Chemical Gloves

Importance of Choosing Chemical Resistant Gloves

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, or an emergency (e.g., a spill) requires their use.

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 Material Safety Data Sheet (MSDS), “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 MSDS (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.

Personal Protection is the Key!
Chemical Gloves (cont.)

Glove Selection Considerations
The selection of the proper chemical-resistant glove begins with an evaluation of the job application. Factors that should be considered include:

- The type of chemicals to be handled (or used)
- Frequency and duration of chemical contact
- Nature of contact (total immersion or splash only)
- Concentration of chemicals
- Temperature of chemicals
- 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 for choosing of what material the glove should be made. With emulsifiable concentrates, volatile solvents (like toluene and xylene), and nonvolatile solvents (like alkylated naphthalenes and petroleum oil) correct glove selection is critical.

Some of the more common glove materials are:

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

Glove Materials (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.

A general rule is that double the thickness will quadruple the breakthrough time. However, the manufacturing process of glove making may result in slight variations in performance. The user is warned to exercise care and to check the glove regularly for breakthrough and diminished physical performance.

Physical performance may be a more critical factor in some cases than chemical resistance. 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. However, 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 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 Material Safety Data Sheet (MSDS), which may recommend a specific glove type.

The purchaser must determine, by testing 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.
Chemical Gloves (cont.)

Glove Materials (cont.)

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 and by 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 wanted, 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.

Lawson offers chemical resistant gloves from three main suppliers. The below web links 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)
   http://training.mcrsafety.com/permeation/index.shtml

Ansell Corporation
   http://www.ansellpro.com/specware/index.asp

Best Glove Company
   http://www.showabestglove.com/site/chemrest
Chemical Gloves (cont.)

Sizing Gloves
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.

<table>
<thead>
<tr>
<th>Glove size</th>
<th>XS</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>XL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand size</td>
<td>6-7”</td>
<td>7-8”</td>
<td>8-9”</td>
<td>9-10”</td>
<td>10-11”</td>
</tr>
</tbody>
</table>

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

![Fig 1 - Measure the circumference of hand across palm](image1)

![Fig 2 - Gauntlet Lengths](image2)

Use and Care

- 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 while not in use, leaving you potentially exposed the next time you use the glove.**

![Fig 3](image3)

![Fig 4](image4)