

SECTION	II.	General Safety and Health
Chapter	1.	Personal Protective Equipment
Revision Date		01/25/2007
Review Date		01/2007

PERSONAL PROTECTIVE EQUIPMENT

INTRODUCTION

PURPOSE

In some work environments Personal Protective Equipment (PPE) must be provided and used to protect personnel against hazards capable of causing injury, illness, or impairment. It is the policy of Duke University to provide appropriate PPE to employees who may be subjected to a hazardous environmental condition. Personal Protective Equipment (PPE) shall be selected, constructed, used and maintained in accordance with the requirements contained in or incorporated by reference in this chapter. Whenever feasible, hazards must be eliminated through engineering or supervisory controls, prior to resorting to the use of PPE.

RESPONSIBILITIES

Departments shall:

- Provide appropriate personal protective equipment and training to personnel exposed to hazards requiring PPE.
- Post areas requiring PPE with appropriate caution signs. These areas include eye, ear, face, head, and hand protection areas.
- Ensure full employee compliance with applicable requirements

Supervisors shall:

- Ensure that appropriate PPE is available to employees.
- Ensure PPE is properly used.

Employees shall:

- Use PPE in accordance with instructions and training received.

- Guard against damage to PPE.
- Care for their personal protective equipment properly.
- Report PPE malfunctions or problems to supervisory personnel.
- Follow safe work practices while working with hazardous materials and wastes.

OESO shall:

- Determine when, where and what PPE is required in work areas.
- Assist departments and supervisors with their departmental personal protective equipment programs.
- Assist in conducting job hazard assessments.

PROCEDURES

GENERAL

PPE will be provided and used in the following circumstances:

- Where it has been determined by an occupational hygienist or safety specialist that PPE is necessary to protect the health and safety of employees.
- Where it has been determined that engineering and/or supervisory controls do not reduce exposure potential to a safe level.
- Where development or installation of engineering controls are pending.
- During short term, non-routine operations for which engineering controls are not practical.
- During emergency situations such as spills, ventilation malfunctions, emergency exit, damage control, activities, etc.

CHARACTERISTICS AND USES OF PPE

PPE SELECTION GUIDE

Table 1 is a checklist for PPE selection in various hazardous situations. The checklist is intended for use as a quick reference and should be used in conjunction with the applicable parts of this chapter. There may be operating conditions in which the use of a listed item from the table is impractical or would increase the hazard. In these instances, use appropriate PPE and procedures to safeguard employee safety and health.

MAINTENANCE OF PPE

PPE, including employee-owned PPE, shall be maintained in a sanitary and serviceable condition by qualified personnel.

PPE issued for exclusive use by an individual employee shall be visually inspected by the employee before each use. Such PPE shall be inspected frequently by supervisory personnel to ensure its serviceability.

PPE subject to use by more than one individual, such as visitor's PPE or PPE used only occasionally, shall be cleaned and disinfected before being made available for use by subsequent personnel. Such cleaning and disinfecting is mandatory for PPE worn on the head and hands.

PPE intended for emergency use shall be cleaned, disinfected, and placed in an operable condition after each use. Such equipment shall be inspected monthly to ensure its serviceable condition. Records shall be kept of these inspections.

STORAGE OF PPE

PPE shall be properly stored to protect against environmental conditions that might reduce the effectiveness of the equipment or result in contamination during storage. PPE having a shelf-life limitation shall be checked periodically to ensure compliance with the expiration date.

PROCUREMENT OF PPE

Each department is responsible for the purchase of adequate PPE required for an employee to do his or her job safely and in compliance with OSHA standards. Where equipment is very personal in nature and is usable by workers off the job, departments

have the flexibility to decide what portion of the cost they will bear. Examples of PPE that is personal in nature and often used away from the worksite include non-specialty safety glasses, safety shoes, and cold-weather outer wear of the type worn by construction workers. Examples of PPE that would not normally be used away from the worksite include, but are not limited to: welding gloves, wire mesh gloves, respirators, hard hats, specialty glasses and goggles (e.g., designed for laser or ultraviolet radiation protection), specialty foot protection (such as metatarsal shoes and linemen's shoes with built in gaffs), face shields and rubber gloves, blankets, cover-ups and hot sticks and other live-line tools used by power generation workers.

EYE AND FACE PROTECTION

GENERAL

Suitable eye and face protectors shall be provided and used where machinery, equipment or operations present the hazards of flying objects, liquids, injurious energies (glare, radiation, etc.), or a combination of these hazards. The selection, use, and maintenance of eye and face protectors shall be in accordance with ANSI Z87.1, "Occupational and Educational Personal Eye and Face Protection Devices," or equivalent.

It is essential that eye and face protectors be kept clean. They shall be cleaned and inspected daily. Pitted or scratched lenses or face shields reduce vision and seriously reduce protection. Accordingly, lenses and face shields that are pitted or scratched to such a degree that vision is obscured shall be replaced.

FACE SHIELDS

Face shields shall be worn to protect the face and front of the neck from flying particles and sprays or splashes of hazardous liquids.

SAFETY GLASSES

Approvals

Safety glasses shall meet the impact requirements of ANSI Z87.1 or equivalent. Lenses and frames shall be marked with the manufacturer's symbol to indicated compliance with ANSI Z87.1. The use of approved lenses in unapproved frames is not acceptable. Tinted lenses in safety glasses, including photo-gray lenses, are permissible only when prescribed for corrective purposes or specifically approved by the OESO.

Side Shields

Side shields should be used on safety glasses worn in buildings or areas designated as eye-hazard areas. Side shields should also be used on safety glasses worn in eye-hazard operations unless it has been specifically determined for a particular operation that it is not possible for injurious objects or energies to enter the wearer's eyes from the side or that the reduced peripheral vision would pose a greater hazard to the employee. Side shields shall not be easily detachable from the frames; snap-on or slip-on types of sideshields are not acceptable unless secure.

Corrective Lenses

Personnel whose vision requires the use of corrective lenses and who are required to wear protective eyewear shall wear one of the following types of goggles or eye glasses:

- Eye glasses whose protective lenses provide optical correction.
- Goggles that can be worn over corrective eye glasses without disturbing the adjustment of the glasses.
- Goggles that incorporate corrective lenses mounted behind the protective lenses.

Goggles

Goggles or eyecups shall be worn to protect against impact, dust particles, liquids, splashes, mists, spray, and injurious radiation. They shall be designed to protect the eye sockets and the facial area around the eyes, thus protecting the wearer from side exposure.

Laser Protection

Eye protection for laser operations must be in compliance with ANSI Z136.1 "Safe Use of Lasers," or equivalent.

HEARING PROTECTION

See the Duke University Occupational Noise Exposure Policy (Section II, Chapter 3 of this manual) for details on specific noise hazards and precautions.

HEAD PROTECTION

HARD HATS

Hard hats shall be constructed, selected, used, and maintained in accordance with ANSI Z89.1, "Personal Protection - Protective Headwear for Industrial Workers".

HAIR PROTECTION

Long hair, including long facial hair, which is susceptible to becoming entangled in moving machinery or drawn into such machinery by the generation of static electricity, shall be controlled by caps or hair nets.

FOOT PROTECTION

GENERAL

Unless otherwise noted, the term shoe as used herein includes boots. See the specific chapter in this manual for more detailed PPE requirements associated with specific hazards.

SAFETY TOE FOOTWEAR

All safety footwear incorporating a steel toe to protect the wearer's toes against impact or compression shall meet the requirements for the 75-pound classification of ASTM F2413, "Standard Specification for Performance Requirements for Foot Protection". The use of toe caps or instep protectors that fit over shoes is prohibited as a substitute for issuing safety shoes. These caps and protectors are only for use by new employees who are pending receipt of shoes, by occasional visitors within designated foot-hazardous operational areas, or by employees who are temporarily wearing a cast or other medical device that precludes them from wearing their safety shoes.

Metatarsal guards that cover the instep and do not enclose the outsole of the shoe, or have straps fitting around the outsole, shall be used as necessary to protect the top of the foot from impact or compression. Metatarsal guards shall meet the strength requirements of ASTM F2413.

OTHER SAFETY FOOTWEAR

Non-Conductive Footwear protect against electrical hazards. They shall be used and tested in accordance with ASTM F2412, "Standard Test Methods for Foot Protection".

RESPIRATORY PROTECTION

See the Duke University Respiratory Protection Program (Section II, Chapter 2 of this manual) for details on protection against inhalation hazards.

ELECTRICAL PROTECTION

See the Duke University Electrical Safety Policy (Section III, Chapter 3 of this manual).

PROTECTIVE CLOTHING

Protective clothing includes coveralls, aprons, sleeves, leggings, gloves, hand pads, finger cots, shoulder capes, and garments that enclose the entire body. These items are intended to protect the wearer against heat, cold, moisture, toxic chemicals, acids, corrosives, electricity, biological and physical hazards such as sharp objects, flying objects, excessive dust, grease, etc.

When specific items of personal attire are judged to be hazardous to an operation or work environment, their use shall be prohibited. For example, the wearing of long sleeves, jewelry, and loose-fitting or dangling clothing shall not be permitted around rotating machinery. Silk, wool, rayon, nylon, and other synthetic fiber garments shall not be worn in any operation in which the generation of static electricity would create a hazard. Suitable attire, including appropriate shoes, normally worn by prudent individuals to avoid unnecessary risk, is the responsibility of the employee and is considered a condition of employment.

SPECIAL CLOTHING

Where employees are required to wear special protective clothing that necessitates changing from street clothes, a designated location for changing clothes and suitable clothing lockers will be provided. Special protective clothing worn on the job shall not be worn or taken away from the premises by employees, since this may expose other persons to unnecessary risk caused by contaminated clothing. Duke University will be responsible for cleaning and drying special clothing contaminated with or exposed to hazardous materials; or for proper disposal in the event contaminated clothing needs to be discarded.

Special clothing for biological hazards is contained in Section VI of this manual.

TABLE 1

Hazard	Recommended PPE
Heavy Impact or Falling Object	Head: hard hat Knees, Legs, and Ankles: fiber metal leggings Feet and Toes: steel toe shoes or metatarsal guards.
Moderate Impact	Head: hard hat Feet and Toes: steel toe shoes.
Large Flying Particles or Objects	Head: hard hat Eyes: goggles or spectacles with side shields Face: plastic face shields Fingers, Hands, and Arms: leather gloves or mittens, sleeves Trunk: leather or canvas fiber aprons, coats, or jackets Knees, Legs, and Ankles: leather, fiber metal, or flame-resistant duck pants, knee guards, shin guards, leggings or spats.
Small Flying Particles	Eyes: goggles or spectacles with side shields Face: plastic face shields Fingers, Hands, and Arms: leather or duck fabric gloves or mittens, sleeves Knees, Legs, and Ankles: long pants.
Dusts	Eyes: goggles or spectacles with side shields Face: plastic face shields Respiratory: as determined by OESO.
Sparks and Metal Spatter	Head: cotton or wool cap (flame retardant treated) Eyes: goggles or spectacles with side shields Face: plastic face shields Fingers, Hands, and Arms: leather flame resistant duck or aluminum fabric gloves or mittens, sleeves Trunk: leather aprons, coats, or jackets Knees, Legs, and Ankles: leather, fiber metal, or flame-resistant duck pants, knee guards, shin guards, leggings, or spats.
Splashing Metal	Eyes: goggles or spectacles with side shields Face: wire screen shield Fingers, Hands, and Arms: leather flame-resistant duck or aluminum fabric gloves or mittens, sleeves Trunk: leather aprons, coats, or jackets Knees, Legs, and Ankles: leather, fiber metal or flame-resistant duck pants, knee guards, shin guards, leggings, or spats Feet and Toes: leather shoes, foundry shoes.
Splashing Liquids and Chemicals	Head: Tyvek or other chemical-resistant hoods Eyes: goggles Face: plastic face shields Fingers, Hands, and Arms: appropriate chemical-resistant gloves, sleeves Trunk: rubber, plastic, or other chemical-resistant material Knees, Legs, and Ankles: rubber, plastic, or other chemical resistant material Feet and Toes: nonskid shoes with rubber, neoprene, or wood soles, rubber or neoprene overshoes Whole Body: coveralls, overalls, or suit of impervious materials.

Mists, Vapors, Gases, Fumes, and Smoke	Eyes: goggles Face: plastic face shields for mists Respiratory: as determined by OESO Fingers, Hands, and Arms: appropriate chemical-resistant gloves, sleeves, protective creams Trunk: rubber, plastic, or other chemical-resistant material Knees, Legs, and Ankles: rubber, plastic, or other chemical resistant material Feet and Toes: conductive shoes (for explosive gases, vapors, or other materials).
Hot Materials	Fingers, Hands, and Arms: leather gloves, mittens, hand pads, or finger cots; leather, or flame resistant duck sleeves Trunk: leather aprons, coats, or jackets Knees, Legs, and Ankles: leather, or flame resistant duck pants, knee guards, shin guards, leggings, or spats Feet and Toes: leather or other appropriate shoes.
Heat	Head: cotton or wool cap Fingers, Hands, and Arms: leather aluminized fabrics, glass fiber insulated gloves, mittens, or hand pads; flame-resistant duck or reflective fabric (for radiant heat) sleeves Trunk: flame-resistant fabrics, aluminized fabrics for radiant heat Knees, Legs, and Ankles: flame-resistant duck, aluminized fabrics for radiant heat Feet and Toes: leather or wood soles, thermal insulated shoes Whole Body: aluminized garments for radiant heat.
Slips and Falls	Feet and Toes: nonskid or slip-resistant shoes.
Cuts and Abrasions	Head: hard hat Fingers, Hands and Arms: leather, metal mesh, or cotton canvas gloves, mittens, hand pads, or finger cots, leather sleeves Trunk: leather or canvas fiber aprons, coats, or jackets Knees, Legs, and Ankles: leather or fiber metal pants, knee guards, shin guards, leggings, or spats Feet and Toes: steel toe, wood soles.
Electricity and Electric Shock	Refer to the Electrical Safety Policy (Section III, Chapter 3 of this manual).
Explosives	Head: cap (flame retardant) Fingers, Hands, and Arms: gloves Trunk: powder uniform Feet and Toes: conductive shoes.
Machinery	Head: hair net or cotton or wool cap Fingers, Hands, and Arms: flame-resistant duck sleeves Trunk: rubber, plastic, or canvas fiber aprons, coats, or jackets Knees, Legs, and Ankles: fiber material or flame-resistant duck pants, knee guards, shin guards, leggings, or spats Feet and Toes: steel toe shoes.

Reflected Light and Glare	Eyes: goggles, spectacles with side shields with filter lenses.
Welding	Head: leather skull cap Eyes: welding goggles and helmets or hand shields with filter lenses Face: helmets or hand shields with filter lenses, face shield Hands: flame proof gauntlet gloves.
Radiant Energy (intense)	Eyes: helmets (filter lenses with metal or plastic spectacles), hand shields (filter lenses) with metal or plastic spectacles Face: helmets or hand shield with filter lenses.
X and Gamma Radiation	Fingers, Hands, and Arms: leaded rubber or leather gloves Trunk: leaded rubber or leather apron.
Laser Radiation	Eyes: protective eyewear.
Radioactive Aerosols and Gases	Respiratory: as determined by OESO. Whole Body: radiation exposure suits of plastic or paper
Noise	Ears: ear plugs, ear muffs, or canal caps.
Cryogenics (liquid oxygen, liquid nitrogen, etc.)	Eyes: goggles or spectacles with side shields Face: plastic face shield Fingers, Hands, and Arms: cryogenic gloves Whole Body: coveralls, cryogenic aprons.

TRAINING

Training will include the selection, use, inspection, and care of the PPE required for work. Such training shall include explanations emphasizing the reasons for using the PPE under consideration. Personnel who maintain and/or issue PPE shall be trained in these functions to ensure that PPE users are provided with serviceable equipment designed for the particular hazard.

REFERENCES

Code of Federal Regulations, Title 29 (OSHA)

- 1910 Subpart I – Personal Protective Equipment (1910.132 – 1910.138)
- 1910.145, *Specifications for accident prevention signs and tags*
- 1910.1030, *Bloodborne Pathogens*
- 1910.1200, *Hazard Communication*

American National Standards Institute (ANSI) Z87.1, *Occupational and Educational Personal Eye and Face Protection Devices*

American National Standards Institute (ANSI) Z89.1, *Personal Protection – Protective Headwear for Industrial Workers*

American National Standards Institute (ANSI) Z136.1, *Safe Use of Lasers*

American Society for Testing and Materials (ASTM) F2412, *Standard Test Methods for Foot Protection*

American Society for Testing and Materials (ASTM) F2413, *Standard Specification for Performance Requirements for Foot Protection*

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