Introduction

Today's companies realize that a safe working environment is important to sales and profitability as it's common for businesses to lose lucrative contracts to a competitor with a better safety record. As a result, organizations must be conscious of the impact that injuries have on employees and the bottom line. Regardless of industry, hand injuries account for a significant number of recordable incidents, making high-performance safety gloves a critical component of any safety program.

One of the most common types of hand injuries involves lacerations, but, choosing the right cut-resistant gloves can help companies lead to the common goal of zero injuries. When selecting a glove for cut resistance one of the most important components to consider is the cut resistant material from which it's made. There are a wide range of cut resistant materials used by glove manufacturers, each with various strengths and weaknesses. Making the best decision about which glove to use can positively impact a safety program, and the following questions must be answered:

- Do workers need cut protection on the back of the hand (360° cut resistance), or just on the palm?
- What, if any, puncture hazards are present? Are these hazards blunt/industrial puncture, or are your workers at risk of coming into contact with hypodermic needles?
- How much dexterity and tactile sensitivity is needed to ensure that tasks can be completed effectively?
- What kind of grip is needed? Will you be dealing with oils, solvents, or wet conditions?
- Can the gloves be laundered? How likely is it that they will be?
- What are the work conditions? Is it a hot or cold environment?

To help take some of the mystery out of the glove selection process, we've collected the key features of the most common materials used in gloves in one easy-to-digest overview.

Leather

When it comes to glove materials, leather has been around since the beginning of time. Leather is a relatively durable and flexible material created through tanning of animal rawhide and skin, often cattle hide. Cow and goat skin are widely used in work gloves, although in recent years it is more common for leather to be synthetic.

Workers rely on leather because it provides both a comfortable fit and useful grip. The grain (created by pores in the skin) helps create friction as the wearer grips an object, making it easier to maintain contact with a surface. Leather is also abrasion-resistant and can withstand contact heat at relatively high temperatures, making it an ideal glove material for applications such as machine shop work or other situations where the user is handling hot metals or working with abrasive materials and machinery.

There are four categories or forms of leather, not including synthetic. The following two are commonly used in gloves:

- Top-grain is the top half of the hide after the leather has been split, and is commonly used in high-end leather products. Because the "split" layer is separated away, it is more pliable than full-grain leather, making it ideal for work gloves.
- Split leather is created from the fibrous bottom part of the leather, and is used to create suede. It is stronger than top grain leather, making it very popular in glove applications.
Although leather gloves are generally durable and abrasion-resistant, they do wear down over time and need to be replaced. They cannot be laundered, and the natural leather fibers will break down over time. Also, exposure to certain environmental factors (ultraviolet light, ozone, air pollutants, etc.) can cause oxidation and chemical damage, which are very harmful to the material.

Synthetic or artificial leather is commonly used in glove construction, especially when natural leather is cost-prohibitive or unsuitable for the application. Because it is a man-made material, synthetic leather is washable and retains its softness when wet, unlike natural leather. Although synthetic and natural leathers are frequently used in cut-resistant safety gloves, it is important to keep in mind that leather itself is technically not a “cut-resistant” material. In order to provide ANSI/ISEA level A3 and CE level 3 cut protection or higher, leather must be used in combination with another high-performance fabric to create an effective cut-resistant work glove.

The bottom line on leather safety gloves:
- Not considered a cut resistant material in itself
- 100-400 grams of cut resistance, depending on type and thickness
- Best used in conjunction with other materials to create a cut-resistant glove

Kevlar®

Kevlar is the registered trademark for a synthetic fiber, related to other aramids such as Nomex and Technora. Developed at DuPont in 1965, this high strength material was first commercially used in the early 1970s as a replacement for steel in racing tires. Typically it is spun into ropes or fabric sheets that can be used as such or as an ingredient in composite material components.

Kevlar is commonly used to make body armor because of its high tensile strength-to-weight ratio; by this measure it is five times stronger than steel on an equal weight basis.

Kevlar is used for gloves for two reasons: it is extremely lightweight and integrates well with other fibers, or even itself. A thin sheet of Kevlar can add a variety of benefits, and is available in different grades for various applications.

While Kevlar gets high marks for its ability to protect against abrasion and cuts, depending on the weave construction, it offers very little puncture resistance. This is important to remember, because the majority of lacerations actually start out as a puncture. This happens with knit gloves because the puncture starts a windowing effect; the offending metal or material then comes through the glove and drags along the surface of the skin. People have incurred severe injuries in which something punctured through a glove and tore the skin, but ironically the glove remained unharmed. Additionally, the material can be itchy to wear, and many workers do not find it comfortable. It also offers a high level of heat resistance, but that same characteristic can make it hot to wear and ultimately not well suited for situations where workers need to wear it for extended periods in warm environments.

Kevlar is also subject to degradation due to UV exposure and temperature extremes. Although it maintains its strength down to extremely low temperatures, it loses tensile strength at extremely high temperatures.

The bottom line on Kevlar® safety gloves:
- Offers decent cut resistance
- Inferior puncture resistance
Dyneema®

Created in 1979 and finally produced in 1990, Dyneema (or High Performance Polyethylene, HPPE), is an ultrahigh molecular weight polyethylene fiber that offers high cut resistance, even when wet. It is ten times stronger than steel per unit weight — making it twice as strong as Kevlar. Because of its unique properties, gloves made with Dyneema are lightweight, flexible, and cool to the hands. They may be used in a variety of applications such as glass handling, sheet metal assembly, and handling small, sharp parts. It is also an excellent fiber for cut resistant gloves in the food industry.

Compared with leather, cotton, or Kevlar, Dyneema is cooler to wear and provides better cut resistance than leather. Dyneema is hydrophobic, meaning it does not absorb water, so gloves made with this fiber will not become heavy and waterlogged when they're worn in damp conditions or in applications that involve contact with water or wet tools and materials. But, because Dyneema or HPPE gloves are knit, they provide little or no protection against punctures.

Chemically inert, Dyneema performs well in environments involving chemicals. Unlike Kevlar, it resists degradation and maintains its performance after exposure to UV light.

The bottom line on Dyneema safety gloves:

- High level of cut resistance
- Does not provide puncture resistance
- Mixes well with other fibers to increase cut resistance

Protective Tiles, such as SuperFabric® Brand Materials

Introduced in 1996, SuperFabric® materials were designed to meet almost every conceivable performance need. SuperFabric® brand material is a HexArmor® exclusively licensed solution for the Industrial PPE Market that is designed specifically to address the needs of PPE, these textiles incorporate a variety of protective fabric functions, such as industry-leading cut, puncture, and needle resistance.

These fabric materials are made through a proprietary process that turns ordinary fabrics into high-performance materials. Tiny guardplates are arranged in "Tessellations," that are optimized for different performance characteristics. These tiles are attached over the surface of a fabric. The "armor plate" provides a barrier from abrasions, scuffs, and scrapes, yet retains fabric-like flexibility. This provides superior tactile sensitivity, even in wet and oily situations, depending on the type of tiles used. The fabric is also highly durable, flexible and lightweight.

The combination of durability, flexibility and protection for various hazards makes protective tile technology ideally suited for use in PPE gloves. The armor plates offer some of the highest levels of cut resistance available on the market, as well as protection from abrasions, punctures and normal wear and tear. The breathable fabric allows air to pass through for long-lasting comfort. It also lasts longer than many other glove materials, and unlike leather and Kevlar, it will not degrade from UV exposure or through laundering.

The bottom line on protective tiles safety gloves:

- The highest level of cut resistance on the market today (greater than 4000 grams)
- Tile arrangements providing industrial puncture resistance
- Tile arrangements providing unbeatable needle stick resistance
- Excellent abrasion resistance