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## Criteria for Glove Selection When Double Donning in Life Sciences and Laboratory Environments

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### Introduction

Single-use gloves are widely used by workers across a variety of industries as a means of protection from chemical, physical and biological hazards. Used properly, such gloves provide an effective barrier between the individual and hazardous or infectious elements. In cleanroom and sterile applications, gloves are also relied on to prevent product contamination. Products or processes must be safeguarded against natural human contaminants, such as the shedding of skin cells and hair from workers, the microorganisms they exhale, and the bacteria, viruses and fungi they host. Furthermore, many applications require that protective gloves not shed particulate matter, which could result in deactivation of chemical and biological actives.

Preventing contamination in controlled environments such as laboratories, pharmaceuticals and cleanrooms requires an exceptional degree of cleanliness, preparation and adherence to best practices. If contaminants are transferred and are detected during manufacture, it can result in the loss of a batch and cost employers millions of dollars. If contamination goes unnoticed in a pharmaceutical product, for example, and product is delivered, it may lead to a safety risk for consumers and a potential product recall for the manufacturer.

As the hands and gloves are at risk of being exposed to contaminants as well as spreading them, selecting the appropriate protective gloves is imperative to helping deliver a cleaner and safer barrier between humans and products alike. While single-use gloves can offer the comfort and tactile sensitivity workers desire, their inherent thin-film design may not stand up to demanding or high-risk workplaces. The risk of tears, punctures or pinholes leave workers and their environments at risk. While a thicker, heavier-duty glove is a possible solution to these hazards, it is often not practical due to the high dexterity needs of some applications. In these situations, the most effective way to increase the level of protection when performing some tasks is to wear two pairs of single-use gloves.



Commonly referred to as double donning, the use of a second pair of gloves significantly increases the level of protection to the wearer and significantly reduces the risk of product contamination. However, double donning poses its own set of special practices and challenges, and not all disposable gloves are equal in their level of comfort when double donned or their ease of use during the double donning process. Differences in material, fit, dexterity, tactile sensitivity and ergonomic support all play a role in selecting suitable products for double donning. This article reviews best practices for double donning and provides additional guidance for proper selection of gloves that afford the end-user the most comfortable experience and the greatest protection.

## Overview of double donning techniques

Double donning is generally done in three types of environments: general laboratory settings, cleanrooms and aseptic (sterile) manufacturing environments. Each of these environments is associated with a different degree of potential exposure to hazardous elements. While the U.S. Occupational Safety & Health Administration does not define an industry standard for double donning processes, employers provide fairly consistent guidelines for best practices across industries.

For general laboratory applications, the purpose of double donning is to provide an added level of protection against common laboratory hazards without sacrificing too much manual dexterity or tactile sensitivity. A variety of glove materials and textures may be suitable in general use cases, depending on the specific application and the hazards present.

In cleanroom environments, typical of pharmaceutical or semiconductor manufacturing, double donning is often desirable or required to help protect against possible sources of contamination such as particulate matter or microorganisms. Staff in cleanrooms must wear non-shedding gloves, which may also protect against the unique chemical, biological and physical hazards present. In aseptic environments where pharmaceutical manufacturing or bio manufacturing takes place, there are even more stringent standards for donning and doffing gloves because a sterile environment must be maintained at all times.



## Special considerations

Organizations such as the Center for Disease Control and Prevention recommend double donning with a darker colored inner glove. The contrasting colors visually alert the glove wearer to change gloves as soon as the light-colored, outer glove becomes compromised. Deciding on a size combination may usually be based on personal preference and comfort, but the most widely accepted technique is to wear a properly fitting glove first, with another properly fitting glove or one a size larger over it. The decision is typically made based on both personal comfort and the specific type of glove itself.

Even when appropriate sizes and contrasting colors are selected, double donning can still pose challenges to the glove wearer. Some situations, such as wet conditions, the need to change gloves while gowned or the presence of hazardous chemicals, require special consideration to ensure ease of use and proper wear for maximum protection.

### Damp donning

Damp donning is a common challenge faced by single-use glove wearers. Whether moisture results from sweat, the use of isopropyl alcohol (IPA) spray or sanitizing solution, or work conducted in liquid solutions, double donning in damp conditions can prove exasperating. For individuals who must double don multiple times a day, it can be a source of significant daily aggravation.

To ease the double donning experience, start by looking for gloves from manufacturers with a proven history of improving the user experience through innovation. At Ansell, we research, design and develop single-use gloves with special attention toward reducing end-user hassles such as damp donning. Our patented technologies, special coatings and innovative materials allow us to offer many gloves that are easy to don in high-moisture environments. For example, a double chlorinated glove such as the **Microflex® Diamond Grip™ (MF-300)** or **Microflex 63-864** is an excellent glove for double gloving since the double chlorination results in a smooth finish facilitating the double donning process even in wet or damp hand conditions.



## Donning while gowned

Double donning while already gowned is another scenario that can pose challenges for the end user. Depending on the level of protection required, there are different ways to approach donning while gowned. While donning may be conducted without special consideration for the sleeve in some situations, many applications require gloves to be worn over the gown or sleeve to create a seal. In cleanroom or aseptic environments, it is common for one glove to be worn under the sleeve and one over it, to fully isolate sleeve material.

Selecting the proper outer glove for cleanroom or sterile applications can mean the difference between holding the sleeve snugly, or not. When a sleeve is not held securely to the arm after donning, there is risk of exposure to workers and contamination to product. In some instances, tape is employed to reinforce the barrier between sleeve and glove. A more reliable solution is to select gloves with extended cuffs that are both long enough and snug enough to grip securely to the sleeve, ensuring an effective barrier every time donning occurs.

## Chemical protection

In laboratory settings, cleanrooms and aseptic (sterile) manufacturing environments, it is important to carefully consider potential chemical hazards. First and foremost, safety managers should conduct a thorough risk assessment to determine the types of chemicals present and their associated risks. In high-hazard environments, where the risk of exposure is great or the effects of exposure are severe, heavy duty gloves suitable for the hazards should be used. When performing work that requires precision and manual dexterity as well as protection from hazardous chemicals, however, single use gloves may be required. In this case, double donning is the most effective preventive measure for reducing the risk of chemical exposure. In the table below (Table 1a.) testing was conducted to demonstrate the added chemical protection received when double donning a glove, in this case the **TouchNTuff® 73-500**.



**Table 1a. Chemical permeation experiment of DMSO against single- and double-walled TouchNTuff Neoprene 73-500 shows 36% increased protection with double film.**

Chemical Tested per EN 374	TouchNTuff Neoprene 73-500: Single Film Breakthrough Time (minutes)	TouchNTuff Neoprene 73-500: Double Film Breakthrough Time (minutes)
Dimethyl sulfoxide (DMSO)	125	345

Source: Ansell Technical Service Lab, Reno, NV, US. Test data on file.

While double gloving does increase the level of chemical protection, it does not necessarily double the protection and is no substitute for using more chemically-resistant gloves. It is also important to note that this increase in protection is not necessarily indicative of all glove/chemical combinations in all circumstances. When handling hazardous chemicals and wearing single-use gloves, Ansell recommends gloves be worn to protect against chemical splashes only. If chemical exposure occurs, gloves should be removed immediately and replaced with new gloves; in the case of double donning, both pairs of gloves should be removed and replaced. Always consult a safety manager for specific recommendations on protective equipment that is most effective for protecting against the specific chemical hazard present.



### Puncture resistance

Single-use gloves are prone to snags, tears or punctures in a wide variety of applications. Not only a result of exposure to needles, glove film may become compromised as a result of contact with an assortment of sharp objects, sharp corners, instruments, tools or machinery. When a puncture breaches the film, it compromises barrier integrity and leaves both worker and product exposed to hazards. Double donning is an effective way to combat these risks within laboratory, aseptic manufacturing or cleanroom manufacturing environments. In fact, in many instances, double donning can significantly increase the level of puncture resistance. Keep in mind that not all gloves perform at the same level, though; a range of outcomes is possible based on glove thickness, durability and other variables.

**Table 2a. TouchNTuff Neoprene 73-500 puncture resistance is doubled by using two gloves rather than a single glove for protection from a sharp stylus.**

Attribute Measured	TouchNTuff Neoprene 73-500: Single Film	TouchNTuff Neoprene 73-500: Double Film
Puncture Resistance (N)	3	6

Source: Ansell Technical Service Lab, Reno, NV, US. Test data on file.

While many gloves within the Ansell product portfolio can be used in double donning situations, the following products below are some excellent choices:

- Sterile, clean environments: **TouchNTuff 73-500, 83-500** and **AccuTec® 91-225**.
- General Laboratory: **Microflex XCEED™, Sensation™, Diamond Grip, TouchNTuff 92-600, 92-220,** and **92-616, Ultraform™: Neogard™**

In conclusion, safety managers and glove wearers alike must consider myriad factors when selecting the appropriate hand protection for the work they perform. When double donning is required, glove wearers face additional challenges associated with everyday wear. By understanding the latest innovations in single-use glove design and materials – and the resulting comfort, fit, dexterity and protection they deliver – the process of selecting gloves for double donning is made easier. Outfitting workers with gloves that are easy to don and comfortable to wear translates into enhanced productivity and a safer and healthier workplace overall. Look to Ansell to deliver the superior protection your workers deserve, and the product consistency your company demands. Glove selection should be based first on the hazards present, then on factors including material preference (be sure to consider possible natural rubber latex sensitivity), comfort, fit, ergonomic support and tactile sensitivity. An extended cuff should also be considered in applications where gloves are worn over the sleeve.

## Proper Sterile Double Donning Techniques

In sterile environments, the double donning process is more involved to ensure gloves remain completely sterile when transitioning from streetwear into personal protective garments. There are two techniques for donning sterile gloves: closed donning and open donning. In each, the purpose is to ensure that the exposed portion of the glove always avoids contact with anything that is not sterile. Closed donning is typically used in a surgical setting while open donning is the normal practice in a life science environment. Regardless of which technique is employed, it is essential that all particulate matter or contaminants be removed from gloves after donning. This may be done either with sterile water from a pour rinse or a sterile wipe.

***For a video detailing sterile open double donning techniques, please visit:***

***[www.Ansell.com/lifesciences](http://www.Ansell.com/lifesciences)***

### Open donning

For the open donning technique, pick up the cuff of the right glove with your left hand. Slide your right hand into the glove until you have a snug fit over the thumb joint and knuckles. Your bare left hand should only touch the folded cuff; the rest of the glove remains sterile. Slide your right fingertips into the folded cuff of the left glove. Pull out the glove and fit your right hand into it. Alternatively, you can start the process with your left glove and right hand.



Unfold the cuffs down over your gown sleeves, making sure your gloved fingertips do not touch your bare forearms or wrists. Continue gowning process and repeat open donning with the second pair of gloves for the added protection double donning affords.

## **Sterile glove removal**

When removing, or doffing, either sterile or non-sterile gloves, be sure contaminated surfaces only touch other contaminated surfaces, and that your bare hand, which is clean, touches only clean areas inside the glove. An easy way to remember the doffing technique is “dirty to dirty, clean to clean.” Start by taking hold of the first glove at the wrist. Fold it over and peel it back, turning it inside out as it goes. Once the glove is off, hold it with your gloved hand. To remove the other glove, place your bare fingers inside the cuff without touching the glove exterior. Peel the glove off from the inside, turning it inside out as it goes. Use it to envelope the other glove, and discard.

**Information on Ansell and its products can be found at [www.ansell.com](http://www.ansell.com)**

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