

# A GUIDE TO CHEMICAL-RESISTANT HAND SAFETY STANDARD EN 374:2016



# INTRODUCTION

When it comes to working with hazardous chemicals, selecting the right protective gloves is far more than just picking a product off the shelf.

Chemical-resistant gloves must stand up to harsh environments and ensure the safety of those who wear them. But how do you determine whether a glove is truly up to the task?

Questions like "How long will this glove last before chemicals break through?" or "Can these gloves be reused after exposure?" are common, yet the answers are often complex.

The **EN 374:2016 standard** provides clear guidance for evaluating the safety and performance of gloves used in chemical environments, but understanding the factors involved—such as how chemicals penetrate, degrade, and permeate the glove material—can feel overwhelming.

This guide will break down the key elements of the EN 374:2016 standard to help you confidently select the right chemical-resistant gloves for your needs.



# WHAT IS EN 374 : 2016

EN 374:2016 is a European standard that specifies the requirements for gloves designed to protect against chemicals and microorganisms.

It replaced the earlier version of the standard (EN 374:2003) to introduce more comprehensive and stringent testing methods, as well as improved labeling requirements.

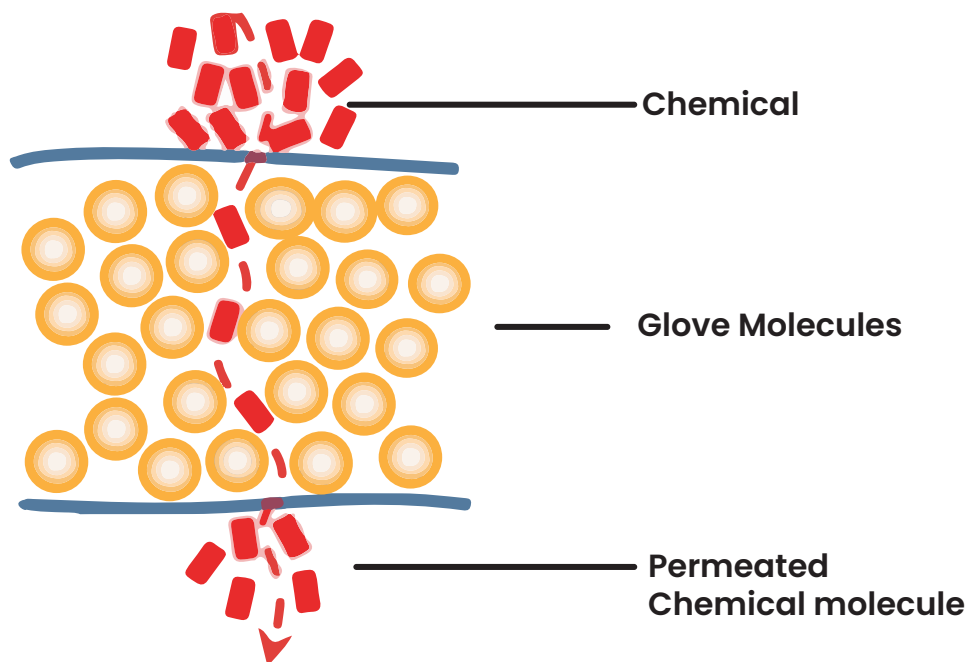
The five parts of the EN ISO 374:2016 standards are shown below



# TYPES OF CHEMICAL RESISTANCE

## Permeation (EN 16523-1:2015)

Permeation refers to the process by which a chemical passes through the glove material at a molecular level. In permeation the chemicals are adsorbed on to the surface of the glove material and they diffuse through and desorb from the other side at molecular level.



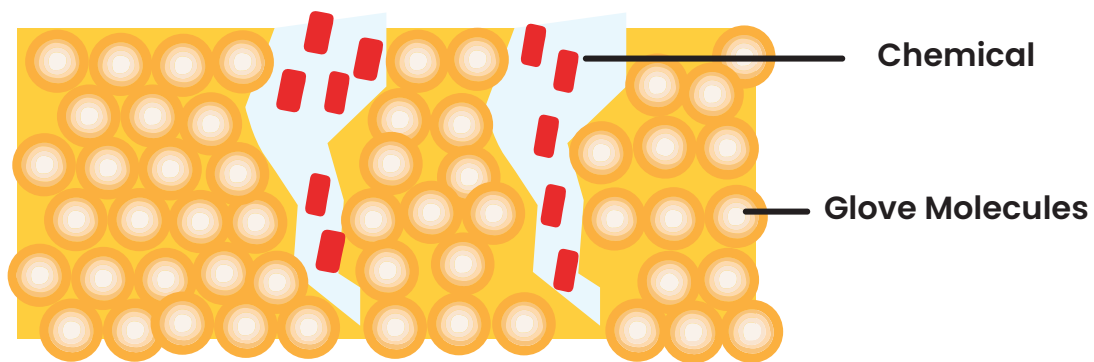
The permeation rate and breakthrough time are measured to determine how long a glove can effectively protect against a specific chemical.

It is important to note, that permeation of chemicals can often occur without any visual change to the PPE leaving the material apparently unaltered. Thus, visual inspection alone does not necessarily indicate the PPEs are suitable for re-use.

## Penetration (EN 374-2:2014)

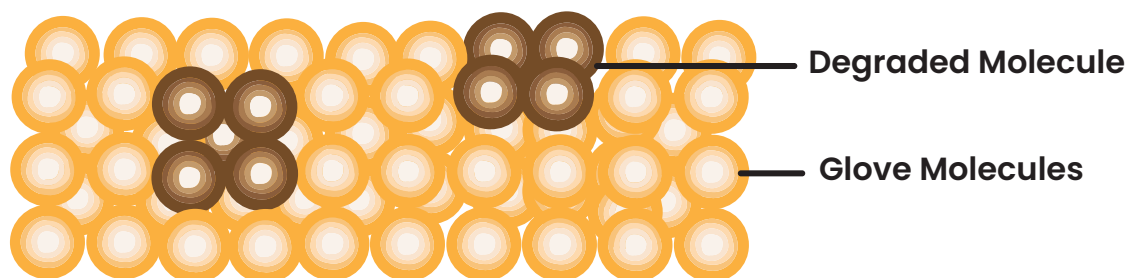
Permeation is the process by which a chemical migrates through the glove material at a molecular level. It measures how quickly and effectively a chemical can enter through the glove, even if the glove appears intact.

Penetration involves testing the physical barrier integrity of the glove against chemicals, microorganisms, or other hazards by checking for leaks or defects.



### Degradation (EN 374-4:2013)

Degradation occurs when a chemical damages the glove's structure, weakening, swelling, or breakdown of the material. This process compromises the glove's strength and protective ability, reducing its effectiveness against chemicals.



## PERMEATION TEST

The permeation test procedure involves assessing the resistance of glove materials to chemical penetration.

A sample of the glove material is mounted in a test cell, separating it into two chambers. One chamber is exposed to the chemical, while the other contains a collection medium, typically a gas or liquid.

The chemical permeates through the glove material, and its concentration is measured in the collection chamber over time.

The breakthrough time (BTT), which is the time taken for the chemical to be detected on the other side of the material at a specific threshold, is recorded.

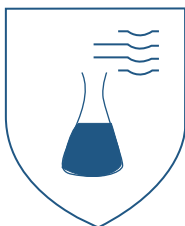
This test helps determine the glove's protective capabilities against hazardous chemicals.

## PERFORMANCE

The EN 374-1:2016 standard classifies gloves based on their chemical resistance properties. Gloves are tested against a set list of 18 chemicals, known as the “**standard chemicals**”, and their performance is rated based on permeation breakthrough time:

Classification	Minimum Performance Level Required	Minimum Number of Chemicals from the list
Type A	Level 2 (min 30 mins breakthrough time)	6
Type B	Level 2 (min 30 mins breakthrough time)	3
Type C	Level 1 (min 10 mins breakthrough time)	1

EN ISO 374-1:2016+A1  
:2018 TYPE A



EN ISO 374-1:2016+A1  
:2018 TYPE B



EN ISO 374-1:2016+A1  
:2018 TYPE C



For gloves that pass the Type A classification it provides the Highest protection, while Type B provides Medium protection and Type C provides Lowest protection.

# Chemicals being tested

There is a list of 18 chemicals that to be tested for in the chemical permeation test. The table below showcases the code letters, chemicals, CAS number and the Class of the chemical

Code Letter	Chemical	CAS Number	Class
A	Methanol	67-56-1	Primary alcohol
B	Acetone	67-64-1	Ketone
C	Acetonitrile	75-05-8	Nitrile compound
D	Dichloromethane	75-0-2	Chlorinated hydrocarbon
E	Carbon Disulphide	75-15-0	Sulphur containing organic compound
F	Toluene	108-88-3	Aromatic hydrocarbon
G	Diethylamine	109-89-7	Amine
H	Tetrahydrofuran	109-99-9	Heterocyclic and ether compound
I	Ethyl acetate	141-78-6	Ester
J	n-Heptane	142-82-5	Saturated hydrocarbon
K	Sodium hydroxide 40%	1310-73-2	Inorganic base
L	Sulphuric acid 96%	7664-93-9	Inorganic mineral acid , oxidizing
M	Nitric Acid 65%	7697-37-2	Inorganic mineral acid , oxidizing
N	Acetic acid 99%	64-19-7	Organic acid
O	Ammonium hydroxide 25%	1336-21-6	Organic base
P	Hydrogen peroxide 30%	7722-84-1	Heterocyclic and ether compound
S	Hydrofluoric acid 40%	7664-39-3	Inorganic mineral acid
T	Formaldehyde 37%	50-00-0	Heterocyclic and ether compound

# HOW DOES THIS RELATE TO THE APPLICATION ?

Understanding how various factors impact glove performance is crucial in real-world applications, especially when dealing with hazardous substances.

Breakthrough time is a controlled measurement from standardized testing, often performed under ideal lab conditions. However, actual work environments introduce additional variables that may affect the glove's protective capabilities.

To determine how long a glove can safely be worn in your specific situation, you must consider several factors unique to your application:

- **Chemical toxicity:** The more toxic the chemical, the more critical it is to accurately assess glove performance.
- **Temperature:** Heat from your hand, chemicals, or the environment can accelerate chemical reactions and permeation rates.
- **Mechanical risks:** Tasks involving puncture, tear, or abrasion can weaken gloves, reducing their chemical resistance.
- **Synergistic interactions:** Chemicals in mixtures can interact, altering how quickly they permeate or degrade the glove.
- **Repeat exposure :** Multiple exposures to different chemicals may cause cumulative degradation or unexpected chemical reactions.

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**Breakthrough time**  
the time it takes for a  
chemical to permeate the  
glove material—  
**does not equate** to a  
**safe use time.**  
”





# FAQ'S

## “ How do chemical mixtures impact glove performance compared to individual chemicals? ”

Gloves tested against individual chemicals may perform adequately, but when exposed to chemical mixtures, the interactions between components can reduce their effectiveness.

This shorten breakthrough times, increase permeation rates, or even cause the formation of new, hazardous compounds.

For instance, handling cleaning solutions or chemicals that react with environmental contaminants may result in reduced glove performance compared to what lab data suggests.



## “ Do higher temperatures affect the performance of chemical-resistant gloves? ”

Yes. Standardized glove testing is typically conducted at 23 +/- 2 °C, but real-world working conditions often involve higher temperatures.

Elevated temperatures can speed up chemical reactions, leading to faster permeation and degradation of the glove material.

It's crucial to consider the temperature of your work environment, as it can significantly reduce a glove's protective abilities over time.

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## Can mechanical risks compromise chemical-resistant gloves ?

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Absolutely.

Tasks that expose gloves to mechanical risks such as abrasion, puncture, or tearing can weaken the glove's protective barrier.

This makes the gloves more vulnerable to chemical penetration.

If your work involves both chemical and mechanical hazards, you should select gloves that offer dual protection.

However, mechanical damage can still reduce wear time, so regular inspection of glove condition during use is essential.



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## How does glove thickness relate to chemical resistance?

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Thicker gloves generally provide better protection against chemical permeation, as it takes longer for chemicals to break through a thicker barrier.

However, thickness can also reduce dexterity and tactile sensitivity, which may impact performance in tasks requiring precision.

It's important to balance the need for protection with the functional requirements of your job when choosing the appropriate glove thickness.

# HOW TO CHOOSE CHEMICAL-RESISTANT GLOVES

When choosing chemical-resistant gloves based on EN 374:2016, it's important to consider the following factors:

- **Type of Chemicals:** Identify the chemicals you'll be handling and check the glove's certification for those specific substances.
- **Duration of Exposure:** Select gloves with breakthrough times that exceed the expected duration of exposure to each chemical. This ensures that the gloves provide adequate protection through the task
- **Degradation Resistance:** Ensure the glove can withstand prolonged exposure to chemicals without breaking down physically. Always check the degradation index before making your choice.



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