Personal Protective Equipment (PPE)

University of Tennessee Safety Program GS-050

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Purpose

This policy provides guidelines to ensure the proper selection, use, and care of PPE through work area hazard assessments and appropriate employee training.

Scope and Applicability

This procedure applies to hazards that require the use of protective apparel, also known as personal protective equipment.

This policy applies to all employees and students on the UTK campus. This procedure is also applicable to UT employees and students who are engaged in off-site, university-sponsored activities.

Abbreviations and Definitions

Abbreviations

ANSI: American National Standards Institute

EHS: Environmental Health and Safety

NIOSH: National Institute of Occupational Health and Safety

OSHA: Occupational Safety and Health Administration

PPE: Personal protective equipment

TOSHA: Tennessee Occupational Safety and Health Administration

Definitions

Hazard Assessment: Identification of physical and chemical hazards in the workplace

Personal Protective Equipment (PPE): Equipment worn to minimize exposure to a variety of hazards. Examples of PPE include such items as gloves, foot and eye protection, protective hearing devices (earplugs), hard hats, respirators and full body suits.

Roles and Responsibilities

EHS

EHS is responsible for the development, implementation, and administration of the University of Tennessee's PPE policy. This involves:

- Assisting supervisors with conducting workplace hazard assessments to determine the presence of hazards which necessitate the use of PPE.

- Providing training, guidance, and assistance to supervisors and employees upon request on the proper use, care, and cleaning of approved PPE.
- Periodically re-evaluating the suitability of previously selected PPE upon request.
- Reviewing, updating, and evaluating the overall effectiveness of PPE use, training, and policies.
- Providing industrial hygiene monitoring and testing to determine if and when PPE is required.
- Developing and making available workplace hazard assessment forms.

Supervisors

Supervisors have the primary responsibility for implementing and enforcing PPE use and policies in their work area. This involves:

- Providing appropriate PPE and making it available to employees.
- Performing and maintaining records on hazard assessments.
- Maintaining records on PPE assignments and training.
- Periodically re-evaluating the suitability of previously selected PPE.
- Ensuring that employees are trained on the proper use, care, and cleaning of PPE.
- Ensuring that PPE training certification and work place evaluation forms are signed and given to back to the supervisor and all other documentation is maintained.
- Ensuring that employees properly use and maintain their PPE and follow the University of Tennessee's PPE policies and rules.
- Reviewing PPE requirements when new hazards are introduced or when processes are added or changed.
- Ensuring that defective or damaged PPE is immediately disposed of and replaced.
- Selecting and purchasing PPE.
- Reviewing, updating, and conducting PPE hazard assessments whenever
    - a job changes
    - new equipment is used
    - there has been an accident where PPE have been a factor
    - a supervisor or employee requests it
    - or periodically as needed

Employees

The PPE user is responsible for following the requirements of the PPE policies. This involves

- Properly wearing PPE as required.
- Attending required training sessions.
- Properly caring for, cleaning, maintaining, and inspecting PPE as required.
- Following the University of Tennessee's PPE policies and rules.
- Informing the supervisor of the need to repair or replace PPE and report problems when they are encountered.

General Requirements

The OSHA standard requires the employer conduct and document a hazard assessment. A work area assessment (Appendix A) is required to determine if any potential hazards exist and select the appropriate personal protective equipment (PPE) for adequate protection. A hazard assessment form must be completed for each job title and maintained in the employee's department's file. A copy of this assessment form is

available from EHS.

Employees must receive training, which includes the proper PPE for their job, when PPE must be worn, how to don/doff, adjust, maintain, proper disposal of PPE, and the limitations of the PPE. All training must be documented (Appendix B). PPE is not a substitute for more effective control methods and its use will be considered when other means of protection against hazards are not adequate or feasible. EHS can provide guidance with the work hazard assessment and can assist with PPE training upon request.

Once the workplace hazards have been identified, the supervisor will determine if the hazards can be eliminated or reduced by methods other than PPE (engineering and/or administrative controls). If those methods are not feasible, then the supervisor will determine the suitability of the PPE presently available, and as necessary, will select new or additional equipment which ensures a level of protection that meets or exceeds NIOSH, ANSI and other standards and regulatory requirements. Care will be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards will be recommended for purchase. All PPE and equipment will be of safe design and construction, and will be maintained in a sanitary and reliable condition. Affected employees whose jobs require the use of PPE will be informed of the PPE selection and will be provided PPE for use. Careful consideration will be given to the comfort and proper fit of PPE in order to ensure that it will be used. EHS can provide guidance and can assist the supervisor in proper PPE selection if requested.

This section addresses general PPE requirements, including eye and face, head, foot and leg, hand and arm and body (torso) protection. Separate programs exist for respiratory protection and hearing protection as the need for participation in these programs is established.

Types of Personal Protective Equipment

Eye and Face Protection:

Employees and students shall wear the appropriate eye and face protection when involved in activities where there is the potential for eye and face injury from:

1. Handling of hot solids, liquids, or molten metals.
2. Flying particles from chiseling, drilling, sawing, cutting, etc.
3. Intense non-ionizing radiation from gas or electric arc welding, torch brazing, oxygen cutting, laser use, etc.
4. Handling of chemicals and gases.
5. Potential for biological exposure.

Appendix D includes a list of common workplace activities performed by employees and the proper eye and face protection equipment needed for each activity. For more guidance, please contact EHS. The most common types of eye protection used in the workplace are listed below.

Eye Protection

Safety Glasses

Ordinary prescription glasses do not provide adequate protection. Eye protection must conform to the American National Standards Institute (ANSI), Standard Z87.1-1989 or latest edition. Look for this stamp on the inside of the safety glass frame. Prescription safety glasses are recommended for employees who must routinely wear safety glasses in lieu of fitting safety glasses over their personal glasses. All safety glasses must

have side shields. Whenever protection against splashing is a concern, “Chemical Splash Goggles” must be worn. For more guidance on safety glasses selection, please contact EHS.

Goggles

Goggles are intended for use when protection is needed against chemicals or particles. Impact protection goggles, which contain perforations on the side of goggle, are not to be used for chemical splash protection. Splash goggles, which contain shielded vents at the top of the goggle, are appropriate for chemical splash protection, and also provide limited eye impact protection.

Face Shields

Face shields must not be used as the sole source of protection for eye hazards. Full-face shields provide the face and throat with partial protection from flying particles and liquid splash. For maximum protection against chemical splash, a full-face shield should be used in combination with chemical splash goggles. Face shields are appropriate as secondary protection when implosion (e.g. vacuum applications) or explosion hazards are present. Face shields, which are contoured to protect the sides of the neck as well as frontal protection, are preferred.

Eye Protection for Non-ionizing Radiation

The radiation produced by welding covers a broad range of the spectrum of light. Exposure to ultraviolet light (UV-B) from welding operations can cause “welders flash”, a painful inflammable of the outer layer of the cornea. Arc welding or arc cutting operations, including submerged arc welding, require the use of welding helmets with an appropriate filter lens. Goggles with filter plates or tinted glass are available for operations where intense light sources are encountered, including but not limited to, gas welding or oxygen cutting operations. Spectacles with suitable filter lenses may be appropriate for light gas welding operations, torch brazing, or inspection.

Hand Protection

Employees shall use hand protection when exposed to hazards including:

1. Skin absorption of harmful substances
2. Lacerations
3. Severe cuts
4. Severe abrasions
5. Chemical burns
6. Thermal burns
7. Harmful temperature extremes

Gloves made from a wide variety of materials are designed for many types of workplace hazards. In general, gloves fall into four groups:

1. Gloves made of leather, canvas or metal mesh
2. Fabric and coated fabric gloves
3. Chemical and liquid resistant gloves
4. Insulating rubber gloves (See Electrical Policy and 29 CFR 1910.137)

They are discussed in greater detail below

Leather, Canvas or Metal Mesh Gloves

Sturdy gloves made from metal mesh, leather or canvas provide protection against cuts and burns. Leather or canvass gloves also protect against sustained heat.

- Leather gloves protect against sparks, moderate heat, blows, chips and rough objects.
- Aluminized gloves provide reflective and insulating protection against heat and require an insert made of synthetic materials to protect against heat and cold.
- Aramid fiber gloves protect against heat and cold, are cut- and abrasive-resistant, and wear well.
- Synthetic gloves of various materials offer protection against heat and cold, are cut- and abrasive-resistant and may withstand some diluted acids. These materials do not stand up against alkalis and solvents.

Fabric and Coated Fabric Gloves

Fabric and coated fabric gloves are made of cotton or other fabric to provide varying degrees of protection.

- Fabric gloves protect against dirt, slivers, chafing and abrasions. They do not provide sufficient protection for use with rough, sharp or heavy materials. Adding a plastic coating will strengthen some fabric gloves.
- Coated fabric gloves are normally made from cotton flannel with napping on one side. By coating the unnapped side with plastic, fabric gloves are transformed into general-purpose hand protection offering slip-resistant qualities. These gloves are used for tasks ranging from handling bricks and wire to chemical laboratory containers. When selecting gloves to protect against chemical exposure hazards, always check with the manufacturer or review the manufacturer's product literature to determine the gloves' effectiveness against specific workplace chemicals and conditions.

Chemical and Liquid Resistant Gloves

Chemical-resistant gloves are made with different kinds of rubber: natural, butyl, neoprene, nitrile and fluorocarbon (Viton); or various kinds of plastic: polyvinyl chloride (PVC), polyvinyl alcohol and polyethylene. These materials can be blended or laminated for better performance. As a general rule, the thicker the glove material, the greater the chemical resistance but thick gloves may impair grip and dexterity, having a negative impact on safety. Appendix E lists types of chemical and liquid gloves, as well as their advantages and disadvantages. Appendix F lists several chemicals and recommends the type of chemical resistant glove that should be used when handling that specific chemical. Some examples of chemical-resistant gloves include:

- **Butyl rubber** gloves are made of a synthetic rubber and protect against a wide variety of chemicals, such as peroxide, highly corrosive acids (nitric acid, sulfuric acid, hydrofluoric acid and red-fuming nitric acid), strong bases, alcohols, aldehydes, ketones, esters and nitro compounds. Butyl gloves also resist oxidation, ozone corrosion and abrasion, and remain flexible at low temperatures. Butyl rubber does not perform well with aliphatic and aromatic hydrocarbons and halogenated solvents.
- **Natural (latex) rubber** gloves are comfortable to wear, which makes them a popular general-purpose glove. They feature outstanding tensile strength, elasticity and temperature resistance. In addition to resisting abrasions caused by grinding and polishing, these gloves protect workers' hands from most water solutions of acids, alkalis, salts and ketones. Latex gloves may cause allergic reactions in some individuals and may not be appropriate for all employees. Hypoallergenic gloves, glove liners and powder less gloves are possible alternatives for workers who are allergic to latex gloves.
- **Neoprene** gloves are made of synthetic rubber and offer good pliability, finger dexterity, high density and tear resistance. They protect against hydraulic fluids, gasoline, alcohols, organic acids and alkalis. They generally have chemical and wear resistance properties superior to those made of natural rubber.

- **Nitrile** gloves are made of a copolymer and provide protection from chlorinated solvents such as trichloroethylene and perchloroethylene. Although intended for jobs requiring dexterity and sensitivity, nitrile gloves stand up to heavy use even after prolonged exposure to substances that cause other gloves to deteriorate. They offer protection when working with oils, greases, acids, caustics and alcohols but are generally not recommended for use with strong oxidizing agents, aromatic solvents, ketones and acetates.

There are no ANSI standards for gloves. However, selection must be based on the performance characteristics of the glove in relation to the tasks to be performed. Wear proper hand protection whenever the potential for contact with chemicals, sharp objects, or very hot or cold materials exists. Select gloves bases on the properties of the materials in use, the degree of protection needed, and the nature of the work (direct contact necessary, dexterity needed, etc.). Leather gloves may be used for protection against sharp edged objects, such as when picking up broken glassware or inserting glass tubes into stoppers. When working at temperature extremes, use insulated gloves. When considering chemical gloves, note that chemicals will permeate glove materials. The permeation rate varies depending on the chemical, glove material, and thickness. Double gloving is recommended when handling highly toxic or carcinogenic materials. Before each use, inspect the gloves for discoloration, punctures and tears. Before removal, wash gloves if the glove material is impermeable to water. Observe any changes in glove color and texture, including hardening or softening, which may be indications of glove degradation. For more information on glove selection, visit the Ansell web-site at: http://www.ansellpro.com/download/Ansell_7thEditionChemicalResistanceGuide.pdf, or contact EHS for guidance.

Body Protection:

Employees working around hazardous materials or machinery shall not wear loose clothing (e.g. saris, dangling neckties, necklaces) or unrestrained long hair. Loose clothing, jewelry, and unrestrained long hair can become ensnared in moving parts of machinery or contact chemicals. Finger rings can damage gloves, trap chemicals against the skin and be an infection control issue.

Cotton lab coats (preferable to rayon or polyester coats) should be worn to protect clothing from becoming soiled and to provide limited protection against minor splashes of chemicals, biological materials, and radioactive materials. Lab coats with button closure are preferred over zipper closer, since these are easier to remove in case of an emergency. Assure that hazardous chemicals, radioactive materials, or toxic dusts are not carried home by using lab coats, disposable protective clothing, or work clothes which remain at the workplace. Tyvek coveralls can be used over street clothes for protection against particles and low hazard liquids. However, this will not resist liquid penetrations, and if splashed with chemicals, should be removed immediately. Vinyl or rubber aprons and sleeves should be used when dispensing corrosive liquids (e.g. hydrofluoric acid, phenol, etc.). When using metal organic liquids or other materials which may self-ignite on contact with air are used, Nomex lab coats are recommended, along with face shields. Where contact with hazardous materials with your protective clothing is likely, such as during spill cleanup or pesticide application, polyethylene-coated Tyvek or similar clothing should be used to provide additional protection. The limitations of the protective clothing must always be understood particularly in situations where contact with the material is likely.

Employees should know the appropriate techniques for removing protective apparel, especially any that has become contaminated. Special procedures may need to be followed for cleaning and/or discarding contaminated apparel. Chemicals spills on leather clothing accessories (watchbands, shoes, belts, and such) can be especially hazardous because many chemicals can be absorbed in the leather and then held close to the

skin for long periods. Such items must be removed promptly and typically be discarded to prevent the possibility of chemical burns. Note that flame resistance should be considered when selecting whole body protection. Source of ignition could include open flames, arcs, sparks, chemicals, radiation energy and more.

Protective clothing comes in a variety of materials, each effective against particular hazards, such as:

1. **Paper-like fiber** used for disposable suits provide protection against dust and splashes.
2. **Treated wool and cotton** adapts well to changing temperatures, is comfortable and fire-resistant and protects against dust, abrasions and rough and irritating surfaces.
3. **Duck** is a closely woven cotton fabric that protects against cuts and bruises when handling heavy, sharp or rough materials.
4. **Leather** is often used to protect against dry heat and flames.
5. **Rubber, rubberized fabrics, neoprene and plastics** protect against certain chemicals and physical hazards. When chemical or physical hazards are present, check with the clothing manufacturer to ensure that the material selected will provide protection against the specific hazard.

Occupational Foot Protection:

Safety footwear shall conform to the requirements and specifications of ANSI Z41.1-1991 or latest edition, "Men's Safety-Toe Footwear." Wear proper shoes, not sandals or open toed shoes, in work areas where chemicals are used or stored. Perforated shoes, sandals or cloth sneakers should not be worn in areas where mechanical work is being done. Safety shoes are required for protection against injury from heavy falling objects (handling of objects weighing more than fifteen pounds which, if dropped, would likely result in a foot injury), against crushing by rolling objects (warehouse, loading docks, etc.), and against laceration or penetration by sharp objects. Pullovers, worn over regular shoes, are available for protection against certain chemicals. These boots are made of a stretchable rubber compound and are well suited for cleaning up chemical spills.

Foot and leg protection choices include the following:

1. Leggings protect the lower legs and feet from heat hazards such as molten metal or welding sparks. Safety snaps allow leggings to be removed quickly.
2. Metatarsal guards protect the instep area from impact and compression. Made of aluminum, steel, fiber or plastic, these guards may be strapped to the outside of shoes.
3. Toe guards fit over the toes of regular shoes to protect the toes from impact and compression hazards. They may be made of steel, aluminum or plastic.

Occupational Head Protection:

Employers must ensure that their employees wear head protection when any of the following apply

1. Objects (such as tools) that might fall from above and strike them on the head
2. Fixed objects, such as exposed pipes and beams
3. Accidental head contact with electrical hazards.

In general, protective helmets or hard hats should do the following:

1. Resist penetration by objects.
2. Absorb the shock of a blow.
3. Be water-resistant and slow burning.

4. Have clear instructions explaining proper adjustment and replacement of the suspension and headband.

Hard hats are divided into three industrial classes:

5. **Class G hard hats** provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts).
6. **Class E hard hats** provide the highest level of protection against electrical hazards, with high-voltage shock and burn protection (up to 20,000 volts). They also provide protection from impact and penetration hazards by flying/falling objects.
7. **Class C hard hats** provide lightweight comfort and impact protection but offer no protection from electrical hazards.

Another class of protective headgear on the market is called a "bump hat," designed for use in areas with low head clearance. They are recommended for areas where protection is needed from head bumps and lacerations. These are not designed to protect against falling or flying objects and are not ANSI approved. It is essential to check the type of hard hat employees are using to ensure that the equipment provides appropriate protection. Each hat should bear a label inside the shell that lists the manufacturer, the ANSI designation and the class of the hat.

Hard hats must have a hard outer shell and a shock-absorbing lining that incorporates a headband and straps that suspend the shell from 1 to 1 1/4 inches (2.54 cm to 3.18 cm) away from the head. This type of design provides shock absorption during an impact and ventilation during normal wear.

Helmets designed to protect the head from impact and penetration from falling/flying objects and from limited electric shock and burn shall meet the requirements and specifications established in ANSI Z89.1-1986 or latest edition, "Requirements for Industrial Head Protection".

Upon inspecting the equipment, if the employees find the following signs of deterioration, then the hard hat should be taken out of service:

- Suspension system (head band and straps) no longer holds the shell from 1 inch to 1 ¼ inches away from the employee's head
- Cracking, tearing or graying of the lining (head band and straps)
- The brim or the shell show signs of chalking, flaking, or loss of surface gloss

Employees working in higher elevations, such as aerial lifts, need chin straps for their helmets.

Use of stickers should be limited for use on hard hats, since they hide deterioration and other defects. Paints, paint thinners and cleaning agents can weaken the shell of a hard hat and may eliminate electrical resistance. Ultraviolet light and extreme heat can reduce the strength of the hard hats. Therefore, employees should not store or transport hard hats in direct sunlight. Manufacturer's specifications must be followed with respect to cleaning.

Electrical Protection:

Specific design, performance, use, and care requirements apply to protective equipment used for isolation against electrical hazards. Persons responsible for the purchase, maintenance, and use of such equipment (insulating blankets, matting, covers, line hose, gloves, and sleeves made of rubber) must be familiar with these

requirements (refer to 29 CFR 1910.137 and the Electrical Safety Program (EHS Safety Manual, GS-070)

Fall Protection:
See the Fall Protection Policy of this Health and Safety manual for more information. (EHS Safety Manual, GS-041).

Respiratory Protection:
See the Respiratory Protection Policy of this Health and Safety manual for more information. (EHS Safety Manual, IH-003)

Hearing Protection:
See Hearing Conservation Requirements for more information. (EHS Safety Manual, IH-010)

Selection, Maintenance, and Assessment

Selection Guidelines
The general procedure for the selection of PPE is as follows:

1. Become familiar with the potential hazards and the type of PPE that is available, and its function.
2. Compare the hazards of the work environment with the capabilities of the PPE.
3. Select the PPE which ensures a level of protection greater than the minimum required to protect the employee from the hazards.
4. Fit the user with the PPE and give instructions on care and use of the PPE.
5. Ensure that the employees are made aware of all warning labels for and limitations of their PPE.

Cleaning and Maintenance of PPE:
It is important that all PPE be kept clean and properly maintained. Cleaning is particularly important for eye and face protection where dirty or fogged lenses could impair vision. Employees must inspect, clean, and maintain their PPE according to the manufacturers' instructions before and after each use (see attached). Supervisors are responsible for ensuring that users properly maintain their PPE in good condition.

Personal protective equipment must not be shared between employees until it has been properly cleaned and sanitized. PPE will be distributed for individual use whenever possible. If employees provide their own PPE, make sure that it is adequate for the work place hazards, and that it is maintained in a clean and reliable condition. Defective or damaged PPE will not be used and will be immediately discarded and replaced. It is also important to ensure that contaminated PPE which cannot be decontaminated is disposed of in a manner that protects employees from exposure to hazards.

Reassessment of Hazards:
It is the responsibility of the supervisor to reassess the workplace hazard situation a necessary, by identifying and evaluating new equipment and processes, reviewing accident records, and reevaluating the suitability of previously selected PPE.

Training
The supervisor shall provide adequate training to each employee who is required to use PPE.

Each employee shall be trained to know at least the following:

1. When PPE is necessary
2. What PPE is necessary
3. How to properly don, doff, adjust, and wear PPE
4. The limitations of the PPE
5. The proper care, maintenance, useful life, and disposal of the PPE

Each affected employee must demonstrate an understanding of the training provided, and the ability to use the PPE properly, before performing any work requiring the use of PPE. Show-and-tell competence demonstrations are appropriate for most situations.

When the supervisor has reason to believe that an affected employee who has already been trained does not have the understanding and skill required the supervisor shall retrain the employee. Circumstances that render previous training obsolete or inadequate and therefore require new training or retraining include, but are not limited to:

1. Changes in the workplace.
2. Changes in the types of PPE to be used.
3. Inadequacies in the affected employee's knowledge or use of assigned PPE.

The supervisor must verify that each affected employee has received and understood the required training through a written certification that must contain the name of each employee trained, the date(s) of training, and identify the subject of certification (e.g. Appendix B).

References

ANSI Z87.1-1989: Eye and Face Protection

ANSI Z89.1-1986: Head Protection

ANSI Z41.1-1991: Foot Protection

OSHA 29 CFR 1910.132: General Requirements

OSHA 29 CFR 1910.133 (Eye and Face Protection)

OSHA 29 CFR 1910.135 (Head Protection)

OSHA 29 CFR 1910.136 (Foot Protection)

OSHA 29 CFR 1910.136 (Hand Protection)

Appendices

Appendix A: Personal Protective Equipment Survey and Hazard Assessment

Appendix B: Personal Protective Equipment Training Certification Form

Appendix C: Guidelines for complying with PPE requirements (Optional checklist for supervisors)

Appendix D: Eye and Face Protection Selection

Appendix E: Types of Gloves and their advantages and disadvantages

Appendix F: List of commonly used chemicals and the type of glove that should be used when handling these chemicals.

Disclaimer

The information provided in these guidelines is designed for educational use only and is not a substitute for specific training or experience.

The University of Tennessee Knoxville and the authors of these guidelines assume no liability for any individual's use of or reliance upon any material contained or referenced herein. The material contained in these guidelines may not be the most current.

Appendix A

Personal Protective Equipment (PPE)

Hazard Assessment Survey and Analysis

Reserved for insertion of Hazard Assessment tool.

Appendix B

Personal Protective Equipment Training Certification Form

Employee's Name: _____ Employee ID No. _____

Job Title/Work area: _____ Employer: _____

Trainer's Name (person completing this form): _____

Date of Training: _____

Types of PPE the employee is being trained to use:

List all equipment. Include **brand**, **model**, and **size** information where applicable.

_____

_____

_____

The following information and training on the personal protective equipment (PPE) listed above were covered in the training session:

- ✓ What work place hazards the employee faces, the types of personal protective equipment that the employee must use to be protected from these hazards, and how the PPE will protect the employee while doing his/her tasks.
- ✓ When (under what conditions) the employee must wear or use the personal protective equipment.
- ✓ How to use the personal protective equipment properly on-the-job, including putting it on, taking it off, and wearing and adjusting it (if applicable) for a comfortable and effective fit.
- ✓ How to properly care for and maintain the personal protective equipment: look for signs of wear, clean and disinfect, and dispose of PPE.
- ✓ The limitations of personal protective equipment: PPE alone cannot protect the employee from on-the-job hazards.

Note to employee: This form will be made a part of your personal file. Please read and understand its contents before signing.

(Employee) I understand the training I have received, and I can use PPE properly.

Employee's signature _____ Date: _____

(Trainer must check off)

_____ Employee has shown an understanding of the training.

_____ Employee has shown the ability to use the PPE properly.

Trainer's signature: _____ Date: _____

Appendix C

Guidelines for complying with PPE requirements

Supervisors can use this optional checklist to help comply with the PPE requirements at your work place. You can use the available tools in the far right column to help you accomplish the step. Check off the boxes in the far left column as you complete each step.

Initial Steps

Done	Step	Tools
☐	Do a work place walk-through and look for hazards (including potential hazards) in all employees' work spaces and work place operating procedures.	PPE Hazard Assessment (form forthcoming as Appendix A)
☐	Consider engineering, administrative, and/or work practice methods to control the hazards first. Identify those existing/ potential hazards and tasks that require PPE.	
☐	Select the appropriate PPE to match the hazards and protect employees.	
☐	Communicate PPE selection to each at-risk employee. Provide properly fitting PPE to each employee required to use it.	
☐	Train employees on the use of PPE and document it.	PPE Training Certification Form
☐	Test employees to make sure they understand the elements of the PPE training.	

Follow Up Steps

☐	Follow up to evaluate effectiveness of PPE use, training, policies, etc. against the hazards at your work place. ☐Yes ☐No All employees have been trained ☐Yes ☐No Employees are using their PPE properly and following PPE policies and procedures ☐Yes ☐No Supervisors are enforcing use of required PPE *(If you checked any No boxes, go back through the steps and correct the deficiencies.)* ☐Yes ☐No Have things changed at your work place? (e.g., fewer injuries/illnesses)	

Appendix D

Eye and Face Protection – Selection

The following chart shows some common workplace activities performed by employees and the proper eye and face protection equipment needed for each activity. Contact EHS for more guidance about the selection of eye and face protection for these and other work activities.

Activity	Eye/Face Hazards	Eye/Face Protection
Acetylene welding	Sparks, optical radiation, flying particles	Welding goggles or welding helmet worn over safety glasses with side shields.
Chemical handling, laboratory operations	Chemical splash or spill, acid burns, fumes, glass breakage	Chemical goggles. Use a face shield plus chemical goggles for severe exposure.
Cutting, brazing, soldering	Sparks, optical radiation, flying particles, flash burns	Safety glasses with shaded lenses or welding shield. Use face shield plus safety glasses for severe exposure.
Electric arc welding	Sparks, optical radiation, flying particles	Welding shield or welding helmet worn over safety glasses with side shields.
Grinding, sawing	Flying particles, dust	Impact goggles or safety glasses with side shields. Use a face shield plus impact goggles or safety glasses for severe exposure.
Laser operations	Reflected or direct laser beam impact	Narrow or broad spectrum laser spectacles or goggles. Selection is based on type of laser.
Machining	Flying particles, mists, vapors	Safety glasses with side shields or goggles.
Medical examinations, First Aid procedures	Contact with body fluids/blood borne pathogens	Safety glasses with solid side shields. Use safety goggles or face shield plus goggles for severe exposure.
Pesticide/fertilizer application with hand sprayer	Chemical splash or spill, airborne chemicals	Chemical goggles or safety glasses. Use face shield plus safety glasses/goggles for severe exposure.

Appendix E

Types of Gloves and their Advantages and Disadvantages

Type	Advantages	Disadvantages	Use Against
Natural rubber	Low cost, good physical properties, dexterity	Poor vs. oils, greases, organics. Frequently imported; may be poor quality	Bases, alcohols, dilute water solutions; fair vs. aldehydes, ketones.
Natural rubber blends	Low cost, dexterity, better chemical resistance than natural rubber vs. some chemicals	Physical properties frequently inferior to natural rubber	Same as natural rubber
Polyvinyl chloride (PVC)	Low cost, very good physical properties, medium cost, medium chemical resistance	Plasticizers can be stripped; frequently imported may be poor quality	Strong acids and bases, salts, other water solutions, alcohols
Neoprene	Medium cost, medium chemical resistance, medium physical properties	NA	Oxidizing acids, anilines, phenol, glycol ethers
Nitrile	Low cost, excellent physical properties, dexterity	Poor vs. benzene, methylene chloride, trichloroethylene, many ketones	Oils, greases, aliphatic chemicals, xylene, perchloroethylene, trichloroethane; fair vs. toluene
Butyl	Speciality glove, polar organics	Expensive, poor vs. hydrocarbons, chlorinated solvents	Glycol ethers, ketones, esters
Polyvinyl alcohol (PVA)	Specialty glove, resists a very broad range of organics, good physical properties	Very expensive, water sensitive, poor vs. light alcohols	Aliphatics, aromatics, chlorinated solvents, ketones (except acetone), esters, ethers
Fluoro- elastomer (Viton) ™ *	Specialty glove, organic solvents	Extremely expensive, poor physical properties, poor vs. some ketones, esters, amines	Aromatics, chlorinated solvents, also aliphatics and alcohols
Norfoil (Silver Shield)	Excellent chemical resistance	Poor fit, easily punctures, poor grip, stiff	Use for Hazmat work

*Trademark of DuPont Dow Elastomers

*Limited service	VG= Very Good	G= Good	F=Fair	P=Poor (not recommended)

Chemical	Neoprene	Natural Latex or Rubber	Butyl	Nitrile Latex
*Acetaldehyde	VG	G	VG	G
Acetic acid	VG	VG	VG	VG
*Acetone	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
*Amyl acetate	F	P	F	P
Aniline	G	F	F	P
*Benzaldehyde	F	F	G	G
*Benzene	F	F	F	P
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
*Carbon tetrachloride	F	P	P	G
Castor oil	F	P	F	VG
*Chlorobenzene	F	P	F	P
*Chloroform	G	P	P	P
Chloronaphthalene	F	P	F	F
Chromic Acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
*Dibutyl phthalate	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins, dry	VG	VG	VG	VG
*Ethyl acetate	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether	VG	G	VG	G
*Ethylene dichloride	F	P	F	P
Ethylene glycol	VG	VG	VG	VG
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G
*Furfural	G	G	G	G
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerine	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrochloric acid	VG	G	G	G
Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Isopropyl alcohol	VG	VG	VG	VG
Kerosene	VG	F	F	VG
Ketones	G	VG	VG	P

Lacquer thinners	G	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lauric acid (36%)	VG	F	VG	VG
Lineoleic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide	G	F	G	F
*Methyl chloride	P	P	P	P
*Methyl ethyl ketone	G	G	VG	P
*Methyl isobutyl ketone	F	F	VG	P
Methyl methacrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G
Naphthalene	G	F	F	G
Naphthas, aliphatic	VG	F	F	VG
Naphthas, aromatic	G	P	P	G
*Nitric acid	G	F	F	F
Nitromethane (95.5%)	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG
Oxalic acid	VG	VG	VG	VG
Palmitic acid	VG	VG	VG	VG
Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates (naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Propyl alcohol (iso)	VG	VG	VG	VG
Sodium hydroxide	VG	VG	VG	VG
Styrene	P	P	P	F
Stryene (100%)	P	P	P	F
Sulfuric acid	G	G	G	G
Tannic acid (65%)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
*Toluene	F	P	P	F
Toluene diisocyanate	F	G	G	F
*Trichloroethylene	F	F	P	G
Triethanolamine	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
*Xylene	P	P	P	F

Cited from: http://www.aps.anl.gov/Safety_and_Training/User_Safety/gloveselection.html