

PPE Descriptions and Design Requirements Standards

BNL's Descriptions and Design Specifications for PPE are described for the following types of protection:

1. [Body Protection](#)
2. [Eye Protection](#)
3. [Foot Protection](#)
4. [Hand Protection](#)
5. [Head Protection](#)
6. [Respiratory Protection](#)
7. [Recommendations for PPE Fabrics](#)

Abbreviations used in this exhibit:

ANSI: American National Standards Institute

ASTM: ASTM International (formerly American Society for Testing and Materials)

ISEA: International Safety Equipment Association

NFPA: National Fire Protection Association

If you have any questions about the appropriate type of personal protective equipment (PPE) required for your work, contact your Supervisor or the Facility Support Representative, Safety & Health Representative, ESH Coordinator, or the PPE Subject Matter Expert.

PPE Descriptions and Design Requirements Standards

1. Body Protection

ANSI/ISEA 101: American National Standard for Limited-Use and Disposable Coveralls - Size and Labeling Requirements.

ANSI/ISEA 107: American National Standard for High Visibility Safety Apparel and Headwear.

ANSI/ISEA 207: American National Standard for High-Visibility Public Safety Vests.

NFPA 1992: Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies.

Body Protective Equipment		
Equipment Title	Description	Illustration
Skin covering clothing	<p>Consists of</p> <ul style="list-style-type: none"> • Socks; • Long pants (or long dress or skirt to the ankles); and • Long sleeve shirt (or short sleeve shirt/dress and lab coat). <p>Provides a minimum protection level for incidental exposure to physical hazards.</p> <p>Design requirements: none</p>	
Laboratory apron	<p>Apron provides protection from abrasion and splash to front of body. Used in conjunction with skin covering clothing.</p> <p>Design requirements: none</p>	
Gauntlets/sleeves	<p>Gauntlets provide protection from abrasion to the forearms, for uses where the maximum potential for exposure occurs in that area. Typical uses are chain saws and knife cutting operations.</p> <p>Design requirements: none</p>	

PPE Descriptions and Design Requirements Standards

Body Protective Equipment		
Equipment Title	Description	Illustration
Lab coat	<p>Long-sleeve coat, open at the collar, covering to knee length.</p> <p>Provides initial chemical splash protection, minimal thermal protection, and some abrasion protection.</p> <p style="color: green;">Design requirements: none</p>	
Lab coat, knitted cuff	<p>Long-sleeve coat, open at the collar, covering to knee length, tight fitting cuff at wrist.</p> <p>Provides initial chemical splash protection, minimal thermal protection, and some abrasion protection. Ideal for laser work.</p> <p style="color: green;">Design requirements: none</p>	
Lab coat, red collar	<p>Lab coats with red collars are reserved for work with radiological hazards.</p> <p style="color: green;">Design requirements: none</p>	
Lab coat, flame resistant	<p>Flame resistant fabric or treated fabric, open at the collar, covering to knee length. Provides thermal protection, (includes Nomex®, Kevlar®, or similar fabrics)</p> <p style="color: green;">Design requirements:</p> <p style="color: green;">NFPA 70E: <u>Hazard Risk Category Level 1</u> or NFPA 1992 for HazMat Response NFPA 2112 for Pyrophorics or open flame uses</p>	

PPE Descriptions and Design Requirements Standards

Body Protective Equipment		
Equipment Title	Description	Illustration
Lab Coat, Disposable	<p>Long-sleeve coat, open at the collar, covering to knee length. Not designed to be laundered. (includes Tyvek®, KleenGuard®, Tychem® and similar fabrics)</p> <p>Provides chemical splash protection, no thermal protection, and some abrasion protection.</p> <p style="color: green;">Design requirements: none</p>	
Coveralls	<p>Reusable or disposable one-piece suit. Provides initial splash protection and some thermal protection, and abrasion protection.</p> <p style="color: green;">Design requirements: none</p>	
Encapsulating suit level B, C, D	<p>Reusable or disposable one-piece suit with polymer coating for chemical permeation resistance. Provide splash and limited protection for sustained chemical contact, thermal sources, and abrasion.</p> <p style="color: green;">Design requirements: ANSI/ISEA 101</p>	
Total encapsulating suit level A	<p>Reusable or disposable one-piece suit coated with polymer or constructed of polymer. Provides maximum degree of chemical permeation resistance. Provides some thermal protection and abrasion protection. Requires breathing-grade air be supplied into the suit.</p> <p style="color: green;">Design requirements: NFPA 1992</p>	

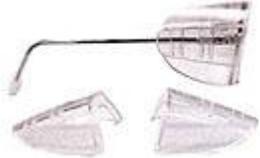
PPE Descriptions and Design Requirements Standards

Body Protective Equipment		
Equipment Title	Description	Illustration
Flame resistant Clothing	<p>Clothing such as shirts, pants, coveralls, jackets, and parkas for protection from momentary electric arc and related thermal hazards. Layering of Fire resistant and natural fiber garments is used for added protection. A typical layering system may include an undershirt, a shirt and trouser and coverall. Loose fitting clothing provides additional thermal insulation due to air spaces.</p> <p style="color: green;">Design requirements: NFPA 2112</p>	
Electrical Flash Suit	<p>Gloves, suit, hood, and face shield constructed to protect from Electrical Flash accidents, hazards that create a large fireball, sending hot metal flying through the air.</p> <p style="color: green;">Design requirements: See the Electrical Safety Subject Area</p>	
High-visibility clothing	<p>High-visibility color and reflective material worn to alert vehicle drivers of the presence of workers on roadways and for other applications where high visibility of workers is needed.</p> <p style="color: green;">Design requirements: ANSI/ISEA 107 or ANSI/ISEA 207</p>	

PPE Descriptions and Design Requirements Standards

2. Eye Protection

ANSI Z87.1: American National Standard for Occupational and Educational Eye and Face Protection

Eye Protective Equipment		
Equipment Title	Description	Illustration
Non-safety eye glasses	Any glasses without impact resistance lenses and safety design features such as specialized lens mounting. <i>Design requirements: none</i>	
Impact-resistant safety glasses with side shields	Lenses insert into frame from the outside with a solid rim on the inner side of frame smaller than the lens. Design may include the lens and frame as one piece. The material of the lens meets impact resistant standards with built in or add-on clear side shields that guard against impact of flying objects entering from the side of the face. <i>Design requirements: ANSI Z87.1</i>	
Prescription Lens safety glasses with side shields	Corrective lenses insert into frame from the outside with a solid rim on the inner side of frame smaller than the lens. Design may include the lens and frame as one piece. On impact with a flying object, the lens will not disengage toward eye. The material of the lens meets impact resistant standards with built in or add-on clear side shields that guard against impact of flying objects entering from the side of the face. <i>Design requirements: ANSI Z87.1</i>	
Add-on side shields	Add-on clear side shields that guard against impact of flying objects entering from the side of the face. <i>Design requirements: ANSI Z87.1</i>	

PPE Descriptions and Design Requirements Standards

Eye Protective Equipment		
Equipment Title	Description	Illustration
Visitor glasses	Impact Resistant Safety Glasses designed to fit over non-safety glasses or be worn without glasses underneath. <i>Design requirements: ANSI Z87.1</i>	
Electrical Flash Eye Protection	Safety glasses and goggles with non-conductive frames (plastic) for work with electrical current. <i>Design requirements: ANSI Z87.1 with Non-conductive Frames</i>	
Vented goggles	Frame makes full contact with the face at all points. Vents in frame allow perspiration to exit goggles helping to reduce fogging. The material of the lens meets impact resistant standards. <i>Design requirements: ANSI Z87.1</i>	
Non-vented goggles	Frame makes full contact with the face at all points. No vents in frame prevent entry of hazardous vapors, mists, fumes or aerosols. The material of the lens meets impact resistant standards. <i>Design requirements: ANSI Z87.1</i>	
Face shield	High-impact resistant shield. Mounts on harness or hard hat. Provides protection from flying particles and liquid splashes. <i>Design requirements: ANSI Z87.1</i>	
Full-face respirator	Face piece makes full contact with the face at all points. The lens meets impact resistant standards. Equivalent to face shield or safety glasses with side shields or non-vented goggles or vented goggles. <i>Design requirements: ANSI Z87.1</i>	

PPE Descriptions and Design Requirements Standards

Eye Protective Equipment		
Equipment Title	Description	Illustration
Biohazard face masks	Thin polymer shield provides a minimal droplet barrier for biohazards and bloodborne pathogens splashes. <i>Design requirements: none</i>	
Combo goggles and face shield (Monoshield)	High-impact resistant face shield attached to goggles as one-piece. Provides protection from flying particles and liquid splashes. <i>Design requirements: ANSI Z87.1</i>	
Combo hard hat and face shield respirator	Impact resistant helmet, face shield, and PAPR loose-fitting respirator. Provides protection to head, respiratory, and face. Equivalent to safety glasses or face shield. <i>Design requirements: ANSI Z87.1</i>	
Laser operations	See the Laser Safety Subject Area.	

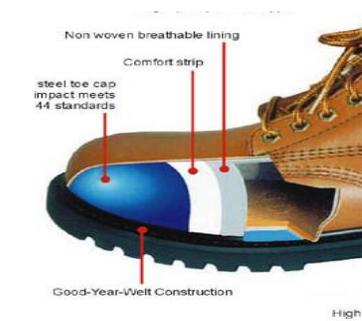
PPE Descriptions and Design Requirements Standards

3. Foot Protection

ASTM 2413 Standard Specification for Performance Requirements for Foot Protection

ANSI Z41 Standard (withdrawn). Footwear with this designation is acceptable for use.

ASTM F 1117: Standard Specification for Dielectric Footwear

Foot Protective Equipment		
Equipment Title	Description	Illustration
Enclosed footwear (substantial)	No impact resistance. Minimal protection from initial brief contact with chemicals and hot objects. Worn with socks. <i>Design requirements: none</i>	
Safety shoe (impact resistant, safety toe)	Structured hardened cap (steel or plastic) capable of withstanding 2500 lbs. of compression. Designation of (I) for absorbing impact and (C) for compression. Typically leather or vinyl uppers, slip-resistant outsole. Falling object, impact protection, and brief chemical protection. Worn with socks. <i>Design requirements: ANSI Z41 or ASTM 2413</i>	
Metatarsal protection	High degree of impact and falling object protection. Provides protection for front and bridge of foot. Worn with socks. <i>Design requirements: ANSI Z41 or ASTM 2413</i>	
Chemical-resistant overboot	Offers protection for hazardous and non-hazardous materials. Seamless waterproof cover that provides a layer of chemical protection. To be worn over “enclosed footwear” or safety toe shoe. Worn with socks. <i>Design requirements: none</i>	

PPE Descriptions and Design Requirements Standards

Foot Protective Equipment		
Equipment Title	Description	Illustration
Chemical-resistant boots with safety toe	<p>Neoprene or other polymer boots in a polymer resistant to the chemicals present. Worn with socks.</p> <p style="color: green;">Design requirements: ANSI Z41 or ASTM 2413</p>	
Dielectric boot	<p>Dielectric overshoe for electrical insulation. Worn with socks.</p> <p style="color: green;">Design requirements: See the Electrical Safety Subject Area</p>	
Conductive sole shoe	<p>Resistance typically under 10,000 ohms for conduction of electricity to prevent static electric discharge. Worn with socks.</p> <p style="color: green;">Design requirements: ANSI Z41 or ASTM 2413</p>	
Conductive shoe covers	<p>Antistatic covers for footwear.</p> <p style="color: green;">Design requirements: none</p>	
Shoe cover	<p>Contaminant protection worn over “enclosed footwear” or safety toe shoe, as appropriate.</p> <p style="color: green;">Design requirements: none</p>	
Disposable boot	<p>Boot cover with elastic top, used for particulates such as asbestos, lead and radioactive dusts. Worn over “enclosed footwear” or safety toe shoe, as appropriate.</p> <p style="color: green;">Design requirements: none</p>	

PPE Descriptions and Design Specifications

4. Hand Protection

Hand Protective Equipment		
Equipment Title	Description	Illustration
Splash glove	<p>Disposable, nitrile, or natural rubber, ambidextrous gloves slightly resistant to a broad range of chemicals for brief periods.</p> <p>Design requirements: none</p>	
Sustained contact and immersion glove	<p>Typically embossed grip, flocked or fabric-lined glove. Usually 10- to 20-mil thick. Select material of construction to be impervious to the chemical based on glove selection charts.</p> <p>Design requirements: none</p>	
Cryogen glove	<p>Thick-insulating fabric provides protection against injury from both cryogenic and hot materials from -160° to 150°C (-260° to 300°F). Not for immersion in liquid cryogenes.</p> <p>Design requirements: none</p>	
Thermal burn-protection glove	<p>Woven fiber gloves for very low to very high temperatures (-70° to 600°C). Aluminized gloves may be present for extra heat reflectivity and molten-splash resistance.</p> <p>Can be used for cryogen liquid handling.</p> <p>Design requirements: none</p>	
Abrasion resistance (a.k.a. work glove)	<p>Heavy glove resistant to abrasion, typically a split leather palm or fabric with coating.</p> <p>Design requirements: none</p>	

PPE Descriptions and Design Specifications

Hand Protective Equipment		
Equipment Title	Description	Illustration
<p>Cut-resistant glove</p>	<p>Heavyweight cut-resistant fiber (such as Kevlar) knitted gloves.</p> <p style="color: green;">Design requirements: none</p>	
<p>Electrical insulating and flash hand protection gloves</p>	<p>Electrically non-conductive glove to prevent electrical shock hazard. Flame resistant to limit arc flash burns. Leather protectors worn over these rubber gloves for mechanical abrasion protection.</p> <p style="color: green;">Design requirements: See the Electrical Safety Subject Area</p>	

PPE Descriptions and Design Specifications

5. Head Protection

ANSI Z89.1: American National Standard Requirements for Protective Headwear for Industrial Workers

Head Protective Equipment		
Equipment Title	Description	Illustration
Bump cap	<p>Bump cap is lightweight and features a suspension. Popular where the possibility of a head bump or laceration is possible. Ideal for those working in areas with low head clearance. Four-point easily adjustable plastic suspension with perforated vinyl sweatband.</p> <p><i>Design requirements: none</i></p>	
Hard hat	<p>A safety cap adjusts from head with 4- to 6-point web suspension system. Designs include those that permit hearing, welding, and face shield accessories to be attached to the helmet.</p> <p><i>Design requirements: ANSI Z89.1</i></p>	
Helmet respirator	<p>Combination of PAPR respirator built into a safety cap adjusts from head with 4- to 6-point suspension system.</p> <p><i>Design requirements: ANSI Z89.1</i></p>	

PPE Descriptions and Design Specifications

6. Respiratory Protection

ANSI Z88.2: American National Standard Requirements for Protective Headwear for Respiratory Protection

OSHA: 29CFR1910.134 and 29CFR1926.103: Respiratory Protection

Respiratory Protection Equipment		
Equipment Title	Description	Illustration
Medical mask; Surgeon's mask	<p>Loose fitting fabric mask. Does not have a sealing edge.</p> <p>Not considered a respirator at BNL. Not to be used for protection from chemicals, asbestos, lead or etiologic agents, or radiological hazards.</p> <p>May be used in a medical setting for low-hazard patient contact.</p> <p>Design requirements: none</p>	
Filtering facepiece respirator	<p>Filtering facepiece (dust mask) contains the filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium. Facepiece makes contact with the face under the chin and above the nose, but does not cover the full face or eyes. Edge of mask is a sealing surface.</p> <p>See the exhibit Requirements for Filtering Facepiece Respirator Use.</p> <p>Design requirements: ANSI Z87.1 and NIOSH certification</p>	
Half-face respirator	<p>Elastomeric material (silicone, neoprene, etc.) face piece makes full contact with the face under the chin and above the nose, but does not cover the full face or eyes.</p> <p>Design requirements: ANSI Z87.1 and NIOSH certification</p>	

PPE Descriptions and Design Specifications

Respiratory Protection Equipment		
Equipment Title	Description	Illustration
Full-face respirator	<p>Elastomeric material (silicone, neoprene, etc.) face piece makes full contact with the face at all points.</p> <p style="color: green;">Design requirements: ANSI Z87.1 and NIOSH certification</p>	
Helmet respirator	<p>Combination of PAPR respirator built into a safety cap adjusts from head with 4- to 6-point suspension system.</p> <p style="color: green;">Design requirements: ANSI Z87.1 and NIOSH certification</p>	
Hood	<p>The air delivery portion of the airline respirator (respiratory inlet) completely covers the head and neck and may also cover portions of the shoulders and torso. Loose-fitting with a partial seal.</p> <p style="color: green;">Design requirements: ANSI Z87.1 and NIOSH certification</p>	
Escape device	<p>Devices intended to be used by persons escaping from fire-generated products of combustion [or oxygen deficient atmospheres]. Not designed for entry into a hazardous atmosphere for rescue.</p> <p style="color: green;">Design requirements: ANSI/ISEA 110-2009</p>	
Self-contained breathing apparatus (SCBA)	<p>Elastomeric material (silicone, neoprene, etc.) face piece makes full contact with the face at all points as part of an atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.</p> <p style="color: green;">Design requirements: ANSI Z87.1, NFPA 1852; 1989, 1991, 1992 and NIOSH certification</p>	

PPE Descriptions and Design Specifications

7. Recommendations for PPE Fabrics

Recommendations for PPE Fabrics when exposure risk is present	
Flame Resistant Fabric (Meets NFPA 1992 and NFPA 2112)	<ul style="list-style-type: none">• Pyrophoric and open flame as per work planning and control documents
100% Cotton fabric	<ul style="list-style-type: none">• Combustible and Flammable liquids as per work planning and control documents• Propane Fuel Gas
Synthetic fiber fabrics or Blends of Synthetic fibers with Cotton fibers	<ul style="list-style-type: none">• Non-combustible liquids, non-flammable chemicals & nanomaterials• Acids & Bases• Biological media and cultures
Disposable fabric (Polyolefin)	<ul style="list-style-type: none">• Visitor and those with no contact with chemicals• Non-combustible/non-flammable nanomaterials