Honeywell
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Hand Protection

A GUIDE

TO SELECTING CHEMICAL PROTECTIVE GLOVES - PART 1

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. The wearing of gloves and the selection of the right gloves for specific tasks is essential if the hands are to be protected. 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

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

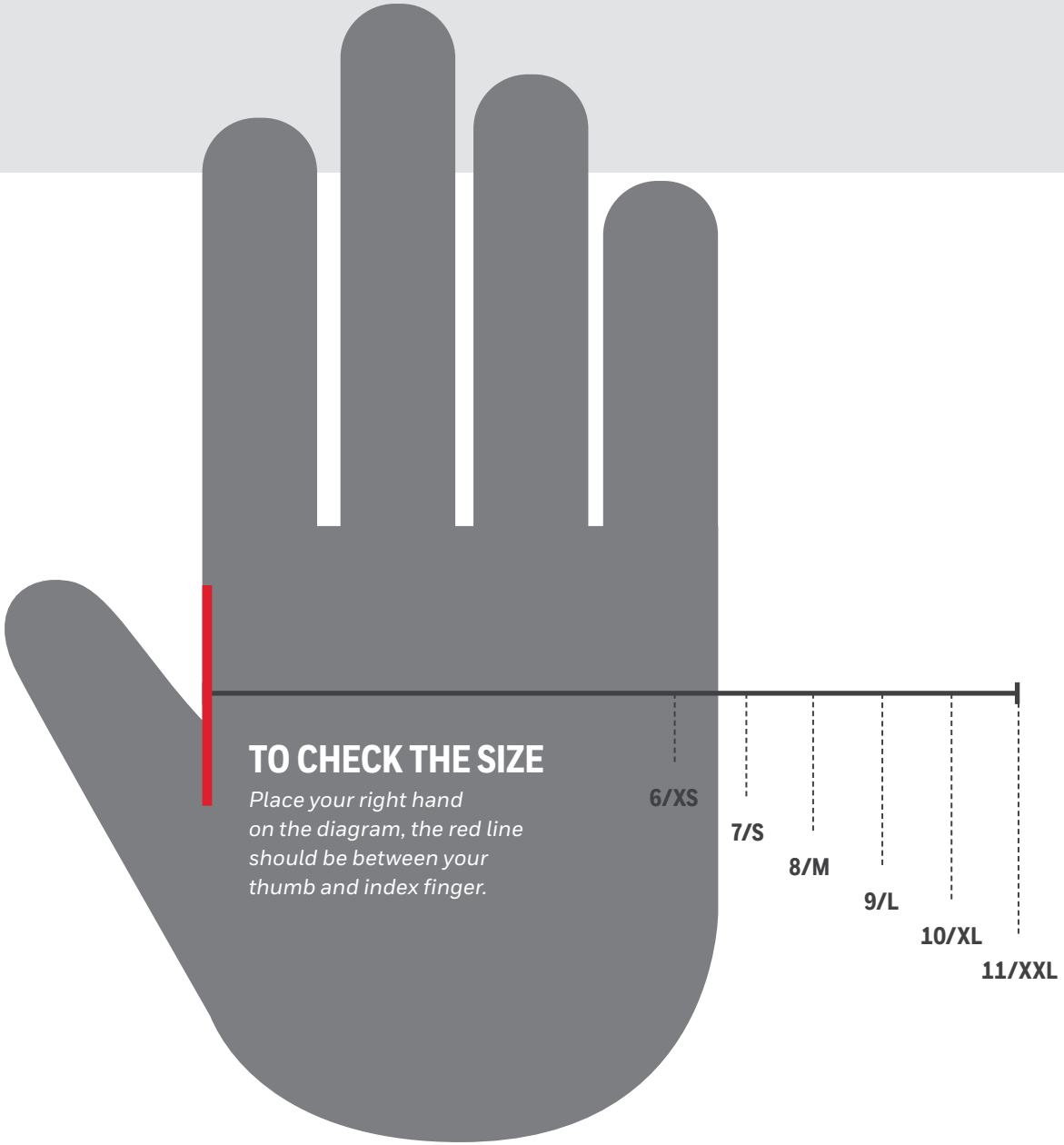
Having identified the chemical to be handled, it is then important to understand the type and duration of contact, which is why it is recommended to request the relevant safety datasheets from the manufacturer of the hazardous substance that needs handling. This is because different gloves offer varying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

STEP 2

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

STEP 3

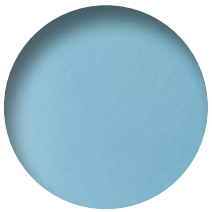
CHOOSE THE RIGHT GLOVE **MATERIAL**

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 nitrile, neoprene or vinyl.

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. For example:

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

STEP 4

CONSIDER THE **APPLICATION**

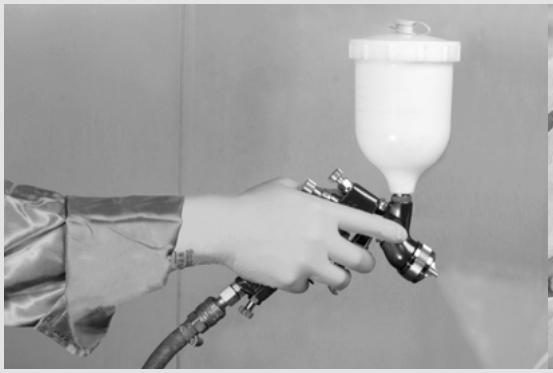
Simply stated, the best gloves for any task involving contact with chemicals are those which provide complete protection against that chemical. Choosing the wrong gloves gives the user a false sense of security and could even prove more dangerous than no gloves at all.

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, in the food industry gloves used to handle food must not allow migration of plasticisers and other substances into the food.

STEP 5



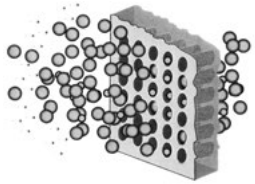
STEP 5 CHECK THE **STANDARD** OF YOUR CHOICE

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.

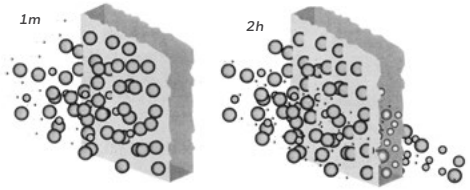
DEGRADATION TESTS to check a glove's mechanical stability when it is subjected to chemical challenges or when it undergoes hot washing in water and detergents. These tests are carried out with reference to international standards, such as **ISO 1817** and **ASTM D471.** The glove's dimensions (length, 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.



Penetration: chemicals travelling through holes in a 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.



Permeation: chemical substances travelling through the glove material

STEP 6

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 significantly less. 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

STEP 6

KNOW WHERE TO GO FOR FURTHER **ADVICE**

Specialist manufacturers of gloves providing protection against chemicals can help you choose the right gloves for specific tasks. 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. The company also offers a dedicated software to allow selection of gloves to protect against specific chemical hazards.

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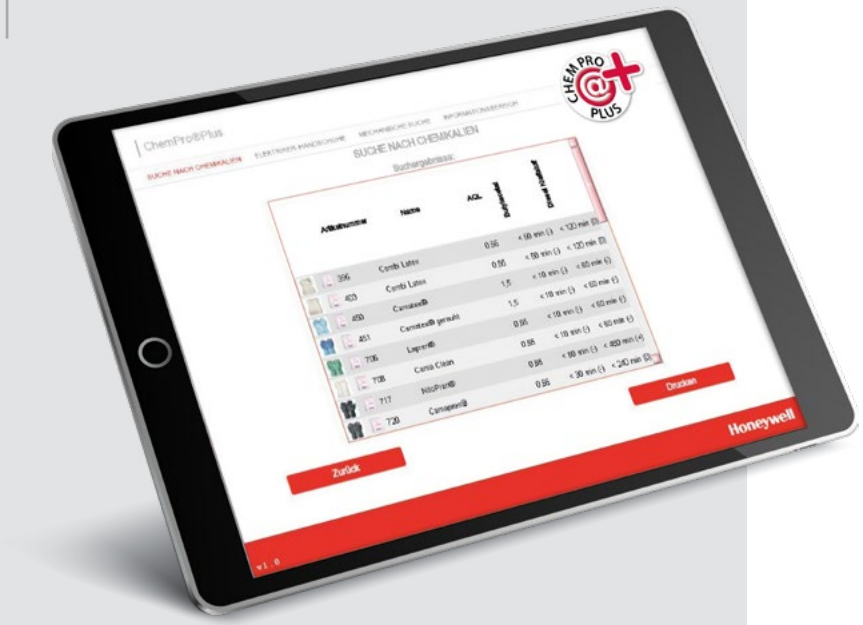

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