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# PERSONAL PROTECTIVE EQUIPMENT



uOttawa

## GUIDELINES



Office of Risk Management  
Bureau de la gestion du risqué

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# PERSONAL PROTECTIVE EQUIPMENT STANDARD

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## 1. INTRODUCTION

University of Ottawa is committed to providing a healthy and safe work and educational environment for all of its employees, students and visitors. Personal Protective Equipment is the last line of defense but one of the ways to ensure that people involved are adequately protected. Other hazard controls, such as Engineering, Administrative and Practices and Procedures, must be evaluated and put in place whenever possible or practical before considering using personal protective equipment.

## 2. PERSONAL PROTECTIVE EQUIPMENT (PPE)

PPE is equipment worn by a person to minimize exposure to specific occupational hazards. PPE does not reduce the hazard itself nor does it guarantee permanent or total protection. It should be used only when the hazard cannot be removed or controlled adequately. Selection of proper PPE depends upon the nature of individual tasks and hazard exposure.

## 3. SCOPE

Anyone within the University of Ottawa workplace such as staff, students, volunteers as well as visitors who may be exposed to potential hazards.

## 4. EDUCATION AND TRAINING

According to the Ontario Occupational Health and Safety Act and Regulations and, Policy 77 of the University of Ottawa:

*A worker required to wear or use any protective clothing, equipment or device shall be instructed and trained in its care, use and limitations before wearing the protective clothing, equipment or device. (Regulation 851, s.79.)*

The employer is required to ensure that a training record is prepared for each worker and that it is kept and available to an inspector on request, as prescribed. For example OHSA, section 42(1), Regulation. 851, section 130, Regulation.213/91, section 26.2, OHSA, 25 2(h): etc.)

## 5. RESPONSIBILITIES

In accordance with Policy 77 of the University of Ottawa

***Principal investigators/supervisors and all others in authority must:***

- incorporate preventive measures in all functions and activities in which there may be some incident or accident with health and / or safety related consequences;
- provide information, instruction, and supervision to employees to protect their health or their safety;
- provide safety training opportunities for all their personnel;
- ensure that employees under their authority use or wear the equipment, protective devices or clothing required;
- provide equipment, materials and protective devices, and ensure they are maintained in good condition and used as prescribed under the OH&S Act;

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### **Workers must:**

- work in compliance with the provisions of the *OH&S Act* and all health and safety procedures and instructions;
- use or wear the equipment, protective devices or clothing that the University requires to be used or worn and report to their supervisors the absence of or defect in any equipment or protective device of which they are aware and which may endanger themselves or other employees;

### **Disciplinary Measures**

Employees who contravene Policy 77 are subject to disciplinary measures in accordance with the policies (Policy 2d Disciplinary Measures for Reprehensible Acts) and collective agreements governing their work conditions.

When persons not on staff violate this policy, the person in charge of the activity taking place must take measures to have the policy obeyed.

**Note: “Worker” for this document includes staff, students, volunteers and visitors at the university. The PPE must be worn when required. The reimbursement of the purchase of the PPE is at the discretion of the university units.**

It is also important to note that a variety of other legislation not listed in this document and may apply to your work environment. For example, Regulation 833, Controls of Exposure to Biological and Chemical Agents, Regulation 490/09, Designated Substances, etc. Ensure that you consult other legislative documents as well.

## **6. HEAD PROTECTION**

### **6.1 Legislation**

*A worker exposed to the hazard of head injury shall wear head protection appropriate in the circumstances. Regulation 851, s.80.*

### **6.2 Standard**

All protective hard hats should comply with the CAN/CSA-Z94.1-05 standard or its equivalent.

### **6.3 Types of Head protection**

Head injuries may be prevented by using the appropriate headwear protection. The appropriate type of head protection should be chosen according to the hazard. Therefore, a prior assessment of potential hazards should be conducted to ensure the appropriate headwear has been selected. There are three classes and two types of protective hard hats. Table 1 below provides a description of protective headwear.

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**Table 1. Types of head protection.**

	<b>Hard Hats</b>	<b>Bump Caps</b>	<b>Hair Protectors</b>
<b>Description</b>	Consists of a shell and the suspension	A bump cap provides only a covering for the scalp and is intended to protect the wearer's head only against injury caused by striking minor bumps	All enclosing caps, hair nets, hoods, turbans, bandanas and beard containers
<b>Protection</b>	<p>Class G – protects against impact and penetration (limited voltage protection)</p> <p>Class E - protects against impact, penetration and better electrical protection than class G</p> <p>(ANSI)Type I–protection for top impact (not recommended)</p> <p>(ANSI)Type II–protection for top and lateral impact</p> <p>Class C – protects against impact and penetration only <b>(No voltage Protection).</b></p>	Protects only against light impacts caused by the motion of worker's head. Does not protect against falling objects, should never be substituted for a hard hat.	Prevents worker's hair from been caught in moving equipment, or is worn for sanitary / hygienic reasons.

***Recommendation – CSA class E Type II hard hats will provide you with the maximum protection, therefore these are recommended for any types of activities.***

**Class C industrial protective headwear** - impact protective headwear that does not provide dielectric protection. This should only be used in areas where there is no risk of electrical hazards.

**Class E industrial protective headwear** - impact protective headwear that provides protection against an applied voltage increasing at a uniform rate of  $1000 \pm 50$  V/s up to a maximum of  $20\,000 \pm 100$  V. This maximum voltage is maintained for 3 min. To qualify, materials used to construct the hat must also pass the electrical test

**Class G industrial protective headwear** - impact protective headwear that provides protection against a maximum voltage of  $2200 \pm 20$  V for 1 min.

### 6.4 Maintenance of Hard Hats

To provide an adequate protection, hard hats must be maintained in good condition. There are some guidelines below for proper hard hat maintenance:

- Inspect and replace a shell that shows signs of wear, scratches or gouges. Shells exposed to heat, sunlight and chemicals can become stiff or brittle. A visible pattern of tiny cracks may develop. Over time, weathered hats can become dull in colour or have a chalky appearance.
- Do not apply any paint, solvent or adhesive (including stickers / labels) to the hat.
- Replace headwear when hairline cracks start to appear.

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- Replace headwear that has been struck / exposed to a hazard, even if no damage is visible.
- Remove and destroy any headwear if its protective abilities are in doubt.
- Follow manufacturer's recommendation for maintenance

***Note: Hard hats should be replaced within 3 to 7 years of manufacture or more frequently if necessary. Damaged hats should be destroyed immediately to avoid their accidental use. A sticker only stating the approval of CSA is not enough; the class and type of the hard hat should also appear engraved on the inside of the peak.***

### 6.5 Hazard Assessment

The CSA Z94.1-05 standard requires that a hazard assessment be performed in the workplace. This assessment is comprised of 4 steps:

1. Observation of worker job functions
2. Worker interviews to determine when potential hazards are present and their associated risk level
3. Review procedures to ensure local, provincial, and/or federal regulatory compliance
4. Review of any past case history

***Should no hazard assessment be conducted / available, the worker shall default to the highest protective level; which is a type 2, class E protective helmet.***

### 6.6 Hard Hat Additions

Some companies will also include their company logo or slogan on the hard hat. Imprinting or adhesive labels may not affect the integrity of the hat, however must be approved by the manufacturer prior to application.

## 7.0 HEARING PROTECTION

### 7.1 Legislation

*Regulation 851, s. 139. (1) In this section:*

*"decibel" means a unit of measurement of sound pressure level that is equal to 20 times the logarithm to the base 10 of the ratio of the pressure of a sound, divided by the reference pressure of 20 micropascals;*

*s.139. (6) "...every employer shall ensure that no worker is exposed to a sound level greater than an equivalent sound exposure level of 85 dB(A), L<sub>ex,8</sub>"*

*(7) Except in the circumstances set out in subsections (8) and (9), the employer shall protect workers from exposure to a sound level greater than the limit described in subsection (6) without requiring them to use and wear personal protective equipment*

*(8) ...workers shall wear and use personal protective equipment appropriate in the circumstances when engineering controls are*

*(a) not in existence, or not obtainable*

*(b) not reasonable or practical to adopt*

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(c) rendered ineffective

The duration of exposure set out in Column 2 of the Table 2 below shall not exceed the duration shown for the particular sound level set opposite thereto in Column 1 of the Table 2 below, or the person shall wear hearing protection

s.139. (10) Clearly visible warning signs shall be posted at the approaches to an area where the sound level regularly exceeds eighty-five decibels.

**Table 2. Maximum noise exposure.**  
(Illustrates maximum exposure for workers not equipped with hearing protection)

Sound Level (in db(A))	Duration (85 dB(A) $L_{ex,8}$ ) (hrs/24 hr day)
82	16
85	8
88	4
91	2
94	1
97	30 mins.
100	15 mins.
Over 115	No exposure

### 7.2 Standard

All Hearing protection should comply with the CSA Z94.2-02 (R. 2007) standard

### 7.3 Types of Hearing Protection

#### 7.3.1 Ear plugs:

Inserted into the ear to block the ear canal. They may be pre-molded (pre-formed) or moldable (such as foam plastic, waxed cotton or silicone). Ear plugs are sold as disposable products or reusable plugs. Custom molded ear plugs are also available.



Figure 1

#### 7.3.2 Semi-insert ear plugs:

Consist of two ear plugs held over the ends of the ear canal by a rigid headband.

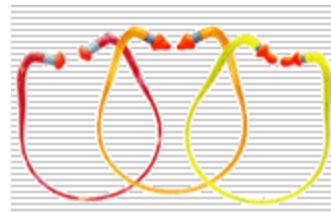


Figure 2

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### 7.3.3 Ear muffs:

Consist of sound-attenuating material and soft ear cushions that fit around the ear and hard outer cups. They are held together by a head band.



Figure 3

### 7.3.4 Helmets:

Can be used to support ear muffs and cover the head to reduce bone-conducted sound. With proper design and fitting of the seal between the helmet edge and the skin, a helmet can provide 5-10 dB(A) additional noise reduction over and above the noise reduction provided with ear muffs without the helmet



Figure 4

### 7.4 Noise Reduction Rating (NRR)

The noise reduction rating (NRR) is usually listed on the package of the hearing protection. Hearing protection NRR is subtracted from the overall noise level; which will provide the noise level at the ear of the user. To note, that these ratings are obtained in laboratory, controlled conditions.

Table 3. Example Levels of Noise Reduction Rating

Type of Hearing Protection	Noise Reduction Rating
Ear Plugs	30-34 dB(A)
Semi-insert Ear Plugs	Around 27 dB(A)
Ear Muffs	19-31 dB(A)
Helmets	19-31 plus 5-10 dB(A)

**Note: Radio headsets / MP3 players are not substitutes, nor are they suitable for hearing protection devices and should not be worn where hearing protectors are required to protect against exposure to noise.**

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### **Examples of Noise Levels:**

Please refer to Appendix 1 for examples of noise levels

#### **7.5 Fit Test**

The effectiveness of hearing protection is reduced greatly if the hearing protectors do not fit properly or if they are worn only part time during periods of noise exposure. Therefore, it is important that hearing protection fits comfortably on the user.

In areas where hearing protection is required, workers should undergo an initial hearing test and the testing should be repeated at regular intervals. This will establish a basis for comparing future results and will identify a worker's particular problem(s) or concern(s). For further information, consult the Assistant Director, Health, Wellness and Leave Sector, Human Resources.

#### **7.6 Maintenance of Hearing Protection**

- Follow the manufacturer's instructions.
- Check hearing protection regularly for wear and tear.
- Replace ear cushions or plugs that are no longer pliable.
- Replace a unit when head bands are so stretched that they do not keep ear cushions snugly against the head.
- Disassemble ear muffs to clean.
- Wash ear muffs with a mild liquid detergent in warm water, and then rinse in clear warm water. Ensure that sound-attenuating material inside the ear cushions does not get wet.
- Use a soft brush to remove skin oil and dirt that can harden ear cushions.
- Squeeze excess moisture from the plugs or cushions and then place them on a clean surface to air dry. (Check the manufacturer's recommendations first to find out if the ear plugs are washable.)

***Note : Always wash hands before inserting ear plugs! Do not reuse or share disposable ear plugs!***

### **8.0 EYE AND FACE PROTECTION**

#### **8.1 Legislation**

*A worker exposed to eye injury shall wear eye protection appropriate in the circumstances. Regulation 851, s.81.*

#### **8.2 Standard**

All protective equipment should comply with the CSA-Z94.3-09 Standard or its equivalent.

Full certification of eyewear by CSA is only possible for non-prescription lenses. For further information, contact the Assistant Director, Occupational Health and Safety, Office of Risk Management.

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### 8.3 Selection of appropriate Eyewear

In order to select protective equipment that is appropriate for the task one must become familiar with the potential work hazards and the type of protective equipment that is available and appropriate for the task undertaken.

Safety eyewear must be worn in circumstances where there is a hazard of:

- Impact (flying particles, dusts, vapours)
- Splash (chemical, radioactive, biological agents) or
- Ultraviolet and Infrared (harmful rays)

Protective eyewear shall be specifically selected in order to be fully protected. Good manufacturers can help you to select the appropriate eyewear and to inform you on the limit of their protection. For further information, contact the Assistant Director, Occupational Health and Safety, Office of Risk Management.

Individuals who wear prescription eyewear should be aware that at the present time glass lenses do not meet the impact requirements outlined in Z94.3; prescription lenses other than glass must have a minimum thickness of not less than 3.0 mm. Lenses of prescription eyewear have to meet the size requirements specified in the CSA standard and be equipped with permanently attached or removable side shields. Excessive thickness of eyewear due to prescription is inappropriate protection! Safety eyewear must be CSA approved.

***Note : Prescription glasses or contact lenses should not be worn without appropriate protection when carrying out operations that require safety eyewear, since they do not provide an adequate protection against possible injuries!***

For assistance, consult the [University of Ottawa Procedure on Safety Eyewear](#)

**Consult Table 4. Eyewear selection will help to select proper eyewear for the situation pertinent to your work environment. This list is a guide supplied for reference purposes only; it is not exclusive.**

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**Table 4. Eyewear selection.**

HAZARD	HAZARDOUS ACTIVITIES INVOLVED	RECOMMENDED PROTECTION						LEGEND
		Spectacles	Eye-Cup Goggles	Monoframe Goggles	Welding Hat	Face Shield	Hood	
Spectacles without side shields may be appropriate for certain work situations.								
Group A  Flying Objects	Chipping/Drilling/Scaling	■	▲	●		◆		          
	Grinding/Polishing/Buffering	■	★	♥		◆		
	Rivetting/Punching/Shearing	■	▲	●				
	Hammer Mills/Crushing	■	▲	●				
	Heavy Sawing/Planing		★	♥		◆		
	Wire & Strip Handling	■	▲	●				
	Hammering/Unpacking/Nailing	■	▲	●		◆		
	Punch Press/Lathe Work	■	▲	●		◆		
Group B  Flying Particles Dust/Wind	Woodworking/Sanding/Turning	■	★	♥		◆		
	Light Metal Working/Machining	■	★	♥		◆		
	Exposure to Wind/Dust	■	★	♥				
	Resistance Welding*	□	△	○				
	Sand/Cement Handling		★	♥			*	
	Painting		★	♥		◆	*	
	Plastering/Concrete Work	■	★	♥		◆		
Group C  Heat/Glare/Sparks Splash from Molten Metal	Material Batching/Mixing	■	★	♥		◆		
	Babbiting/Casting/Pouring/Molten Metal		★	♥		◆		
	Soldering/Brazing	□	△	○		◆		
	Spot/Stud Welding*		△	○		◆		
Group D  Chemical Splash	Hot Dipping Operations		★	♥		◆		
	Acid/Alkali Handling		★	♥		◆	*	
	Pickling/Plating/Degreasing		★	♥		◆	*	
	Glass Breakage		▲	●		◆		
	Chemical Spraying		★	♥		◆	*	
Group E  Abrasive Blasting	Liquid Bitumen Handling		★	♥		◆		
	Sandblasting		★	♥		◆		
	Shot Blasting						*	
Group F  Glare/Stray Light	Shotcreting						*	
	Reflection/Sunlight	□	△	○				
	Reflected Welding Flash	□	△	○				
	Metal Pouring/Furnace Work	□	△	○		◆		
	Spot/Stud Welding*		△	○		◆		
Group G  Injurious Optical Radiation	Photographic Copying	□	△	○				
	Gas Cutting/Welding*		△	○		◆		
Group H  Injurious Optical Radiation	Furnace Work	□	△	○		◆		
	Electric Arc Welding*	□				+		
	Heavy Gas Cutting*	□				+		
	Plasma Spraying /Cutting*	□				+		
	Inert Gas Shielded Arc Welding*	□				+		
Atomic Hydrogen Welding*	□				+			

This chart adapted from Canadian Standards Association (CSA) recommendations found in Industrial Eye and Face Protectors Standards Z94.3 1992  
 \*For additional information on welding / eye and face protection refer to Safety InfoGram D17.

Definitions for Group G and H follow.

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### *Definition for Injurious Optical Radiation*

Optical radiation refers to that portion of the electromagnetic spectrum ranging in wavelength from 100nm to 1.0mm taking into account the following subintervals: UV-C, UV-B, UV-A, visible, IR-A, IR-B and IR-C.

*Group G:* Where moderate reduction of optical is required

*Group H:* Where a large reduction of optical is required

### **8.3.1 Eyewear Protection considerations for Laser**

Laser equipment is included in this category and specific eye protection must also be considered when using laser equipment, in particular when full enclosure of the laser or beam path is not feasible. Laser protective eyewear shall be specifically selected to withstand either direct or diffusely scattered beams depending upon the circumstances of exposure. The eyewear shall be used in a manner so that the damage threshold is not exceeded in the "worst case" exposure scenario. The following factors, suggested by ANSI Z136.1-2007 (Sec. 4.6.2.4), shall be considered in selecting the appropriate laser protective eyewear to be used:

- Laser power and/or pulse energy
- Wavelength(s) of laser output
- Potential for multiwavelength operation
- Radiant exposure or irradiance levels for which protection (worst case) is required.
- Exposure time criteria.
- Maximum permissible exposure.
- Optical density requirement of eyewear filter at laser output wavelength.
- Angular dependence of protection afforded.
- Visible light transmission requirement and assessment of the effect of the eyewear on the ability to perform tasks while wearing the eyewear.
- Need for side-shield protection and maximum peripheral vision requirement; side shields shall be considered and should be incorporated where appropriate
- Radiant exposure of irradiance and the corresponding time factors at which laser safety filter characteristics change occurs, including transient bleaching especially for ultrashort pulse lengths
- Need for prescription glasses
- Comfort and fit.
- Degradation of filter media, such as photobleaching.
- Strength of materials (resistance to mechanical trauma and shock)
- Capability of the front surface to produce a hazardous specular reflection
- Requirement for anti-fogging design or coatings.

For further information, contact the Laser Safety Specialist or Assistant Director, Radiation and Biosafety, Office of Risk Management.

***Note : Consider UVA and UVB protective eye lenses when working outside in order to protect the eyes from harmful rays. Select***

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***sunglasses that comply with CSA or ANSI standards. Glasses should have side shields and fit against cheek bones.***

### **8.4 Fitting**

Consideration should be given to fit and comfort. This increases the chances of eyewear being worn at all times and consequently maximizes protection. Most eyewear comes in different sizes and styles. Ensure it is well adapted and fitted to the physiognomy of the user.

### **8.5 Cleaning and Maintenance of the Eyewear**

Cleaning and proper maintenance of eyewear is especially important; dirty or fogged lenses could impair vision and lead to potentially serious incidents. Eyewear should be inspected and cleaned before and after each use in order to provide needed protection. It should also be properly stored between uses. Ensure manufacturer's instructions are followed.

### **8.6 Contact Lenses**

Contact Lenses are not a substitute for eye protection and should be covered by appropriate eye protection if an exposure to hazard or risk of injury is possible.

Considerations to be evaluated if wearing contact lenses in workplaces are as follows:

- Dusts or chemicals can be trapped behind the lens and cause irritation or damage to the eye;
- Gases and vapours can cause irritation and excessive eye watering; and
- Chemical splash may be more injurious when contact lenses are worn. This increased risk is related to the removal of the lenses. If removal is delayed, first aid treatment may not be as effective and, in turn, the eye's exposure time to the chemical may be increased.

***Note: If a worker wears contact lenses he / she should notify his supervisor, so that in case of emergency proper first-aid activities can be carried out.***

## **9.0 SKIN PROTECTION**

### **9.1 Legislation**

*A worker exposed to the hazard of injury from contact of the worker's skin with,*

- (a) A noxious gas, liquid, fume or dust;*
- (b) a sharp or jagged object which may puncture, cut or abrade the worker's skin;*
- (c) a hot object, hot liquid or molten metal; or*
- (d) radiant heat*

*shall be protected by:*

- (i) wearing apparel sufficient to protect the worker from injury;*
- (ii) a shield, screen or similar barrier, appropriate in the circumstances. Regulation 851, s. 84.*

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*Protective clothing or other safety device that has been worn next to the skin shall be cleaned and disinfected prior to being worn by another worker.*  
*Regulation 851, s.137*

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**Table 5. Selection of skin Protection**

Different PPE materials should be used according to type of potential hazard.

Hazard	Degree of Hazard	Protective Material
Abrasion	Severe	Reinforced heavy rubber, staple-reinforced heavy leather
	Less Severe	Rubber, plastic, leather, polyester, nylon, cotton.
Chemicals and Fluids	Risk varies according to the chemical, its concentration, and time of contact among other factors. Refer to the manufacturer or product MSDS.	Dependant of chemical. Examples include: Natural rubber, neoprene, nitrile rubber, butyl rubber, PTFE, Teflon, etc.
Cold		Leather, insulated plastic or rubber, wool, cotton.
Electricity		Rubber-insulated gloves tested to appropriate voltage with leather outerglove.
General Duty		Cotton, terry cloth, leather.
Heat	High Temperatures (over 350 deg C)	Asbestos, Zutex
	Medium High (up to 350 deg C)	Nomex, Kevlar, neoprene-coated asbestos, heat-resistant leather with linings.
	Warm (up to 200 deg C)	Nomex, Kevlar, heat-resistant leather, terry cloth (aramid fiber).
	Less Warm (up to 100 deg C)	Chrome-tanned leather, terry cloth.
Product Contamination		Thin-film plastic, lightweight leather, cotton, polyester, nylon.
Radiation		Lead-lined rubber (for gloves and aprons should not be folded), plastic or leather.
Sharp Edges	Severe	Metal mesh, staple-reinforced heavy leather, Kevlar aramid-steel mesh.
	Less Severe	Leather, terry cloth (aramid fiber)
	Mild with delicate work	Lightweight leather, polyester, nylon, cotton.
X-Ray		Protective apron and gloves, providing shielding equivalent to at least 0.5 millimetre of lead

Adapted from Canadian Center for Occupational Health and Safety (CCOHS).

### 9.2 Hand Protection

Depending on the type of activity conducted, hands can be protected by wearing gloves. The selection of the proper type of glove is essential to the

## PERSONAL PROTECTIVE EQUIPMENT STANDARD

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performance of the glove as a barrier to a hazard. The type and level of risks must be assessed before selecting a type of glove for the work to be conducted. Risks can vary from electrical shocks, vibration, cuts and abrasions, chemical exposures, biological exposures, physical agents (ex: dust), etc. All sort of gloves are available and may not be described in this document. Good manufacturers can help you to determine the appropriate type of gloves and provide you with information on the limits of usage.

A logical starting place is the material safety data sheet (MSDS) for hazardous chemicals. Once the chemical is known, a proper selection of gloves can be made. Keep in mind that there is no such thing as an "impermeable" glove. No one glove material is resistant to all chemicals and no glove materials are impermeable to the chemical at all times or forever. Please check Appendix 2 for proper selection of gloves when using chemicals substances.

The required dexterity for the operation must also be taken into consideration when selecting a pair of gloves. In general, biological and radioactive hazards are well addressed through the use of latex, nitrile or vinyl gloves.

***Note : Always test gloves before using them!***

Standard: only certain types of gloves have standards

### **9.3 Testing of Gloves for Defects**

Please refer to Appendix 3 for details on how to test gloves prior to use.

### **9.4 Allergies / Sensitivities related to Latex gloves**

Over the past decade there has been an increase in allergic reactions to the glove material, most likely as a result of widespread use of latex gloves. Studies have shown that up to 17 percent of workers who regularly wear latex gloves have developed an allergy / sensitivity to them. Allergic reactions may either be due to the natural latex proteins or to the chemical additives added to the latex during the manufacturing process. These reactions can present a serious health risk. Allergic reactions range from immediate latex skin reactions, to more serious health effects such as dermatitis, asthma and sometimes can be even life-threatening. Gloves are now primarily available in nitrile material.

Workers are encouraged to disclose their allergy to latex to the Assistant Director, Health Wellness and Leave Sector of Human Resources., when there is a possibility that other workers in their work vicinity might use latex gloves. If a worker is not sure if he or she is allergic to latex, they should be instructed to contact the Assistant Director, Health Wellness and Leave Sector of Human Resources.

### **9.5 Proper techniques of donning and glove removal**

Please refer to APPENDIX 4 for techniques on how to don and remove gloves.

## PERSONAL PROTECTIVE EQUIPMENT STANDARD

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### 9.6 Protective Clothing (using chemicals, radioactive or biological agents)

Lab coats must be worn at all times when working in the laboratory using hazardous materials. Laboratory coats are intended to protect against minor splashes or spills, and to minimize contamination of street clothing with materials used in the laboratory. Laboratory coats should be at least knee length and made of material (e.g. cotton or cotton/polyester blend) as well as fastened when worn. No buttons are permitted. A laboratory coat should be chosen with snaps only. Disposal lab coats can be used when appropriate but special considerations must be given to their limitations and disposal. The sleeves of the coat should extend to wrist line. Additional requirements for solid front gowns with tight fitting wrists are required when working with biological material, level 3 containment. Ensure periodic replacement as necessary.

Laboratory coats must be removed when leaving the laboratory, unless needed for special purposes. Laboratory coats must not be worn in eating areas (e.g. cafeterias, food courts, lunch rooms,) in administrative office areas, or in public areas (e.g. class rooms, libraries, public meeting places, washrooms).

***Note: Natural type fiber (ex: cotton, wool, etc) tends to provide better protection than man-made fibre (nylon, polyester, etc).***

### 9.7 Chemical Resistant Clothing

Sometimes a higher protection, for example, aprons, leggings, coveralls, or sleeve protectors may be required. Selecting the clothing material which best protects against a particular chemical must be based on chemical resistance performance upon contact with the chemical. Appropriate chemical resistant clothing must show **no penetration, no significant degradation, a breakthrough time greater than the duration of the task, and a low permeation rate** upon contact with the chemicals used.

### 9.8 Cleaning and Maintenance of Protective Clothing

Lab coats as well as other types of protective clothing must be washed regularly according to the manufacturer specifications. All protective clothing has to be washed separately from non-protective clothing to avoid possible transfer of chemicals.

## 10.0 RESPIRATORY PROTECTION

### 10.1 Legislation

*Regulation 851, section 138 (1) Where a worker is likely to be exposed to an atmosphere at atmospheric pressure with an oxygen content of less than 18 percent, the worker shall be protected by mechanical ventilation so that the worker's safety and health is not endangered.*

*Regulation 851, section 138 (2) Where the measures prescribed by subsection (1) are not practicable, the worker shall be protected by air supplied breathing equipment so that the worker's safety and health is not endangered.*

## PERSONAL PROTECTIVE EQUIPMENT STANDARD

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*Regulation 833, section 7.2(2), The employer shall provide, and workers shall wear and use, personal protective equipment appropriate in the circumstances to protect the workers from exposure to the agent, if engineering controls required by this Regulation,*

- (a) are not reasonable or not practical to adopt, install or provide because of the duration or frequency of the exposure or because of the nature of the process, operation or work;*
- (b) are rendered ineffective because of a temporary breakdown of such controls; or*
- (c) are ineffective to prevent, control or limit exposure because of emergency,*

*the employer shall provide, and worker shall wear and use, personal protective equipment appropriate in the circumstances to protect the workers from exposure to a hazardous biological or chemical agent.*

### 10.2 Standard

All respirators should meet, or exceed CSA Standard Z94.4-02 or it's equivalent, which sets out requirements for the proper selection, use and care of respirators.

***Note : An employer must ensure that a worker is medically fit to wear a respirator. To arrange for a medical screening consult the Assistant Director, Health, Wellness and Leave sector, Human Resources.***

### 10.3 Fit-testing

Fit-testing has to be performed by a competent person according to the OH&S Act which states that a competent person is someone who:

- (a) is qualified because of knowledge, training and experience to organize the work and its performance,*
- (b) is familiar with this Act and the regulations that apply to the work, and*
- (c) has knowledge of any potential or actual danger to health or safety in the workplace;*

Respirators must fit properly to prevent leaks around the edges. Fit-testing must be done before first wearing a respirator, in cases of any physical change, and every two years thereafter (it is recommended that the re-testing be done annually). In fit-testing a worker, several types and sizes of respirators are tried on first and after a comfortable respirator is selected, qualitative or quantitative fit-tests are conducted.

***Note: the respirator will not provide the needed protection if the seal between the skin and the respirator mask is broken. This may happen if the worker has:***

- ***A beard / facial hair (worker need to be clean-shaven)***
- ***Glasses***
- ***Facial scars***

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- *Long side burns*
- *Acne*

### 10.4 Qualitative Fit Test

The worker is exposed to an atmosphere containing an irritant or taste agent and then asked to breathe normally, breathe deeply, move head side to side, move head up and down, grimace, bend at the waist, and talk. Then the wearer reports any noticed odor or taste changes. No eating, smoking or chewing gum is permitted 15 minutes prior to testing.

### 10.5 Quantitative Fit Test

A particle counting instrument compares the dust concentration in the surrounding air with the dust concentration inside the respirator, while the wearer is breathing normally, is breathing deeply, moves his head side to side, or up and down, grimaces and talks. The ratio of these concentrations is called the fit factor.

### 10.6 Seal check

Whenever the respirator is put on, a seal check must be performed, as illustrated.



Figure 5

#### **Inhalation Check or Negative Pressure Check**

Cover the cartridges with your hands, inhale gently to collapse the face piece slightly, and hold your breath for 10 seconds. If the face piece remains slightly collapsed and no leakage is detected, the respirator fits properly.

#### **Exhalation Check or Positive Pressure Check**

Cover the exhalation valve with your hand and exhale gently into the face piece. If a slight positive pressure is built up inside the face piece without any evidence of leakage, the fit is satisfactory.

Depending on the type of the respiratory protection qualitative and / or quantitative tests follow seal checks.

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### 10.7 Different Types of Respirators

The two main types are air-purifying respirators (APRs) and supplied-air respirators (SARs).

### 10.8 Air Purifying Respirators

There are two basic types of APRs: mechanical and chemical. Mechanical filters remove contaminants in the air by filtering out particulates (e.g., dusts, metal fumes, mists, etc.). Chemical cartridge filters purify air by adsorbing or neutralizing gases or vapours on a sorbent (adsorbing material) in a cartridge. They are tight-fitting and are available in several forms:

#### 10.8.1 Mouth bit respirator:

Fits in the mouth and comes with a nose clip to hold nostrils closed; it is used for escape purposes only.



Figure 6

#### 10.8.2 Quarter-mask:

Covers the nose and mouth;

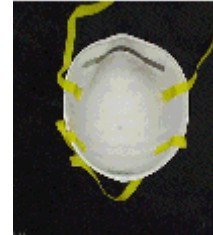


Figure 7

#### 10.8.3 Half-face mask:

Covering the face from the nose to below the chin; half-face cartridge respirators only provide protection to levels 10 times above the chemical or dust permissible limit.

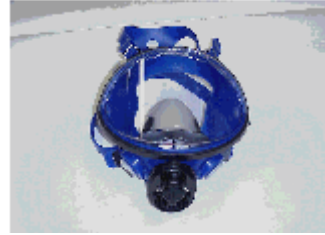


Figure 8

## PERSONAL PROTECTIVE EQUIPMENT STANDARD

### 10.8.4 Full-face respirators

Covers the face from above the eyes to below the chin. Full-face respirators also provide eye protection for irritating chemicals.



**Figure 9**

### 10.9 Filter series

Oil droplets in the air have been found to degrade the filtering capability of some filter material. To ensure that a suitable filter is used, there are basic categories; classed N-, R- and P- series filters.

- N for Not resistant to oil - appropriate when there is no oil-based products in the air.
- R for Resistant to oil – this filter resists oil but may break down in contact with oil or solvent over a long time.
- P for oil Proof – filter has a limited service life, manufacturers recommendations should be checked to determine how long the filter can be used for.

**Table 6. Filter series.**

Class of Filter	Efficiency (%)	Suitable for/Service time
N series		All particulate (airborne solids) where no oil or solvent is in the air. N- series have <b>no specific service time</b> . They may be used multiple shifts and use may continue until a change in breathing resistance is noted
N95	95	Fine particulate when no oil or solvent is in the air
N99	99	Very fine particulate when no oil or solvent is in the air
N100	99.97	Extremely fine and very toxic particles when no oil or solvent is in the air
R series		Resistant to oil but <b>should not be used more than one shift</b> . (Note: these filters do not provide protection from organic vapours)
R95	95	Fine particulate when oil or solvent is also in the air
R99	99	Very fine particulate when oil or solvent is also in the air
R100	99.97	Extremely fine and very toxic particulate when oil or solvent is also in the air
P series		Oil-Proof. However, <b>check manufacturer's recommended service life</b> when oil aerosols are present. Long-term exposure to oil may lead to degradation. (Note: these filters do not provide protection from organic vapours)
P95	95	Fine particulate when oil or solvent is also in the air
P99	99	Very fine particulate when oil or solvent is also in the air
P100	99.97	Extremely fine and very toxic particulate when oil or solvent is also in the air

Adapted from National Institute for Occupational Safety and Health

**Note: N, R, and P filters do not provide protection against organic vapors.**

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### 10.10 Maintenance of Respirators

- Clean respirator before storing it
- Store a mask and cartridges in separate plastic sealed bags
- If used by more than one person, mask must be cleaned and disinfected before and after each use.
- Indicate date on cartridges before using them.
- Cartridges must be capped when stored

### 10.11 How Cartridge APRs Work and Their Limitations

When used properly, respirators prevent the inhalation of chemicals and dust in the air and protect the lungs. During inhalation, air is pulled through the cartridge, where air contaminants are trapped. Cartridges are manufactured to protect from a specific contaminant; for examples, a chemical cartridge doesn't filter out dust and a dust cartridge doesn't eliminate chemicals from the air. Combination cartridges (dust/chemical cartridges) can be used where more than one type of hazard exists. All cartridges are color-coded for the type of chemical or dust. Cartridges must be changed regularly to ensure maximum protection. Dust cartridges are changed when they become difficult to breathe through or are damaged. Chemical cartridges are changed on a predetermined schedule. When their capacity is reached, breakthrough will occur. It is very important to know the life of cartridge, as some chemicals have no odor, or can only be smelled at high levels.

### 10.12 Shelf life of cartridges

It is necessary to keep in mind that most cartridges have a limited shelf life. Please refer to manufacturers instructions to verify the length of a shelf life of a particular cartridge.

### 10.13 Cartridge Respirator Limitations

Cartridge respirators don't work where there is a lack of oxygen. For workers who have heart or lung problems, respirators can be hazardous to their health. A medical assessment is to be done and the worker must receive confirmation from the Health, Wellness and Leave sector that he or she is fit to wear a respirator prior to being assigned any type of work that requires the use of respirator.

### 10.14 Air Supplied Respirators

Supplied air respirator needs to be worn where chemicals have levels immediately dangerous to life and health (IDLH) or in a potential or actual oxygen deficient environment.

Supplied-air respirators (SARs) supply clean air from an air tank or through an air line. The air supplied in tanks or from compressors must meet certain standards for purity and moisture content (e.g., CSA Standard Z180.1-00 (R. 2005): Compressed Breathing Air and Systems).

Supplied-air respirators may have either tight-fitting or loose-fitting respiratory inlets. Respirators with tight-fitting respiratory inlets have half or full face pieces. Types with loose-fitting respiratory inlets can be hoods

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or helmets that cover the head and neck, or loose-fitting face pieces with rubber or fabric side shields. These are supplied with air through airlines.

All new Self Contained Breathing Apparatus (SCBA) used in an emergency situation should comply with the revised NFPA 1981 STD, 2002 editions. It covers minimum documentation, design criteria, performance criteria, test methods and certification for open-circuit self-contained breathing apparatus used in fire fighting rescue and other hazardous duties. SCBA air cylinder must meet CSA Standard Z180.1 on breathing air.

### 11.0 FOOT PROTECTION

#### 11.1 Legislation

*A worker exposed to the hazard of foot injury shall wear foot protection appropriate in the circumstances. Regulation 851, s.82.*

#### 11.2 Standard

Protective Footwear must meet or exceed CSA Standard CSA-Z195-09.















#### 11.3 Types of Protective Footwear

Protective footwear is identified with various coloured labels to indicate the type of protection they provide. A Green patch provides the most protection. Yellow and red indicate lower levels of protection but they come in a wider variety of styles. **Table 7. Selection of Safety Footwear.** below provides guidance on the selection of safety footwear. Additional types of footwear are available; however these are the most common for a University environment.

***Note: Coloured labels must be sewn to the shoes. Stickers are insufficient and are not recognized as acceptable labeling.***

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Table 7. Selection of Safety Footwear.

Selection of Safety Footwear		
		
Grade I will withstand 125 joules, or 93 ft. lbs.; a 50 lb weight dropped from a height of 22 in.	Grade II will withstand 90 joules, or 65 ft. lbs.; a 50 lb. weight dropped from a height of 16 in.	Grade III will withstand 60 joules, or 45 ft. lbs.; a 50 lb. weight dropped from a height of 10.5 in.
		
<p><b>Electric Shock Resistant Footwear</b> carries this CSA marking tag. Footwear must withstand (under dry conditions) a test potential of 18 kV (18,000 volts), 60 Hz for a period of one minute, without discharge to ground of more than one milliampere (1 mA).</p> <p>*Use where there is danger of high voltage</p>		<p>If the triangle is Green it is Grade I; Yellow it is Grade II; Red it is Grade III</p> <p>The triangle designates a puncture resistant sole able to withstand 135 kg. of pressure, (300 ft. lbs.) without being punctured by a 5 cm. nail.</p> <p>** Use where there is danger of punctures.</p>
		
<p>Combined with:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">               ** for punctures         </div> <div style="text-align: center;">               * for high voltage         </div> </div> <ul style="list-style-type: none"> <li>• Freight companies</li> <li>• Steel mills</li> <li>• Construction</li> <li>• Mining</li> <li>• Auto industries</li> <li>• Paper Mills</li> <li>• Lumbering</li> </ul>	<p>Combined with:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">               ** for punctures         </div> <div style="text-align: center;">               * for high voltage         </div> </div> <ul style="list-style-type: none"> <li>• Warehousing</li> <li>• Machine shops</li> <li>• Auto industries</li> <li>• Aircraft Industries</li> <li>• Paint companies</li> <li>• Home appliance company</li> <li>• Fire Departments</li> </ul>	<p>Combined with:</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">               ** for punctures         </div> <div style="text-align: center;">               * for high voltage         </div> </div> <ul style="list-style-type: none"> <li>• Light manufacturing</li> <li>• Retail stores</li> <li>• Supervisors</li> <li>• Office staff</li> <li>• Hospitals</li> <li>• Service stations</li> <li>• Security</li> <li>• Ambulance staff</li> </ul>

Reprinted with a permission of the Canadian Centre for Occupational Health and Safety (CCOHS - <http://www.ccohs.ca/oshanswers/prevention/ppe/footwear.html>)

**Recommendations – Grade 1 footwear will provide you with the maximum protection, therefore is recommended for any type of activities but a grade 2 or 3 may still be selected if appropriate for the type of risk**

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### 11.4 Selecting Footwear

Good footwear should have the following qualities:

- The inner side of the shoe must be straight from the heel to the end of the big toe.
- The shoe must grip the heel firmly.
- The forepart must allow freedom of movement for the toes.
- The shoe must have a fastening across the instep to prevent the foot from slipping when walking.
- The shoe must have a low, wide-based heel; flat shoes are recommended.

### 11.5 Fitting

- Walk in new footwear to ensure it is comfortable.
- Boots should have ample toe room (toes should be about 12.5 mm from the front)
- Make allowances for extra socks or special arch supports when buying boots.
- Boots should fit snugly around the heel and ankle when laced.
- Lace up boots fully. High-cut boots provide support against ankle injury.

### 11.6 Maintenance of Footwear

- Use a protective coating to make footwear water-resistant, if necessary.
- Inspect footwear regularly for damage.
- Repair or replace worn or defective footwear.
- Electric shock resistance of footwear is greatly reduced by wet conditions and with wear.
- Refer to manufacturer's instructions.

***Please note that open-toed and high-heeled shoes are not allowed and should not be worn in laboratories or other workplaces where exposure to chemical, radioactive or biological agents can occur!***

## 12.0 OTHER TYPE OF PROTECTION

It is important to consider special protection when working outside, such as:

- Sunscreen (minimum SPF-15, used as directed), sun block, sun glasses
- Insect repellent (visit the Health Canada or City of Ottawa website for further information on the best repellent to use).
- Rain suits
- Hats
- Long sleeves / pants

These means of protection are usually not considered to be typical PPE, however, the long-term exposure to the sun, or black fly and mosquito bites as well as rain can create a great discomfort for worker, or even lead to potential diseases. Therefore these means of protection should be kept in mind.

### 12.1 Avoidance

In order to minimize sun exposure and the potential hazards associated thereto, all outdoor work (if possible) should be scheduled for early morning or late afternoon. On days when a high UV index exists, the outdoor work should be avoided where possible. If work occurs during

## PERSONAL PROTECTIVE EQUIPMENT STANDARD

peak periods of UV radiation (11:00-16:00) appropriate clothing and skin protection must be worn. Working around reflective surfaces also should be avoided as this increases radiant heat and can increase exposure, especially to the face and eyes.

All exterior workers should drink plenty of water to prevent sunstroke and / or heat exhaustion.

### 13.0 FALL PROTECTION

#### 13.1 Legislation

*As per Regulation 851, s.85 – where a worker is exposed to the hazard of falling and the surface to which he or she might fall is more than three metres below the position where he or she is situated,*

- (a) the worker shall wear a serviceable safety belt or harness and lifeline adequately secured to a fixed support and so arranged that the worker cannot fall freely for a vertical distance of more than 1.5 metres; and*
- (b) the fall arresting system described in clause (a) shall,*
  - I. have sufficient capacity to absorb twice the energy and twice the load that under the circumstances of its use may be transmitted to it, and*
  - II. be equipped with a shock absorber or other devices to limit the maximum arresting force to 8.0 kilonewtons to the wearer.*

#### 13.2 Standard

All fall protection equipment must meet or exceed CSA standards

- Z259.2.1-98 [Fall Arresters, Vertical Lifelines, and Rails](#)
- Z259.2.2-98 Self-Retracting Devices for Personal Fall-Arrest Systems
- Z259.2.3-99 Descent Control Devices
- Z259.10-06 Full Body Harnesses
- Z259.11-M92 Shock Absorbers for Personal Fall-Arrest Systems

**For detailed information, consult the University of Ottawa [Fall Protection Guidelines](#).**

#### 13.2 Different Types of Fall Protection

##### 13.3.1 Fall-restricting system

Designed to limit workers' free fall distance to 0.6 metres

##### 13.3.2 Safety net

Installed below a work surface to protect any location where a fall hazard exists

##### 13.3.3 Fall-arrest system

Prevents a falling worker from hitting the ground or any object or level below the work. (Refer to Appendix 6) The system consists of

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- **Full body harness** – wrap around the waist, shoulders and legs. In the event of fall, a full-body harness distributes the force of the impact throughout the trunk of the body.
- **Lanyard with Shock Absorber** – are used both to restrain workers in position and to arrest falls. A lanyard used for a fall is limited to allow a maximum six-foot free fall.
- **Rope grab** – allows the worker to move along the length of the lifeline
- **Lifeline** – adds versatility to the fall arrest system. Lifelines can be vertical, horizontal or retractable.
- **Lifeline Anchor or Tie-off Point** – is where the lifeline or lanyard is attached to a structural support.

### 13.3.4 Positioning / Travel Restraint System

Restricts the elevated worker, preventing him / her from getting into a hazardous position where a fall could occur

### 13.3 Maintenance

All fall protection must be inspected for damage, wear, and obvious defects by a competent worker before each use.

***Any equipment exposed to a fall must be taken out of service. Once the equipment has been exposed, replace the equipment, IT IS NOT TO BE USED AGAIN for the purposes of fall protection***

## 14.0 OTHER PROTECTIVE EQUIPMENT AND CLOTHING

In cases where additional protective devices or clothing, not specified in this document, may be required, the worker will be notified by his/her supervisor. For assistance in determining / selecting other protective devices, please contact the Office of Risk Management.

## 15.0 OFF CAMPUS RESEARCH ACTIVITIES AND FIELD TRIPS

Supervisor must inform workers prior to the activity if any personal protective equipment is required.

University of Ottawa employees will be provided with all appropriate equipment for the activity.

Students **must** provide their own personal protective equipment in accordance with supervisor instructions (for example, safety shoes, safety glasses / goggles and hearing protection equipment depending on the task being undertaken) unless alternate arrangements have been made (at the discretion of the supervisor)

Students not wearing appropriate personal protective equipment on these occasions will be excluded from participating in activities.

For further information, consult the University of Ottawa fieldwork guide.

# PERSONAL PROTECTIVE EQUIPMENT STANDARD

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*Last modified: 24-Jun-2011*

# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 1

### Typical noise levels

<b>Typical Noise Levels</b>	
<b>Sound Source</b>	<b>Decibel dB(A)</b>
Normal breathing	<b>10</b>
Whispering at 5 feet	<b>20</b>
Soft whisper	<b>30</b>
Rainfall; large office	<b>50</b>
Normal conversation	<b>60</b>
Shouting in Ear	<b>110</b>
Ambulance siren	<b>120</b>
Airplane taking off (at 25 metres)	<b>140</b>

# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 2 Glove selection.

### How to Read the Charts

Three categories of data are represented for each Ansell Edmont product and corresponding chemical: 1) overall degradation resistance rating; 2) permeation breakthrough time, and 3) permeation rate. **Standards for Color-Coding**

A glove-chemical combination receives **GREEN**  if either set of the following conditions is met:

- The degradation rating is Excellent or Good
- The permeation breakthrough time is 30 minutes or longer
- The permeation rate is Excellent, Very Good, or Good.

OR

- The permeation rate is not specified
- The permeation breakthrough time is 240 minutes or longer
- The degradation rating is Excellent, Very Good, or Good

A glove-chemical combination receives **RED**  if: the degradation rating is Poor or Not Recommended, regardless of the permeation rating.

All other glove-chemical combinations receive **YELLOW** . In other words, any glove-chemical combination not meeting either set of conditions required for Green, and not having a Red degradation rating of either Poor or Not Recommended, receives a **YELLOW**  rating.

#### Key to Permeation Rate

	Simply Stated Drops Per Hour Through A Glove (Eyedropper size drop)
E - Excellent; permeation rate of less than 0.9 µg/cm <sup>2</sup> /min.	0 to 1/2 drop
VG - Very Good; permeation rate of less than 9 µg/cm <sup>2</sup> /min.	1 to 5 drops
G - Good; permeation rate of less than 90 µg/cm <sup>2</sup> /min.	6 to 50 drops
F - Fair; permeation rate of less than 900 µg/cm <sup>2</sup> /min.	51 to 500 drops
P - Poor; permeation rate of less than 9000 µg/cm <sup>2</sup> /min.	501 to 5000 drops
NR - Not Recommended; permeation rate greater than 9000 µg/cm <sup>2</sup> /min.	5001 drops up

Note: The current revision to the ASTM standard permeation test calls for permeation to be reported in micrograms of chemical permeated per square centimeter of material exposed per minute of exposure, "µg/cm<sup>2</sup>/min."

#### Key to Permeation Breakthrough

>Greater than (time) <Less than (time)

#### Key to Permeation Degradation Ratings

E - Excellent; fluid has very little degrading effect.  
 G - Good; fluid has minor degrading effect.  
 F - Fair; fluid has moderate degrading effect.  
 P - Poor; fluid has pronounced degrading effect.  
 NR - Fluid is not recommended with this material.

NOTE: Any test samples rated P (poor) or NR (not recommended) in degradation testing were not tested for permeation resistance. A dash (-) appears in those cases.

#### Specific Gloves Used for Testing

	Degradation	Permeation
Nitrile	Sol-Vex <sup>®</sup> 37-145 (11 ml/0.28 mm)	Sol-Vex <sup>®</sup> 37-165 (22 ml/0.54 mm)
Neoprene Unsupported	29-865 (15 ml/0.38 mm)	29-865 (15 ml/0.38 mm)
Polyvinyl Alcohol Supported	PVA <sup>™</sup>	PVA <sup>™</sup>
Polyvinyl Chloride Supported	Snorkel <sup>®</sup>	Monkey Grip <sup>™</sup>
Natural Rubber Latex	Canners 392 (19 ml/0.48 mm)	Canners 392 (19 ml/0.48 mm)
Neoprene/Latex Blend	Chem-Pro 224 (27 ml/0.67 mm)	Chem-Pro 224 (27 ml/0.67 mm)
Laminated LCP <sup>™</sup> Film	Barrier 2-100 (2.5 ml/0.06 mm)	Barrier 2-100 (2.5 ml/0.06 mm)

Single palm thickness is listed in both ml and metric millimeter (mm) for Unsupported Gloves. Supported Gloves are specified by glove weight, not thickness.

#### Why is a product with a shorter breakthrough time sometimes given a better rating than one with a longer breakthrough time?

One glove has a breakthrough time of just 4 minutes. It is rated "very good," while another with a breakthrough time of 30 minutes is rated only "fair." Why? The reason is simple: in some cases the *rate* is more significant than the *time*.

Imagine connecting two hoses of the same length but different diameters to a faucet using a "Y" connector. When you turn on the water, what happens? Water goes through the smaller hose first because there is less space inside that needs to be filled. But when the water finally gets through

the larger hose it really gushes out. In only a few minutes the larger hose will discharge much more water than the smaller one, even though the smaller one started first.

The situation is similar with gloves. A combination of a short breakthrough time and a low permeation rate may expose a glove wearer to less chemical than a combination of a longer breakthrough time and a much higher breakthrough rate, if the glove is worn long enough.

**SPECIAL NOTE:** The chemicals in this guide highlighted in BLUE are experimental carcinogens, according to the ninth edition of Sax' *Dangerous Properties of Industrial Materials*. Chemicals highlighted in GRAY are listed as suspected carcinogens, experimental carcinogens at extremely high dosages, and other materials which pose a lesser risk of cancer.

# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 2 (CONTINUED)

The first square in each column for each glove type is color coded. This is an easy-to-read indication of how we rate this type of glove in relation to its applicability for each chemical listed. The color represents an overall rating for both degradation and permeation. The letter in each square is for Degradation alone...

**GREEN:** The glove is very well suited for application with that chemical.

**YELLOW:** The glove is suitable for that application under careful control of its use.

**RED:** Avoid use of the glove with this chemical.



CHEMICAL	LAMINATED FILM			NITRILE			UNSUPPORTED NEOPRENE			SUPPORTED POLYVINYL ALCOHOL			POLYVINYL CHLORIDE (Vinyl)			NATURAL RUBBER			NEO PRENE/NATURAL RUBBER BLEND		
	BARRIER			SOL-VEX			29-865			PVA			SNORKEL			CANNERS AND HANDLERS*			CHEMI-PRO*		
	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate
1. Acetaldehyde	■	380	E	P	—	—	E	10	F	NR	—	—	NR	—	—	E	7	F	E	10	F
2. Acetic Acid	■	150	—	G	270	—	E	60	—	NR	—	—	F	180	—	E	110	—	E	260	—
3. Acetone	▲	>480	E	NR	—	—	E	10	F	P	—	—	NR	—	—	E	10	F	G	10	G
4. Acetonitrile	▲	>480	E	F	30	F	E	20	G	■	150	G	NR	—	—	E	4	VG	E	10	VG
5. Acrylic Acid	—	—	—	G	120	—	E	390	—	NR	—	—	NR	—	—	E	80	—	E	65	—
6. Allyl Alcohol	▲	>480	E	F	140	F	E	140	VG	P	—	—	P	60	G	E	>10	VG	E	20	VG
7. Ammonium Fluoride, 40%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—
8. Ammonium Hydroxide	E	30	—	E	>360	—	E	260	—	NR	—	—	E	240	—	E	90	—	E	240	—
9. Amyl Acetate	▲	>480	E	E	60	G	NR	—	G	>360	E	P	—	—	NR	—	—	—	P	—	—
10. Amyl Alcohol	—	—	—	E	30	E	E	290	VG	G	180	G	G	12	E	E	26	VG	E	45	VG
11. Aniline	▲	>480	E	NR	—	—	E	100	P	F	>360	E	F	180	VG	E	26	VG	E	50	G
12. Aqua Regia	—	—	—	F	>360	—	G	>480	—	NR	—	—	G	120	—	NR	—	—	G	180	—
13. Benzaldehyde	▲	>480	E	NR	—	—	NR	—	G	>360	E	NR	—	—	G	10	VG	G	25	F	—
14. Benzene, Benzol	▲	>480	E	P	—	—	NR	—	E	>360	E	NR	—	—	NR	—	—	—	NR	—	—
15. Bromopropionic Acid	▲	>480	—	F	120	—	E	420	—	NR	—	—	G	190	—	E	190	—	G	180	—
16. Butyl Acetate	▲	>480	E	F	75	F	NR	—	G	>360	E	NR	—	—	NR	—	—	P	—	—	—
17. Butyl Alcohol	▲	>480	E	E	>360	E	E	210	VG	F	75	G	G	180	VG	E	20	VG	E	45	VG
18. Butyl Carbitol	—	—	—	E	323	E	G	188	F	E	>480	E	E	397	VG	E	44	G	E	148	G
19. Butyl Cellulose	▲	>480	E	E	90	VG	E	120	F	■	120	G	P	—	—	E	45	G	E	40	G
20. gamma-Butyrolactone	▲	>480	E	NR	—	—	E	190	F	E	120	VG	NR	—	—	E	60	G	E	100	F
21. Carbon Disulfide	▲	>480	E	G	30	F	NR	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	—
22. Carbon Tetrachloride	—	—	—	G	150	G	NR	—	E	>360	E	F	25	F	NR	—	—	NR	—	—	—
23. Cellulose Acetate	▲	>480	E	F	90	G	E	40	P	▲	>360	E	NR	—	—	E	10	G	E	15	G
24. Cellulose Solvent	—	—	—	G	210	G	E	120	F	■	75	G	P	—	—	E	26	VG	E	20	VG
25. Chlorobenzene	▲	>480	E	NR	—	—	NR	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	—
26. Chloroform	E	20	G	NR	—	—	NR	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	—
27. Chloronaphthalene	▲	>480	E	P	—	—	NR	—	G	>360	E	NR	—	—	NR	—	—	P	—	—	—
28. Chromic Acid, 50%	—	—	—	F	240	—	NR	—	—	NR	—	—	G	>360	—	NR	—	—	NR	—	—
29. Citric Acid, 10%	—	—	—	E	>360	—	E	>480	—	P	—	—	E	>360	—	E	>360	—	E	>360	—
30. Cyclohexanol	▲	>480	E	E	>360	E	E	390	VG	G	>360	E	E	360	E	E	10	G	E	20	G
31. Cyclohexanone	▲	>480	E	F	103	G	P	—	E	>480	E	NR	—	—	P	—	—	P	—	—	—
32. Diacetone Alcohol	▲	>480	E	G	240	E	E	140	G	■	150	G	NR	—	—	E	15	VG	E	60	VG
33. Dibutyl Phthalate	—	—	—	G	>360	E	F	<10	F	E	>360	E	NR	—	—	E	20	—	G	>360	E
34. Diethylamine	▲	>480	E	F	45	F	P	—	—	NR	—	—	NR	—	—	NR	—	—	NR	—	—
35. Di-Isobutyl Ketone, DIBK	▲	>480	E	E	120	F	P	—	—	G	>360	E	P	—	—	P	—	—	P	—	—
36. Dimethyl Acetamide, DMAC	▲	>480	E	NR	—	—	NR	—	—	NR	—	—	NR	—	—	E	15	G	E	30	G
37. Dimethyl Formamide, DMF	▲	>480	E	NR	—	—	E	40	F	NR	—	—	NR	—	—	E	25	VG	E	40	G
38. Dimethyl Sulfoxide, DMSO	▲	>480	E	E	>240	VG	E	360	G	NR	—	—	NR	—	—	E	180	E	E	150	E
39. Dioctyl Phthalate, DOP	▲	>480	E	G	>360	E	G	>480	E	E	30	F	NR	—	—	P	—	—	E	>360	E
40. Dioxane	▲	>480	E	NR	—	—	NR	—	—	P	—	—	NR	—	—	F	5	F	F	15	F
41. Electroless Copper	—	—	—	E	>360	—	E	>360	—	NR	—	—	E	>360	—	E	>360	—	—	—	—
42. Electroless Nickel	—	—	—	E	>360	—	E	>360	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—
43. Epichlorohydrin	▲	>480	E	NR	—	—	P	—	—	E	300	E	NR	—	—	E	5	F	E	15	G
44. Ethyl Acetate	▲	>480	E	NR	—	—	F	10	P	F	>360	E	NR	—	—	G	5	F	F	10	F
45. Ethyl Alcohol	▲	>480	E	E	240	VG	E	113	VG	NR	—	—	G	60	VG	E	37	VG	E	20	G
46. Ethylene Dichloride	▲	>480	—	NR	—	—	NR	—	—	E	>360	E	NR	—	—	P	—	—	P	—	—

Note: All numeric designations within the product classifications are denoted in minutes.

▲ A degradation test against this chemical was not run. However, since its breakthrough time is greater than 480 minutes, the Degradation Rating is expected to be Good to Excellent.

■ A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent.

\*CAUTION: This product contains natural rubber latex which may cause allergic reactions in some individuals.

# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 2 (CONTINUED)



This Information Applies Only to Ansell Protective Products Glove Brands	LAMINATED FILM			NITRILE			UNSUPPORTED NEOPRENE			SUPPORTED POLYVINYL ALCOHOL			POLYVINYL CHLORIDE (Vinyl)			NATURAL RUBBER			NEOPRENE/NATURAL RUBBER BLEND		
	BARRIER			SOL-VEX			29-865			PVA			SNORKEL			CANNERS AND HANDLERS*			CHEMI-PRO*		
	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate
CHEMICAL																					
47. Ethylene Glycol	▲	>490	E	E	>360	E	E	>480	—	F	120	VG	E	>360	E	E	>360	E	E	—	—
48. Ethyl Ether	▲	>490	E	E	120	G	F	<10	P	G	>360	E	NR	—	—	NR	—	—	NR	—	—
49. Ethyl Glycol Ether	▲	>490	E	G	210	G	E	120	F	■	75	G	F	—	—	E	25	VG	E	20	VG
50. Formaldehyde	▲	>490	E	E	>360	E	E	105	G	P	—	—	E	80	VG	E	10	G	E	15	VG
51. Formic Acid, 90%	▲	>490	—	F	240	—	E	>480	—	NR	—	—	E	>360	—	E	150	—	E	>360	—
52. Furfural	▲	>490	E	NR	—	—	E	30	P	F	>360	E	NR	—	—	E	15	VG	E	40	G-VG
53. Glutaraldehyde, 25%	—	—	—	—	>360	—	E	>480	E	P	—	—	E	>360	E	E	210	VG	E	—	—
54. Gasoline (hi-test)	■	170	E	E	>360	E	NR	—	—	G	>360	E	P	—	—	NR	—	—	NR	—	—
55. HCFC-141b	▲	>490	E	E	92	F	F	33	P	P	—	—	NR	—	—	NR	—	—	NR	—	—
56. Hexamethyldisilazane	▲	>490	E	E	>360	—	E	15	—	G	>360	—	P	—	—	F	15	F	F	40	F-G
57. Hexane	▲	>490	E	E	>360	E	E	40	F	G	>360	E	NR	—	—	NR	—	—	P	—	—
58. Hydrazine, 65%	—	—	—	E	>360	—	E	380	—	NR	—	—	E	>360	—	E	150	VG	E	>360	—
59. Hydrobromic Acid	▲	>490	—	E	>360	E	E	>480	—	NR	—	—	E	>360	E	E	>360	E	E	>360	E
60. Hydrochloric Acid, conc.	▲	>490	—	E	>360	—	E	>480	—	NR	—	—	E	>300	—	E	290	—	E	>360	—
61. Hydrochloric Acid, 10%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—
62. Hydrofluoric Acid, 48%	▲	>490	—	E	120	—	E	5	—	NR	—	—	G	40	—	E	190	—	E	150	—
63. Hydrogen Peroxide, 30%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	G	90	—
64. Hydroquinone, saturated	—	—	—	E	>360	E	E	140	F	NR	—	—	E	>360	E	G	>360	E	E	>360	—
65. Isobutyl Alcohol	▲	>490	E	E	>360	E	E	470	E	P	—	—	F	10	VG	E	15	VG	E	45	VG
66. Iso-Octane	▲	>490	E	E	360	E	E	230	G	E	>360	E	P	—	—	NR	—	—	P	—	—
67. Isopropyl Alcohol	▲	>490	E	E	>360	E	E	<10	VG	NR	—	—	G	150	E	E	20	VG	E	40	VG
68. Kerosene	▲	>490	E	E	>360	E	E	170	P	G	>360	E	F	>360	E	NR	—	—	P	—	—
69. Lactic Acid, 85%	▲	>490	—	E	>360	E	E	>480	—	F	>360	E	E	>360	E	E	>360	—	E	>360	—
70. Lactic Acid, 36%EtOH	—	—	—	E	>360	—	E	>480	—	NR	—	—	F	15	—	E	>360	—	E	>360	—
71. d-Limonene	▲	>490	E	E	>480	E	P	—	—	G	>490	E	G	125	G	NR	—	—	NR	—	—
72. Maleic Acid, saturated	—	—	—	E	>360	—	E	>480	—	NR	—	—	G	>360	—	E	>360	—	E	>360	—
73. 1-methoxy-2-acetoxypropane	▲	>490	E	E	200	F	G	37	F	E	>360	E	P	—	—	G	13	F	G	18	F
74. Methyl Alcohol	E	>490	E	E	11	F	E	65	G	NR	—	—	G	45	G	E	20	VG	E	20	VG
75. Methylamine	▲	>490	E	E	>360	E	E	140	G	NR	—	—	E	135	VG	E	55	VG	E	80	VG
76. Methyl Cellosolve	E	440	E	F	11	G	P	—	—	G	30	G	P	—	—	E	20	VG	E	20	VG
77. Methylene Bromide	▲	>490	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—
78. Methylene Chloride	E	20	VG	NR	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—
79. Methyl Ethyl Ketone, MEK	E	>490	E	NR	—	—	P	—	—	F	90	VG	NR	—	—	F	5	F	P	—	—
80. Methyl Glycol Ether	▲	>490	E	F	11	G	P	—	—	G	30	G	P	—	—	E	20	VG	E	20	VG
81. Methyl Iodide	▲	>490	E	NR	—	—	NR	—	—	F	>360	E	NR	—	—	NR	—	—	NR	—	—
82. Methyl Isobutyl Ketone	▲	>490	E	P	—	—	NR	—	—	F	>360	E	NR	—	—	P	—	—	P	—	—
83. Methyl Methacrylate	▲	>490	E	P	—	—	NR	—	—	G	>360	E	NR	—	—	P	—	—	NR	—	—
84. N-Methyl-2-Pyrrolidone	▲	>490	E	NR	—	—	NR	—	—	NR	—	—	NR	—	—	E	75	VG	F	40	G
85. Propane Gas	—	—	—	▲	>480	E	—	—	—	—	—	—	■	7	VG	—	—	—	—	—	—
86. Methyl t-Butyl Ether	E	>490	E	E	>360	E	P	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—
87. Mineral Spirits, rule 66	▲	>490	E	E	>360	E	E	100	F	E	>360	E	F	150	VG	NR	—	—	G	20	F
88. Monoethanolamine	—	—	—	E	>360	E	E	260	E	F	>360	E	E	>360	E	E	50	E	E	50	E
89. Morpholine	▲	>490	E	NR	—	—	P	—	—	G	90	G	NR	—	—	G	20	G	E	30	F-G
90. Muriatic Acid	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>300	—	E	290	—	E	>360	—
91. Naphtha VM&P	▲	>490	E	E	>360	E	G	100	F	E	>420	E	F	120	VG	NR	—	—	NR	—	—
92. Nitric Acid, 10%	▲	>490	—	E	>360	—	E	>480	—	NR	—	—	G	>360	—	G	>360	—	E	>360	—

Note: All numeric designations within the product classifications are denoted in minutes.

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■ A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent.

\*CAUTION: This product contains natural rubber latex which may cause allergic reactions in some individuals.

# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 2 (CONTINUED)



This Information Applies Only to Ansell Protective Products Glove Brands	LAMINATED FILM			NITRILE			UNSUPPORTED NEOPRENE			SUPPORTED POLYVINYL ALCOHOL			POLYVINYL CHLORIDE (Vinyl)			NATURAL RUBBER			NEOPRENE / NATURAL RUBBER BLEND		
	BARRIER			SOL-VEK			29-866			PVA			SNORKEL			CANNERS AND HANDLERS*			CHEMI-PRO*		
	Degradation Rating	Permeation Breakthrough	Permeation Rate	Degradation Rating	Permeation Breakthrough	Permeation Rate	Degradation Rating	Permeation Breakthrough	Permeation Rate	Degradation Rating	Permeation Breakthrough	Permeation Rate	Degradation Rating	Permeation Breakthrough	Permeation Rate	Degradation Rating	Permeation Breakthrough	Permeation Rate	Degradation Rating	Permeation Breakthrough	Permeation Rate
	CHEMICAL																				
93. Nitric Acid, 70%	E	>480	—	NR	—	—	E	>480	—	NR	—	—	F	345	—	NR	—	—	G	90	—
94. Nitric Acid, Red Fuming	—	—	—	NR	—	—	NR	—	—	NR	—	—	P	—	—	P	—	—	NR	—	—
95. Nitrobenzene	▲	>480	E	NR	—	—	NR	—	G	>360	E	NR	—	—	F	15	G	F	40	G	—
96. Nitromethane, 95.5%	▲	>480	E	F	30	F	E	60	G	G	>360	E	P	—	—	E	10	G	E	30	VG
97. Nitropropane, 95.5%	▲	>480	E	NR	—	—	E	<10	F	E	>360	E	NR	—	—	E	5	G	E	10	G
98. Octyl Alcohol	—	—	—	E	>360	E	E	<10	E	G	>360	E	F	>360	E	E	30	VG	E	50	G
99. Oleic Acid	—	—	—	E	>360	E	F	<10	G	G	60	E	F	90	VG	F	>360	—	G	120	—
100. Oxalic Acid, saturated	—	—	—	E	>360	—	E	>480	—	P	—	—	E	>360	—	E	>360	—	E	>360	—
101. Pad Etch 1 (Ashland Chem.)	—	—	—	F	>360	—	E	>480	—	F	34	—	E	>360	—	E	>360	—	E	>360	—
102. Palmitic Acid, saturated	—	—	—	G	30	—	E	>480	—	P	—	—	G	75	—	G	5	—	E	180	—
103. Pentane	—	—	—	E	>360	E	G	20	F	G	>360	E	NR	—	—	P	—	—	E	6	F
104. Pentachlorophenol, 5%	—	—	—	E	>360	E	E	151	F	E	5	F	F	180	E	NR	—	—	—	—	—
105. Perchloric Acid, 60%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	F	>360	—	E	>360	—
106. Perchloroethylene	▲	>480	E	G	300	VG	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—
107. Phenol	▲	>480	E	NR	—	—	E	140	F	F	>360	E	G	75	VG	E	90	—	E	180	—
108. Phosphoric Acid, conc.	▲	>480	—	E	>360	—	G	>480	—	NR	—	—	G	>360	—	F	>360	—	G	>360	—
109. PMA Glycol Ether Acetate	▲	>480	E	E	200	F	G	37	F	E	>360	E	P	—	—	G	13	F	G	18	F
110. Potassium Hydroxide, 50%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—
111. Propyl Acetate	—	—	—	F	20	G	P	—	—	G	120	VG	NR	—	—	P	—	—	P	—	—
112. Propyl Alcohol	▲	>480	—	E	>360	E	E	200	VG	P	—	—	F	90	VG	E	20	VG	E	30	VG
113. Propylene Oxide	▲	>480	—	NR	—	—	NR	—	—	G	35	G	NR	—	—	P	—	—	P	—	—
114. Pyridine	▲	>480	E	NR	—	—	NR	—	G	10	F	NR	—	—	F	10	F	P	—	—	—
115. Rubber Solvent	—	—	—	E	>360	E	E	40	F	E	>360	E	NR	—	—	NR	—	—	NR	—	—
116. Silicon Etch	—	—	—	NR	—	—	E	>480	—	NR	—	—	F	160	—	NR	—	—	P	—	—
117. Skydrol hydraulic fluid	E	>480	E	NR	—	—	NR	—	—	F	—	—	NR	—	—	NR	—	—	NR	—	—
118. Sodium Hydroxide, 50%	E	>480	—	E	>360	—	E	>480	—	NR	—	—	G	>360	—	E	>360	—	E	>360	—
119. Stoddard Solvent	▲	>480	E	E	>360	E	E	120	F	E	>360	E	F	360	E	NR	—	—	G	10	F
120. Styrene	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—
121. Sulfuric Acid, 95%	E	>480	—	NR	—	—	F	105	—	NR	—	—	G	220	—	NR	—	—	NR	—	—
122. Sulfuric 47% battery acid	—	—	—	E	>360	—	E	>480	—	NR	—	—	G	>360	—	E	>360	—	E	>360	—
123. Tannic Acid, 65%	—	—	—	E	>360	E	E	>480	—	P	—	—	E	>360	E	E	>360	—	E	>360	—
124. Tetrachloroethene	▲	>480	—	G	300	VG	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—
125. Tetrahydrofuran, THF	▲	>480	E	NR	—	—	NR	—	—	P	90	G	NR	—	—	NR	—	—	NR	—	—
126. Toluene, toluol	▲	>480	E	F	10	F	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—
127. Toluene Di-isocyanate	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	P	—	—	G	7	G	—	—	—
128. Trichloroethylene, TCE	▲	>480	E	NR	—	—	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—
129. Tricresyl Phosphate, TCP	—	—	—	E	>360	E	G	<10	P	G	>360	E	F	>360	E	E	45	E	E	>360	E
130. Triethanolamine, 85%	—	—	—	E	>360	E	E	<10	G	G	>360	E	E	>360	E	G	>360	E	E	—	—
131. Turpentine	▲	>480	E	E	30	E	NR	—	—	G	>360	E	P	—	—	NR	—	—	NR	—	—
132. Verbel MCA	▲	>480	E	E	110	G	E	20	F	F	>480	E	G	13	F	G	<10	F	G	<10	F
133. Verbel SMT	E	<10	G	P	—	—	F	<10	P	G	17	G	G	<10	F	F	<10	F	P	—	—
134. Verbel XE	E	105	E	E	>480	E	E	47	G	F	40	VG	G	303	E	E	17	VG	E	43	VG
135. Verbel XF	E	>480	E	E	>480	E	E	>480	E	F	387	VG	E	>480	E	E	337	VG	E	204	VG
136. Verbel XM	E	120	E	E	>480	E	E	105	E	F	10	G	P	—	—	E	23	VG	E	30	VG
137. Xylene, Xylol	▲	>480	E	G	75	F	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—

Note: All numeric designations within the product classifications are denoted in minutes.

▲ A degradation test against this chemical was not run. However, since its breakthrough time is greater than 480 minutes, the Degradation Rating is expected to be Good to Excellent.

■ A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be Good to Excellent.

\*CAUTION: This product contains natural rubber latex which may cause allergic reactions in some individuals.

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# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 3 Instructions for testing protective gloves prior to their usage

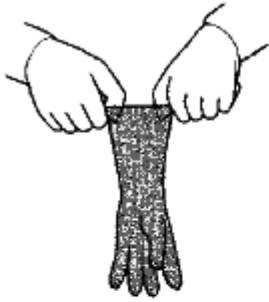


Figure 1

Hold cuff as illustrated, with thumbs inside, stretch cuff slightly.



Figure 2

Swing glove outward and over towards the face, two or three times, trapping air inside.



Figure 3

Squeeze inflated portion of glove with left hand, causing rubber to expand and magnify any defect.

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# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 4 Closed Donning:



2. With your gown covering your fingers, use your right hand to remove the left glove. Hold your left hand palm up, fingers straight. Lay the glove on your left wrist, and grip the cuff with your left thumb.

3. Place your right thumb inside the top cuff edge. Make a fist with your right hand and stretch the glove over your left fingertips.



4. Keeping your left fingers straight, pull down the glove.

5. Repeat the above procedure to don the other glove, that is: use your gloved left hand to lay the right glove on your right wrist. Slide your left thumb inside the top of the cuff, make a fist, and stretch the cuff over your right fingertips. Pull down the sleeve and glove together.



## Open Donning

1. Pick up the cuff of the right glove with your left hand. Slide your right hand into the glove until you have a snug fit over the thumb joint and knuckles. Your bare left hand should only touch the folded cuff - the rest of the glove remains sterile.



2. Slide your right fingertips into the folded cuff of the left glove. Pull out the glove and fit your right hand into it.

3. Unfold the cuffs down over your gown sleeves. Make sure your gloved fingertips do not touch your bare forearms or wrists.



## PERSONAL PROTECTIVE EQUIPMENT STANDARD

### APPENDIX 4 (CONTINUED)

#### Glove Removal

The key to removing gloves is:

**"Dirty to Dirty - Clean to Clean",**

that is, contaminated surfaces only touch other contaminated surfaces: your bare hand, which is clean, touches only clean areas inside the other glove.



1. Take hold of the first glove at the wrist.

2. Fold it over and peel it back, turning it inside out as it goes. Once the glove is off, hold it with your gloved hand.



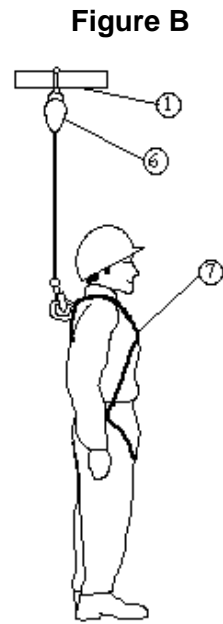
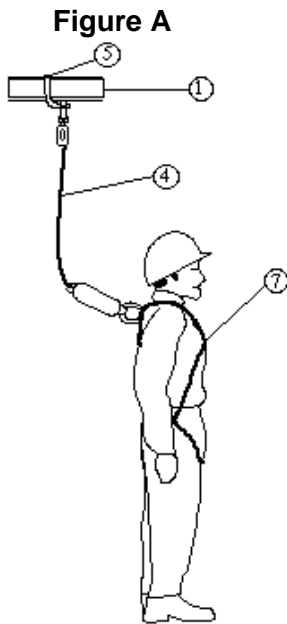
3. To remove the other glove, place your bare fingers inside the cuff without touching the glove exterior. Peel the glove off from the inside, turning it inside out as it goes. Use it to envelope the other glove.

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**[http://www.ansellhealthcare.com/latex\\_gloves/what\\_you\\_should\\_know/E/donning\\_techniques.html](http://www.ansellhealthcare.com/latex_gloves/what_you_should_know/E/donning_techniques.html)**

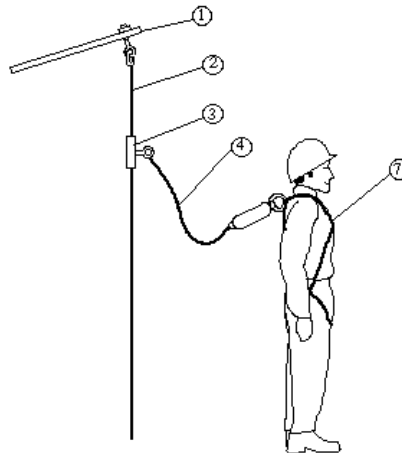
# PERSONAL PROTECTIVE EQUIPMENT STANDARD

## APPENDIX 5



1. Tie-off Point
2. Lifeline
3. Rope Grab
4. Shock-Absorbing Lanyard
5. Cross-Arm Strap
6. Retractable Lifeline
7. Full-Body Harness

**Figure C**



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<http://www.labsafety.com/refinfo/ezfacts/ezf130.htm#FigureC>