

UCOR
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Gloves: Cut & Puncture Protection

Understanding ANSI/ISEA 105-16 and EN388

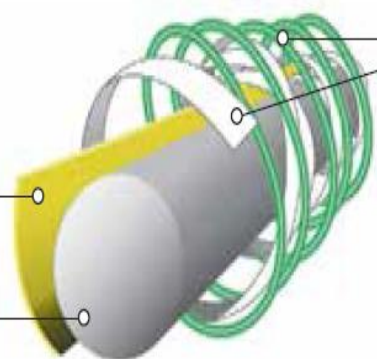
Presented by: Travis Watson



Advanced Composite Yarn

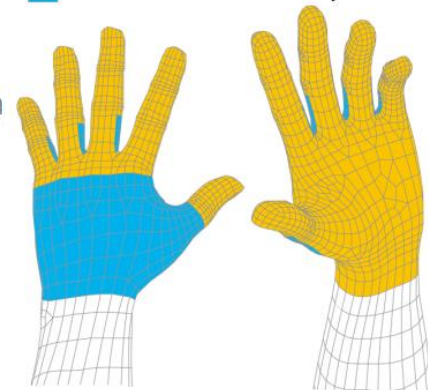
Kevlar® fiber
for strength

Stainless steel for
hardness



High strength synthetic yarn
for lubrication and rolling action

ANSI Level 4 cut resistance only



Safely Delivering DOE's Vision for the East Tennessee Technology Park Mission

- To better understand the evolving safety standards, testing methods, ratings, and glove engineering for cut and puncture hazards.
- Enable safety professionals to choose the proper hand protection with greater precision and accuracy.

OSHA 29 CFR 1910.138

- 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 the PPE performance characteristics relative to the tasks being performed.

- Employers reported 144K LWD injuries with a 5 day average - (BLS 2015)
- 70% could have been prevented/reduced by PPE – (OSHA)
- Type of Injuries
 - 39% cuts or lacerations (many of these are initiated by **puncture** to glove)
 - 13% punctures
 - 11% fractures
- Average claim is \$22,000 - (BLS & NSC 2012-2013)

- There are two commonly used industry standards
 - ANSI/ISEA 105-16
 - EN388
- Standards/ratings have changed
- Different test methods that are not equivalent
- Ratings/labels can be misleading/misinterpreted
- Not reflective of real world conditions & applications

ANSI/ISEA 105-16

- Previous Testing Standard & Ratings
 - Two different test methods could be used
 - Reduced consistency & accuracy
 - Ratings Scale from 1 - 5 (0 – 4,000 grams)
 - Large ranges creates gaps in protection (Level 4 covered 1,500 - 3,500 grams)
 - Didn't address current cut resistant materials
- New Testing Standard & Ratings
 - Only one test method accepted
 - Ratings Scale from A1 – A9 (0 – 6,000 grams)
 - Increased accuracy of protection
 - Previous Cut Rating 4 is now divided into 3 separate ratings



Cut Rating Change Chart

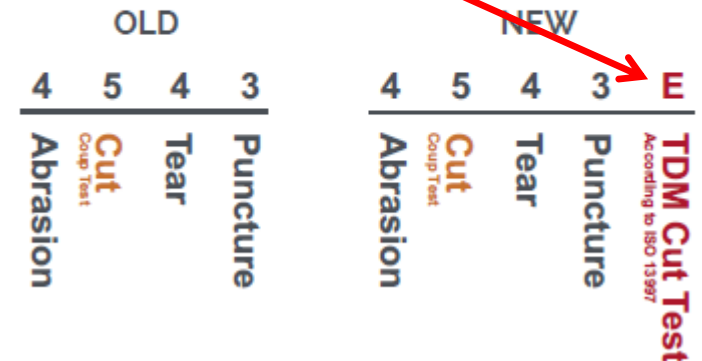
ANSI 105-16



HexArmor

EN388

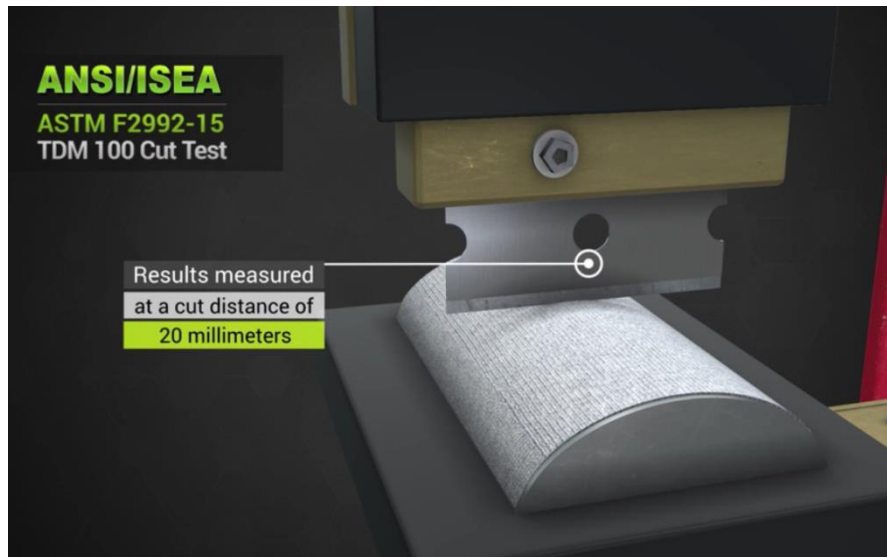
- Keeps original cut rating using CPPT method
 - Cut Index Rating 0 – 5 scale
 - Sample compared to reference cotton fabric
 - Rating of 5 means it has 5 times better cut resistance than the cotton fabric
- Added a new rating using TDM method
 - Rating scale A – F (204 – 3,059 grams)



MajesticGlove

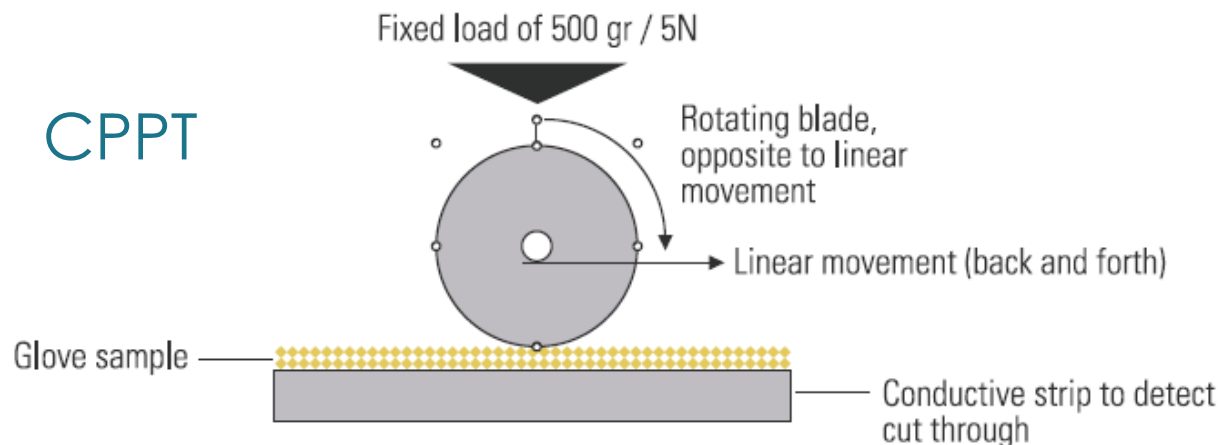
- ANSI/ISEA 105-16 requires ASTM F2992-15 method
 - Tomodynamometer (TDM) is the ASTM F2992-15 method
 - Coup Test (CPPT) was removed from the new standard
- EN388 uses CPPT and TDM testing
 - CPPT still used for original rating of 0 - 5
 - TDM used for newly added rating with score A - F

- Weighted razor blade slides 0.8 inches (20mm) across material
- New blade after each cut & weight (in grams) added
- Cuts made until cut through achieved
- Average calculated off a minimum of 15 cuts
- Converted to A1 – A9 scale



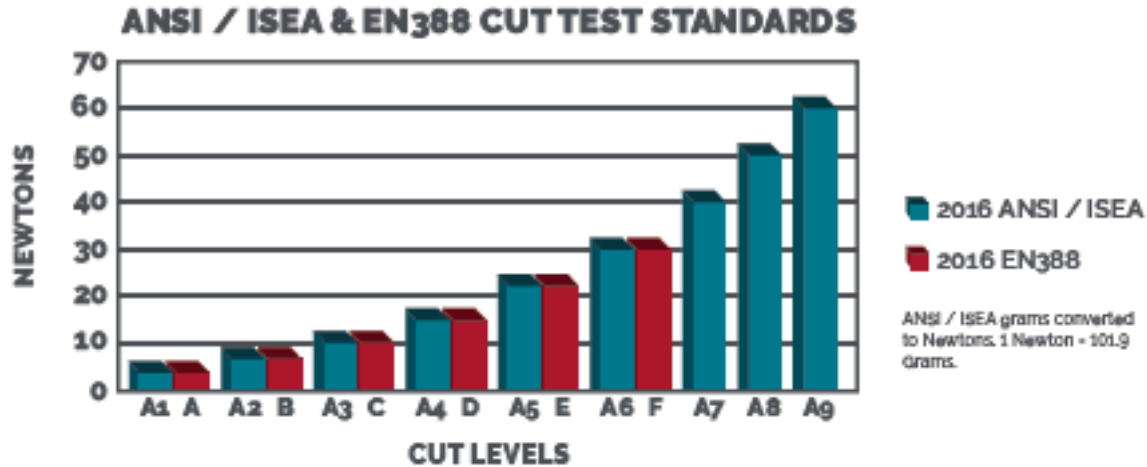
HexArmor

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Superior Glove

ANSI 105-16 vs EN388





Cut Test Ratings

EN388 (CE)	Pre-2016 ANSI/ISEA	GRAM Score	ANSI/ISEA
5	4	2539	A-5



Cut Test Ratings

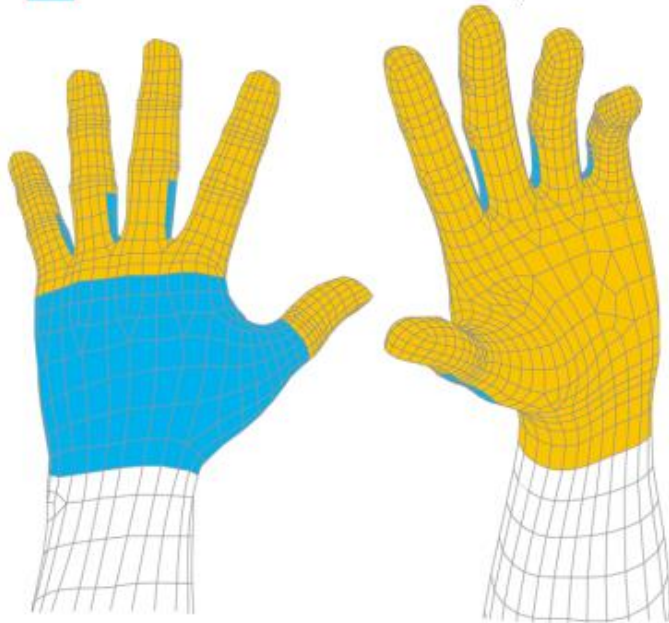
EN388 (CE)	Pre-2016 ANSI/ISEA	GRAM Score	ANSI/ISEA
5	5	5139	A-8

HexArmor

RhinoGuard

HexArmor

ANSI Level 4 cut resistance only



SuperFabric®
Protection Zone



ANSI/ISEA CUT	GRAM SCORE
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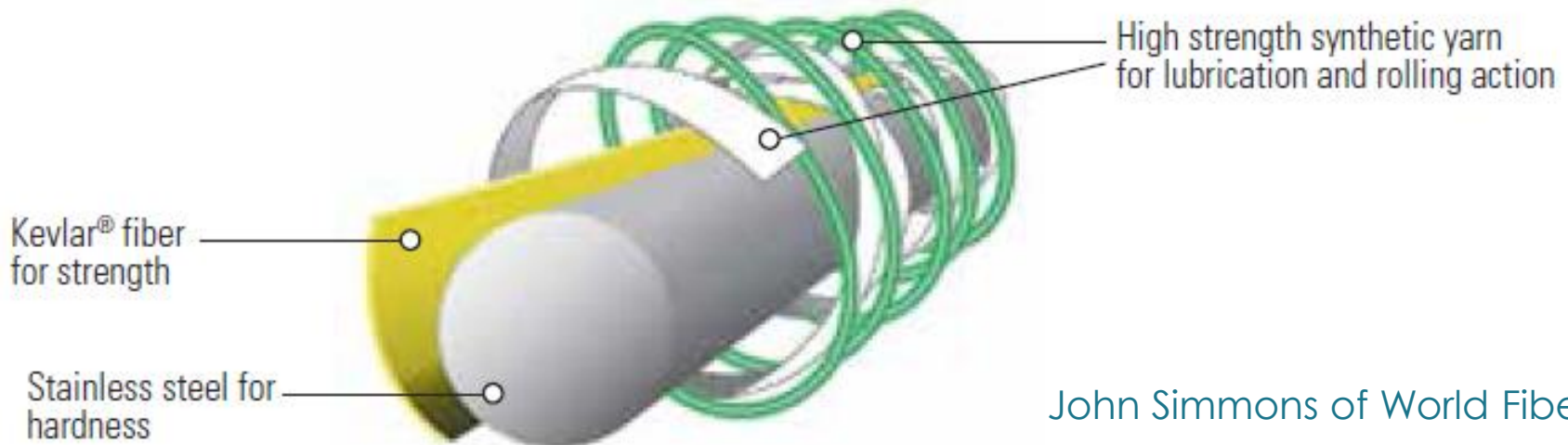
A7	4818
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CE 
4544

Kevlar, Dyneema, Spectra, steel, glass, etc.

- Cut resistance in knitted gloves is influenced by four factors:
 - Strength - Dyneema, Kevlar, steel, etc.
 - Hardness (dulling) – stainless steel
 - Lubricity (slickness) - slippery yarns allow blade to slide over surface
 - Rolling action - most knit yarns “roll” creating a ball-bearing effect

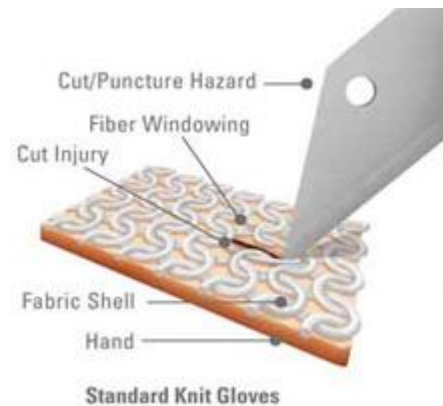
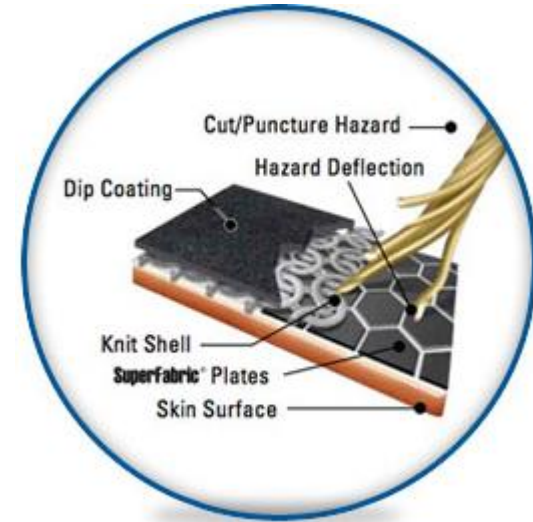
Advanced Composite Yarn



John Simmons of World Fibers

HexArmor, Superior Glove, RhinoGuard,

- Tiles are extremely thin to maintain comfort & dexterity
- Minimal gaps between tiles
- Multiple layers cover gaps of single layer
- HexArmor examples:



Needle

- Over 500,000 sharps-related injuries a year (healthcare, recycling, waste, etc.)
- No standard prior to ANSI/ISEA 105-16
- ASTM F2878 Hypodermic Needle Puncture Test
 - 25 gauge needle at 90 degrees & 500 mm/m
 - 0 – 10 newton scale
- Rating 0 - 5

Industrial

- Industrial Puncture Protection

- EN388 in newtons translated to a 0 - 4 rating scale

- ANSI/ISEA 105-16 recognizes the EN388 but uses 0 - 5 rating scale

Level	ANSI 105	EN 388
0	<10N	<20N
1	≥10N	≥20N
2	≥20N	≥60N
3	≥60N	≥100N
4	≥100N	≥150N
5	≥150N	n/a

- ASTM 1342 not incorporated by ANSI

- Results in newton - **NO** rating scale

Testing May Not Reflect Real World

- At a 90 degree angle
- Slow rate of speed compared to real world
- Trampoline effect
- Elastic coating increases Trampoline effect
- Some ratings reflect the base fabric and may not accurately reflect the protective layer (i.e. HexArmor Superfabric protective tile fabric)

Slide Title

- **EN388 / ANSI**

- 1 mm tip (similar to ball point pen)



- 100 mm/min
- Replicates more of a tear or burst
- ANSI rating not identified by most manufacturers

- **ASTM 1342**

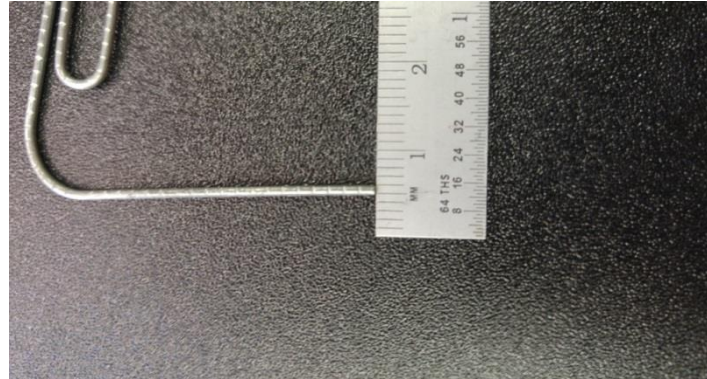
- 0.25 mm tip



- 500 mm/min
- More accurately (not fully) replicates industrial hazards
 - Slivers
 - Burrs
 - Frayed wire/wire rope
 - Glass shards
- Manufacturers rarely use/label
- RhinoGuard identifies for some
 - ASTM F1342-05: Achieves 86N

Leather vs. Level 4 Mechanic Glove

1mm Flat Tip



Which glove would you select to inspect a wire rope sling?

Don't Assume and Increase Knowledge Base

- Know the standards behind the standards
 - Multiple standards may exist
- Understand the details of testing
 - Test methods may be multiple
 - May not accurately reflect the work environment
- Use the spec sheets – if available
 - Additional information
 - Detailed information
- Know your markings
 - Multiple markings may exist
 - Markings may change

- HexArmor Gloves
- Majestic Gloves
- PIP Gloves
- Rhino Gloves
- Superior Gloves
- RhinoGuard Gloves
- John Simmons of World Fibers