HAND HAZARDS!

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Hand Hazards!

I. Legal Standards for Hand Protection!

The Occupational Safety & Health Administration (OSHA) directly addresses personal protective equipment (PPE) for hands under the 29CFR 1910.138 standard titled – "Hand Protection." The general requirements are as follows: "Employers shall select and require employees to use appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes." (https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=9788)

There is additional reference to PPE including hand protection noted in the Hazard Communications Standard (29CFR 1910.1200) and the Laboratory Standard (29CFR 1910.1450). HazCom address PPE when working with hazardous chemicals. The Lab Standard requires standard operating procedures when working with hazardous chemicals, including PPE.

The general OSHA requirements for PPE (29 CFR 1910.132) include the performance of a written hazard assessment, selection of the appropriate PPE to protect the employee and proper training and records noting appropriate employees have been trained. Five important questions science teachers should be asking are as follows relative to hand protection:

1. When is it necessary to use hand PPE?
2. What type of hand PPE is necessary?
3. How is hand PPE properly put on, worn, adjusted and removed?
4. What are the limitations of the hand PPE?
5. What is the appropriate care, life span, maintenance and disposal of hand PPE?

I. What Kind of Hazard Exposures Warrant Hand PPE?

The first thing to do in determining what kind hand protection is needed is a hazards analysis followed by a risks assessment Remember when working in a lab, selection of glove type and material should be based on type of exposure and nature of the hazard. Lab factors can include the following:

- Chemical type
- Temperature extremes, cryogenic properties
- Physical hazards (sharps, piercing objects)
- pH
- Toxicity
- Infectious potential of biological hazards
- Electrical shock

III. What Type Of Glove Should Be Used?

Once the Hazards analysis and resulting risks assessment are done, the appropriate safety action or in this case type of glove selected needs to be effected.

The University of California at Berkeley has a great Glove Selection Guide. (http://www.ehs.berkeley.edu/workplace-safety/glove-selection-guide)

Below is a list from their website of glove types, intended use, advantages and disadvantages along with photos to help science teacher match the right glove for the right hazards and risks:

Glove material	Intended use	Advantages and disadvantages	Example Photos
Latex (natural rubber)	Incidental contact	• Good for biological and water-based materials. • Poor for organic solvents. • Little chemical protection. • Hard to detect puncture holes. • Can cause or trigger latex allergies	
Nitrile	Incidental contact (disposable exam glove) Extended contact (thicker reusable glove)	• Excellent general use glove. Good for solvents, oils, greases, and some acids and bases. • Clear indication of tears and breaks. Good alternative for those with latex allergies.	

Glove material	Intended use	Advantages and disadvantages	Example Photos
Butyl rubber	Extended contact	• Good for ketones and esters. Poor for gasoline and aliphatic, aromatic, and halogenated hydrocarbons.	
Neoprene	Extended contact	• Good for acids, bases, alcohols, fuels, peroxides, hydrocarbons, and phenols. • Poor for halogenated and aromatic hydrocarbons. • Good for most hazardous chemicals.	
Norfoil	Extended contact	• Good for most hazardous chemicals. • Poor fit (Note: Dexterity can be partially regained by using a heavier weight Nitrile glove over the Norfoil/Silver Shield glove.	
Viton	Extended contact	• Good for chlorinated and aromatic solvents. • Good resistance to cuts and abrasions. • Poor for ketones. • Expensive.	
Polyvinyl chloride (PVC)	Specific use	• Good for acids, bases, oils, fats, peroxides, and amines. • Good resistance to abrasions. • Poor for most organic solvents.	

Glove material	Intended use	Advantages and disadvantages	Example Photos
Polyvinyl alcohol (PVA)	Specific use	• Good for aromatic and chlorinated solvents. • Poor for water-based solutions.	
Stainless steel **Kevlar**	Specific use	**Cut-resistant gloves.** Sleeves are also available to provide protection to wrists and forearms. (If potential for biological or chemical contamination: wear appropriate disposable gloves on top of your cut-resistant gloves and discard after use).	
Leather	Specific use	What description belongs Here?	 
Cryogenic Resistant Material	Specific use	For use with cryogenic materials. Designed to prevent frostbite. Note: Never dip gloves directly into liquid nitrogen.	

IV. SDS Information Is Critical!

OSHA required SDS information must include appropriate PPE for each hazardous chemical. The SDS section on PPE addresses not only hand protection but also may address other forms of PPE such as eye, face, body, respiratory, etc.

An example is the SDS for Hydrochloric Acid recommendation for hand protection reads as follows:

SDS Section VIII:

Glove Type Recommended: Wear neoprene, nitrile, butyl rubber or PVC gloves to prevent exposure.

Bottom-line is always consult the SDS for the hazards analysis and risks assessment, along with the safety action – glove section type.

V. Chemical Hazards: Special Attention for Hand Protection!

The type of glove protection used in the laboratory is first determined by the nature of the substances involved as was noted. Commercial labeling on the container and SDSs should be viewed prior to working with any hazardous chemical. Most often, glove type is provided for that specific hazardous chemical, as well as additional PPE.

Over time, all gloves will be permeated by the chemical. Try to determine the gloves characteristics relative to life span such as thickness and permeation rate. Gloves should have a scheduled replacement date which depends on how often they are used and the permeability to the substance(s) handled. Gloves being taken out of service should be cleaned of the contaminate material and then appropriately discarded.

One great resource to check out is the *NIOSH Recommendations for Chemical Protective Clothing*. It provides a list of chemicals and the appropriate PPE for each one. See resources below for Internet address.

VI. Getting Off The Gloves!

The Centers for Disease Control and Protection or CDC provides the following guidance in removing gloves:

"To take off your gloves when you're done working, peel one glove off by holding the cuff. Then, with your ungloved hand, hold it wrong-side out as you peel off the other glove by the cuff.

When you're finished, both gloves will be wrong-side out and the contaminated surface will be on the inside."

VII. FINAL THOUGHTS!

In summary – consider the following items when the need for hand PPE is there:

1. Make sure the glove size fits and is comfortable.
2. Remove jewelry such as watches, rings that can puncture gloves.
3. Always inspect gloves before putting them on and when using them for signs of deterioration, holes, cuts, tears, etc.
4. Always replace worn or damaged gloves.
5. When the work is completed, make sure the gloves are disposed of in the correct waste container.
6. Always wash hands with soap and water before and after glove use.

Live Long & Prosper Safely!

Resources:

NIOSH Recommendations for Chemical Protective Clothing: https://www.cdc.gov/nioshncpc/

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