A GUIDE TO SELECTING CHEMICAL PROTECTIVE GLOVES – PART 1

Honeywell

TABLE OF CONTENTS

2 Introduction
3 Knowing the task
4 Knowing the work environment
5 Chosing the right fit
6 Other important considerations
7 Conclusion

INTRODUCTION

The hands are two of the most valuable and widely used tools in the workplace environment. They are also two of the most vulnerable, especially when handling chemicals. Wearing gloves and selecting the right gloves for specific tasks is essential to help protect workers' hands. However, a glove to suit all activities simply does not exist and it is important to seek professional and expert advice to ensure the correct choice is made.

This eGuide explores the problems surrounding the selection of chemical protective gloves specifically and offers a step-by-step approach to choosing the correct gloves.

STEP 1 – KNOW YOUR CHEMICALS **INTIMATELY**

STEP 2 – MAKE SURE THEY FIT **PROPERLY**

STEP 3 – CHOOSE THE RIGHT GLOVE **MATERIAL**

STEP 4 – CONSIDER THE **APPLICATION**

STEP 5 – CHECK THE **STANDARD** OF YOUR CHOICE

STEP 6 – KNOW WHERE TO GO FOR FURTHER **ADVICE**

STEP 1
KNOW YOUR CHEMICALS INTIMATELY

First of all, it is important to know the chemicals being handled. It is the duty of an employer to provide suitable personal protective equipment (PPE) for employees but it is still advisable for employees to be aware of the dangers of the chemicals they are handling because no single glove protects against all hazards.
European Regulation (EC) 1272/2008, the labelling law also known as the CLP Regulation, requires all hazardous chemicals to be clearly labelled.
This label should contain the name of the substance, its origin, a danger symbol or pictogram (see examples below) and an indication of the danger involved in using the substance.

Causes severe skin burns and eye damage / May cause an allergic skin reaction

May cause allergy or asthma symptoms or breathing difficulties if inhaled

Toxic if swallowed or if inhaled

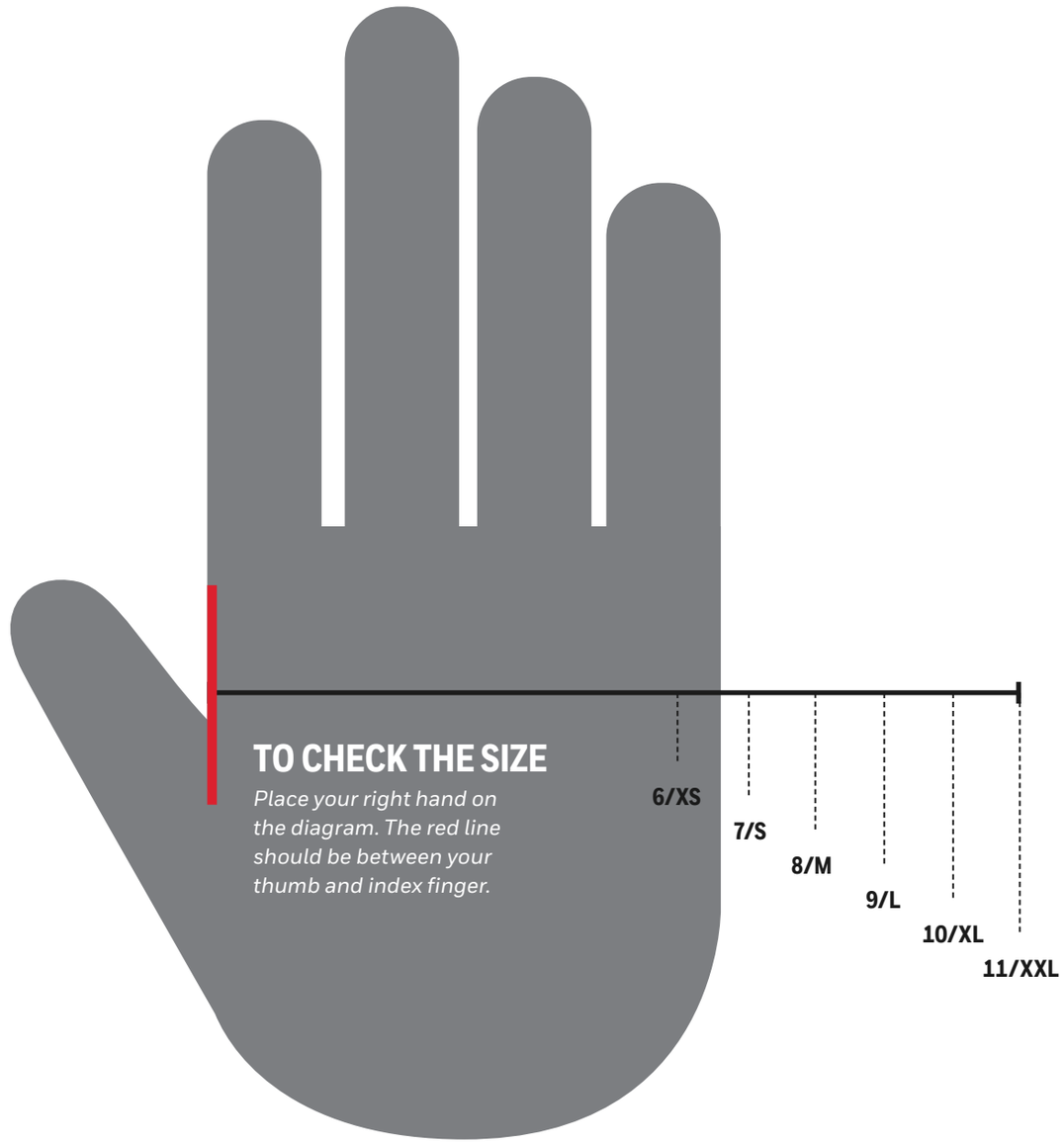
Having identified the chemical to be handled, it is then important to understand the type and duration of contact, which is why it is recommended to request the relevant safety datasheets from the manufacturer of the hazardous substance that needs handling. This is because different gloves offer varying protection against penetration and permeation of specific chemicals and the scale of degradation of the glove material when in use.

STEP 2
MAKE SURE THEY FIT PROPERLY

It may sound obvious but correctly fitting gloves are vitally important. If you feel uncomfortable wearing gloves or they make working difficult, then there is a temptation to take them off and stop using them – leaving your hands unprotected.

For example, although thicker gloves can provide greater protection, they can be more uncomfortable and cumbersome to wear.

Similarly, if the contact with the substance is by immersion, rather than occasional splashing, then longer gloves covering the forearms should be considered.



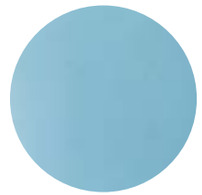
STEP 3
CHOOSE THE RIGHT GLOVE MATERIAL

The glove material itself is important. Some people can suffer an allergic reaction to materials such as latex with symptoms including a rash, hives, flushing, itching, nasal/eye/sinus irritation, asthma and shock. In this case, depending on the application, other materials should be considered such as nitrilenitrile or neoprene.

If you do choose materials such as latex, use powder-free gloves with reduced protein content. Such gloves reduce exposures to latex proteins and thus reduce the risk of latex allergy. Also avoid oil-based creams or lotions when using latex gloves as these can cause the gloves to degrade and break down.
Wash hands with a mild soap and dry hands thoroughly after using gloves.

It is also worth bearing in mind that the glove material is normally a good indication of its ability to protect against specific substances.

POLYCHLOROPRENE
is resistant to diluted acids and alkalis, saturated salt solutions, glycols, glycerin, plasticizers, vegetable and animal fats and oils.



NITRILE is resistant to aliphatic and alicyclic hydrocarbons, long-chain alcohols, diluted acids and alkalis, saturated salt solutions, glycols, glycerin, plasticizers, vegetable and animal fats and oils.

BUTYL RUBBER is resistant to diluted and also concentrated acids and alkalis, organic acids, saturated salt solutions, alcohols, glycols, but also against glycerin, plasticizers, aldehydes, esters and ketones.

FLUORINATED rubber is resistant to diluted and also concentrated acids and alkalis, organic acids, saturated salt solutions, alcohols, glycols, glycerin, plasticizers and also to aliphatic, aromatic and chlorinated hydrocarbons, aniline and benzene.

STEP 4
CONSIDER THE APPLICATION

Simply stated, the best gloves for any task involving contact with chemicals are those which provide best protection against that chemical. Choosing the wrong gloves gives the user a false sense of security and could even prove more dangerous than no gloves at all.

As explained in Step 1, it is first important to know which chemicals are presenting a hazard to health. This varies from working environment to working environment. A hairdresser will use different chemicals from a composites engineer in the aerospace sector, for example. Consequently, gloves should be selected to protect against those application-specific chemicals used in a working day.

The specific job being done should also be taken into account when considering the fit to ensure appropriate dexterity and comfort during use.

It is also worth pointing out that there can be other application-specific considerations. For example, gloves used to handle food in the food industry must not allow migration of plasticisers and other substances into the food. Users should be aware of the other hazards in application. For example, sharp objects may damage the material providing the chemical protection during the use.

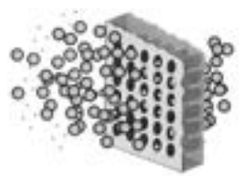
STEP 5
CHECK THE STANDARD OF YOUR CHOICE

Clinically-speaking, you will know you have made the right choice of gloves if you don't suffer any skin damage or irritation after handling chemicals in the workplace. However, there is no need to take the risk of waiting and seeing if you were right. Gloves for handling chemicals are rigorously tested to European standards to ensure that they perform their job in the field. Specifically, they are tested for degradation, penetration and permeation.

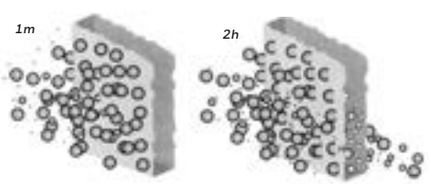
Degradation tests check a glove's mechanical stability when it is subjected to chemical challenges or when it undergoes hot washing in water and detergents. These tests are carried out with reference to international standards, such as ISO 1817 and ASTM D471. The glove's dimensions (length, width, thickness), density and stability under mechanical stress are also checked.

Penetration checks are carried out to standards such as ISO 13994, where liquids such as water and gases such as nitrogen are introduced to the glove and visual inspection is carried out to ensure that no bubbles or droplets are present inside the glove.

Permeation tests involve investigating molecular diffusion and are also carried out in accordance with EN and ASTM standards such as EN 16523-1:2015, ASTM F739 and ISO 6529. These tests check for any passage of organic molecules into the glove. They are carried out for a wide range of chemicals and are quite complex. A glove that forms an effective barrier against two solvents as pure compounds may end up being a poor barrier against a mixture of those compounds, and could perform even worse against inorganic acids.



Penetration: chemicals travelling through holes in a glove



Permeation: chemical substances travelling through the glove material

In addition, the glove must be checked for continuous use, as the interior structure of the glove material in contact with the chemical may deteriorate over time. This is known as the **breakthrough time** and can be greater than 8 hours but also only some minutes. According to EN 374-1:2016, gloves are classed as Type A, Type B or Type C depending on their minimum breakthrough time and number of chemicals they can protect against, as illustrated in the table below:

TYPE A	**Penetration resistance (EN 374-1)** Breakthrough time ≥ 30 min for at least 6 chemicals from the list of defined test chemicals (EN 16523-1)
TYPE B	**Penetration resistance (EN 374-1)** Breakthrough time ≥ 30 min for at least 3 chemicals from the list of defined test chemicals (EN 16523-1)
TYPE C	**Penetration resistance (EN 374-1)** Breakthrough time ≥ 10 min for at least 1 chemical from the list of defined test chemicals (EN 16523-1)

The illustration below shows two examples of marking in line with EN 374-1:2016.

EN ISO 374-1/Type A

UVWXYZ

EN ISO 374-1/Type B

XYZ

For More Information
sps.honeywell.com/en/en/products/safety

HONEYWELL
SAFETY PRODUCTS
UNITED KINGDOM
Honeywell Safety Products UK LTD
Honeywell House, Skimped Hill Lane,
Bracknell, Berkshire RG12 1EB
United Kingdom
Phone: +44 (0) 1256 274938
Email: info-uk.hsp@honeywell.com

HONEYWELL SAFETY PRODUCTS
BENELUX
Honeywell Safety Products Benelux BV
Lange Amerikaweg 55, 1H – 1831 Diegem
7332 BP Apeldoorn, Nederland
Tel: +31 (0) 20 5656 988
Email: info-benelux.hsp@honeywell.com

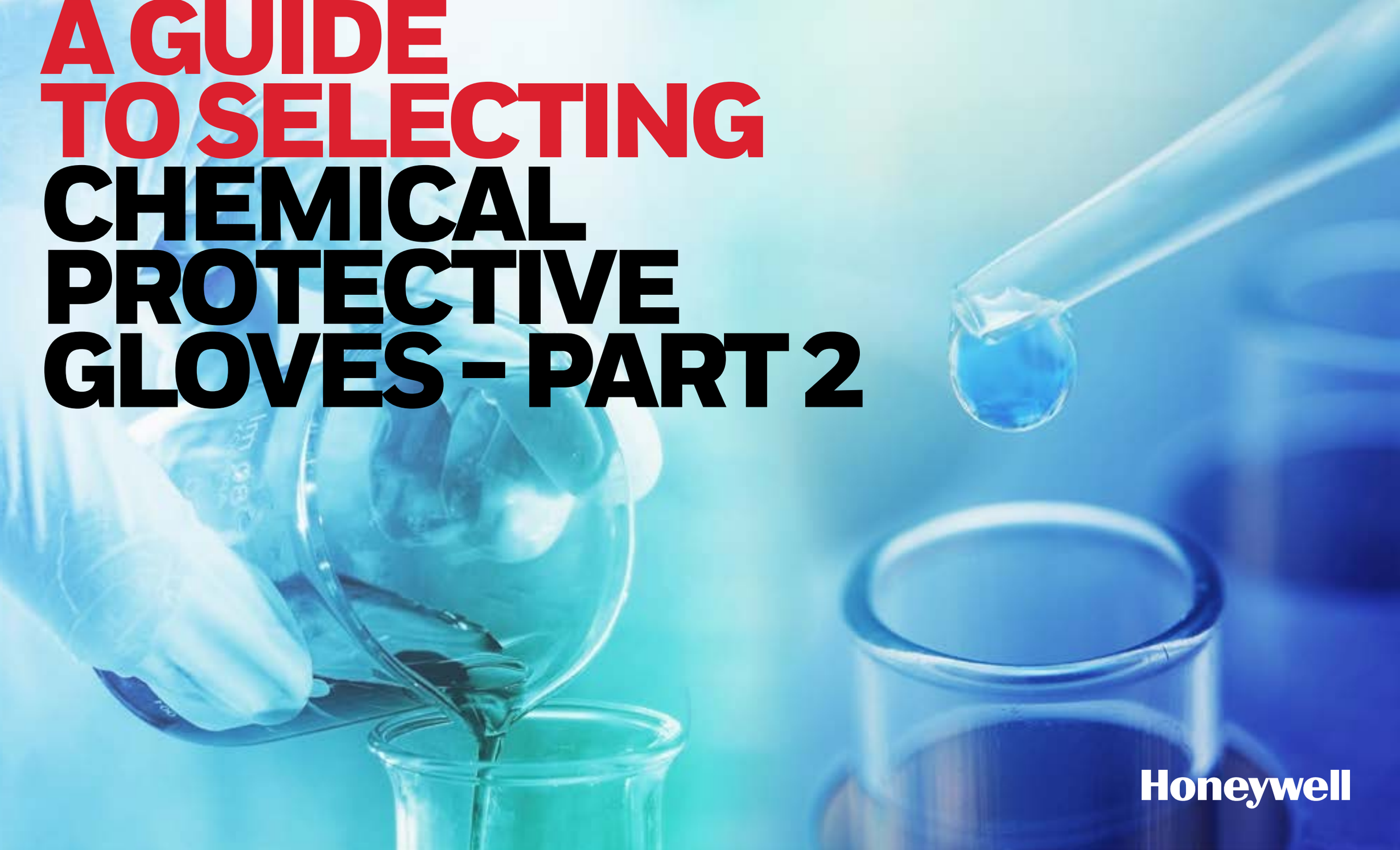
HONEYWELL
SAFETY PRODUCTS
NORDICS
Honeywell Safety Products Nordic AB
Box 15 147
SE-167 15 Bromma – Sverige
Phone: +46 (0) 424480433
Email: info-nordic.hsp@honeywell.com

HONEYWELL SAFETY PRODUCTS
GREEK-MALTA-ISRAEL
Honeywell Safety Products Iberica SA
Calle Josefa Valcárcel 24 - 5ª
Planta CP. 28027 Madrid, España
Phone: +34 91 676 45 21
Email: info-spain.hsp@honeywell.com

FOR TECHNICAL QUESTIONS
INDUSTRIAL SAFETY PPE
TECHNICAL SUPPORT
Free Phone: 00 800 3344 2803 (free calls in Europe)
Phone: +44 (0) 1698 647 087 (paid calls)
Email: IS.PPE.TECHSUPPORT.EUROPE@honeywell.com

Honeywell

A GUIDE TO SELECTING CHEMICAL PROTECTIVE GLOVES - PART 2



Honeywell

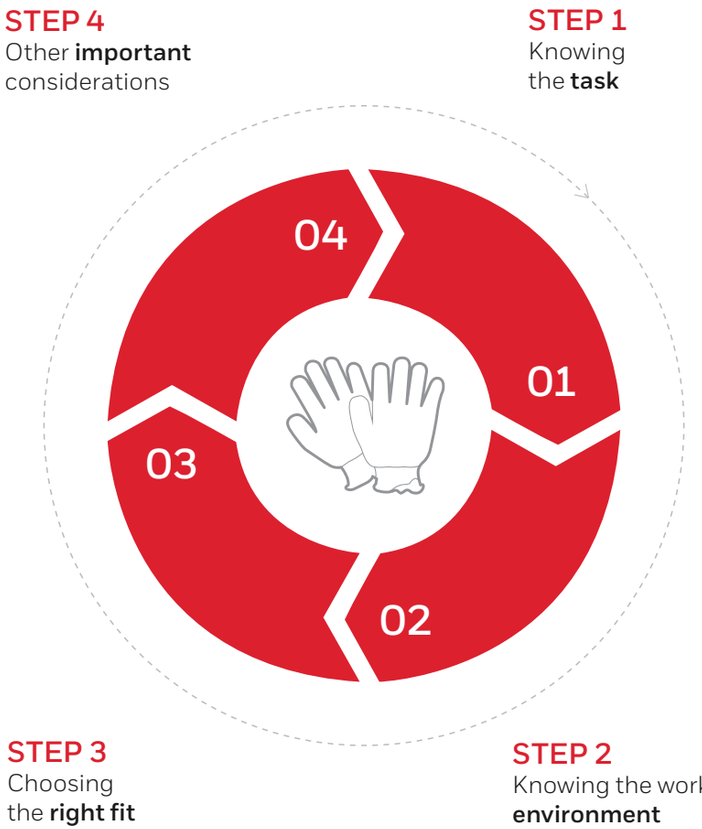
TABLE OF CONTENTS

1 Introduction
3 Knowing the task
4 Knowing the work environment
5 Chosing the right fit
6 Other important considerations
7 Conclusion

INTRODUCTION

When it comes to personal protective equipment (PPE), chemical protective gloves are arguably the most difficult to choose. As A Guide To Selecting Chemical Protective Gloves - Part 1 already illustrated, no single glove provides universal protection. In order to make the right choice, health and safety professionals need to consider many different factors, from the type of chemicals in the workplace to the length of the exposure.

Building upon these considerations, this eGuide looks at other important factors that health and safety professionals need to bear in mind when selecting protective gloves. It pays special attention to the important role that task, environment and fit play in glove selection, looking at four key steps to making the right choice.



STEP 1
KNOWING THE TASK

Knowing the ins and outs of the task that needs to be performed is key to selecting the right protective gloves. Consider the three important factors outlined here:

01 FULL CONTACT / SPLASH PROTECTION

The first question to ask should always be: are a worker's hands at risk of coming into contact with chemicals and, if so, how likely are they to be exposed? The two key scenarios to consider here are incidental and intentional - or full - contact. The former means that a worker may accidentally be exposed to chemicals as a result of a splash or spill, while the latter implies that they will inevitably come into contact with chemicals when carrying out their task.

In both scenarios, it is essential to consider which chemicals are involved and, when it comes to intentional contact, it is also vital to bear in mind how long the contact is likely to last. This is key to selecting gloves with the correct breakthrough time for the specific substance. Gloves with a short breakthrough time are normally appropriate for incidental contact as they will give workers enough time to discard them in case of exposure. In any case, relying on a trusted supplier is critical to choosing gloves with the appropriate level of protection for specific applications.

Knowing the ins and outs of the task that needs to be performed is key to selecting the right protective gloves. Consider the three important factors outlined here.

02 DEXTERITY REQUIREMENTS

Another important consideration is the level of dexterity and precision required to carry out a task. This shouldn't be underestimated as a choice that is purely dictated by chemical resistance levels – the more resistant the better – may not necessarily be the best one.

A laboratory worker who is wearing thick re-usable gloves with a very high breakthrough time, for example, may be well protected against chemicals. However, they will probably find it extremely difficult to handle delicate glassware such as pipettes or beakers and end up damaging or dropping them, potentially exposing themselves and their colleagues to splashes and cuts. By contrast, thin, disposable chemical-resistant gloves will give the worker the level of dexterity they need while ensuring sufficient protection if the risk of contact is relatively low.

03 GLOVE POSITION

The way in which gloves are positioned during the task is also worthy of attention.

For example, if a worker is operating equipment or handling tools above their head, it is vital to select gloves featuring a safety rolled edge that stops liquids from dripping down. This is also recommended when workers are wearing gloves over their workwear sleeves to prevent them from being contaminated or corroded by dangerous substances.

STEP 2
KNOWING THE WORK ENVIRONMENT

There are at least three main reasons why the environment in which a task is carried out also deserves special attention:

01 EXPLOSIVE ATMOSPHERES

It is not unusual for workers in sectors such as oil and gas and petrochemicals to operate in highly explosive atmospheres where it is vital that every tool and equipment used, including gloves, are antistatic. Handling flammable substances in such environments can be especially dangerous. The problem is that gloves may offer appropriate breakthrough times against substances such as solvents, which are generally made using materials such as polychloroprene, may not offer antistatic properties. It is crucial to opt for alternative materials such as butyl rubber that combine protection against a wide range of chemicals and gases with antistatic properties.

02 WET AND GREASY ENVIRONMENTS

Grip is another important consideration. If the environment involves greasy or wet ladders or machinery, for example, gloves need to offer high grip levels. Normally, the rougher the glove surface the better. Materials such as natural rubber and neoprene offer particularly good grip. However, it's worth bearing in mind that substances such as solvents may interact with them and hamper their grip properties. Knowing the chemicals that need handling is paramount and so is selecting gloves that offer chemical protection and grip, for example, a nitrile glove with a diamond or fishbone finish. While natural rubber offers better grip for contact with water, nitrile (optimally nitrile foam) is the better choice in oily environments.

03 AMBIENT TEMPERATURE

Some work environments may be particularly cold, for example laboratories or storage facilities that need to maintain sub-zero temperatures. When a task involves handling chemicals in such environments, gloves with a sealed nitrile layer combined with a wool liner are normally the best solution as they offer thermal insulation together with protection against chemicals. This type of glove is often suitable for hot environments too, providing a flexible solution for workers who need to switch from low to high temperatures. If a task also involves operating hot equipment, a para-aramid liner to protect the skin should be considered. Another important reason why ambient temperature should be taken into account is that it may influence a glove's breakthrough time. Breakthrough times are determined through tests that are performed in laboratories with a constant 25° C temperature. However, when a worker wears gloves, their breakthrough time will inevitably be influenced by both body and ambient temperatures. For this reason, it is recommended to reduce 'official' breakthrough times by 30 percent to allow for a 'safety window'. It is also advisable to rely on a trusted supplier such as Honeywell to help you choose the correct gloves for each unique work environment. On the other hand, nitrile tends to harden in very cold temperatures so that chloroprene might be the better choice.

STEP 3
CHOSING THE RIGHT FIT

As A Guide To Selecting Chemical Protective Gloves - Part 1 illustrated, fit is of paramount importance. Gloves that feel uncomfortable to wear can hamper a worker's wellbeing and, worse, also put them at risk if they decide to take them off. There are other important considerations:

01 AMBIDEXTROUS OR ANATOMIC?

When it comes to fit, a good starting point is always to consider whether gloves should be ambidextrous or anatomic. The former can be worn on either hand while the latter category means that each pair of gloves has a right and a left hand.

If a worker only needs to wear gloves for short periods of time and contact is incidental, disposable gloves, which most of the time are ambidextrous, may offer the best solution. The other advantage of ambidextrous gloves is their flexibility, which can come in handy when, for example, a laboratory worker has to move from one side of a glovebox to another.

If workers need to wear gloves for longer periods of time, re-usable gloves, which in most cases are anatomic, will typically offer better comfort. Also flexibility and thickness of the material play a role when deciding for an ambidextrous glove for comfort reasons.

02 LINER

A liner may also be advisable for a worker who has to wear gloves for prolonged shifts, particularly in hot environments, as it will help absorb sweat and thus improve comfort. It also has the advantage of providing extra support when a worker has to handle heavy objects such as a gearbox in an automotive production facility.

03 CUFF LENGTH

When it comes to comfort, it is also important to bear in mind that a glove cuff's length will influence the amount of air inside the glove. Normally, the shorter the glove the better the ventilation. With this in mind, unless full contact with chemicals is part of a worker's task, for example immersing hands in a tank, shorter gloves may be the best option comfort wise. However, it is important to remember that if workers are wearing short-sleeved clothing, their naked arms may be exposed to splashes, so, depending on the task, either long sleeves or longer gloves may be needed. When long gloves are needed, it is important to look for models that allow good ventilation.

STEP 4
OTHER IMPORTANT CONSIDERATIONS

In addition to the steps mentioned above, it is also essential that health and safety professionals pay attention to the following when selecting gloves:

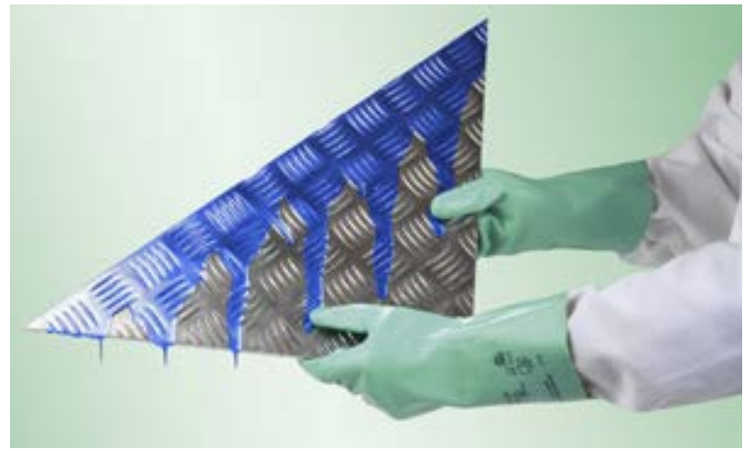
01 FOOD CONTACT

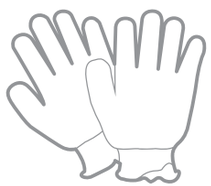
For specific applications such as food processing, gloves will need to be certified for food contact. It is crucial that health and safety professionals familiarise themselves with the latest standards in this field before specifying gloves.

02 CUT AND CHEMICAL RISK

In some applications, a worker's hand may not only be exposed to contact with chemicals, but also to potential cuts. This is arguably one of the worstcase scenarios as, without appropriate hand protection, a dangerous substance may immediately reach a worker's bloodstream, with dramatic consequences. With this in mind, the safest choice is always to wear a chemical protective glove under one protecting against mechanical hazards.

Alternatively, depending on the application, it is possible to opt for gloves featuring a chemical-protective coating over a cut-protective liner. It is always recommended to contact a trusted manufacturer for guidance on how to best match the two.





03 MAINTENANCE

Maintenance is another important consideration when it comes to reusable gloves. Gloves should always be inspected carefully for discoloration, cracking or damage before use and discarded if any such defects are found. It is vital to take extra care when taking gloves off to avoid any exposure to residual substances.
With this in mind, reusable gloves should be cleaned thoroughly after work to remove any residual chemicals before being taken off.

CONCLUSION

Selecting protective gloves is not an easy task, especially when chemicals are involved. Considering the nature of the task a worker will have to carry out, the work environment and how gloves are going to fit the wearer are key to making the right choice.

Finally, it is always important to seek further guidance from specialist manufacturers of gloves. Honeywell, for example, has a unique database of over 350,000 chemicals, including mixed substances, which have been tested for permeation and penetration on a variety of glove fabrics and materials.

For More Information
sps.honeywell.com

HONEYWELL
SAFETY PRODUCTS
UNITED KINGDOM
Honeywell Safety Products UK LTD
Honeywell House, Skimped Hill Lane,
Bracknell, Berkshire RG12 1EB
United Kingdom
Phone: +44 (0) 1256 274938
Email: info-uk.hsp@honeywell.com

HONEYWELL SAFETY PRODUCTS
BENELUX
Honeywell Safety Products Benelux BV
Lange Amerikaweg 55, 1H – 1831 Diegem
7332 BP Apeldoorn, Nederland
Tel: +31 (0) 20 5656 988
Email: info-benelux.hsp@honeywell.com

HONEYWELL
SAFETY PRODUCTS
NORDICS
Honeywell Safety Products Nordic AB
Box 15 147
SE-167 15 Bromma – Sverige
Phone: +46 (0) 424480433
Email: info-nordic.hsp@honeywell.com

HONEYWELL SAFETY PRODUCTS
GREEK-MALTA-ISRAEL
Honeywell Safety Products Iberica SA
Calle Josefa Valcárcel 24 - 5ª
Planta CP. 28027 Madrid, España
Phone: +34 91 676 45 21
Email: info-spain.hsp@honeywell.com

FOR TECHNICAL QUESTIONS
INDUSTRIAL SAFETY PPE
TECHNICAL SUPPORT
Free Phone: 00 800 3344 2803 (free calls in Europe)
Phone: +44 (0) 1698 647 087 (paid calls)
Email: IS.PPE.TECHSUPPORT.EUROPE@honeywell.com

Honeywell