Global Standards for Hand Protection

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Introduction

Jill Clements is a Senior Research Engineer with DuPont and has 18 years of experience in the development of new products and new applications and currently holds 14 patents. Of those 18 years with DuPont, Jill has been in the Kevlar® business for 15 years and has worked in a variety of market segments including composites, mass transportation, the automotive industry, and high-performance apparel. Jill has presented at numerous trade shows and conferences in North America, Europe, and China and is often seen demonstrating the DuPont Cut Demo Unit. Jill received both her Bachelors and Masters of Science degrees in Mechanical Engineering from The Georgia Institute of Technology.
Global Cut Standards

- The Keys to Cut Resistance
- Background & Comparison of Cut Standards
- Changes to the Cut Standards

The Why
The What
The When
The Keys to Cut Resistance

- Cut resistance is a function of basis weight and material composition.
- Cut resistance can be increased by:
  - Increasing basis weight (14 oz/yd² Kevlar® better than 8 oz/yd² Kevlar®)
  - Using engineered yarns made with stainless steel wire or yarns blended with glass fibers in the core.
Considerations for Selection of Cut-Resistant Gloves

- Know your fiber (Kevlar® vs. nylon vs. cotton vs. HPPE)
- Cut Resistance Value (ANSI vs. CE)
- Abrasion Resistance - indicates potential performance in applications
- Overall Glove Construction
  - String knit vs. loop-out terry
  - Coatings/ dots/ leather palms
  - Zonal reinforcements
  - Sizing & fit

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Cut Test Methods and Performance Standards
Why Are There Changes?

・Glove performance in the cut-resistant market has improved tremendously in recent years as new yarns and new technologies have been developed.

・Increased granularity is needed within the current level 4 range (1500-3499 grams).

・The goal of moving to a single machine is to reduce the complexity and improve the reliability of the test method.
NO MORE ASTM F1790

ASTM F2992-15
Newly issued 2015 standard for measuring cut resistance of materials
Uses ONLY the TDM-100 machine to measure cut resistance

EN388-2003
European standard to measure cut resistance and other mechanical characteristics
Uses the Coupe Test machine & References ISO 13997

ISO 13997
International Test Standard
Provides a global standard around the TDM-100 machine - will now be used in Europe
Standards are used to specify test methods

Standards usually refer to levels that are achieved by the product tested according to a certain method

ANSI/ISEA 105-16:

ANSI (American National Standards Institute / ISEA (International Safety Equipment Association) 105 Standard

- US Standard only - is not a government regulation like OSHA
- Indicates the mechanical, thermal, chemical and dexterity requirements, among others
- The final properties are classified by performance levels
- The standard uses a combination of ASTM (American Society for Testing and Materials) and EN (European Norm) methods

Hand Protection Standards
What Are The Changes? - ANSI/ISEA 105

- Key area of focus for the changes is the area of cut-resistance testing and classification
- The changes include the use of a single test method - consistent ratings
- There will be an expansion of the classification levels
- Better alignment with similar international standards
- Incorporation of a puncture test for hypodermic needles
What Are The Changes? - ANSI/ISEA 105

<table>
<thead>
<tr>
<th>Load (grams)</th>
<th>ANSI/ISEA 105-11</th>
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<tr>
<td>&lt; 200</td>
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<tr>
<td>201 - 499</td>
<td>1</td>
</tr>
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<tr>
<td>1500 - 3499</td>
<td>4</td>
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<tr>
<td>&gt; 3500</td>
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</table>

<table>
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<tr>
<th>Load (grams)</th>
<th>ANSI/ISEA 105-16</th>
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<td>201 - 499</td>
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<tr>
<td>500 - 999</td>
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<tr>
<td>&gt; 6000</td>
<td>A9</td>
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</table>
A new blade is required for each cut.
The blade is moved across the sample once.
The cut resistance is determined by the load required to cut a 20mm reference distance.
EN388 (European Norm)

- Standard referenced throughout the entire EU
- Government regulated
- Gloves are marked with levels with mechanical performance only
- Although a European standard, it is recognized globally
EN388 Test Equipment

- The blade is re-used
- The cut resistance measured is a ratio of performance of the sample to the performance of a control fabric (cotton canvas)
- ISO 13997 is recommended instead for materials with higher cut performance
Most significant change will be in regard to the acceptance of the ISO 13997 (TDM) cut test method (accounts for dulling of blade in Coupe Test)

- The results will still be reported in Newtons, not grams
- Levels achieved through the use of the TDM method will be lettered A through F to avoid confusion with the Coupe test method results

There will be a change of the abrasive paper used

A new impact protection threshold will be added
What Are The Changes? - EN388

<table>
<thead>
<tr>
<th>Abrasion (cycles)</th>
<th>Example:</th>
</tr>
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<tbody>
<tr>
<td>Level 2</td>
<td></td>
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<tr>
<td>Cut (Coupe Test)</td>
<td>Level 5</td>
</tr>
<tr>
<td>Tear (N)</td>
<td>Level 4</td>
</tr>
<tr>
<td>Puncture (N)</td>
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<table>
<thead>
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<table>
<thead>
<tr>
<th>TDM Cut Resistance (N)</th>
<th>Level A</th>
<th>Level B</th>
<th>Level C</th>
<th>Level D</th>
<th>Level E</th>
<th>Level F</th>
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<td>5</td>
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<td>15</td>
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Coupe method cannot be used interchangeably with ASTM & ISO

EN 388 Coupe Method

ANSI/ISEA 105-16 & ISO 13997
What Are The Changes? - EN388

NO CORRELATION between Coupe method and TDM-100 method
Kevlar® fiber has the highest cut resistance

- 100% Kevlar® (20oz) - 1,230
- 100% Dyneema® (20oz) - 1,020
- 100% Kevlar® (14oz) - 925
- Cotton (26oz) - 410
- Leather (36oz) - 360
What It All Means

Global alignment around one piece of equipment (TDM) for conducting cut testing will reduce confusion in the market around glove performance.

Once both NA & Europe are both using the TDM-100 machine, there will be a realignment of glove performance claims - specifically regarding the EN388 standard.

North America remains an unregulated market - manufacturers are still not required to label products or even adopt the new standards.

DuPont is currently conducting multiple tests to better understand how glove performance classification will change specific to the EN388 standard - stay tuned!
DuPont SafeSpec

DuPont™ SafeSpec™ helps you choose the right glove for the right task:

http://www.safespecgloves.dupont.com/
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