

ENVIRONMENTAL HEALTH & SAFETY

UNIVERSITY *of* WASHINGTON

# GUIDELINES FOR PERSONAL PROTECTIVE EQUIPMENT (PPE)

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This is a guide to fulfill the minimum requirements and doesn't cover every conceivable hazard. If you need additional assistance in identifying engineering or administrative controls or in selecting PPE for a hazard, contact the EH&S Occupational Safety and Health Office at 206.543.7262.



## REQUIREMENTS

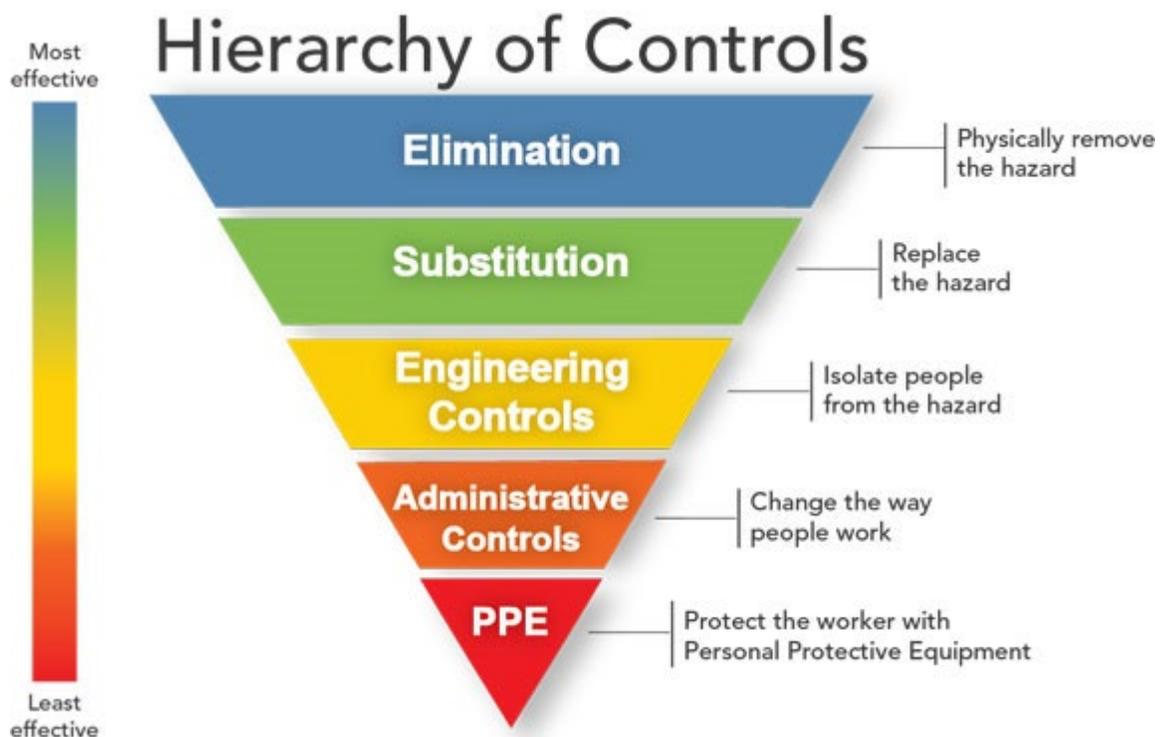
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The Washington State Department of Labor and Industries (L&I) in [WAC 296-800-160](#) Personal Protective Equipment (PPE) requires all employers to assess their workplace for hazards that might require the use of personal protective equipment. If PPE has to be used, the supervisor must select the proper equipment and require its use.

## HAZARD CONTROL

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Eliminating hazards through engineering or administrative control measures is the best way to protect people. The strategy used for the selection of controls is called the “hierarchy of controls” which prioritizes the types of controls that are most effective in eliminating or reducing the risk of exposure to the hazard.



PPE is the least effective method for controlling or preventing exposure to a hazard. PPE provides a barrier to protect the worker from potential exposure to hazards, however due to the reliance on the worker to select, wear and maintain PPE, the likelihood of exposure to the hazard with PPE alone increases.

In some cases, PPE is required by regulations or internal procedures and can provide an additional control to help protect the worker. This guide will provide information and tools to assess PPE, manage and understand the limitations of PPE.

## SUPERVISOR RESPONSIBILITIES

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Each Supervisor has the responsibility to review all of their employees' jobs for PPE needs. The regulations, the degree of hazard, and the engineering or administrative controls that are in place will determine what PPE is needed. If departments will be using PPE for personnel hazards, the following items must be completed:

- Assess the workplace for hazards
- Select appropriate PPE
- Ensure PPE is used
- Establish inspection, maintenance and replacement procedures to make sure damaged PPE is not used
- Train employees in proper use, limitations, care and maintenance of PPE
- Document assessment, selection, and training

If all of the above mentioned items are documented in existing departmental procedures, such as a laboratory safety manual, departmental Standard Operating Procedures (SOPs) or Job Hazard Analyses (JHAs), for all employee worksites, then no further work is needed.

When the hazard assessment indicates that PPE is required, employing departments must provide the PPE to employees free of charge. Exceptions are prescription safety glasses and safety shoes.

Where a hazard assessment determines that no PPE is needed, document the assessment and you are done. However, remember that if a hazard exists which does not require PPE, other regulations or programs may be applicable. Contact EH&S if you have questions or concerns.

## HOW TO USE THIS GUIDE

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This guide is designed to help departments, organizations, and units, and supervisors in the steps to assess their workplace, select the right equipment, train employees and document this work. In addition, EH&S has developed the following "PPE Tools" for laboratories and shops to assist Principle Investigators (PIs), laboratory managers and shop supervisors in assessing and documenting hazards and appropriate PPE for their specific work areas.

- [Laboratory PPE Hazard Assessment Guide](#)
- [Shop PPE Hazard Assessment Guide](#)

## Step One: Assessment

Select the job, process or procedure you are going to assess. Survey the worksite and identify the hazards the worker will be exposed to while doing the work. Use one of the EH&S PPE Hazard Assessment Guides or a worksheet of your own to list the identified hazards. The HAZARD CONTROL AND PPE section below may help determine the hazards.

## Step Two: PPE Selection

If PPE must be used, list the PPE that will be used for each hazard identified on your form. The supervisor or person completing the assessment and selection must sign and date the form.

## Step Three: Training

After the assessment and selection, employees required to use PPE must be trained before they are required to use the PPE. Retraining must be done if PPE requirements change and as needed. All of the following must be covered:

- What PPE to use and when to use it
- Limitations of the PPE
- How to put it on, take it off and adjust it
- Inspection and maintenance
- Any manufacturer instructions and warnings
- Make sure the PPE fits well
- How to obtain PPE
- How to dispose of PPE

## Step Four: Documentation

The following information must be retained by University departments to document the PPE hazard assessment, PPE selection and training.

- Job, process, or activity being assessed
- Hazards identified
- Selection of PPE used for each hazard identified. PPE type, brand, model may need to be specified.
- Person(s) or job title identified to use PPE
- Name and title of person completing the hazard assessment
- Date hazard assessment was completed
- Name, title, training date for all employees required to wear PPE.

Forms are included in the laboratory and shop PPE hazard assessment guides. You may devise your own method for documenting these actions.

*Remember:* Departments that record this information in existing policies or procedures may continue to use their current method and do not need to create new documentation for PPE.

For example, laboratories write an SOP as part of their Chemical Hygiene Plan. A properly written SOP contains all of the needed information along with documentation of the employee training.

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## HAZARD CONTROL AND PPE

This section provides an overview of exposure controls and PPE that may be needed for a variety of tasks that have potential hazards. For specific task procedures and recommended controls in laboratories, consult the Laboratory Safety Manual; for Shops and Maintenance work, consult the UW Facilities employee website.

<b>Laboratory workers</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Working with low hazard chemicals when a low probability of splash exists	Skin and eye irritation	Fume hood, local exhaust, good general ventilation, enclose process	Safety glasses Light chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with smaller amounts (<1 liter) of corrosive or injurious chemicals where a reasonable probability of splash exists	Skin and eye damage	Fume hood, local exhaust, good general ventilation, enclose process Bench top shield	Chemical splash goggles Light chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with larger quantities of corrosive liquids (> 1 liter), or toxic corrosives	Large surface area skin and eye damage Poisoning, or great potential for eye and skin damage	Fume hood, local exhaust, good general ventilation, enclose process	Chemical splash goggles & face shield Appropriate heavy chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts) and chemical resistant apron
Working with small volumes of organic solvents (< 1 liter)	Skin and eye damage Slight poisoning potential through skin absorption	Fume hood, local exhaust, good general ventilation, enclose process	Safety glasses, goggles if splash hazard exists Light chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with large volumes of organic solvents (> 1 liter), highly toxic organic solvents or work which may create a splash hazard	Major skin and eye damage Potential poisoning through skin absorption	Fume hood, local exhaust, good general ventilation, enclose process Bench top shield	Safety goggles & face shield Appropriate heavy chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts) and chemical resistant apron
Working with small volumes of human blood, body fluids or other potentially infectious materials (OPIM) as defined in the UW Bloodborne Pathogen Exposure Control procedures	Potentially infected with infectious disease (BBP) Potential spread of infectious disease	Biological safety cabinet (BSC)	Safety glasses Disposable nitrile gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)

<b>Laboratory workers (continued)</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Working with large volumes of human blood, body fluids or other potentially infectious materials and/or splash hazards	Increase potential of becoming infected with infectious disease (BBP) Increased potential spread of infectious disease	BSC Bench top shield	Safety goggles & face shield, nitrile gloves, lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts), coveralls and foot covers may be necessary
Working with hazardous powders	Potential skin and eye damage Potential for poisoning through skin absorption	Fume hood, good general ventilation, enclose process	Safety glasses, goggles for large quantities Light chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with acutely toxic hazardous powders	Great potential skin and eye damage Great potential for poisoning through skin absorption	Fume hood, good general ventilation, enclose process	Safety goggles Appropriate chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts), coveralls and booties if necessary
Working with dispersible radioactive materials	Potential tissue damage Potential spread of radioactive contamination	Shield the source Minimize exposure time Increase distance to source	Appropriate eye protection Disposable nitrile gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with radioactive chemicals (corrosives, solvents, toxics, etc.)	See appropriate chemical section above Potential tissue damage Potential spread of radioactive contamination	Fume hood, good general ventilation, enclose process	Safety glasses, goggles for splash hazard Light chemical resistant gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts). Use PPE for applicable tasks above.
Working with radioactive human blood, body fluids or other potentially infectious materials	Potential tissue damage Potential spread of radioactive contamination Potential exposure to OPIM	BSC Shield the source Minimize exposure time Increase distance to source	Safety glasses, goggles for splash hazard Disposable nitrile gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with sealed radioactive sources	Damaged or leaking source may spread contamination Some leaking sources may pose an external dose risk.	Fume hood Bench top shield Minimize exposure time Increase distance to source	Safety glasses Light gloves Shield may be needed for high energy source

<b>Laboratory workers (continued)</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Working with cryogenic liquids	Major skin, tissue and eye damage	Good general ventilation	Chemical splash goggle and face shield Cryogenic insulated gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with very cold materials and equipment (freezers, dry ice)	Frostbite Hypothermia	Use tools to handle objects Well insulated storage containers	Safety glasses Insulated gloves and warm clothing Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with hot liquids, equipment and/or open flames (autoclave, Bunsen burner, water bath, oil bath)	Skin damage Eye damage	Exhaust heat, good general ventilation Equipment guards	Safety glasses or goggles for large volumes or splash hazards Insulated gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with large volumes of hot, cold, or cryogenic liquids	Major skin and eye damage Frozen or burned body tissues	Excellent general ventilation Well insulated storage containers	Safety glasses or goggles and face shield Heavy insulated gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts), apron or coveralls
Working with Ultraviolet Radiation	Conjunctivitis Corneal eye damage Erythema	Guard source or use bench top shield	UV face shield and goggles Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Working with LASER radiation	Retinal eye damage Skin damage	Guard source or use bench top shield	Appropriate shaded goggles with optical density based on individual beam parameters Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts) No jewelry/reflective items allowed
Working with Infrared emitting equipment (glass blowing)	Cataracts and flash burns to cornea	Guard source or use bench top shield	Appropriate shaded goggles Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)
Arc/TIG welding	Conjunctivitis Corneal eye damage Erythema	Local exhaust ventilation, excellent general ventilation Shielding	Appropriate shaded goggles, welder's helmet with appropriate eye shade (see Appendix A) Working gloves
Instrument or equipment repair/service	Eye damage from foreign objects	Equipment guards Local exhaust	Safety glasses No loose clothing or jewelry
Metal working/Woodworking shop	Eye damage from foreign objects	Equipment guards Local exhaust	Safety glasses No loose clothing or jewelry
Glassware washing	Skin lacerations	Designated area Appropriate equipment and supplies	Safety glasses Heavy rubber gloves Lab coat, closed shoes, long pants, long skirt or equivalent leg covering (no shorts)

<b>Laboratory workers (continued)</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Working in Industrial lab with potential injury from falling equipment or tools (ex. Earthquake lab, Structural Engineering lab, etc.)	Head injury, foot injury	Equipment bracing, securements, tool lanyards	Hard hat Steel toe shoes

<b>Shop and Maintenance workers</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Automobile/Heavy Equipment Mechanic Work	Flying particles, petroleum solvents and wastes	Equipment guards, shielding Local exhaust, good general ventilation Good housekeeping	Safety glasses, chemical resistant gloves
Locksmith Work	Flying particles	Equipment guards, shielding Local exhaust, good general ventilation Good housekeeping	Safety glasses, face shield when using high speed tools
Wood Working Work (Shop)	Noise, flying particles, lifting/carrying, rough surfaced materials	Equipment guards, shielding Local exhaust, good general ventilation Good housekeeping Insulate, secure noisy equipment	Hearing protection, safety glasses, face shield for high speed tools, puncture/cut resistant gloves, safety shoes, guards in place
Metal Working Work (Shop)	Noise, flying particles, lifting/carrying, rough surfaced materials, metal working chemicals	Equipment guards, shielding Local exhaust, good general ventilation Good housekeeping Insulate, secure noisy equipment	Hearing protection, safety glasses, face shield for high speed tools, puncture/cut resistant gloves, safety shoes, guards in place
Painting (Shop)	Vapors, mists, solvents and chemicals, flammables	Local exhaust, good general ventilation Good housekeeping	Safety glasses, organic vapor respirator w/particulate pre-filter, chemical resistant gloves
Power Plant Work	Hot surfaces, contact with surfaces (head), noise	Equipment guards, shielding Local exhaust, good general ventilation Insulate, secure noisy equipment	Heat resistant gloves, hard hats, hearing protection
Tunnel Work	Contact (head), restricted access areas, heat stress, hot surfaces	Good general ventilation, lighting	Hard hat, light clothing, temperature resistant gloves, safety glasses
Elevator Maintenance Work	Uncovered electrical switches and circuits, falling, moving machinery	Equipment guards, shielding Local exhaust, good general ventilation	Electrically insulated gloves (rated for energized voltage), fall protection, cut/puncture resistant gloves

<b>Shop and Maintenance workers (continued)</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Confined Space Work	Hazardous atmosphere, restricted exit, other depending on nature of the space	Warning signs, restricted entry, permit may be required per UW Confined Space Entry Program	Determine appropriate personal protective equipment in accordance with the UW Confined Space Entry Program
Arc Welding or Cutting	Electric shock, metal sparks, molten and hot metal, UV, IR and visible light, falling, dropping, rolling and sharp objects	Local exhaust ventilation, excellent general ventilation Shielding	Insulating mats or blankets, insulated/heat and puncture/cut resistant gloves, safety shoes, hard hat, safety glasses, welding shield or helmet with appropriate eye shade (see Appendix A).
Oxy-fuel Welding or Cutting	Metal sparks, molten and hot metal, UV, IR and visible light, falling, dropping, rolling and sharp objects	Local exhaust ventilation, excellent general ventilation Shielding	Heat and puncture/cut resistant gloves, safety shoes, hard hat, safety glasses, welding shield or helmet with appropriate eye shade (see Appendix A)
Torch Brazing	Metal sparks, molten and hot metal, UV, IR and visible light, falling, dropping, rolling and sharp objects	Local exhaust ventilation, excellent general ventilation Shielding	Heat and puncture/cut resistant gloves, safety shoes, hard hat, filter lens spectacles or goggles, or safety glasses and hand shield, with appropriate eye shade (see Appendix A).
Torch Soldering	Molten and hot metal, UV, IR and visible light, falling, dropping, rolling and sharp objects	Local exhaust ventilation, excellent general ventilation Shielding	Heat and puncture/cut resistant gloves, flame resistant clothing, safety shoes, hard hat, filter lens spectacles or goggles, or safety glasses and hand shield, with appropriate eye shade (see Appendix A).
Metal Grinding or Chipping	Metal sparks and chips, falling, dropping, rolling and sharp objects	Local exhaust ventilation, excellent general ventilation Shielding	Heat and puncture/cut resistant gloves, typical work clothing, safety shoes, safety glasses, full face shield
Carpentry Work (Construction Site) Masonry Work (Construction Site) Laborer Work (Construction Site)	Flying particles, falling, falling objects, cuts/punctures, lifting/carrying	Equipment guards, secure objects and tools, guard rails, warning lines	Safety glasses, safety shoes, hard hat, cut/puncture resistant gloves, fall protection when working at elevations. When using high speed power tools, a face shield.
Painting Work (Construction Site)	Flying particles, falling, falling objects, cuts/puncture, lifting/carrying, cleaning solvents	Equipment guards, secure objects and tools, guard rails, warning lines	Safety glasses, safety shoes, hard hat, cut/puncture resistant gloves, chemical resistant gloves, fall protection when working at elevations. When using high speed power tools, a face shield.
Roofing Work	Falling, hot surfaces, heat and cold stress, sealing chemicals, solvents, lifting/carrying	Installed roof anchors, guard rails, warning lines, fall protection plans	Safety glasses, safety shoes, fall protection, heat resistant gloves, chemical resistant gloves. Temperature stress protective clothing, depending on weather conditions.

<b>Shop and Maintenance workers (continued)</b>			
<b>Task(s)</b>	<b>Potential Hazard</b>	<b>Controls</b>	<b>PPE</b>
Sheet Metal Work (Construction Site)	Flying particles, lifting/carrying, rough surfaced materials	Equipment guards	Safety glasses, safety shoes, puncture/cut resistant gloves. When using high speed power tools, a face shield.
Low Voltage Electrified Equipment Work	Electric shock, falling	Equipment guards and insulation, guard rails, warning lines, fall protection plans	Electrically insulated gloves (rated for voltage of energized equipment), insulated blankets or mats, non-synthetic work clothing, fall protection when working at elevations
High Voltage Electrified Equipment Work	Electric shock, arc, explosion and burns, falling, confined spaces, vehicles in traffic areas	Equipment guards and insulation, guard rails, warning lines, fall protection plans	Hard hat, safety glasses, face shield, insulated gloves (rated for voltage of energized equipment), insulated blankets or mats, non-synthetic work clothes, safety shoes, fall protection when working at elevations, reflective clothing when working near traffic
Air Conditioning/Refrigeration Work	Water treatment chemicals	Good general ventilation	Chemical resistant gloves, safety glasses. When using large quantities of chemicals, a face shield & goggles
Plumbing Work	Hot surfaces, rough surfaced materials, sewage		Heat resistant gloves, safety glasses, cut/puncture resistant gloves, rubber gloves
Carpentry Work Operating wood and metal saws and other power tools	Eye hazard, cuts from blade, noise	Equipment guards	Safety glasses with side shields or goggles, face shield, hearing protection, guard in place Gloves appropriate for work
Moving wood and metal pieces, lifting	Foot hazard, dropping objects and piercing objects, wood splinter, pinch		Leather work shoe/boot with thick sole, gloves
General Maintenance Work	Rough surfaced materials, lifting/carrying		Cut/puncture resistant gloves, safety glasses, safety shoes
Custodial Work	Cleaning chemicals, splashes	Good ventilation and housekeeping in chemical storage areas	Chemical resistant gloves, safety glasses. When pouring large quantities of chemicals, a face shield & goggles.
Refuse Work	Noise, sharp objects, garbage		Hearing protection, safety glasses, cut/puncture resistant gloves, rubber gloves, safety shoes
Grounds Keeping Work	Pesticides, noise, flying particles, heat stress, insect and plant toxins	Good ventilation and housekeeping in chemical storage areas	Hearing protection, safety glasses, gloves, protection from pesticides according to label, application, and reentry requirements, skin protection from insects and plants, safety shoes, gloves, respiratory protection as needed

Shop and Maintenance workers (continued)			
Task(s)	Potential Hazard	Controls	PPE
Pest Management Work	Pesticides, animals and plants	Good ventilation and housekeeping in chemical storage areas	Safety glasses, gloves, protection from pesticides according to label, application, and reentry requirements, skin protection from animals and plants, respiratory protection as needed
Tree Trimming work	Pesticides, falling, noise, flying particles, heat stress, insect and plant toxins	Good ventilation and housekeeping in chemical storage areas	Fall protection, hearing protection, protection from pesticides according to label, application, and reentry requirements, skin protection from insects and plants, safety shoes, safety glasses, gloves
Moving Work	Lifting/carrying	Provide carts, hand trucks	Safety shoes, gloves

## PPE SELECTION

PPE selection should be based on a job hazard analysis (JHA), which includes evaluation of hazards, specific tasks, procedures and work practices, in consultation with area supervision and EH&S as needed. See the [EH&S Job Hazard Analysis webpage](#) for more information and link to a template JHA. This PPE selection guidance is not intended to be a comprehensive resource on PPE.

[Eye and Face Protection](#)

[Hand Protection](#)

[Skin and Body Protection](#)

[Respiratory Protection](#)

[Bench Top Shields](#)

[Head Protection](#)

[Foot and Leg Protection](#)

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[Arc Flash Protective Clothing and PPE for Electrical Workers](#)

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## Eye and Face Protection

Safety glasses, safety goggles, laser eyewear, face shields and helmets provide a level of protection as designated by the manufacturer. The hazard and the protection standards for each piece of eye and face protection PPE must be considered during selection.

PPE	Specific Type	Characteristics	Applications
<b>Safety glasses</b>  Comply with ANSI Z87.1		Polycarbonate lens, side shields [Note: Personnel with corrective lenses will need "over-prescription" safety glasses or prescription safety glasses. See Appendix B for procedure to obtain prescription safety glasses]	Working with chemical, biological, radiation, physical hazards
<b>Goggles</b>  Comply with ANSI Z87.1	Direct vented  	Allows the flow of air into the goggle. Protection from impact	Working with particulates  [Tends to fog less, but should not be used with liquid or fine dust hazards]
	Indirect vented  	Provides protection from splash entry by a hooded or covered vent	Protection from particulates and from chemical splash
	Non-vented  	Provides protection against the passage of dust, mist, liquid and vapors	Protection from particulates, chemical splash, and mist, liquid and vapors
<b>Disposable medical eye shield</b>		Provides protection from splash, spray, spatter or droplets of blood or other potentially infectious materials.  [Not ANSI Z87.1 compliant]	Health care, biological hazards  [Note: Not for protection from chemical, physical, and impact hazards]

(continued)

PPE	Specific Type	Characteristics	Applications
<b>Laser eyewear</b>		Appropriately shaded goggles; optical density based on beam parameters	Working with Class 3 or Class 4 lasers, consult laser use authorization for specific applications.
<b>Surgical/procedure mask</b>		Protects nose and mouth from direct contact with biological and chemical fluids; prevents spread of aerosolized infectious biological agents	Anatomical, surgical, medical and clinical settings [Note: Mask is <b>not</b> a respirator that protects from breathing anything into the lungs.]
<b>Face shield</b>  Comply with ANSI Z87.1		Impact and chemical resistant face shield must be combined with safety glasses or goggles	For use with potential chemical splash or projectiles, apparatus under pressure or vacuum, cryogenics handling
<b>Disposable medical face shield</b>		Provides protection from splash, spray, spatter or droplets of blood or other potentially infectious materials  [Not ANSI Z87.1 compliant]	Health care, biological hazards  [Note: Not for protection from chemical, physical, and impact hazards]
<b>Optical face shield</b>		Face shield with special optical density (OD) value for ultraviolet radiation (UV) or infrared shielding	Working with UV or infrared emitting equipment

(continued)

PPE	Specific Type	Characteristics	Applications
<p><b>Welder's goggles</b></p>		<p>Impact resistant lenses and available in graduated shades of light filtration</p>	<p>Welding with potential sparking, scaling, harmful light rays</p>
<p><b>Welder's helmet</b></p>		<p>Durable helmet with filtered lens Ensure proper shade number is chosen for darkness of the lens. See Appendix A.</p>	<p>Welding to protect eyes and face against heat, sparks, flash burn, ultraviolet or infrared light</p>
<p><b>Arc-rated face shield</b></p>		<p>Specialized electrical safety equipment for facial protection</p>	<p>Electrical safety applications with higher hazard/risk or unknown</p>

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## Hand Protection

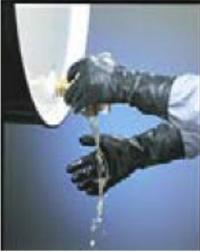
Gloves should be selected for each procedure to provide protection from the hazards. In some circumstances there may be several hazards and glove selection may involve different gloves for different steps of the procedure and/or several layers of gloves may be needed to address all hazards. For example, when injecting radioactive materials into a research animal one may need a layer of disposable gloves for protection from the radioactive liquid augmented with a metal mesh glove for protection from animal bites.

In general, heavy loose gloves should not be worn around moving machinery. Moving parts can pull the glove, hand and arm into the machine.

For glove chemical resistance and permeation information consult the glove manufacturer’s website or contact EH&S for assistance. The SDS of chemicals may also provide specific glove recommendations and information.

PPE	Specific Type	Characteristics	Applications
<b>Disposable gloves, thin-gauge* (&lt;8 – 10 mils)</b>  [Note: Avoid powdered gloves - banned in medical use, possible inflammation and allergic reactions]	Disposable nitrile gloves 	Some chemical resistance – consult glove resistance chart, incidental chemical contact only	Working with biological hazards and chemical hazards of small quantity
	Disposable vinyl gloves 	Economical and thin	Working with biological hazards, <b>not</b> for chemical handling
	Disposable latex gloves 	Some chemical resistance – consult glove resistance chart, incidental chemical contact only  [Note: some workers may be allergic to latex]	Working with biological hazards (known or potentially infectious materials including work with animals)
<b>Leather gloves</b>		Protect and comfort hands from moderate temperatures, sharp objects, damage by friction	Handling sharp objects and metal, field work, welding
<b>Wire mesh gloves</b>		Cut resistant	Working with sharp instruments or live animals

(continued)

PPE	Specific Type	Characteristics	Applications
<p><b>Chemical resistant gloves, multi-use*</b></p> <p>[Note: Avoid powdered gloves - banned in medical use, possible inflammation and allergic reactions]</p>	<p>Natural rubber latex</p> 	<p>Good resistance to biological or water-based materials, poor organic solvent resistance – consult glove resistance chart</p>	<p>Working with small volumes of aqueous-based low hazard chemicals</p>
	<p>Nitrile gloves</p> 	<p>Chemical resistant to many chemicals – consult glove resistance chart</p>	<p>Working with larger volumes of chemicals</p>
	<p>Butyl gloves</p> 	<p>Generally good chemical resistance to many chemicals – consult glove resistance chart</p>	<p>Working with larger volumes of chemicals, hazardous material spills</p>
	<p>Viton® II gloves</p> 	<p>Generally good chemical resistance to many chemicals, consult glove resistance chart</p>	<p>Working with larger volumes of chemicals, hazardous material spills</p>
	<p>Silver Shield gloves</p> 	<p>Generally good chemical resistance to many chemicals, consult glove resistance chart, may need overglove for manual dexterity</p>	<p>Working with larger volumes of chemicals, hazardous material spills, good resistance to methylene chloride</p>

(continued)

PPE	Specific Type	Characteristics	Applications
Insulated gloves	<p>Terrycloth autoclave gloves</p> 	Heat resistant	Working with hot equipment
	<p>Flame resistant (FR) gloves and glove liners</p> 	Heat resistant due to fabric construction and properties, some typical materials include Nomex® and leather, Nomex® and lycra blend, Rhovv/ESD carbon filament, and acrylic/FR rayon knit. Gloves may be referred to as “flight gloves”	Some pyrophorics handling, liners can be worn under chemical-resistant gloves, flight gloves can be worn over chemical-resistant gloves. Consult EH&S for the best FR glove for your needs and materials.
	<p>Cryogen gloves</p> 	Water resistant protection against ultra-cold temperatures	Cryogenics handling
Electrical safety gloves		Insulated voltage-rated rubber, gauntlet length, leather gloves worn over to protect against cuts, abrasions and punctures The different voltage classes of gloves are as follows: Class 00 – up to 500 volts Class 0 – up to 1000 volts Class 1 – up to 7500 volts Class 2 – up to 17,000 volts Class 3 – up to 26,500 volts Class 4 – up to 36,000 volts	Electrical safety applications with higher hazard/risk or unknown

\*Always check the manufacturer’s chemical resistance and permeation guides before selecting chemical-resistant gloves.

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## Skin and Body Protection

Laboratory coats, scrubs, uniforms and disposable body coverings provide a level of protection from splash hazards. Special hazards and material qualities such as flame resistance, specific chemical resistance, physical strength (e.g., leather) and visibility should be considered when selecting PPE for skin and body protection.

PPE	Specific Type	Characteristics	Applications
Disposable sleeves		Disposable clothing and skin protection, protection from particulates Some sleeve materials are coated for chemical resistance	Working with particulates or potent compounds
Disposable gowns		Clothing and skin protection, manufactured from variety of materials depending upon needed application	Working with biohazards and animals
Scrubs		Provides a layer of protection for the skin and/or clothing from contact with biological and chemical fluids	Working in clinical, medical and surgical settings as needed
Tyvek gown/coveralls		Clothing and skin protection, tear resistant, protection from particulates Some Tyvek clothing is coated for chemical resistance	Working with biohazards, chemicals, animals or airborne particulates
Safety (visibility) vest		Colorful and/or reflective	Construction sites, traffic hazard areas, emergency response
Cooling vest		Compartments contain chemical coolant and can be heavy	Hot environments

(continued)

PPE	Specific Type	Characteristics	Applications
<p><b>Lab coats (knee length)</b></p>	<p>Cotton</p> 	<p>Protects skin and clothing from dirt, inks, non-hazardous chemicals, biohazards without aerosol exposure</p>	<p>General use; chemical, biological, radiation, physical and animal hazards</p>
	<p>Barrier</p> 	<p>Does not permit blood or other potentially infectious materials to pass through due to 3-layer construction</p>	<p>Working with human blood, body fluids, tissues, cells or other potentially infectious material which may contain human bloodborne pathogens</p>
	<p>Flame Resistant (FR)</p> 	<p>Flame resistant (e.g. Nomex or flame resistant cotton)</p>	<p>Working with water or air reactive chemicals, flammable solvents, potentially explosive chemicals</p>
<p><b>Flame resistant coveralls</b></p>		<p>Flame resistant (e.g. Nomex or flame resistant cotton)</p>	<p>Working with water or air reactive chemicals, flammable solvents, potentially explosive chemicals, welding, or electrical systems</p>
<p><b>Reflective clothing</b></p>		<p>Flame and heat resistant (aluminized flame resistant material)</p>	<p>Working in hot environments, welding</p>
<p><b>Leather apron, jacket, coveralls and sleeves</b></p>		<p>Leather clothing</p>	<p>Welding or other shop work with potential sparks or projectiles</p>

(continued)

PPE	Specific Type	Characteristics	Applications
<b>Aprons</b>	Flame resistant (FR) apron 	Flame resistant (e.g. Nomex or flame-resistant cotton)	Working with flammable solvents, welding or electrical systems
	Rubber-coated wash apron 	Chemical splash protection, good abrasion resistance	Working with apparatus under pressure, splash potential of hazardous liquids
	Neoprene apron and sleeves 	Chemical resistant, tear resistant, splash protection	Working with apparatus under pressure, splash potential of hazardous liquids

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## Respiratory Protection

In a laboratory, airborne contaminants are kept very low through adequate general room ventilation and by working with open containers of volatile materials inside a chemical fume hood or enclosure designed to effectively capture air contaminants at the source. When airborne contaminants cannot be adequately controlled by engineered exhaust ventilation respiratory protection may be needed. The use of respiratory protection has very stringent regulatory requirements. Users must participate in the [UW Respiratory Protection Program](#), which includes medical clearance, annual training and fit testing.

Although not respirators, different types of face masks are listed because they may be used for protection in various environments under certain conditions. See the chart [Masks and Respirators – Understanding the Difference in Appendix C](#) for more information.

PPE	Specific Type	Characteristics	Applications
<b>Cloth masks</b>		Not a respirator, surgical or procedure mask ( <i>does not require fit testing</i> ). May protect persons nearby from wearer’s respiratory emissions (speaking, coughing, sneezing).	Infection control in office work areas, public environments
<b>Surgical and procedure masks</b>		Not a respirator ( <i>does not require fit testing</i> ). Protects the wearer against large droplets, splash and/or aerosols. Protects persons nearby from the wearer’s respiratory emissions (speaking, coughing, sneezing).	Infection control, working in clinical settings, working with live animals or potentially infectious materials
<b>Dust mask</b>		Not a respirator. May protect against dusts, fumes, mists, microorganisms including animal allergens ( <i>does not require fit testing</i> ).	Dusty environments, working with live animals or potentially infectious materials
<b>N95 respirator</b>	  Respirator pictured has an exhalation valve option that reduces exhalation resistance, which makes it easier to breathe (exhale). Also may keep face cooler and reduce moisture build up inside the facepiece.	Protects against dusts, fumes, mists, microorganisms including animal allergens  N95 respirators filter at least 95% of airborne particles. They are not resistant to oil.	Dusty environments, working with live animals or potentially infectious materials

(continued)

PPE	Specific Type	Characteristics	Applications
Healthcare Surgical N95 respirator	<p>flat-fold </p> <p>molded </p>	<p>Certified as surgical mask, meets fluid resistance standards. Reduces particles both inhaled and expelled by wearer (plus fluid resistance)</p> <p>Note: Exhalation valves are not installed in Healthcare N95 respirators since the valves do not filter exhaled breath.</p>	<p>Used during surgery and other tasks when both:</p> <ul style="list-style-type: none"> <li>• Wearer requires respiratory protection, <b>and</b></li> <li>• Expelled particulates must be contained or fluid resistance is required</li> </ul>
N99 and N100 respirators	<p>N99 </p> <p>N100 </p>	<p>N100 highest rated filtration efficiency for disposable respirator.</p> <p>N99 respirators filter at least 99% of airborne particles. N100 respirators filter at least 99.97% of airborne particles. They are not resistant to oil.</p>	<p>N100 - for solid particulates and liquid mists in concentrations not exceeding 10X PEL/OEL (lead, arsenic, cadmium)</p>
R95, R95 AG, R95 OV respirators  R99, R100 (not common)	<p>R95 </p> <p>R95 OV </p>	<p>R95 protects against liquid or oil based particles from sprays that do not also emit vapors. R95 AG also protects against nuisance levels of acid gases. R95 OV has carbon layer to reduce nuisance odors from organic vapors. (Nuisance level refers to concentrations not exceeding PEL/OEL whichever is lower.) R95 respirators filter at least 95% of airborne particles. They are somewhat resistant to oil.</p>	<p>Somewhat oily environments. Processes that may emit acid gases (R95 AG). Workshop odors from painting, dust (R95 OV)</p>
P95, P95 AG, P95 OV and P100 respirators  P99 (not common)	<p>P95 </p> <p>P100 </p>	<p>P95 and P100 protects against certain oil and non-oil based aerosol particles. P95 AG also protects against nuisance levels of acid gases. P95 OV has carbon layer to reduce nuisance odors from organic vapors. (Nuisance level refers to concentrations not exceeding PEL/OEL whichever is lower.) P95, P99, and P100 respirators filter at least 95%, 99%, and 99.97% respectively, of airborne particles. They are strongly resistant to oil.</p>	<p>Work with petrochemicals, pharmaceuticals, dusty, oily environments. P100 for lead, arsenic, cadmium in oily environments.</p>

(continued)

PPE	Specific Type	Characteristics	Applications
<b>Cartridge respirator</b>	Half face air-purifying 	Protects against variety of particulates, vapors, dust, mists, fumes, or a combination of these; depends on filter or cartridge used	Dusty environments, potentially infectious materials, chemical vapors, particulates, and select gases (cartridge dependent)
	Full face air-purifying 	Similar to half-face, but with greater protection factor, and greater protection of eyes and face; depends on filter or cartridge used	Dusty environments, potentially infectious materials, chemical vapors, particulates, and select gases (cartridge dependent)
<b>Powered air-purifying respirator (PAPR)</b>		Powered air purifying respirator delivers steady supply of filtered air with loose fitting hood; can be used with HEPA filters or chemical cartridges	Working in some BSL-3 environments, high levels of chemical vapors, particulates. For persons with facial hair.
		Powered air purifying respirator for welders, selection of shades, HEPA filter	Welding in low ventilation areas; tack welding, stick, MIG/MAG, TIG >1A, plasma, grinding
<b>Self-contained breathing apparatus (SCBA)</b>		Bulky, limited operation time, highly protective (mostly used by emergency response personnel)	Used in oxygen deficient atmospheres, immediately dangerous to life or health (IDLH) or areas of high concentration or unknown airborne contaminants

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## Bench Top Shields

Laboratories and shops may have needs for shielding of certain procedures or operations. The hazards must be thoroughly evaluated before selecting proper shields.

PPE	Specific Type	Characteristics	Applications
Radiation shields		Different styles based on the isotope and type of radiation. There are beta and gamma rated shields	For use when handling beta emitting isotopes and offers some splash protection
Safety shield		Acrylic, 1 and 3-sided available	Protects from chemical splash
Blast shield		Made from ballistic material	Protects from explosive and over-pressure blasts

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## Head Protection

Head protection may be as simple as a disposable bouffant surgical cap to protect the head from aerosols during surgical operations, or a hard hat to protect from overhead hazards. Electrical work may require arc flash protection of the head, face, hands and body; please consult your supervisor or EH&S safety staff for guidance.

PPE	Specific Type	Characteristics	Applications
<b>Bouffant cap</b>		Economical protection for hygienic work environments; protection from dirt, dust	Working with biohazards, surgical applications, animal facilities
<b>Flame resistant balaclava</b>		Specialized electrical safety equipment	Electrical safety applications with higher hazard/risk or unknown
<b>Bump cap</b>		Light-weight plastic cap used to protect against scraping or bumping one's head	Designed for use in areas with low head clearance. 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.

(continued)

PPE	Specific Type	Characteristics	Applications
<p><b>Hard hat</b></p>		<p>Light-weight, metal or reinforced plastic to protect against overhead hazards incorporates a suspension to dissipate impact from falling objects</p> <p>Hard hats have an expiration date and should be replaced before they expire.</p>	<p>Hard hats are divided into three industrial classes: <b>Class A</b> hard hats provide impact and penetration resistance along with limited voltage protection (up to 2,200 volts). <b>Class B</b> 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. <b>Class C</b> hard hats provide lightweight comfort and impact protection but offer no protection from electrical hazards.</p>

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## Foot and Leg Protection

Foot protection may be simple disposable shoe covers to minimize spread of contamination. In food service and vivariums, slip resistant shoes may reduce the risk of slips, trips and falls. In shops and industrial activities, the supervisor must evaluate the hazards and select foot protection accordingly.

PPE	Specific Type	Characteristics	Applications
Shoe cover		Protection from dirt, dust; maintenance of hygienic work environments, non-slip soles	Working with biohazards, animal facilities, or potential floor contaminants
Foot/shin guards, knee pads		Typically strap on to legs or feet  If hazard is severe, use safety shoes with metatarsal guards.	Use of high-pressure washers, protection of shins and feet when handling heavy materials.  Protection of knees when kneeling.
Slip resistant shoes		Shoe with sole designed to enhance traction in slippery work environments	Working in animal facilities, custodial applications, food service facilities, medical/clinical settings, and shops
Safety shoes		Toe, metatarsal, foot protection, steel reinforcements and inserts. There are numerous types of safety shoes for specific applications.  See Appendix B for information on obtaining safety shoes.	Handling heavy items, construction, warehouse applications, agricultural field work

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## Hearing Protection

In general, if workplace noise is loud enough that you cannot hold a conversation with a person one arm length away, then a noise assessment must be performed by EH&S prior to PPE selection. Some exposures may require enrollment in the UW [Hearing Conservation Program](#), which includes annual hearing tests and training. All hearing protection comes with a “Noise Reduction Rating” or NRR; the higher the rating, the better the protection.

PPE	Specific Type	Characteristics	Applications
Ear plugs		Disposable, inexpensive	Working with loud equipment, noises, sounds, alarms, etc.
Canal caps		Inexpensive, easy to insert, not as effective as ear plugs, but easier to insert with soiled hands	Working with loud equipment, noises, sounds, alarms, etc.
Ear muffs		Reusable, not as effective when worn with safety glasses	Working with loud equipment, noises, sounds, alarms, etc.

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## Fall Protection

A fall protection system is needed where there is a potential for injury due to falling while working at elevated height. Consult with EH&S prior to procurement of any items for a fall protection system. Fall protection regulations are contained in both General Industry Standards and Construction Standards. Proper training and inspection of equipment is required under these regulations. For additional information refer to the [EH&S Fall Protection Program Manual](#) and the [EH&S Fall Protection webpage](#).

PPE	Specific Type	Characteristics	Applications
<b>Full body harness</b>		Provides protection from injury while falling from heights	Working at heights (greater than 6 feet) and confined space retrieval
<b>Locking carabiner</b>		Connect components of a fall protection system	Working at heights (greater than 6 feet) and confined space retrieval
<b>Shock absorbing lanyard</b>		Provides connection from harness to anchor point with ability to lessen fall force factor, working length of 6 feet	Working at heights (greater than 18.5 feet of fall clearance) for fall arrest situations
<b>Self-retracting lifeline w/swivel</b>		Provides connection from harness to anchor, shorter activation distance reduces fall force factor	Working at heights for fall arrest situations where greater worker mobility is needed
<b>Anchor</b>		Primary point of attachment for a fall protection system, minimum 5,000 pound breaking strength	Working at heights (greater than 6 feet) and confined space retrieval

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## Arc Flash Protective Clothing and PPE for Electrical Workers

Hazard/risk category	Minimum arc rating (cal/cm <sup>2</sup> )	Arc-rated clothing	Fire-rated protective equipment
0	NA	<p><b>Arc-rated not required</b>  <u>Untreated natural fiber or non-melting clothing</u></p> <ul style="list-style-type: none"> <li>Long sleeve shirt and long pants</li> </ul>	<ul style="list-style-type: none"> <li>Safety glasses or safety goggles</li> <li>Hearing protection</li> <li>Heavy duty leather gloves as needed</li> </ul> 
1	4	<ul style="list-style-type: none"> <li>Long sleeve shirt and long pants or coverall</li> <li>Face shield or arc flash suit hood</li> <li>Jacket, parka, rainwear or hard hat liner as needed</li> <li>1 layer</li> </ul>	<ul style="list-style-type: none"> <li>Hard hat</li> <li>Safety glasses or safety goggles</li> <li>Hearing protection</li> <li>Heavy duty leather gloves</li> <li>Leather footwear as needed</li> </ul> 
2	8	<ul style="list-style-type: none"> <li>Long sleeve shirt and long pants or coverall</li> <li>Face shield or flash suit hood and balaclava</li> <li>Jacket, parka, rainwear or hard hat liner as needed</li> <li>1 or 2 layers</li> </ul>	<ul style="list-style-type: none"> <li>Hard hat</li> <li>Safety glasses or safety goggles</li> <li>Hearing protection</li> <li>Heavy duty leather gloves</li> <li>Leather footwear</li> </ul> 
3	25	<ul style="list-style-type: none"> <li>Long sleeve shirt</li> <li>Long Pants</li> <li>Coverall</li> <li>Arc flash suit jacket, pants and hood</li> <li>Gloves</li> <li>Jacket, parka, rainwear as needed</li> <li>Hard hat liner as required</li> <li>2 or 3 layers</li> </ul>	<ul style="list-style-type: none"> <li>Hard hat</li> <li>Safety glasses or safety goggles</li> <li>Hearing protection</li> <li>Heavy duty leather gloves</li> <li>Leather footwear</li> </ul> 
4	40	<ul style="list-style-type: none"> <li>Long sleeve shirt</li> <li>Long pants, coverall</li> <li>Arc flash suit jacket, pants and hood</li> <li>Gloves</li> <li>Jacket, parka, rainwear as needed</li> <li>Hard hat liner as required</li> <li>3 or more layers</li> </ul>	<ul style="list-style-type: none"> <li>Hard hat</li> <li>Safety glasses or safety goggles</li> <li>Hearing protection</li> <li>Heavy duty leather gloves</li> <li>Leather footwear</li> </ul> 

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## SAFE USE AND REMOVAL OF PPE

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PPE should fit properly, snug but not tight or loose, and it should not impede movement or communication. Select the right PPE for the task. Do not wear PPE that could potentially cause injury, such as loose fitting gloves that could be caught in moving parts of equipment or machinery. For loose fitting gloves, tape or fold a cuff on the gloves to prevent chemicals from running down the users arm.

Do not wear PPE outside of laboratory or shop areas to prevent spreading contamination to other areas.

Employees must be trained in how to put on (don) and take off (doff) PPE and the limitations of the PPE for the specific procedure. Employees working with chemicals, hazardous materials, biological materials, and animals, or work in medical and potentially infectious environments need to handle PPE properly when removing it from the body to avoid contaminating themselves and surfaces nearby. Disposable gloves, sleeves, shoe covers and Tyvek clothing and potentially contaminated PPE such as aprons, lab coats and other items need to be removed so that any contamination is not exposed. Disposable items should be peeled off turning them inside out as they are removed. Reusable gloves, aprons and other potentially contaminated items should be rinsed off before removing them, and then peeled off or folded so that the contaminated surface is inside. For specific instructions, refer to procedures designated for the specific department, organization or unit (i.e., Laboratory Safety Manual and SOPs for laboratory workers).

## INSPECTION, MAINTENANCE AND STORAGE

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The PPE must be inspected for defects every time it is put on. Look for symmetry; does each side look like a mirror image of the other or is one side distorted? Are there any broken, bent, frayed or torn pieces? Are the lenses scratched so they are hard to see through? Is the elastic still springy or is it stretched out?

In addition to visual inspection as above, insulating gloves, sleeves and blankets for electrical workers must be electrically tested. All must be tested prior to initial use, and then every 6 months thereafter for gloves, and every 12 months for sleeves and blankets.

PPE should be clean. If dirty, clean it with soap and warm water. Do not use solvents or abrasives to clean it.

Store it out of sunlight in an area where it will be protected and kept clean.

Replace reusable PPE every 2-5 years, earlier if recommended by the manufacturer or if there is a major impact. Replace any defective parts with parts made by the same manufacturer for that equipment. Do not make makeshift repairs. If it cannot be repaired properly, replace it. Do not use paint or glue on PPE. Use decals or stickers to mark it.

## SOURCES FOR PPE

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Some University stores carry a selection of protective clothing, face shields, safety glasses and goggles, gloves, hard hats, hearing protectors, and respirators. Other PPE may need to be ordered through local safety supply retailers.

New respirator users need to wait until they have completed respirator medical clearance, training and fit testing before ordering a respirator.

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## RESOURCES

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### University of Washington Administrative Policy Statements

- APS 10.4 Personal Protection Equipment and Clothing  
<http://www.washington.edu/admin/rules/policies/APS/10.04.html>
- APS 12.3 Review of Research Projects Involving Biological Hazards and Recombinant DNA  
<http://www.washington.edu/admin/rules/policies/APS/12.03.html>
- APS 12.5 Hazard Communications Program  
<http://www.washington.edu/admin/rules/policies/APS/12.05.html>

### Environmental Health & Safety

- UWEH&S Laboratory Personal Protective Equipment (PPE) Hazard Assessment Guide  
<https://www.ehs.washington.edu/system/files/resources/lab-ppe-hazard-assessment.docx>
- EH&S Shop Personal Protective Equipment (PPE) Hazard Assessment Guide  
<https://www.ehs.washington.edu/system/files/resources/Shop-PPE-Hazard-Assessment.docx>
- UW Biosafety Manual  
<https://www.ehs.washington.edu/resource/biosafety-manual-4>
- UW Laboratory Safety Manual  
<https://www.ehs.washington.edu/resource/laboratory-safety-manual-510>
- UW Radiation Safety Manual  
<https://www.ehs.washington.edu/resource/radiation-safety-manual-521>
- Personal Protective Equipment  
<https://www.ehs.washington.edu/workplace/personal-protective-equipment-ppe>
- Respiratory Protection Program  
<https://www.ehs.washington.edu/workplace/respiratory-protection>

### Washington State Labor & Industries

- Personal Protective Equipment (PPE) WAC 296-800-160  
<https://app.leg.wa.gov/wac/default.aspx?cite=296-800-160>
- Hazard Assessment Checklist  
<http://www.lni.wa.gov/Safety/Rules/Chapter/800/helpfultools/HT7-CR.doc>

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## Appendix A: Welding Operation Shading Guide\*

Welding Operation	Shade Number
Shielded metal-arc welding – (1/16, 3/32, 1/8, 5/32-inch electrodes)	10
Gas-Shielded arc welding (nonferrous) – (1/16, 3/32, 1/8, 5/32 – inch electrodes)	11
Gas-shielded arc welding (ferrous) – (1/16-, 3/32-, 1/8-, 5/32-inch electrodes)	12
Shielded metal-arc welding: 3/16, 7/32, ¼ inch electrodes	12
Shielded metal-arc welding: 5/16, 3/8 inch electrodes	14
Atomic Hydrogen Welding	10-14
Carbon Arc Welding	14
Soldering	2
Torch brazing	3 or 4
Light cutting, up to 1 inch	3 or 4
Medium cutting, 1 inch to 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to ½ inch	5 or 6
Gas welding (heavy) ½ inch and over	6 or 8

\* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxy-fuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

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## Appendix B: Safety Shoes and Prescription Safety Glasses

### Safety Shoes

Safety shoes may be required or recommended in various jobs at the University to help prevent foot injuries. Departments are not required by regulations to provide safety shoes. Individual departments determine policy on providing, not providing, or sharing the cost of safety shoes. It is recommended that any acquired safety shoes meet ANSI Z41-1999 or ASTM F2413-2005 standards. The UW Facilities (UWF) organization has a safety shoe policy, which is given below. Note that other organizations and departments may have different policies.

In the UWF organization, protective footwear, including steel-toed safety shoes, when required, must be provided at the employees' expense, maintained in good repair, and worn at all times when on the job. This requirement applies to temporary, part-time, and student workers, as well as to permanent employees. For some union positions, a stipend is provided annually.

UWF will provide foot protection for campus use only in-jobs such as listed below. This also avoids potential chemical exposures if employees accidentally take hazardous chemicals on their shoes to their personal vehicles and homes.

- Suitable rubber shoes and boots for personnel working with hazardous chemicals such as in floor stripping with a corrosive chemical, waste collection and sewer or concrete work
- Suitable boots for roofers applying tar and asphalt
- Suitable footwear for motor equipment mechanics who work with oils that are considered hazardous materials

This supplied equipment, when worn out, will be replaced by the University.

Authorized visitors to UWF shop areas will not be required to wear protective footwear unless deemed necessary by the shop supervisor. If so, steel-toed caps or steeled toed over-shoes will be provided.

UWF persons employed in certain occupations in Grounds, General Maintenance, Trades and Crafts, and Transportation & Stores shall wear safety shoes that must be steel toed or composite toed (or equivalent) boots or shoes that meet ANSI Z41-1999 or ASTM F2413-2005 standards. (Note: Anyone in these occupations who has a medical exception to wearing steel-toed footwear may be required to wear steel-toed caps or steeled toed over-shoes, or foot guards when engaged in operations particularly hazardous to feet.)

UWF persons employed in the certain occupations in Custodial, Waste Collection, Grounds, General Maintenance, Trades & Crafts, Power Plant, and Transportation & Stores shall wear "substantial footwear," made of leather or other equally firm material that meets the requirements of WAC 296-155-212. At the Supervisor's discretion - depending on the degree of hazard and the nature of the work - any employee in these occupations may be directed to wear steel-toed caps or steeled toed over-shoes, foot guards or steel-toed footwear.

For more information see the UWF Safety Manual on the UWF employee website.

### Prescription Safety Glasses

Safety glasses are required in many jobs at the University to help prevent eye injuries. Personnel who wear corrective lenses need to wear “over-prescription” safety glasses that fit over the glasses or wear prescription safety glasses. Departments are not required by regulations to provide prescription safety glasses, with the exception of providing prescription insert lenses for workers who wear full face respirators. Individual departments determine policy on providing, not providing, or sharing the cost of prescription safety glasses. Any acquired prescription safety glasses must have impact resistant lenses/frames, permanently attached side shields, and meet ANSI standard Z87.1.

If the department approves of the purchase of prescription safety glasses the process to obtain them through the Grainger/HOYA Safety Prescription Eyewear (SRx) program is given below. Email [HOYA\\_Safety\\_RX@Grainger.com](mailto:HOYA_Safety_RX@Grainger.com) for more information.

1. Go to the Grainger/HOYA webpage  
<http://www.grainger.com/content/mc/services/benefit-management/hoya-safety-prescription-eyewear>
2. Complete and submit the online request for a HOYA SRx Eyewear order form.
3. After you receive the HOYA SRx Eyewear order form, take it to an approved eye care professional in the local area (see below) to choose the eyewear and order it.
4. An invoice will be sent when the eyewear has shipped.

#### Local Eye Care Professionals in Grainger/HOYA program

Seattle area	Address	Telephone
EYEBALLZ LTD Contact: LORI FENDER	166 ROY ST SEATTLE, WA 98109	206-217-2015
<b>Bothell area</b>		
EYEBALLZ LTD Contact: LORI FENDER	166 ROY ST SEATTLE, WA 98109	206-217-2015
EYE Q DOCS OF EVERETT LTD Contact: BEN	3726 BROADWAY STE 106' EVERETT, WA 98201	425-252-2020
EYE SITE OPTICAL Contact:-LISA RENAULT/MELISSA PIERRE	620 SE EVERETT MALL WAY, SUITE 320 EVERETT, WA 98208	425-355-2377
<b>Tacoma area</b>		
SUBURBAN OPT OF UNIV PLACE Contact: CATHY/RHONDA/MELISSA	6720 REGENTS BLVD TACOMA, WA 98466	253-565-2500

### Prescription Respirator Inserts for Full Face Respirators

Prescription respirator inserts (spectacle kits) for full face respirators can be obtained from various vendors. The inserts must be compatible with the respirator and fitted with prescription lenses by an eye care professional.

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## Appendix C: Masks and Respirators – Understanding the Difference

See next page.

## Masks and Respirators - Understanding the Difference

	<b>Cloth face covering/mask (with or without paper filter insert)</b> 	<b>Face mask (non-cloth disposables)</b> 	<b>Surgical/procedure/medical mask</b> 	<b>N95 respirator</b> 	<b>Surgical N95 respirator</b> 
	Reusable cloth face covering/mask that fully covers mouth and nose. Homemade masks are not recommended.	Dust mask, KN95, KF94, or other non-NIOSH approved foreign filtering facepiece respirators, or non-FDA approved surgical/procedure/ medical masks.	Disposable FDA approved and ASTM tested mask, types for medical, surgical, procedure, dental use, and different levels of protection.	Disposable NIOSH approved respirator for industrial use.	Disposable FDA and NIOSH approved respirator for medical use.
<b>Medical device?</b>	No	No*	Yes	No	Yes
<b>Testing and approval</b>	Look for product manufacturers that follow: <a href="#">ASTM F-3502-21</a> (new) and <a href="#">Interim NIOSH Workplace Performance Standard</a>	*Some KN95 (China) and KF94 (Korea) have FDA approval, see <a href="#">CDC document</a> . See <a href="#">3M document</a> that lists standards from several countries.	Approved by U.S. Food and Drug Administration (FDA) and tested by ASTM.	Evaluated, tested, and approved by CDC/NIOSH as per requirements in 42 CFR Part 84	Evaluated, tested, and approved by FDA and CDC/NIOSH as per requirements in 42 CFR Part 84
<b>Intended use and purpose</b>	Intended for general public use. <b>Protects the wearer</b> by capturing respiratory droplets breathed out by others. <b>Protects others</b> by containing the wearer's respiratory emissions when talking, sneezing, or coughing.	Intended for non-medical use, construction, agriculture, general industry, general public use. <b>Protects the wearer</b> by capturing respiratory droplets breathed out by others. <b>Protects others</b> by containing the wearer's respiratory emissions when talking, sneezing, or coughing.	Intended for healthcare providers, medical use. Fluid resistant. <b>Protects the wearer</b> against respiratory droplets, splashes, or splatter from bodily fluids. <b>Protects others</b> by containing the wearer's respiratory emissions.	Intended for industrial use. <b>Protects the wearer</b> from inhaling particles including small particle aerosols and large droplets (only non-oil aerosols). <b>Respirators without exhalation valves protect others</b> by containing the wearer's respiratory emissions.	Intended for healthcare providers, medical use. Fluid resistant. <b>Protects the wearer</b> from inhaling particles and respiratory droplets, splashes, or spatter from bodily fluids. <b>Protects others</b> by containing the wearer's respiratory emissions.
<b>Fit</b>	Mask should completely cover mouth and nose, fit snugly against sides of face without gaps, and ideally have a nose wire to prevent air from leaking out top of mask. Does not seal around mouth and nose.	Mask should fit firm across face, over nose and under chin. Does not seal around mouth and nose.	Mask should fit firm across face, over nose and under chin. Does not seal around mouth and nose.	Mask should fit firm across face, over nose and under chin. Can seal around mouth and nose. Fit testing is required if activity requires a respirator.	Mask should fit firm across face, over nose and under chin. Can seal around mouth and nose. Fit testing is required if activity requires a respirator.
<b>Fit testing requirement</b>	No	No	No	Yes. Wearer must be clean shaven.	Yes. Wearer must be clean shaven.

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	<b>Cloth face covering/mask (with or without paper filter insert)</b>	<b>Face mask (non-cloth disposables)</b>	<b>Surgical/procedure/medical mask</b>	<b>N95 respirator</b>	<b>Surgical N95 respirator</b>
	 <p>Reusable cloth face covering/mask that fully covers mouth and nose. Homemade masks are not recommended.</p>	 <p>Dust mask, KN95, KF94, or other non-NIOSH approved foreign filtering facepiece respirators, or non-FDA approved surgical/procedure/ medical masks.</p>	 <p>Disposable FDA approved and ASTM tested mask, types for medical, surgical, procedure, dental use, and different levels of protection.</p>	 <p>Disposable NIOSH approved respirator for industrial use.</p>	 <p>Disposable FDA and NIOSH approved respirator for medical use.</p>
<b>Face seal fit</b>	Loose	Loose	Loose	Tight	Tight
<b>User seal check requirement</b>	No	No	No	Yes. Required each time respirator put on.	Yes. Required each time respirator put on.
<b>Leakage</b>	Leakage occurs around mask when user inhales.	Leakage occurs around mask when user inhales.	Leakage occurs around mask edges when user inhales.	When properly fitted and put on, minimal leakage occurs around edges when user inhales.	When properly fitted and put on, minimal leakage occurs around edges when user inhales.
<b>Filtration efficiency</b>	Does not provide wearer with reliable level of protection from inhaling smaller airborne particles and is not considered respiratory protection.	Some KN95 masks have filtration efficiency greater than 95%. See <a href="#">CDC document</a> .	Does not provide wearer with reliable level of protection from inhaling smaller airborne particles and is not considered respiratory protection.	Filters out at least 95% of airborne particles including large and small particles.	Filters out at least 95% of airborne particles including large and small particles.
<b>Fluid resistance (resistant to body fluid penetration)</b>	Not fluid resistant	Not tested for fluid resistance. May provide some protection from large droplets.	Fluid resistant	Not tested for fluid resistance	Tested to be fluid-resistant
<b>Care and use limitations</b>	Can be reused; it should be washed daily and if it becomes dirty or wet. See additional instructions on the CDC website. Put on and take off with clean hands. Keep in dry, breathable bag to keep clean between uses.	Discard after each use, when contaminated in the workplace, if becomes wet, or per unit-specific procedures. Put on and take off with clean hands or clean gloves.	Discard after each patient encounter or after each use, when contaminated in the workplace, if becomes wet, or per unit-specific procedures. Put on and take off with clean hands or clean gloves.	Discard after exposure to bodily fluids, or if becomes wet, deformed or damaged. Put on and take off with clean hands or clean gloves.	Discard after exposure to bodily fluids, or if becomes wet, deformed or damaged. Put on and take off with clean hands or clean gloves.

Adapted from CDC guidance and publications, Washington state Division of Occupational Safety and Health (DOSH)