Introductions

Key Staff

- Dr. Stephen Veldhuis – Director, MPAL
- Steve Remilli – Operations Manager
- Brady Semple – Facilities Manager
- Ellen Mack– Institute Administrator

Laboratories

The MMRI has several different lab areas:

- Machine Shop (MMRI 111)
  - Contains mills, lathes, microscopes, and general machining and fabrication equipment
- Waterjet Room (MMRI 109)
  - Waterjet and welding, grinding, and sandblasting equipment
- Materials Property Assessment Laboratory (MMRI 108)
  - Surface test equipment: indenters, AFM, tribometers, and scratch testers
- PVD Coater Lab (MMRI 215)
  - PVD coater, laser cutter, and associated equipment

MMRI Health and Safety

Objectives

- To establish a safe and enjoyable working environment for students, staff, faculty, and guests
- To highlight existing documentation available through the Ontario Occupational Health and Safety Act (OHSA) and McMaster University Health and Safety (UHS) - all information presented comes from these sources
- To prevent situations that may result in personal injury or death

MMRI Health and Safety

- Both supervisors and workers are required to enforce and abide by safe working practices as they have been laid out in this and other training documents. This includes safe and proper use of PPE and all equipment
- Maximum fines for corporations are $500,000
- Maximum fines for individuals are $25,000 and imprisonment for up to 12 months

MMRI Health and Safety

Key Terminology

- Worker: A person who works or provides service for monetary compensation
- Employer: A person who employs or contracts for the service of others
- Supervisor: A person who has control of a workplace or authority over a worker

- PPE: Personal Protective Equipment (e.g., safety glasses, shoes, goggles)
- SOP: Standard Operating Procedure
- WHMIS: Workplace Hazardous Material Information System
- SDS: Safety Data Sheet
- UHS: University Health and Safety (formerly EOHSS)
- JHSC: Joint Health and Safety Committee
- MOL: Ministry of Labour

MMRI Health and Safety

Joint Health and Safety Committee (JHSC)

- A tool which workers and management can use to work together to participate in safety discussions and improvement
- Acts in an advisory role to encourage awareness and compliance
- Undertakes audits and inspections

The MMRI is a member of the MARC JHSC

- Any safety concerns can be raised with our JHSC by contacting Brady Semple (semplebg@mcmaster.ca)
- Or reach out to any other members of the committee : https://hr.mcmaster.ca/app/uploads/2019/01/JHSC-Master-List.pdf

MMRI Health and Safety

Rights of the Worker

- Right to Know:
  - As a worker, you have the right to be informed by the employer of known or likely hazards in the workplace, and to be provided with the information, instructions, education, training, and supervision necessary to protect your health and safety
- Right to Participate:
  - Workers are allowed to have input on the steps taken by the employer to ensure health and safety. This includes participating in the JHSC, reporting concerns that could affect the health and safety or yourself or your coworkers, and making suggestions to your committee or employer
- Right to Refuse:
  - You have the right to refuse work that could affect your health and safety and that of others. The right to refuse is normally used when the first two rights fail to ensure your health and safety. Exercising this right is serious and should not be done lightly or as a routine method of solving workplace problems

MMRI Health and Safety

McMaster Policies and Programs

- Ministry of Labour – Ontario Wide
- Central Health and Safety Committee – Campus Wide
- Faculty Health and Safety – Engineering Specific
- MARC Health and Safety Committee – Only the MARC building and the MMRI

MMRI Health and Safety

Risk Management Manuals/Policies

- McMaster University Health and Safety
  - UHS has developed a ranges of standardized operating policies and procedures for use campus wide
  - Copies of the policies can be found on the UHS website: https://hr.mcmaster.ca/employees/health_safety_well-being/our-safety/risk-management-manuals-rmms/
- The Ontario Occupational Health and Safety Act
  - OHSA provides additional regulations that are to be followed in the workplace

MMRI Health and Safety

Incident Reporting

- Any accidents or incidents in the workplace involving injuries or potential hazards must be reported to your supervisor immediately
- McMaster Incident Reporting Form:

https://hr.mcmaster.ca/app/uploads/2018/11/injury-incident-report-fillable-1-36.pdf

MMRI Health and Safety

Incident Reporting

- Employee Responsibilities:
  1. Promptly receive appropriate medical treatment. At MIP, Dial 911 for emergency response
  2. Notify your supervisor as soon as possible of injury and any related healthcare measures taken
  3. Assist with the completion of an injury/incident form and sign it
  4. Assist in the incident investigation and implementation of any corrective action
  5. Adhere to the legal requirements of WSIB and participate in McMaster University's Return to Work Program if modified work and/or lost time results from a work-related injury

MMRI Health and Safety

"Critical Injury" is an injury of a serious nature that includes any of the following:

- Places life in jeopardy
- Produces unconsciousness
- Results in substantial loss of blood
- Involves the fracture of an arm or leg
- Involves the amputation of an arm, hand, leg, or foot
- Consists of burns to a major portion of the body
- Causes the loss of sight on an eye

In the case of a critical injury, supervisors are responsible for:

- Securing the accident site to ensure that further injury is prevented
- Immediately arranging for medical and emergency assistance by calling Security at "88" or "5555" at host hospitals and "911" at any other off-campus locations
- Immediately notifying Environmental and Occupational Health Support Services at 905-525-9140x24352 and communicating details of the incident
- Ensuring that the site remains undisturbed until Environmental and Occupational Health Support Services provide clearance
- Cooperating with directives from Environmental and Occupational Health Support Services and the Ministry of Labour

MMRI Health and Safety

McMaster has a range of standard safety courses that MUST be completed before you can begin to work at the MMRI.

- A training matrix developed by UHS is available here: https://hr.mcmaster.ca/app/uploads/2019/02/Corporate-Training-Matrix.pdf
- Sign up for required training through Mosaic (https://mosaic.mcmaster.ca/)
- A summary of the MMRI relevant courses is presented here:

Mandatory For Everyone:	MMRI Required:	Equipment/Role Specific
• SAFE Training • Health & Safety Orientation • Violence & Harassment Prevention • WHMIS 2015	• Chemical Handling and Spills • Ladder Safety • Machine Guarding Awareness • Noise Awareness	• Gas Cylinder (welding and coater) • Laser Safety (laser cutter) • Lock-Out/Tag-Out (maintaining equipment) • Fire Warden (Brady, Kevin, Dr. Veldhuis, Brooke) • Accident Investigation (supervisors) • Due Diligence (supervisors)

Working in the MMRI – General Safety

Emergencies

- In the event of an emergency, call 911
  - Our location is 230 Longwood Road South, Hamilton, Ontario
- If time and the incident conditions permit, follow up with a call to McMaster security through either:
  - Telephone: 905-525-9140 x24281
  - The McMaster Security App

Working in the MMRI – General Safety

Fire Safety

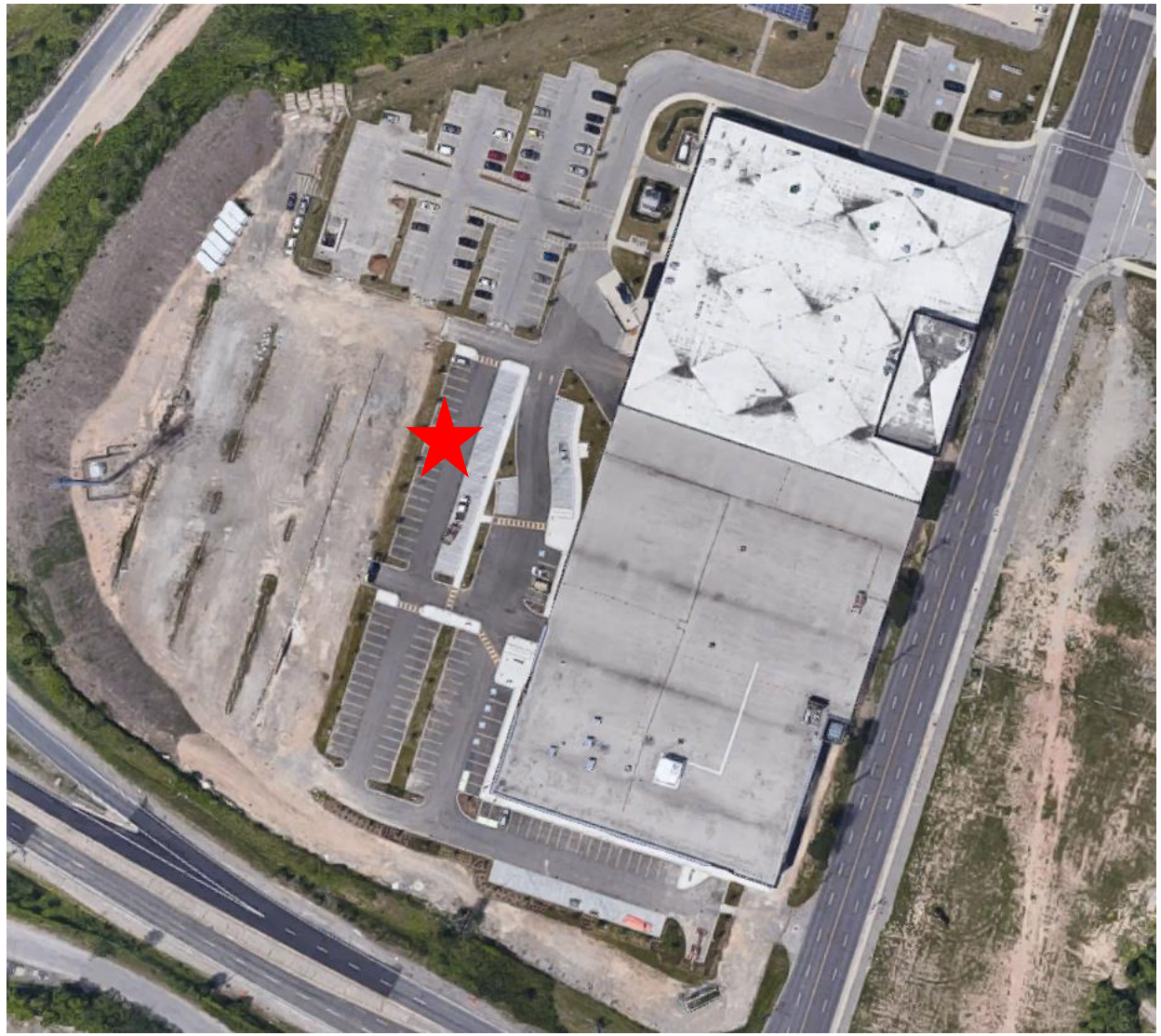
- When an alarm sounds, secure equipment in a safe condition and leave the building by the nearest exit immediately
- Do not use elevators
- Feel doors before opening them. If hot, find a different exit
- Close all doors behind you as you evacuate
- If it is unsafe to evacuate, close doors and block cracks with a damp towel. Call 911 immediately
- Do not re-enter building until given an explicit all-clear by a fire warden, fire department, or security

*If you require any special accommodations in order to evacuate the building safely, discuss them in advance with your supervisor

Working in the MMRI – General Safety

Fire Safety – Muster Point

- When evacuating the building, leave via the nearest exit
- Make your way around the building to the MMRI's muster point: Across the road from the MMRI main entrance, West of the building



Working in the MMRI – General Safety

Safety Data Sheets (SDS):

- McMaster has moved to using an online SDS system
- SDS sheets can be found here: https://jr.chemwatch.net/chemwatch.web/account/autologinbyip (no sign in required if logging in from campus)

- A lab laptop in the SouthWest corner of the Machine Shop has a link to this address on the desktop

- If you are bringing any chemicals into the laboratory that are not found in this SDS listing, let your supervisor know before bringing it into the lab

Working in the MMRI – General Safety

Hazardous Waste Disposal

- All chemical waste must be handled properly, not dumped down drains
- For solvents, disposal containers are available in MPAL
- For waste oil and machine coolant, there are disposal bins in the Machine Shop
- If either container is full, let your supervisor know so that it can be emptied
- If you have any special waste to dispose of, let your supervisor know

Working in the MMRI – General Safety

- Only operate equipment that you have been trained and approved to use by your supervisor
  - If you have any questions, concerns, or doubts, ask your supervisor for help
- Alteration to machines and equipment is prohibited without specific authorization
- Floors, walkways, and work areas should be kept clean, clear, and tidy at all times
- Spills and damage to equipment must be reported immediately to your supervisor
- Never leave equipment running unattended without explicit permission

Working in the MMRI – General Safety

Hours of Operation

- The MMRI operates on weekdays (excluding days when the university is closed)
- 8:30 AM until 5:00 PM
  - Stop operating equipment by 4:30 PM in order to give enough time to clean up before end-of-day

If special circumstances require that you work on any equipment in the MMRI outside of these hours, inform your supervisor so that arrangements can be made

- McMaster has Working Alone policies that dictate the University's process: https://hr.mcmaster.ca/app/uploads/2022/05/RMM-304-Working-Alone-Program.pdf
- When operating machinery, another member of the MMRI must be present

Working in the MMRI – General Safety

Electrical

- Use extension cords only when necessary
- Extension cords should never be used for stationary/permanent purposes
- If you find a cord in poor condition, make your supervisor aware of it immediately. Do not use it
  - Your supervisor will repair or dispose of the cord in question
- Mark and tape down all extension cords as necessary
- Do not alter or repair electrical equipment unless authorized to do so

- Abide by lock-out tag-out procedures when working on equipment

Working in the MMRI – General Safety

Consequences

- Failure to follow the rules and policies outlined in this and other safety training will result in a warning and expulsion from the lab until the safety issue can be remedied
- Repeated offense will result in a written notice to the offender and their supervisor
- If an offender shows a repeated disregard for or inability to follow safety requirements, then they will be banned from the lab environment

Working in the MMRI – General Safety

General Attire in lab spaces

- Closed-toe shoes
- Full-length pants
- No watches, rings, necklaces, or loose clothing – this can get caught in machinery and pose a serious risk
- Long hair should be tied back and/or tucked in to reduce risk

Working in the MMRI

Headphones

- No headphones or earbuds are allowed to be worn in the MMRI except in the desk areas
- They reduce your awareness of what is going on around you, and make it difficult for your coworkers and supervisor to alert you of hazards
- While headphones can reduce the perceived volume of sounds around you, they are not hearing protection, and the music played through them adds to the noise level you are experiencing

Working in the MMRI

PPE

- **Safety glasses** and **safety shoes** must be worn in the:
  - Waterjet Lab
  - Machine Shop – Any point within the yellow lines on the floor
- Safety glasses and shoes must be CAS approved designs
  - Shoes will have a green triangle indicating such
- Additional PPE requirements depending on the task at hand:
  - Hearing protection (always required in waterjet room when waterjet is running)
  - Gloves (when handling material but NEVER when working on machinery with rotating components)
  - As needed (discuss with staff to arrange special PPE to be supplied)

Working in the MMRI

PPE

- MPAL
  - Safety Shoes – recommended but not required
  - Safety Glasses – recommended but not required
  - Gloves (Nitrile) – required with AFM, indenters, microscope turrets. Recommended with all equipment and samples
- Coater Lab
  - Safety Glasses – when working in coating chamber
  - Safety Shoes – when performing maintenance or replacing parts
  - Gloves – when working in coating chamber

Working in the MMRI

PPE – Special Events

- Tours:
  - It may be necessary to have a tour group through the lab where not all members of the tour have complete PPE
  - If this is the case:
    - Provide everyone with safety glasses from the rack at the front (West) of the lab
    - Warn people within the lab that a tour is coming through
    - Escort the members of the tour, do not allow them to roam freely
    - Make sure that all material handling activities (cranes, forklifts, pallet trucks, etc.) are kept well away from the tour
    - You are responsible for the members of the tour group
- Events:
  - Very rarely, special events like an open house may allow PPE requirements to be fully relaxed. Your supervisor will communicate this well in advance

Working in the MMRI

Material Handling

- Material handling is a common source of injury
- For heavy materials, ask a staff member for help to use an overhead crane or forklift for you
- Be aware of sharp edges and corners. Use gloves to protect your hands from cuts and scrapes
- Be careful when stacking material. Do not make unstable stacks, and secure loads properly

Working in the MMRI

Cut Hazards

- Many of the materials in the machine shop are inherently sharp. Tooling and workpieces in particular pose risks
- Knives, scissors, deburring tools, and other hand-held cutting edges are also frequently used in the labs. Handle with caution, and never draw a knife or other cutting tool towards your hands or body
- Do not run fingers along edges of workpieces, especially if they have not been thoroughly de-burred
- Be careful when handling cutting tools, especially if oily (such as when removing them from a machine)
- If you drop something sharp, move your feet out of the way and do not attempt to catch it. Allow it to fall to the floor

Working in the MMRI

Compressed Air

- Compressed air is present throughout the lab space in various hoses and plumbing
- Be aware that compressed air represents an enormous store of energy
- No not modify, adjust, or otherwise handle compressed air line or systems without specific permission from your supervisor
- Make sure not to allow air lines to run across walkways or aisles
- Do not use compressed air to clean yourself, your clothing, or any other person. Compressed air pointed at your skin is a serious potential danger
- Avoid using compressed air to clean machinery except where absolutely necessary

Working in the MMRI

Clean-up

- Be sure to clean your workstation at the end of every day
- This includes:
  - Putting tools away
  - Cleaning and wiping down surfaces
  - Disposing of rags or any other waste
  - Labeling samples and tooling and storing them in project boxes
    - Make sure samples and sample boxes are clearly labelled with your name and the project code
- At the end of the job, fully clean off the equipment
  - Remove any special fixturing and workpieces
  - Break down tooling assemblies and put away
  - Put away any data acquisition equipment
  - Put all workpieces and samples in your project box. Anything left at the equipment will be disposed of
  - Coat any steel surfaces in oil, to prevent corrosion, where applicable

Working in the MMRI – Machine Shop and Waterjet Room

Machinery and Training

- The Machine Shop contains a range of high powered and potentially lethal equipment
- Do not operate equipment within the machine shop that you have not been trained to use
  - Discuss training needs with one of the staff or your supervisor. Observing a student operating a piece of equipment does not replace proper training
- If it has been a while since you used a machine or piece of equipment, do not be afraid to ask one of the staff to provide you with a refresher
- If you have any doubts or concerns about your setup or process, review it with one of the staff members

- When welding, grinding, or performing other activities that generate fumes or odors, use the snorkel built into the room. Make sure that it is working by listening to it as it starts up

Working in the MMRI – MPAL

Machinery and Training

- MPAL contains a range of sensitive equipment, all of which have moving components. Therefore, please keep loose clothing and hands away from any moving parts
- Do not operate equipment that you have not received training for. Discuss training needs with one of the staff or your supervisor
- Do not make any attachment changes without first consulting the staff in charge
- Do not provide training to others unless you have been designated to do so by a supervisor
- If it has been a while since you last used a piece of equipment, do not hesitate to ask one of the staff members in charge for a refresher or even a complete training session
- If you have any doubts or concerns about your setup or process, review them with one of the designated staff members. Next to each piece of equipment, you can find the SOP. Always adhere to these SOPs

Working in the MMRI – Coater Lab

Machinery and Training

- The coater is equipped with a variety of high-powered connections, so caution is essential when working around them
- Do not attempt to operate the coater or touch any of its components unless you have received proper training and/or have been assigned by a supervisor
- Exercise caution around hot surfaces after deposition and when the chamber is open
- When closing the door, be mindful of the vacuum suction to avoid any hand-related incidents
- Do not handle the gas cylinders unless you have obtained proper training and permission from a supervisor. Operate with care and adhere to appropriate safety procedures
- The snorkel should be in use while a deposition cycle is in progress

Working in the MMRI – MPAL and Coater Lab

Chemical Handling

- Only chemicals like Acetone, Isopropanol, and Ethanol are permitted for use in MPAL and the Coater lab
- Ask the staff in charge before using any chemical
- Carefully handle the chemicals to avoid spills, and use gloves
- Make sure not to inhale or expose cuts to the chemicals
- Proper disposal containers must be used. Ask the staff in charge before disposing of any chemical if you are not sure about the proper chemical disposal procedure