Protective Glove Standard: Selection, Use and Care

Exposure to chemicals, infectious agents, sharp or abrasive objects, extreme temperatures, electrical shock, and other hazards can all create a potential for injury to the hand. Wherever practicable, these hazards shall first be eliminated or mitigated through the use of engineering and/or administrative controls. Where hazards to the hand continue to exist, appropriate hand protection (protective gloves) must be used.

Under the Ontario Occupational Health and Safety Act, employers must take every precaution reasonable in the circumstances for the protection of the worker. In addition, Ontario Regulation 851 (Regulation for Industrial Establishments, as amended) specifies that a worker must wear protective apparel or use a shield, screen, or similar barrier when there is a risk of skin exposure to:

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.

Note: This standard applies only to protective gloves for the protection of the hands, wrists, and forearms. Other forms of personal protective clothing aimed at providing protection for other regions of the body are covered under the University of Toronto Protective Clothing Standard.

SCOPE:

This standard applies to any individuals (e.g., faculty, staff, students and visitors) who may be exposed to a hand injury from an operation or process conducted during University-sanctioned activities and/or on University owned and operated premises.

RESPONSIBILITIES:

Supervisors / Principal Investigators and all others in authority shall:

- Identify situations where hand protection is required and communicate this information through education, written procedures and/or signage;
- Determine (using this standard or in conjunction with Environmental Health and Safety) the type of hand protection required for the specific hand hazard;
- Provide individuals exposed to hand hazards with appropriate protective gloves;
- Ensure that individuals are provided education and training on specific hand hazards in the workplace and the effects of skin contact, proper use, care, and maintenance of protective gloves (per manufacturer instructions), limitations of protective gloves, and emergency procedures to follow in the event of hand injury or glove failure.
- Ensure that individuals always wear appropriate protective gloves in areas where hand hazards exist.

Faculty, staff, students, and visitors shall:

- Wear appropriate hand protection at all times in hand hazard areas;
- Use protective gloves appropriately per training/instruction;
- Inspect protective gloves regularly to ensure it is in good condition;
- Notify their PI/supervisor when their protective gloves are damaged and requires replacement, or if they encounter a novel or hazardous situation where different hand protection may be required;
- Not alter or modify protective gloves; and

- Store and maintain protective gloves in good condition between use.

PROTECTIVE GLOVES:

Appropriate protective gloves must be worn in all situations where the hands are potentially exposed to workplace hazards such as chemicals, infectious agents, radiation, lacerations, abrasions, punctures, burns, electric shock, harmful temperature extremes, and vibrations. Glove selection must include an initial workplace assessment to identify the hazards encountered, the specific tasks to be performed, and the conditions and duration of such work. **Appendix A** outlines recommended protective glove materials for protection against specific types of hazards.

For individuals who work in laboratories, also review the University of Toronto General Laboratory PPE Assessment Tool for determining protective eyewear, facewear, and other PPE needs.

1. Protective Glove Selection

A. Workplace and Job Task Factor Considerations

When selecting the appropriate glove for a particular application, consider the nature of the hazard(s) and the task(s) involved. Factors to consider during selection include:

- Type of hazardous agent handled (e.g., physical, chemical, biological, radiological, electrical, thermal);
- Nature of potential contact (e.g., occasional contact, splash protection, or continuous immersion of hands);
- Duration, frequency, and degree of contact;
- Potential effects of skin exposure (e.g., immediate irritation/corrosion, systemic effects, contribute to skin condition/allergy, burns);
- Area requiring protection (e.g., hand only, wrist, forearm, whole arm);
- Size and comfort needs;
- Dexterity and touch sensitivity needs;
- Abrasion, cut, puncture, tear resistance requirements;
- Grip requirements (e.g., dry, wet, oily);
- Decontamination procedure requirements (e.g., disposable or reusable);
- Type (e.g., solid/liquid/gases) and properties (e.g., hot/cold) of the tools, equipment, or materials being handled; and
- Compatibility and fit with other personal protective equipment or clothing worn.

B. Types of Protective Gloves

There are many types of gloves for protection against a wide variety of hazards. Appropriate glove protection must protect against the specific hazards presented and provide a comfortable and secure fit.

General purpose gloves: helps reduce hand injuries from snags, punctures, abrasions, and cuts. These gloves range from light-, medium-, to heavy-duty and are made of materials such as cotton canvas, aramid fibre, leather, and Kevlar®.

Cut-resistant gloves: provides protection against cuts and scrapes caused by sharp tools and equipment. These gloves are rated according to the level of force required to cut the material. They are available in a wide variety of materials such as metal-mesh, aramid fibre, Kevlar®, aluminized, and other cut-resistant materials.

Puncture-resistant gloves: protects against sharp objects, including glass, metal, and needle sticks. These gloves are rated according to the level of force required to puncture the material.

They are available in a wide variety of materials including leather, metal mesh, Kevlar®, and epoxy plates.

Coated Fibre Gloves: these gloves are ideal for job tasks requiring dexterity (e.g., handling of small parts). Typically, the glove is made of fibre material with the glove “shell” dipped in various coatings (e.g., nitrile, latex, polyurethane) to provide improved elasticity, grip and strength, and protection against extreme temperatures, chemicals, cuts, punctures, or abrasions.

Temperature-resistant / insulating gloves: provides protection from high or low temperatures. Common materials used in this type of glove include leather, Kevlar®, cotton canvas, aramid fibre, terry cloth, cryogenic gloves, rubber, aluminized, Nomex®, and Zetex®.

Anti-vibration / impact gloves: provides protection from vibration or impact from tools/equipment and helps prevent hand, finger, and arm fatigue.

Electrical protection: gloves which are voltage-rated provide protection against electrical shock hazards.

Chemical- and Liquid-Resistant Gloves: are made of different kinds of natural or synthetic rubber [e.g., natural (latex), neoprene, nitrile, fluorocarbon (viton)] or plastic [e.g., polyvinyl chloride (PVC), polyvinyl alcohol, polyethylene] to provide different levels of protection against powders and chemicals/liquids. Refer to **Appendix A – Table G** for chemical resistance and physical properties of common glove materials.

C. Glove Characteristics

The performance characteristics of a particular glove and its ability to protect against the specific hazards encountered depends on several factors including:

Type of glove material: The glove material will determine the protective qualities of the glove such as resistance to cut, tear, puncture, and abrasion, thermal and electrical protection, ability to withstand deterioration, oxidation, and ozone corrosion.

Sizing: Gloves come in sizes ranging from small to XX-large. Choose the correct size so that a proper and comfortable fit is obtained. Gloves that are too small may cause fatigue and discomfort and gloves that are too large may create dexterity issues or entanglement hazards.

Length: Depending on the glove length, protection can be provided for the hand only; hand, forearm, and elbow (for immersion or extra splash protection); or full arm (for full arm immersion).

Thickness: The thickness of the glove will impact its flexibility, touch sensitivity, and amount of protection. For disposable gloves, glove thickness is commonly expressed in mils (thousandths of an inch, 1 mil = 0.001 inch) or micrometers (microns).

Cuff: There are various cuff styles including straight, knitted/fitted, rolled, slip-on, ranched, and gauntlet. The cuff style not only affects the finished appearance of the glove, but also helps to meet specific needs. Knitted/fitted cuffs provide a firm grip around the wrist to hold the glove in place and prevent dirt and debris from getting into glove. Rolled cuffs act as a barrier to prevent chemicals from running off the glove and onto the skin. Slip-on cuffs do not have a seam between the glove and the cuff, allowing for the glove to slide on and off the hand easily for tasks that require frequently removal of the gloves. Ranched cuffs promote breathability and prevent hands from getting too hot. Gauntlet cuffs provide extra length to protect the wrist and forearm area.

Lining: The inside surfaces of gloves may be lined or unlined. Gloves may be lined with flock (fine cotton fibers) to absorb perspiration and facilitate easy donning/doffing. Gloves with cotton or other synthetic material knitted to the inside surface of the glove can absorb perspiration and provide temperature protection. Gloves lined with soft cotton jersey provide additional temperature protection and greater cushioning effect.

Unlined gloves provide better sensitivity and dexterity than lined gloves. Powdered unlined gloves make donning/doffing of gloves easier and can increase comfort. However, the powder may be an irritant or sensitizer to some individuals.

Disposable or reusable: Disposable (single-use) gloves are usually made of lightweight plastic or rubber materials and offer greater sensitivity and dexterity to the user. Users should be aware of the limitations of such gloves in protecting against chemical or physical hazards. Disposable gloves are generally intended to guard against mild chemicals or other materials and provide little or no protection against many chemicals. Although the need for high dexterity and low costs are often major factors in the selection of gloves, the potential for permeation of toxic materials through the glove material must be of prime consideration. Disposable gloves should be replaced frequently and should never be reused. Reusable gloves can be cleaned after use. If using reusable gloves, consider the decontamination method, frequency of cleaning, and life cycle of the reusable gloves.

Textured or non-textured: Gloves may be non-textured or have textured fingertips and/or palms to improve grip and touch sensitivity.

Ambidextrous or hand-specific: Gloves may come in two fit configurations: ambidextrous or hand-specific. Ambidextrous gloves can be worn on either hand and are suitable for tasks that require minimal dexterity, precision, or control. Gloves that are hand specific (right and left) provide a more comfortable fit and are ideal for tasks requiring precision and a higher degree of dexterity.

D. Chemical Resistant Gloves Selection

Chemical resistant gloves which provide an effective barrier against the specific chemicals used must be worn whenever hands are potentially exposed to chemicals. An appropriate chemical resistant glove must demonstrate no significant degradation, a high breakthrough time, and a low permeation rate upon contact with the chemicals used. Chemical permeation through an inappropriate glove can result in significant worker exposure and serious health effects, particularly when using highly toxic chemicals which are readily absorbed into the bloodstream via the skin.

Appendix B, "Guide to Selection of a Chemical Resistant Glove" is provided to assist in the selection of an appropriate chemical resistant glove material. It describes the type of information that is available to indicate the type and degree of chemical resistance a glove material can provide. It also provides a summary of general chemical resistance and physical properties of common glove materials. **Appendix B** is to be used in conjunction with safety data sheets for the specific chemicals used, as well as glove manufacturers' performance data regarding degradation, permeation rate, and breakthrough time for their individual glove products.

E. Latex Allergies

The use of latex gloves in and out of the workplace has resulted in a corresponding increase in the reporting of irritant and allergic reactions to the glove material. Reactions may either be due to exposure to the natural latex proteins or to the chemical additives added to the latex during the manufacturing process. Allergic reactions due to the natural latex proteins, in particular, can present a health risk to a significant number of workers who need to wear glove protection. Symptoms can range from local skin reactions to more serious health effects such as rhinitis, conjunctivitis, asthma and rarely, life-threatening anaphylactic shock. As a result, it is strongly recommended that departments implement a latex management program to minimize the risk of latex sensitization in workers and to address latex-sensitive workers. **Appendix C, “Management of Latex Glove Usage in the Workplace”** is provided to assist department’s with establishing a latex management program.

Individuals who are experiencing symptoms suggestive of latex allergy reactions should notify their supervisor to discuss the use of hypoallergenic gloves (e.g., latex-free), latex-free glove liners, or powderless gloves. If allergic symptoms continue to persist after switching to a latex-free alternative, the individual should consult with their personal physician or be referred to [University of Toronto Occupational Health]() for an assessment. Until a definitive diagnosis can be made, measures should be taken to prevent or reduce latex exposure in the workplace.

Additional information on latex allergies and reactions and measures to be taken to eliminate or minimize latex exposures in the workplace can be found at the following resources:

- National Institute for Occupational Safety and Health (NIOSH) Publication Number 98-113: Latex Allergy – A Prevention Guide: https://www.cdc.gov/niosh/docs/98-113/

- National Institute for Occupational Safety and Health Publication Number 97-135: Preventing Allergic Reactions to Natural Rubber Latex in the Workplace: https://www.cdc.gov/niosh/docs/97-135/

F. Other Types of Hand and Arm Protection:

In addition to protective gloves, other categories of hand and arm protection include:

- Finger guards, cots, and thimbles;
- Palm/hand pads;
- Mitts; and
- Sleeves and arm coverings.

As with protective gloves, choose protective hand and arm protectors that are suitable for the hazards and tasks found in the workplace. Ensure to follow manufacturer's guidance on selection, use, and care of the hand/arm protector.

2. Use of Protective Gloves

Proper size selection and fitting of protective gloves is important to ensure the gloves remain secure to the hands, provide optimum hand protection, and is comfortable to wear while working. Gloves that do not fit properly will not provide adequate hand protection. Always follow manufacturer's guidance on proper use and storage.

When wearing protective gloves, consider the following:

- Ensure gloves fit properly;
- Perform a visual inspection of gloves before use to ensure they are not discoloured, torn, punctured, cracked, or made ineffective in any way;
- Test gloves for defects (e.g., pin holes/leaks, cuts, and tears) before use;
- Do not wear gloves with metal parts near electrical equipment;
- Make sure all exposed skin is covered by gloves;
- Glove should be long enough so that there is no gap between the glove and sleeve;
- Know how to properly remove and either clean or dispose of used gloves. If gloves are reusable, clean gloves as instructed by the supplier;
- Discard and replace any defective or damaged gloves.

3. Inspection and Care of Protective Gloves

Follow manufacturer's instructions for cleaning, storage, and care of gloves. Inspection and care of protective gloves should be routinely conducted. Protective gloves will break down after repeated hazardous exposures and should be inspected each time they are reused. Reusable gloves should be cleaned thoroughly after use and allowed to air dry. Gloves that are deteriorated or stiff may indicate deficiencies caused by excessive use or degradation from chemical exposure.

Chemical resistant gloves should be replaced on a regular and frequent basis. They should be replaced immediately upon signs of degradation and particularly after contact with toxic chemicals. Once a chemical has been absorbed onto the glove material, the chemical can continue to diffuse through the material even after the surface has been washed. Individuals should dispose of contaminated gloves in appropriate containers following established procedures for hazardous waste disposal set by their department.

4. Personal Hygiene Practices

Hand washing and other personal hygiene practices are important measures for preventing or reducing contact with chemical contaminants. Current research tends to indicate that barrier creams and lotions offer little protection against chemical hazards and can increase the likelihood of contact dermatitis. Such products often contain mineral oil lubricants which can weaken glove materials such as natural rubber latex.

Appendix A

CLASSIFICATION OF HAZARDS AND RECOMMENDED GLOVE PROTECTION

NATURE OF HAZARD	DEGREE OF HAZARD	PROTECTIVE MATERIAL
Abrasion	Severe	Reinforced heavy rubber, staple-reinforced heavy leather
	Moderate	Rubber, plastic, leather, polyester, nylon, cotton
Sharp edges	Severe	Metal mesh, staple-reinforced heavy leather, Kevlar-steel mesh
	Moderate	Leather, terry cloth (aramid fibre)
	Mild with delicate work	Lightweight leather, polyester, nylon, cotton
Chemicals and Fluids	Risk varies according to the chemical, its concentration, and duration of contact among other factors. Refer to **Appendix B**, product safety data sheet (SDS), and/or glove manufacturer data.	**Dependent on chemical:** Natural rubber, neoprene, nitrile rubber, butyl rubber, polyvinyl chloride, polyvinyl alcohol, Saranex™, Tychem®, Trellchem®, etc.
Cold		Leather, insulated plastic or rubber, wool, cotton, cold resistant specialty fabrics (e.g. Zetex®). Loose fitting gloves for liquid nitrogen or carbon dioxide.
Heat	High temperatures (>350°C)	Heat-resistant specialty fabrics
	Medium high temperatures (up to 350°C)	Nomex®, Kevlar®, Zetex®, heat-resistant leather with linings
	Warm temperatures (up to 200°C)	Nomex®, Kevlar®, Zetex®, heat-resistant leather, terry cloth (aramid fiber)
	Less warm temperatures (up to 100°C)	Chrome-tanned leather, terry cloth
Electricity		Rubber-insulating gloves and mitts tested to appropriate voltage (CSA Standard Z259.4-M1979, R2001) with leather outer glove.
General Duty	Low risk duties	Cotton, terry cloth, leather, rubber, plastic
Product Contamination		Thin-film plastic, lightweight leather, cotton, polyester, nylon
Radiation		Lead-lined rubber, plastic, or leather

Reference: Adapted from CCOHS: Chemical Protective Clothing – Glove Selection.

Appendix B

GUIDE TO SELECTION OF A CHEMICAL RESISTANT GLOVE

A. INTRODUCTION

An appropriate chemical protective glove is one which will provide an effective barrier between the chemicals being used and the hand. Proper care must be taken when selecting a glove for use with chemicals, particularly with highly toxic chemicals which are readily absorbed through the skin and into the blood stream. An inappropriate choice of glove material can result in direct exposure to potentially harmful chemicals. This guideline is intended to help users select the most appropriate chemical resistant glove for a given application.

B. GLOVE LIMITATIONS

No single glove material will protect against all chemicals
Different glove materials interact differently with different types of chemicals. It is therefore important to match the right glove material to the type of chemical(s) being used. Natural rubber latex gloves may be suitable for dilute aqueous solutions; however, oils, greases and many organic solvents will easily permeate the latex material. Nitrile gloves may be used against oils and greases but are generally unsatisfactory for use against aromatic or halogenated solvents.

No glove material is totally impermeable
Glove materials only temporarily resist chemical breakthrough and the chemical will permeate through the glove material over time. Even the best chemically-resistant glove will break down after repeated chemical exposures.

Glove performance can vary with product and manufacturer
Chemical resistance of a particular type of glove material (e.g., nitrile) can vary significantly from product to product, and from manufacturer to manufacturer. The degree of protection will depend on factors related to the specific glove itself, including its chemical make-up, thickness, design, and method of construction. It is important to compare performance data from individual manufacturers.

C. GLOVE SELECTION PROCESS

The steps involved in selecting the best protective glove for a specific application are summarized as follows:

1. Assess the hazards related to the specific chemical(s) to be used, the conditions of use, and the tasks to be conducted. Chemical hazards, in terms of the degree of toxicity, the types of health effects (local or systemic), and the severity of the effects must be considered. The greater the toxicity and potential hazard to the worker, the more care is required in selecting the best glove for the job. The tasks being undertaken, including duration, frequency and degree of chemical exposure, degree of dexterity required, and physical stresses which will be applied must also be considered.
2. Select a glove material which has the required chemical resistance properties for the specific chemicals to be used. In terms of selection criteria, the best protective glove is one which demonstrates no significant degradation upon contact with the specific chemical(s), and has an appropriately high breakthrough time and a low permeation rate under the conditions of use (see **Section D**).
3. Consider factors associated with actual conditions of use that may affect performance of the glove for the final selection (see **Section E**). Additional testing under the conditions of use may need to be conducted.

D. CHEMICAL RESISTANCE PROPERTIES OF GLOVES

The selection of a glove material which provides the best protection against a particular chemical is based mainly on its chemical resistance performance upon contact with the chemical. Chemical resistance performance of a glove is generally defined in terms of its **degradation, penetration,** and **permeation** properties.

Degradation is the physical deterioration of a glove material due to contact with a chemical. This may cause the glove to soften, swell, shrink, stretch, dissolve, or to become hard and brittle. Gloves having a good to excellent rating against degradation should be selected.

Penetration is the leakage of a chemical through seams, pinholes, and other imperfections in the material.

Permeation is the process by which a specific chemical diffuses through a glove material at the molecular level, from the outside to the inside surface of the glove material. Chemical permeation frequently occurs with no obvious signs of physical degradation of the glove material. Permeation testing of glove products are conducted in accordance with standards of the American Society for Testing and Materials (ASTM). Permeation testing provides two important pieces of data for glove selection – **breakthrough time** and **permeation rate**.

a) **Breakthrough Time** is the time from initial chemical contact on the glove exterior to the time it is first detected on the inside surface. The breakthrough time is often the most important factor used to indicate the degree of protection a particular glove material will provide, particularly with highly toxic chemicals. The breakthrough time is usually expressed in minutes or hours. A typical test runs for up to 8 hours. If there is no measurable breakthrough after 8 hours, the result is reported as a breakthrough time of >480 minutes or >8 hours. The glove material with the highest breakthrough time should be selected. This generally means selecting a glove with a breakthrough time of eight hours or greater; however, this level of resistance is not always available. Users must ensure that the expected duration for handling the particular chemical is well within the breakthrough time of the selected glove material. Otherwise, more frequent changes of the gloves are warranted.

b) **Permeation Rate** is the rate at which a chemical passes through the glove material. The permeation rate is generally expressed in terms of the amount of a chemical which passes through a given area of clothing per unit time (micrograms per square centimetre per minute). The higher the permeation rate, the faster the chemical will move through the material. Some manufacturers provide descriptive ratings from poor to excellent.

The best protective glove is one which demonstrates no significant deterioration upon contact with the specific chemical and has an acceptably high breakthrough time and a low permeation rate under the conditions of use. For each chemical used, always consult the glove manufacturer's chemical resistance charts for degradation and permeation test results on individual glove products.

E. OTHER CONSIDERATIONS

Chemical resistance data are obtained under standard test conditions and should be used to screen for the best glove candidates. Many factors can affect final glove performance under actual work conditions and must be considered when selecting a chemical resistant glove:

Degree of Exposure
Glove performance can decrease significantly as chemical exposure increases. Increase in chemical concentration or direct immersion in a chemical can cause breakthrough to occur within a much shorter time period than that specified by the manufacturer.

Temperature
In general, permeation rates increase and breakthrough times decrease as temperatures increase. Standard permeation test data are obtained at room temperature (20°C to 25°C). For chemicals that are used at temperatures higher than this, there may be a significant decrease in glove performance.

Glove Thickness
Selecting a thicker glove or double gloving may be required for adequate protection because a thicker glove offers better chemical resistance and a significant increase in breakthrough time. As a general guidance, doubling the glove thickness will quadruple the breakthrough time. When considering glove thickness, the required degree of manual dexterity and sensitivity must also be considered. Thicker gloves offer better chemical resistance, but can impair grip, manual dexterity, and safety. A proper balance must be struck between the need for greater sensitivity and dexterity and an acceptable degree of chemical resistance. Disposable gloves will offer greater dexterity but are generally intended to guard against mild chemicals and provide little or no protection against many chemicals.

Manufacturer Methods and Product Quality Assurance/Quality Control
Because of variations in the manufacturing process and quality assurance and quality control, the same glove material from different manufacturers can have significantly different permeation properties. A particular manufacturer's test data should always be consulted for a specific glove product.

Chemical Mixtures
Permeation tests are conducted using pure chemicals. Mixtures of chemicals can significantly change the permeation rates and physical properties of a given glove material. In general, for mixtures of chemicals, a glove which demonstrates the greatest resistance against the most permeable chemical component should be chosen. A chemical mixture, however, can have a significantly higher permeation rate than any of its components. Users may need to conduct further evaluation of glove performance for their specific chemical mixtures under the conditions of use, particularly with highly toxic materials.

Physical Resistance
The physical properties of a particular glove material and its likelihood for puncture, tearing, abrasion or snagging under conditions of use must always be considered when selecting a glove. Penetration of chemicals through a tear or hole in a glove will lead to much higher exposures than by molecular permeation alone. It may sometimes be necessary to wear two different types of gloves – one for its chemical resistance properties, and the other for its physical resistance properties.

F. SOURCES OF INFORMATION

A summary table of general chemical resistance and physical properties of common glove materials is provided in **Section G**. Users should consult the safety data sheet of the specific chemical for the recommended chemical resistant glove. Further chemical resistance data can be obtained from individual glove manufacturers for their own glove products. Many manufacturers of chemical protective clothing provide glove-material compatibility charts and online databases and tools to help in selecting appropriate gloves when working with specific chemical or chemical mixtures. Environmental Health and Safety (EHS) may also be contacted for assistance in glove selection.

Below are some links to websites and documents providing chemical resistance information:

- **Quick Selection Guide to Chemical Protective Clothing, 7th edition** by Krister Forsberg, Ann Van den Borre, Norman Henry III, James P. Ziegler. 4th edition available online via the UofT Libraries website.

- **AnsellGUARDIAN® Chemical Digital Tools:** https://www.ansell.com/ca/en/ansellguardian-chemical
- **Cole-Parmer Safety Glove Chemical Compatibility Database:** https://www.coleparmer.com/safety-glove-chemical-compatibility
- **Chemical Resistance Guide for Honeywell North Gloves:** Contact manufacturer for most up to date version. Copy also found at this link.
- **National Institute for Safety and Health (NIOSH) Recommendations for Chemical Protective Clothing:** http://niosh.dnacih.com/nioshdbs/ncpc/ncpc1.htm
- **U.S. Department of Labour, Occupational Safety and Health Administration, OSHA 3151-02R 2023 Personal Protective Equipment – Table 4:** https://www.osha.gov/sites/default/files/publications/osha3151.pdf

G. CHEMICAL RESISTANCE AND PHYSICAL PROPERTIES OF COMMON GLOVE MATERIALS

The following table is intended to be used only as a general guideline during glove selection. Always consult the glove manufacturer's chemical resistance and physical properties test data on specific glove products.

GLOVE MATERIAL	CHEMICAL RESISTANCE PROPERTIES		PHYSICAL PROPERTIES E: Excellent G: Good F: Fair P: Poor						
	RECOMMENDED FOR USE WITH	NOT RECOMMENDED FOR USE WITH	ABRASION RESISTANCE	CUT RESISTANCE	FLEXIBILITY	HEAT RESISTANCE	OZONE RESISTANCE	PUNCTURE RESISTANCE	TEAR RESISTANCE
Natural rubber (latex)	Aqueous solutions of acids, bases, salts, ketones, alcohols.	Oils, greases, organic solvents.	E	E	E	F	P	E	E
Butyl rubber	Aldehydes, ketones, esters, glycol ethers, polar organic solvents, peroxides, highly corrosive acids and strong bases.	Aliphatic and aromatic hydrocarbons, halogenated solvents.	F	G	G	E	E	G	G
Neoprene	Oxidizing acids, caustics, alcohols, oils, fats, aniline, phenol, glycol ethers, hydraulic fluids, gasoline, organic acids and alkalis	Chlorinated hydrocarbons.	E	E	G	G	E	G	G

Nitrile	Oils, greases, acids, caustics, alcohols, aliphatic chemicals, chlorinated solvents.	Aromatic solvents, strong oxidizing agents, many ketones, acetates, esters, many other halogenated solvents.	E	E	E	G	F	E	G
Polyvinyl alcohol (PVA)	Aliphatics, aromatics, chlorinated solvents, ketones (except acetone), esters, ethers.	Acids, alcohols, bases.	F	F	P	G	E	F	G
Polyvinyl chloride (PVC)	Strong acids and bases, salts, other aqueous solutions, alcohols, glycol ethers.	Aromatic solvents, hydrocarbons, chlorinated solvents, aldehydes, ketones, nitrocompounds.	G	P	F	P	E	G	G
Fluoroelastomer (Viton®)	Aromatic and chlorinated solvents, aliphatics and alcohols.	Some ketones, esters, amines.	G	G	G	G	E	G	G
Silver Shield™ (Norfoil™, 4H™)	Wide range of solvents, acids and bases.		F	P	E	F	E	F	E

Reference: Adapted from Table 8.2 from ACGIH Guidelines for the Selection of Chemical Protective Clothing (1987) and U.S. OSHA 3151-02R Personal Protective Equipment, Table 4 (2023).

Appendix C

MANAGEMENT OF LATEX GLOVE USAGE IN THE WORKPLACE

The use of latex gloves in the workplace can present a significant health risk to workers who need to wear glove protection, particularly those within high-risk groups. To prevent the development of sensitization in workers and to protect already-sensitized workers, department heads and supervisors are strongly encouraged to take appropriate measures to eliminate or minimize latex exposure in the workplace.

Supervisors / PIs should incorporate the following measures within their workplaces:

1) Latex glove usage in the workplace should be reviewed to determine whether latex gloves are appropriate for the specific risks encountered in the workplace environment. The unnecessary use of latex gloves should be eliminated. Non-latex gloves should be used in workplaces where there is little potential for contact with infectious materials.
2) In workplaces where latex gloves are used, only powder-free, low-protein latex gloves should be provided to workers. Where practicable and appropriate, workers at a high risk of developing latex sensitivity should be provided with non-latex gloves or non-latex glove liners. Glove manufacturers should be consulted for data on the levels of powder, latex protein allergens, or chemical allergens in their products.
3) Additional control measures should incorporate:
    - good housekeeping practices to avoid the build-up of latex-containing dust on workplace surfaces;
    - personal hygiene practices, including washing of hands after removal of latex gloves.
4) All workers required to wear latex gloves should be provided with education and training about latex allergies, the potential health effects associated with using latex gloves, the risk factors associated with latex sensitization, and appropriate precautions to minimize exposure. Workers should be able to recognize the symptoms of latex allergy, including skin rash, hives, itchiness, eye, nose and sinus symptoms, asthma, and shock.
5) Early detection of symptoms and elimination of latex exposure are essential for preventing further and more serious health effects. Workers, particularly those who fall within high-risk groups for developing latex sensitivity, should be encouraged to conduct self-screening for latex allergy symptoms on an ongoing basis. Workers should be encouraged to report any symptoms suggestive of latex allergy reactions to their supervisor. Workers reporting such symptoms should be encouraged to consult with their personal physician or be referred to University of Toronto Occupational Health for prompt assessment. Until a definitive diagnosis can be made, measures should be taken to prevent or reduce latex exposure in the workplace, including the use of non-latex gloves or non-latex glove liners.
6) Should a worker be diagnosed with latex allergy:
    - The worker should be provided with non-latex gloves and should avoid all latex-containing products. Good quality nitrile or vinyl gloves may offer appropriate protection against the hazards encountered. Other workers in the same workplace should wear non-latex gloves or non-powdered, low-protein latex gloves;
    - The adequacy of existing control methods for latex exposure should be re-evaluated. This can be done in consultation with Environmental Health and Safety;
    - Appropriate efforts to accommodate the latex-sensitive worker should be taken. For the highly sensitive worker, relocation of the worker to a latex-free area may need to be considered;
    - Appropriate emergency procedures for latex-allergic workers should be in place and well-documented.

7) Workers diagnosed as having a latex allergy should:

- Use only non-latex gloves, and avoid all latex-containing products;
- Inform their supervisor about their latex allergy;
- Follow their physician's recommendations for dealing with latex allergic reactions, which may include carrying an epinephrine self-injection kit (e.g. Epi Pen with non-latex accessories) for highly sensitive workers;
- Wear a medical alert bracelet indicating their allergy.