Personal Protective Equipment: Selection, Use and Maintenance

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About This Training

Please plan to review this training during normal business hours. If at any time during the training you have questions, contact Jocelyn Locke at jlocke@mailbox.sc.edu (803) 777-7650 or Adam Roberge at aroberge@mailbox.sc.edu.

There is no quiz associated with this training. After reviewing the materials, you must consult with your supervisor to discuss the specific personal protective equipment (PPE) required for your laboratory work. You will then download and complete the Lab PPE Training Form. Once completed, the form must be filed in the lab-specific training section of your Chemical Hygiene Plan.

Course overview

This course is designed to provide USC faculty, staff, and students with the necessary knowledge to minimize the risk of exposure and injury when handling hazardous chemicals while performing their job duties.

This course is required for all research faculty, staff, and students prior to working in the laboratory. A refresher must be completed every two years thereafter.

Once you completed this course, you and your supervisor will sign a Lab PPE training form (template in next slide).

Lab Personnel PPE Training

A PPE hazard assessment will be conducted for each laboratory employee at the start of employment and whenever job duties change.

Job Title:		Date Trained:	
Lab Personnel:		Principal Investigator:	

			TYPES OF PPE REQUIRED					
Job Activity	**Hazard**-*any source of potential damage, harm or adverse health effects*	**Exposure or Risk Potential**	**Eye/ Face**	**Hand/Arm**	**Head/ Ears**	**Feet**	**Body**	**Other**
Lab Entry Requirement	General lab hazards	Trip/slip/fall, spills, splashes, sharps, entanglement, fire		Clothing that covers upper arms, not sleeveless.	Tie back long hair, avoid dangling accessories	Full-coverage shoes, preferably liquid resistant	Clothing that covers the skin, not too loose and not skintight	Clothing made of cotton if lab stores or handles flammable substances.
Handling acids								
Working with ovens and furnaces								
Performing ammonia synthesis								
Etc.								

The employee has been trained and demonstrates competency in the proper use of the required PPE and fully understands all applicable PPE requirements.

Supervisor Signature _____ Date_____

I acknowledge that I have been issued the required personal protective equipment, trained in their proper use, and understand my obligation to wear them while performing my job duties.

Employee Signature _____ Date _____

Course Module

1. OSHA Personal Protective Equipment (PPE) Standard

2. PPE as a Control: Their Function and Limitations

3. Selecting Appropriate PPEs

4. Do I need a respirator?

5. Proper Use of PPE

6. Maintaining PPE

7. USC PPE Policy

MODULE 1

The OSHA Personal Protective Equipment Standard

What is Personal Protective Equipment?

Personal protective equipment, commonly known as PPE is an equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses.

Injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards.

PPE may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, coveralls, vests, and full-body suits.

This training focuses on the use of PPE for protection against exposure to hazardous chemicals and select physical hazards in the laboratory.

What regulation/standard governs the use of PPE?

General Industry (29 CFR 1910)

Subpart I - Personal Protective Equipment

Click on the links below to learn more about PPE regulations.

1910.132, General requirements.
1910.133, Eye and face protection.
1910.134, Respiratory protection.
**1910.135, Head protection.*
1910.136, Foot protection.
**1910.137, Electrical Protective Equipment.
1910.138, Hand Protection.
**1910.140, Personal fall protection systems.*

*Usually not needed in a lab environment except in buildings and rooms under construction or renovation

**Required for primary insulation when working with energized circuit parts

What does the PPE standard require?

Employers shall

- Identify hazards present that requires the use of PPE.
- Obtain appropriate PPEs.
- Train employees on
  - when PPE is necessary.
  - what kind is necessary.
  - how to properly put it on, adjust, wear, and take it off.
  - the limitations of the equipment.
  - proper care, maintenance, useful life, and disposal of the equipment.

Module 2
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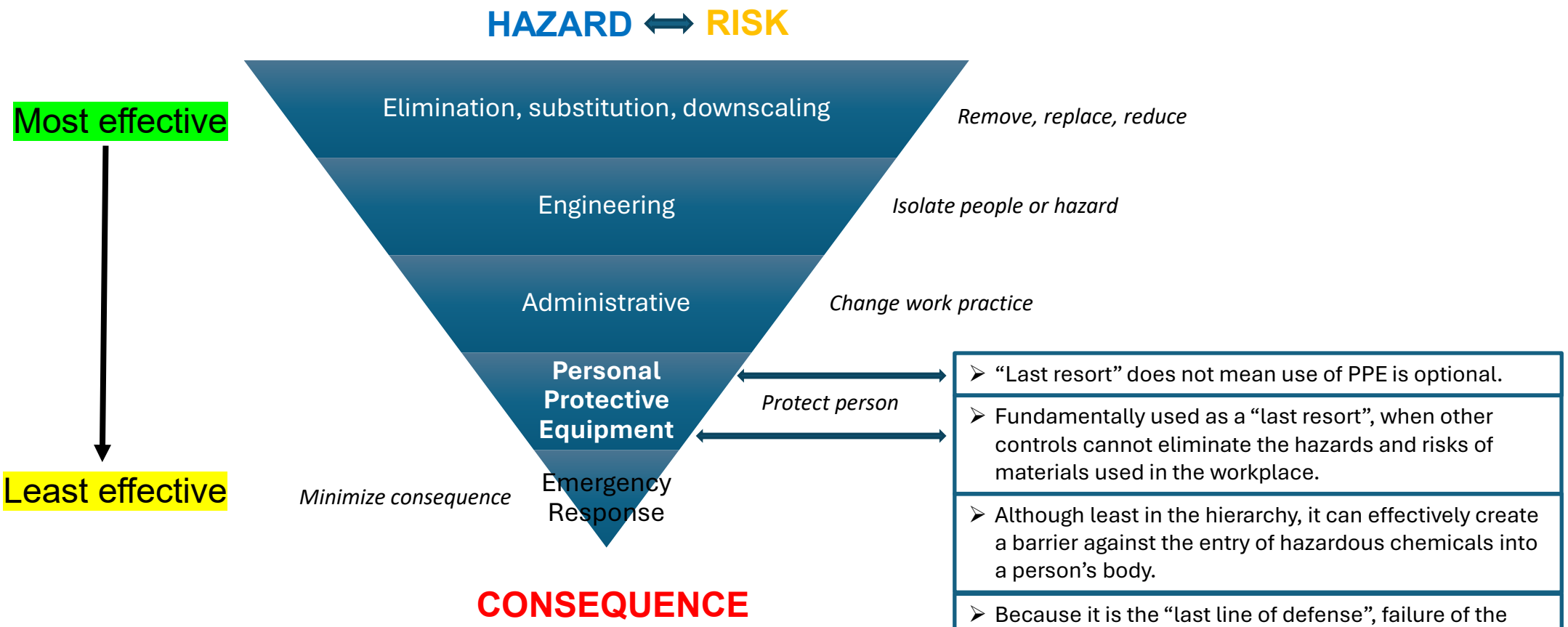
MODULE 2

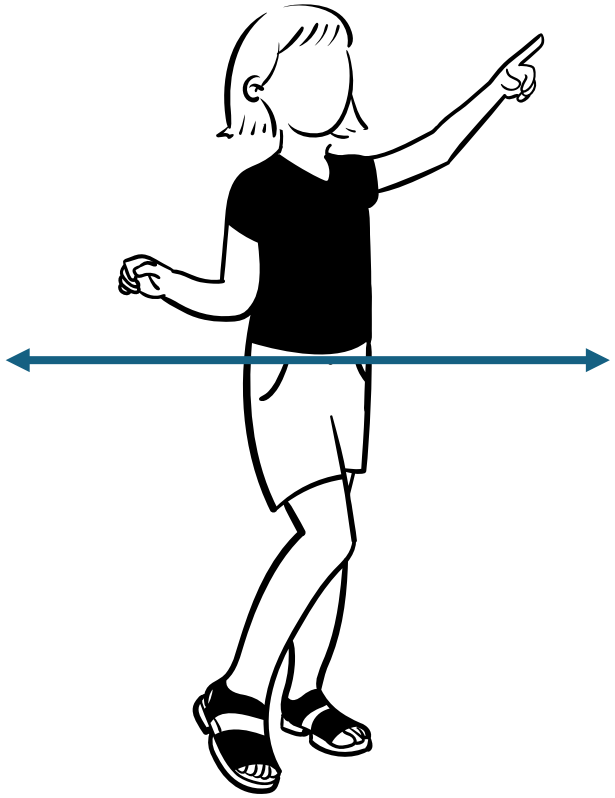
PPE as a Control: Their Function and Limitations

When must PPE be used? Why is it used a "last resort"?



Wearing PPE protects you!

Chemical exposure routes	Protect/create a barrier
• Skin	• Proper lab attire, lab coat, gloves, full coverage shoes
• Mucous membranes of the eyes, nose, mouth	• Safety glasses, goggles, face shield
• Injection	• Double gloves, proper syringe handling
• Ingestion	• Proper glove removal, washing hands
• Inhalation	• Engineering control • Respirator (rarely)



Why is PPE used only as a last resort?

- PPE only protects the wearer.
- It is ineffective if faulty, inappropriate, or ill fitted.
- Theoretical levels of protection are seldom reached in practice.
- The use of PPE always restricts the wearer to some degree.
- The psychological effect of PPE may be such that the individual wearing the PPE feels more protected than they actually are.
- Therefore, all controls on the top of the hierarchy (downscaling, engineering, administrative) must be implemented before relying on PPE for protection.

Module 3
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MODULE 3

Selecting Appropriate Personal Protective Equipment

Types of PPEs and their uses.

PPE Item	Primary Use / Protection Provided	When to Use
Lab Coat / Protective Gown	Protects skin, arms, and personal clothing from chemical splashes, spills, minor fires, and biological contamination	Always required in labs; flame-resistant versions for fire-risk work; remove before leaving lab area
Safety Glasses (with side shields)	Protects eyes from flying particles, dust, minor chemical splashes, and low-impact hazards	Minimum eye protection for most lab activities; must meet ANSI Z87.1 standard
Chemical Splash Goggles	Tighter seal against significant chemical splashes, mists, vapors, aerosols, and larger liquid volumes	Required when pouring corrosives, working with large quantities, or high splash risk
Face Shield	Protects entire face (eyes, nose, mouth) from major splashes, sprays, or flying debris	Worn over glasses/goggles; use with highly corrosive materials, pressurized systems, or grinding/cutting
Chemical-Resistant Gloves	Protects hands/skin from direct contact with chemicals, biohazards, sharps, or temperature extremes	Match glove material to chemical (e.g., nitrile = most common; butyl/neoprene/Viton for aggressive solvents)
Full coverage shoes	Protects feet from dropped objects, spills, broken glass, punctures, and chemical contact	No sandals, open-toe, or mesh shoes allowed in labs

Types of PPEs and their uses.

PPE Item	Primary Use / Protection Provided	When to Use
Respirator (e.g., N95, half-face, full-face)	Protects against inhalation of hazardous dusts, fumes, vapors, aerosols, or airborne pathogens	Required only when fume hoods/other controls are inadequate; needs fit-testing & training
Hearing Protection (earplugs / earmuffs)	Protects hearing from high noise levels produced by equipment (e.g., sonicators, centrifuges)	Use when noise exceeds 85 dB; required for prolonged exposure
Cut-Resistant Gloves	Protects hands from cuts, slashes, or punctures when handling sharp tools, glassware, or blades	Task-specific (e.g., working with broken glass, scalpels, or wires)
Heat / Cryogenic Gloves	Protects hands from extreme heat (ovens, hot plates) or cold (liquid nitrogen, dry ice)	Insulated materials; never use regular gloves for cryogenics
Shoe Covers / Booties	Prevents tracking contaminants in/out of cleanrooms or contaminated areas	Used in cleanrooms, BSL-3, or spill cleanup
Head Cover / Bouffant Cap	Prevents hair from contaminating samples or products; contains hair in clean environments	Common in cleanrooms, tissue culture, or sterile processing

What should I do before buying PPE?

Supervisor conducts hazard and risk assessment

- Identify the correct type of PPEs to protect against hazards present.

-Identify PPE with a level of protection appropriate for the level of risk.

Select PPE according to wearing and fitting - one size may not fit all.

Select PPE that is user friendly- one that fits the individual correctly.

Consider individual medical conditions that may restrict the wearing of PPEs (i.e. allergies, vision, etc.).

Ensure that the selected PPE is designed, manufactured, and tested in compliance with nationally recognized safety and performance standards (*i.e.*, ANSI Z87, UL Listed, CE Marked).

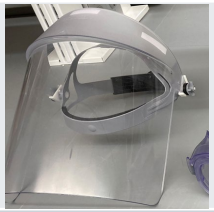
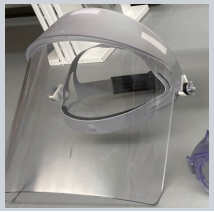
Required PPE must be determined per individual, for example:

Lab Personnel	Hazard Handled	Exposure Risk Level	PPE Fit	Physical and medical considerations	Product compliance with standards	Other considerations (cost)	PPE Selected
Jane D.	**Concentrated** nitric, sulfuric, formic acids	**High** (prepares 5N dilutions using 2 L of concentrated acids weekly for acid baths, rise glassware in acid baths, potential for splash)	**Small frame**	**Wears prescription glasses**	ANSI Z87	VWR offers institutional discount	• Safety goggles that fits small frame and fits over prescription glasses • Face shield, adjustable for small frame • Nitrile gloves, 6 mil, elbow length, small
John M.	0.5 M hydrochloric acid	**Low** (adjust pH of buffers with ~ 10 ml of 0.5 M HCl)	**Large frame**	None	ANSI Z87	VWR offers institutional discount	• Safety glasses that fit a large frame • Nitrile gloves, 2 mil, wrist length, large

Minimum Lab PPEs

- Lab entry requirement: proper lab attire
  - Clothing that minimizes exposed skin such as sleeved shirts, long pants or equivalent, and
  - Full-coverage shoes
- While handling chemicals with minimal hazard:
  - Safety glasses for eye protection,
  - Chemical-resistant gloves for hand protection, and
  - Lab coat for additional skin protection

Select eye and face PPE according to the hazard type and levels of exposure risk (example).

Hazard type (RISK LEVEL)	Lab activities example	Suitable eye PPE
Corrosive (LOW)	Adjusting pH of buffers using ~ 20 ml of 0.5 M HCl	Safety glasses 
Corrosive (HIGH)	Rinsing glassware in 10 M HNO_3	Safety goggle and face shield  
Cryogen (MODERATE)	Transferring liquid nitrogen from a large supplier dewar into a 10 L dewar	Safety goggle and face shield  
Laser Class IIIB (High)	Laser is used for laser diffraction experiment; includes laser beam alignment	Laser goggle 

Are my glasses safety glasses?

Regular Glasses	Safety Glasses
• Designed to correct vision • Glass or plastic, thicker lenses • Lens may shatter upon impact.	• Polycarbonate - lightweight • Impact resistant • Passed ANSI design and testing standard • Stamped “ANSI Z87+” or equivalent on the lens or frame • “+” rating indicates passing the high impact test

Impact testing for ANSI Z87 Rating

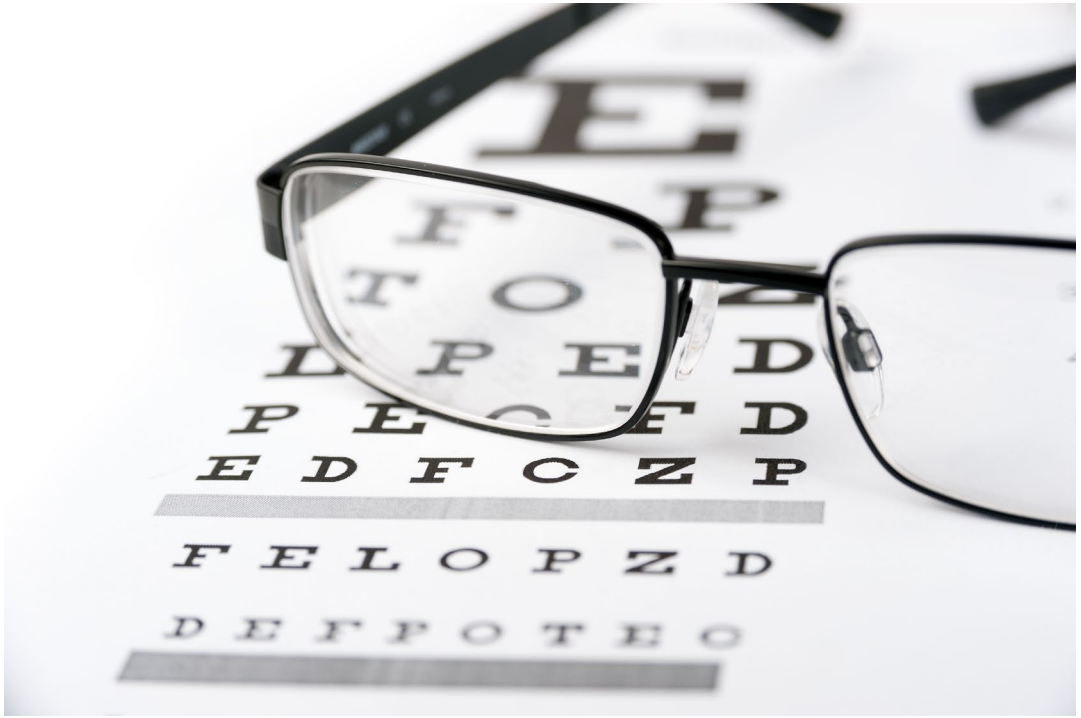
Ball Drop Test Mechanism

High Mass Impact Test

High Velocity Test

Are my glasses safety glasses?

Regular/Prescription Glasses



Safety Glasses

Select skin PPE according to the hazard type and level of exposure risk.

Hazard type (RISK LEVEL)	Lab activities example	Suitable skin PPE
Chemical (LOW)	Handling dilute concentrations of hazardous chemicals	Traditional lab c 
Biological (MODERATE)	Handling bloodborne pathogens and other potentially infection materials	Barrier lab coat 
Flammable or pyrophoric chemical (HIGH)	Handling flammable or pyrophoric chemicals	Flame resistant 
Hazardous chemicals (HIGH)	Clean-up of large volume of hazardous chemical spills	Chemical-resistant s 

Examples of suitable lab coat products with varying hazard types and risk levels.

Click on the link below:

National Institutes of Health Guidance for the Selection of Laboratory Coats

Select hand PPE according to hazard type and level of exposure risk

Risk type (RISK LEVEL)	Lab activities example	Suitable hand PPE example
Corrosive (LOW)	Adjusting pH of buffers using ~ 20 ml of 0.5 M HCl	Nitrile 3 mil, wrist-length 
Corrosive (HIGH)	Rinsing glassware in 10 M HNO3	Nitrile, 8 mil, (elbow-length) Acid-resist. Apron  
Cryogen (MODERATE)	Transferring liquid nitrogen from large supplier dewar into a 10 L dewar	Cryogen glove 
Hydrofluoric Acid (Moderate)	Adding 5-ml aliquot of concentrated HF to rock samples	5 mil chloroprene, mid-arm length over 3 mil nitrile  

Am I wearing the appropriate gloves?

To find out, visit a glove manufacturer or distributor's website and consult their glove compatibility guide.

Consult the manufacturer's Glove Compatibility Chart to determine the type of gloves resistant to specific chemicals.

Example: https://www.coleparmer.com/Chemical-Resistance

Begin Compatibility Search:

CHEMICAL TO MATERIAL | CHEMICAL TO CHEMICAL

Use dropdowns below to select a Chemical, and compare against ALL MATERIALS or any specific material.

1. CHEMICAL: Hydrofluoric Acid 50%
2. MATERIAL: All Materials

VIEW COMPATIBILITY | Clear Search

CHEMICAL SELECTED : Hydrofluoric Acid 50%

SHARE | PRINT

FILTER BY COMPATIBILITY RATING

☑ A - Excellent ☐ A^1 - Excellent ☐ A^2 - Excellent ☐ B - Good ☐ B^1 - Good ☐ B^2 - Good Clear filter(s)

☐ C - Fair ☐ C^1 - Fair ☐ C^2 - Fair ☐ D - Poor ☐ N/A

MATERIAL	COMPATIBILITY
Carbon graphite	A - Excellent
ChemRaz (FFKM)	A - Excellent
Fluorocarbon (FKM)	A - Excellent
Kalrez	A - Excellent
PPS (Ryton®)	A - Excellent
PTFE	A - Excellent

Ratings - Chemical Effect
A - Excellent
B - Good: Minor Effect, slight corrosion, or discoloration.
C - Fair: Moderate Effect, not recommended for continuous use. Softening or loss of strength, and swelling may occur.
D - Severe Effect: Not recommended for any use.
E - Information not available.

Explanation of Footnotes
1-Satisfactory to 72°F (22°C)
2-Satisfactory to 120°F (48°C)

ver 10-Dec-2021

Chemical Compatibility Chart

Ratings -- Chemical Effect
A = Excellent.
B = Good -- Minor Effect, slight corrosion or discoloration.
C = Fair -- Moderate Effect, not recommended swelling may occur.
D = Severe Effect, not recommended for ANY use.
NA = Information Not Available.

****Explanation of Footnote***
1. Satisfactory to 120°F (48° C)

All data are based on ambient or room temperature conditions, about 64° F (18° C) to 73° F (23° C).

ISM

	304 Stainless Steel	316 Stainless Steel	ABS Plastic	Acetal, POM	Acrylic (PMMA)	Aluminum	Brass	Bronze	Buna N (Nitrile)	Cast Iron	Copper	CPVC	EPDM	Hastelloy® - C	Hytrel® (TPE)	Kel-F® (PCTFE)	HDPE	LDPE	Natural Rubber	Neoprene (CR)	Noryl® (PPO)	Nylon (PA)	Polycarbonate (PC)	Polypropylene (PP)	PTFE	PVC	PVDF (Kynar®)	Silicone (VMQ)	Titanium	Tygon	Viton® (FKM)
Ammonium Bifluoride	D	B	A	D	NA	B	D	D	B	D	B	A	A	B	NA	NA	A	A[1]	NA	D	A	NA	NA	A	A	A	A	NA	NA	A	A
Ammonium Carbonate	B	B	A	D	D	B	D	D	B	B	D	A	A	B	NA	NA	B	B[1]	A	A	A	A	C	A	A	A	A	C	A	A	A
Ammonium Chloride, 10%	C	B[1]	A	B	B	B	D	D	B	D	D	A	A	D	A	A	A	A[1]	A	B	A	B	A[1]	A	A	A	A	C	B	A	A
Ammonium Hydroxide (Aqueous Ammonia)	A	A	B	D	A	B	D	D	D	D	D	A	A	B	C	A	A	A	D	A	A	A	D	A[1]	A	B	A	A	C	B	D
Ammonium Nitrate, 10%	A	A	A[1]	A[1]	A	B	D	D	A	B	D	A	A	B	B	A	A	A	C	B	A	A	R	A	A	A	A	C	A	A	A
Ammonium Persulfate	A	B	A	D	D	D	D	D	A	D	D	A	B	B	NA	A	A	A[1]	A	A	A	D	A	A	A	A	A	D	A	A	A
Ammonium Phosphate, Dibasic	B	C	A[1]	B[1]	A	B	B	D	A	D	D	A	A	B	NA	A	NA	A[1]	A	A	A	C	A[1]	A	A	A	A	A	A	A	A
Ammonium Phosphate, Monobasic	B	C	A[1]	B	A	B	A	D	A	D	D	A	A	B	B	NA	NA	A	A	A	A	B	A	A	A	A	NA	A	A	A	A
Ammonium Phosphate, Tribasic	B	B	A[1]	B	A	B	NA	C	A	D	D	A	A	B	NA	NA	NA	C	A	A	A	B	NA	A	A	A	NA	A	A	A	A
Ammonium Sulfate	B	B	A	B	B	A	D	D	A	D	D	A	A	B	B	A	A	A	A	A	A	A	A[1]	A	A	A	A	A	A	A	A
Ammonium Thiosulfate	A	A	NA	B	NA	A	D	D	A	D	D	NA	A	A	A	NA	B	A	A	A	NA	NA	NA	A	A	A	B	A	A	NA	A
Amyl Acetate	A	A	D	B	C	A	A	A	D	C	A	D	A	A	C	A	NA	C	D	D	D	B	D	B	A	D	A	D	D	D	D
Amyl Chloride	A	A	D	A	A	A	C	A	D	A	A	C	D	A	NA	A	B	D	D	D	D	C	D	D	A	D	A	D	C	C	B
Antifreeze	A	A	B	D	A	A	B	A	A	A	NA	A	A	A	NA	NA	NA	NA	A	C	A	D	NA	D	A	A	NA	C	NA	B	A
Aqua Regia (80% HCl, 20% HNO_3)	D	D	D	D	D	D	D	D	D	D	D	C	C	C	NA	A	D	B	D	D	D	D	D	B	A	C	A[1]	D	A	D	B
Arsenic Acid	A	A	A	D	A	D	D	B	A	D	A	A	A	B	NA	NA	B	B	B	A	A	C	A	A	A	A	A	A	B	B	A
Asphalt	B	A	NA	B[1]	NA	A	B	A	B	A	A	A	D	NA	B	A	NA	A	D	D	NA	A	D	B	A	A	A	D	NA	NA	A
Barium Carbonate	B	B	A	A	A	D	B	B	A	A	A	A	A	B	NA	A	A	B	NA	NA	A	A	A	A	A	A	A	NA	A	NA	A
Barium Sulfate	B	B	A	B[1]	A	B	B	C	A	B	B	B	A	A	D	A	B	B[1]	A	A	A	A	D	B	A	B	A	A	A	NA	A
Barium Sulfide	B	B[1]	A	A	C	D	D	D	A	D	D	A	A	NA	NA	NA	A	B[1]	A	A	A	A	NA	B	A	A	A	A	A	NA	A
Beer	A	A	A	A	A	A	B	A	A	D	B	A	A	A	A	A	A	A[1]	A	A	A	A	A[1]	A	A	A	A	A	B	C	A
Benzaldehyde	B	B	B	A	C	B	A	A	D	A	B	D	A	A	B	A	B	A	D	D	B	A	D	D	A	D	A[1]	D	A	D	D
Benzene	B	B	D	A	D	B	A	A	D	A	B	D	D	B	C	B	D	C	D	D	D	A	D	D	A	C	A[1]	D	A	C	A
Benzene Sulfonic Acid	B	B	NA	C	NA	D	B	NA	D	D	NA	D	D	B	B	NA	A	A	A	A	A	D	D	D	A	A	A	D	B	B	A
Benzoic Acid	B	B	D	B	A	B	D	B	D	D	NA	A	D	B	D	A	A	A	D	B	B	D	B	B	A	A	A	B	A	A	A
Benzyl Chloride	C	B	D	A	A	D	D	D	D	D	D	A	D	C	D	NA	NA	NA	D	D	D	A[1]	NA	C	A	NA	A	D	NA	NA	A
Borax (Sodium Borate)	A	A	A[1]	B	A	B	A	B	B	A	B	A	A	B	A	A	A	A[1]	A	A	A	A	A	A[1]	A	A	A	B	B	NA	A
Boric Acid, 10%	B	A	A[1]	A	A	D	B	B	A	D	B	A	A	A	A	A	A	A[1]	A	D	A	B	A	A	A	A	A	A	A	A	A
Bromine Gas	D	D	D	D	D	D	D	D	D	NA	D	D	D	A	D	A	D	D	D	D	A	D	C	D	A	C	A	D	D	B	A
Butadiene	A	A	NA	A	B	A	A	C	D	NA	C	A	C	C	D	A	D	D	D	B	D	C	D	C	A	C	A	D	NA	NA	B

It is the sole responsibility of the system designer and user to select products suitable for their specific application requirements and to ensure proper installation, operation, and maintenance of these products. Material compatibility, product ratings and application details should be considered in the selection. Improper selection or use of products described herein can cause personal injury or product damage.
****Conditions are based on ambient or room temperature unless otherwise noted, about 64°F (18°C) to 73°F (23°C).***

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Example of non-chemical hazards that require additional PPE

Hazard type	Required PPE
Noise above 90 decibel	Earmuff or ear plugs
Nuisance dust	Dust masks
Slippery floor, other foot hazards	Non-slip shoes, safety shoes
Renovation/construction zone	Helmet
Arc flash (electrical)	Arc flash helmet and visor, insulated gloves




Who pays for your PPE?

<u>Your employer.</u>

(If you are a student taking classes in a teaching lab, you may be required to provide your own PPE.)

Where to buy PPE from?

- Hardware stores generally sell PPEs.
- However, specialized PPE suppliers will have a broader range of PPE suitable for use in the laboratory and can provide you with good advice on choosing the correct PPE for your needs.
- Reputable suppliers will offer PPE selections that are designed, manufactured, and tested in compliance with nationally recognized safety and performance standards.

Module 4
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MODULE 4

Do I Need a Respirator?

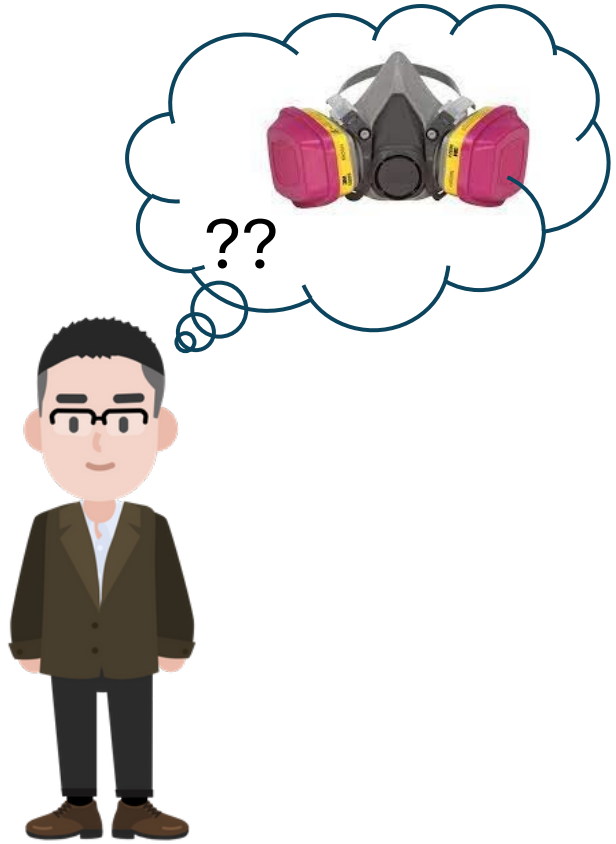
Do I need a respirator?

<u>99% of the time: NO!</u>

Engineering controls are put in place and designed to prevent and eliminate hazardous fumes and particulates escaping into the open lab BEFORE considering the use of a respirator.

If you think you need a respirator:

- Contact EH&S at (803)777-5269 or 777-7650.
- We will identify and measure the level of inhalation hazards.
- We will conduct a hazard and risk assessment to determine if another control can be implemented to reduce your risk or if a respirator is indeed needed for you to safely perform your experiment, procedure, or task.



If we (EH&S) determine you need a respirator:

You must participate in the USC Respiratory Protection program.

- Medical Assessment of Employee Health – medical clearance from your physician.
- Respirator Selection – to ensure that the respirator is appropriate for the hazards present.
- Fit Testing – to ensure that the respirator fits and will be effective.
- Employee Training – how to put on the respirator and the required inspection and maintenance.
- Recordkeeping – inspection and maintenance log.
- Periodic Program Review – to ensure that the record-keeping is done and that the respirator continues to effectively reduce the exposure risk.

Module 5
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MODULE 5

Training for Proper Use of Personal Protective Equipment

Why do I need training to use PPE?

- Know the risks against which you are being protected by the PPE.
- Know the level of protection afforded and the limitations of your assigned PPE.
- Learn the proper wearing, care, or maintenance of PPE to enable you to make effective use of any PPE provided for your protection.
- Know the persons involved in the selection, maintenance, repair, and testing of your PPE as applicable.
- The level of training provided will vary with the level of risk involved and the complexity and performance of the PPE. For instance, the use of a respirator will require comprehensive training with regular refresher courses, whereas the training for donning and doffing protective gloves for hazardous chemicals may require a one-time demonstration only.

Proper use of PPE: what does this mean?

- Properly selected PPE used when handling hazards.
- Each PPE item inspected prior to use (lab coats for signs of chemical degradation, fraying at the cuffs, stains; gloves for holes, tears, degradation; safety glasses/goggles for scratches and pitting that may impair vision, splash apron for tears, holes and thinning).
- Donned (put on) so that PPE fits properly and creates an effective barrier against the entry of hazards.
- Doffed (take off) properly to prevent cross contamination.

Proper use of PPE: what does this mean?

PPE removed before leaving the lab

When transporting hazardous materials, one gloved hand to handle hazardous materials, the other ungloved hand is used to operate doorknobs, light switches, elevator buttons, etc.

Disposable gloves that have been used are never, (*you read that correctly*), **never re-used**.

Proper Glove Donning and Doffing

Click on the links below to watch two short videos on proper glove removal techniques. The goal is to avoid touching the contaminated side of the gloves during the removal process.

Video: Glove removal technique #1

Video: Glove removal technique #2

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MODULE 6

Maintaining Your Personal Protective Equipment

PPEs MUST be inspected, and replaced or repaired.

- PPEs must be thoroughly and regularly examined by a competent staff according to the manufacturer's instructions.
- Simple maintenance may be carried out by the user, provided that the user has been adequately trained (e.g. lens cleaning on goggles or replacing face shield straps).
- The examination, maintenance, and repair of PPE used in high-risk situations (i.e. full-face respirator) should be carried out by properly trained staff in EH&S who have the skills and tools to carry out repairs, if needed.

How often should PPE be replaced?

- Consult the manufacturer's specification to determine the end of life, maximum service time, or date of expiration for all PPEs purchased.
- Disposable PPEs should be used only once, then disposed.
- Disposable gloves should never be reused. (*Used gloves are contaminated and highly likely partly, if not fully deteriorated from chemical exposure, so therefore must NOT be reused.*).

PPEs must be properly stored.

- Store PPEs according to the manufacturer's instructions.
- Common improper storage of PPEs
  - Leaving PPE lying around in fume hoods and benches. This increases the risk of parts being contaminated and deteriorating by exposure to chemicals, dirt, oil, UV rays, sunlight, etc.
  - Hanging lab coats on the utility knobs on the side of the fume hood.
  - Storing HF gloves and apron in the same cabinet where HF is stored.
  - Storing used disposable gloves to the side for future reuse.

A friendly reminder-

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MODULE 7

USC Personal Protective Equipment Policy

Responsibilities

Personnel	Responsibility
ALL personnel entering a laboratory room	Wear all required PPE for entry (proper lab attire and any additional PPE required by the particular lab).
Principal Investigator/Supervisor	Ensure properly selected PPEs are provided to all laboratory personnel and visitors.
Individual Lab Personnel handling hazardous materials	Wear required, assigned PPEs, inform supervisor of any medical or other concerns that restrict the wearing of PPEs, report any defects or damage to PPEs, pparticipate in any PPE training or instruction offered.
Students in teaching labs	May be required to provide their own PPEs and wear them while in the lab.
Visitors	Wear PPEs provided by the host laboratory.

Minimum Lab Entry Requirement (Includes proper lab attire)

- Clothing that provides maximum reasonable skin coverage (*i.e.*, long pants or equivalent, sleeved shirts)
- Shoes that cover the entire feet
- No dangling accessories
- Long hair, if any, tied in a ponytail or equivalent

Risk-based PPE Prescription

PPE worn when handling hazardous chemicals should be based on the level of exposure risk, which in turn depends on the type of chemical, volume, concentration, and additional process hazards such as splash potential, heating, pressurization, and aerosolization, etc.

A risk-based approach to prescribed PPEs (example)

Risk Level	Lab Hazard	Prescribed PPE
LOW	Very dilute concentration of hazardous chemicals	Barrier lab coat, safety glasses, nitrile gloves
MEDIUM	Concentrated corrosive chemicals, with the potential for splash	Barrier lab coat, safety goggles, face shield over safety goggles, gloves specifically resistant to substance/s handled
HIGH	Flammable or pyrophoric chemicals	Flame-resistant (FR) lab coat, safety goggles, gloves resistant to specific substance/s handled

Appropriate PPE for specific hazards and tasks (examples)

Hazard	Task	Prescribed PPE	
Cryogen	Transferring liquid nitrogen or retrieving samples from liquid-nitrogen-filled dewar	Barrier lab coat, face shield over safety goggles, cryogen gloves	
Strong corrosives	Working with >200 ml concentrated HF	Barrier lab coat, acid-resistant sleeved coat that ties in the back (over lab coat), tightly fitting safety goggles, face shield over safety goggles, chloroprene gloves (at least 0.6 mm thick), acid resistant booties over shoes	
High temperature, steam	Retrieving items from an autoclave	Barrier lab coat, face shield over safety goggles, autoclave gloves	
Laser	Laser beam alignment	Laser safety goggles, traditional lab coat	

Lab-specific PPE Guidelines

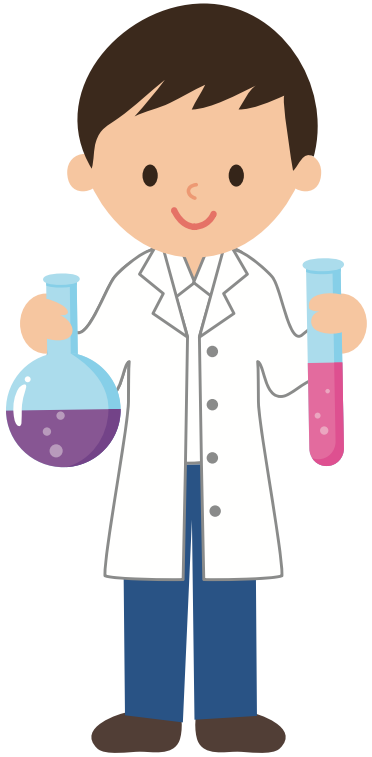
- Lab Principal Investigator reserves the right to enforce a stricter PPE requirement than what is stated in the USC PPE policy.
- For instance, lab-specific guidelines may require everyone to wear safety glasses before entry into a particular laboratory.

Consequence of non-wearing of PPEs

- All lab personnel are required to wear appropriate PPEs when entering a lab and when handling hazards.
    - When PPEs are not worn, the PI needs to find out if there are genuine difficulties encountered when wearing particular PPEs and resolve these difficulties.
    - Persistent non-wearing of required PPEs is a cause for suspension of an individual's access to the laboratory.

Test your acquired knowledge.

What’s wrong with these pictures?



What's wrong with these pictures?

What’s wrong with these pictures?

What’s wrong with this picture?

What’s the next step?

- There is no quiz for this training.
- Download, complete and sign the Lab PPE Training Form.
- File completed form in the lab-specific training section of your Chemical Hygiene Plan.
- See next slide for PPE training template.

Lab Personnel PPE Training

A PPE hazard assessment will be conducted for each laboratory employee at the start of employment and whenever job duties change.

Job Title:		Date Trained:	
Lab Personnel:		Principal Investigator:	

			TYPES OF PPE REQUIRED					
Job Activity	**Hazard**-*any source of potential damage, harm or adverse health effects*	**Exposure or Risk Potential**	**Eye/ Face**	**Hand/Arm**	**Head/ Ears**	**Feet**	**Body**	**Other**
Lab Entry Requirement	General lab hazards	Trip/slip/fall, spills, splashes, sharps, entanglement, fire		Clothing that covers upper arms, not sleeveless.	Tie back long hair, avoid dangling accessories	Full-coverage shoes, preferably liquid resistant	Clothing that covers the skin, not too loose and not skintight	Clothing made of cotton if lab stores or handles flammable substances.
Handling acids								
Working with ovens and furnaces								
Performing ammonia synthesis								
Etc.								

The employee has been trained and demonstrates competency in the proper use of the required PPE and fully understands all applicable PPE requirements.

Supervisor Signature _____ Date_____

I acknowledge that I have been issued the required personal protective equipment, trained in their proper use, and understand my obligation to wear them while performing my job duties.

Employee Signature _____ Date _____

QUESTIONS?

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Thank you!