

Product Information Report

Chemical-Resistant Gloves



Overview

The average hand injury costs employers \$7,000.

No single glove will protect your hands from every hazard. Each glove has its strengths and weaknesses in terms of chemical resistance and physical properties.

No protect-all polymer exists; selecting the right glove for the job is imperative to your safety. Chemical protective gloves should not be considered a replacement for engineering control methods. However, there are often few alternatives available. In an emergency (e.g., a spill) their use may be required.

Since gloves are the last line of defense for protecting the skin, care must be taken to ensure they provide the protection expected.

The phrase commonly found on the Safety Data Sheet (SDS), "Wear impervious (or impermeable) gloves" has very limited value. It is technically inaccurate. No glove material will remain impervious to a specific chemical forever. No one glove material is resistant to all chemicals. Some chemicals will travel through or permeate a glove in a few seconds, while other chemicals may take days or weeks.

Information specifying the best type of chemical protective material is what should be on the SDS (e.g., neoprene, butyl rubber). If this information is missing, contact the supplier or manufacturer of the product. Manufacturers of chemical protective gloves and clothing may also assist their customers in making the appropriate choices.

Research reveals that at least 80% of total body exposure to chemicals is to the hands. Once exposed, the person could be adversely affected through the development of skin dermatitis or a burn from a corrosive chemical.

Chemicals can also be absorbed through the skin and into the body, causing a reaction that can lead to acute poisoning. General symptoms often associated with mild exposure to industrial chemicals include headache, fatigue, dizziness, loss of appetite, stomach cramps and diarrhea. Severe exposure to highly toxic compounds can lead to loss of coordination, seizures and unconsciousness.



Glove Selection Considerations



The selection of proper chemical-resistant gloves begins with an evaluation of the job. Factors that should be considered include:

- The types of chemicals to be handled or used
- Frequency and duration of chemical contact
- Nature of contact (total immersion or splash-only)
- Chemical concentration
- Chemical temperature
- Abrasion-resistance requirements
- Puncture-, snag-, tear- and cut-resistance requirements
- Length to be protected (hand only, forearm, arm)
- Dexterity requirements
- Grip requirements (dry grip, wet grip, oily)
- Cuff edge (safety cuff, knit wrist or gauntlet)
- Color requirements (to show contamination)
- Thermal protection
- Size and comfort requirements
- Price

Glove Materials

The type of chemical being used is the key factor in glove material choice. With emulsifiable concentrates, volatile solvents (like toluene and xylene), and non-volatile solvents (like alkylated naphthalenes and petroleum oil), correct glove selection is critical.

Some of the more common glove materials are:

- Butyl – a synthetic rubber with good resistance to weathering and a wide variety of chemicals
- Natural Rubber – a highly flexible, conforming material made from rubber plant sap
- Neoprene – a synthetic rubber with chemical- and wear-resistance properties superior to those of natural rubber
- Nitrile – a copolymer available in a wide range of acrylonitrile (propane nitrile) content – chemical resistance and stiffness increase with higher acrylonitrile content
- Polyethylene – a fairly chemical-resistant material used as a freestanding film or a fabric coating
- Polyvinyl chloride (PVC) – a stiff polymer that is made softer and more suitable for protective clothing applications by the addition of plasticizers
- Polyurethane – an abrasion-resistant rubber that is either coated onto fabrics or formed into gloves or boots
- Silver Shield® – a registered trademark of North® Hand Protection, it is highly chemical-resistant to many different classes of chemicals
- Viton® – a registered trademark of DuPont®, it is a highly chemical-resistant, but expensive, synthetic elastomer

Glove Material (cont.)



For a given thickness, the type of polymer selected has the greatest influence on the level of chemical protection. For a given polymer an increase in thickness will result in a higher level of protection.

As a general rule, double the thickness will quadruple the breakthrough time. However, the glove manufacturing process may result in slight variations in performance. The user should exercise care and check the gloves regularly for breakthrough and diminished physical performance.

Physical performance may be a more critical factor than chemical resistance in some cases. If a job application involves handling heavy, rough or sharp objects, then the glove must have high resistance to abrasion, cuts, snags, etc. A hole in a glove can provide much greater chemical exposure potential than molecular permeation.

The thicker the glove material, the greater the chemical resistance. But thick gloves can impair grip, dexterity and safety. Consider sensitivity and the ability to grip as very important factors.

The proper glove design and fit contribute to comfort, productivity and safety. Curved-finger glove design fits the natural hand contour for working comfort. Gloves that are too small bind and cause undue hand fatigue. Gloves that are too large are uncomfortable, hard to work in and can be dangerous if they get caught in moving machinery.

Glove Selection



Use the following steps in selecting the proper gloves when handling chemicals:

1. Refer to the manufacturer's Chemical Resistance Guide and Physical Performance Chart and select the glove type with the highest rating for the chemical and physical conditions. Also refer to the chemical label and the Safety Data Sheet (SDS), which may recommend a specific glove type. The purchaser must test to determine the product's suitability for use with the specific chemical.
2. Select unsupported gloves for extra dexterity and sense of touch. An unlined glove is recommended to minimize exposure from contamination.
3. Select a palm finish to provide the grip needed for the job – smooth, dipped or embossed.
4. Choose the glove length by the depth to which the arm will be immersed, allowing for protection against chemical splash.
5. Select thin-gauge gloves for jobs demanding sensitive touch and high flexibility. If greater protection or durability is desired, choose a heavy-duty style.
6. Choose the glove size that will assure optimum wear, dexterity, working ease, comfort and employee satisfaction.

Chemical resistance and physical performance charts vary among manufacturers. A good example is white gasoline. One manufacturer rated neoprene as an excellent glove for this, while another would not recommend it because of a high permeation rate. It is up to you to consult charts from specific glove manufacturers to make a safe decision.

The web links below will direct you to their glove selection pages for chemical resistance. It is important to remember that the results on these pages are not to be the final determining factor when selecting your gloves. It should only be used as a starting point. Ultimately it is up to the end user to determine the chemical/glove compatibility.

MCR (Memphis Glove)

<https://www.mcrcsafety.com/resources/tools/glove-permeation>

Global Glove

<https://www.globalglove.com/content/material-chemical-resistance-chart>

Glove Sizing

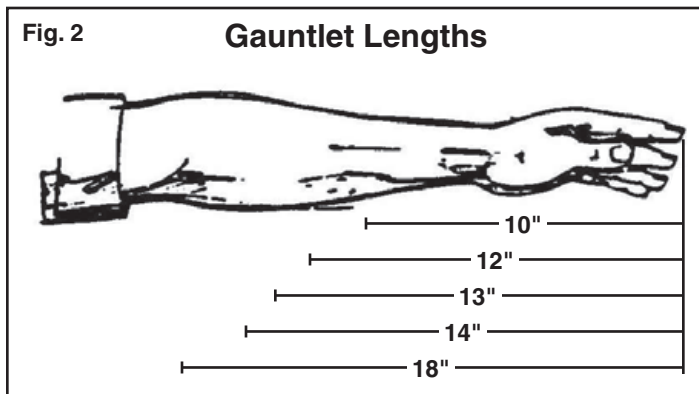


Fig. 1 – Measure the circumference of hand across the palm

Properly fitting gloves are important. Gloves that are too small are binding and cause hand fatigue. Gloves that are too large are uncomfortable and can be hazardous. To determine glove size, measure the circumference of the hand across the palm (Fig. 1), then refer to the chart below. This chart is meant to be used as a guide only.

Choose the glove length by the depth to which the arm will be immersed and by allowing for protection against chemical splash (Fig. 2).

Glove Size	Hand Circumference
XS	6" – 7"
S	7" – 8"
M	8" – 9"
L	9" – 10"
XL	10" – 11"



Use and Care



Fig. 3

- Always inspect your gloves before using them.
 - Look for cuts, tears and punctures.
 - Discoloration or stiffness may indicate non-uniformities in the rubber.
- Wear your gloves properly.
 - When handling chemicals, wear your gloves on the inside of your shirt sleeves (Fig. 3).
 - When handling chemicals overhead, put your shirt sleeves inside the gloves and turn up the cuff of the glove to catch any material that may run down your arm (Fig. 4).

Before removing the gloves, thoroughly wash and rinse them with continuous running water. If you do not wash your gloves after use, they continue to be exposed and degrade, potentially leaving you exposed the next time you use the glove.



Fig. 4