MIOSHA Regulations
Covered in this Training Session

- Hazard Communication Standard
- Personal Protective Equipment Standard
- Laboratory Safety Standard
Occupational Safety and Health Regulations

- Federal Department of Labor
  - Federal OSHA Regulations

- State of Michigan Department of Consumer and Industry Services
  - Michigan Occupational Safety and Health Act (MIOSHA)
Introduction to the Hazard Communication Standard
Purpose of the Hazard Communication Standard (Right to Know)

- To assure that employees are provided with the information they need to handle hazardous materials and equipment safely.
Requirements of the Hazard Communication Standard

- Written HazCom Program
- Hazardous Chemical Evaluation
- List and Label Hazardous Chemicals
- Chemical Safety Information Available
- Employee Training
- Recordkeeping
- Anti-discrimination Clause
No Discrimination

Employees are protected from discrimination or discharge resulting from a request for information regarding hazardous chemicals under the Hazard Communication (Right-to-Know) law.
Hazardous Chemical List

- Include all hazardous chemicals found in your work area
- Maintain up-to-date copy identifying:
  - Chemical name
  - Maximum potential quantity
  - Storage location
- Available to employees
- Can be useful to emergency response personnel
Hazardous Chemicals

- Strong Acids and Bases
- Flammable solvents: acetone, ethanol
- Toxics: formaldehyde, acetonitrile, ethidium bromide, phenol, silane
- Carcinogens: acrylamide, osmium tetroxide
- Compressed gases
Container Labeling

- Manufacturer must label - Bulk chemical containers
- Lab personnel must label - Secondary containers
- Label must include full chemical name, concentration and the primary hazard
- Deface & triple rinse empty chemical containers for disposal
HEALTH HAZARD
4  Deadly
3  Extreme Danger
2  Hazardous
1  Slightly Hazardous
0  Normal Material

SPECIFIC HAZARD
OX  Oxidizer
ACID  Acid
ALK  Alkali
COR  Corrosive
W  Use NO WATER
Radiation Hazard

FIRE HAZARD
Flash Points
4  Below 73 F
3  Below 100 F
2  Below 200 F
1  Above 200 F
0  Will not burn

REACTIVITY
4  May Detonate
3  Shock/Heat May Detonate
2  Violent Chemical Change
1  Unstable If Heated
0  Stable

Health Hazard
Reactivity
Specific Hazard
Fire Hazard
Warning Labels
What Training is Required?

- **Baseline Training** = this class
- **Work Specific Training** = instruction you receive from your supervisor

Maintain records for all training
Material Safety Data Sheets (MSDS)

- Primary resource for chemical hazard communication
- For every hazardous chemical
- Available online
- Locator poster required
- Standard information required by the regulation will be contained in the MSDS
This Workplace Covered by the Michigan Right To Know Law

Employers must make available for employees in a readily accessible manner, Material Safety Data Sheets (MSDS)* for those hazardous chemicals in their workplace.

Employees cannot be discharged or discriminated against for exercising their rights including the request for information on hazardous chemicals.

Employees must be notified and given direction (by employer posting) for locating Material Safety Data Sheets and the receipt of new or revised MSDS(S).

*Employees may also request MSDS from the Michigan Department of Consumer & Industry Services, Bureau of Safety & Regulation, Occupational Health Division, 7150 Harris Dr., PO Box 30649, Lansing, Michigan 48909-8149, (517) 322-1608.
What information will be in the MSDS?

- Substance Identification and Synonyms
- Hazardous Components (if mixture)
- Physical Data: appearance, melting point
- Fire & Explosion Data: flash-point, LEL
- Toxicity Data: LD50’s, carcinogenicity
MSDS Information (Cont’d)

- Health Effects & First Aid
- Reactivity: incompatibilities
- Storage & Disposal Procedures
- Spill & Leak Procedures
- Protective Equipment
Methylenes Chloride

1. Product Identification

**Synonyms:** MC; Dichloromethane (DCM); Methylene dichloride; Methylene bichloride; Methane dichloride

**CAS No.:** 75-09-2

**Molecular Weight:** 84.93

**Chemical Formula:** CH2Cl2

**Product Codes:** 9264, 9266, 9295, 9315, 9324, 9329, 9330, 9341, 9348, 9350, 9965, Q480
2. Composition/Information on Ingredients

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<tr>
<th>Ingredient</th>
<th>CAS No</th>
<th>Percent</th>
<th>Hazardous</th>
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<tbody>
<tr>
<td>Methylene Chloride</td>
<td>75-09-2</td>
<td>&gt; 99%</td>
<td>Yes</td>
</tr>
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</table>

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER, CARDIOVASCULAR SYSTEM, AND BLOOD. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

J.T. Baker SAF-T-DATA™ Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES & SHIELD, LAB COAT & APRON, VENT HOOD, PROPER GLOVES
Storage Color Code: Blue (Health)
7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Outside or detached storage is recommended. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. To minimize decomposition, all storage containers should be galvanized or lined with a phenolic coating. This material may corrode plastic and rubber. Wear special protective equipment (Sec. 8) for maintenance break-in or where exposures may exceed established exposure levels. Wash hands, face, forearms and neck when exiting restricted areas. Shower, dispose of outer clothing, change to clean garments at the end of the day. Avoid cross-contamination of street clothes. Wash hands before eating and do not eat, drink, or smoke in workplace. Odor Threshold: 205 - 307 ppm. The odor threshold only serves as a warning of exposure; not smelling it does not mean you are not being exposed.

8. Exposure Controls/Personal Protection

**Airborne Exposure Limits:**
Methylene Chloride (Dichloromethane):
- OSHA Permissible Exposure Limit (PEL) -
  25 ppm (TWA), 125 ppm (STEL), 12.5 ppm (8-hour TWA - Action Level)
- ACGIH Threshold Limit Value (TLV) -
  50 ppm (TWA), A2 - suspected human carcinogen.
Protective Equipment

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment. Natural rubber and polyvinyl chloride ARE NOT recommended materials for personal protective equipment.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.
Health Hazard Definitions

- **Carcinogen**: Causes cancer
- **Corrosive**: Causes visible destruction of living tissue by chemical action
- **Irritant**: Causes reversible inflammatory effect on living tissues
- **Sensitizer**: Causes most people to develop an allergic reaction after repeated exposure
- **Toxic**: Poisonous
Target Organ Effects

- **Hepatotoxins**: Liver damage
- **Neurotoxins**: Nervous system damage
- **Nephrotoxins**: Kidney damage
- **Hematopoietic**: Blood function/production damage
Target Organ Effects (continued)

- Pulmonary Hazard: Damages the lung
- Cutaneous Hazard: Affects or damages skin
- Ocular hazards: Affects eye or visual capacity
Target Organ Effects (continued)

◆ **Reproductive toxins:**
  Affects reproductive capabilities
  - **Teratogen:** Impacts developing fetus
  - **Mutagen:** Impacts DNA
What Factors Affect Chemical Exposure?

- Amount and toxicity of chemical
- Duration and frequency of exposure
- Route of entry
- Hazard controls (Engineering, Administrative and PPE)
Control of Hazards

- **Engineering Controls**
  - Substitution
  - Isolation
  - Ventilation

- **Administrative Controls**
  - Standard Operating Procedures (SOP)
  - Duration of exposure

- **Personal Protective Equipment (PPE)**
  - Gloves, Glasses, Lab coat
How to Detect a Potential Personal Exposure

- Visual appearance (dust, mist, fume)
- Odor (odor threshold)
- Body signs and symptoms
  - (acute vs. chronic effects)
- Environmental monitoring
  - Permissible Exposure Limit (PEL)
Personal Monitoring
Working Safely with Hazardous Chemicals

- Read labels
- Receive chemical specific training
- Stay alert
- Wear personal protective equipment
- See your supervisor for non-routine tasks
Personal Protective Equipment (PPE) Standard
Purpose of the PPE Standard

To provide employees with appropriate, reliable and sanitary PPE that is of safe design and construction.
What Is Personal Protective Equipment?

Equipment worn to protect workers and students against hazards in the workplace.
How Does PPE Work?

By creating a barrier between the hazard and your body
Requirements of PPE Standard

- Conduct hazard assessment
- Assign and purchase PPE
- Train employees
  - use, storage, maintenance
- Document everything
- PPE covered: Hand, Eye, Foot, Head
Why Is PPE Important?

Every year nearly two million people are injured on the job.

One quarter of disabling work injuries affect the eyes, face, head, feet or hands.

Most injuries could be prevented with the proper use of Personal Protective Equipment.
Who Needs PPE?

Anyone potentially exposed to chemical, physical, radioactive or biological hazards to the eyes, face, head, feet or hands.
Protective Eyewear
Damage to eye caused by metal fragment

Photo courtesy of the Canadian Ophthalmologic Society
Damage to eye caused by acid

Photo courtesy of the Canadian Ophthalmologic Society
Face Shields
Whose Eyes Are Really Protected?
# What Type of Eye/Face Protection Do I Need?

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<tr>
<th>Required when:</th>
<th>Required when:</th>
<th>Required when:</th>
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<tr>
<td>An impact hazard exists or when working with low hazard chemicals*, or when a low probability of splash exists.</td>
<td>Working with smaller amounts of corrosive or injurious chemicals* and a reasonable probability of splash exists.</td>
<td>Working with larger quantities of corrosive chemicals* and / or a high probability of eye and face injury exists.</td>
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### Examples:
- Pipeting
- Handling closed bottle of injurious chemical
- Mixing solutions
- Opening centrifuge tubes
- Pouring acid out of a 1 pint bottle
- Pouring methylene chloride from a 1 liter bottle
- Working with liquids under pressure
- Working with an acid bath
- Pouring 4 liters of acid into a container
- Handling highly reactive chemicals that may spatter
Gloves

- Ensure proper equipment is available
- Replace as needed
- Do not re-use disposable gloves
<table>
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<tr>
<th>CHEMICAL:</th>
<th>Laminated Film</th>
<th>Nitrile</th>
<th>Unsupported Neoprene</th>
<th>Supported Polyvinyl Alcohol</th>
<th>Polyvinyl Chloride (Vinyl)</th>
<th>Natural Rubber</th>
<th>Neoprene/Natural Rubber Blend</th>
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<tr>
<td>Acetaldehyde</td>
<td>■ 380 E P -- --</td>
<td>E 10 F NR -- --</td>
<td>E 10 F P -- --</td>
<td>E 10 F G NR -- --</td>
<td>E 10 F G NR -- --</td>
<td>E 7 F E 10 F</td>
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<td>Acetic Acid</td>
<td>■ 150 -- G 270</td>
<td>E 60 -- NR --</td>
<td>E 10 F P -- --</td>
<td>F 180 -- E 110 --</td>
<td>E 260 --</td>
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<td>Acetone</td>
<td>▲ &gt;480 E NR -- --</td>
<td>E 10 F P -- --</td>
<td>P 60 G E &gt;10 VG</td>
<td>E 20 VG</td>
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<td>Acetonitrile</td>
<td>▲ &gt;480 E F 30 F</td>
<td>E 20 G</td>
<td>E 150 G NR -- --</td>
<td>E 4 VG</td>
<td>E 10 VG</td>
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<td>Acrylic Acid</td>
<td>-- -- G 120</td>
<td>E 390 -- NR --</td>
<td>E 80 -- E 65</td>
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<td>Allyl Alcohol</td>
<td>▲ &gt;480 E F 140 F</td>
<td>E 140 VG P -- --</td>
<td>P 60 G E &gt;10 VG</td>
<td>E 20 VG</td>
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<td>Ammonium Fluoride 40%</td>
<td>-- --</td>
<td>E &gt;360 -- E &gt;360</td>
<td>NR -- NR</td>
<td>NR -- E &gt;360</td>
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<td>Ammonium Hydroxide</td>
<td>E 30 -- E &gt;360</td>
<td>E 250 -- NR --</td>
<td>E 240 -- E 90</td>
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<td>Amyl Acetate</td>
<td>▲ &gt;480 E E 60 G</td>
<td>NR -- G &gt;360 E P</td>
<td>-- NR -- P</td>
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<td>Amyl Alcohol</td>
<td>-- -- E 30 E</td>
<td>E 290 VG</td>
<td>G 180 G G 12</td>
<td>E E 25 VG</td>
<td>E 45 VG</td>
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<td>Aniline</td>
<td>▲ &gt;480 E NR -- --</td>
<td>E 100 P F &gt;360 E F</td>
<td>180 VG</td>
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<td>Aqua Regia</td>
<td>-- -- F &gt;360</td>
<td>G &gt;480 -- NR --</td>
<td>G 120 -- NR --</td>
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<td>Benzaldehyde</td>
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<td>NR -- G &gt;360 E NR --</td>
<td>G 10 VG</td>
<td>G 25 F</td>
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<tr>
<td>Benzene, Benzol</td>
<td>▲ &gt;480 E P -- --</td>
<td>NR -- E &gt;360 E NR --</td>
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<td>NR -- NR --</td>
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<tr>
<td>Bromopropionic Acid</td>
<td>▲ &gt;480 -- F 120</td>
<td>E 420 -- NR --</td>
<td>G 180</td>
<td>E 190</td>
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<tr>
<td>Butyl Acetate</td>
<td>▲ &gt;480 E F 75 F</td>
<td>NR -- G &gt;360 E NR --</td>
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<td>Butyl Alcohol</td>
<td>▲ &gt;480 E E &gt;360 E</td>
<td>E 210 VG</td>
<td>F 75 G G 180 VG</td>
<td>E 20 VG</td>
<td>E 45 VG</td>
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Hydrofluoric acid burn
Gloves (continued)

- Remove gloves BEFORE leaving the work area
- ALWAYS wash hands after removing gloves
Don't Wear Protective Gloves Outside the Research Laboratory

Gloves may become contaminated during research procedures

Wearing gloves into public areas may lead to cross-contamination

As a routine safety precaution, gloves should be Removed prior to entering any unrestricted area such as corridors, elevators, restrooms, public dining areas, and offices. Please be considerate and protect both the safety and peace of mind of others.

Transporting Specimens

When research samples are transported from one location to another, secondary containers should be used, eliminating the need for gloves.

Contact OSEH at 763-6973 for additional copies or information
Protective Footwear
Minimum PPE Required In All Labs

No shorts or open toe shoes allowed in labs!

- Safety Glasses
- Lab coat
- Disposable Gloves
What's Wrong?
What's Wrong?
Are There Limitations?

YES!!!

- PPE cannot protect you if...
  - you do not wear it
  - you do not wear it properly
  - you do not wear the appropriate type for the task you are performing
INSPECT Your PPE PRIOR To Each Use...

Do NOT Use Damaged Or Defective PPE!!!
Who Do I Call With Questions?

- Your Supervisor
- Your OSEH Representative
Purpose of the Laboratory Safety Standard

To reduce or eliminate the risk of exposure to employees from hazardous chemicals in the laboratory
Chemical Hygiene Plan (CHP)

- Review before working in the laboratory
- If unavailable please see your supervisor
- **Generic CHP is available on-line at:**
  [http://www.umich.edu/~oseh/chp1.html](http://www.umich.edu/~oseh/chp1.html)
- Labs must customize the CHP Notebook section
Laboratory Safety Standard

- Chemical Hygiene Plan (CHP) Components
  - Chemical List
  - Standard Operating Procedures
  - Material Safety Data Sheets
  - Emergency Preparedness
Laboratory Safety Standard

CHP Components (continued)

- General and Specific Training
- Specific Waste Disposal Methods
- Personal Protective Equipment
- Inspections and Exposure Monitoring
Standard Operating Procedure (SOP)

- Written for an individual hazardous chemical or method using that chemical and includes:
  - Hazardous properties of chemical
  - Proper chemical storage
  - PPE (gloves, glasses, etc.)
Standard Operating Procedure (SOP) (continued)

- Proper location to perform procedure
- Proper waste disposal
- Accident and spill reporting
- Equipment hazards and precautions
Name of Procedure: Working with strong acids in general

Prepared By: John Doe

Revision Date:

LOCATION - This procedure may be performed at the following location(s):
Procedures are performed in Lab 00 in the fume hood. The acids are stored in a corrosive resistant cabinet under the fume hood.

HAZARDS - The following materials and equipment associated with this procedure presents exposure or physical health hazards. Safety precautions are prudent and mandatory:
Eyewash/Safety shower is located down the hall from Lab 00. Dilution of some acids, such as sulfuric acid, produce heat. When diluting, always add acid to water. Never add water to acid. Allow acid to run down the inside of the container and mix slowly by gentle rotation. Acid bottle carriers should be used for containers over one quart in size.

ENGINEERING CONTROLS - Prior to performing this procedure, the following safety equipment must be accessible and ready for use: (ex. chemical fume hood, biological safety cabinet, laminar flow hood, chemical spill kits)
Fume hood is located in Lab 00. The spill kit for neutralizing strong acids is located in the hallway outside of Lab 00.

PROTECTIVE EQUIPMENT - Prior to performing this procedure, the following personal protective equipment must be obtained and ready for use: (ex. acid resistant gloves, safety eyewear, lab coat, chemical splash apron)
Small to Medium Quantities (≤ 1 liter) Acid resistant gloves (Utilize vinyl gloves when working with hydrofluoric acid). Safety goggles (Do not wear contact lenses when working with corrosive materials). Laboratory coat
Large Quantities (> 1 liter) Safety goggles, Face Shield, Utility Gloves, Laboratory coat, and Acid resistant apron

WASTE DISPOSAL - This procedure will result in the following regulated waste which must be disposed of in compliance with environmental regulations:
Prior to filling up a waste container, place a bottle label on with the EPA ID #, start accumulation date, name of chemical, etc.
Once full, four one gallon bottles can be placed in a box. Place a box label on the box and fill out a manifest. See the CHP Notebook section on Hazardous Waste to see how to fill out a manifest for the different types of strong acids utilized in Lab 00.

ACCIDENTAL SPILL - In the event that a hazardous material spills during this procedure, be prepared to execute the following:

Compressed Gas Cylinders

- Always secure in an upright position
- Use valve protection caps
- Properly label cylinder
  - Name of gas
  - Type of gas (Oxidizer, Flammable, etc.)
  - Current status "Full or Empty"
Compressed Gas Cylinders (continued)

- Do not store flammable gasses near ignition sources or oxidizers
- Do not block access to cylinders
- Do not run hoses throughout lab
Compressed Gas Rocket

Photo courtesy of AIChE
What's Wrong?
What's Wrong?
What's Wrong?
Safe Chemical Storage

- Separate stored chemicals by compatibility: (acid, base, flammable, oxidizer)
- Store bulk flammable liquids in a Flammable Liquid Storage Cabinet
- Refrigerate flammable chemicals only in a unit designed for that purpose
- To redistribute unopened chemicals call OSEH HazMat at 3-4568
Emergency Preparedness

- Rule of thumb - Plan ahead!!
  It will explode, catch fire, spill, or release
- Evacuate the lab
- Shut door & post restriction if necessary
- Activate alarm & call 911
- Implement emergency response plan for your unit
Emergency Response

- Ventilation failures
- Plumbing leaks
- Power failures
- Fires and explosions
- Spill control and clean-up
- Personal injury and exposure
Chemical Waste Disposal: What can go down the sink?

- Bleach and other disinfectants
- Blood and blood-products
- Detergent and other cleaners
- Buffers, isotonic saline solutions, or non hazardous liquid media, acids/bases with a pH between 5-10
Hazardous Chemical Waste Management

- Properly store compatible waste
- Use secondary containment when > 10 gallons
- Pack in a suitable container for transportation
- Affix completed “Hazardous Waste” label listing chemicals in the container
- Make sure the container is closed and sealed
Hazardous Chemical Waste Labeling

- EPA ID Number:
  - MI0000052852
- Manifest Number
- Generator Information
- Chemical Description of Hazardous Waste
- Accumulation Start Date

Call OSEH HazMat (734-763-4568) for assistance
Hazardous Chemical Waste Labeling

- Label **ALL** hazardous waste containers

![Hazardous Waste Label](image)

- **Name:** Joe Generator
- **Room Number:** 2264
- **Building:** H.H. Dow
- **Chemical Description:** Hexane (70%), ethyl acetate (30%)
- **EPA ID No.:** MIR 000 001 792
- **Manifest Document #:** 16412
- **Date:** 03/17/02
Hazardous Waste Manifest

*See handout for explanation of numbers

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**Chemical Description**

(DO NOT ABBREVIATE)

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</table>

Additional descriptions for materials listed above:

| 14 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

Include Safety precautions and special handling instructions:

| 15 |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

Discrepancy Indication Space: – FOR OSEH USE ONLY –

WASTES WILL NOT BE PICKED UP UNLESS ACCOMPANIED BY A COMPLETE MANIFEST WITH SIGNATURE AND DATE

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**GENERATOR’S CERTIFICATION:**

I hereby declare that the contents of this consignment are fully and accurately described above by chemical description and are marked, labelled, and are in all respects in proper condition for transport.

| 16 |   |   |   |   |   |   |   |   |   |   |   |

**SIGNATURE**

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**DATE**

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**FOR OSEH USE ONLY –**

Transporter 1 Acknowledgment of Receipt of Materials

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**SIGNATURE**

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**DATE**

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Transporter 2 Acknowledgment of Receipt of Materials

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

**SIGNATURE**

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**DATE**

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Tips for Fume Hood Use

- Check that the hood is operating correctly
- Use the sash to protect yourself
- Keep sash at the certification mark
Kim wipe shows air being drawn into hood when sash is at proper sash height.
Tips for Fume Hood Use (continued)

- Do not use for chemical storage
- Be aware of ignition sources when using flammables (multiple users of a hood)
- Keep the work surface neat
- Close the sash when not in use
What's Wrong?
What's wrong with this picture?

No air movement
Additional Safety Precautions

- Know location of Emergency Shower and Eyewash (100 feet/10 second rule)
- Know location of Fire Response Equipment
- No eating or drinking in laboratories
- Do NOT store food in laboratory refrigerators; label with appropriate sign
- Frequent hand washing recommended
Do Not block access to emergency showers and eyewash stations
What is wrong?
Class 3B and 4 Lasers require appropriate warning signs and laser in-use notification systems (light/sign)
Welcome to the University of Michigan Department of Occupational Safety & Environmental Health. We've created this web site, the Pollution Prevention Program web site, and the OSEH/SNRE Storm Water Education Site to provide the University Community with easy access to information on OSEH's many services and resources.

Occupational Safety & Environmental Health
University of Michigan
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