



## Chemical Handling & Spills Response

Environmental & Occupational Health Support Services (EOHSS)




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## Agenda

- Legislation: Occupational Health & Safety Act (OHSA), Regulations and, Workplace Hazardous Information System (WHMIS)
- McMaster University's Risk Management Manual (RMM)
- Handling Chemicals Safely
- Controlling Hazards
- Waste Disposal
- Spills Response
- References & Resources

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## Occupational Health and Safety Act (OHSA)

<p><b>Regulations</b></p> <ul style="list-style-type: none"> <li>▪ Industrial</li> <li>▪ Construction</li> <li>▪ Health Care</li> <li>▪ Mining</li> </ul> <ul style="list-style-type: none"> <li>▪ Control of Exposure to Biological and Chemical Agents</li> <li>▪ WHMIS</li> <li>▪ Diving Operations</li> <li>▪ First Aid</li> </ul>	<p><b>Designated Substances:</b></p> <p>Asbestos Lead Mercury Silica Isocyanates Arsenic Benzene Acrylonitrile Vinyl Chloride Ethylene Oxide Coke Oven Emissions</p>
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### Reg. 833: Control of Exposure to Biological or Chemical Agents

Includes:

- ◆ Every employer shall take all measures reasonably necessary in the circumstances to protect workers from exposure to a hazardous biological or chemical agent because of the storage, handling, processing or use of such agent in the workplace
- ◆ Exposure means by inhalation, skin contact (absorption), through mucous membranes (e.g. eyes), ingestion and injection

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### Reg. 833: Control of Exposure to Biological or Chemical Agents, continued...

Provides exposure values of 700 chemicals:

- OELs (Occupational Exposure Limits),
- STEV (short term exposure values),
- CEV (ceiling exposure values),
- TWAEV (time-weighted average exposure values),
- ◆ Values are usually listed in the MSDS (Material Safety Data Sheets)

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### WHMIS

Ensuring workers receive the **education,**  
 and **site-specific training,**  
 in the **safe storage,**  
**handling,**  
 and **use**  
 of controlled products in the workplace

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## WHMIS, cont'd

**Labeling Requirements**

- Supplier must provide a label
- Workplace must provide a label when decanting or manufacturing
- 8 Classifications/Symbols

**MSDS (Material Safety Data Sheets)**

**Training**

- Employer and Worker

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## Hazard Symbols

**Class A: Compressed Gas**  
Any material which is a gas at normal temperature and pressure, but is packaged as pressurized, dissolved or liquefied gas by compression or refrigeration. E.g. oxygen, chlorine



**Class B: Flammable & Combustible**  
Will ignite and continue to burn in air if exposed to a source of ignition  
Can be a gas, liquid, aerosol, solid  
E.g. methane, acetone




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## Hazard Symbols (cont'd)

**Class C: Oxidizing Material**

- May or may not burn but will release oxygen contributing to the combustion of other material
- E.g. ozone, chlorine, nitrogen dioxide




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## Hazard Symbols (cont'd)

**Class D: Poisonous & Infectious Material**

**Materials Causing Immediate & Serious Toxic Effects**  
E.g. styrene, hydrogen cyanide

**Materials Causing Other Toxic Effects** (carcinogens, irritants, sensitizers)  
E.g. asbestos, ammonia

**Biohazardous Infectious Material:**

- Either a living organism or the chemical toxin it produces that can cause illness in humans
- E.g. Hepatitis B, Cholera

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## Hazard Symbols (cont'd)

**Class E: Corrosive Material**

- Can attack metals and cause skin damage
- May weaken containers
- E.g. acids, ammonia

**Class F: Dangerously Reactive Material**

- May react violently under conditions of shock or increases in temperature or pressure
- May react with water to create a toxic gas
- E.g. ozone, benzoyl peroxide

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## Risk Management Programs (RMMs)

<http://www.workingatmcmaster.ca/eohss>

- RMM #100 McMaster University Environmental Health and Safety Policy
- RMM # 101 McMaster University Risk Management System
- RMM # 102 Occupational Health and Safety Act
- RMM # 103 Environmental Protection Act

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**Risk Management Programs (RMMs)**

- RMM # 309 Laboratory Safety (see Lab Safety Handbook)
- RMM # 310 Eye Protection Program
- RMM # 311 Respiratory Protection Program
- RMM # 312 Foot Protection Program
- RMM # 313 Head Protection Program
- RMM # 320: Personal Protective Equipment Program
- RMM# 321: Hand Protection Program

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**Risk Management Programs (RMMs)**

- RMM # 500 Designated Substances Control Program
- RMM # 501 Hazardous Materials Management Systems/ WHMIS
- RMM # 502: Hazardous Waste Management Program
- RMM # 503 Chemical Weapons Convention Program
- RMM # 504 Compressed and Liquefied Gas Program
- RMM # 505 Transportation of Dangerous Goods Program

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**Specific Training**

- Supervisors, Principal Investigators (PI) must identify real and potential hazards and train workers on these hazards
- Training is to eliminate the risk to workers from the hazard(s)
- Supervisors/PI must provide specific training, evaluate, and retain records. Specific training may include use of equipment, standard operating procedures (SOP)
- Workers must attend site-specific training from their Supervisor/PI on the hazards they may encounter

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## Controlling Hazards

- **At the Source:** (e.g. eliminate, substitute)
- **Administratively, or Along the Path:** (e.g. fume hood, SOPs)
- **At the Worker, or Personal Protective Equipment:** (e.g. goggles, gloves, lab coat)




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## Fume Hood Use

- Verify hood is working (e.g. Ventalert, flow meter, tissue movement)
- If fume hood is not working, inform your supervisor; use another fume hood and contact appropriate maintenance
- Fume hoods are NOT meant for storage



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## Fume Hood Use, Cont'd

- Set up equipment at least 6 inches into hood. Raise the equipment 6 inches from the work surface inside the hood to allow for uninterrupted air flow
- Set up experiment to ensure only arms extend past the sash
- Keep sash as low as possible, a 12 inch space is considered the proper working height
- Keep sash closed when not in use
- Wear personal protective equipment as appropriate
- Clean up

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## Fire Protection and Prevention Act

- Ontario Fire Code and Industrial Regulations: Section 4.12 provides information re: Laboratories/Studios
- Containers used for flammable and combustible liquids in a lab shall be of not more than 5 L (Section 4.12.3.1)
- Where individual containers with a capacity of more than 5 L are required for storage, safety containers conforming to ULC/ORD-C30, "Safety Containers", and of not more than 25 L capacity, shall be used (Section 4.2.6.4)




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## Fire Protection and Prevention Act, Cont'd

- Except as permitted in Sentence (3), not more than 300 L of flammable liquids and combustible liquids, of which not more than 50 L shall be flammable liquids, shall be permitted in the open area of a lab [4.12.3.1 (2)]
- Quantities in excess of those permitted in Sentence (2) shall be stored in cabinets conforming to Subsection 4.2.10 or in a room conforming to Subsection 4.2.9
- Containers of flammable liquids or combustible liquids shall be kept closed when not in use

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## Fire Protection and Prevention Act, Cont'd

Storage Cabinets shall

- Be labeled in conspicuous lettering to indicate that the cabinet contains flammable materials and that open flames must be kept away [4.2.10.4]
- Conform to ULC-C1275, "Storage Cabinets for Flammable Liquid Containers",
- Conform to ULI 1275, "Flammable Liquid Storage Cabinets",
- Be "FM Approved" by FM Global, or
- Be listed as meeting NFPA 30, "Flammable and Combustible Liquid Code" [4.2.10.5]

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## Static Electricity

Static electricity is the electric charge generated when there is friction between two things made of different materials or substances  
(e.g. liquid poured from a container)




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## Do all types of containers have to be bonded or grounded?

- Only containers that conduct electricity, such as those made from metal or special, conductive plastics
- Non-conductive containers include polyethylene plastic or glass do not require bonding
- Details on bonding and grounding can be found in the Lab Safety Handbook




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## Refrigerators must meet Electrical Safety Code to store Class 1 Liquids [4.1.4.1]




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### Basic Principles of Personal Protective Equipment (PPE)

- PPE only provides a barrier between the hazard(s) and you
- Therefore must provide the maximum protection based on the hazard
- For example, rubber boots and rubber aprons must be worn when working with large volumes
- When selecting PPE, consult MSDS, your Supervisor/PI and Review the applicable Risk Management Manuals (RMMs)

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### Personal Protective Equipment Eyewear

- Safety goggles when handling hazardous chemicals (RMM# 310)
- Full face shield recommended when handling cryogenics, any explosion hazard or combustion and high-temp reactions.
- Contact lenses not recommended when working with chemicals




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### Personal Protective Equipment Gloves

- Select compatible gloves for type of chemicals being used (RMM# 321)
- Check safety supply catalogues for compatibility tables
- Inspect gloves for tears and holes prior to use




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### Personal Protective Equipment Lab Coat/Aprons (Handout)

- Lab coats are required and to be worn in the lab



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### Personal Protective Equipment Footwear

- Closed toed shoes must be worn in a chemical laboratory /studio (RMM# 312)
- Reasonable heel height should be a consideration when choosing footwear

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### Personal Protective Equipment Respirators

Contact EOHSS/FHSc for selection, use and care of respirators as per RMM # 311 and the CSA standard.



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## Handling Chemicals Safely

- Review and understand hazards **before** using a chemical (MSDS)
- Follow standard operating procedures (SOPs) developed in your lab, studio, or worksite
- Review McMaster University's Lab Safety Handbook
- Control your exposure through engineering, administrative and personal protective equipment (PPE)
- Review Risk Management Manual (RMM)

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## Handling Chemicals Safely, cont'd

- Chemicals falling under the Designated Substance Regulations provide specific requirements for Control Programs and may include medical monitoring
- Handling toxic, reactive, corrosive, or flammable chemicals requires wearing the appropriate Personal Protective Equipment (PPE) for the protection of eyes, face, hands, feet and body
- Annual Training and Fit testing is mandatory prior to using a respirator

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## Handling Chemicals Safely, cont'd

- Hazardous chemicals shall be used in a fume hood. Adequate ventilation must be maintained and use of an alarm system is mandatory
- Know the location of and how to use safety showers and eye wash stations
- Order sufficient quantities to eliminate unnecessary storage and/or disposal (i.e. smaller amounts)
- Ensure enough spill kits are available to contain all of the chemical(s) you are working with in case of a spill
- Ensure you are trained on how to use the appropriate spill kit(s)
- After handling chemicals and removing gloves, thoroughly wash hands

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## Toxic Chemicals

***In addition to following Standard Safety Practices (Slides 31,32,33):***

- Install and arrange maintenance for automatic monitors and alarms where asphyxiates are present
- Where required by law, keep chemicals locked up




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## Reactive Chemicals

***In addition to following Standard Safety Practices (Slides 31,32,33):***

- Isolate reactive chemicals from all other materials
- Provide secondary containment for all containers
- Avoid contact with combustible materials
- Date all peroxide forming materials and dispose of after a six month period

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## Corrosive Chemicals

***In addition to following Standard Safety Practices (Slides 31,32,33):***

- Use concentrated acids in fume hoods
- Transport corrosive chemicals in secondary safety container
- Provide secondary containment for all containers

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## Flammable Chemicals

**In addition to following Standard Safety Practices (Slides 31,32,33):**

- Keep away from heat, sparks and sources of ignition
- Keep containers closed, except when in use
- Ground all metal drums and transfer vessels
- Make sure your containers are labeled and stored in flammable cabinets or explosion proof refrigerator
- Know how to use a fire extinguishers and the location

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## Dispensing Flammables

- Pouring, dispensing, or transferring any liquid from a container labeled "Flammable" requires bonding and grounding
- Must be done in a fume hood




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## Compressed Gas

**In addition to following Standard Safety Practices (Slides 31,32,33):**

- May include an additional WHMIS class: know the full hazards of the gas you are working with
- Identify chemical contents of cylinder
- Cylinder must be chained individually
- Before moving cylinders, Remove Regulator and replace with safety cap
- Moving cylinders requires the use of a proper (3 or 4 wheeled) cart




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### Compressed Gas, Cont'd

- Toxic gases should to be stored in a dedicated flammable cabinet and used in a fume hood e.g. chlorine, ammonia
- Use only a regulator designated for the specific gas being used
- Gas Cylinder Training shall be taken before using compressed gases

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### When a Hazardous Gas Cylinder is Leaking:

- If there is a **FLAME** present, do not extinguish the flame before the cylinder is turned off, it could re-ignited explosively
- If possible move the leaking cylinder to a fume hood
- Make sure there are no incompatible chemicals nearby
- Do not take an elevator or go in an enclosed space
- Contact Security/Emergency Services

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### Compressed Liquids

**In addition to following Standard Safety Practices (Slides 31,32,33):**

- Compressed liquids may include an additional WHMIS class: know the full hazards of the gas you are working with (e.g. propane is a liquid when compressed)
- Compressed liquids present a danger of frost bite and burns

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### Hydrogen Fluoride (HF)

- Can cause severe burns and potentially life threatening health effects
- There is NO safe level of HF Exposure

If working with HF:

- HF Training
- HF Emergency Kit
- HF emergency protocol

[www.workingatmcmaster.ca/eohss](http://www.workingatmcmaster.ca/eohss)

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### Video: Flammable and Explosives

- Definitions
- Ventilation
- Transporting
- Storage
- Compressed Gases
- Emergency Planning

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### Waste Disposal: RMM # 502: Hazardous Waste Management Program

- Waste must be packaged in the appropriate containers for the chemical
- All waste containers must be labeled with the yellow Chemical Waste labels available through EOHSS or ABB Stores, Room B166
- Complete a Chemical Waste Disposal Record available at [working@mcmaster.ca/eohss](mailto:working@mcmaster.ca/eohss) and fax to EOHSS at 905 540-9085
- Chemical waste will be picked up Tuesdays
- For FHSc, call 24956

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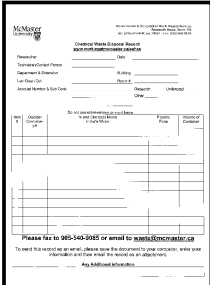
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## Chemical Waste Disposal Record



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## Biological Waste Disposal

- Double bag in yellow or red bags, biomedical waste box or appropriate sharps container
- Labeled
- Cannot be stored longer than 4 days

See Lab Safety Handbook

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## Waste Pick Up Locations

- Ivor Wynne Centre (IWC)
- John Hodgins Engineering (JHE)
- General Science Building (GSB)
- Tandem Accelerator Building (TAB)
- Togo Salmon Hall (TSH)
- Psychology Building
- Nuclear Research Building (NRB)
- Burke Science Building (BSB)
- Life Science Building (LSB) (Biohazardous Waste)

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### Contaminated Broken Glassware

- For chemical contaminated glassware, pack in box lined with plastic bag
- Close bag and tape with packing tape
- Label box following disposal of chemical waste

**Radioactive Broken Glassware: Call Health Physics (ext. 24226)**

**Biological Broken Glassware: Call Bio Safety Office (ext. 23453)**

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### Empty Glass Disposal (Handout)

**Water Soluable:**

- Follow Chemical Waste procedure
- Rinse bottles, dry, deface label, place in hallway for custodial pick up (main campus only)

**Toxic and Solvent:**

- Follow Chemical Waste procedure
- Evaporate in fume hood
- Place in hallway for custodial pick up (main campus only)

*Do Not Pour Chemicals Down the Drain!*  
*Do Not Place Any Empty Chemical Bottles in Recycling!*

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### Sharps Disposal

- Needles
- Razors
- Blades

Must be in sharp containers




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Practice safe usage and disposal of

# Sharps

**Sharps** are sharp objects used in the workplace such as needles, scalpels and scalp shavers, dental awls, lancets, and lancet dispensers

**Protecting yourself from sharps**

1. Plan safe handling and disposal before beginning any procedure using sharps. Sharps should be a sharps container disposal priority.
2. Participate in the safety training.
3. Participate in the completion of other safety technologies.
4. Use devices with safety features when available.
5. Dispose of used sharps devices promptly in sharps disposal containers, which are available in all work areas.
6. Tell your supervisor or manager when sharps disposal bins are full.
7. Report any needles and other sharps related injuries promptly to ensure you receive appropriate medical care.

**FOR MORE INFORMATION ON THE DISPOSAL OF SHARPS CONTACT**  
**EDHSS ext. 24362 or FHS SAFETY OFFICE ext. 24596**

**PURCHASING CONTACT INFORMATION**  
**ASH STORES ext. 2436 HSC STORES ext. 22763**

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## Chemical Spills

- Anyone using chemicals needs to plan for a spills response, including spills kits
- Each work area is unique, therefore, only the Supervisor/Principal Investigator and Workers involved can adequately plan to clean up the spill



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## When A Spill Occurs

- Move away from spill
- Determine type of spill: minor or complex
  - Minor spill may be cleaned up
  - Complex spill: follow Standard Operating Procedure (SOP)
- Refer to Material Safety Data Sheet (MSDS)
- Notify Supervisor/PI immediately



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## Spills, cont'd

**How to Identify a Minor or Complex Spill:**

**What is:**

- The hazard(s) posed by chemical?
- The potential impact to health and environment?
- Spill size?
  - ◊ Type of chemical(s)
  - ◊ The amount
  - ◊ The location
  - ◊ Proper method for cleaning up spill
  - ◊ The Personal Protective Equipment (PPE) available
  - ◊ Training of the personnel




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## Minor Spill

- Any amount that is safe to clean up
- Easily contained (away from drains, ignition sources, and incompatible chemicals)
- Not immediately dangerous to life or health (IDLH)
- No likelihood of fire or explosion
- Proper PPE is immediately available and worker has been fit tested/trained
- Appropriate spill kit is available and worker has been trained to use

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## Complex Spill

- Any amount that is not safe to clean up
- Potential for release to atmosphere, discharge to sewer, leak directly into soils or surface water (environmental threat)
- Dangerous to life or health
- Likelihood of fire or explosion
- No PPE is available or worker has not been fit tested or trained
- Appropriate spill kit is not available




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**Complex Spill, cont'd**  
**Follow Site-Specific Standard Operating Procedure (SOP)**

- Alert other staff in the area
- Pull fire alarm or call Security/Emergency Response
- Be prepared to provide details of chemical spill (location, amount, MSDS, and any other potential hazards/chemical mixtures)
- Notify Supervisor/Principal Investigator
- On Campus Security, dial 88
- Faculty of Health Science MUMC Site: 5555
- For Hospital hosted off site locations call a Code Brown
- For non hospital hosted locations, dial 911

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**Mercury Spill**

- Isolate the area of spill (limit exposure to other personnel and prevent spread)
- As a Designated Substance, Mercury spills require specific spill clean up: Mercury Spills Kit are available
- A Mercury Vacuum is available in ABB Room 107. Access is available through ABB Room 156 or Security. In MUMC call ext. 5555; St. Joseph's call ext 7777
- Only trained workers may clean up a mercury spill
- Additional information is available in the Lab Safety Handbook

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**General Guidelines for Spill Cleanup**

- Ventilate area if required
- Wear appropriate PPE before starting clean up; Obtain Spills Kit
- Place pads working from the outer edge of spilled liquid toward the centre of the spill
- Sprinkle absorbent from the outer edges toward the centre of the spill
- Collect and contain the clean up residues using tools to reduce contact with spilled material
- Decontaminate the area and equipment
- Decontaminate the surface where spill occurred
- Place waste including gloves into a double poly bag, label with chemical waste label
- Dispose of chemical waste as per RMM # 502
- Complete McMaster's Injury/Incident Form and fax to EOHSS (905) 540-9085 or, where applicable to FHSc Safety Office at (905) 525-8539
- Replace Spills Kit

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**Report and Follow Up**

Complete Injury/Incident Report available on line [www.workingatmcmaster.ca/ehss](http://www.workingatmcmaster.ca/ehss) or pre-printed copy

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**Chemical Spill Kit**

A Spills Kit will contain:

- Chemical goggles, face shield
- Gloves suitable for the chemical(s) you are working with
- Lab coat/apron
- Shoe covers

Basic equipment must be in a visible location and known to workers

Respirators are to be stored where there is no potential for contamination

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**How to Clean Up a Spill Using a Spills Kit**

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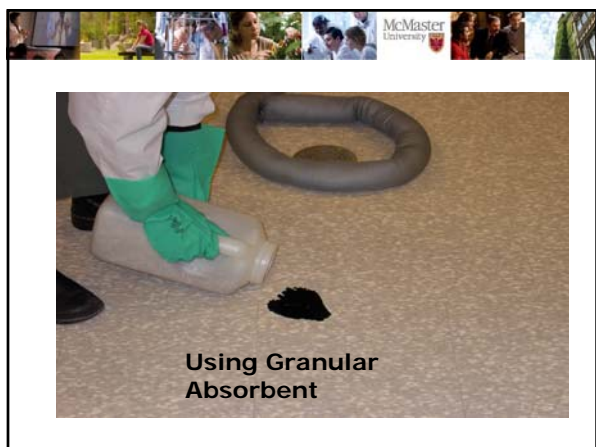
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Using Granular Absorbent

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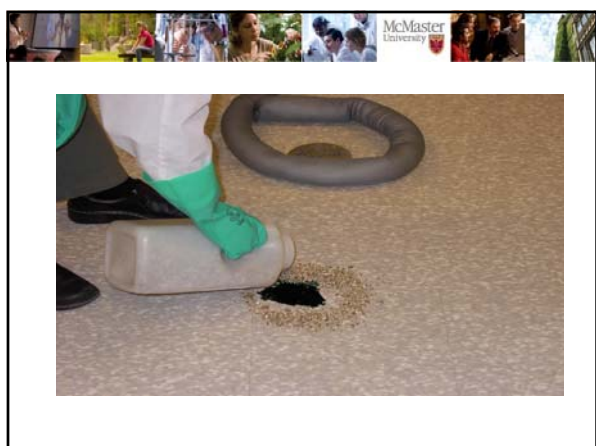
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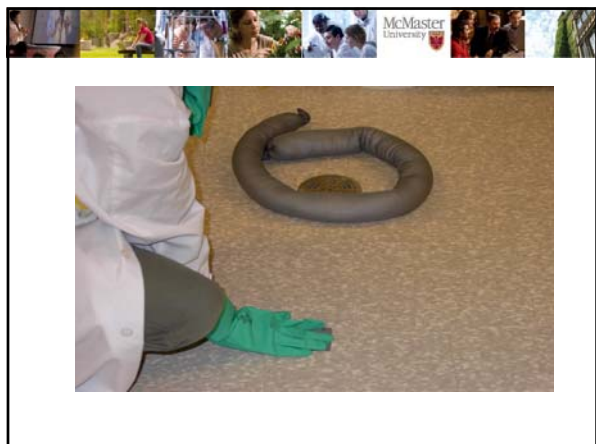
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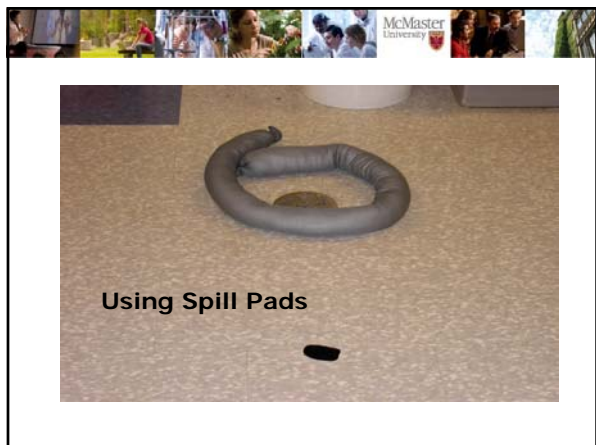
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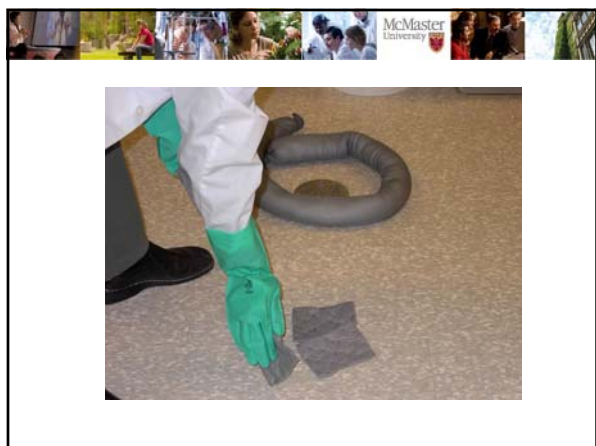
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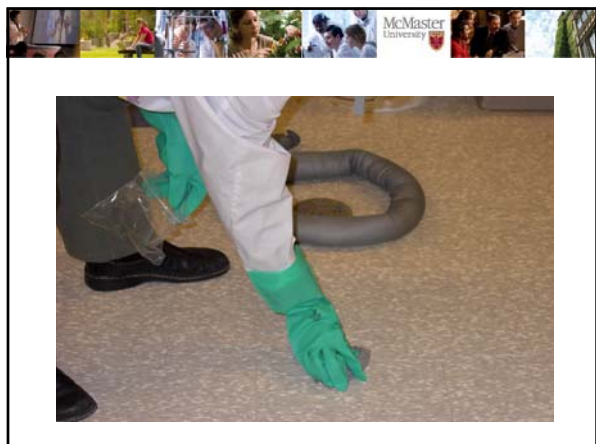
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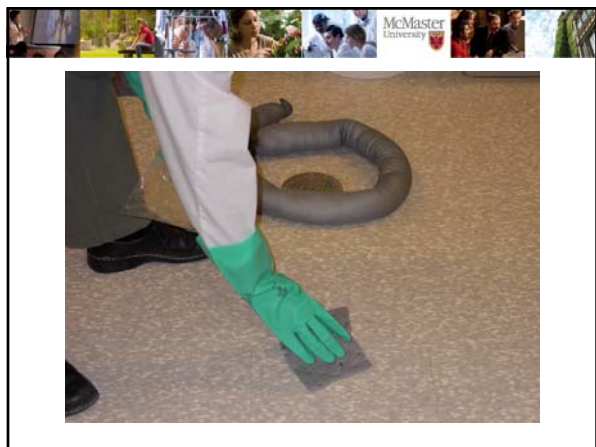
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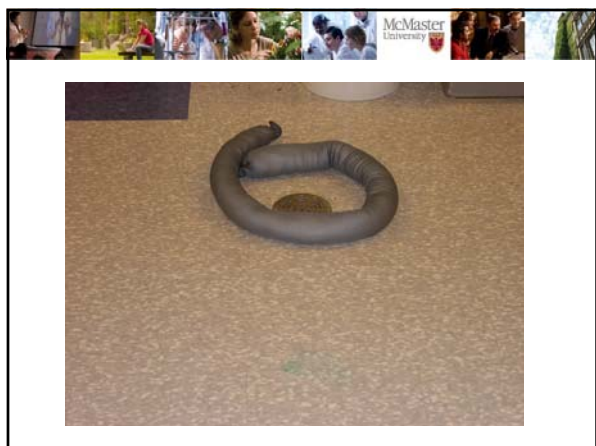
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## References and Resources

- [www.workingatmcmaster.ca/eohss](http://www.workingatmcmaster.ca/eohss)
- <http://fhs.mcmaster.ca/safetyoffice>
- [www.ccohs.ca](http://www.ccohs.ca)
- Laboratory Safety Handbook
- Fire Code:  
<http://www.ofm.gov.on.ca/english/Legislation/firecode/Default.asp>
- Safe Disposal of Empty Chemical Bottles
- Lab Coat, Laundering / Disposal Options
- General Guidelines for Spills Clean Up

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