustion of another material by yielding oxygen or any other oxidizing substance
- Nitrates (ammonium nitrate), nitrites
- Bromates, chlorates
- Perchlorates, permanganates
- Nitric acid



Materials causing immediate and Serious Toxic Effects

“What is it that is not poison? All things are poison and nothing is without poison. It is the dose only that make a thing not a poison”
Theophrastus Paracelsus (1493 - 1541)

- Immediate symptoms, e.g., nausea, headache, vomit
- Sub-division A: Very Toxic (low LD50 and LC 50)
- Benzene, chlorine, phosphine
- Sub-division B: Toxic (higher LD50 and LC50)



Lethal Dose LD₅₀/LC₅₀

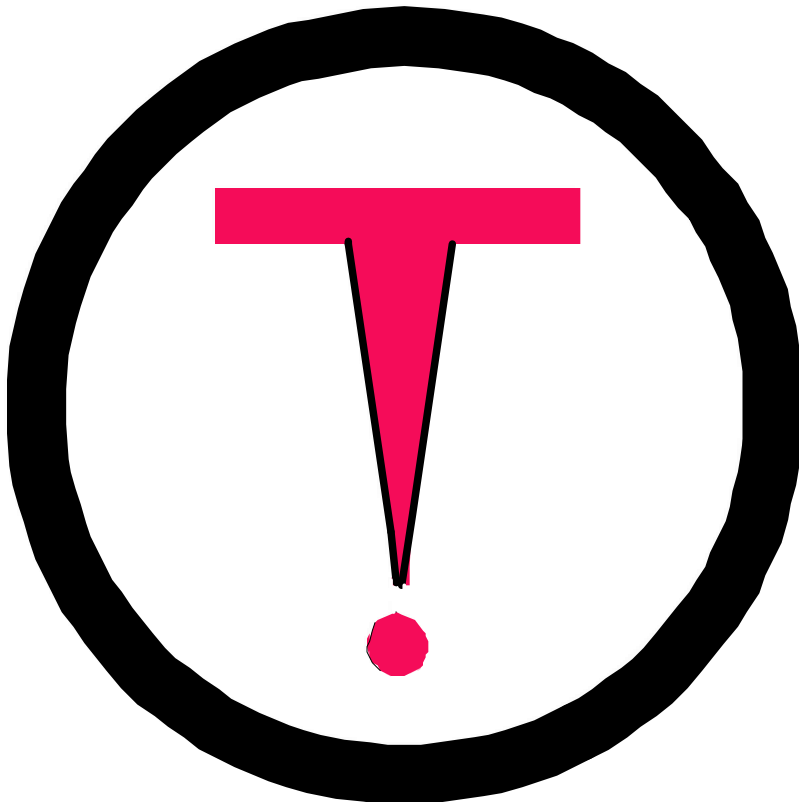
LD/LC = 0



LD/LC = 50 %



Materials Causing Other Toxic Effects



- Longer term effects, e.g., carcinogens, mutagens, sensitizers
- Sub-division A: Very toxic
- Sulphuric acid
- Sub-division B: Toxic
- Hexane, sodium hydroxide



Biohazardous Infectious Material

- **Viruses**
- **Bacteria**
- **HIV**
- **Flu**
- **Hepatitis A, B, C**
- **E Coli**



Corrosive Materials



- **Substances that corrode steel or destroy human/animal tissue**
- **Acids: Sulphuric acid**
- **Bases: Sodium hydroxide**
- **Gases: Chlorine**



Dangerously Reactive Material

- **Reacts violently with water to produce a poisonous gas, e.g., alkali metal cyanides**
- **Undergoes vigorous polymerization, decomposition, or condensation, e.g., 1,3-butadiene**
- **Becomes self reactive under conditions of shock, friction or increase pressure or temperature, e.g., metal azides, dry picric acid**



WHMIS Labels

- **Two types of WHMIS label: Supplier and Workplace**
- **First line of information**
- **Identifies hazardous material in container**
- **Draws attention to MSDS**
- **Alert to dangers and hazards of product**



Supplier Label

SULPHURIC ACID, FUMING ACIDE SULFURIQUE

Risk phrases:

HIGHLY IRRITATING TO SKIN, EYES AND NOSE.

Health Hazard Data:

STRONG ACID, VAPOURS HIGHLY TOXIC, BURNS SKIN ON CONTACT.

Precautionary Statements:

EYES: FACESHIELD AND GOGGLES
GLOVES: RUBBER

Personal Protective Equipment:

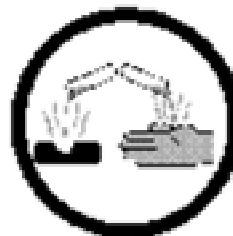
RUBBER APRON, RUBBER BOOTS.

First Aid Measures:

EYES: FLUSH WITH LARGE QUANTITIES OF WATER. CONSULT PHYSICIAN AT ONCE.
SKIN: FLUSH WITH WATER. CONSULT PHYSICIAN.

Ingestion:

TREAT WITH BAKING SODA, MILK OF MAGNESIA OR LARGE QUANTITIES OF MILK. DO NOT INDUCE VOMITING.



Risque(s) possible(s):

EXTREMEMENT IRRITANT POUR LA PEAU, LES YEUX ET LE NEZ.

Reinseignement sur les dangers pour la santé:
ACIDE FORTE, TRAITER COMME POUR L'ACIDE FORTE.

Surexposition aiguë: PEAU ET YEUX.

Measures de précaution:

EQUIPEMENT DE PROTECTION SPECIFIQUE:

YEUX: ECRAN FACIAL ET LUNETTES

GANTS: EN CAOUTCHOUC

Autre vêtements et équipement:

TABLIER EN CAOUTCHOUC, BOTTES EN CAOUTCHOUC.

Premiers Soins:

YEUX: BEN RINCER A GRANDE EAU PENDANT 15 MINUTES. CONSULTER UN MEDECIN.

Peau: RINCER A L'EAU. CONSULTER UN MEDECIN.


Ingestion: TRAITER COMME POUR L'ACIDE FORTE. CONSULTER UN MEDECIN.

**REFER TO MATERIAL DATA SHEET FOR FURTHER INFORMATION.
POUR PLUS D'INFORMATION, CONSULTER LA FICHE SIGNALÉTIQUE.**

Université d'Ottawa • University of Ottawa, Faculty of Science, Ottawa, Ont. K1N 6N5, (613) 5625800-5499



Label from a laboratory supply house

<p>®  Catalog number 11,133-3 Contains 100g</p>	<p>F.W. 102.18 $(\text{CH}_3\text{CH}_2\text{CH}_2)_2\text{O}$ b.p. 88-90° n_D^{20} 1.3800 d 0.736</p>	<p>[111-43-3]</p>	
<p>Propyl ether, 99+% Flammable Liquid! Store under Nitrogen!</p>			<p>Lot no. 07316LV</p> <p>For Laboratory use only. Not for drug, household or other uses.</p>
<p>Aldrich Chemical Company Inc. CRAFTSMEN IN CHEMISTRY MILWAUKEE WIS53223 USA</p>			



Label from a laboratory supply house

100 g M-5750 Lot 119F0448

SIGMA

IRRITANT
Irritating to eyes,
respiratory system
and skin. In case of
contact with eyes,
rinse immediately
with plenty of water
and seek medical
advice. Wear suit-
able protective
clothing.



MENADIONE SODIUM BISULFITE

(2-Methyl-1,4-naphthoquinone sodium
bisulfite)

Minimum 95%

[57414-02-5]

Water soluble addition
compound of vitamin K₃
Light sensitive
Desiccate
Store at less than 0 °C

$C_{12}H_8O_7 \cdot NaHSO_3$ mw 276.2
 H_2O content 1.5 mol/mol
For laboratory use only. Not for drug,
household or other uses.
Prepared for Sigma

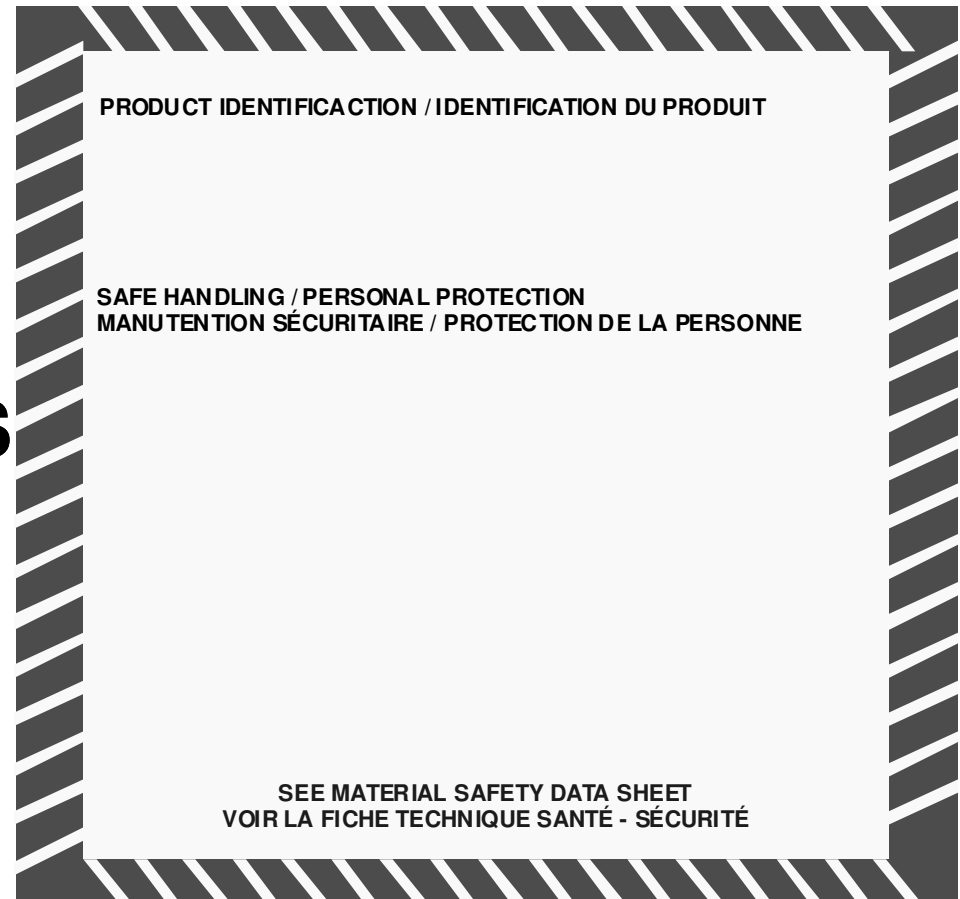


SIGMA CHEMICALS CO. P.O. Box 14508 St. Louis MO 63178 USA 314-771-5750



Workplace Labels Design Requirements

- Name of product
- Safe handling information
- Reference to MSDS
- No design requirements, e.g., no hatched border

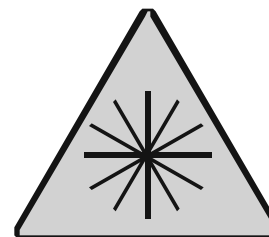
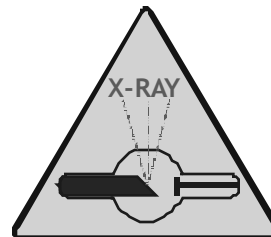
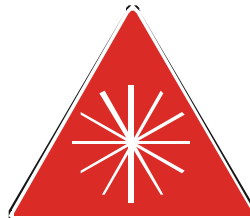
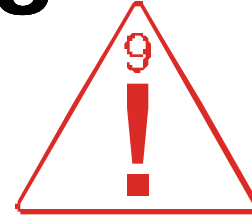


Other Labels and Warning Signs

- **Lab Doors Signs**
- **Hazardous waste**
- **Radioisotope Decay**
- **Biohazard**
- **Scintillation Waste**
- **Radioactive trefoil**



Lab Doors Warning Signs



Biohazard

- **Sharps container**
- **Biohazard bags**
- **Biohazard drum**
- **Biohazard rooms**



Material Safety Data Sheets (GHS will call them SDS)

- **Provides more detail than on label**
- **Describes safe use of product and emergency/spill clean up procedures**
- **MSDS contains current information**
- **Updated every three years**
- **MSDS must be readily available**
- **Contains minimum nine categories**
- **MSDS varies in length and detail**
- **Canadian 9, European 16, US up to 36**



Where To find MSDS's

- **Must be provided by the Supplier**
- **<http://www.uottawa.ca/services/ehss/>**
- **Some labs have binders with MSDS's**
- **EHSO can help to find**



MSDS Categories

- **Preparation Date and who prepared**
- **Product Information**
- **Hazardous Ingredients**
- **Physical Data**
- **Fire and Explosion Hazard**
- **Reactivity Data**
- **Toxicological Properties**
- **Preventative Measures**
- **First Aid Measures**



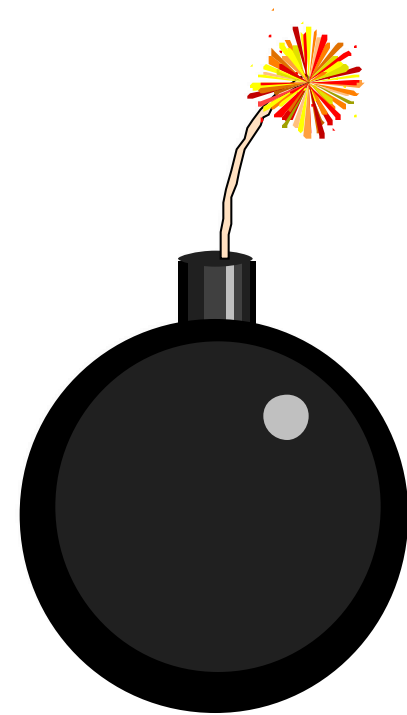
Physical Data

- **Physical state, e.g., solid, liquid**
- **Odour and appearance**
- **Vapour pressure**
- **Vapour density**
- **Evaporation rate**
- **Boiling points/ freezing points**
- **pH**



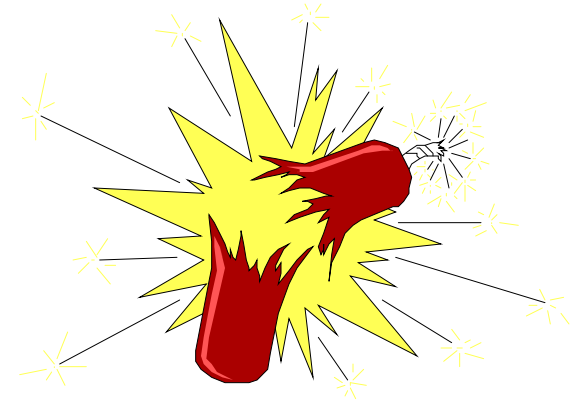
Fire and Explosion Hazard

- **Flammability**
- **Means of extinction**
- **Flashpoint**
- **Flammable limits (LFL, UFL)**
- **Auto-ignition temperature**
- **Hazardous combustion products**
- **Explosion date, e.g., sensitivity to shock**



Reactivity Data

- **Chemical compatibility**
- **Incompatibility of chemicals/
products**
- **Conditions of reactivity**
- **Hazardous decomposition products**



Toxicological Properties

Routes of entry into the body

Inhalation



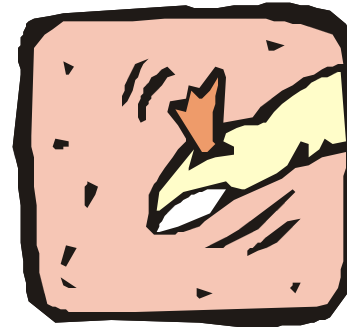
Ingestion



**Contact with skin
or eyes**



Autoinnoculation



Toxicological Properties

- **Effects of short term acute exposure**
- **Effects of chronic long term exposure**
- **Exposure limits**
- **Time weighted average exposure value**
- **Short term exposure value**
- **Exposure ceiling**
- **Threshold limit value**
- **LD50 and LC50**



Preventive Measures

- **Personal protective equipment, e.g., gloves, lab coat, safety goggles**
- **Storage requirements, e.g, shelf life, control of sources of ignition**
- **Engineering controls, e.g. ventilation, fume hoods**
- **Waste disposal: Note follow University guidelines only**
- **Leak and spill procedures, e.g., clean up small spills. Larger spills contact 5411 for ERT**



Summary

- **Be aware of hazards in your workplace**
- **Know where to find information**
- **Put safety consideration as a critical parameter of all your activities**
- **Regularly run Safety reviews of All of your processes.**
- **Ask question before not after. Be a Pro not Amateur**

