

CHAPTER 17 – PERSONAL PROTECTIVE EQUIPMENT (PPE)

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CHAPTER 17 - PERSONAL PROTECTIVE EQUIPMENT

A. INTRODUCTION

1. The purpose of Personal Protective Equipment (PPE) is to protect employees from the risk of injury or illness by creating a proper barrier against workplace hazards. PPE is NOT a substitute for good engineering or administrative controls, or good work practices, in eliminating the hazard source. However, when used in conjunction with these controls, or in the interim as more permanent controls are implemented, PPE can serve as an effective means of reducing risk.
2. This Chapter applies to all Smithsonian Institution (SI) personnel who, by nature of their job function, have the potential to be adversely exposed to (or come in contact with) chemical, physical, radiological, or biological hazards. This Chapter provides information on recognizing those conditions that require PPE, as well as selecting PPE for hazardous activities.
3. This Chapter addresses the overall PPE program of hazard identification, PPE selection, use, and maintenance, and shall conform, at minimum, to the Occupational Safety and Health Administration (OSHA) 29 Code of Federal Regulations (CFR) Standard 1910 Subpart I, "Personal Protective Equipment," including:
 - a. [1910.132](#) – "General Requirements;"
 - b. [1910.133](#) - "Eye and Face Protection;"
 - c. [1910.135](#) - "Head Protection;"
 - d. [1910.136](#) - "Occupational Foot Protection;"
 - e. [1910.137](#) - "Electrical Protective Devices;" and
 - f. [1910.138](#) - "Hand Protection."

Additional specific PPE requirements are also included in every operational topic chapter in this *Manual*.

B. CHAPTER-SPECIFIC ROLES AND RESPONSIBILITIES

1. Safety Coordinators shall assist supervisors in conducting and reviewing their PPE Hazard Assessments and identifying appropriate PPE, and training in the proper use, care and storage of PPE when applicable.
2. Supervisors shall:
 - a. Assess work areas for hazards with assistance as needed from their Safety Coordinator and Office of Safety, Health and Environmental Management (OSHEM).

- b. When necessary reassess work area certifications and notify the Safety Coordinator when a hazard or process changes, which could render previously used PPE ineffective.
 - c. Select and provide appropriate PPE and make it available to their employees.
 - d. Ensure employees are trained in the proper use, cleaning, maintenance, inspection and storage of PPE.
 - e. Ensure that affected employees wear any and all PPE during tasks that require protection.
 - f. Ensure that defective or damaged PPE is not used and immediately replaced.
 - g. Maintain documentation of individual employee PPE issuance and training per requirements of this Chapter.
3. Employees shall:
- a. Wear PPE as directed by their supervisor.
 - b. Participate in PPE training.
 - c. Inspect, clean, maintain and store properly assigned PPE.
 - d. Notify their supervisor of the need to replace or repair PPE.
 - e. Notify their supervisor when a hazard or process changes, which may render previously used PPE ineffective.
 - f. Notify their supervisor of any other changes (e.g., medical conditions, physical changes) that may require assigned PPE to be re-evaluated for proper fit.
4. Office of Safety, Health and Environmental Management (OSHEM) shall provide technical assistance to Directors, Safety Coordinators, and supervisors in carrying out their responsibilities under this Chapter. Technical assistance may include:
- a. Evaluating employee exposures and advising as to the appropriate PPE controls.
 - b. Conducting PPE training as required by specific chapters, such as [Chapter 18, "Respiratory Protection"](#) of this *Manual* and [Chapter 41, "Occupational Noise"](#) of this *Manual*, or assisting Safety Coordinators in providing other PPE training.
 - c. Providing medical clearance examinations, when applicable, for suitability of employee to wear required PPE.

C. PPE PROGRAM COMPONENTS

An effective PPE program must include the following four steps:

1. PPE hazard assessment of the work place.
2. Proper selection and assignment of PPE.
3. Training users in the correct fit, use, care, and storage of PPE
4. Cleaning, maintenance and inspection methods for PPE.

D. HAZARD ASSESSMENT

1. Supervisors shall inspect/assess work areas and review work operations to identify potential hazards and to determine which types of PPE should be used to protect employees. Depending on the severity of the hazard the area may need to be inspected more frequently. When a supervisor needs assistance he/she should contact the facility Safety Coordinator or OSHEM staff.
2. [Attachment 1](#), "PPE Hazard Assessment Certification" or equivalent, shall be completed as a component of the PPE program.
3. Certified PPE hazard assessments shall be reviewed and modified, as needed, to address changing site conditions or operations.

E. PROPER SELECTION AND ISSUANCE OF PPE

1. Hazard Control Priorities. Supervisors shall make efforts to eliminate or reduce the identified hazards through product or process substitution, engineering controls (physically changing a machine or work environment) or administrative controls (changing how or when employees perform their job) must first be attempted. If the hazards cannot be reduced to an acceptable risk by any of these methods, then PPE shall be selected that will protect employees from the identified hazards.
2. PPE Cautions. PPE devices alone shall not be relied on to provide protection against hazards, but shall be used in conjunction with feasible engineering controls, administration controls, and safe work practices.
3. PPE Selection. After identification of workplace hazards has been completed, the Safety Coordinator shall assist the supervisor in making PPE product and selection recommendations. Selection shall be based on the technical requirements of this and applicable other chapters in this *Manual*, and with careful consideration of the following factors:

4. Supervisors shall reassess the workplace by identifying and evaluating new equipment and or processes, review accident records and reevaluate the suitability of previously selected PPE.
 - a. Application - what part of the body is being protected?
 - b. Chemical resistance - will the PPE material maintain its structural integrity and protective qualities? If hazardous materials are a concern, the Material Safety Data Sheet (MSDS) shall also be reviewed for PPE recommendations.
 - c. Strength - is the PPE material resistant to punctures, tears, and abrasions?
 - d. Flexibility - does PPE provide the necessary dexterity and tactile sensitivity required of the task?
 - e. Thermal limits - does the PPE material maintain its mobility and protective capacity in temperature extremes?
 - f. Cleanable - can the material be easily decontaminated and reused?
 - g. Longevity - will the material resist aging?
 - h. Ergonomic considerations (comfort and fit) – will the equipment be extremely uncomfortable (increasing the likelihood of its not being worn or worn properly), excessively restrict movement, or lead to ergonomic injuries when used in this task?
5. Selection must meet the minimum technical criteria applicable to the hazard. However, the choice of models meeting these criteria are often varied and therefore input from the affected employees as to the final selection is to be solicited. Employee involvement will greatly enhance wearer acceptance.
6. SI will provide the PPE required by the job function, per this *Manual*, at no cost to the employee. Employees will not provide or bring into the workplace from home, their own PPE.
7. All PPE shall be of safe design and construction for the work performed.
8. Hazard assessments, training certification and the PPE issuance is required per this chapter, and shall be documented for each employee, using the examples, or their practical equivalent, of [Attachments 4](#).

F. SPECIFIC PPE SELECTION REQUIREMENTS

1. Eye/Face Protection
 - a. Eye protection and/or face protection shall be worn when there is the potential for exposure to the eyes or face from flying particles, molten metal, chemical splashes, gases or vapors, or potentially injurious light radiation.

- b. Workers with prescription eyeglasses are entitled, to receive prescription safety glasses if required in their work. Regular eyeglasses or contact lenses must not be used as eye protection against flying particles because they do not meet ANSI impact-resistant standards. Refer to [Attachment 6](#), for procedures on obtaining safety eyewear at the SI.
- c. Employees whose vision requires the use of corrective lenses, and whose job duties require goggles or face shields in the course of their work, must be provided a type of goggle or full-face shield that can be worn over their prescription lenses.
- d. There are four general classes of eye and face protection: safety glasses, goggles, face shields and welding helmets. The type of protection required shall be determined by the type and degree of the hazard, and shall comply with OSHA 29 CFR 1910.133, "Eye and Face Protection," and the American National Standard Institute (ANSI) Standard Z87.1-2003 "Practice for Occupational and Educational Personal Eye and Face Protective Devices." Refer to [Attachment 2](#), "Eye and Face Protection Selection Guide," for additional information on eye and face protection.

(1) Safety glasses.

- (a) Basic safety glasses (spectacles) are to be used only as protection against frontal impact hazards. Side protection shall be required when there is a lateral hazard from flying particles. Detachable side protectors (e.g., clip-on or slide-on shields) meeting ANSI requirements are acceptable but not recommended, as they do not offer the same sturdy coverage as safety glasses that are constructed with side protection.
- (b) Safety glasses are not to be used for protection against mists, dusts, gases, vapors, or liquid splashes, because they will not protect the eyes from these agents.
- (c) Safety glasses with specially tinted lenses [per 29 CFR 1910.133(a)(5)] are to be used for protection against impact and optical radiation hazards, such as from welding, ultraviolet light sources, or lasers. These operate by reducing transmittance of specific wavelengths of concern. They are designated by shade numbers corresponding to the radiation hazard.

- (2) Safety goggles are to be used for protection against splash or irritation from liquid chemicals, gases, or fine particulates. They are also rated for impact protection, and may provide optical radiation protection if tinted to the appropriate shade. They are designed to fit snugly, and are designed in 3 basic configurations:

- (a) Direct vented goggles have air holes or slits on the top and sides of the goggle and provide direct air passage. This type offers the least protection and is not to be used for jobs with the potential for chemical splash or vapors.
 - (b) Indirect vented goggles have deflector caps over the side and top ventilation holes, and so may prevent the direct entry of chemicals into the goggle, while providing some relief from fogging. This type is to be used for tasks in which the potential for chemical splash is low to moderate.
 - (c) Unvented goggles are to be used for protection against gases or vapors which can be irritating to the eyes or easily absorbed through the eye (such as ammonia or formaldehyde), or when the risk is high of substantial liquid chemical splash.
 - (3) Face shields, in addition to safety glasses, are to be worn when working with large volumes of hazardous materials, where the potential exists for significant chemical splash to the face, neck, and ears. Face shields do not offer adequate impact protection and so must never be worn alone (if impact is a concern), but always over the appropriate type of safety spectacle or goggle.
 - (4) Welding helmets and goggles for optical radiation hazards
 - (a) Welding helmets, worn over safety glasses or goggles, are to be used when protection is required for the worker's eyes, ears, face, and front of neck against weld splatter. Welding helmets/goggles must have a tinted window (meeting the appropriate transmittance requirements) to protect against optical radiation.
 - (b) Ultraviolet, infrared, and visible glare radiation hazards require workers to wear goggles with appropriate degrees of shading to protect against the intensity of the radiation.
2. Foot Protection
- a. Foot protection (closed toed) shall be worn when there is the potential for injury to the feet from falling or rolling objects, objects piercing the sole of the foot, electrical hazards, hot surfaces and slippery surfaces.
 - b. [Attachment 7](#) provides detailed information on obtaining safety shoes or boots at the SI.

- c. Foot protection shall comply with [OSHA 29 CFR 1910.136](#), "Occupational Foot Protection," and ASTM F 2413-05 Standard Specifications for Performance Requirements for Foot Protection.
- d. Safety shoes will be recommended only when the process or task warrants such protection (i.e., if there is a danger from heavy equipment or objects falling or rolling over the foot).
- e. Shoes that offer complete foot coverage (i.e., no sandals or open-toed shoes) are to be worn in the chemical laboratory or any work area with the potential for chemical spills or broken glass.
- f. The boot material must be chemically-resistant if the work has the potential for significant chemical contact. (see F. 5 in this Chapter).
- g. Foot protection must be constructed so as not to create a spark or generate static electricity in areas electrically classified for fire or explosion hazards.
- h. Foot protection must be non-conductive if the work poses an electrical hazard.(see F. 6 of this chapter).
- i. Foot protection must be slip-resistant.for work in slippery conditions.
- j. ORTHOPEDIC SAFETY SHOES

Employees who believe they may need or are instructed by their doctor that they need orthopedic safety shoes should submit their requests on Form SI-3389, (attachment 7) as described above, (2b) however locating a supplier for the shoes is the responsibility of the employee. Employees must also obtain and submit one bid for the price of approved orthopedic safety shoes. All expenses of obtaining a prescription for orthopedic safety shoes, locating a supplier, and acquiring the bid for purchase of the shoes must be paid for by the employee. Organizational units shall pay for the cost of the orthopedic safety shoes.

3. Head Protection

- a. Head protection shall be worn when:
 - (1) There is a potential for injury to the head from impact or flying objects;
 - (2) There is a potential for injury to the head from falling objects (e.g., working below other workers who are using tools and materials which could be dropped);
 - (3) Any employee enters a construction site;

- (4) There is danger of contact with energized power lines or equipment;
 - (5) Hair may be caught in machinery; or
 - (6) Sanitary protection is required.
- b. Hard hats worn for protection against impact and penetration of falling objects shall comply with [OSHA 29 CFR 1910.135](#), "Head Protection," and the ANSI Standard Z89.1.2003, "American National Standard for Industrial Head Protection." Hard hats worn for protection against electrical shock and burns shall comply with ANSI Standard Z89.1.2003 Class E requirements.
 - c. Any hard hat that has been subjected to damage, especially by impact, must be discarded.
 - d. Any hard hat that demonstrates signs of ultraviolet (sunlight) degradation must be discarded. (Degradation of plastic by UV light will cause the glossy finish of the plastic to fade, turn chalky, and eventually fall apart).
 - e. The "Useful Service Lifeline Guide" suggests that hard hats used regularly, with no visible signs of damage, be replaced every 5 years. The manufacturing date of the hard hat is stamped on the inside.
 - f. The webbing in hard hats should be replaced after 12 months.

4. Hand Protection

- a. Hand protection shall be worn when hands are exposed to hazards such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical burns, thermal burns and harmful temperature extremes.
- b. The type of hand protection used shall conform to the requirements in [OSHA 29 CFR 1910.138](#), "Hand Protection," and shall be based on:
 - (1) Performance characteristics of the hand protection relative to the task(s) to be performed;
 - (2) Conditions present;
 - (3) Duration of use; and
 - (4) Hazards or potential hazards identified.
- c. When selecting gloves for protection against chemical hazards, including their vapor or gaseous forms, consider the following (see [Attachment 3](#) for additional guidance):

- (1) The toxic properties of the chemical(s) shall be determined; especially the ability of the chemical to cause local effects on the skin and/or to be absorbed by the skin and cause systemic effects.
 - (2) Glove materials are eventually permeated by chemicals. However, gloves may be used safely for limited periods if specific use and glove characteristics (i.e., thickness, permeation rate, and time) are known. Common glove materials include: neoprene, polyvinyl chloride, nitrile, and butyl and natural rubbers. These materials differ in their resistance to various substances.
 - (3) For mixtures and formulated products (unless specific test data are available), a glove shall be selected based on the chemical component with the shortest breakthrough time. It is possible for solvents to carry active ingredients through polymeric (a chemical compound or mixture of compounds formed by polymerization and consisting essentially of repeating structural units) materials.
- d. Thin, surgical-type gloves (latex, vinyl, nitrile are most common) can be protective against incidental contact with certain chemicals, but are not to be used as protection during full immersion or prolonged contact with chemicals.
 - e. Latex (natural rubber) containing products must not be used by persons allergic to latex. Consult OSHM for further assistance.
 - f. Employees shall be able to remove the gloves in a way that prevents skin contamination.
 - g. Refer to the glove manufacturer's chemical resistance specifications when choosing a glove material, and consult with [NIOSH Recommendations for Chemical Protective Clothing: A Companion to the NIOSH Pocket Guide to Chemical Hazards](#)
5. Body Protection/Protective Clothing.
- a. Body protection/protective clothing shall be worn when there is a potential for exposure to other parts of the body (e.g., legs, arms, back, chest and feet) from:
 - (1) Excessive heat or cold;
 - (2) Hot liquid or molten metal splashes;
 - (3) Radiation;
 - (4) Impacts or cuts; or

- (5) The contact or absorption effects of acids, alkalis, and other hazardous chemicals.
 - b. Selection of body protection/protective clothing depends on the type of hazardous exposure, the working environment, and the task to be performed (see [Attachment 3](#) for additional guidance). Body protection/protective clothing may include one or more of the following items:
 - (1) Lab coats or jackets;
 - (2) Leather chaps and sleeves;
 - (3) Aprons or vests;
 - (4) Cotton coveralls; and/or
 - (5) Poly-coated or saran-coated tyvek suits.
 - (6) High visibility apparel
 - c. Live animal handlers shall wear, as necessary and in addition to proper gloves, arm protection against injury from animals (bites, scratches).
 - d. An employee's personal work clothes are to fit his/her work assignment. The minimum protection required is a full short sleeve "T" shirt (tank shirts and cut down "T" shirts are not permitted) and long pants. These work clothes will help to prevent sunburn, plant rashes, abrasions and insect bites, and to afford some protection against flying particles and accidental spills of liquids. Shorts may be approved for some work duties (e.g., mail carriers) that do not present hazards to the skin. Any exceptions shall first be approved by your supervisor and the Safety Coordinator.
 - e. Latex (natural rubber) containing products must not be used by persons allergic to latex. Consult OSHM for further assistance.
 - f. Refer to the glove manufacturer's chemical resistance specifications when choosing a glove material, and consult with [NIOSH Recommendations for Chemical Protective Clothing: A Companion to the NIOSH Pocket Guide to Chemical Hazards](#)
6. Electrical Protective Devices
- a. Rubber insulating equipment shall be used to protect employees from shocks/burns while working on/near "live" electrical systems and equipment. Electrical protective devices shall comply with [OSHA 29 CFR 1910.137](#), "Electrical Protective Devices."
 - b. Electrical protective PPE shall be inspected for damage, deterioration, and visible defects before each day's use, and immediately after an incident suspected of causing damage.

Supervisors shall ensure the proper use of electrical protective PPE (e.g., gloves not turned inside out, leather protectors in place, etc.).

- c. Supervisors shall ensure that a hard hat designed to reduce electrical shock hazard is worn by each affected employee when near exposed electrical conductors which could contact the head.
- d. Supervisors shall ensure that occupational safety footwear designed to reduce electrical shock hazard is worn by each affected employee when near exposed electrical conductors which could contact the feet.
- e. Rubber insulating equipment shall comply with the following American Society for Testing and Materials (ASTM) standards:
 - (1) Specification for Rubber Insulating Gloves (D120-87);
 - (2) Specification for Rubber Insulating Matting (ASTM D178-93 or D178-88);
 - (3) Specification for Rubber Insulating Blankets (ASTM D1048-93 or D1048-88a);
 - (4) Specification for Rubber Insulating Covers (ASTM D1049-93 or D1049-88);
 - (5) Specification for Rubber Insulating Line Hose (ASTM D1050-90); and
 - (6) Specification for Rubber Insulating Sleeves (ASTM D1051-87).
- f. All electrical protective equipment shall be subjected to periodic electrical tests conducted in accordance with voltages identified by *American Society of Testing Materials* (ASTM) standards to indicate if the insulating equipment can withstand the voltage involved. Insulating equipment that fails to pass an inspection or electrical test shall be removed from service immediately, tagged with a "Do Not Use" sign, and discarded. Rubber insulating equipment test intervals shall be performed:
 - (1) Rubber insulating line hoses shall be tested upon indication that the insulating valve is suspect.
 - (2) Rubber insulating covers shall be tested upon indication that the insulating valve is suspect.
 - (3) Rubber insulating blankets shall be tested before first issue and every 12 months thereafter.
 - (4) Rubber insulating gloves shall be tested before first issue and every six months thereafter.
 - (5) Rubber insulating sleeves shall be tested before first issue and every 12 months thereafter.

- g. Insulating equipment that has not been electrically tested within the previous 12 months shall not be placed into service. Supervisors shall be responsible for making test arrangements for rubber insulating equipment. Supervisors shall retain test results on file for the duration of use of the insulating equipment item.
7. Respiratory Protection. Selection and use of respiratory protection shall be in accordance with [Chapter 18, "Respiratory Protection"](#), of this *Manual*.
8. Hearing Protection. Selection and use of hearing protection shall be in accordance with [Chapter 41, "Occupational Noise"](#), of this *Manual*.
9. Fall Protection. Selection and use of fall protection shall be in accordance with [Chapter 10, "Fall Protection"](#), of this *Manual*.
10. Water Safety. If a project/task will require employees to perform activities on or adjacent to water, employees must don a personal flotation device (PFD). PFDs shall be U.S. Coast Guard (USCG) approved Type I, II, or III floatation devices, and must be of the appropriate size for the intended wearer.

G. CLEANING, MAINTENANCE, AND INSPECTION of PPE

1. All PPE provided shall be used and maintained in a sanitary and reliable condition, and in accordance with manufacturer's recommendations and the provisions of this *Manual*.
2. The PPE Hazard Assessment is to state whether gloves and other chemical protective clothing are capable of being washed/decontaminated after use or whether it must be discarded after use (typically for use with highly hazardous materials). Consult the Safety Coordinator for technical assistance.
3. Lab coats used for protection against hazardous materials must not be taken home to be washed, but must either be washed on premises in a dedicated washer or sent to a commercial launderer or uniform cleaning company who has been notified that the lab clothing may be contaminated with hazardous materials.
4. Employees shall inspect all PPE (using Attachment 5 or its equivalent) prior to each use for tears, punctures, holes, cuts, cracks, embedded foreign objects and texture changes (e.g., swelling, softening, hardening, becoming sticky, inelasticity). Changes in glove color or hardening indicates degradation, requiring the glove to be replaced.
5. Damaged or dirty PPE shall be discarded, changed and/or decontaminated. At a minimum, all PPE shall be discarded when it has become excessively contaminated, worn, torn or has other integrity problems.

6. Any PPE that has been subjected to damage, especially by impact, must be discarded.
7. A determination of whether contaminated PPE must be disposed of as hazardous waste (refer to [Chapter 29, "Hazardous Waste Management"](#), of this *Manual*) is to be made during the PPE hazard assessment process, with assistance from the Safety Coordinator.

H. TRAINING

1. Any employee who is required to wear PPE shall receive training on the proper use and care of the assigned PPE, to ensure that maximum protection is achieved by wearing the PPE correctly and maintaining it in good condition. The training shall be provided by the supervisor, with assistance as needed from the Safety Coordinator.
2. PPE issuance and certification of training per this Chapter shall be documented for each employee, using the example, or their practical equivalent, of [Attachments 4](#). Documentation is to be maintained by the supervisor and/or Safety Coordinator.
3. The training shall include at least the following subjects:
 - a. When PPE is necessary to be worn, and why (i.e., the results of the Hazard Assessment);
 - b. What PPE is necessary for each task;
 - c. How to properly don, do, adjust, and wear PPE;
 - d. The limitations of the PPE; and
 - e. The proper care, cleaning, useful life, storage and maintenance of PPE;
 - f. How to properly inspect PPE for signs of damage or wear, and how to tell when the PPE needs repair or replacement.
4. As part of the training, employees shall demonstrate their ability to use, maintain, and inspect their assigned PPE properly before being allowed to perform work requiring its use.
5. Retraining will be required under the following circumstances:
 - a. Changes in the workplace render previous training obsolete.
 - b. Changes in the types of PPE to be used render previous training obsolete.
 - c. Evidence that the employee does not understand the need for, or proper use, maintenance or inspection of assigned PPE.
6. Training documentation must verify that the affected employee has received and understood the required PPE training, through a written certification containing the name of each employee trained, the date(s) of training, and the subject of the training. The Personal Protective

Equipment Issuance and Training Certification (example in [Attachments 4](#)) or equivalent, is to be used to document all PPE training received by an individual employee. Supplemental training documentation (e.g., group training sign-in logs or the OSHEM issued respiratory protection training memorandum) must include at least the name of the employee, date(s) and subject of the training.

I. REQUIRED INSPECTIONS AND SELF ASSESSMENTS

1. Hazard Assessments shall be reviewed and modified to address changing site conditions or operations as necessary.
2. The supervisor shall evaluate the condition and effectiveness of required PPE at least monthly or more often as warranted. [Attachment 5](#), "Personal Protective Equipment Inspection Form", or equivalent, shall be used to perform and document PPE inspections.
3. Refer to Section F (6) above for rubber insulating equipment testing information.
4. PPE that does not withstand daily workplace rigors shall be re-evaluated and replaced with alternatives that are more suitable.
5. In-Use Monitoring
 - a. Chemical degradation or permeation of PPE and worker heat/cold stress may significantly affect the length of time an employee can work in PPE. PPE in-use monitoring shall include observations of chemical degradation or permeation of PPE, signs or symptoms of heat/cold stress, visual monitoring of PPE for signs of degradation or rips and tears.
 - b. Limitations on the length of time an employee can work may be expected during the summer and winter months. Employees shall be monitored for potential heat stress illnesses in accordance with [Chapter 42, "Temperature Extremes: Heat"](#) of this *Manual*. Employees shall be monitored for potential cold stress injuries in accordance with [Chapter 43, "Temperature Extremes: Cold"](#), of this *Manual*.
 - c. Employees shall report any perceived problem or difficulties with PPE to their supervisor or Safety Coordinator, including any signs or symptoms of heat stress (e.g., rapid pulse, nausea, fatigue) or cold stress (e.g., sluggish pulse, fatigue); chest pains, discomfort, interference with vision or communication, restriction of movement, unusual residue on PPE, or skin irritation.
 - d. Modifications to PPE may be made based on the findings of in-use monitoring.

J. RECORDS AND REPORTS

1. Supervisors shall maintain a copy of PPE Hazard Assessment Certifications applicable to their workplace, along with related PPE certified training and PPE issuance forms, for a minimum of 5 years.
2. Supervisors shall retain insulating equipment test results on file for the duration of use of the insulating equipment item.

K. REFERENCES

1. [U.S. Department of Labor, Occupational Safety Administration \(OSHA\), Safety and Health Topics, "Personal Protective Equipment \(PPE\): Hazards and Solutions"](#)
2. [OSHA Fact Sheet, "Personal Protective Equipment," 2002](#)
3. OSHA 29 Code of Federal Regulations (CFR) Standard 1910 Subpart I, "Personal Protective Equipment," including:
 - a. [1910.132](#) – "General Requirements;"
 - b. [1910.133](#) - "Eye and Face Protection;"
 - c. [1910.135](#) - "Head Protection;"
 - d. [1910.136](#) - "Occupational Foot Protection;"
 - e. [1910.137](#) - "Electrical Protective Devices;" and
 - f. [1910.138](#) - "Hand Protection."
4. American Society for Testing and Materials (ASTM) standards:
 - a. Specification for Rubber Insulating Gloves (D120-87);
 - b. Specification for Rubber Insulating Matting (ASTM D178-93 or D178-88);
 - c. Specification for Rubber Insulating Blankets (ASTM D1048-93 or D1048-88a);
 - d. Specification for Rubber Insulating Covers (ASTM D1049-93 or D1049-88);
 - e. Specification for Rubber Insulating Line Hose (ASTM D1050-90);
 - f. Specification for Rubber Insulating Sleeves (ASTM D1051-87); and
 - g. Specifications for Performance Requirements for Foot Protection (ASTM F 2413-05).
5. American National Standard Institute (ANSI) Standard Z89.1.2003, "American National Standard for Industrial Head Protection."

6. ANSI Standard Z87.1-2003 "Practice for Occupational and Educational Personal Eye and Face Protective Devices."
7. ANSI Standard Z41.1-1991, "American National Standard for Personal Protection - Protective Footwear."
8. [Oklahoma State University Chemical Guide and Permeation Tables](#).

PPE Hazard Assessment Certification

Location:	
Date:	Conducted By:
Specific tasks performed at this location:	

Are any of the following hazards present during the project/task?	No	Yes	Eliminate Hazard or Use the Following PPE (use Chapter 17 guidelines)
Overhead Hazards			
Suspended loads that may fall			Hard hat, ANSI Class A, B
Overhead beams or load that could strike head			Hard hat, ANSI Class A, B
Energized wires or equipment that could strike head			Hard hat, ANSI Class B
Employees working above at an elevated site who could drop objects on others below			Hard hat, ANSI Class A, B
Sharp objects or corners at head level			Hard hat, ANSI Class A, B, or C
Eye and Face Hazards			
Liquid chemical under pressure			Chemical protective goggles (indirect vented or unvented). Add face shield if chemical is irritating to the skin or is corrosive faceshield
Chemical splashes or irritating mists (acids/caustics/corrosives)			Chemical protective goggles (indirect vented or unvented). Add face shield if chemical is irritating to the skin or is corrosive faceshield
Powders, dusts, compressed air			Safety glasses or impact goggles
Smoke and/or fumes			Chemical protective goggles
Welding/cutting/brazing (hot sparks) operations			Refer to Attachment 2
Light radiation/Laser/temperature extremes			Refer to Attachment 2
Flying or falling objects/Projectiles			Refer to Attachment 2
Sawing, cutting, chipping, grinding			Refer to Attachment 2
Hand and Body Hazards			
Chemical exposure			Use chemical resistant gloves as recommended by MSDS, safety coordinator/OSHEM advice, and this chapter (Attachment 7).
Cuts, abrasions, punctures, sharp edges or objects			Leather/work gloves
Temperature extremes - heat			Leather gloves, Kevlar gloves, welder's gloves
Temperature extremes - cold			Leather gloves, insulated gloves
Blood			Nitrile gloves
Exposure to electrical current			Electrical protective gloves
Sharp tools, machine parts, etc.			Leather gloves, Kevlar gloves

Material handling			Leather gloves
Using a chain saw, cutting brush			Chain saw chaps, leather jacket
Live animal handling			Proper gloves plus arm/leg/body protection against bites/scratches.
Foot Hazards			
Heavy materials (greater than 50 pounds) handled by employees (falling hazards, hoisting/lifting, material handling)			Safety shoes or boots
Potential to crush whole foot (falling or rolling hazards, hoisting/lifting, material handling)			Safety shoes or boots with metatarsal guards
Sharp edges or points – puncture risk to sole			Safety shoes or boots
Exposure to electrical wires			Safety shoes or boots with electrical protection
Unusually slippery conditions			Rubber-sole boots or grips
Chemical contamination			Chemical resistant boots or boot covers
Wet conditions			Rubber boots or boot covers
Construction / demolition			Safety shoes or boots with metatarsal guards if foot crushing hazard exists
Fall Hazards			
Fall hazards present, based on results of Job Hazard Analysis.			Refer to Safety Manual Chapter 10, "Fall Protection", for selection guidance.
Water Hazards			
Working on or above water where drowning hazards exist			U.S. Coast Guard approved personal flotation device - Type I, II, or III PFD
Excessive Heat or Flame			
Full body chemical protective clothing in temperatures greater than 80 degrees			Cooling vest
Work around molten metal or flame			Nomex or Kevlar clothing
Welding activities			Welding leather clothing for those areas exposed to flame, spark, or molten metal
Respiratory Hazards			
Respiratory/inhalation hazards present, based on results of Job Hazard Analyses and employee exposure determinations by OSHM			Refer to Safety Manual Chapter 18, "Respiratory Protection," for selection guidance
Excessive Noise			
Hearing hazards present, based on results of Job Hazard Analyses and employee exposure determinations by OSHM			Refer to Safety Manual Chapter 41, "Occupational Noise," for selection guidance

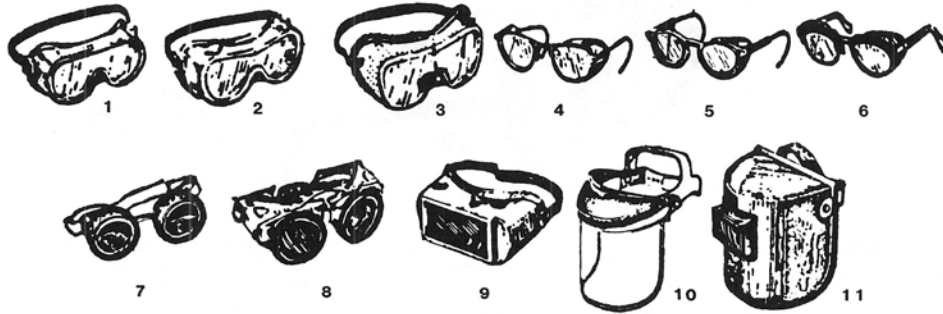
I certify the above PPE hazard analysis meeting the requirements of SI Safety Manual Chapter 17 was conducted at the job task or work area indicated above. This assessment was conducted to identify hazards present or likely to be present which necessitate the use of personal protective equipment.

Signature

(date)

Eye and Face Protection Selection Guide

EYE AND FACE PROTECTOR SELECTION GUIDE



- | | |
|---|---|
| <p>1. GOGGLES, Flexible Fitting, Regular Ventilation</p> <p>2. GOGGLES, Flexible Fitting, Hooded Ventilation</p> <p>3. GOGGLES, Cushioned Fitting, Rigid Body</p> <p>*4. SPECTACLES, Metal Frame, with Sideshields</p> <p>*5. SPECTACLES, Plastic Frame, with Sideshields</p> <p>*6. SPECTACLES, Metal-Plastic Frame, with Sideshields</p> <p>*7. WELDING GOGGLES, Eyecup Type, Tinted Lenses (Illustrated)</p> <p>7A. CHIPPING GOGGLES, Eyecup Type, Clear Safety Lenses (Not Illustrated)</p> | <p>*8. WELDING GOGGLES, Coverspec Type, Tinted Lenses (Illustrated)</p> <p>8A. CHIPPING GOGGLES, Coverspec Type, Clear Safety Lenses (Not Illustrated)</p> <p>*9. WELDING GOGGLES, Coverspec Type, Tinted plate Lens</p> <p>10. FACE SHIELD, (Available with Plastic or Mesh Window)</p> <p>11. WELDING HELMETS</p> |
|---|---|

APPLICATIONS		
OPERATION	HAZARDS	RECOMMENDED PROTECTORS <small>Bold Type Numbers Slightly Preferred Protection</small>
ACETYLENE-BURNING ACETYLENE-CUTTING ACETYLENE-WELDING	SPARKS, HARMFUL RAYS MOLTEN METAL, FLYING PARTICLES	7,8,9
CHEMICAL HANDLING	SPLASH, ACID BURNS, FUMES	2,10 (For severe exposure add 10 over 2)
CHIPPING	FLYING PARTICLES	1,3,4,5,6,7A,8A
ELECTRIC (ARC) WELDING	SPARKS, INTENSE RAYS, MOLTEN METAL	9,11 (11 in combination with 4,5,6 in tinted lenses, advisable)
FURNACE OPERATIONS	GLARE, HEAT, MOLTEN METAL	7,8,9 (For severe exposure add 10)
GRINDING-LIGHT	FLYING PARTICLES	1,3,4,5,6,10
GRINDING -HEAVY	FLYING PARTICLES	1,3,7A,8A (For severe exposure add 10)
LABORATORY	CHEMICAL SPLASH, GLASS BREAKAGE	2 (10 when in combination with 4,5,6)
MACHINING	FLYING PARTICLES	1,3,4,5,6,10
MOLTEN METALS	HEAT, GLARE, SPARKS, SPLASH	7,8 (10 in combination with 4,5,6 in tinted lenses)
SPOT WELDING	FLYING PARTICLES, SPARKS	1,3,4,5,6,10

* Non-side shield spectacles are available for limited hazard use requiring only frontal protection.

CHEMICAL PROTECTIVE GLOVES AND CLOTHING SELECTION GUIDE

Gloves, lab coats, aprons, and other chemical protective clothing (CPC) are to be worn to protect the skin and prevent contamination on clothing, when exposed to hazards such as:

- Absorption of harmful chemicals,
- Chemical or thermal burns,
- Lacerations, abrasions, punctures,
- Harmful temperature extremes.

The degree of chemical protection afforded by a certain material is a function of:

- Chemical type you need protection against,
- The task length, and
- The level of activity.

Plus, the barrier effectiveness of CPC against a particular chemical is rated (and advertised) in terms of each chemical's:

- Permeation rate: the rate at which a known amount of chemical diffuses through a given area of clothing per unit time and can be detected on the inside surface.
- Breakthrough time: the time it takes for a given chemical to pass through a material from the start of contact on one side, to the detection of chemical on the other side. Units of breakthrough time are usually expressed in minutes or hours and a typical test takes up to 8 hours. If no measurable breakthrough is detected after 8 hours, the result might be reported as a breakthrough time of ">8 hours".
- Degradation (and loss of elasticity) potential of the material: rated in terms of a change in one or more physical properties after contact with the chemical: includes cracking, swelling, shrinking, stretching, and dissolving. It is a more subjective observation but factors into the recommendations of both manufacturers and independent raters. Note that a good degradation value does not mean the chemical will not permeate.

Compare the chemicals in use against published selection charts, such as:

- CPC manufacturers (check web sites) and suppliers (such as Fisher Scientific or Lab Safety Supply),
- "Quick Selection Guide to Chemical Protective Clothing", Forsberg & Mansdorf, available at the MSC/SIL, OSHM, or through your safety coordinator
- [NIOSH Recommendations for Chemical Protective Clothing: A Companion to the NIOSH Pocket Guide to Chemical Hazards](#)

Consider all of the following factors in making your decision.

1. **Toxicity of the chemical:** For a highly toxic material, particularly one with high skin absorption rates, gloves may not even be an appropriate final control. Review the MSDS and other literature with your LSO and consult OSEM for guidance.
2. **Physical Requirements of the Work:** Remember, the most perfect glove is useless if easily cut, torn, or damaged. For highly physical work, double gloving is an alternative, or using dipped (multi-compound) or multilayered gloves. Consider the following:
 - Will tasks lead to puncture, abrasion, or tearing of the glove? (i.e., will palms or fingers need to be lined with abrasion-resistant material).
 - Will tactile sensitivity or extra grip be needed?
 - Will the weight of heavy gloves impair work or lead to fatigue and other related safety hazards? (may need to alter the task or institute more frequent breaks).
 - Will there be extreme temperature or humidity conditions ? (if so, check with manufacturer on what effect this may have such as brittling or faster breakthrough; permeation & breakthrough tests are done at a specified temperature).
 - Will the glove be used extensively outdoors? Will sunlight, ozone, UV degrade the product more quickly?
 - Is the glove material flammable? Or, flame resistant?
3. **Research published rating charts.** Scan safety catalogues for a wide variety of CPC manufacturers, then review each manufacturer's charts for your specific chemicals. Do not rely on charts that indicate the protective ability of a certain material against an entire class of chemicals, such as "acids". Reputable manufacturers will list at least permeation data. Call the manufacturer with questions and be comfortable that the product was tested under similar work and environmental conditions. Forsberg & Mansdorf recommends starting with a material that has at least a 4 hour breakthrough time, then looking at permeation rates.
4. **Chemical Mixtures.** Remember that no one clothing material will be a barrier to all chemicals; it may be more efficient to purchase different gloves for distinct purposes than to search for a "wonder" glove. In fact, the OSHA Standard recommends that for mixtures of chemicals, a glove should be selected on the basis of the chemical component with the shortest breakthrough time.
5. **Manufacturer Variability.** The chemical resistance of a certain material may vary widely from manufacturer to manufacturer, depending on construction methods, (and even from lot to lot for a given source). So check with a specific manufacturer on the match (i.e, not everyone's nitrile glove protects equally). Also, check with the manufacturer on specific storage or shelf-life requirements of its products.

- 6. Material Thickness/Immersion Time.** Usually, the thicker the glove, the slower the permeation rate for a given chemical. Likewise, your potential exposure to a chemical increases if you are immersing your entire hand in a chemical as opposed to just handling a contaminated surface with fingertips. Once again, know your task.

Thin, surgical-type gloves (latex, vinyl, nitrile are most common) are somewhat protective against incidental contact with certain chemicals and allow dexterity but may not be protective against full immersion or prolonged contact.

- 7. "Persistent Permeation".** Note, also, that once a chemical has begun to diffuse into a plastic/rubber material, it will continue to diffuse toward the interior (a phenomenon known as "persistent permeation") even after the surface has been wiped clean with soap and water. The next workday, some absorbed chemical may reach the inside of the glove. This amount should be insignificant through a glove of highly resistant material. However, it may be a critical factor if purchasing gloves for highly toxic or carcinogenic materials (of which any amount inside a glove is undesirable) or highly viscous materials (which are difficult to remove).
- 8. Consider quality construction of the CPC.** Clothing (lab coats, aprons, etc) are rated in same manner, with same standards. However, the swatch of material does not include seams. Seams are either stitched (which can leave holes) or welded with a welding/cementing tape over the stitching. The latter seam type is more expensive but offers the best splash protection. Quality gloves will have stitched seams overlaid with tape or sealed with a coating. For clothing, multiple layers of fabric overlap should be present to avoid penetration of chemical.
- 9. A special note on latex gloves.** If using surgical-type barrier gloves for handling objects, they should be vinyl material, not latex. Latex gloves, particularly when powdered, can cause a mild-to-severe allergic reaction in sensitive individuals. The use of vinyl barrier gloves (disposed after use) is highly recommended when handling objects potentially contaminated with residual particulate preservatives and pesticides. If cotton gloves are desired for tactile reasons, they should be worn in addition to vinyl gloves for full dermal protection (cotton alone will act as a contaminant "wick" to the skin, especially if moistened by perspiration).

Personal Protective Equipment Issuance and Training Certification

EMPLOYEE: _____

Facility/Dept/WORK AREA(S):

SUPERVISOR: _____

SAFETY HAZARDS:

Health or safety hazards identified in your assigned work tasks include:

- ____(see Job Hazard Analysis)
- ____(see Lab Safety Plan)
- ____(see Laser Safety Plan)

OTHER:

PPE (PERSONAL PROTECTIVE EQUIPMENT) ISSUED:

PPE required for each job task include, based on your job hazard analysis:

Welding Equipment:

- ____Hoods
- ____Leather gloves, jacket, sleeve protectors, aprons

Electrical Non-conductive Gloves:

- ____(state type)

Cryogenic Equipment:

- ____Gloves
- ____Apron
- ____Face shield

Other chemical protective clothing:

- ____Gloves (types : _____)
- ____Rubber apron
- ____Lab coat
- ____Other _____

Eye and Face Protection:

- ____Safety glasses, with side shields (for impact – not chemical-protection only)
- ____Chemical safety goggles, indirect vented (for chemical splash protection)
- ____Chemical safety goggles, non-vented (for protection against irritant vapors, such as formaldehyde, ammonia)
- ____Face shield, to be used with safety glasses or goggles as appropriate.
- ____Laser goggles

Respirator:

Half-mask or full-face air-purifying respirator (annually trained, fit-tested, medically certified)
 Filtering face pieces (“dust masks”), NIOSH-approved. () N95 () P100
 Other _____

Hearing Protection:

Ear muffs
 Ear plugs

Safety boots/shoes:

(state type, especially if electrical non-conductive) _____

Head and Fall Protection

Hard hats
 Body harnesses

CERTIFICATIONS:

(1) I have received the required Hazard Communication training specific to my work environment. I have reviewed and understood the safe work practice requirements of my work tasks, as presented to me by my supervisor, project scientist or administrator, and agree to abide by these requirements.

(2) Based on my work task hazard assessment, I have been issued the above PPE equipment and instructed in its proper use and care as well as the location and the use of appropriate safety equipment

Signature of Employee/Visiting Scientist

Date

I have reviewed the safe work practice requirements as applicable to the tasks of this employee/visiting scientist work tasks, and have issued the above Personal Protective Equipment with instructions regarding location, proper care and use of appropriate safety equipment.

Signature of Supervisor/Project Scientist

Date

Personal Protective Equipment Inspection Form

Date:	Name of Inspector:
Location:	
Specific tasks performed at this location:	

PERSONAL PROTECTIVE EQUIPMENT USED	Yes	No (or N/A)
Head Protection		
Head protection is being worn when required by the JHA.		
Head protection is inspected by wearer prior to each use.		
The brim or shell does not show signs of exposure or excessive wear, loss of surface gloss, chalking, or flaking.		
The brim or shell does not have any signs of paint or solvent use.		
The brim or shell is not cracked, perforated, or deformed.		
The suspension system inside hardhat does not show signs of deterioration, including cracking, tearing, or fraying.		
Hardhat areas are marked.		
Employees wear hard hats in marked areas.		
Footwear		
Safety footwear is being worn when required by the JHA.		
Safety footwear is inspected by wearer prior to each use.		
Safety footwear areas are marked.		
Employees wear safety footwear in marked areas.		
Safety footwear worn by employees does not show signs of excessive wear.		
Chemical resistant footwear is decontaminated or disposed prior to leaving the work area.		
Hand Protection		
Hand protection is being worn when required by the JHA.		
Gloves are inspected by wearer prior to each use.		
Gloves do not show signs of exposure or excessive wear, cracking, scrapes/cuts, thinning, discoloration, or breakthrough to the skin.		
Chemical resistant gloves are decontaminated or disposed prior to leaving the work area.		
Body Protection/Protective Clothing		
Body protection/protective clothing is being worn when required by the JHA.		
Protective clothing is inspected by wearer prior to each use.		
Protective clothing does not show signs of exposure or excessive wear, cracking, scrapes/cuts, thinning,		

discoloration, or breakthrough to the skin.		
Chemical resistant clothing is decontaminated or disposed prior to leaving the work area.		
Hearing Protection		
Hearing protection is being worn when required by the JHA.		
Hearing protection is inspected by wearer prior to each use.		
Noise hazardous areas are marked.		
Employees wear hearing protection in marked noise hazard areas/ equipment.		
Eye/Face/Inhalation Protection		
Eye/Face/Respirator protection is being worn when required by the JHA.		
Eye/Face/Respirator protection is inspected by wearer prior to each use.		
Eye/Face hazardous areas are marked.		
Employees wear eye/face protection in marked eye/face hazard areas/ equipment.		
Employees store, clean, maintain respirators properly.		
Fall Protection		
Equipment & PPE used, maintained according to Chapter 10, Safety Manual		
Water Hazard Protection		
U.S. Coast Guard approved flotation devices used, maintained.		

Remarks:

PRESCRIPTION SAFETY GLASSES REQUEST PROCEDURES

1. The SI provides employees in the Metropolitan DC area and New York with prescription safety glasses ***once per month*** to those employees whose job requires them.
2. Employees must have a current prescription, less than 2 years old.
3. The safety glasses request form must be completed properly with supervisor signatures and payment information.
4. The form is forwarded to the Office of Safety Health and Environmental Management (OSHEM), who will review it and schedule an appointment for the employee to see the vendor and order his/her glasses.
5. Once ordered the glasses will take approximately 2 weeks to come back to the SI for distribution to the appropriate employee.
6. The organization pays up to a certain amount for certain frame styles, and pays the full cost for lenses.
7. If an employee wants a more expensive frame, the employee must pay the balance when they are ordering.

For vendor, location, dates and times, see OSHEM web page.

SAFETY SHOE REQUEST PROCEDURES

1. As a service to employees in the Metropolitan DC area, the SI attempts to provide two vendors each month to supply employees with safety shoes.
2. The employees' organization subsidizes the full amount for certain styles of safety shoes.
3. If an employee wants shoes costing more than what the organization subsidizes, than the employee must pay the balance.
4. The completed safety shoe request forms (SI-3389, which can be printed from the OSHEM web page), with signatures and payment information must be brought to the shoe mobile to purchase the shoes.

***For vendors, location, subsidy amount, dates and times,
see OSHEM web page.***