

The Power of Gloves

Pointing towards the right selection

Making sure you're wearing gloves to protect your hands when there is a potential for hand injury sounds simple enough. The truth is much more complex, and a great number of important factors must be considered first.

A good rule of thumb is when you select protective gloves base your choice on the type of work to be accomplished, the wearer and the environment in which they work.

So how are you supposed to make sure that you have the correct glove?

An effective way of anticipating and overcoming potential obstacles is to follow a step by step procedure to selecting the correct glove for each situation or application.

Identifying the hazard

Hazards may fall into one of the following categories:

1. Abrasions, scrapes and cuts

The nature of the surface we are trying to protect ourselves against will determine which glove material will work best. Rough surfaces, sharp edges and puncture potential need to be protected against. There are chemical protective gloves that also give protection against mechanical hazards (those marked EN388) and thermal hazards (those marked EN407).

2. Chemicals

Various chemicals have adverse properties when they come into contact with skin. The nature of the chemical will determine the nature of the polymer we will have to use to protect the hands. Material Safety Data Sheets, MSDS, from the chemical manufacturer or supplier and chemical resistant charts from the individual glove manufacturer should be used to determine which glove will offer the best protection.

Chemical protective gloves which are personal protective equipment are used only as a last line of protection. In addition, the law requires that the chemical protective gloves selected are adequate and suitable and that the users are trained and instructed on correct use, care storage and disposal.

There are an important number of issues requiring attention for correct selection and use, they include:

- *The presence of the 'CE' mark does not automatically mean that the gloves are adequate and suitable*
- *One size will not fit all users*
- *Gloves can keep contamination in just as effectively as they keep it out; once gloves are contaminated inside, they act as a reservoir, ready to re-contaminate the hands, which may then go on to contribute to inadvertent inhalation and ingestion exposures as well as to transfer contamination to other parts of the* ▶



skin. Putting contaminated hands inside gloves will re-contaminate the hands every time afterwards

- Wearers rarely look inside the glove to see if it is contaminated. They may not see the problem even if they do look because the contamination may not be visible to the eyes for a number of reasons – the chemical may be colourless or at a low concentration but at toxic levels, or it may be a gas or vapour
- Gloves sometimes have extremely small and difficult to detect pin point holes, and the wearers may not realise that this can be present in new and used gloves; the presence of holes can be particularly dangerous against fast acting chemicals, for example hydrofluoric acid
- Dip-coated gloves may cause a significant wicking effect, allowing chemicals to reach the skin inside the gloves. Dip-coated gloves are fabric gloves dipped in a rubber compound. The fibres from the liners may penetrate the rubber coating and act like a wick to draw the chemicals inside
- Chemical degradation of a glove may not be visible, but it can make the glove useless. It can increase internal contamination significantly. Gloves may pick up contamination on the outside as well as the inside during storage. This can happen when they are not stored correctly even before first use or inbetween uses
- It would not be an unusual situation for wearers to not remember where the gloves have been stored or what other chemicals they have been exposed to. Also, copious sweat inside the glove is a good environment for microbial growth. Think of this in relation to how long gloves may be stored, with unrecorded usage; this is an ideal situation for the onset of a variety of skin conditions for glove users
- Gloves contaminated with potentially toxic chemicals may act as a source for third party exposures. Examples would include family members if, for instance, the gloves are taken home. Other workers may also be exposed to toxic risk if the contamination is transferred to paperwork or surfaces. Waste handlers may also be at potential risk if potentially risky (toxically exposed) gloves are being disposed of incorrectly



Identifying why a glove is necessary

There are two reasons why a glove might be necessary:

- To protect the hands against the product – In this category we have chemical resistant gloves, cut resistant gloves or anti-vibration gloves. The basic nature of this assessment says that the product that we are handling has the potential to cause injury, and that we need the glove to protect us against this potential
- To protect the product against the hands – Many products in industrial use can readily be contaminated by oils and particles that are on the hands, for example, circuit boards or patients in an operating theatre

Another often ignored piece of common sense is to make sure the glove material you choose protects against the exact substances being handled. Glove manufacturers usually produce charts to show how well their gloves perform against different substances. Manufacturers use three key terms:

- Breakthrough time is the time a chemical takes to permeate through the glove material and reach the inside. Permeation is a process by which a chemical can pass through a material without going through pin holes or pores or other visible openings. This tells you how long you can use a glove for
- The permeation rate is the amount that then permeates through. The higher the rate the more of the chemical will move through the glove. Choose a low rate
- Some chemicals can destroy the glove material. It may get harder, softer or may swell. Degradation indicates the deterioration of the glove material on contact with a specific chemical. Choose gloves with an excellent or good degradation rating

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The single best way to protect vulnerable hands from harmful substances or chemicals is to choose a glove that conforms to European Standard EN374-3 (Health and Safety Executive 2003, Protective gloves against chemicals and micro-organisms: Resistance to permeation by chemicals).

The performance of glove materials can vary slightly from manufacturer to manufacturer; ensure your own safety by closely following the data supplied by the manufacturer while considering your glove selection. Keep in mind that the manufacturers' data is for pure chemicals, not mixtures. ▶

When you mix chemicals, their properties can change.

Allergies to gloves made of natural rubber latex are prevalent in many workplaces and this is also a determining factor in glove selection. Choose non-latex gloves unless there are no alternatives that give the protection needed. If you must use latex, choose low-protein, powder-free gloves.

Potential harm from substances in products

Look out for the effects of substances created by the work processes and ‘natural’ substances.

- *Substances in products – Some products contain substances that can harm the skin or enter the body through skin contact. The product label or material safety data sheet should tell you if this is the case. These may also give information on what protective gloves to use. If this is missing then try contacting the product supplier or manufacturer for help*
- *Created and ‘natural’ substances – Not all harmful substances come in labelled containers. Substances can be generated during work activities, like wood dust or solder fumes. Remember that handling some ‘natural’ substances like foods and flowers can cause skin problems too. If you are unsure if a substance produced*

by a work process or a natural substance you are handling is harmful, you can get help from a variety of sources. Try your trade association website or the UK Health and Safety Executive info line (+44 845 345 0055)

Other considerations

Before committing to your glove type, it is well worth considering a few more elements that can substantially affect how safe you actually are in your work environment, elements such as the type and duration of any potentially harmful contact.

- *Will gloves be worn for a short or intermittent period of time, or longer periods? Comfort is more important for longer wear. Generally, thicker, robust gloves offer greater protection than thinner gloves but thinner gloves offer better dexterity*
- *Will contact be from occasional splashes or by total immersion? Short gloves are fine to protect against splashes. If hands are immersed choose a length greater than the depth of immersion*

What is the task?

A paramount consideration for correct choice of glove wear is the consideration of the precise task to be performed.

Gloves should not hamper the task. If wet/oily objects are handled, choose gloves with a roughened/textured surface for good grip. Select gloves that balance protection with dexterity. Ensure the gloves selected meet any standards required for the task, e.g. sterile gloves for a stringent, sterile environment, or food grade gloves for food handlers.

Prolonged or frequent contact with water, particularly in combination with soaps and detergents, can cause dermatitis. ‘Wet work’ is the term used to describe tasks in the workplace that can cause this. To protect the hands from ‘wet work’ choose a glove that meets the European Standard EN374-2. This shows that the gloves are stringently tested as waterproof.

Once you have selected your gloves, the logical next step is the basic instruction of employees in the correct use of the personal protection you are providing. Tell them when they should be replaced, and if they are reusable gloves, ask them to rinse them before removal (if practical) and tell them how they should be stored. Review their use periodically and get employee feedback – this can help check that the gloves are performing properly.

Match material to workplace hazard

Individual workplaces present us with specific challenges for the type of material that we will eventually choose to protect us. The specific hazard will in turn eliminate many materials as practical, or fit for purpose, and at the same time dictate the materials that will suit the task.

As an example, it would be impractical to use latex gloves in an environment consistent with oil based materials. Oil based substances will quickly degrade the structure of latex, rendering it useless and unsafe. In this context we would look at the effectiveness of nitrile gloves as an alternative.

There is an extensive list of materials that are purpose developed for particular use in particular ▶

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workplaces, each with its own properties, advantages and disadvantages. The list includes materials such as cotton, leather, vinyl, nitrile, latex, PVC, Neoprene, Butyl, Viton, Hypalon, Kevlar, Dyneema, Spectra, Polyvinyl Alcohol (PVA) and many more.

Consider the user – size and comfort

- *Gloves should fit the wearer. Tight gloves can make hands feel tired and lose their grip. Too large gloves can create folds; these can impair your ability to work and be uncomfortable. It can help to use data supplied by manufacturers, such as accurate sizing charts*
- *Comfortable gloves are more likely to be worn, less likely to be discarded by employees as nuisance value and eventually lead to possible exposure to risk. Involve employees in the selection process and give them a reasonable choice*
- *Hands can sweat inside gloves making them uncomfortable to wear. Getting staff to take glove breaks, removing gloves for a minute or so before hands get too hot and sweaty, can help air the hands. You could also consider supplying separate cotton gloves to wear under protective gloves. These can increase*

comfort by absorbing sweat. Additionally, such liner gloves can be laundered and reused

Some gloves, such as a seamless, string knit glove, will stretch to fit most hands, but many other gloves are sized specifically for the individual user.

Making sure that you've got the correct size is simply a matter of grabbing a tape measure (a flexible one, like tailors' use) and measuring around your hand across the palm, excluding the thumb.

Based on your measurement, you then select your glove size.

EU sizes		US sizes	
152 - 178 mm	EU - 6	6 - 7 inches	XS
178 - 203 mm	EU - 7	7 - 8 inches	S
203 - 229 mm	EU - 8	8 - 9 inches	M
229 - 254 mm	EU - 9	9 - 10 inches	L
254 - 279 mm	EU - 10	10 - 11 inches	XL
279 + mm	EU - 11	11 + inches	XXL

(Measurement table from Health and Safety Executive: www.hse.gov.uk/skin/employ/glovesizes.htm)

Selecting the correct sized glove is important and it can be done easily with a glove size selection chart. ▶

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One size will not fit all workers. Employers will have to provide a selection of sizes to meet the requirements of their employees. If the glove is too tight, a reusable glove can't be put on or taken off easily.

Assessing other factors

Having done all the above, you are almost ready to select the glove that you will need. Additional factors that you need to consider before you make your glove selection are:

How long do you need the glove to be?

Do you simply need to protect the hands themselves or is there a need to protect the wrists and even part of the arm? Length of glove is as important to the assessment of the correct glove as any other factor.

Where gloved hand immersion is justified as necessary in a risk assessment, one way to improve glove use and prevent the spread of contamination is to reduce the immersion depth of the hands. In addition, it is important to establish cuff length requirements. The glove cuff must exceed the immersion depth or handling area by a good margin. If the 'spare' cuff is too short, chemicals can splash backwards onto the sleeves or skin. This spare cuff is also used as a safe handling area to remove and replace the gloves.

No matter how long the cuff, if there is a need to raise the hand and liquids can run down the glove and onto the arm, the first priority should be to look for alternative ways to accomplish the job. One way to reduce the problem, where a small amount of run-off is expected, is to fold back the cuff to form a drip catcher. This effectively makes the glove shorter, so the cuff length should be increased to allow for the fold back to maintain the splash back length of cuff.

Think about interaction with other clothing

The glove/sleeve interaction has a significant affect on performance. Wide, heavy sleeves of workwear (not considered to be PPE) can

touch surfaces and become contaminated. There are several ways to reduce this. One is to substitute a narrower sleeved garment, another is to fold back the cuff just in front of the sleeve, but this reduces overall glove length drastically.

A third way is to use a heavier duty gauntlet with a longer, wider cuff that fits over the garment; if it is not wide enough, however, it will create problems with fit and comfort. Here is a cheap and easy solution: take a 15cm sticky backed length of Velcro loops and an equal length of hooks - the sticky side grips the workwear to help you fit it on yourself without help. The loops bind the sleeve more tightly.

Do you need a safety cuff?

If you are working around moving parts and machinery, for example, you will probably want a safety cuff on your glove to allow the glove to slip off the hand if it should get

caught in the machinery, rather than pulling the hand into it.

Vibration and/or impact issues

Vibration and impact issues require special anti vibration gloves in order to help prevent the condition known as 'white finger', also known as Hand Arm Vibration Syndrome or HAVS. You can find out all you need to know about hand arm vibration syndrome at www.handarmvibrationsyndrome.org.uk

Dealing with temperature/ weather variables

Leather gloves, for example, provide a certain amount of resistance to cold, but lose much of that quality when they get wet. Insulated cold weather gloves might be a better choice for rain and snow. In hot weather, workers will prefer gloves that breathe, allowing the hands to not get too sweaty. ▶

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When are gloves more of a threat than a help?

There are some jobs or locations where we should not wear gloves because it is unsafe to wear them, or gloves should be used with caution. Here are some examples:

- *Gloves can get caught in moving machinery such as powered rollers, belts, pulleys, chain drives, and rotating or moving parts such as motor shafts*
- *Some people are allergic to latex gloves so if this is the case, it is important that other gloves, such as those made of nitrile, are provided*
- *Gloves can actually cause more problems if chemicals get inside them, trapping hazardous materials around the hand; if a glove is to be worn it must decrease the likelihood of exposure, not increase it*
- *Gloves can fail in conditions of extreme temperatures, high mechanical force, high vibration, or when handling extremely harsh chemicals; have procedures and good practice in place for any of these eventualities*

Having taken all of these factors into consideration, you are ready to make

an appropriate glove choice for your working environment in the secure knowledge that you have taken all reasonable precautions to provide what can be an essential piece of Personal Protective Equipment, in many varied work places. ■

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British Safety Services (BSS) is an international consultancy offering advice and training on health and safety issues. Established in 1990, BSS has gained an international reputation as a major provider of high quality safety training that gets results. The team at BSS also provides guidance on all aspects of public safety, specialising in workplace legislation and best practice.

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