CUT RESISTANCE: WHAT'S IN A CE LEVEL 5 GLOVE?

All CE Level 5 gloves are not created equal. Many of these gloves offer a minimal level of protection for industrial applications.

When it comes to cut resistance ratings on PPE, all Level Five's are not created equal. There is significant confusion in global markets because many glove manufacturers misrepresent how they test their gloves, and the standard doesn't provide clear direction.

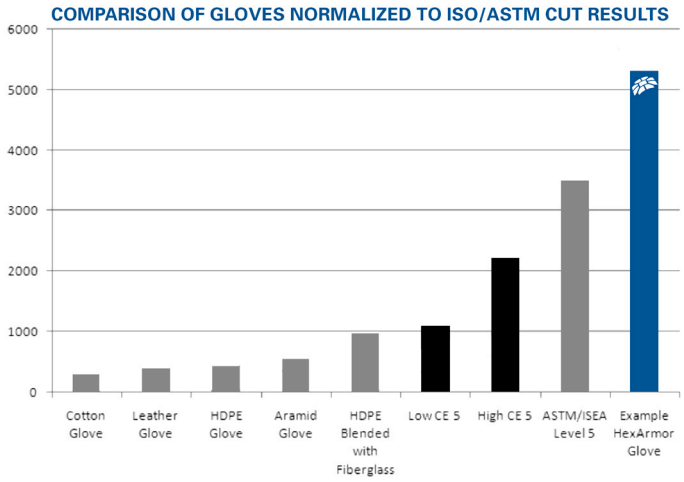
In the European market, gloves are evaluated according to EN388, the mandatory performance standard for all gloves as standardized and regulated by the CEN. The cut test method, called the Coup test, uses a constant weight on a counter-rotating circular blade that is moved back and forth across a sample by the test machine. Ironically, this test, designed to measure cut resistance, is not suitable for materials that have a high degree of cut resistance as the materials that contribute to cut resistance (glass fibers, steel or hard guard plates) tend to dull the blade and overestimate the real world protection provided by such gloves.

The U.S. uses a different standard developed by ASTM, method F1790-04. This standard is similar to the ISO (13997) test. This test involves the interpretation of data obtained from putting varying pressure (weights) on a standardized razor-type blade and recording the distance the blade travels (at a constant speed) before cutting through. The ISO 13997 or the ASTM F1790-04 test are the recommended method by the EN388 standard to calibrate the cut resistance of high cut resistant materials. In fact, it is noted in the EN388 documentation that the standard EN388 test is not applicable to gloves made from very hard materials.(ie glass fibers, fibers mixed with steel, **SuperFabric®** plates). It is further noted that the alternative test method for high cut resistant materials is described in ISO 13997.

If test results of various products identified as CE Level 5 products are taken and normalized on the ISO or ASTM test, you can see the relative test results of various types of products (see graph). You will note that there are two bars on the graph for the CE 5 rating. This is because in our own tests (and in those of other respected manufacturers) we find that CE Level 5 gloves offer a wide array of performance ranges. Some of these gloves score as low as 1000 grams (10 Newtons), qualifying them barely for a level 3 on the ASTM/ISEA scale. Note that the force required to cut through is expressed as grams in the ASTM test and in Newtons in the ISO test. These numbers can be converted for comparing the results on these tests. (100 grams = .98 Newtons).

100% VARIABLITY IN CE 5 SCORES?

When normalized, we see that the scores of gloves claiming to be CE Level 5 gloves vary quite a bit. Why is this? There are several reasons for the variability; testing consistency, operator variability, material variability, etc. However, the single largest factor is this: While the EN388 standard suggests that the Coup test is not appropriate for materials that abrade the cutting wheel, the standard doesn't require the alternative ISO be used. Section 6.2 of the standard merely states that the test is not appropriate for hard materials like chain mail, but doesn't contemplate other hard materials like fiberglass, **SuperFabric®**, etc. So, some manufacturers, while knowing the test is not appropriate, use it anyway to get the higher score (and sell more gloves). This is very common in gloves that are blended with fiberglass, as the fiberglass "fools" the Coup test by dulling the blade



The range of performance that gloves can score and still qualify for a level 5 is so varied, that the CEN body is going to require gloves to not only list their Cut Level, but to note their average Newton force. Why would they do this? Because they recognize that worker safety requires a better understanding of the real cut protection a glove is providing.

We can now conclude that all Level Five's are not created equal. There is significant confusion in global markets because many glove manufacturers misrepresent how they test their gloves, and the standard doesn't provide clear direction.

WHAT CAN WE DO ABOUT PROTECTING EMPLOYEES WITH THE BEST PPE?

In our field studies of injuries and the corresponding hand protection worn, we see that many injuries can happen with PPE rated in the range below ASTM/ISEA level 5 of 3569 grams (35 Newtons). This can be demonstrated easily with a razor blade (simulating sharp metal or glass) and how easily typical CE 5 gloves, for example, will cut. As a result, many of our customers have adopted standards in their own organization, specifying a minimum cut at a certain number such as 3000 or 3500 grams- level 4 or 5 ASTM. Keep in mind the standard is just a guide, the profile of the hazard and actual use conditions are paramount. We always encourage conducting a safe test in actual situations; new gloves, used gloves, saturation with oils and fluids, etc.

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MANY CUTS BEGIN WITH A PUNCTURE

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. Plating with small guard plates, such as in HexArmor® products, reduces this effect as the 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.

OTHER FACTORS

Abrasion Resistance is also a critical factor in preventing hand injuries. In fact if a glove fails too early due to wearing through from an abrasive hazard, the skin is quickly exposed to cut hazards. So the higher the abrasion level the higher the level of protection from not just abrasion, but from cut and punctures.

Stability. Evaluate Performance of a new glove versus a glove that has been worn for a day. Look for products that don't degrade when exposed or used. Some products are affected when subject to abrasion, washed or exposed to UV light. Many products on the market lack the ability to provide consistent performance.

Wind-Up, All Occurences. Some materials can be caught in machine parts such as rotating grinding wheels or drills and sanding materials. This can pull the hand or finger into the equipment and cause severe injury to tendons, muscles, and ligaments. Protective gloves that prevent or reduce windup risks are available and can be used where risks are present.

Fit plays a part in the level of protection. Gloves that are too tight may cut easier as many of the fibers used for cut resistance use a rolling action to increase cut resistance. When these fibers cannot roll, such as when they are stretched from an ill-fitting or wrong sized glove, they can "lose" some of their cut resistance. Take an example from the kitchen and do this simple experiment: Put a cucumber on a cutting board and take a very sharp knife. Try to cut the cucumber with a sawing motion without holding the cucumber. It just rolls and doesn't cut. Now hold that cucumber and do the same thing. It cuts very easily. So, tight fitting gloves can perform like the immobilized cucumber. Loose fitting gloves can also be a hazard for catching or snagging on tools and equipment. Make sure your glove program accounts for proper sizing and employees know what to look for when picking gloves.

Coating impacts cut resistant gloves that use cut resistant fibers. Once the coating is applied, the rolling and twisting that helps the fiber achieve its cut resistance can be reduced. Most coated gloves have a higher cut resistance on the back of the hand than on the palm because the fibers are not coated. Keep this in mind as you select your hand protection.

Grip is also important. Using grip that isn't appropriate for the job can lead to higher injury rates as objects with sharp edges slip, causing slicing motion on the gloves.

WHAT TO DO WHEN 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 test is probably about 2lbs. 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:

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

2. 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, and something must be wrong.

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

4. 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 setup a safe test for a true work hazard in the real world.

5. 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. Classify cuts,

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