2016 American ANSI/ISEA 105 Hand Safety Standards

Cut Standards Whitepaper
2016 REVISION - AMERICAN ANSI/ISEA 105 HAND SAFETY STANDARDS

According to data from the Bureau of Labor and Statistics, lacerations and punctures are the most common workplace hazard. It stands to reason that these risks would be considered first by safety managers when selecting PPE. Yet, this is not always an easy task. The need to compare various gloves, understand standards from two different certifying bodies, and differentiate between multiple rating scales and testing methods can make selecting the proper cut- and puncture-resistant PPE difficult.

As of February 2016, that has all changed.

The standards as outlined in the ANSI/ISEA 105-16 American National Standard for Hand Protection Selection Criteria have changed and changes have been proposed to the EN 388 European regulatory standard for protective gloves (CE). The new glove standards will enable safety managers to choose the proper hand protection with greater precision and accuracy.

This paper will examine the background and need for changes in cut protection standards, the new needle stick testing methods and ratings systems, and recommendations for choosing the best hand PPE for your workers.

Standards in Need of Updating

The Occupational Safety and Health Administration (OSHA) requires employers to mandate use of appropriate hand protection where workers are exposed to hazards, including cuts and punctures. OSHA also requires that selection be based on an evaluation of hand PPE performance characteristics relative to the tasks being performed.

The American National Standards Institute (ANSI) and International Safety Equipment Association (ISEA) developed the first American national standard for glove selection criteria in 1999. ANSI/ISEA 105-16 “American National Standard for Hand Protection,” now in its fourth revision, specifies test methods for rating PPE against hazards including cut, puncture, and abrasion resistance, chemical permeation and degradation, detection of holes, vibration reduction, and heat and flame resistance. Compliance with the standard is not required in order to sell products in the United States, but most safety managers/purchasers follow it as a guide in choosing safe hand PPE.

The European Union (EU) developed a standardized system of laws that require anyone wanting to sell products in Europe to attain the CE (Conformité Européene) compliance/marketing through the performance testing described in EN 388 “Protective Gloves Against Mechanical Risks.” The standard specifies testing methods for rating mechanical properties including abrasion, cut, tear, and puncture resistance. The tests are required on products for sale in the EU. EN 388 also is recognized internationally.

High Performance Fabrics on the Market Today

For years, leather was the most-used material for cut-resistant gloves. But better protection calls for thicker leather, which means less dexterity, comfort, and grip. As a result, manufacturers began developing alternative materials including synthetic fibers, composite yarns, and protective tile technology that increased cut, abrasion, and puncture protection without compromising dexterity and flexibility.
The purpose of both standards is to provide manufacturers with a mechanism for classifying their products for specified areas of glove performance. The information from this testing and classification also aids end users in the selection of appropriate hand protection.

Until now the two standards for testing and classifying cut resistance of PPE varied greatly due to the difference in testing machines and results measured. Both employ a 1-5 rating scale, which portrays inconsistent results for high cut-resistant materials. In addition, a large performance gap exists for gloves considered highly cut-resistant (ANSI/ISEA Level 4 ranges from 1500 grams to 3500 grams of cut resistance, for example). And with new technologies and high-performing fabrics, the cut protection of highly cut-resistant PPE has improved beyond the current scales.

The 2016 changes are the result of recognition for a more consistent testing method between ANSI/ISEA and European safety standards, as well as higher and more accurate ratings. These ratings take into account recent advances in cut-resistant knit fabrics, synthetics, and other technologies that have improved cut protection to much higher levels. The overall goal is to reduce use of insufficient hand PPE by making it easier to clearly identify the level of protection PPE provides.

Understanding the Changes to the ANSI/ISEA 105 American National Standard for Hand Protection

A major change in the new edition of ANSI/ISEA 105 relates to how cut-resistance classifications are determined. In an effort to apply consistent meaning to these ratings for the end user, a single test method has been selected for establishing cut level (ASTM F2992-15). In addition, the number of classification levels has been expanded both to address the gaps between particular cut levels and to model the classification approach used in similar international standards.

The standard employs a new, 9-level scale (expressed as A1-A9) that spans 0 grams to 6000 grams of cut resistance. This allows for more accurate identification of the protection offered by hand PPE. The most significant change calls for cut level 4—which ranged from 1500 grams to 3500 grams of cut resistance—to be divided into three separate levels. The more granular rating allows end users to more precisely identify a level of cut resistance that meets a specific need. The following chart shows the changes:

![Cut Resistance Rating System: What’s Changing](chart)
Cut resistance testing: In addition to a more accurate cut resistance classification scale, the ANSI/ISEA 105-16 references only the Tomodynamometer Test Method (TDM) based on the ASTM F2992-15, discarding the Cut Protection Performance Tester (CPPT) method formerly recognized as an alternative test. The TDM determines the amount of weight, measured in grams, necessary for a blade to achieve cut-through of PPE material at the reference distance of 20 MM of blade travel. This is a change from the old standard, which called for a blade travel of 25 MM.

**NEW: Hypodermic Needle Puncture Resistance**

ANSI/ISEA 105 and EN 388 both offer standards for puncture resistance, but neither has ever adopted a standard for hypodermic needle puncture resistance — until now.

Puncture resistance is among the major mechanical properties required of protective clothing. The EN 388 standard test method is the only test recognized by both the EU and North American standards. The EN 388 test uses a blunt puncture probe, similar to that of a ball point pen that moves at a 90° angle at a speed of 100mm/minute. Results are reported in Newtons and converted to a 1-4 rating scale for EN 388 and a 1-5 scale for ANSI/ISEA 105-16.

This test does not replicate puncture hazards such as needles, slivers, burrs, frayed wire, wire rope, or glass shards. The test probe for the EN 388 test is rounded and blunt, larger than the end of a ball-point pen. The test measures more of a tear or burst hazard, but has very little relevance when it comes to real-life industrial punctures or needlesticks.

An increasingly common cause of puncture wounds, hypodermic needlesticks pose a life-threatening safety risk to health care professionals, law enforcement officials, sanitation workers, and others due to risk of infection from blood-borne pathogens such as HIV and Hepatitis C.

The ASTM F2878 -10 "Standard Test Method for Protective Clothing Material Resistance to Hypodermic Needle Puncture" addresses the unique mechanics of needlesticks. As of early 2016, the ANSI/ISEA 105 standard has been updated to include this test, recognizing that needlesticks are common potential exposure for the medical, sanitation, and recycling industries.

**Needlestick Testing:** The ASTM F2878-10 test method uses a 25 gauge needle to determine the force required for a hypodermic needle to penetrate protective clothing or material. The puncture probe (25 gauge needle) travels at a 90° angle into a specimen at a velocity of 500mm/min. Results are reported in Newtons on a scale of 0– 5

### Hypodermic Needle Puncture Resistance

<table>
<thead>
<tr>
<th>Level</th>
<th>Puncture (Newtons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>≤ 2</td>
</tr>
<tr>
<td>1</td>
<td>≤ 2</td>
</tr>
<tr>
<td>2</td>
<td>≤ 4</td>
</tr>
<tr>
<td>3</td>
<td>≤ 6</td>
</tr>
<tr>
<td>4</td>
<td>≤ 8</td>
</tr>
<tr>
<td>5</td>
<td>≤ 10</td>
</tr>
</tbody>
</table>

**NOTE:** ASTM F2878 describes three test probes that may be used: 21, 25, or 28 gauge needles. To be able to properly categorize the resistance to puncture in a consistent standard manner, only a 25 gauge hypodermic needle is to be used for classification to ANSI/ISEA 105-16
Understanding the Proposed Changes to the EN 388 European Standard for Cut Resistance

A number of important changes have been proposed to the EU cut resistance standard, EN 388. Most notably, the changes address inconsistencies with the Coup Test and provide additional cut levels for highly cut-resistant materials.

Cut Resistance Classification

The EN388 standard currently requires the Coup Test and recommends the ISO 13997 which uses the TDM test method for high cut-resistant materials. The proposed changes will require the use of both the Coup Test and the ISO 13887 for high cut materials. An additional rating will be added to the current 4-digit EN388 score.

This is a significant change and a big step toward equivalency with the North American standard. As with the ANSI/ISEA standard, the ISO 13997 results are based on the weight required to achieve cut-through at the distance of 20 MM. Cut resistance levels are reported in Newtons and lettered A – F to avoid confusion with the Coup Test ratings, which will continue to employ the 1 – 5 scale.

Comparison of ANSI/ISEA 105-16 and EN 388 Cut-resistance Levels

<table>
<thead>
<tr>
<th>EN 388 Cut Level</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newtons</td>
<td>2 N (204 G)</td>
<td>5 N (509 G)</td>
<td>10 N (1020 G)</td>
<td>15 N (1530 G)</td>
<td>22 N (2243 G)</td>
<td>30 N (3059 G)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ANSI/ISEA Cut Level</th>
<th>A1</th>
<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>A5</th>
<th>A6</th>
<th>A7</th>
<th>A8</th>
<th>A9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Newtons</td>
<td>≥ 200 G</td>
<td>≥ 500 G</td>
<td>≥ 1000 G</td>
<td>≥ 1500 G</td>
<td>≥ 2200 G</td>
<td>≥ 3000 G</td>
<td>≥ 4000 G</td>
<td>≥ 5000 G</td>
<td>≥ 6000 G</td>
</tr>
</tbody>
</table>

In the comparison above, the proposed EN 388 cut-level ratings roughly correlate to the ANSI/ISEA scale for cut levels A1-A6, but still falls short of differentiating highly cut-resistant materials. For that reason, as well as the continued use of two potential testing protocols in the EN 388, the ANSI/ISEA standard can provide a more accurate score for your PPE.

Cut resistance Testing: In the Coup Test, a circular blade moves back and forth across a material sample under a fixed load of 500 grams (5N, a very low force, amounting to less than 1 lb.), while rotating in the opposite direction of the linear motion of the mounting device. The number of blade revolutions needed to cut through the material is then compared to a cut index that rates the material from 1 (low) to 5 (high). This test is reported in Newtons. The Coup Test is not recommended for rating high cut-resistant materials, which dull the blade quickly resulting in an inaccurate representation of the protection provided by such materials.

Among other changes, the new standard would modify the Coup Test to account for the dulling of the test blade by utilizing an equation to determine the maximum number of cycles the test should be run before dulling might occur. If dulling is detected—possible with high cut-resistant materials—the TDM test result becomes the final measure. The Coup Test results, if reported, are for reference only. The Coup Test is slated to be discarded from EN 388 testing protocols all together at a later (undetermined) date.
Navigating Changes to the Cut Standards

In North America, the proposed ANSI/ISEA standard became official with the 2016 revision accepted in February 2016. In Europe, the proposed EN 388 changes have yet to be approved as of February 1st, 2016.

Although the changes to both the ANSI/ISEA 105 standard and the EN 388 standard will help alleviate some of the confusion surrounding selection and purchase of PPE, differences do remain between the standards. Notably, since EN 388 is law in the EU, changes made to the standard will be mandatory, unlike changes to the North American standard, which could take effect more slowly.

The practice of labeling PPE with only the EN 388 cut level – mandatory for selling in the EU– will likely continue while the Coup Test is still in use, since lower cut-resistant materials that rate highly using the Coup Test can seem to be more cut resistant than they are. This is in spite of the addition to the EN 388 change that attempts to equalize cut levels between the two standards by adopting the ISO 13997 test method and the 6-point rating scale, comparable to the ASTM F2992-15 method used in the ANSI/ISEA standard.

Although the changes represent a step forward in equalizing standards for cut resistance, the use of a new numeric rating scale under the ANSI/ISEA standard, additional rating levels for the EN 388 test method, and the continued use of two different testing methods and devices under EN 388 makes it highly likely that some confusion will continue when it comes to choosing the right hand PPE.

Safety managers should maintain a good relationship with suppliers and distributors who have the background and expertise to aid in the selection and purchase of proper hand protection for workers. This knowledge of global variations in standards for glove performance puts them in a unique position to offer advice on PPE for specific applications in specific work environments. As noted earlier, the North American standards for cut resistance performance levels are simply guidelines. In spite of the welcome updates to both the North American standard and that of the EU, the standards still do not offer strict one-to-one comparisons of gloves.

Getting good information and expert advice from reputable companies can help safety managers and other PPE purchasers make sense of the differing information available, allowing for more informed decisions about PPE. That way you can be confident that workers are getting the hand protection they deserve.

Let HexArmor® be your trusted supplier

The efforts to standardize testing between ANSI/ISEA, ISO, and EN 388 will allow glove manufacturers to more accurately rate cut-resistant gloves and glove purchasers to see greater differences among levels of cut protection. That means safety managers globally will be better able to protect their workers against cut, abrasion and puncture hazards.

HexArmor® is excited to now be able to showcase our top quality safety products, many of which have long exceeded traditional cut protection classifications due to our proprietary SuperFabric® brand material.
Additionally, while the ASTM F2878 is a new standard for ANSI/ISEA 105-16, HexArmor® has used this test method for years as a performance metric for all of our needlestick resistant products. Our SuperFabric® brand material has consistently outperformed the competition in not only needlestick resistance, but cut protection as well, which is typically an equally-important attribute for the sanitation and recycling industries.

Safety of the employee has always been the driving force behind everything HexArmor® does. Our goal is to work with safety professionals around the globe to help determine appropriate solutions to the hazards their workers face daily. These new changes will allow safety managers to be better equipped to provide appropriate solutions. HexArmor® is an industry leader in hand protection and now we are making further strides for worker safety with top quality cooling personal protection equipment for use in hot environments. We work in cooperation with safety professionals in a never-ending effort to provide the most complete protection for any given hazard, application, or task. We believe collaborative solution development is our competitive advantage. We encourage all safety managers, regardless of their industry or application, to consult one of our qualified Solution Specialists.