

**Personal Protective Equipment:  
Gloves Policy Arrangements**

**HSA-10105**

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## Document Control

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2		
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4		
5		

## 1. Introduction

These policy arrangements sets out what managers, staff and students have to do when selecting and using protective gloves as a control measure to protect our staff and students from health and physical hazards.

These arrangements covers:

- Selection criteria for biological, chemical, thermal and mechanical hazards.
- Information, instruction and training requirements for users of protective gloves.
- Information on hand care.

Protective gloves are one of the most frequently used forms of personal protective equipment (PPE). Their role is to protect hands, and in some cases the forearms, against various hazards including chemical and biological substances, thermal (heat or cold), and mechanical.

As with all other PPE, gloves should be seen as the last option for protection and should only be used after considering other control measures to remove or reduce the hazard (using a less hazardous substance, changing processes to remove handling/contact etc.). Protective gloves can be used, often in combination with other control measures to prevent occupational skin disorders, skin damage or injury.

These policy arrangements provide information on the selection and use of protective gloves and advice on skincare in the workplace and occupational health surveillance. The guidance should be used in conjunction with the relevant hazard policy arrangements.

Occupational skin disorders are one of the commonest occupational diseases reported in the UK. Skin conditions can have considerable impact on the individual causing discomfort, skin infections, and sickness absence. Occupational skin disorders include the worsening of pre-existing skin problems such as eczema.

Contact dermatitis accounts for up to 90% of all occupational skin disease. It occurs as a result of repeated contact with substances that cause either irritation or specific sensitisation.

**Irritant Contact Dermatitis** - is caused by contact of the skin with irritant substances. Irritants at work include 'wet work' ( defined as hands immersed in water for 2 or more hours per day or washed more than 20 times per day), solvents, detergents, degreasers, alcohols, cutting oils, coolants, degreasers, disinfectants, petroleum products, soaps and cleaners and repeated friction. Individuals that may encounter irritants at work include cleaners, caterers, engineers and laboratory workers.

**Allergic contact dermatitis** - This is caused by sensitisation of the individual's immune system to a specific substance such as epoxy resins, metals (e.g. nickel, cobalt, chromates), preservatives, biocides, acrylics, colophony (pine resin) and plants. Once an individual has developed sensitivity to a substance the problem is lifelong. They may react to increasingly smaller amounts of it in the workplace and a change of occupation may be necessary.

## 2. Selecting the right glove for the job

When deciding which glove is suitable for a task there are three main factors to consider:

<p>The nature of the hazard</p>	<p>Chemical, biological, thermal or mechanical – see next sections for further details on selecting the correct glove for the hazard.</p>
<p>The task and conditions</p>	<p>The type of contact with the hazard:</p> <ul style="list-style-type: none"> <li>• <b>Incidental contact</b> - no intended direct contact with the hazard. Contact will only occur through a splash, spill or slip of the hand.</li> <li>• <b>Intentional contact</b> – tasks where contact with the material is inevitable e.g. direct handling of the substance or materials containing the materials e.g. cleaning rags or immersing hands in liquids. Often a reusable glove will be required for direct handling of chemicals.</li> </ul> <p>Dexterity and grip requirements:</p> <ul style="list-style-type: none"> <li>• Thick gloves will offer greater resistance to chemicals or mechanical damage, but can impair grip and dexterity.</li> <li>• Some gloves are available with improved grip features for wet or greasy work.</li> <li>• Repetitive movements require a glove with good flexibility and elasticity.</li> </ul> <p>Cuff length and type:</p> <ul style="list-style-type: none"> <li>• Extra length gloves may be required to ensure lower arm protection when working with toxic or irritant chemicals, handling higher grade pathogens or working with large volumes or liquids which may splash over the top of the gloves.</li> <li>• Elasticated cuffs may also provide protection from material entering the top of the gloves.</li> </ul>
<p>The User</p>	<p>Hand size:</p> <ul style="list-style-type: none"> <li>• It is important to select the correct size of glove. Gloves that are too small will restrict movement and cause fatigue in the hand and fingers. Gloves that are too large interfere with the precision of grip and are liable to snag.</li> <li>• Appendix 1 has a common sizing chart for selecting glove sizes – however sizes can vary between manufacturers so it is important to have a range of sizes available.</li> </ul> <p>Skin conditions:</p>

- Pre-existing conditions can affect selection or use of gloves.
- People with eczema or psoriasis may need to use a thin cotton or silk liner inside the gloves to avoid irritation from sweat. Liners must be washed frequently and rinsed well to remove soap residues prior to re-use.

Task or chemical risk assessments must specify the type of glove to be used and refer to any specific requirements necessary to ensure the protection provided by a glove is maintained (e.g. specifying the frequency and circumstances in which gloves shall be changed etc.).

### 3. Chemical Protective Gloves

Gloves should be worn when working with substances that cause dermatitis or otherwise damage the skin e.g.

- corrosive chemicals (Hazard statement H314)
- skin irritants (H315/316) or can cause skin dryness (EUH066)
- sensitisers (H317)
- chemicals which can enter the body through intact skin (skin absorption) and produce internal toxic effects
  - acutely toxic (H340-341),
  - mutagens (H340-341) and carcinogens (H350-351),
  - cause specific organ damage (H370-373)

No single type of glove material can offer complete protection from all substances/chemicals. When selecting a glove material it is important to consider the permeation and breakthrough times of the chemicals to be used and the resistance of the material to degradation.

**Permeation** is where a chemical can pass through an intact glove by diffusion, without damaging the glove. The time taken to cross from the outside of the glove to the inside surface is referred to as **breakthrough time**.

Breakthrough times vary with different chemicals, glove materials and thickness and information can be attained from the manufacturer for specific chemicals.

- For use for incidental contact (splash protection), gloves should ideally have a breakthrough time of > 10 mins as often spills or contamination is not detected immediately
- For tasks involving direct contact, the breakthrough time is the maximum time the glove may be used for before it should be discarded. Feeling/touch cannot be relied on to detect breakthrough, skin exposure will occur long before any perceptible feeling of wetness on the inner surface of the glove.

**Degradation** is damage caused by changes in one or more physical properties of the glove upon contact with the chemicals. Signs of degradation include swelling, loss of flexibility, tackiness etc.

**Penetration** of a substance through porous materials, seams, pinholes or other imperfections in a protective glove material.

Disposable Gloves purchased will have information on their acceptable quality levels (AQL - accepted number of damaged gloves per 100 in a batch before it is rejected).

When different chemicals are in use at the same time in a task or experiment and have different recommended glove material, the glove that best withstands the chemical with the longest breakthrough time will usually be the best choice. If one chemical is significantly more dangerous than others then this may dictate which glove material to choose.

### Chemical resistance standards and labelling



Gloves use for chemical protection will usually require gloves conforming to Safety Standard EN 374:2016.

For gloves to be labelled with this pictogram they must have met the following standards:

- **Type A:** Protective glove with permeation resistance of at least 30 minutes each for at least 6 test chemicals.
- **Type B:** Protective glove with permeation resistance of at least 30 minutes each for at least 3 test chemicals.
- **Type C:** Protective glove with permeation resistance of at least 10 minutes for at least 1 test chemical.

For types A and B the letters below the symbol identifies the chemicals against which it has been successfully tested.

A	Methanol	CAS# 67-56-1	J	n-Heptane	CAS# 142-82-5
B	Acetone	CAS# 67-64-1	K	Sodium hydroxide 40%	CAS# 1310-73-2
C	Acetonitrile	CAS# 75-05-8	L	Sulphuric acid 96%	CAS# 7664-93-9
D	Dichloromethane	CAS# 75-09-2	M	Nitric acid 65%	CAS# 7697-37-2
E	Carbon disulphide	CAS# 75-15-0	N	Acetic acid 99%	CAS# 64-19-7
F	Toluene	CAS# 108-88-3	O	Ammonium hydroxide 25%	CAS# 1336-21-6
G	Diethylamide	CAS# 109-89-7	P	Hydrogen peroxide 30%	CAS# 7722-84-1
H	Tetrahydrofuran	CAS# 109-99-9	S	Hydrofluoric acid 40%	CAS# 7664-39-3
I	Ethyl acetate	CAS# 141-78-6	T	Formaldehyde 37%	CAS# 50-00-0

Appendix 2 gives some generic guidance on the suitability of different types of glove materials with different chemicals but manufacturers information and selection charts (such as that shown below) and chemical safety data sheets (section 8.2 "Exposure Control") should be referred to when completing risk assessments and selecting gloves.

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	LAMINATE 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
1. Acetaldehyde	■	380	E	■	270	—	■	10	F	■	—	—	■	180	—	■	E	7	F	■	10	F
2. Acetic Acid	■	150	—	■	270	—	■	60	—	■	—	—	■	180	—	■	E	110	—	■	260	—
3. Acetone	▲	>480	E	■	—	—	■	10	F	■	—	—	■	—	—	■	E	10	F	■	10	G
4. Acetonitrile	▲	>480	E	■	30	F	■	20	G	■	150	G	■	—	—	■	E	4	VG	■	10	VG
5. Acrylic Acid	—	—	—	■	120	—	■	390	—	■	—	—	■	80	—	■	E	80	—	■	65	—
6. Acrylonitrile	E	>480	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
7. Allyl Alcohol	▲	>480	E	■	140	F	■	140	VG	■	—	—	■	60	G	■	E	>10	VG	■	20	VG

### Choice of disposable or reusable gloves for chemical protection

#### Disposable, single use

##### Pros

- Provide good tough sensitivity and dexterity
- Designed for incidental exposure (splash protection)
- Designed for single use – must not be re-used

##### Cons

- Comparatively poor chemical resistance
- May not be suitable for intentional contact with hazardous substances or for high hazard chemicals
- Easier to damage/tear

#### Re-usable

##### Pros

- Resist chemical attack for longer
- Less likely to tear
- Usually have longer cuff length

##### Cons

- Interfere with dexterity and touch sensitivity
- Can still be damaged and penetrated by many chemicals
- Must be looked after correctly and replaced to prolong their protection

Disposable gloves should be changed immediately after they become contaminated i.e. after a splash or spillage has occurred.

If re-usable gloves are used for direct handling of chemicals they must be thoroughly washed after use. They may also need to be discarded *before* the total use time exceeds the breakthrough time, as permeation through to the inner surface will continue even after the glove is washed.

#### Care of re-usable gloves

- Inspect carefully before each use for discoloration, cracking or damage. Discard if such defects are found or if the inside becomes contaminated.
- Remove as to avoid contact with the contaminated outside – a poster on correct removal of gloves is available on the HSE website.
- Wash and dry after work to remove residual chemical from the surface of the glove.
- Periodically turn inside out and wash inner surface then rinse well and dry.

## 4. Biological agents

Activities involving biological human health hazards may also involve handling harmful chemical and the risk assessment should give due consideration to both hazards when identifying the need for protective gloves. Generally, gloves manufactured from protection from chemicals provide adequate protection against infectious hazards such as bacteria and viruses. Gloves for protection against biological agents are usually disposable/single use.

### Biological safety - glove standards and labelling

EN 374-5:2016 These gloves have been tested for resistance to penetration by micro-organisms (bacteria and fungi), where gloves have been tested for resistance to penetration for viruses it will be clearly indicated with the word VIRUS below the label.



Gloves will also be rated for acceptable quality levels (acceptable number of damaged gloves per 100 before a batch it is rejected)

- Level 1 – 4 gloves per 100
- Level 2 – 1.5.gloves per 100 (recommended minimum for CL2 labs or above)
- Level 3 - 0.65 gloves per 100



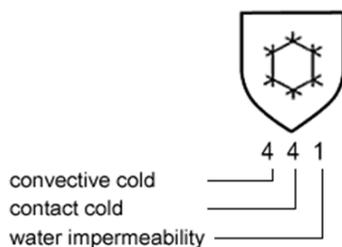
Healthcare settings – gloves that have been tested according to this standard are assessed for suitability for use in health care, a glove that conforms to safety standard EN 455:2009 will provide adequate protection against infection risks in a medical setting but chemical protection will not have been assessed.

## 5 Thermal

### 5.1 Low Temperatures

It is important to understand the difference between gloves provided for very low temperature situations and those for cryogen work. The blue gauntlets often found in labs used mainly for accessing -80°C freezers or for manipulating cold objects and provide additional arm protection against cold contact with shelves or other cold surfaces.

Gloves for work with cryogenic liquids are usually leather, thicker and have knitted cuffs. These gloves are not for immersion but will prevent cold damage to skin from contact with hoses and cold machine parts. Gloves without cuffs have the potential to get liquid trapped in the glove which can lead very quickly to cold burns and blistering and should not generally be used with liquid cryogenes. It may be permissible, under certain conditions, to use the blue gauntlet type gloves for work which needs more dexterity than is available using the leather cryogenic gloves, for example for manipulation of cryotubes taken out of liquid nitrogen storage.



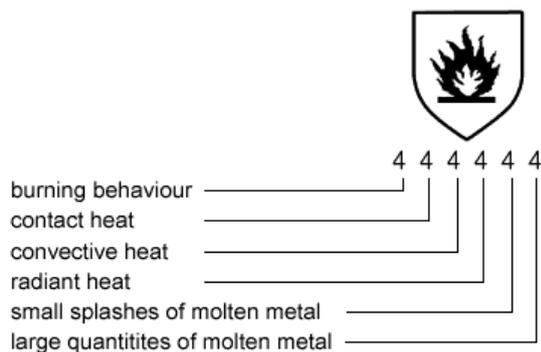
Gloves used for protection against convective and contact cold will be labelled in accordance with Safety Standard EN 511:2006.

Resistance to cold is given on a scale of 0-4 (where 4 is the best).

Water permeability is on a scale of 0-1 where 0 is a fail (after 5 minutes).

### 5.2 Heat and Flammability

There are a number of different types of gloves which provide protection against heat and fire. These tend to be gauntlet style gloves made from leather, cotton or kevlar fibre. Heat-protective gloves tend to be bulky with reduced dexterity.



Gloves used for protection against heat are covered by Safety Standard EN 407:2004.

Burning behaviour 0-4

Contact heat 0-4 Where levels 1-4 provide protection at temperatures for >15 seconds.

1	100°C
2	250 °C
3	350 °C
4	500 °C

Convective heat 0-3 Where 3 is the best (protection of heat)

		inside glove <18 seconds)
Radiant heat	0-4	Where 4 is best
Molten metal (s)	0-4	Where 4 is best
Molten metal (l)	0-4	Where 4 is best

## 6. Mechanical Hazards

Protection against mechanical hazards usually requires a fabric based glove to provide the necessary resistance to damage. Gloves are often coated with a polymer to provide waterproofing and a degree of chemical protection, these gloves can be considered as reusable.

Safety Standard EN388:2016 applies to gloves that protect against physical and mechanical hazards. It specifies requirements for resistance to damage from abrasion, tearing and cutting.

### Mechanical resistance labelling

		Ranking (the higher the number the better performance)
4 5 4 4		
abrasion resistance	4	Abrasion resistance 0-4
blade cut resistance	5	Blade cut resistance 0-5
tear resistance	4	Tear resistance 0-4
puncture resistance	4	Puncture resistance 0-4*
		TDM Cut Resistance (force) A-F

Where 0 is no protection (fail) or not tested.

\*It is worth noting that puncture resistance is measured for resistance to items as sharp as ball point pens and not needles.

Gloves for general outdoor use should be fit for purpose and suitable for the task providing good grip as well as thermal protection. Rigger style gloves will provide some protection against puncture and abrasion for moving equipment or materials.

Gloves during manual handling operations can be used to protect against bruising, entrapment, puncture or abrasion injury. Some gloves have enhanced grip systems for working in wet or oily environments.

## 7. Information, instruction and training

Correct use of personal protective gloves is critical in providing effective control of hazards, and it is essential that workers are informed, instructed and trained about the risks from skin exposure or physical hazards and the steps they need to take to protect themselves. This includes instruction in the correct use of any PPE provided and in good skin care regimes.

Users should understand:

- What the gloves are used to protect against.
- Limitations of the gloves, for example:
  - Gloves only protect the wearer and do not remove contaminant from the workplace
  - Some types of gloves are inconvenient and can interfere with the way the wearer does their work
  - Wearing gloves often causes the wearer to lose touch, feel and dexterity
  - Protection depends on the correct selection of glove material, a good fit and proper use.
- Correct use and removal.
- Any maintenance required for re-usable gloves.
- The duties of users under the personal protective equipment regulations to:
  - Use PPE supplied properly, in accordance with instructions
  - Not to miss use or damage PPE
  - Return to correct storage
  - Report any loss or defect in PPE supplied



The use of targeted mandatory “wear hand protection” signage can be used to reinforce the requirement for use of gloves for certain equipment or tasks e.g. at cryogenic vessels or heat sources.

Supervisors should monitor to check that, where gloves are mandatory, workers are complying with this requirement.

## 8. Maintenance and replacement

For re-usable gloves it is essential that an effective system for maintenance and replacement is in place. Users should understand how to check for faults, damage or wear and tear of the gloves prior to use, how to remove and clean the gloves and where to store safely after use and that defective gloves are replaced.

## 9. Hand care

Wearing protective gloves for any period of time will have an adverse effect on the skin, hence it is important to assess whether gloves are required for the tasks performed, this should form part of the task risk assessment. In many instances gloves are required to provide protection the user must consider appropriate measures to prevent dry hands and the possible development of more debilitating skin conditions described earlier in this document.

There are some simple rules that should be observed when using gloves to minimise skin problems:

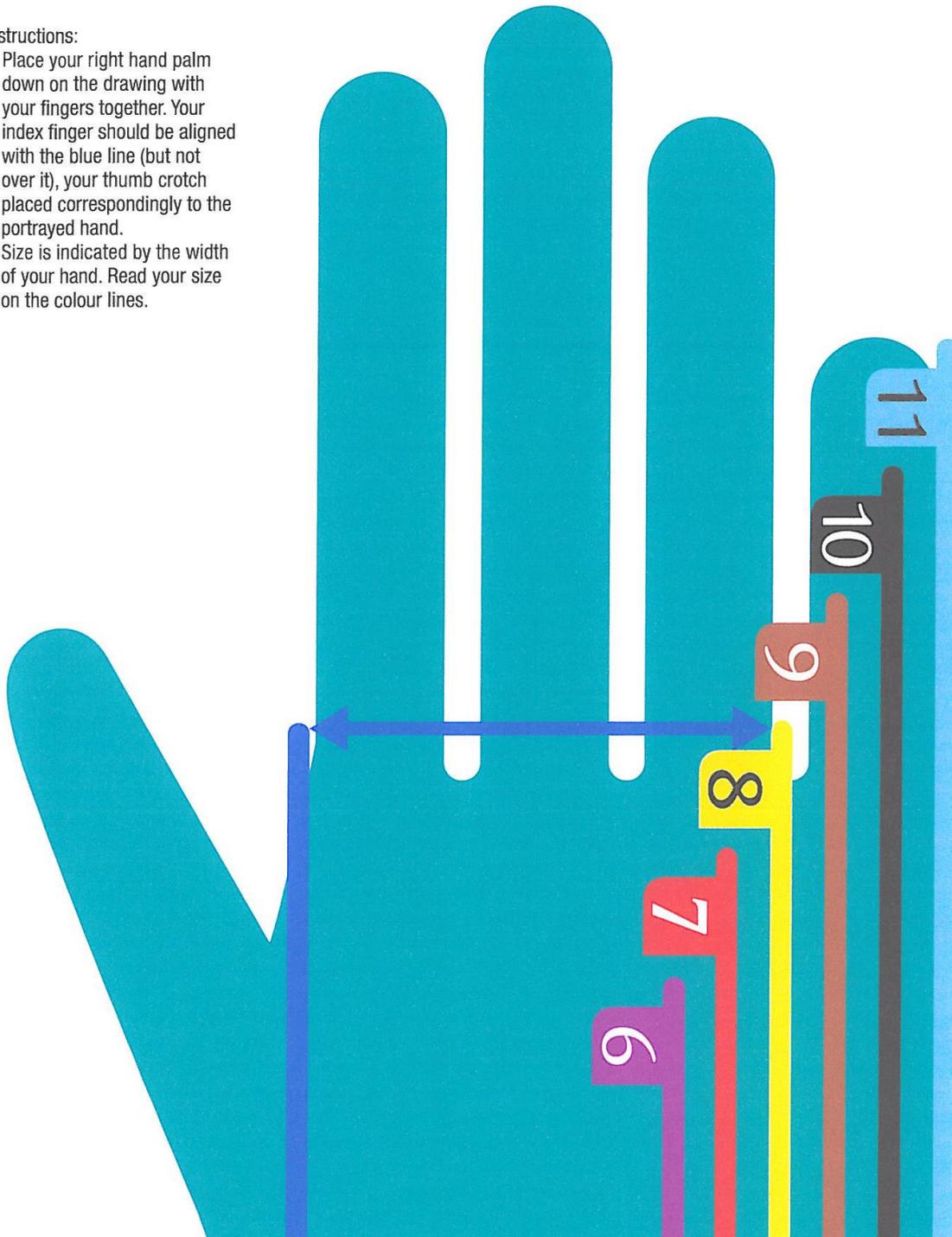
- Protective gloves should not be worn for more than 60 minutes at any one time (especially single use disposable gloves).
- Most barrier creams should not be used before wearing any type of protective gloves as they may cause damage to their protective availability or increase skin absorption – there are a small selection of glove-compatible hand treatments available – contact H&S for further information.
- Hands should be washed with a mild detergent once gloves are removed.
- It is recommended that glove users apply an emollient moisturiser following use to return lost oils and moisture to the skin before breaks or at the end of the working day.

Staff and students should seek advice from H&S or Occupational Health if their skin develops cracks, sores, swelling or redness.

## Appendix 1: Glove sizes

**Instructions:**

- Place your right hand palm down on the drawing with your fingers together. Your index finger should be aligned with the blue line (but not over it), your thumb crotch placed correspondingly to the portrayed hand.
- Size is indicated by the width of your hand. Read your size on the colour lines.



General glove size	Small	Medium	Large	Extra Large
Hand width	8cm	9cm	10cm	11cm

## Appendix 2: General information on glove material and chemical compatibility.

Material	Chemical resistance		Notes
	Good for	Not recommended for	
Nitrile	Broad range of chemicals including some acids and alkalis, fuels, solvents, hydrocarbons, greases etc.	Ketones, aromatics and chlorinated solvents Oxidising acids and organic compounds containing nitrogen	
Neoprene	Acids, bases, alcohols, peroxides, hydrocarbons and phenols	Organic solvents. Halogenated and aromatic hydrocarbons	
Latex	Incidental exposure to Water based chemicals, alkalis and alcohols	Organic chemicals and greases	Due to the possibility of latex allergies the use of powdered latex gloves is prohibited. Use of powder-free latex gloves is strongly discouraged but may be permitted in limited, justified circumstances
Vinyl	Incidental exposure to Poor resistance to most chemicals – some protection against petroleum based products		There is evidence to support release of low levels of harmful chemicals from these gloves which can be absorbed into the body. As such use of these gloves are strongly discouraged.
Polyvinyl chloride	Acids, bases, oils, fats, peroxides and amines	Organic solvents, ketones, aromatic solvents	
Butyl rubber	Ketones and esters	Aliphatic, aromatic and halogenated hydrocarbons	
Viton	Chlorinated and aromatic solvents	Ketones	