



Thomas Jefferson  
National Accelerator Facility  
**Jefferson Lab**

# **R&D Chem Room Safe Use Procedure**



**Requirements for  
the use of the  
R&D Chem Room  
at Jefferson Lab**

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Any questions should be directed to Jennifer Williams,  
R&D Chem Room Safety Warden at ext. 7882



## A. Qualification Requirements

### How to Become Qualified to Use the R&D Chem Room

- Have your supervisor's approval.
- Complete a walkthrough orientation of the lab with the Safety Warden.
- Pass a proficiency test on safe use procedures.

### Your Responsibilities as a Qualified User

- Inform the Safety Warden of any new chemicals/procedures or operations.
- Log all daily activities in the lab logbook.
- Clean-up workspace with soap and water and triple rinse containers used.

### Rules of the Room

- No open-toed shoes.
- No shorts, skirts, or dresses.
- Chemical splash protection must be worn when working with chemicals.
- A written procedure must be submitted to the Safety Warden for any new process (other than ultrasonics).

**Safe operation of the R&D Chem room depends on your efforts.**

**It is extremely important to:**

- Follow guidelines in this booklet.
- Report any incidents to the Safety Warden
- Avoid cross-contamination. Clean-up work station and wash hands when leaving room.

## B. Prechecks

1. Check safety shower/eyewash: remove any obstacles, activate the eyewash.
2. Check hood face velocity: must be at least 100 fpm at the face.
3. Check fire extinguishers: one unit in the room. Verify its location. (See Map)
4. Check waste water treatment system: A pH meter indicates the pH in tanks 1 and 2 of the neutralization tank. The pH in tank 2 must not be below 4. If it is, immediately contact the Safety Warden.

## PH Monitor pic

5. Make sure all doors are closed.
6. Make entry in logbook: chemicals used, process used, and equipment used.

## C. Working in the Room:

- Select appropriate PPE (according to MSDS and PPE chart located on pages 7-9 of this booklet)
- Write on fume hood white boards: Process/Chemicals Used/ User Name.

### Unattended Work

- Only ultrasonics with detergents (Micro & Super HD) & water may be left unattended.
- Any ultrasonics with flammable solvents must be monitored.
- No acid work may be left unattended!

## D. Finishing Up

1. Dispose of all waste (see waste disposal section).
2. Leave no unlabeled containers in the room.
3. Store all chemicals properly (see chemical handling section).
4. Triple rinse all empty containers, except those that contained poisons, before placing them in the trash\*\*. Give all empty poison containers to the Safety Warden.
5. Wash fume hood with soap & water when finished for the day.

## E. Emergency Response

### Alarms

If any alarms sound, immediately evacuate and notify the Safety Warden. Alarms are most likely caused by:

- Fire : Bell alarm.
- Hood failure : If power to either of the two hood fans fails, a high-pitched alarm will sound and red flashing lights on the ceiling will activate.



Red light flashes when hood power is lost. Audible alarm also sounds.

- Low DI water : loud buzzer coming from the DI water panel box by entrance (entrance by men's room).

### Odors

If any unusual odors are detected in the Chem Room, **immediately evacuate and notify the R&D Chem Room Safety Warden at ext. 7882.**

## Spills

Any unintended spill must be reported to the Safety Warden. Small spills of chemicals can be cleaned up by the user. For large spills, isolate the spill and contact the Chem Room Safety Warden ext. 7882.

### Spill Cleanup Supplies

1. Spill X: located under the large metal sink on the high bay wall side.
  - Small acid spills, less than 1 pint, apply Spill X A.
  - Small solvent spills, less than 1 gallon, apply Spill X S.
  - Small base spills, less than 1 gallon, apply Spill X C.

All cleanup waste is to be brought to the Safety Lab for proper disposal.



## F. Chemical Exposure to Personnel

### Chemical Splashes to Skin or Eye



#### **Initial:**

Immediate flushing at the safety shower/eyewash station for 5 minutes.

**Notify emergency services.**

#### **Followup:**

Continue flushing for up to 15 minutes and until emergency services arrive. NEVER transport a chemical splash victim directly to the hospital. Hospitals may not accept chemical splash victims unless they are sure flushing has occurred. It is much more important that flushing continue until medical services arrive. For minor splashes, have Jefferson Lab Medical Services respond (ext. 7539). **For serious splashes, immediately call 911.**

**NOTE:** Both safety shower/eyewash units in the room are equipped with CANS Alarms. When a shower or eye-

wash is activated, an alarm is sent to the Jefferson Lab Security and 911 is dispatched. A bypass button is located on each station to bypass the alarm. The bypass should be used when conducting inspections or flow checks.

### Special Procedures

#### **Splash of Chemical That Contains Hydrofluoric Acid (including BCP):**

##### **After initial flush:**

- Go to the first aid station get the calcium gluconate or zephiran solution and apply it to the affected area (do not put calcium gluconate or zephiran solution in eyes).
- Immediately call Emergency Services 911 for assistance.
- For eye exposure, continue to flush the eye with water until emergency services arrives.

NOTE: even for minor exposures, the victim MUST receive medical treatment after first aid has been rendered.

## G. Rules for Handling Chemicals

### Required Use of Personal Protective Equipment (PPE)

Check the Material Safety Data Sheet (MSDS) for the chemicals used, and wear the recommended PPE.

PPE available in the room:

- Gloves
- Faceshields
- Goggles
- Boots
- Aprons
- Disposable Lab Coats

If any special PPE is needed, request the proper equipment from the R&D Chem Room Safety Warden.



### Special PPE Requirements for Handling Buffered Chemical Polish (BCP)

<i>Large Amounts of BCP: more than 500 ml</i>	<i>Small amounts of BCP: less than 500 ml and First Aid responders</i>
Apron	Apron
Face shield and safety goggles	Safety goggles
Gloves: two pair Inner glove: nitrile Outer glove: heavy neoprene	Gloves: one pair nitrile

### Glove Selection

- Gloves are stocked by color code in the R&D Chem Room.
- Check the compatibility chart before selecting the glove.
- Gloves and aprons must be thoroughly rinsed after each use and before disposal.
- Gloves should not be kept for more than one shift.

## Eye Protection Chart

Degree of Hazard	Hazard	Required Protection		Examples of typical chemroom application
<b>Low</b>	<b>Splash</b>		<b>Safety Glasses</b>	<ul style="list-style-type: none"> <li>• Microclean</li> <li>• Squeeze bottles of solvents</li> <li>• Walkthrough of chemroom only</li> </ul>
<b>Medium</b>	<b>Splash</b>		<b>Goggles</b>	<ul style="list-style-type: none"> <li>• Solvent use in quantities greater than squeeze bottle</li> </ul>
<b>High</b>	<b>Splash Burns</b>		<b>Goggles with a face shield</b>	<ul style="list-style-type: none"> <li>• Acids and bases in quantities greater than 1 liter</li> <li>• HF containing acids in any quantity</li> <li>• Pair part etching</li> <li>• Setting up BCP baths</li> </ul>

## Hand Protection Chart

Degree of Hazard	Hazard	Required Protection		Examples of typical chemroom application
<b>Low</b>	<b>Skin irritation</b>		<b>none</b>	<ul style="list-style-type: none"> <li>• Microclean</li> <li>• Non carcinogenic non skin absorbing solvent in squeeze bottle quantities</li> <li>• HD degreaser</li> </ul>
<b>Medium</b>	<b>Skin defatting/sensitization</b>		<b>Single glove Check glove compatibility chart</b>	<ul style="list-style-type: none"> <li>• Solvent use in quantities greater than squeeze bottle</li> <li>• First aid response</li> </ul>
<b>High</b>	<b>Burns</b>		<b>Check glove compatibility chart  Discard glove immediately after use.</b>	<ul style="list-style-type: none"> <li>• Acids and bases in quantities greater than 1 liter.</li> <li>• Carcinogens</li> <li>• HF containing acids in any quantity</li> <li>• Moving acid bottles</li> </ul>
<b>Extreme</b>	<b>Systemic effects from skin absorption</b>		<b>Double glove inner nitrile Outer glove neoprene  Rinse outer immediately after use or discard.  Discard inner glove after use.</b>	<ul style="list-style-type: none"> <li>• Buffered chemical polish in quantities greater than 1 liter.</li> <li>• Pair part etching</li> <li>• Setting up BCP baths</li> <li>• Moving large acid carboys (&gt;2 gallons) (Not in manufacturer's bottle)</li> </ul>

## Body Protection Chart

Degree of Hazard	Hazard	Required Protection		Examples of typical chemroom application
<b>Low</b>	<b>Skin irritation</b>		<ul style="list-style-type: none"> <li>• Disposable splash resistant labcoat</li> <li>• No shorts</li> <li>• No skirts</li> <li>• No open-toe shoes (Sandles)</li> </ul>	<ul style="list-style-type: none"> <li>• Microclean</li> <li>• Non carcinogenic, non skin absorbing chemicals</li> <li>• Solvent in squeeze bottle quantities</li> <li>• HD degreaser</li> </ul>
<b>Medium</b>	<b>Skin defatting/sensitization</b>		<ul style="list-style-type: none"> <li>• Disposable splash resistant labcoat</li> <li>• No shorts</li> <li>• No skirts</li> <li>• No open-toe shoes (Sandles)</li> </ul>	<ul style="list-style-type: none"> <li>• Solvent use in quantities greater than squeeze bottle</li> <li>• Acid or base &lt;1 liter</li> <li>• First aid response</li> </ul>
<b>High</b>	<b>Burns</b>		<ul style="list-style-type: none"> <li>• Disposable splash resistant labcoat</li> </ul>	<ul style="list-style-type: none"> <li>• Acids and bases in quantities greater than 1 liter</li> <li>• Carcinogens</li> <li>• HF containing acids in any quantity</li> </ul>
<b>Extreme</b>	<b>Systemic effects from skin absorption</b>		<p style="text-align: center;"><b>Neoprene apron</b></p> <p><b>Note: inner glove must be captured under apron sleeve</b></p>	<ul style="list-style-type: none"> <li>• Buffered chemical polish in quantities greater than 1 liter</li> <li>• Any acid work</li> </ul>



## Compatibility of Gloves Available in R&D Chem Room

Chemical	Recommended Glove	Description
Solvents		
Acetone	neoprene	Black
Methanol	nitrile or neoprene	Green or black
Isopropanol	nitrile or neoprene	Green or black
Trichloroethylene	polyvinyl alcohol	Red
Acids		
Hydrofluoric acid (conc.)	Inner : nitrile Outer: heavy-duty neoprene	Inner: green Outer: black
Nitric acid (conc.)	nitrile	Green
Phosphoric acid (conc.)	nitrile	Green
Sulfuric acid (conc.)	polyvinyl chloride	Orange
Bases		
Sodium hydroxide (conc.)	nitrile	Green
Ammonium hydroxide (conc.)	nitrile	Green
Oxidizers		
30% hydrogen peroxide	nitrile	Green



Glove Cabinet



Apron Cabinet



Rubber Bottle Holder  
All acids must be carried  
in Bottle Holder no matter  
what the distance.

## H. Requirements for Labeling Chemicals Used in Room

- All chemicals must have the manufacturers label.
- Chemicals poured over into secondary containers must have NFPA label completely filled out.
- Ingredients must be listed on the label. (Include mix percentage)



## Special Requirements for Labeling and Containerizing BCP

Any buffered chemical polish solutions must be :

- Stored in high density polyethylene containers
- Dated
- Poured into new container every 6 months
- **MAXIMUM SIZE: 1 GALLON**
- Ingredients must be listed on container (include mix percentage)

## I. Disposal of Waste Chemicals



Specifically labeled waste containers are located in the Satellite Accumulation Area.

The containers are used for specific waste streams including acids and solvents.

For disposal of any chlorinated solvents or other special wastes, notify the R&D Chem Room Safety Warden.

\* Do not pour waste mixtures into virgin chemical containers (i.e. do not pour mixtures into bottles from chemical manufacture). Use bottle provided by R&D Chem Room to store chemical mixtures/waste mixtures.

Chemicals must not be discharged down drains in the Chemroom. It is important that no chemical be poured down the drains because:

1. Unwanted chemical reactions can occur forming toxic gases which can backup into the Chemroom.
2. Hampton Roads Sanitation District (HRSD) permit restricts what can be poured down the drain: only acid and base rinsewater can be poured into drains in the chemical fume hoods.



## J. Proper Storage of Chemicals

All storage cabinets are labeled

1. Flammable storage cabinet . . . . . flammables
2. Acid storage cabinet . . . . . acids, except nitric and organic acids
3. Nitric acid cabinet . . . . . nitric acid
4. Organic acid cabinet . . . . . organic acids
5. Base cabinet . . . . . bases
6. Oxidizer storage . . . . . oxidizers
7. Shelves . . . . . chlorinated solvents
8. Under lock and key . . . . . all poisons
9. Carcinogens Storage . . . . . Carcinogens



## Chemical Compatibility

<i>Chemical</i>	<i>Chemicals not compatible with</i>
Acetic acid	Nitric acid, peroxides, permanganates
Acetone	Concentrated sulfuric and nitric acid
Ammonia, anhydrous	Mercury, hydrogen fluoride, calcium hypochlorite, chlorine, bromine
Copper	Acetylene, hydrogen peroxide
Flammable liquids	Ammonium nitrate, chromic acid, hydrogen peroxide, sodium peroxide, nitric acid, the halogens



Organic Acid Cabinet



Flammable Cabinet



Chemical Storage Cabinet

## K. Emergency Equipment

- Fire extinguishers.
- Fire alarms.
- Safety shower/eyewash.
- Self-Contained Breathing Apparatus

### Emergency Equipment stored outside the room



First Aid Oxygen



Self-Contained  
Breathing Apparatus

## Emergency Equipment stored inside the room



First Aid Unit

### First Aid Equipment

- Calcium gluconate.
- HF/BCP first aid kit, located in first aid refrigerator (zepharin solution, basin, and compresses).



### Spill Equipment

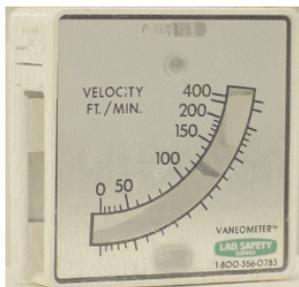
- Spill-X-A
- Spill -X-S
- Spill -X-C

Spill X agents are located under the sink

- Mercury spill kit: hallway across from vending machines.

## L. General Equipment Rules

### Hood Use

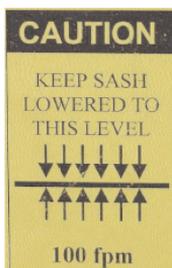


Hoods must be checked before each use to ensure a minimum face velocity of 100 feet per minute.

Use the vaneometer held at the face of the hood to measure 100 fpm.



Hoods are marked at the 100 fpm sash height. It is recommended that when using the hood, lower the hood as far as feasible, and never put your head inside the hood.



**Never operate the hood with the sash above the 100 fpm marker.**

### Ultrasonics Use

No flammable solvents are to be used with ultrasonics unless the solvent is used in secondary containment, with heaters removed, electronics are nitrogen inerted, and the temperature of the solvent is monitored to ensure that it does not exceed the flash point. A special ultrasonics hood setup is available for such use in the Chem Room.

## M. Hazardous Chemical Inventory

Chemicals with special hazards that are normally stored in the room are listed here, along with their primary special hazards. For a full chemical inventory, check the material safety data sheet book in the R&D Chem Room.

If you are planning to use any chemicals not already on the inventory, you must receive approval from the Chem Room Safety Warden. The safety warden will ensure that adequate personal protective equipment (PPE) and compatible storage areas are available.

### **Hydrofluoric acid**

...special hazard with this acid because on skin contact the fluoride will penetrate the skin and bind calcium in the blood stream. IF medical treatment is not administered death can occur. See first aid procedures.

Hydrofluoric acid must **not** be stored in metal or glass containers. 50% HF is normally stocked.

### **Nitric acid**

...a strong mineral acid, 70% nitric acid is normally stocked. Nitric acid must be stored separately from all other acids.

Nitric acid, in its most concentrated form, will ignite sawdust and other cellulose-based materials.

A nitric acid splash to the skin will cause a telltale ugly yellow burn due to the nitration of skin protein.

Concentrated nitric acid will embrittle High-density polyethylene (HDPE) over time. Every 6 months, nitric acid stored in HDPE must be poured over into a new container and, of course, the containers must be dated.

### **Flammable liquids:**

...flammable liquids must be put back in the flammables cabinets after use.

### **Sodium Hydroxide:**

...a strong base. Pay special attention to heat evolved when dissolving sodium hydroxide pellets...beware of splattering. Pay special attention to eye protection when using this and any other base. Bases are lipid soluble

and will penetrate deeply into the eye. A splash to the eye from a base is always the most serious chemical splash in terms of eye safety. The most serious exposure from an eye safety point of view is ammonium hydroxide, which is also stored in the room.

### **Trichloroethylene**

**DANGER** ...a suspect carcinogen. Used as a solvent. Do not allow any skin contact.

### **Hydrogen peroxide**

...normally found in the Chem Room as 30% solution. This chemical is an OXIDIZER; it provides oxygen in a fire situation. This chemical must not be stored in the flammables cabinet. Pay special attention to eye protection when using this chemical, as it destroys the cornea of the eye rapidly.

### **Sulfuric Acid**

...a strong acid normally found in the Chem Room as a 95% sulfuric acid. Accute exposure to skin/eye can cause severe burns.

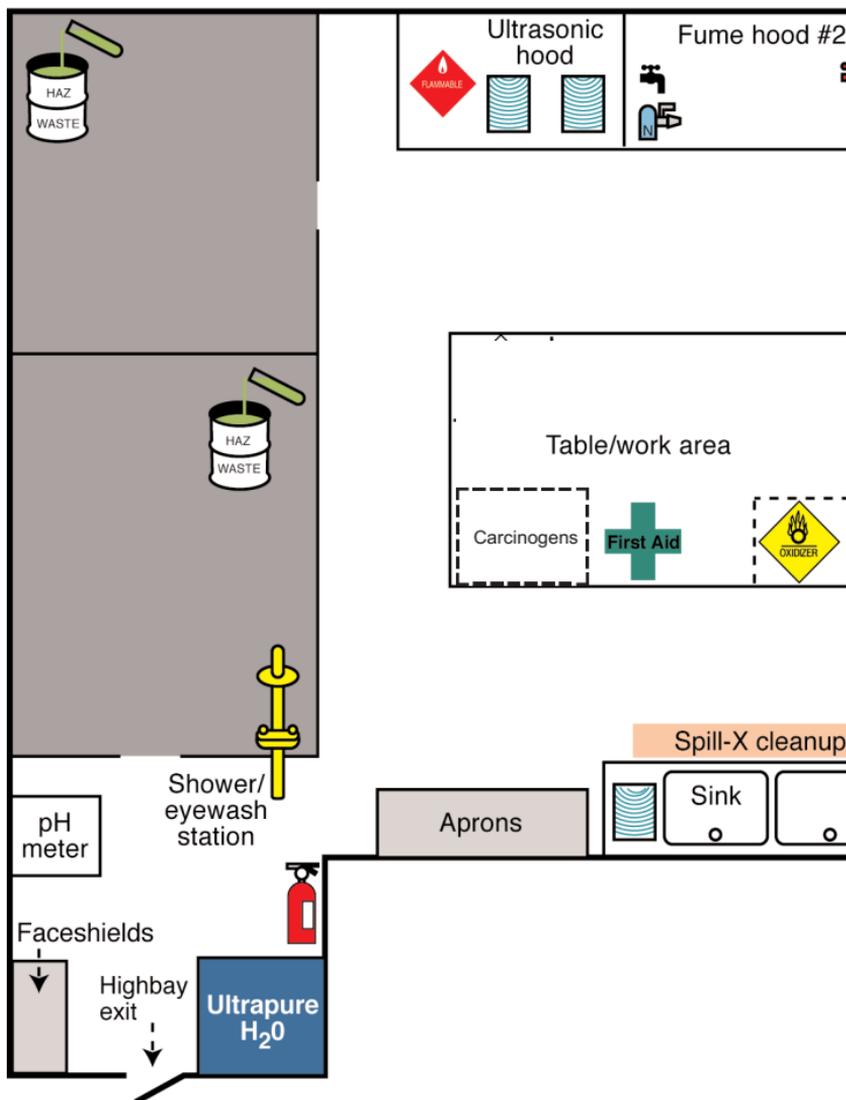
\*Special Hazard: Sulfuric Acid is carcinoenic with long-term exposure. Sulfuric Acid will also embrittle HDPE bottles. Every 6 months, sulfuric logo stored in HDPE must be poured into a new container and the container must be dated.



### **NOTE:**

**A (MSDS) must be available in the Chem Room for every chemical used or stored in the room. Refer to these sheets for safety information. Do not bring new chemicals into the room until you have submitted an MSDS and gotten approval from the R&D Chem Room Safety Warden, Jennifer Williams.**

-  Phone
-  Fire extinguisher
-  Nitrogen
-  Ultrasonic
-  City water
-  DI water
-  Hot City
-  Logbook
-  Under table



Water

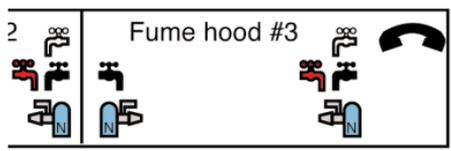
able chemical storage

Harmful Liquid

Corrosive

Oxidizer

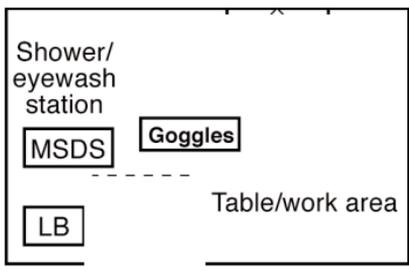
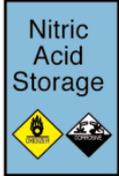
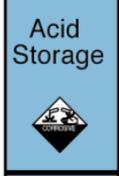
Poison



Fume hood #3

Office hallway exit

Flammables Storage



Shower/eyewash station

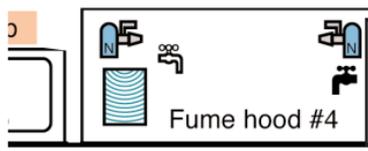
MSDS

Goggles

LB

Table/work area

Gloves

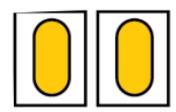


Fume hood #4

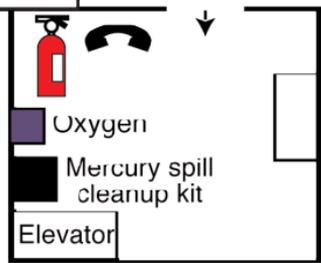
Organic Acids



Elevator exit



Self-Contained Breathing Apparatus (SCBA)



Oxygen

Mercury spill cleanup kit

Elevator

Vending machines

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