MEMORIAL UNIVERSITY

Department of Health and Safety

Hand Protection

1.0 Introduction

Appropriate protective gloves must be worn in all situations, except when the use of this equipment introduces greater hazards where the hands are potentially exposed to workplace hazards such as chemicals, infectious agents, cuts, lacerations, abrasions, punctures, burns, and harmful temperature extremes. Special electrical protective gloves are described in the "Electrical Safety" policy.

2.0 Scope

Any worker who may be exposed to hazards involving the hand from an operation or process conducted within a Memorial University workplace. (Note: In this standard, "worker" includes faculty, staff, students, and visitors).

3.0 Responsibilities

3.1 Supervisors shall:

- Identify the hazards in the workplace requiring the use of hand protection;
- Determine (using this standard and in consultation with the Department of Health & Safety) the type of hand protection required for the specific hand hazard;
- Provide employees with appropriate protective gloves;
- Ensure workers are informed in the proper use, care, and maintenance of gloves; and
- Ensure employees, students, and visitors wear appropriate hand protection at all times where hazards to the hand exist.

3.2 Workers shall:

- Wear appropriate protective gloves at all times when performing a task or working in an area where hazards to the hand exist; and
- Use, care for, and maintain protective gloves appropriately.

4.0 Personal Protective Gloves

4.1 Glove selection must include an initial workplace assessment to identify the specific hazards relating to the types of chemicals or other hazardous materials to be used, the specific tasks to be performed, and the conditions and duration of such work.

4.2 Appropriate glove protection must protect against the specific hazards presented and provide a comfortable and secure fit. The performance characteristics of a

particular glove and its ability to protect against the specific hazards encountered are based on a number of factors, including the type of glove material, the manufacturing process, and its thickness, design, and size. Glove manufacturer performance data should always be consulted for physical and chemical resistance properties of their particular glove products.

5.0 Chemical Resistant Gloves

5.1 Chemical resistant gloves that 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 that are readily absorbed into the bloodstream via the skin.

5.2 Inspection and care of chemical resistant gloves shall be routinely conducted. Chemical resistant gloves will break down after repeated chemical exposures and should be inspected each time they are reused. Reusable gloves should be thoroughly rinsed and allowed to air dry. Gloves will be replaced on a regular and frequent basis upon need. 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.

5.3 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 that can weaken glove materials such as natural rubber latex.

6.0 Guide to Selection of a Chemical Resistant Glove

6.1 Introduction:

6.1.1 Appropriate chemical protective gloves are those that will provide an effective barrier between the chemicals being used and the hand. Care must be taken when selecting a glove for use with chemicals, particularly with highly toxic chemicals that can be readily absorbed through the skin.

6.2 Glove Limitations:

6.2.1 No single glove material will protect against all chemicals. Different glove materials interact differently with different types of chemicals. It is 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.

6.2.2 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.

6.2.3 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.

7.0 Glove Selection Process

7.1 The following steps are recommended in selecting the best protective glove for a specific application:

- **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 that will be applied must also be considered.

- **Select a glove material** that 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).

- Consider factors associated with actual conditions of use that might affect performance of the glove for the final selection. Additional testing under the conditions of use may need to be conducted.

8.0 Chemical Resistance Properties of Gloves

8.1 The selection of a glove material that 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 and permeation properties.

9.0 **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.

9.1 **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 is 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.

9.2 **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.

9.3 **Permeation Rate** is the rate at which a chemical passes through the glove material once it has broken through. The permeation rate is generally expressed in terms of the amount of a chemical that passes through a given area of clothing per unit time (micrograms per square centimeter per minute). Some manufacturers provide descriptive ratings from poor to excellent.

9.4 The best protective glove is one that 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.

Legislative reference: OH&S regulations Part VII 71 and 72. Occupational Health & Safety Act 5 (a).