Chapter 19: **Personal Protective Equipment**

Quick Start Summary

Product ID: 524 | Revision ID: 2018 | Date published: 18 July 2018 | Date effective: 18 July 2018


1 Who needs to know about these requirements

The requirements of Personal Protective Equipment (PPE) apply to workers who may be exposed to common workplace hazards (such as cutting, grinding, drilling, sharp edges, pinch, and temperature extremes) or exposed to harmful substances and physical agents in the work area (including chemicals, extreme heat or cold, lasers, radiation hazards, biohazards, fall hazards, and dust), their supervisors, other persons overseeing their activities.

2 Why

PPE is required for many activities at SLAC and its proper use can prevent serious exposures and injuries.

3 What do I need to know

Supervisors must ensure that workers are protected primarily by engineering and administrative controls and that the appropriate PPE is available for any remaining hazards. Supervisors must determine PPE requirements, with assistance as needed from the Environment, Safety, and Health (ESH) Division, and workers must be trained or informed to identify, use, and maintain the appropriate PPE as specified. This chapter addresses general types of PPE for protecting the body, head, hands, feet, eyes, and face. Hazard-specific PPE requirements are listed in each appropriate ESH Manual chapter.

SLAC is responsible for providing PPE to its employees and students of Stanford University assigned to work at SLAC. For temporary agency and job shop employees, SLAC either provides the PPE or reimburses the employers for PPE they provide, which will be the case for more specialized PPE such as half-faced or full-faced air purifying respirators, safety footwear, and prescription safety glasses. Subcontractors, independent contractors, and user institutions are responsible for providing PPE to their employees.

4 When

The requirements of this chapter take effect 18 July 2018.

5 Where do I find more information

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)
- Chapter 19, “Personal Protective Equipment”

Or contact the [program manager](mailto:program.manager@slac.stanford.edu).
Chapter 19

Personal Protective Equipment

1 Purpose

The purpose of this program is to protect workers from common workplace hazards (such as cutting, grinding, drilling, sharp edges, pinch, and temperature extremes) or exposures to harmful substances and physical agents in the work area (including chemicals, extreme heat or cold, lasers, radiation hazards, biohazards, fall hazards, and dust) by setting forth requirements for the most common types of personal protective equipment (PPE), such as hard hats/helmets, safety shoes and glasses, and protective clothing. (Hazard-specific PPE requirements, such as laser safety glasses, dust masks, and hearing protection, are listed in each appropriate ESH Manual chapter.) It covers determining, acquiring, using, inspecting and maintaining, and posting for common types of PPE. It applies to workers, their supervisors, and others overseeing their activities.

Important Workplace hazards are to be managed through a combination of engineering controls, such as fume hoods and interlocking doors, administrative controls, such as the posting of signs and medical surveillance, and PPE. PPE is the last line of protection from hazards and must not be used to replace primary forms of hazard control.

2 Roles and Responsibilities

Functional roles and general responsibilities for each are listed below. More detailed responsibilities and information on when they apply are provided in the procedures and requirements.

The roles may be performed by one or more individuals and one individual may play more than one role, depending on the structure of the organizations involved. Responsibilities may be delegated.

2.1 Worker

- Identifies when PPE is required
- Inspects and wears PPE properly and as required
- Stores PPE as directed by supervisor and training
- Maintains current PPE training and medical monitoring, as required

2.2 Supervisor

- Ensures that PPE required for work assignments is determined and available
Consults with the PPE program manager and other ESH program managers to determine appropriate PPE for specific work hazards, as necessary
- Requires that workers use specified PPE
- Ensures workers are trained or provides on-the-job training (OJT) for PPE as needed
- Determines and ensures that employees needing medical monitoring for PPE receive it
- Ensures that PPE is stored and maintained according to the manufacturer’s specifications

2.3 Field Construction Manager / Service Manager / Point of Contact
- Verifies subcontractors, students, and users comply with SLAC PPE requirements

2.4 Subcontractor, Independent Contractor, User Institution
- Determines and provides PPE needed to perform work safely at SLAC to their employees
- Requires that workers use specified PPE and ensures they are properly trained and medically cleared as necessary

2.5 Personal Protective Equipment Program Manager
- Coordinates the PPE program and keeps documents and related training current
- Advises on PPE requirements

Note: Program managers for hazard-specific programs are responsible for assisting supervisors in assessing their employees’ activities, determining hazards, and selecting appropriate PPE for specific work hazards.

3 Procedures, Processes, and Requirements

These documents list the core requirements for this program and describe how to implement them:
- Personal Protective Equipment: PPE Requirements (SLAC-I-730-0A21S-052). Describes requirements for determining, acquiring, using, inspecting and maintaining, and posting for common types of PPE

These documents provide useful guidance; their use is not mandatory:
- Personal Protective Equipment: PPE Guidelines for Common Tasks (SLAC-I-730-0A21T-015). Provides guidance for determining and using common PPE

4 Training

Workers who are required to use PPE must receive training specific to both the required PPE and the conditions under which it will be used. ESH provides the following general PPE training:
The immediate supervisor must determine if the general training meets the level of training required for the work area. If it does not, the supervisor is responsible for ensuring on-the-job training is completed for any specialized PPE. Training requirements for hazard-specific PPE are listed in each appropriate ESH Manual chapter.

5 Definitions

*boots, safety.* Boots designed to protect feet from physical hazards. For example, safety boots offer more protection when splash or spark hazards (chemicals, molten materials) are present.

*boots, steel-toed.* Durable boots (sometimes safety boots and now often with composite, or ceramic toe boxes) made of leather or rubber that have a steel reinforcement in the toe to protect the foot against falling objects. They also often have steel inserts in their soles to prevent puncture from below.

*bump cap.* Form of headgear that provides lightweight protection from minor bumps, scrapes and lacerations. They are smaller, less sturdy, and more comfortable than hard hats, and can be worn in tight spots or in congested areas with low, overhanging objects. They are not a substitute for hard hats. (See hard hat.)

*construction site.* An area in which any combination of the following activities takes place: erection, installation, assembly, demolition, or fabrication to create a new facility, or to alter, add to, rehabilitate, dismantle, or remove an existing facility. It also includes any area in which construction and excavation activities are conducted as part of environmental remediation efforts.

*control.* Measure (engineering and/or administrative) used to protect workers

- *engineering controls,* such as ventilation systems or physical barriers, are the preferred method of hazard control because they are designed to prevent exposure.
- *administrative controls,* such as job rotation and time exposure limitation, are less desirable than engineering controls because they are difficult to implement and maintain.

*gloves, aluminized.* Gloves made of aluminized fabric designed to insulate hands from intense heat. These gloves are most commonly used by persons working molten materials.

*gloves, chemical resistance.* Gloves may be made of rubber, neoprene, polyvinyl alcohol or vinyl. The gloves protect hands from corrosives, oils, and solvents. When selecting chemical resistance gloves, be sure to consult the manufacturers’ recommendations, especially if the gloved hand will be immersed in the chemical.

*gloves, leather.* Gloves made of leather typically used to protect hands from abrasions, cuts and blisters

*goggles, single-lens.* Vinyl-framed goggles of soft pliable body design provide adequate eye protection from many hazards. These goggles are available with clear or tinted lenses, perforated, port vented, or non-vented frames.

*goggles, welder’s/chipper’s.* These goggles are available in rigid and soft frames to accommodate single or two eyepiece lenses.
hard hat. A lightweight protective helmet, usually of metal or reinforced plastic, worn by workers in industrial settings. A hard hat is a type of helmet predominately used in workplace environments such as construction sites to protect the head from injury such as from falling objects. They are typically required personal protective equipment where heavy labor is being performed. (See bump cap.)

permissible exposure limit (PEL). Generally, a limit for personal exposure to a substance

personal protective equipment (PPE). Clothing, headgear, shoes, gloves, glasses/goggles and other such items meant to protect individuals from exposure to harmful substances and physical agents

safety glasses. Protective eyeglasses made with safety frames, tempered glass or plastic lenses, and temples and side shields that provide eye protection from moderate impact and particles encountered in job tasks such as carpentry, woodworking, grinding, and scaling. Safety glasses are also available in prescription form for those persons who need corrective lenses.

shield, face. Normally consists of an adjustable headgear and face shield of tinted/transparent acetate or polycarbonate materials, or wire screen. Face shields are available in various sizes, tensile strength, impact/heat resistance and light ray filtering capacity. Face shields will be used in operations when the entire face needs protection and should be worn to protect eyes and face against flying particles, metal sparks, and chemical/biological splash.

shield, welding. Shield assemblies consisting of vulcanized fiber or glass fiber body, a ratchet/button type adjustable headgear or cap attachment and a filter and cover plate holder

steel-reinforced safety shoes. Shoes designed to protect feet from common machinery hazards such as falling or rolling objects, cuts, and punctures. The entire toe box and insole are reinforced with steel, and the instep is protected by steel, aluminum, or plastic materials. Safety shoes are also designed to insulate against temperature extremes and may be equipped with special soles to guard against slip, chemicals, and/or electrical hazards.

6 References

6.1 External Requirements

The following are the external requirements that apply to this program:

  - Section 1910.133, “Eye and Face Protection” (29 CFR 1910.133)
  - Section 1910.135, “Head Protection” (29 CFR 1910.135)


Section 1926.100, “Head Protection” (29 CFR 1929.100)

Section 1926.102, “Eye and Face Protection” (29 CFR 1929.102)

The following industry-accepted consensus standards:

- American National Standards Institute (ANSI) Z87.1, “Practice for Occupational and Educational Eye and Face Protection” (ANSI Z87.1)
- ANSI Z89.1, “Personal Protection Protective Headwear for Industrial Workers” (ANSI Z89.1)
- ANSI/International Safety Equipment Association (ISEA) 107, “High Visibility Safety Apparel” (ANSI/ISEA 107)
- ANSI Z41.1, “Personal Protection – Protective Footwear” [ replaced by ASTM F2412 ]

### 6.2 Related Documents

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)
Chapter 19: Personal Protective Equipment

PPE Requirements

Product ID: 525 | Revision ID: 2019 | Date published: 18 July 2018 | Date effective: 18 July 2018
URL: http://www-group.slac.stanford.edu/esh/eshmanual/references/PPEReq.pdf

1 Purpose

The purpose of these requirements is to ensure the proper selection and use of personal protective equipment (PPE). They cover determining, acquiring, using, inspecting and maintaining, and posting for common types of PPE. (Hazard-specific PPE requirements, such as laser safety glasses, dust masks, and hearing protection, are listed in each appropriate ESH Manual chapter.) They apply to workers, their supervisors, and others overseeing their activities.

2 Requirements

2.1 Determination

PPE requirements are determined as part of the routine work authorization process described in Chapter 2, “Work Planning and Control”. Minimally any part of the body at risk from the following types of personal hazards needs to be protected:

- Flying particles, objects
- Crushing hazards
- Excessive noise
- Electric shock/arc flash
- Temperature extremes
- Cuts and abrasions
- Chemical splashes
- Soldering spatter
- Chemical contamination of skin and clothing

Consult with your ESH coordinator or the appropriate ESH program manager if assistance is needed in selecting appropriate PPE.

Important Engineering and administrative controls should already be in place; PPE must not be used to replace these primary hazard control methods.

2.2 Acquisition

SLAC is responsible for providing PPE to its employees and students of Stanford University assigned to work at SLAC. (For the full SLAC policy on reimbursing employees, see Personal Protective Equipment (PPE) Reimbursement.)
For temporary agency and job shop employees, SLAC either provides the PPE or reimburses the employers for PPE they provide, which will be the case for more specialized PPE such as half-faced or full-faced air purifying respirators, safety footwear, and prescription safety glasses.

Subcontractors, independent contractors, and user institutions are responsible for providing PPE to their employees.

- Only PPE that meets applicable safety standards can be approved for purchase.
- Many organizations maintain and provide the PPE their employees need.
- The appropriate ESH program manager should be consulted before purchasing some hazard-specific PPE (for example, for laser glasses, contact the laser safety officer, for electrical PPE, the electrical safety officer, for respiratory protection, the respiratory protection program manager)
- Prescription safety glasses (meeting ANSI Z87.1) and footwear (meeting ANSI Z41.1 or ASTM F2413) are purchased and reimbursed following the Non-PO voucher process (see HDI for Employee and Faculty>Reimbursement for non-PO expenditures). Note reimbursement limits are established by the Office of the Chief Financial Officer.
- Other PPE types such as protective clothing involve an individual purchase order.

### 2.3 Inspection and Maintenance

PPE must be inspected for wear and defects before and after each use, maintained following the manufacturer’s recommendations, and removed from use immediately if damaged or defective.

### 2.4 Posting

Areas in which specific hazards can be anticipated because of work performed or having known hazards or chemicals are posted as described in the hazard-specific chapter. Entrants must obey all PPE postings. Example posting:

**CAUTION – EYE HAZARD AREA – DO NOT ENTER WITHOUT EYE PROTECTION**

### 2.5 Use

This section is organized by specific body area. For additional guidance, see Personal Protective Equipment: PPE Guidelines for Common Tasks or contact the PPE program manager.

#### 2.5.1 Head

Head protection includes helmets and *hard hats* as well as *bump caps* that protect from abrasion and hats that provide shade and ultraviolet protection.

- Hard hats must be worn whenever high-impact force or penetration by a falling object is a possibility, such as when working below scaffolding, in a crane service area, or at a *construction site*.

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1 A *construction site* is an area in which any combination of the following activities takes place: erection, installation, assembly, demolition, or fabrication to create a new facility, or to alter, add to,
Important  Bump caps/skull guards only protect against scalp lacerations and cannot be substituted in conditions that call for a hard hat.

2.5.2  Eyes and Face

Workers must wear eye protection when performing any task that presents such eye-injury hazards as impact, chemical exposure, foreign bodies, intense light or heat, flame, or electrical arc. Certain operations require face protection in addition to eye protection, but unless a face shield is specifically designed for eye protection it is not to be worn in lieu of safety eyewear.

- Single-lens goggles may be worn in combination with spectacles or corrective lenses to ensure protection along with proper vision.
- *Welder’s goggles* provide protection from sparking, scaling, or splashing metals and harmful light rays. Lenses are impact resistant and are available in graduated shades of filtration.
- *Welding shields* protect workers’ eyes and face from infrared or radiant light burns, flying sparks, metal splatter, and slag chips encountered during welding, brazing, soldering, resistance welding, bare or shielded electric arc welding and oxyacetylene welding and cutting operations.
- *Chipper’s goggles* provide eye protection from flying particles. The dual protective eye cups house impact resistant clear lenses with individual cover plates.

Operations that pose a potential eye hazard include those that

- Produce flying particles, such as those created by machining equipment or portable power tools
- Involve handling hazardous liquids that may splash (chemicals, liquid hazardous waste, plating bath, epoxy, cryogens)
- Involve exposure to intense light, such as working with ultraviolet or lasers (the system laser safety officer determines protective eyewear for working with a laser)
- Produce molten metal by welding or brazing
- Produce an electric arc, such as by grounding a charged capacitor
- Could expose workers to electrical arc flash
- Use pressurized systems such as compressed air or hydraulic systems

All eye and face protection must meet ANSI Z87.1. The PPE program manager and the Occupational Health Clinic are available to assist in defining eye-hazard operations and in selecting appropriate eye protection.

2.5.3  Body

2.5.3.1  High-visibility Safety Apparel

A high-visibility safety vest or jacket must be worn by anyone who performs tasks on or near moving vehicles or equipment, such as when working in or near roadways or on a construction site. Workers must be visible to vehicle operators in all work lighting conditions. The required clothing must be Class 2 or Class 3 fluorescent yellow-green (preferred) or fluorescent orange-red per ANSI/ISEA 107.
2.5.3.2 Protective Clothing

Protective clothing must be worn when working with hazardous chemicals and physical agents. Examples include:

- Coveralls to protect against chemicals, hazardous dust, and heavy lubricants
- Flame-retardant apron, coveralls, and gloves to protect against fire
- Rubber apron to protect against chemical liquids
- Special flame-resistant overalls to protect from electrical flash burns
- Apron to protect against burns while welding
- Hat to provide shade and protect against the sun’s ultraviolet rays

2.5.4 Hand

Suitable gloves must be worn when the following hazards are present: chemical; thermal (extreme heat or cold); radiological; electrical; bio-hazard; possibility of abrasion, puncture, or contamination. Padded gloves should be used to improve ergonomics, as needed.

Important: Do not use gloves when operating rotating equipment such as a lathe, drill, or drill press.

Select the glove type that addresses the specific hazard(s) as illustrated by these examples:

- Abrasion-resistant gloves for handling sharp or rough objects
- Electrical lineman gloves for both low- and high-voltage electrical hazards
- Chemically resistant gloves for use with the specific chemical(s) to be handled
- Flame-retardant and heat-resistant gloves for working with extremely hot materials
- Cold-resistant gloves for working with cryogens
- Rubber or other suitable gloves for handling contaminants
- Padded gloves to relieve ergonomic stress

2.5.5 Foot

Foot protection is required in the following instances:

- Safety-toed (steel, composite, or ceramic) boots are required at all construction sites.
- Safety shoes or boots must be worn where there is a potential for electrical hazards; special electrical hazard boots are designed with no conductive materials other than the steel toe, which is insulated (Safety-toed electrical hazard boots are also available with composite or ceramic toe box and no steel).
- Safety shoes or boots with impact protection must be worn in work areas where carrying or handling materials such as packages, objects, parts or heavy tools, which if dropped, could injure the feet.
- Safety shoes or boots with compression protection (safety-toed) must be worn for work activities in which materials or equipment could potentially roll over a foot.
- Safety shoes or boots with puncture protection are required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal, could be stepped on.
Neoprene or nitrile safety boots may be required while working with corrosives, caustics, cutting oils, and petroleum products.

These requirements commonly apply to construction workers, riggers, machinists, mechanics, carpenters, electricians, store keepers, shipping/receiving personnel, technicians, and laborers.

All safety shoes must meet ANSI Z41.1 or ASTM F2413. The PPE program manager is available to make recommendations to ensure applicable standards are met.

3 Forms

The following are forms required by these requirements:

- None

See HDI for Employee and Faculty > Reimbursement for non-PO expenditures

4 Recordkeeping

The following recordkeeping requirements apply for these requirements:

- None

5 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)

- Chapter 19, “Personal Protective Equipment”
  - Personal Protective Equipment: PPE Guidelines for Common Tasks (SLAC-I-730-0A21T-015)
- Chapter 2, “Work Planning and Control”

Other SLAC Documents

- Personal Protective Equipment (PPE) Reimbursement (ESH-2018-012)
- Safety Coordinators
- Programs and Program Managers List

Other Documents

- American National Standards Institute (ANSI) Z87.1, “Practice for Occupational and Educational Eye and Face Protection” (ANSI Z87.1)
- ANSI/International Safety Equipment Association (ISEA) 107, “High Visibility Safety Apparel” (ANSI/ISEA 107)
- ANSI Z41.1, “Personal Protection – Protective Footwear” [ replaced by ASTM F2412 ]
Chapter 19: Personal Protective Equipment

PPE Guidelines for Common Tasks

1 Purpose

The purpose of these guidelines is to ensure the proper selection and use of personal protective equipment (PPE). They cover determining and using PPE for common tasks and apply to workers, their supervisors, and others overseeing their activities.

These are examples only; requirements for common PPE are covered in Personal Protective Equipment: PPE Requirements. Hazard-specific PPE requirements, such as laser safety glasses, dust masks, and hearing protection, are listed in each appropriate ESH Manual chapter.

2 Guidelines

See the following table.
### Table 1 PPE Guidelines for Common Tasks

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<tr>
<th>Task</th>
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<th>Hand</th>
<th>Foot</th>
<th>Requirement Reference</th>
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</thead>
<tbody>
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<td>Asbestos work</td>
<td>Inhalation of asbestos fibers</td>
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<td>Leather gloves (used in combination with an insulated liner when working with electricity)</td>
<td>Chapter 27, “Asbestos”</td>
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<tr>
<td>Brazing, grinding</td>
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<td>Leather gloves</td>
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<td>Cafeteria work</td>
<td>Slip, trips, and, falls</td>
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<tr>
<td>Chemicals, hazardous handling</td>
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<td>High visibility safety apparel, fluorescent yellow-green (preferred) (ANSI/ISEA 107) Work shirt (long or short sleeve), work pants (long)</td>
<td>High-top steel-toed boots (ASTM F2413)</td>
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<td>Concrete work, or in standing water</td>
<td>Slips, standing water</td>
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<td>Concrete saw cutting, core drilling, scarifying, grinding, jack hammering</td>
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<td>Task</td>
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<td>Electrical work</td>
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<td>Maintenance operations in tunnels</td>
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<td>Medical work</td>
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<td>Task</td>
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<td>Plasma cutting, electrical work</td>
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<td>Cutting, torch brazing, torch soldering</td>
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<tr>
<td>Working in high noise areas or near high noise machinery</td>
<td>Hearing loss</td>
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</tbody>
</table>

**Requirement Reference**

- SLAC Radiological Control Manual
- Chapter 13, "Traffic and Vehicular Safety"
- Chapter 45, "Fall Protection"
- Chapter 18, "Hearing Conservation"
3 References

SLAC Environment, Safety, and Health Manual (SLAC-I-720-0A29Z-001)
- Chapter 19, “Personal Protective Equipment”
  - Personal Protective Equipment: PPE Requirements (SLAC-I-730-0A21S-052)
- Chapter 2, “Work Planning and Control”
- Chapter 8, “Electrical Safety”
- Chapter 10, “Laser Safety”
- Chapter 13, “Traffic and Vehicular Safety”
- Chapter 18, “Hearing Conservation”
- Chapter 20, “Lead Safety”
- Chapter 27, “Asbestos”
- Chapter 29, “Respiratory Protection”
- Chapter 36, “Cryogenic and Oxygen Deficient Hazard Safety”
- Chapter 45, “Fall Protection”
- Chapter 53, “Chemical Safety”
- Chapter 56, “Respirable Crystalline Silica”

Other SLAC Documents
- SLAC Radiological Control Manual (SLAC-I-720-0A05Z-001)

Other Documents
- American National Standards Institute (ANSI) Z87.1, “Practice for Occupational and Educational Eye and Face Protection” (ANSI Z87.1)
- ANSI Z89.1, “Personal Protection Protective Headwear for Industrial Workers” (ANSI Z89.1)
- ANSI/International Safety Equipment Association (ISEA) 107, “High Visibility Safety Apparel” (ANSI/ISEA 107)
- ANSI Z41.1, “Personal Protection – Protective Footwear” [replaced by ASTM F2412]