McGill

Mining and Materials Engineering

Departmental Safety Guidelines

A complementary tool to the safety demos that you have received today.
This presentation and a summary of the demos is available on the website, safety section.

Why?

- Accidents have happened
- We have some dangers specific to our department

- Nobody can foresee when accidents occur. So we have to be always ready to prevent them and to respond if they do occur.

Departmental safety resources

Your supervisor

Safety committee

Marta Cerruti (Chair), Mathieu Brochu, Kirk Bevan, George Demopoulos, Ferri Hassani, Teresa Barrett, Robert Paquette, Mehrdad Fadaei Kermani, Paul Carriere

All the technicians

Departmental safety requirements

- EVERY graduate student and undergrad doing research has to:

1) Attend and pass WHMIS, and keep this updated!

http://www.mcgill.ca/ehs/training/whmis

2) Attend and pass the Hazardous Waste safety training from EH&S, and keep it updated

http://www.mcgill.ca/ehs/training/hazardwaste/

3) Attend and pass this departmental safety orientation

4) Fill out and sign, with the supervisor, the laboratory safety orientation checklist

http://www.mcgill.ca/materials/sites/mcgill.ca.materials/files/lab_safety_orientation_checklist.pdf

5) When you give your department seminar presentation, add a safety slide in it.

Lab safety orientation checklist

McGill Environmental Health and Safety

Laboratory Safety Orientation Checklist

Name (Print) _____

Department _____

Supervisor _____

Date (DD/MM/YY) _____

A Laboratory Safety Orientation Checklist should be completed within one month of arriving in the laboratory.

Please check all items which were fully explained to you by your laboratory supervisor or delegate, for which you have received training and/or for which you have read written procedures. For those items not applicable to your work or research activities, indicate N/A (not applicable).

1. INTRODUCTION

I was informed of McGill's Health & Safety Policies, including:

- ☐ Laboratory Responsibilities
- ☐ Health & Safety Internal Responsibility System
- ☐ Personal Protective Equipment Policy
- ☐ Accident, Incident and Occupational Disease Reporting Policy and Procedure
- ☐ Reporting a safety hazard

2. SAFETY RESOURCES

I was informed of the various health & safety resources available, including:

- ☐ Department Safety Committee
- ☐ Departmental Safety Officer (if applicable): _____
- ☐ Certified First Aid Providers
- ☐ Environmental Health & Safety (514-398-4563, www.mcgill.ca/ehs)
- ☐ McGill Student Health Services (students only, www.mcgill.ca/studenthealth/)

Montreal Neurological Institute

- ☐ MNI Safety Committee (http://apps.mni.mcgill.ca/icrcl/index.htm)

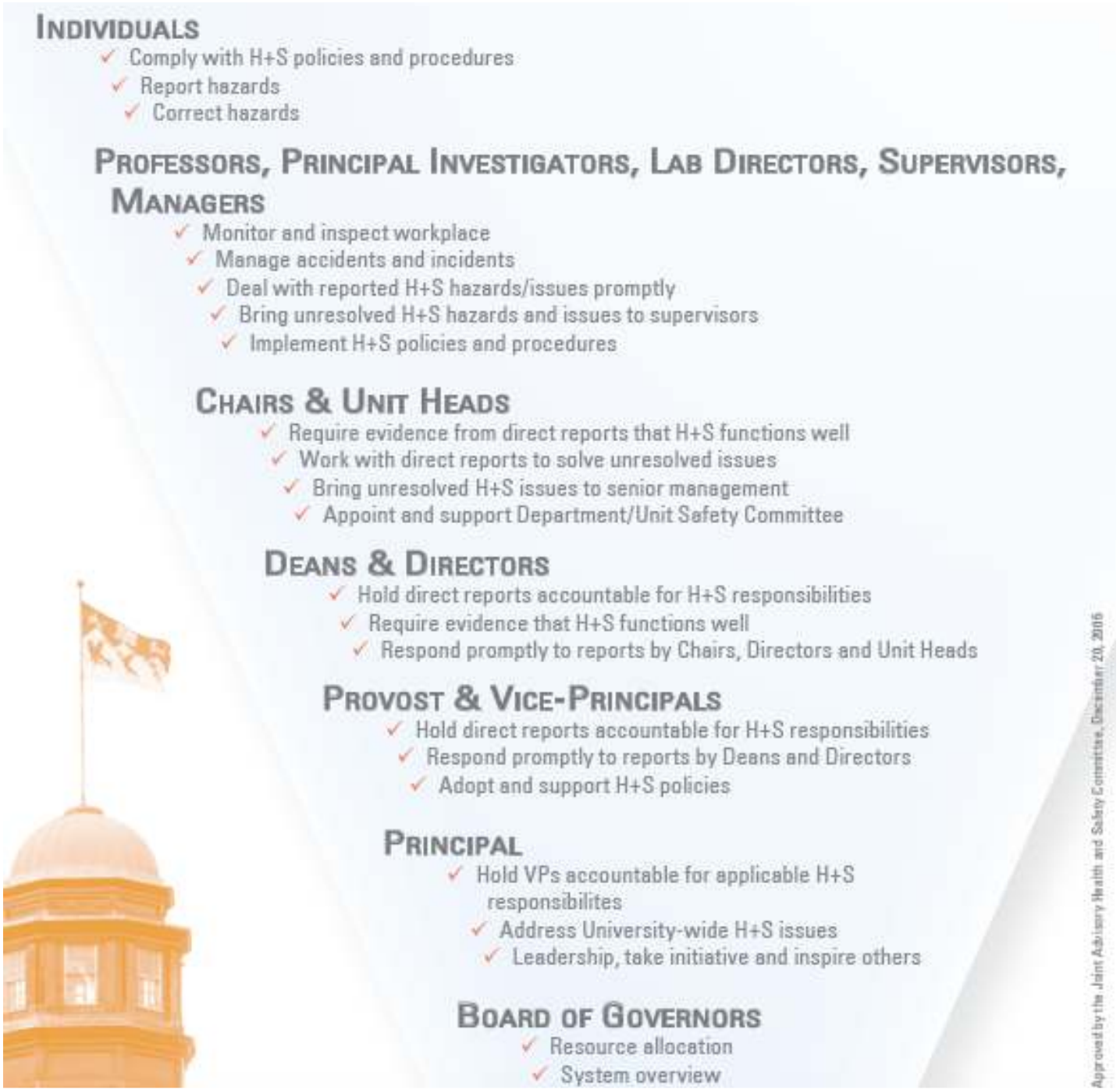
3. EMERGENCY PROCEDURES

- ☐ I was informed of McGill's Emergency Phone Numbers and procedures.
  In case of an accident or incident requiring ambulance, fire or police call **911** - if you call 911 from a cellular phone, you must also call McGill Security Services immediately at:

Check of dept requirements

- **Emails or certificates showing that you passed the WHMIS course and the Haz Waste training, and the lab safety checklist must be attached to the departmental fellowship application form.**
- **We will check your attendance and passing of the departmental safety orientation**
- Failure to do so means not having access to departmental fellowships and awards

Who is responsible for safety?



Safety Begins with you.

It is your responsibility to conduct experiments safely.

Evaluate the risks of your processes.

To help evaluate these risks use:

1. Your advisor
2. Technicians
3. McGill EHS

Safety Begins with you.

1. Be aware of your surroundings
2. Politely correct others not following safety guidelines (personally or anonymously)
3. Evaluate your surroundings for unsafe procedures since they can harm you

Safety Begins with you.

Before you begin a new procedure…

Fill out the MIME TRACK form we have sent to everyone, and discuss it with your supervisor.

Keep this in your notebook and have it handy when you do your experiments.

What do you think are the most dangerous things we deal with in our department?

- Concentrated acids
- HF
- Liquid metals/fine metal powders
- Heavy machines with movable parts

A few examples of acid dangers

- H_2SO_4

More dangerous than others b/c both strong acid and dehydrating agent. Can be oxidant too.

- HNO3

Not only strong acid, but strong oxidant. This means that it's more reactive than other acids and its reactions with solvents & metallic powders are EXPLOSIVE.

Also, it can react with many compounds (e.g. metals, other acids, bases) giving rise to NO and NO2. NO2 is highly toxic.

- HF

Probably the most dangerous acid we have around. Even in diluted form, inhalation or contact with as little as 1% of skin area can lead to DEATH.

In most cases, you won't feel it since it's a weak acid.

What to do in case of acid spill/contamination?

- Immediately RINSE!!!! For a very long time, min 15 minutes.
- If HF, apply neutralizing cream (Ca gluconate) as soon as possible
- Call for help, have someone call emergency

A few notes on dangers of metals

- Fine metal powders and liquids are highly flammable
- Mg and other alkali or alkali-earth are particularly dangerous: they strongly react with water—danger of explosion, plus they generate H_2– highly flammable!

$Mg + 2H_2O \rightarrow Mg(OH)_2 + H_2$

- Fine metal powders are also explosive hazard, if in contact with oxidizers or exposed to sparks
- Can you give examples of oxidizers?

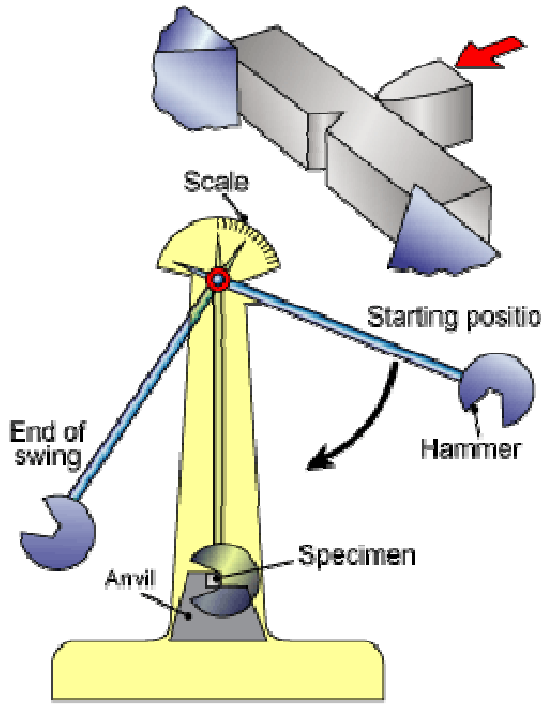
Answer: H2O2 and other peroxides, permanganates, nitrates, chromates, persulfates

If you work with metals

- Special training is ALWAYS required
- Supervision is required in specific instances (eg liquid metals)

Machines with movable parts

- An example: Charpy tester



60 lbs hammer!

A crucial precaution

- **Never, ever work alone when you are dealing with these very dangerous materials/equipment**
- In general: if you are working after hours or during weekends, you should have discussed your work with your supervisor before hand and have him/her approve
- If you work in the lab after hours or during weekends, we strongly recommend that you are NOT alone (another labmate be with you).
- If you are alone, let security know (3000). They will periodically check on you.

Materials Safety Data Sheets (MSDS)

- List the hazards and precautions which should be taken with a chemical
- Required for each chemical in your lab
- Located online mylab.mcgill.ca

Chemical Inventory: mylab

- Input and update chemicals in mylab
- Replaces/complements MSDS sheets in binders
- The existence of mylab should be mentioned on lab info cards under MSDS
- **If you are using mylab only and not MSDS there should be a computer accessible in the lab with access to mylab.**
- **Everyone who uses the lab should have access to mylab in “reading mode”**

Access to mylab

- There are two types of access :
- Full Access - Each authorized user can view and modify the full inventory and MSDS documents. Sign in will be your McGill user name and password.

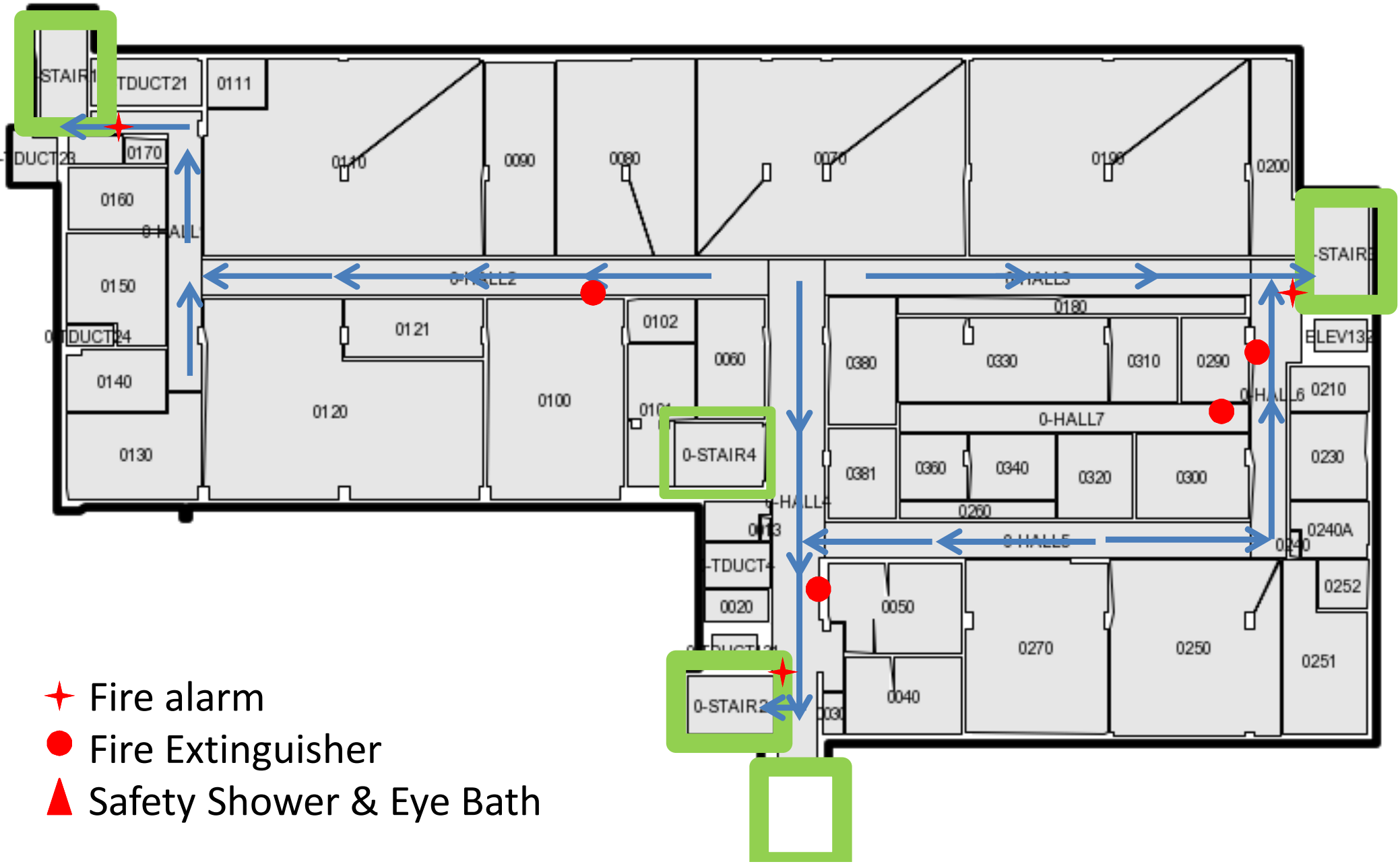
  THIS IS GRANTED BY YOUR SUPERVISOR. He/she has to ask for each individual that he/she wants to have full access to be added.
- Read Only - These allow users to view the full inventory and MSDS documents. Sign in is a generic username (ex: Cerrutilab) and a password chosen by your supervisor

  THIS LOGIN AND PASSWORD SHOULD BE WRITTEN CLOSE TO THE COMPUTER YOU HAVE IN THE LAB WITH ACCESS TO Mylab.

Know your surroundings

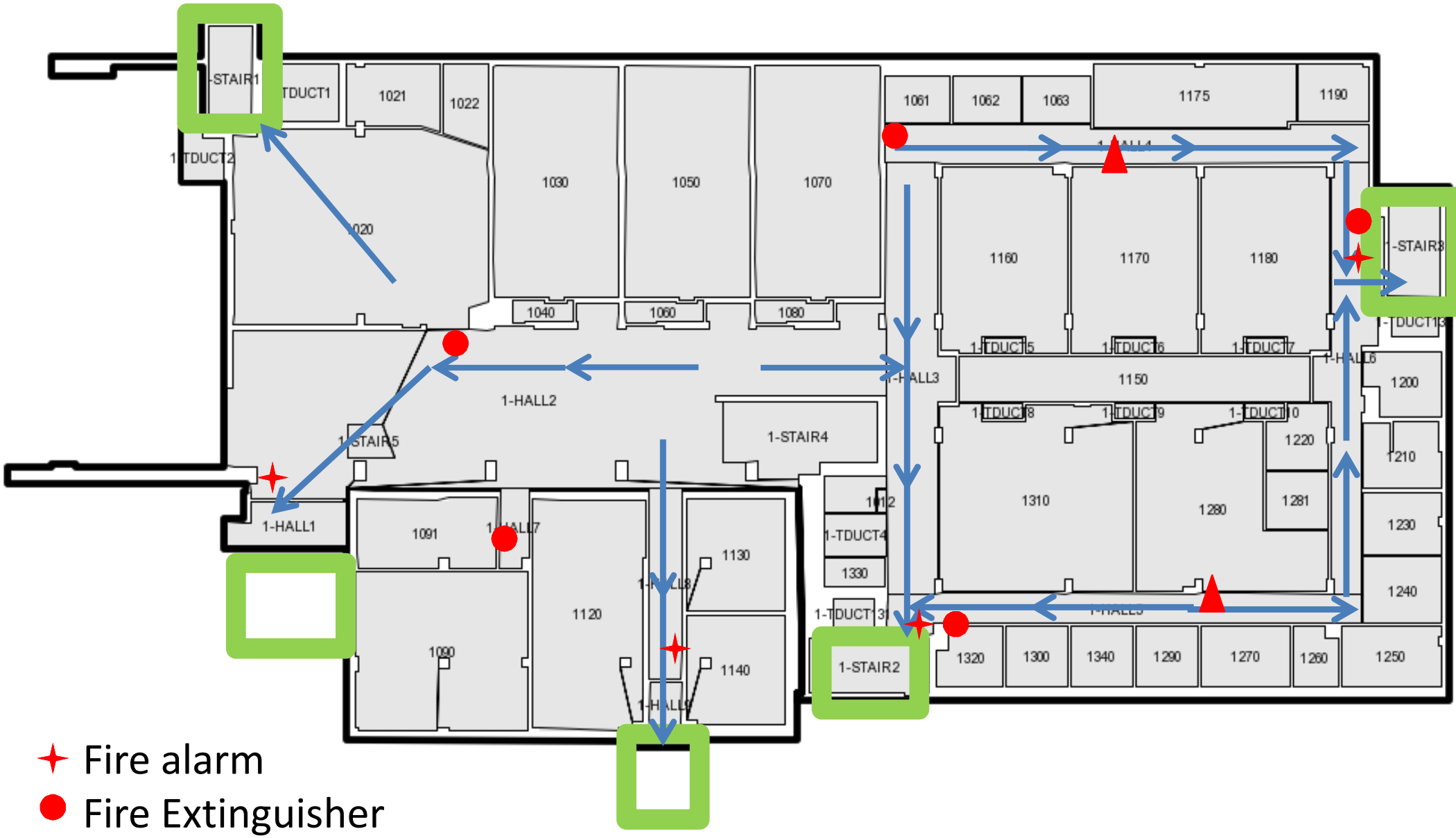
- Before you begin lab work know the location of:
  - Safety Showers
  - Eyewashes
  - Fire Extinguishers
  - Fire Exits

Wong Building – Basement



- Fire alarm
- Fire Extinguisher
- Safety Shower & Eye Bath

Wong Building – First Floor

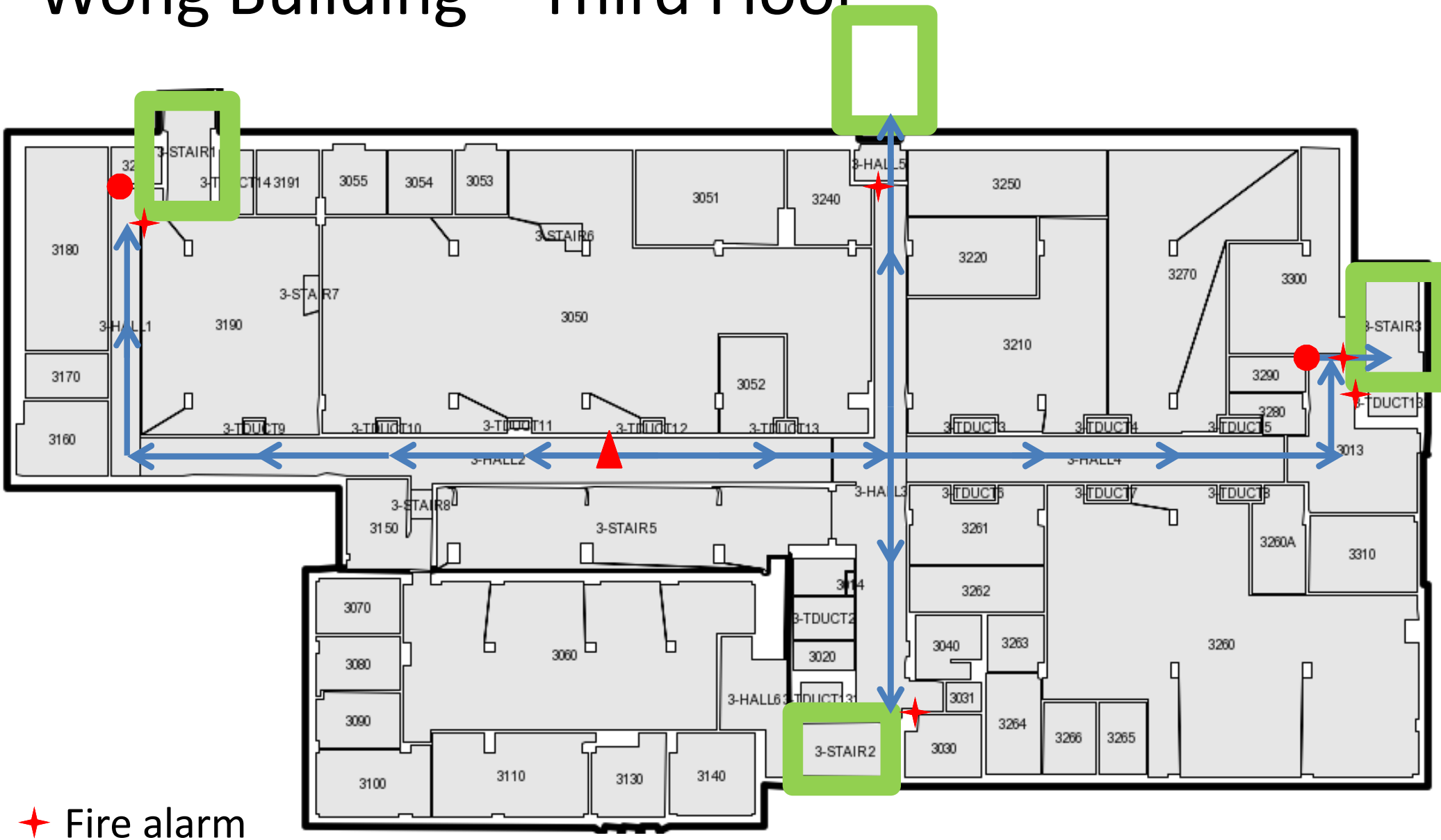


- Fire alarm
- Fire Extinguisher
- Safety Shower & Eye Bath

Wong Building – Second Floor

- Fire alarm
- Fire Extinguisher
- Safety Shower & Eye Bath

Wong Building – Third Floor



- Fire alarm
- Fire Extinguisher
- Safety Shower & Eye Bath

Personal Protective Equipment (PPE)

- Evaluate your risks and determine the proper PPE
- Examples of PPE:
  - Lab Coat
  - Eye Protection
  - Gloves
  - Apron
  - Face shield

When do you use them?

In Lab

- Lab coat and eye protection should be worn
- Gloves may also be required

Outside Lab

- Lab coat and gloves should be removed; transporting chemicals is an exception

Gloves-not all created the same

High temperature glove

Cryogenic glove

Nitrile glove

Vinyl gloves

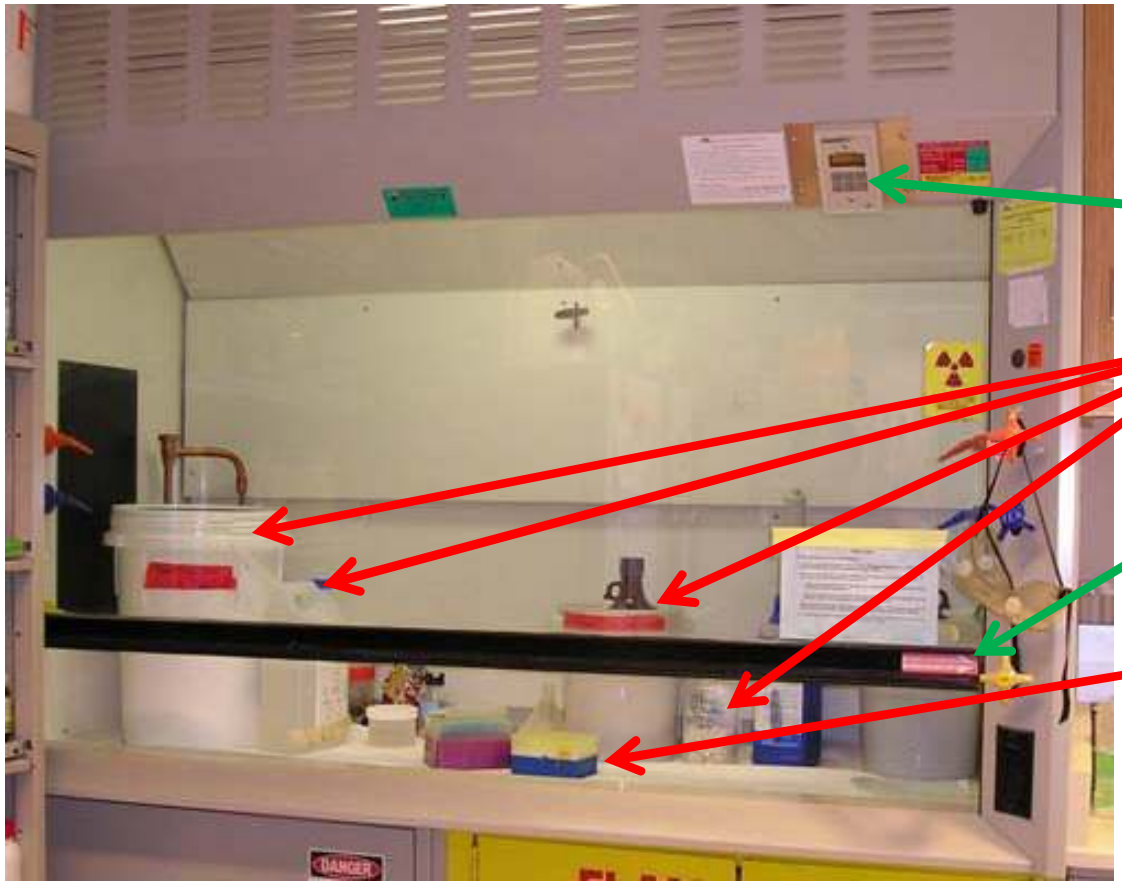
Latex gloves

Which ones *cannot* be used in a materials engineering lab?

Fume hood operation

What's bad about this fume hood?

Is there anything okay about it?



Ensure exhaust is working

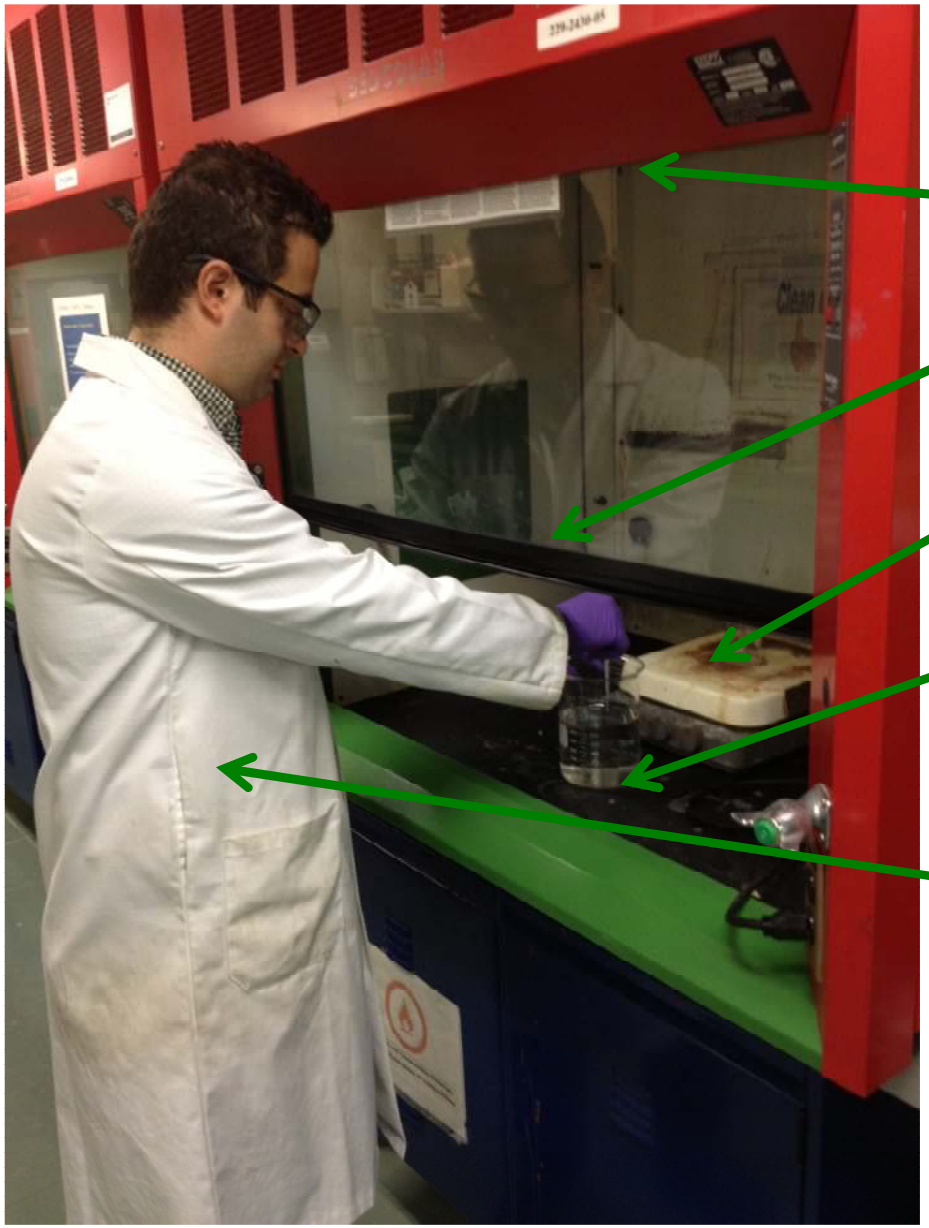
Minimize materials in the hood

Keep sash as low as possible and not higher than your face

Do not work on ledge

Fume hood operation

Proper use of a fume hood



Exhaust is working

Sash is at appropriate level

Work surface is free of stored or extraneous chemicals

Work area is at least 6 inches from the ledge and not too deep in the fume hood

Student is wearing appropriate PPE

Chemical Handling: Use

(you should know about chemical transportation from the demos)

- Know what reaction will ensue before mixing chemicals and take the proper precautions.

One example from this interesting website: the failure knowledge database

Explosion from polystyrene factory in Sakai, Osaka, Japan, Aug 20, 1982. 6 dead, 204 injured.

http://www.sozogaku.com/fkd/en/cfen/CC1000179.html

Chemical Handling: Storage

(you should know about cabinets and more info from the demos)

- **Label chemicals!**
- Store in proper container
- Store with compatible chemicals

Chemical compatibility resource

www.mcgill.ca/ehs/laboratory/labsafety/#cli_4.5

A bad example: HF and organic solvents.

Chemical Handling: Storage

Secondary containment is necessary to separate incompatible chemicals in case of leaks

Ketones and aromatic hydrocarbons

Halogenated compounds, Acetaldehydes, Aldehydes

Other

Amines, Alkanolamines, Alcohol, Glycol, and Glycol ethers

Organic acids

tall bottles of organic acids in tub

Inorganic acids

Chemical Handling (Waste)

- Place in **properly labeled** waste container
- Mix only **compatible chemicals** in waste container
- Dispose of waste container by contacting Monique or Robert.

Disposal of Solids, Liquids and Sharps

- Different disposal containers and regualations for different forms of waste..

Bulk waste

Corrosive waste container

Solvent waste container

Heavy usage container (polyethylene drum)

Use: Corrosive & Radiactive liquid materials

Heavy usage container (steel drum)

Use: Solvents, oils & non-corrosive materials.

http://www.mcgill.ca/hwm/guidelines

http://www.mcgill.ca/ehs/laboratory/labsafety/

Chemical Handling (Waste)

- Besides the standard disposal containers, you can use others, not provided (required for certain chemicals).
- EHS will pick these up directly from your lab
- http://www.mcgill.ca/hwm-webforms/waste-pickup/

Spills and clean up

Emergencies

What constitutes an emergency?

HWM is fully equiped to deal with hazmat situations

The Hazardous Waste Management department provides the McGill community with a Hazardous Materials (HAZMAT) Spill Response service for all types of accidental spills. Trained employees and equipment are available 24 hours/day, 7 days/week to respond to such emergencies.

Procedure for spill response

Call security (3000):

http://www.mcgill.ca/ehs/laboratory/labsafety/

1. Identify yourself.
2. Say that you are calling about a spill.
3. Be precise about the type of spill (Example: a solvent spill, liquid radioactive spill, etc.).
4. Provide information about your location and extent of damages (Building, floor, room number, etc.)

First Aid (kit requirements)

Do you know where it is in your lab?
Do you know what's in it?

- Approved first aid manual
- Bandage scissors
- Splinter forceps
- 12 safety pins
- 25 sterile band (25 x 75 mm^2)
- 25 sterile gauze squares (101.6 x 101.6 mm^2)
- 4 rolls sterile gauze (50 mm x 9 m)
- 4 rolls sterile gauze (101.6 x 9 m)
- 6 triangular bandages
- 4 sterile bandage compresses (101.6 x 101.6 mm^2)
- Adhesive tape (25 mm x 9 m)
- Antiseptics

First Aid

- Automatic Electric Defibrilator (AED)

We now have one in Wong lobby!

Certified First Aid Trainers

Building Wong Building
3610 University, Montreal (Quebec) H3A 0C5

Department Department of Chemical Engineering

Certified First Aid Provider	Room Number	Telephone	Ext.	Certification Valid Until
Andrew Golsztajn	4200	(514) 398-8274		16-Dec-13
Francesco Caporuscio	4200	(514) 398-7472		16-Dec-13
Gerald Lepkyj	3270	(514) 398-4873		25-Oct-13
Jason Ivall	7250	(514) 775-3121		31-Mar-14
Melanie Gorman	3270	(514) 398-4267		16-Dec-13
Nathan Hordy	5140	(514) 862-6034		23-Feb-14
Ranjan Roy	4200	(514) 398-8274		16-Dec-13
Zeinab Hosseinidoust	6050	(514) 963-2899		16-Dec-13

Department Department of Mining and Materials Engineering

Certified First Aid Provider	Room Number	Telephone	Ext.	Certification Valid Until
Pierre Hudon	2270	(514) 398-7176		11-May-15
Raymond Langlois	2470	(514) 398-2665		31-Oct-15
Robert Paquette	2340	(514) 398-5587		20-Oct-15

Department Faculty of Engineering

Certified First Aid Provider	Room Number	Telephone	Ext.	Certification Valid Until
Maurice Ouellet	3260	(514) 398-4823		19-Jan-16

Building Adams Building
3450 University, Montreal (Quebec) H3A 0E8

Department Department of Mining and Materials Engineering

Certified First Aid Provider	Room Number	Telephone	Ext.	Certification Valid Until
Jenyfer Mosquera	109	(514) 398-4890		19-Apr-16

Department Faculty of Engineering

Certified First Aid Provider	Room Number	Telephone	Ext.	Certification Valid Until
Antonella Fratino		(514) 398-7138		11-May-15

http://www.mcgill.ca/ehs/training/firstaid/certified

Emergency Telephone Numbers

Situations requiring immediate internal assistance

Call **McGill Security:** 514-398-**3000**

- Chemical spills
- Flooding
- If you use a fire extinguisher
- Any other reason you would want a security officer present

Emergencies requiring immediate outside help

Call **911** then call **McGill Security:** 514-398-**3000**

- Montreal Police
- Montreal Fire Department
- Ambulance Service

Emergency services will need to be escorted by McGill Security. Therefore, if you ever call 911, call McGill Security afterward.

Useful Contact Information for the Wong Building

McGill Facilities

Facilities Call Centre: 514-398-4555 (24 hours)
Website: http://www.mcgill.ca/facilities/

Wong Building Porter: Michael Yakobina

Daytime phone: 514-398-7102 (7:00 – 14:45)

Custodial daytime pager: 514-339-6710 (7:00 – 14:45)

Custodial evening pager: 514-423-4809 (16:15 – 24:00)
Email: physicsporter.fmd@mcgill.ca

McGill Security non-emergency

Phone: 514-398-3731 (24 hours)

McGill Facilities or the porter should be contacted for issues of building cleanliness, routine maintenance, and general functionality.

Useful Contact Information for the Wong Building

Building Director: Kevin Hart

Daytime phone: 514-398-4784

Email: builddir.engineering@mcgill.ca

Setting Up After Hours Building Access

Evening and weekend access to engineering buildings must be requested through the **building director**. All students and staff using the Wong Building may be granted access.

McGill Safety Resources

University-wide Laboratory Safety Manual
http://www.mcgill.ca/ehs/laboratory/labsafety/

Safety trainings
http://www.mcgill.ca/ehs/training/

Thank you

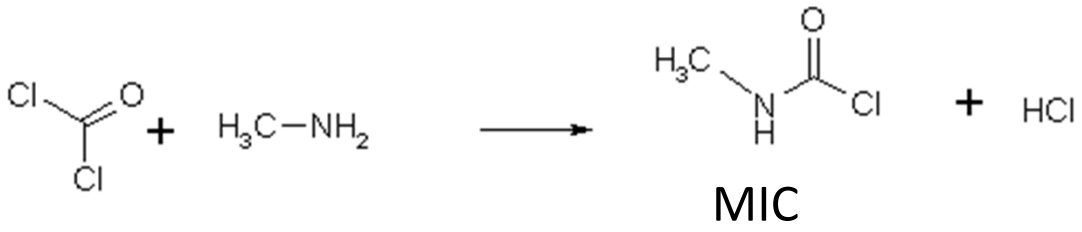
Chemical Handling: Storage

- Check for expiration dates of some chemicals

www.mcgill.ca/ehs/laboratory/labsafety/#cli_4.7

What is the worst example of accident due to bad chemical storage?

Bhopal, 2-3 December 1984, Union Carbide; estimated 16,000 deaths, 35,000 temporary injuries, 4,000 permanent injuries



MIC

Stored and leaked

Methyl isocianate

What else can be learned from Bhopal

- Bad SOP: MIC-free routes to produce same pesticide (more expensive)
- Production continued with low demand; extra MCIC was stored for no good reason
- There were previous leaks who killed and severely injured few people: SOP was not revised
- MIC storage containers extra full: SOP violated
- Poor maintenance of containers and of safety devices towards end of 1984 (plant shut down)
- Switched off safety systems to save money including refrigeration of MIC storage!
- Lack of skilled operators
- Dangerous plant close to highly populated area
- Authorities were not told the amount of dangerous material stored