UOW SAFE@WORK

UNIVERSITY OF WOLLONGONG AUSTRALIA

Selection and use of gloves guidelines

Selection of the right type of glove is essential in protecting users from hazards that they may encounter during their work. Including chemicals, biological hazards, heat, extreme cold, abrasive surfaces and mechanical hazards.

Gloves can protect against chemical exposure, infections, burns, cuts and damage to the skin. This guide has been prepared to assist in selecting the right type of glove for the different types of hazards encountered in the workplace.

Contents

1. Selecting Gloves

1.1 FACTORS TO CONSIDER

There is no one type of glove that will protect against all the hazards encountered in the workplace. That is why it is important to conduct a risk assessment prior to the purchase and selection of any gloves in order to determine the aspects of use (including environmental conditions) and the type of glove to suit the task or tasks being performed. To ensure the most appropriate glove(s) are provided for the task and the environmental conditions, it is necessary to:

Identify the hazards and the need for protection. This identification should include a list of the chemicals involved as well as physical hazards such as abrasion, tearing, puncture, fire/ flames, temperature, and/or biological hazards. The kind of hazards present will also affect the decision to use other protective clothing in addition to gloves. Always check the Safety Data Sheet (SDS) and other sources for information about hazards.

Identify manual dexterity required. Thicker gloves provide greater resistance to chemicals or mechanical damage, however thick gloves can impair grip and dexterity and could compromise safety.

Select a suitable material to give the protection required. Materials should be selected based on quantitative information such as permeation rate, breakthrough time, penetration and degradation, and any other considerations such as temperature and grip requirements. For example, if you a using a number of different chemicals you will need to select gloves that will give the greatest level of protection from the hazards that are associated with all of the chemicals being used. You may need to consider using two different types of glove material to offer the greatest protection against the hazards.

Select a suitable style and fit. Different sizes will need to be provided to fit different sized hands and gloves must be comfortable for the user to wear.

Ensure there will be no adverse effects from the selection as a result of style, fit or material. Latex gloves can cause allergic reactions in some users and other alternative materials should be considered.

Determine the potential effects of skin exposure. When using chemicals the immediate irritation or corrosion of the skin must be considered in addition to the potential health effects to the entire body from absorbing the chemical through the skin.

Consider the workplace conditions such as temperature and the need to perform repetitive movements. Exposure to sweat inside gloves can cause dermatitis and other skin conditions. If repetitive tasks are being performed, such as pipetting, select gloves that are flexible and elastic.

Consider the duration and nature of contact. Tasks that require hands to be immersed in liquids will need a higher level of protection than ones where only splash protection is required and tasks where the user is exposed to extreme temperatures will also need a higher level of protection. Also consider how long persons will be in contact with the hazards (e.g. occasional contact or continuous immersion of hands or continual contact).

Consider cuff length. Some hazards will require a longer cuff length to protect the both the hand and forearm and to prevent liquids seeping into gloves. A longer cuff length needs to be considered if large volumes are being used or if hands are required to be immersed in liquids.

Determine whether re-usable or disposable gloves are required. Thicker reusable gloves may be required as single use gloves do not offer a high degree of protection against abrasion, puncture, snag, tears and some types of highly toxic or corrosive chemicals.

Consult with the workers to achieve acceptance by the wearers. Cultural differences may rule out the use of materials such as pigskin.

Consider maintenance required including cleaning.

Ensure all gloves meet the appropriate Australian standards.
See 4. Related documents and References.

1.2 FACTORS TO CONSIDER FOR BIOLOGICAL HAZARDS

Working in biosciences, in the field and medical laboratories can involve handling both chemical and biological hazards. Generally, gloves manufactured for protection against chemicals provide adequate protection for infectious hazards including bacteria and viruses. If handling both chemical and biological hazards then the chemical hazard should take precedence as a glove effective for chemicals should also resist biological breakthrough.

While standard latex gloves provide protection for biological hazards they may cause sensitisation or an allergic reaction and should be avoided wherever possible. Therefore non-latex gloves such as synthetic rubber, nitrile, vinyl, or neoprene are preferred as they eliminate the risk of an allergic reaction and can provide acceptable barrier protection against viruses, other micro-organisms and chemicals.

If a biological material, such as DNA, is being prepared in phenol/chloroform, nitrile gloves are not suitable as they are not resistant to both of these chemicals.

1.3 FACTORS TO CONSIDER FOR CHEMICAL HAZARDS

No single gloving material can offer complete protection from all substances/chemicals. Each are liable to damage or failure by degradation or permeation by some chemicals and damage from other sources such as heat or mechanical damage.

You should always consult the relevant SDS. Each chemical needs to be looked at to determine which glove material should be used.

Where different chemicals have different recommended glove material, the best choice is usually the glove with the greatest resistance to the chemical with the fastest breakthrough time. In some cases it may be necessary to double glove when no single type of glove material will provide full protection and in this case it is advisable to select two sets of gloves made from different materials.

If one chemical is significantly more dangerous (e.g. highly toxic) than others, then this may take priority for choice of glove material rather than chemical breakthrough time. Seek advice from your supervisor if you are uncertain about which should take priority (i.e. fastest breakthrough time or highest toxicity).

Most glove manufacturers provide chemical resistance charts on their websites giving test data on their gloves. Ansell also provide some useful glove selection tools and resources (https://www.ansell.com/au/en/glove-finder). They usually provide information on both degradation and permeation performance. They are specific for the brand of glove used in the test but can be used to work out which glove material will provide the best resistance for the chemicals in use.

1.4 FACTORS TO CONSIDER FOR OTHER HAZARDS

For mechanical and physical hazards you will need to select gloves that provide the necessary resistance to damage and ensure that the gloves do not become a hazard themselves for example loose fitting gloves can become an entanglement hazard when working with plant and equipment. For example, specially designed gloves are required for electrical work and must conform to AS/NZS IEC 60903:2022.

2. Advantages and disadvantages of glove materials

Table 1 – Common glove types and their advantages and disadvantages

Glove Type	Protects against	Advantages	Disadvantages
Natural rubber (latex) 	Biological hazards, most dilute solutions of acids, alkalis, salts and ketones.	Excellent tensile strength and elasticity.	Can cause allergic reactions. Hypoallergenic gloves, glove liners and powderless gloves are available.
Butyl 	Peroxide, strong acids and bases, alcohols, aldehyde, ketones, esters.	Protects against a wide variety of chemicals.	Do not use with aliphatic and aromatic hydrocarbons and halogenated solvents.
Neoprene 	Alcohols, oxidising acids, organic acids, hydraulic fluids, phenol, glycol ethers.	Good pliability, finger dexterity, high density and tear resistance.	Poor for halogenated and aromatic hydrocarbons.
Nitrile 	Oils, greases, aliphatic chemicals, chlorinated solvents such as dichloromethane, chloroform, xylene, alcohols, acids, caustics.	Good dexterity and sensitivity.	Poor against strong oxidising agents, benzene, methylene chloride, phenol, ketones, acetates & aromatic solvents.
Polyvinyl chloride (PVC) 	Strong acids and bases, salts, and other water solutions.	Can be used for immersion, less dexterity and sensitivity.	Plasticizers can be stripped, poor tear resistance.
Cryogenic gloves 	Cryogens or very cold containers and equipment.	Protects against tissue damage from cryogens or very cold containers & equipment.	Not for immersion.
Leather 	Welding, sheet metal work, handling hot or cold objects, gardening.	Provides protection against heat, cold, sparks & cuts, they come in a wide variety of styles & fit.	Not for working with liquids and when wet will offer poor protection against heat and cold.
Kevlar brand fibre 	Work where temperature extremes are an issue.	Protects against tear, abrasion and cutting.	Thicker gloves can impede movement
Mesh Gloves 	Used for work that requires repeated cutting and slicing.	Protects against cutting and slicing.	Steel mesh gloves can be heavy and impede movement.
Alumisied gloves 	Furnace work, handling hot objects.	Provides good protection against heat.	Not to be used for electrical work.
Cotton 	General duty work.	Moderate resistance to heat and cold.	May need to be thicker to offer full protection.

3. Key Principles

3.1 TRAINING

Training should be provided on the appropriate use of gloves and include:

- Preferred method of glove removal
- Cleaning and maintenance
- How to inspect gloves for wear and tear

3.2 USE AND MAINTENANCE OF GLOVES

- Before use, inspect gloves (even new ones) for physical damage such as tears or pinholes. A more thorough check can be made by filling the gloves with water and tightly rolling the cuff towards the fingers. This will help reveal any pinhole leaks.
- Gloves that are discoloured or stiff may also indicate excessive use or degradation from chemicals. Dispose of gloves when they show any sign of deterioration.
- Disposable gloves should be changed often and not re-used.
- Any gloves from which hazardous chemical contamination cannot be removed must be collected as contaminated waste. Gloves contaminated with bio-hazardous material should be handled as bio-hazardous waste.
- Do not wear gloves outside of the laboratory. Gloves should NOT be worn in public corridors, or when touching doorknobs, light switches, telephones, key boards or any shared-use item which will be used by others who are not wearing gloves.
- Always wash hands with soap and water after removing gloves.
- Look for an expiration date on individual packages of gloves.Some gloves, especially lightweight disposables, may be flammable: keep hands well away from flames or other high temperature heat sources.
- Wash reusable gloves appropriately before removing them.(NOTE: some gloves, e.g., leather and polyvinyl alcohol, are water-permeable).
- When removing gloves, do so in a way that avoids skin contact with a possibly contaminated glove exterior.
- When used in a laboratory setting, gloves should be disposed of and replaced when overtly contaminated or when the integrity of the glove is compromised, and removed when work is completed. Disposable gloves should never be washed, reused, or used for touching "clean" surfaces (keyboards, telephones, etc.). Used gloves should not be worn outside the laboratory.

3.3 HAND HYGIENE

As well as wearing gloves hand hygiene plays an equally important role in protecting yourself against biological and chemical hazards.

Click on this link to watch a short video on handwashing to ensure a thorough decontamination of your hands.

4. Related documents and references

AS/NZS 2161.1:2016 *Occupational protective gloves – Part 1: Selection, use and maintenance*. This standard provides recommendations for achieving hand protection against hazards in the workplace.

AS/NZS 2161.2:2020 *Occupational protective gloves – Part 2: General requirements and test methods.*

AS/NZS 2161.3: 2020 *Occupational protective gloves – Part 3: Protection against mechanical risks.*

AS/NZS 2161.4:1999 *Occupational protective gloves – Part 4: Protection against thermal risks (heat and fire).*

AS/NZS 2161.7.1:1998 *Occupational protective gloves – Part 7.1: Protection against cuts and stabs by hand knives — Chainmail gloves and arm guards.*

AS/NZS 2161.7.2:2005 *Occupational protective gloves – Part 7.2: Protection against cuts and stabs by hand knives - Gloves and arm guards made of material other than chainmail.*

AS/NZS 2161.10.1:2005 *Occupational protective gloves – Part 10.1: Protective gloves against chemicals and micro-organisms - Terminology and performance requirements.*

AS/NZS 2161.10.2:2005 *Occupational protective gloves – Part 10.2: Protective gloves against chemicals and micro-organisms - Determination of resistance to penetration*

AS/NZS 2161.10.3:2005 *Occupational protective gloves – Part 10.3: Protective gloves against chemicals and micro-organisms - Determination of resistance to permeation by chemicals*

AS/NZS IEC 60903:2022 *Live working – Electrical insulating gloves*

AS/NZS 4011.1:2014 *Single-use medical examination gloves – Part 1: Specification for gloves made from rubber latex or rubber solution.*

AS/NZS 4011.2:2014 *Single-use medical examination gloves – Part 2: Specification for gloves made from poly (vinyl chloride).*

AS/NZS 4179:2014 *Single-use sterile surgical rubber gloves – Specification*