Industrial Safety & Hygiene News ISHN
IGA INTERNATIONAL GLOVE ASSOCIATION

helping HAND

February 2011

Protecting your hands

The price of no protection

Hand injuries average five lost workdays

By AARON COFER

Hand protection is a crucial component of workplace safety in most industries and occupational environments, from construction to maintenance, food service and hospitality, healthcare, mechanical labor and many more. According to OSHA, hand and finger injuries accounted for more than 141,000 workplace injuries in 2009, resulting in an average of five days away from work to recuperate.

In an effort to reduce work-related hand injuries, OSHA requires that employers enforce the use of "appropriate hand protection when employees' hands are exposed to hazards such as those from skin absorption of harmful substances; severe cuts or lacerations; severe abrasions; punctures; chemical burns; thermal burns; and harmful temperature extremes." A wide variety of hand protection products are available in the marketplace to help employers adhere to OSHA's guidelines, and new, innovative products are continually being introduced.

Developing a good hand protection program requires consideration of a number of different factors to keep employees safe. It is important to examine the various tasks and applications performed in the workplace and identify the potential hazards. A clear understanding of these hazards provides a starting point for helping select appropriate materials and styles that will protect workers' hands. Of course, hand protection is useless if the employees do not wear their gloves or remove them to complete a task. It is just as important to consider performance characteristics of hand protection such as dexterity, tactile sensitivity, grip and overall fit. This will help in selecting gloves that will provide the comfort and functionality required to complete the job and minimize exposure of hands to hazards.

Chemical handling

Where chemical hazards exist, employers should read the Material Safety Data Sheet (MSDS) for each chemical and determine if employees will have incidental or extended contact with the hazardous materials. Disposable gloves are often selected for incidental contact whereas unsupported and supported chemical- or liquid-resistant styles are used for extended contact or where immersion is required. Unsupported gloves provide enhanced dexterity and tactile sensitivity. Supported styles are constructed of base fabrics for added physical strength.

There are various compounds used to manufacturer chemical-resistant gloves and each provides varying levels of resistant properties to specific chemicals. Employers should consult the manufacturers' permeation and degradation data to aid in the selection of a suitable glove compound for use with specific chemicals. Permeation is a process by which a chemical can pass through a protective film without going through pinholes, pores, or other visible openings. Breakthrough times represent the amount of time it takes for the chemical to first be detected on the other side of the

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The price of no protection

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film. Rate is a measurement of the highest flow rate for the permeating chemical during the course of a six-hour test. Degradation is a reduction of one or more physical properties of a glove due to contact with a chemical.

Durability

A glove's durability and its resistance to cuts, punctures and abrasion must also be taken into account as a critical usage factor. General purpose gloves such as cottons and leather help keep hands clean and provide basic abrasion protection for a wide variety of applications but often fall short when protecting hands from sharp edges such as glass and metal where cuts and punctures are likely to occur. Common high-strength yarns used for construction of cut-resistant gloves include Kevlar® and Dyneema®, which are often blended with stainless steel or fiber-glass fibers for improved cut levels. Terrycloth styles, with their high loop structure, cause sharp edges to roll across one surface to the next, protecting hands from cuts and abrasions. Cut resistance is a function of a glove's material composition and weight. Cut protection can be influenced by the strength, hardness (dulling effect), lubricity (slickness) and/or roll of the yarns used in glove construction.

When selecting a cut-resistant glove, it is helpful to compare data on cut levels. Globally, there are two different performance standards for cut resistance: the European Standard EN388 and the American National Standard ANSI/ISEA 105-2005. Cut-level results for these two standards are based on different testing methods and therefore cannot be correlated. When comparing cut levels, it is important to know which standard is being referenced in order to set the right expectation for performance and specifications.

Temperature resistance

When handling hot materials, the degree of heat resistance a glove may offer is directly related to the duration of exposure and weight of the object being handled. Cotton, rayon and wool are common base layers for heat-resistant gloves and have varying insulation values. Double-palm and hot-mill gloves consist of two or three layers of fabric on the palm side creating a natural insulating property and are usually sized larger to help in quick removal. Terrycloth gloves create an insulating layer of air between each loop to allow heat to dissipate quickly. Heat-resistant gloves made of Kevlar® fabric provide superior high-heat hand protection as it is inherently flame resistant and self-extinguishing. For foundry and welding applications, aluminized material such as aluminized rayon or aluminized carbon Kevlar® are incorporated in the glove to protect from radiant heat and some afford molten metal splash resistance. On the other hand, gloves designed for use when handling cold or freezing materials — such as in a storage freezer or dry ice — are typically made of leather or heavy-duty cloth or canvas.

Ergonomics

Beyond protection, ergonomic factors such as fit, dexterity, tactile sensitivity and grip can play a key role in selecting hand protection that benefits workers in terms of comfort and productivity. Gloves that are too tight may restrict movement and can increase stress to the hands. Gloves that are too large or bulky can cause workers to exert more force in handling objects, which can result in unnecessary hand fatigue or cause a safety hazard by getting caught in moving parts. Enhanced sense of touch and the ability to manipulate objects is also relevant — especially to individuals working with small parts such as nuts, bolts or electronic components.

Responsibility works both ways

Proper use of hand protection while on the job can undoubtedly reduce the incidence of work-related hand and finger injuries. And with hand protection products continually evolving and improving to meet the demanding needs of a wide array of industries, employers have a responsibility to understand the options and provide their employees with appropriate hand protection for their specific work environment. Employees, too, have a responsibility to utilize hand protection equipment in the required manner. When hand protection is used correctly, workplace safety and productivity are likely to improve. ISHN

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See Sidebar: Selecting hand protection, p.40

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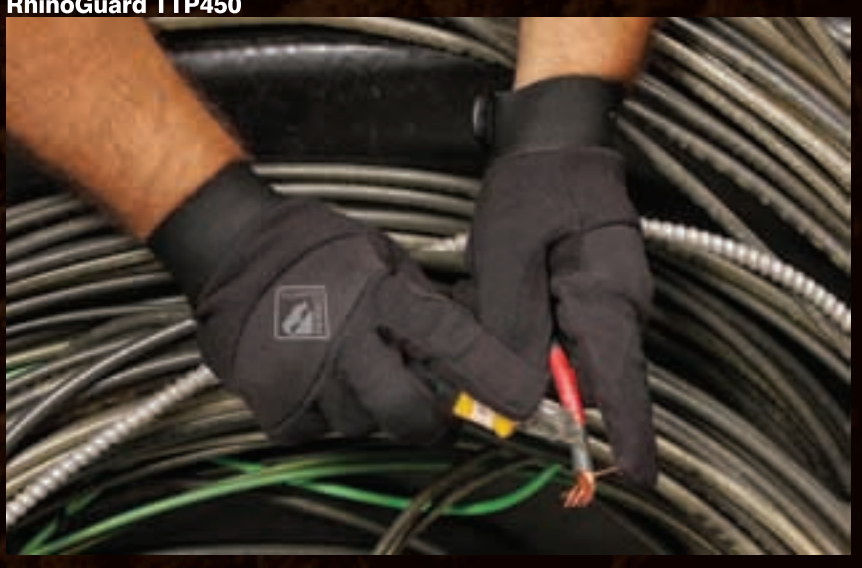

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Ambi gloves: Deal or no deal?

Short-term convenience; long-term threat of CTD

By DR. MICHAEL S. ZEDALIS and BILL BENNETT

Ambidextrous (ambi) gloves are seemingly easy to use and ubiquitous in today's workplace. Since ambi gloves are designed to fit either hand modestly well, a worker can grab any glove from a box without worrying about whether he or she has a matched pair.

Many companies choose ambi gloves because they are interchangeable and perceived as inexpensive. A worker can replace an ambi glove with another ambi glove without the company paying for a pair of anatomically designed gloves.

That said, while ambi gloves seem to represent convenience, the gloves may actually end up costing the company or employee more in the form of productivity losses or increased stress and hand fatigue due to the gloves' poor fitting nature. Such stress and fatigue may result in cumulative trauma disorder (CTD) and other worker injuries (www.eothopod.com/content/cumulative-trauma-disorder).

A difference in design

Ambi gloves are designed for intermittent and short-term wear in a range of applications, from light duty maintenance and intricate parts handling to lab work and food processing and preparation. Ambi gloves have a two-dimensional shape because they are dipped on flat narrow formers designed to improve manufacturing efficiencies. This design ignores the ergonomic, natural curve of the hand and the bulbous "thumb ball" typical of a hand in its natural relaxed position.

It is easy to examine the hand's natural form by holding your own hand in front of you or to the side and allowing it to relax. Notice the hand hangs in a neutral position, with a slightly curved and arched shape. The thumb actually rolls forward and is nearly at a right angle to the palm or back of the hand.

Anatomical gloves are designed and shaped to mimic the outline of a relaxed hand. They include a slight curvature over the fingers and thumb, with a pronounced and offset thumb ball.

Ambi versus anatomical

Ansell recently worked with Dave Narasimhan, Ph.D., former chief scientist and fellow for AlliedSignal/Honeywell International and a recipient of the Thomas Alva Edison Award, to investigate the ergonomic impact of 13 mil rubber ambi gloves versus 13 mil rubber anatomical (handed) gloves. The anatomical gloves were designed to fit the natural shape of the right and left hand individually.

Narasimhan created a printed 2-dimensional grid on

Photos courtesy of Ansell

ambi and anatomical glove samples of equal size, with 0.15-inch spacing in an unstretched state to assess the distortion of a glove after donning. He photographed the glove along with a flat paper printed with the same grid and used the photograph as a reference (photo 1).

Additional photographs were taken as he donned and stretched the gloves over his own hand. He then measured the elongated grid pattern to assess the related strain associated with the gloves' natural fit. Using the same grid, he measured both the ambi and anatomical gloves, with the hand held in two different positions.

Narasimhan donned the gloves and took measurements with his own hand in the natural relaxed position. He measured the gloves a second time with the hand in a grasping position as if the thumb and forefinger were "grabbing hold" of a small object. Using the grid to measure the distortion in each position, he easily measured strain in orthogonal directions when he compared the measurements taken when the gloves were in the flat position before donning.

Donning

During donning, the ambi glove immediately created a load on the thumb, pulling it back from its natural

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Ambi gloves: Deal or no deal?

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position (photo 2). This strain occurs because the glove was manufactured on a flat, almost two-dimensional former. The measurements taken from the grid showed a 76 percent stretch (from .75 to 1.32 inches) when the ambi gloves were donned. Based on premeasured tensile properties of these gloves, this elongation correlates with approximately 1.8 pounds of load placed on the hand.

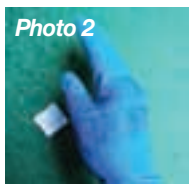


Photo 2

The ambi glove also had a very baggy fit, with excess material sagging on the palm side of the hand. This extra material again reflects the poorly fitting nature of the ambi glove and its inability to conform to the hand's natural shape. During normal use, the excess material in the palm region could hinder a worker's dexterity, grip and tactile sensitivity and could even fold over, which could lead to injury.


Photo 3

Narasimhan took similar measurements with the anatomical glove. The test subject wearing the anatomical glove reported the glove was easy to don and the individual felt no pull on the thumb. Photo 3 shows the shape of the anatomical glove from the back of the hand. You will notice the thumb naturally rolls forward and maintains a natural position.

Because it is designed around the natural shape of the hand, the anatomical glove showed significantly less elongation after donning (from .75 to .85 inches).

Grasping small objects

Tests were conducted to determine how the ambi and anatomical gloves would react when the hand made a grasping motion, simulating a worker gripping a tool or picking up small objects. During the grasping action, measurements showed the forefinger of the hand wearing the ambi glove had to extend more, which resulted in more stretch on the rubber. There was greater stress on the hand overall because of the backward pull on the thumb (photo 4).


Photo 4

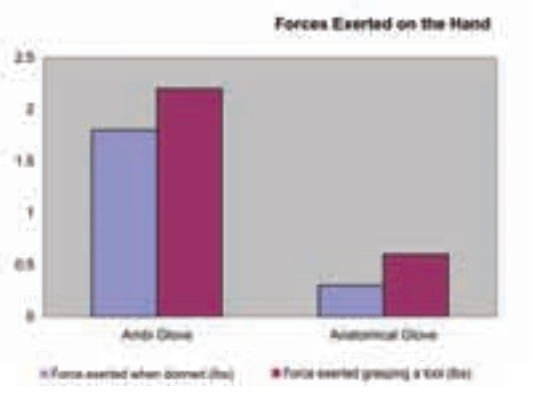
The grasping motion created a 93.3 percent elongation for the ambi glove (from 0.75 to 1.45 inches), which correlates to a load of approximately 2.19 pounds exerted on the glove. When the same test was conducted with the anatomical glove, the load was calculated at 0.59 pounds, which is nearly a quarter of the load created by the ambi glove.

Conclusion

The ambi glove had a poorer fit, in general. When donned by the human hand, the glove pulled the fingers and thumb backwards, placing considerable strain on the muscles and joints. .

Figure 1 illustrates the forces exerted on the hand while wearing the ambi and anatomical gloves during the donning process and while grasping an object. As you can see, the force was significantly greater with the ambi glove than the anatomical glove in both situations.

In conclusion, ambi gloves are designed for



short-term wear and may result in discomfort and muscle fatigue when worn for prolonged periods. Discomfort results because the fingers — and especially the thumb — are pulled backwards with significant force into an abnormal position. This situation could promote stress-related injuries and reduce productivity for jobs requiring high levels of dexterity. ISHN

Dr. Michael Zedalis serves as senior VP of science & technology for Ansell Limited.

Bill Bennett serves as marketing manager, chemical & disposable products, for Ansell. For more information about gloves designed to protect against injury, visit www.ansellpro.com.

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Does your glove have "windows"?

Check the density of knit and gauge

By STEVE VANERMEN

Cut resistance tests are just one element of what needs to be considered. Often punctures are misreported as cuts. A sharp edge, corner, burr, or other protruding hazards can penetrate the glove and scrape or cut skin. With knit gloves the hazard can actually poke through the open knit and cut the skin without cutting the glove.

How does this happen?

Depending on the density of the knit and gauge of the glove (the measure of the number of knitting needles per inch), and the thickness of the fibers, a glove may "window" and allow the knit to spread apart, thus allowing a sharp point or blade to cut the hand. Some hand protection offerings are made of material that reduces the window-effect as the tiny hard guard plates shield the knit structure from the hazards. The plates also lock in the knit and don't allow the knit to window as in traditional gloves.

Be cautious about cut-resistance claims

While many products on the market claim to be "cut-resistant," they don't offer protection from the variable nature of hazards in the workplace. This claim of cut-resistance is made based on industry tests like the EN388 and ASTM F1790, which only test resistance to straight and circular blades. These tests do not account for things like metal burrs, wood slivers, glass shards, and angled blades that are commonly seen in the workplace.

Users need a product that offers both cut and puncture resistance (laceration protection); something that essentially acts as a shield from straight- and jagged-edged hazards in a variety of field uses.

Technologies that use tiny hard guard plates provide a high level of cut resistance (exceeds ASTM and CE level 5) as well as protect from industrial puncture hazards like metal burrs, slivers, glass shards and wire pokes. There are few technologies on the market that are able to perform at a high cut and puncture level, so be aware of manufacturer specs when evaluating your PPE.

Case in point

While replacing a steam valve on a lumber manufacturing site, a maintenance worker was exposed to a nail on a wooden crate. The worker accidentally grabbed the crate where the nail was protruding and the top layer of leather in his glove was torn. Luckily for the worker, the layer beneath the leather was able to stop the puncture force of the nail, and the worker did not sustain any trace of an injury.

If the worker had been wearing a traditional knit cut-resistant fiber, he would have had a serious laceration with the risk of losing his finger. The initial nail puncture would have torn through the leather and caused the cut-resistant fiber to "window," allowing the hazard to penetrate the worker's finger.

Lacerations usually begin with a jagged or angled hazard puncturing the surface of gloves and ripping through to the skin. Remember to evaluate your PPE based on your application, and work with your manufacturer to obtain the correct specs for hand protection.

Evaluating gloves

With all of this confusion (what tests are relevant today, what performance factors to consider) in the PPE market, what can be done to make sure that, as safety professionals, we pick the best gloves for the job? In our opinion based on real world tests, the Coup test is not a relevant test for today's materials. An oscillating blade with a mere 500 Grams of force (1.1lbs) is not relevant to, for example, an automotive worker moving sheet metal fenders and body panels. Look around your office. That steel stapler on your desk is probably about 2 lbs. The ISO and ASTM tests offer a better approximation of what you are going to find in a real-world work situation. That combined with an assessment of "other factors" mentioned above is what you need for picking the correct PPE. To summarize, we have the following recommendations:

Partner with respectable distributors and glove manufactures to analyze your operations, specific hazards, injury rates, and cost of current products used.

> **Evaluate PPE based on your application, and work with your manufacturer to obtain the correct specs for hand protection.**

Get the data. Ask for the outside lab results and focus on the Newton/Gram Results, not just cut levels. If you are not getting the Newton number, then the glove was tested with the Coup test.

Assess the risk. Is it purely cut? Or is there a puncture risk too? If so, how can it best be protected?

Test, test, test. Conducting safe and scientific tests with typical hazards is something your glove manufacturers should be able to help with. A hunting knife in the conference room does not qualify! Get out in the plant and set up a safe test for a true work hazard in the real world.

Keep good records. If you don't already, begin collecting injury data with pictures and an assessment of what happened, so you can track successes over time and evaluate new products as they become available. ISHN

Steve VanErmen is president and CEO of HexArmor. Call 1-877-MY ARMOR or visit hexarmor.com.

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Experts lend a hand

Use suppliers' **assessments, training** & **awareness** support

By GIL LEVERNE, JR.

Hand protection is an important element in every industrial company's PPE portfolio. With new developments in R&D, gloves are both becoming more and more specific to job functions and, at the same time, certain gloves now have the flexibility to multi-task for a variety of functions. For example, the glove provided to protect workers on the construction site can also double to be used when they drive the trucks, change a tire and unload cargo.

The broad landscape of thousands of hand protection products in the marketplace — many with varying combinations of materials, fibers and utility — complicates the situation for the safety manager who wants the best hand protection for his or her employees. Fortunately, the experts from hand protection companies have the tools to help safety officers determine precisely what is needed for each application. In most cases, all the safety officer needs to do is ask for help.

Some of the most effective manufacturer-offered programs involve a three-step process:

Step 1: The Hand/Arm Safety Assessment

Step 2: On-Site Technical Training

Step 3: Awareness Support

Hand/arm safety assessment

Successful safety programs start by partnering with a trusted PPE manufacturer to conduct a comprehensive Hand/Arm Safety Assessment. These assessments are based on the premise that applications drive the development of a successful hand protection program. An intense assessment is conducted to determine the most effective portfolio of products for the manufacturer taking into account safety, efficiencies and economics. The assessment covers the gamut of end-user applications with a site survey of every application for which the manufacturer has a current hand protection product. Each application is assessed regarding:

Photo courtesy of Showa Best Glove

What gloves are currently being used?

What are the costs associated with hand protection?

What is the injury rate and cost of these injuries to the employer and employee in lost workdays, efficiency, etc?

What can be done to improve safety, efficiency, and overall cost (short, mid and long-term)?

The goal of this assessment is to help manufacturers protect workers and make the best use of all available hand protection options for their specific applications. It also involves looking at each specific area of the plant operation and assessing needs specific to that area. The end result is a definitive picture of the existing situation and a solid recommendation for a future PPE program. Often, the manufacturer will find that moving to a higher quality glove type that can be used longer and for more applications will bring cost savings in the long run.

On-site technical training

The successful rollout of a comprehensive hand protection program depends largely on the training of employees. The first step is to bring in a manufacturing technical expert to train key personnel regarding glove type, usage and the importance of glove fit. Manufacturers often work to train plant managers, site supervisors, shift managers and, in some cases,

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even individual employee's teams. Time and again, it has been found that the comfort level of the user dictates the success of a hand protection program. Making certain that each worker understands the glove he or she is to use, how it is supposed to fit and the tasks for which it is mandatory is essential.

Depending on the work environment, training for each glove type and its associated applications can be offered:

Cut-resistant gloves and applications: Cut-resistant gloves are designed specifically to protect workers' hands and fingers against sharp blades and edges. The glove's composition and thickness play pivotal roles in its ability to protect hands against injury from glass, metal, and other hazardously sharp materials. During the selection process, manufacturers typically review ANSI / ISEA (American National Standards Institute / International Safety Equipment Association) cut resistance ratings — measuring the cut protection performance of protective apparel to determine the best product for certain applications. PPE manufacturers' representatives are able to help safety officers understand which gloves offer the best protection for specific tasks.

Chemical-resistant gloves and applications: Selecting the correct Chemical Resistant-rated glove is one of the most important aspects of a hand protection program. Using an incorrect glove to protect from hazardous chemicals may be worse at times than no glove at all. Cotton and Leather gloves offer no barrier to workplace chemicals and should not be used. In contrast, a fully coated polymer glove offers excellent protection from exposure to a number of chemicals. Utilizing resources such as www.chemrest.com, manufacturers are able to provide chemical permeation testing information for several hundred individual chemicals, with hundreds if not thousands of chemical resistant glove options at their fingertips, giving them the ability to truly provide the right glove for the job.

Disposable gloves and applications: Disposable gloves make up the great majority of daily-use hand protection in almost any environment. Disposable hand protection is relevant for everyone from the lab technician to the law enforcement officer, from the medical assistant to the special operations soldier, janitorial worker, EMS volunteer and food service and industrial worker.

General-purpose gloves and applications: Whether the job calls for small parts handling, general maintenance or heavy lifting, contractor work, general hand protection, and many applications in between, general purpose is one of the most popular categories for hand protection. These gloves need to handle a variety of applications with comfort, flexibility,and durability. They also need to minimize hand fatigue and supply excellent grip in oily or wet conditions. Today's lighter, coated, thinner knit gloves are easily worn for a variety of tasks where workers previously may have shed thicker, more cumbersome gloves to gain the touch sensitivity and dexterity needed to perform a task.

Keep awareness levels high

Once a safety program is ready for launch, creating awareness is key. As a best practice for the implementation of a successful safety program, manufacturers will prepare individual glove boards for posting in break rooms or other gathering spots through the plant, warehouse or company. These "glove boards" are actually posters showing the glove to be used and its associated applications (years ago, the glove board was quite often just that — a board with tacked gloves and signage with usage next to it). Manufacturers will customize these glove boards or posters to the needs of the end user or company.

More than ever before, PPE manufacturers are prepared to step in with assessments, training and support materials that help ensure a safety program that not only reduces hand and arm injuries but also addresses industrial concerns about efficiency, cost-savings and PPE that multitasks in the everyday work environment. ISHN

Gil LeVerne, marketing communications manager, has been in the hand protection industry for over 13 years. His office is at Showa Best Glove corporate headquarters in Menlo, Georgia. (www.showabestglove.com)

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The matter at hand: **Welding gloves** that function *and* fit

By BILL GARDNER

Before striking your next arc, take a minute to think about what's protecting your hands or the hands of your employees. Shockingly enough, little thought is given to welding gloves. After all, a glove is merely a commodity item that should be purchased solely based on cost, right?

Photo courtesy of Miller Electric Mfg. Co. Inc.

Unfortunately, this common perception could not be farther from the truth. Recent innovations have further separated welding gloves by their intended application, material composition and design.

A brief history lesson

The basic design of welding gloves has remained the same, year in year out, since the dawn of arc welding. A standard glove template was created by sewing together two pieces of leather from one base material and possibly adding a thin layer of padding. This design was mass produced and marketed as the welding glove. Due to the fact that gloves were viewed as a commodity item, the cheapest glove that provided an adequate amount of protection was chosen and purchased in bulk. Discomfort, fatigue and lack of dexterity were often acceptable in the name of cost and durability. Companies have been known to buy one or two styles of welding gloves, giving welders a choice between a glove that either does not provide enough protection for the intended application or one that provides the necessary protection, but is too bulky and restrictive.

Historically welding gloves have suffered from a major design flaw: the fit. A human hand is not flat but rather is composed of a multitude of unique contours. Yet welding gloves, for years, have been designed around a flat form. Welders are expected to perform a skill that requires precise dexterity while wearing a glove that does not fit the contours of the hand, but rather fits like an oven mitt. This restriction can impair welders' abilities to produce quality work, decrease productivity and most importantly, jeopardize their safety.

It is not uncommon to see welders work without proper hand protection due to traditional poor fitting glove designs. However, increased welding safety awareness has challenged glove manufacturers to rethink the design and composition of welding gloves, taking into consideration the full scope of a welder's daily tasks and related safety requirements. After all, who said that being safe meant sacrificing comfort and fit?

Time for a change

The welding industry is beginning to evolve from its "one size fits all" mentality. Welding glove manufacturers are taking design cues from welders, fashion trends, and sporting industries to re-engineer the traditional welding glove designs.

New welding gloves feature a three-dimensional pattern designed to fit the natural contours of the human hand. Multiple types and grades of leather are strategically selected and placed to maximize the benefits of each material. There is an array of leathers available, each providing its own level of protection and comfort. Contrary to traditional gloves that use only a top and bottom piece of leather, new gloves utilize multiple pieces of quality leather, intricately cut and sewn, to form the shell. An assortment of patches and padding can then be added for additional protection based upon the specific need or application.

Manufacturers are also redesigning the interior of welding gloves. A variety of linings — such as moisture wicking fabrics, channeled foam and aluminized materials — are incorporated to provide heightened protection and enhance user comfort.

Together the design, materials, and lining allow the glove to conform to the natural shape of the hand resulting in a more favorable fit. Durability is still a very important component of welding gloves, but the focus has expanded to include comfort, fit and style into the mix.

How do I choose?

Given the plethora of welding gloves available, choosing a solution for your welders or yourself can be overwhelming. First, consider the application or set of work tasks that need to be completed. Many new glove styles can provide protection for welding applications but also have features making them suitable for other material handling or metal fabrication tasks. After a glove style is chosen, put the finalists to a test in regard to comfort, fit, performance and durability to see firsthand which products meet the needs of your organization.

Employees are known to take better care of their personal protective equipment (PPE) if it is something they value. When employees find a comfortable welding glove, they are more likely to keep the gloves on their hands throughout their shift, rather than removing them between welding tasks. Keeping gloves on your welders will decrease the chance of hand injuries in the workplace, ultimately increasing productivity, morale and overall safety of the welder. ISHN

Bill Gardner is product manager for the Arc Armor™ welding protection line, Miller Electric Mfg. Co., Appleton, Wis., www.millerwelds.com.

Selecting the appropriate ***hand protection***

Contributed by AIRGAS, INC.

With so many options to consider when selecting proper hand protection, it can be complicated to determine the best product for your specific needs. If you are overwhelmed, consider working with a safety specialist or hardgoods distributor who can recommend some options. Here's a look at some of the most common types of gloves and the uses and benefits of each:

Type of Glove	Common Uses and Benefits
Finer gauge, hi-dexterity knit gloves	Extreme dexterity and tactile sensitivity
Seamless knit gloves	Improved fit and breathability compared to cut-and-sewn styles, comfortable when worn over extended periods of time
Coated glove styles (both general purpose and cut resistant)	Enhanced mechanical properties and grip characteristics to improve the wear life of the gloves while maintaining dexterity, tactile sensitivity and overall comfort
Latex coated gloves	Economical option known to have superior flexibility, resistance to tear and enhanced wet and dry grip
Polyurethane (PU) coated gloves	Highly flexible and soft coating with excellent tensile strength. Provides good abrasion and tear resistance with great wet/dry grip and resistance to light oil.
Air-infused PVC coated gloves	Afford exceptional wet and dry grip with good mechanical properties. Stay flexible at lower temperatures making it a coating of choice in cold environments.
Nitrile coated gloves	Stand up well in applications involving light oil. Flat nitrile coatings help repel oil whereas foamed nitrile or sponge nitrile create and open surface texture to channel light oils from the glove surface for enhanced grip. Nitrile coatings perform well at higher temperatures and offer a good alternative to users with latex allergies.

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Glove **performance**

Understanding cut-resistance materials and performance

By FO ABIAD

The last decade has been progressively enlightening when it comes to safety in the workplace. In no small measure advanced textiles have played a major role in enhancing worker safety. These materials have helped to bridge the gap between worker safety and cost of safety in the workplace.

Advanced materials continue to provide lighter, comfortable and on-going lower cost solutions in hand and arm protection. The safety industry has embraced these materials in the manufacturing of new and improved hand and arm protective products. It is imperative that one become familiar with the various materials available for use in cut resistance, including Kevlar®, Twaron®, Dyneema®, Spectra®, Tilsatec Rhino®, fiberglass and many other options currently used today. Truly understanding the pros and cons, the characteristics and the efficacy of these materials will help in understanding the best material for the job.

It's hard to ignore costs

On numerous occasions safety professionals in the supply chain walk into work situations where cost and safety are primary concerns. While most if not all companies put safety first, there is definitely a cost sensitivity that is hard to ignore. Advanced textile materials have come a long way in providing solutions that allow safety professionals to provide optimum protection at continuously more affordable prices. This has led to a plethora of new products with wide ranging claims of protective capabilities. While this is ultimately a positive and progressive phenomenon, it can lead to some confusion for the consumer. It does help to have an understanding of the way these materials are tested and what those tests mean.

Photo courtesy of Tilsatec North America

ASTM tests

Currently in North America there are two ASTM tests in practice to determine cut resistance of textile materials, one being the ASTM F1790-97 testing protocol and the other is the F1790-05 protocol. Both tests consist of a measurement of the amount of pressure applied to a razor blade while moving over the material in question without cutting through for 0.8 inches. In principle, the higher the force/load (usually measured in grams) that the material withstands, the better the cut resistance of the material.

European test

Another process often referenced is the European standards referred to as EN388, which can be either a "Couptest" method for cut resistance or a TDM machine-based test (a TDM machine test protocol is similar to ASTM); the test protocols are at the discretion of the manufacturer. In general the Couptest consists of a circular blade moving back and forth across the material under a fixed force/load of 5 Newtons/500g while the blade rotates in the opposite direction to the back and forth movement. The test then measures the number of repetitive cuts needed to cut through the material. The result is then compared to the cut resistance of a reference cotton material and provided a cut index. As an example, an index of 5 means that the material is 5 times more cut resistant. The index is as follows:

Level 0: <1.2x
Level 1: 1.2x – 2.4x
Level 2: 2.5x – 4.9x
Level 3: 5.0x – 9.9x
Level 4: 10.0x – 19.9x
Level 5: >20x

The EN388 test is also accompanied by abrasion, tear and puncture tests.

There is one thing that must be noted, because of the way these various tests are performed and measured, there is no cross-reference between the European and North American tests. It is not possible or proper to equate any result in the ASTM testing to any result in the EN388 testing.

ISEA/ANSI test

The International Safety Equipment Association (ISEA) developed the "ANSI" table as a reference guide for test results from ASTM test protocols. These guidelines for cut resistance are:

Level 0: < 199g
Level 1: 200g – 499g
Level 2: 500g – 999g
Level 3: 1000g – 1499g
Level 4: 1500g – 3499g
Level 5: >3500g

IGA certification program

Due to the complexity and confusion surrounding all the test methods, guidelines and interpretations, the International Glove Association (IGA) developed and implemented its glove certification program. The IGA has specified the applicable ASTM testing protocol. Cut-resistant products certified by the IGA are provided a performance rating based on the following result:

IGA CERTIFICATION PROGRAM: (with equivalents in both grams & pounds)

	Lbs.	Grams
Level 1	< .88	< 398
Level 2	.89 to 1.76	401 to 796
Level 3	1.77 to 2.73	797 to 1233
Level 4	2.74 to 3.78	1234 to 1707
Level 5	3.78 to 5.38	1708 to 2430
Level 6	5.38 to 6.98	2431 to 3153
Level 7	6.98 >	3154 >

It is extremely important to understand the testing methods and testing levels quoted above. Due to numerous claims in the industry and the multiple testing methods, it is imperative to compare apples to apples as they say. In North America, safety specialists should ensure the source of the quoted levels as they are not directly comparable. For example, further even within the ANSI guidelines the spread is quite large for level 4 between 1500 and 3499, allowing for a vast and significant range of cut resistant product. Therefore it is always helpful to have not just the level that a particular product achieves but also the specific gramage weight achieved in that range.

While numbers and levels quoted above are extremely helpful in at the least narrowing the range of product to use in a particular application, it should not be the only qualifier. The testing and the subsequent level ratings simply provide a guideline that states that one material performed X and another material performed Y. One can gauge that if X>Y then the first material is more cut resistant — but only in the context of the test.

Examining the tests, both are performed using a sharp razor blade under a controlled environment. In practice, most applications requiring cut resistance are not set in such a controlled environment. Some applications have parts that are oily, have a serrated edge or even have sparks and flames involved. For these reasons, it is understandable to set a minimum level or cut test result as criteria for choosing hand protection, but not the only criteria. Careful examination of the application and any extraneous hazards that may be present is an absolute necessity to select the correct or ideal hand protection.

The cost of incorrect selection

It is important to ensure that the right hand protection is of primary concern and is addressed accordingly. Lacerations are the #1 safety issue in most plants. Common causes range from hand protection not being worn, poor compliance to PPE (personal protective equipment) programs and PPE simply misapplied. The COST of not selecting or complying correctly could be extremely heavy and is often not fully realized until after the fact.

The Iceberg Principle for costs of injuries includes direct costs such as medical costs, workers' compensation, and workers' loss time. Indirect costs include hours lost to first aid, hours lost to assisting victim, transporting the victim, hours lost to handling inquiries, cost of damaged equipment, administrative costs and lost hours used for investigation. These costs far outweigh the price of proper hand protection on all hands. The good news is that those costs are falling as more and more product hits the shelves. New materials are helping to make it completely irresponsible not to have highly effective products available for your workforce.

The one constant is that new materials are playing an ever-increasing role in the range of protective products available. These products all perform at varying levels and have their own list of strengths and weakness. The main beneficiary of this evolution is the consumer or the person in the workplace. While all of this growth is positive, it does require attention and education in order to get the best out of the myriad of products. Understanding the product and the way tests are performed and what the results mean is integral to an effective safety program. If homework is done on the products available there is no doubt the cost of poor or inappropriate hand protection will continue to get smaller and smaller. We should understand:

- numerous products are available;
- products are increasingly more affordable;
- testing should be quoted from third-party labs and relevant to North America; and
- what the results mean.

Ask for as much detail as possible to ensure that the workers you are responsible for are wearing the best protection at the best possible price. ISHN

Fo Abiad is director of Tilsatec North America. He has approximately 20 years of experience in safety product manufacturing and supply. Fo is also president of Windsor Textiles Limited and is past president of the Canadian Glove Manufacturers Association (CGMA). He can be contacted at foabiad@tilsatec.net.

The facts about **cut-resistance**

Glove materials make a difference

The **Cut Resistant Facts Handbook** distributed by the International Glove Association (IGA) discusses both the advantages and limitations of the materials used in cut resistant gloves. One of those limitations comes in the form of a reminder that the gloves are cut *resistant*, not cut *proof*, and should not be used with or around powered machinery, rotating blades or saws.

While OSHA does not require cut resistant gloves to meet a specific standard, employers are urged to get documentation from manufacturers that the gloves they are buying have met "appropriate test standards for the hazards anticipated." The handbook describes the methodology and equipment used by the ASTM and ISO to test gloves for cut resistance.

Most gloves offer *some* level of cut resistance, but the recent availability of materials like para-aramids, high modulus polyethylene polymers, liquid crystal polyester and thin strands of stainless steel has lead to greater cut resistance — without reducing comfort and dexterity. Some glove treatments like polymer coating, dotting or leather also increase cut protection levels, but at the expense of other end use properties.

Yarns may not sound as if they contribute much to cut resistance, until one realizes that Kevlar® and Twaron® are aramid yarns, or that yarns can be combined with stainless steel or fiberglass through engineering. In fact, the emergence of synthetic high performance fibers over the last 20 years has had a major impact on the hand protection industry, allowing PPE manufacturers to design lighter, more comfortable, higher dexterity gloves that still provide sufficient protection against typical industrial hazards.

Glove style (ie., three-finger, long-cuff) is also a factor to be considered by the end user. Stainless steel mesh gloves are not as form fitting as fiber gloves and may periodically need repair and reconditioning, but they offer the highest level of cut protection.

IGA Headquarters, 814-328-5208, gloves@windstream.net, www.iga-online.com

A selection challenge:

The versatility of **coated work gloves**

The **Coated Work Gloves Handbook** by the International Glove Association is a comprehensive guide to this type of hand protection, providing information that will help safety professionals choose the right gloves for their high-hazard worksites, whether the hands that need protecting work in manufacturing, construction, health facilities or service industries.

Coated work gloves consist of a fabric layer made of knitted or woven cotton, wool or synthetic blends coated with materials such as rubber, PVC, polyurethane, nitrile or neoprene. Although the concept is simple, the many variables available are what make the coated work glove adaptable to hundreds of different types of tasks and environments.

The design and length of liners, cuffs and grips are a few of the factors that differentiate coated work gloves. In addition to providing the "support" for the coating material, the lining contributes most of the glove's physical strength, along with resistance to puncture, snagging, cutting, abrasion and tearing. The liner is also a key feature in the glove's comfort, since it affects donning and doffing ease and may also absorb perspiration.

The coated work glove is adaptable to hundreds of different tasks and environments.

The handbook examines OSHA requirements for hand protection and suggests choosing the glove that offers the optimum combination of comfort and performance. Coated work gloves protect against cuts, punctures, abrasion, tears and snags. Gloves may also be chosen based on the need for some barrier protection that will protect the wearer from water, oils, detergents, chemicals or biological agents. Chemical protection, for example, calls for liquid-tight integrity and materials that provide a high level of resistance to the specific chemicals involved, while coating materials that have resistance to electrostatic discharge are vital for cleanroom operations.

IGA Headquarters, 814-328-5208, gloves@windstream.net, www.iga-online.com

From humble origins…

Textile gloves cover many applications

From their humble cotton origins, gloves have come a long way in terms of the range of textiles used in their manufacture. According to the **Textile Facts Handbook** produced by the International Glove Association, those textiles make it possible to produce hand protection for all kinds of work environments, from high heat to no lint, from oil fields to film processing labs.

Gloves have come a long way in terms of the range of textiles used in their manufacture.

Traditional cotton — a unicellular, natural fiber that makes a soft and breathable textile — remains a mainstay of the glove industry. Cotton may be used in a canvas or jersey form, depending on the glove construction style (woven, knit or seamless knit). It may also be combined with polyester and other synthetics, making it very versatile.

Wool is another popular natural fiber, as is — surprisingly — bamboo. The tall, woody plant can be processed to make a thin, soft fabric, as well as a yarn that can be knitted into gloves.

Manufactured or synthetic fibers like acrylic, nylon, polyester, polyurethane, rayon and acetates are attractive to glove makers because scientists are able to enhance manufactured fibers with certain properties that occur naturally in animals or plants.

Along with various design features, the weight of the textiles used in gloves helps determine their effectiveness and protectiveness in specific workplaces. For instance, extra heavyweight gloves made of terry cloth synthetic fibers are cut- and flame-resistant. The thermal properties of heavyweight gloves make them useful in high-heat environments. Medium weight textile gloves are used in general industry, giving the wearer warmth, dexterity and protection from cuts, abrasions, dirt and chafing. Lightweight cotton gloves can be worn alone or as a liner under other gloves, to absorb perspiration.

The handbook includes details and illustrations of thumb styles, wrist types and glove types along with a description of the manufacturing process.

IGA Headquarters, 814-328-5208, gloves@windstream.net, www.iga-online.com

Glove industry sets certification standards

Independent testing, new labels are key program features

Due to the complexity and confusion surrounding all the hand protection test methods, guidelines and interpretations, the International Glove Association (IGA) has developed and implemented a glove certification program. The IGA has specified the applicable ASTM testing protocol and goes beyond any other North American organization by certifying the performance level of products by testing products in independent laboratories.

The Certification and Standards 2010 Initiative is based on the need for "a system to clearly provide comparable data on the performance level of hand protection products," according to IGA President Bill Trainer, who is also president of Wells Lamont Industry Group.

The program determines what will be tested and how it will be tested — even to specifying the type and model of equipment used — and has a performance grading system, with different numbers of levels for different product groups. Cut-resistant gloves, for instance, are graded on seven levels of performance, while puncture testing involves four levels.

Trainer says certified gloves from the first product group to be tested — cut-resistant — are on the market now.

The cost to end-users

The Cut and Abrasion Test for anyone having their products certified is priced at $550, with $200 for the optional puncture test. Will that cost be passed along to end-users? "We don't think so," said Trainer. "The cost is very reasonable and small when compared to the size of the glove market ($4.5 billion in the U.S.)."

Glove manufacturers who want to participate in the certification process will supply the IGA with gloves, which will then be submitted to an approved testing facility. If the testing determines that the product is eligible for certification, the IGA will issue a certification letter and a label that identifies the IGA logo, product registration number and associated certification level.

Simple, clear and unbiased information

How will end-users know that the certification process doesn't amount to the glove industry policing itself? "The performance testing is being independently performed to ASTM standards by a third party," said Trainer. "The IGA will simply communicate the facts and monitor for consistency. It is in the best interest of the glove industry and the users we serve to provide simple, clear and unbiased information to help their decision-making."

A list of hand protection products that receive certification will be published on the IGA and *ISHN* websites.

Passing the test of time

Leather's natural abrasion resistance

Leather making may well be the world's oldest trade, according to anthropologists. The discovery of 600,000-year-old tools used to tan animal hides and skins lends credence to that belief, as does evidence that leather was used extensively in several ancient civilizations.

Among its many contemporary uses, leather is a common glove material. The introduction of engineered materials hasn't pushed the more traditional leather into obsolescence, since many of the synthetics lack leather's natural abrasion resistance and aesthetic appeal.

The **Leather Facts Handbook** produced by the International Glove Association describes the process of manufacturing leather, sorts out the various types of leather and provides illustrations and descriptions of the features available in leather gloves.

The manufacturing process section explains industry terms like "in the blue" and "in the crust" (the former refers to hide after it's been chrome tanned, the latter to hide that is ready to be finished) and runs through the various phases of preparing hides for use, many of them time-consuming. Brine curing washed hides in large vats takes 12 hours; wet salting occurs over several days.

Leather made from the hides of different animals has different properties that must be considered by glove manufacturers and end users. Deerskin offers the highest tensile strength, pigskin the highest resistance to heat and cowhide good thermal protection.

The features of leather gloves also determine their appropriate usage. The gunn cut — which results in a seamless backside and finger seams that are away from the palm — increases durability. The gauntlet cuff's 4 ½-inch extension gives the wearer's forearm additional protection against lacerations and heat. A leather bound hem is durable and won't expand, but is not as economical as a fabric bound hem. The *Leather Facts Handbook* is a useful resource for understanding all the options that are available.

IGA Headquarters, 814-328-5208, gloves@windstream.net, www.iga-online.com

Coming soon:

Standards & ratings for **heat glove** protection

A committee of the International Glove Association (IGA) has been formed to establish standards and rating procedures for heat glove protection.

Victor LaPenna of Jomac Canada Inc. will chair the committee. On board are Richard Blocker of DuPont, Larry Garner of MCR Safety, Tom Ragan of Shelby Gloves and Brent Fidler of Southern Glove.

Standards like the EN407 and the NFPA are probably the most common ones but fall short in certain applications. There have been some initial communications with the committee but it is at the very early stages of this process. There also has been recently an initial conversation with Dr. Roger Barker of North Carolina State University who is in the process of developing procedures to test whole gloves, not just the components of the gloves. IGA will be relying on his expertise, and the group looks forward to hearing him speak at the upcoming IGA conference in March.

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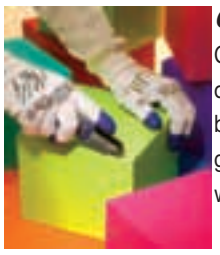

Cut-resistant gloves

CartonCutter™ gloves provide comfort and protection in warehouse operations where cut hazards often occur. These cut-resistant gloves can be worn on either hand, making them ideal for use as opposite hand cut gloves. For more information, call **Banom** at 800-227-7694 or visit our website at banom.com. ***Circle 251***

Silicone-free glove

Premium 15 gauge nylon shell with lunar foam nitrile coating provides extra grip in dry, oily or wet applications. Antibacterial and silicone-free glove with a knit wrist to keep out debris. Machine washable. Ideal for material handling, general maintenance, manufacturing, machinery and assembly. For more information, visit **West Chester** at www.west-chester.net or call 1-800-647-1900. ***Circle 285***

High-visibility gloves

Our "Specialty Series" of gloves are the next generation of professional work gloves that offer increased protection and greater flexibility, allowing you to work safe, fast and be visible. Features include: hi-viz fabric with reflective knuckle; grain leather goatskin that provides good dexterity, wear and abrasion; foam padded palm for vibration resistance and tool use; and 3-inch rubberized safety cuff. **Bob Dale Gloves**, www.bobdalegloves.com. ***Circle 252***

Biodegradable work glove

Gloves-online.com has introduced GO Greens™, a new line of environmentally friendly, coated work gloves made from bamboo fibers, a renewable and sustainable plant. Bamboo fiber is comparable to the texture and feel of silk, but with added benefits such as being highly absorbent, naturally abrasion resistant, naturally antibacterial, 100% biodegradable and offering UV protection with a UPF 50+ rating. **Gloves Online**, www.gloves-online.com, (877) 456-8313. ***Circle 286***

Glove clip

Designed primarily for the firefighting industry, the Handi Klip® glove clip uses a ball-and-socket joint that has a higher breakaway point and holds up to the brief flash temperatures of a fire. With its oversized jaws and interlocking teeth, it will hold even the largest pair of gloves. **Glove Guard, LP**, www.gloveguard.com. ***Circle 253***

Powder-free gloves

NeoPro® powder-free gloves are created with a chloroprene blend, providing your hands with puncture and chemical resistance greater than latex in some cases. NeoPro® gloves offer unique protection against a variety of chemicals, including chemotherapy drugs. NeoPro® gloves are micro-textured for enhanced wet and dry grip and are also available in extended cuff for greater protection over the wrist and forearm. **Microflex,** www.microflex.com, (800) 876-6866. ***Circle 287***

Cut and cold protective glove

The MAPA Krytherm 585 is a high cut and thermal protection glove for cold environments. One liner combines cut and cold protection without compromising dexterity and comfort. Outer nitrile rough finish provides excellent grip while ¾ dip protects palm, fingers and ¾ back side of hand from oily and aqueous exposure. Available in sizes 9 & 10, the Krytherm 585 is a great solution for transportation, energy and local authority workers who encounter mechanical hazards in frigid winter temperatures. **MAPA Glove**, www.mapaglove.com. ***Circle 254***

Enhanced cut protection

Protective Industrial Products announces a recent enhancement to the ATG MaxiCut Dry product range. The reinforcement of the thumb crotch provides longer wear to an area that can fray prematurely in most metal fabrication applications due to constant contact with metal edges. This latest product improvement is another way ATG continues to innovate and design products that protect the most sophisticated work tools…the hands. **Protective Industrial Products**, www.pipusa.com. ***Circle 258***

Cold weather protection

MCR Safety ForceFlex HV200 was developed with the oil industry to achieve maximum protection from cold environments. ForceFlex HV200 is designed with a water/wind-resistant inner breathable bladder and 3M Thinsulate lining. The extended fleece snow guard cuff provides warmth in cold environments. Rated to temperatures as low as - 20° F. Call **MCR Safety** at 800-955-6887 or visit www.mcrsafety.com for all of your safety gear needs. ***Circle 255***

Welding glove

The new LS50 AngelFire® stick welding glove is designed exclusively for women and is embellished with a swirl decoration. Features include high-quality genuine leathers, strategic reinforcements, Revco's exclusive DragPatch® and a pre-curved ergonomic construction that maximizes dexterity while helping to reduce fatigue. For more information, visit **Revco Industries** at www.revcoindustries.com or call us at 800-527-3826. ***Circle 260***

Safety glove

A glove that absorbs punishment so your hands don't. The M-Pact® Glove has been designed with an anatomically engineered direct sonic welded rubber top and EVA foam palm pads for improved protection. Tapered finger stretch side panels and a reflective ink printed Spandex stretch panel thumb area give an improved fit. High-visibility Day-Glow two-way stretch Spandex also adds visibility. Imported. **Mechanix Wear, Inc.**, www.mechanix.com. ***Circle 256***

Comfort and cut resistance

Showa® Best® Glove unveils the AEGIS KVS4™, combining a (ANSI) level 4 cut-resistant liner with durable, sponge nitrile Zorb-IT® palm coating. The blend of KEVLAR®, steel and polyester provides comfortable cut-resistance and the innovative composition of the high performance liner and the sponge nitrile technology coating affords the wearer excellent protection in applications where oil and sharp edges are prevalent. **Showa Best Glove**, www.showabestglove.com. ***Circle 261***

Cold weather gloves

NorthFlex Cold Grip Gloves are insulated to provide comfort and warmth in sub-zero conditions, while maintaining dexterity and flexibility. Productivity stays up even when temperatures go down to -15ºF. Foamed PVC coating extends to the knuckles to provide liquid protection, excellent dry and wet grip. Learn more by visiting **North Safety** at www.NorthSafety.com. ***Circle 257***

Fitter style glove

The TTP208 – Fitter, constructed from our ANSI Level 4 cut-resistant Rhino liner and incorporating quality split leather in a Fitter's style glove, can be used in automotive stamping, assembly, metal fabrication, glass handling, lumber and forestry and any other heavy material handling. Leather knuckle strap and safety cuff provide excellent protection. **Tilsatec**, www.tilsatec.com. ***Circle 262***

High-visibility glove

QS Safety is proud to add the newly 79# Hi-Vis Microfoam in its range of high performance Taeki5 protective gloves. Developed and tested specifically for outdoor and cold chain application where high cut protection and cold resistance are required. **QS Glove**, available in the USA at www.cordovaisc.com, www.west-chester.net and www.globalglove.com. Do you Taeki? Now you do! ***Circle 259***

Cut and abrasion protection

The Heavy Weight Metalguard glove is now IGA certified with Cut Level 7 and Abrasion Level 5. The patented yarn technology and glove construction allows the glove to reach high IGA ratings. Metalguard gloves are ideal for metal handling and stamping and are available with a leather palm. **Wells Lamont Industrial**, (800) 247-3295, www.wellslamontindustrial.com. ***Circle 263***

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Do cut tests indicate protection?

There are two parts to this answer with the first being the cut tests themselves. The second relates to the applications.

Cut Tests:

Currently, our industry is using the following cut tests: ASTM F1790-97, ASTM F1790-04, and ASTM F1790-05 which are multiple blade tests with varying weights, and EN388 (The European Norms Standard), which uses a circular blade with a constant weight. In addition, there are two different machines (TDM and CPPT) used for the ASTM tests. These combined variations mean that there can be a wide variety of test results for the same glove.

To illustrate, our style 4200 TriMax® tested at 3200 grams on ASTM F1790-97 with a CPPT machine, but only tested at 1730 grams on ASTM F1790-04 with a TDM machine. Same glove – vastly different results.

Consequently, cut tests should be used as a guideline, not as an absolute.

Applications:

Applications are different from cut tests because cut tests are performed with a clean edge knife blade and applications can include edges as varied as sheet metal or glass.

Knife blades cut, sheet metal tears. Gloves with a dulling action are used to stop knife blades, while gloves with tensile strength are used to protect against sheet metal. Glass, as the hardest substance, requires entirely different cut resistance features.

For example, the glove on the right (cut test 600) uses high tensile strength to resist a cut through from rough edged metal (1), but lacks the dulling action to prevent the cut from a knife (2). (Note: a protective liner is worn underneath in photos 1 through 4)


1

2

In this second example, the gray glove on the right (cut test 1135) prevents a knife cut with its dulling action (3), but tears when exposed to the rough metal edge due to its lack of tensile strength (4).


3


4

In these cases, the level of cut resistance does not correlate to the actual protection.

In this next group of photos, the glove on the left (cut test 4289) sustains a cut from sheet glass (5), while the glove on the right (cut test 1794) shows only minor damage after repeated passes along the same edge (6).


5


6

In Conclusion:

Sheet metal edges require gloves with **high tensile strength** yarns that will resist breaking when exposed to their rough edge.

Knife blades require gloves that will **dull** a blade before it can cut through to the hand.

Glass core gloves protect best against **glass** and stainless steel core gloves protect best against **stainless steel**.

The most effective way to evaluate a potential hazard is to expose the test glove to the edge itself and WITHOUT anyone's hand in the glove.

Cut tests can have wide variances for the same glove and may not indicate the proper protection for any given application.

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