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HAND PROTECTION STANDARDS UPDATE

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January 2017

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Introduction

Jill Clements

Jill 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 received both her Bachelor's and Master's of Science degrees in Mechanical Engineering from The Georgia Institute of Technology and is the 2017-2018 Chair of the ISEA Hand Protection Group.

CUT TEST METHODS AND PERFORMANCE STANDARDS

The Keys to Cut Resistance

Steel or glass in the core

- 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

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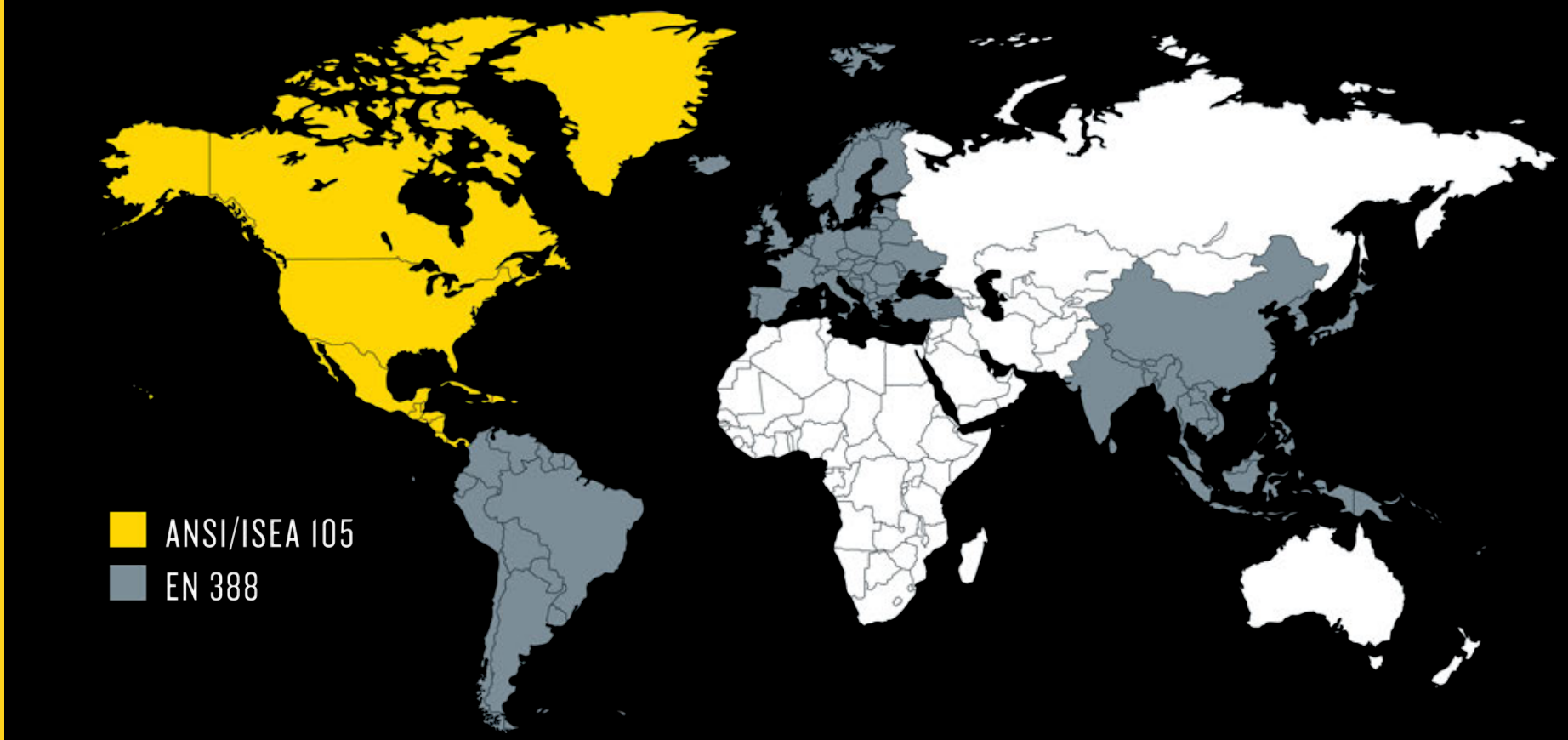
Global Recognition of Cut Standards



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Hand Protection Standards

- Standards are developed and used to specify test methods that replicate the threats potentially seen in a task
- Standards usually refer to levels that are achieved by the product tested according to a certain test method
- Why do we need standards? Don't we already have regulations in place that tell us what to do? What about OSHA?

Hand Protection Standards

- ANSI/ISEA 105-16: American National Standard for Hand Protection Classification
  - ANSI: American National Standards Institute
  - ISEA: International Safety Equipment Association
- U.S. Standard only – it is not a government regulation like OSHA
- Indicates the mechanical, thermal, chemical and dexterity requirements, among others
- The final performance is classified by levels

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Why Were Changes Made?

- 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)

1,600 grams

Both ANSI 4

3,200 grams

- The goal of moving to a single machine is to reduce the complexity and improve the reliability of the test method

What Are The Changes? – ANSI/ISEA 105

- Key area of focus for the changes is the area of cut-resistance testing and classification
  - ASTM F2992-15
  - ASTM F1790 methods are no longer referenced
- The move to a single test method will give more consistent ratings between glove manufacturers
- There will be an expansion of the classification levels
- There is a change to the test for Abrasion Resistance
- There is incorporation of a puncture test for hypodermic needles

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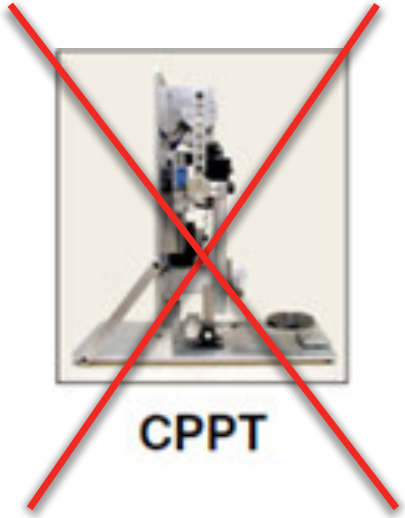
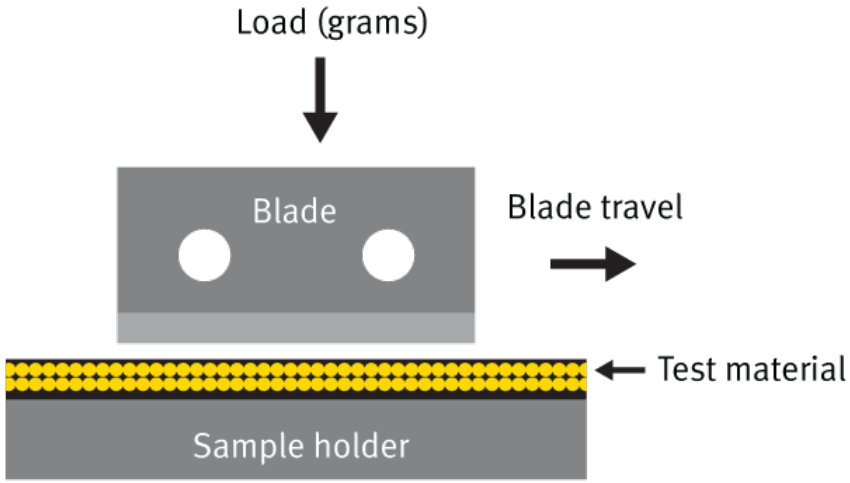
Move to a single Test Method: TDM-100

TDM



CPPT



- 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

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What Are The Changes? – New Levels

ANSI/ISEA 105 STANDARD

OLD STANDARD	
LOAD (GRAMS)	ANSI/ISEA 105-11
<200	0
201-499	1
500-999	2
1000-1499	3
1500-3499	4
>3500	5

NEW STANDARD	
LOAD (GRAMS)	ANSI/ISEA 105-16
<200	–
201-499	A1
500-999	A2
1000-1499	A3
1500-2199	A4
2200-2999	A5
3000-3999	A6
4000-4999	A7
5000-5999	A8
>6000+	A9

ITEMS HIGHLIGHTED IN YELLOW REPRESENT THE EXPANDED ANSI/ISEA CUT STANDARD.

EN 388 (EUROPEAN NORM)

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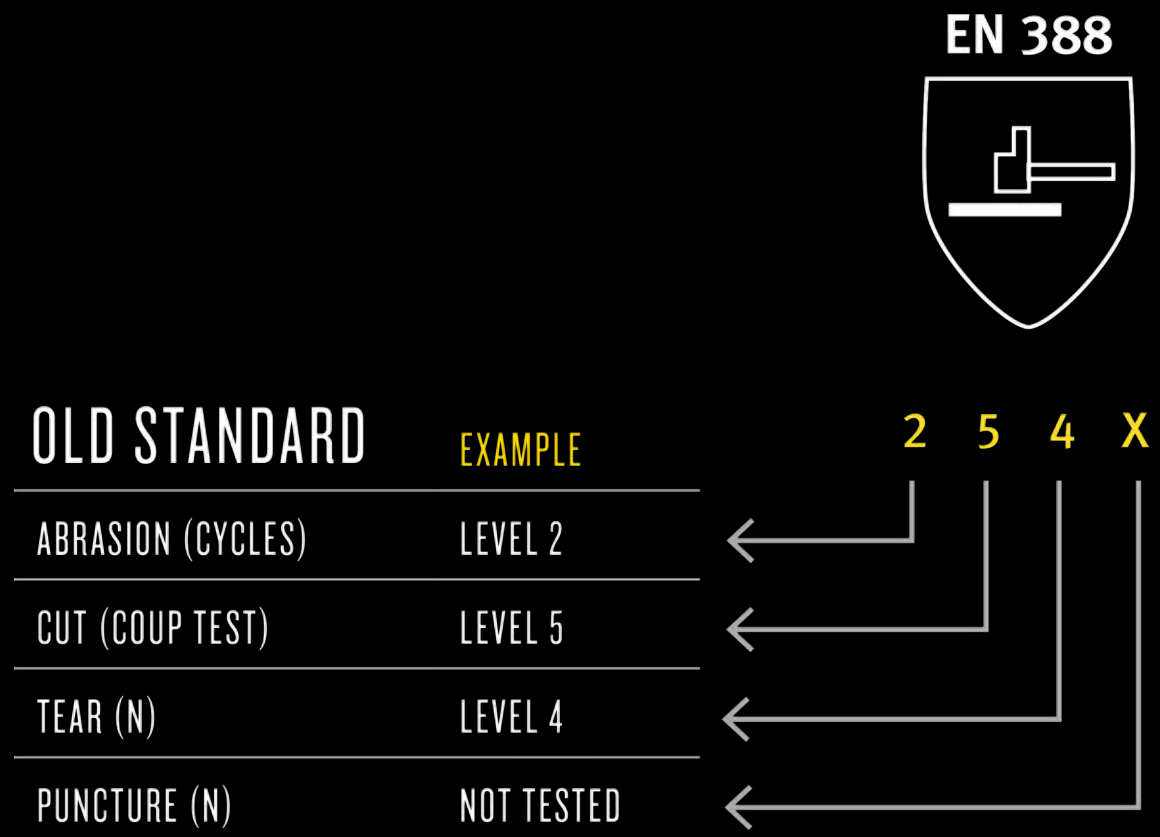
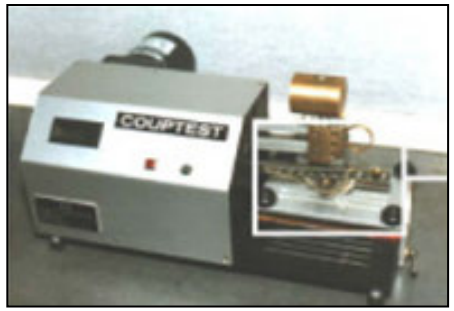
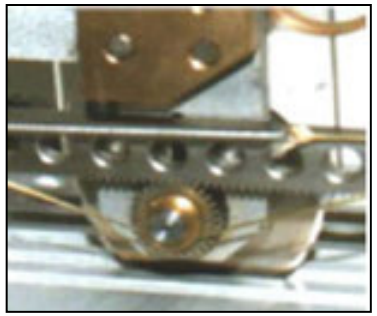
EN 388 (European Norm)

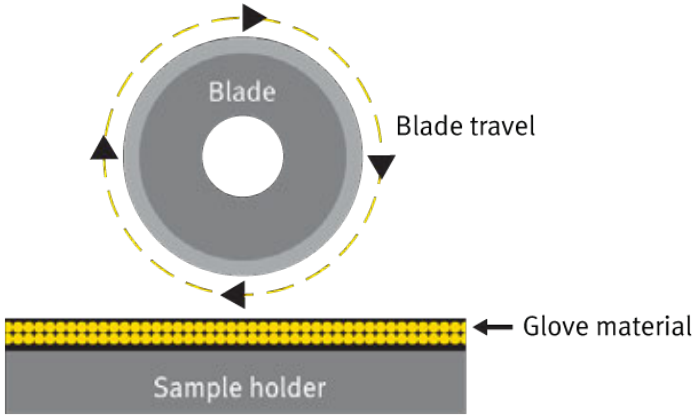


- Standard referenced throughout the entire EU
- Government regulated
- Gloves are marked with levels of mechanical performance only
- Although a European standard, it is recognized globally

Current EN 388 Test Equipment

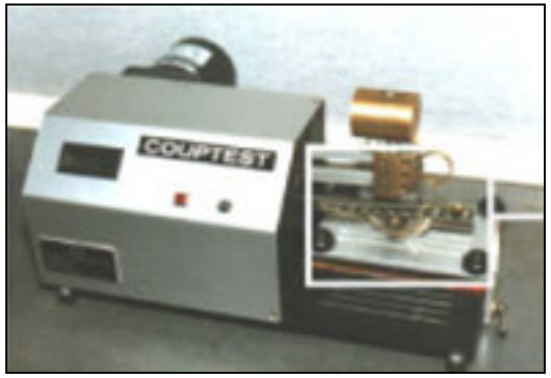






- The blade is reused
- The cut resistance measured is a ratio of performance of the sample to the performance of a control fabric (cotton canvas)
- ISO 13997 is recommended instead for materials with higher cut performance

Inclusion of the TDM-100



- The most significant change will be in regard to the acceptance of the ISO 13997 (TDM) cut test method (accounts for dulling of blade in Coup 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 Coup test method results
- There will be a change of the abrasive paper used
- A new impact-protection threshold will be added

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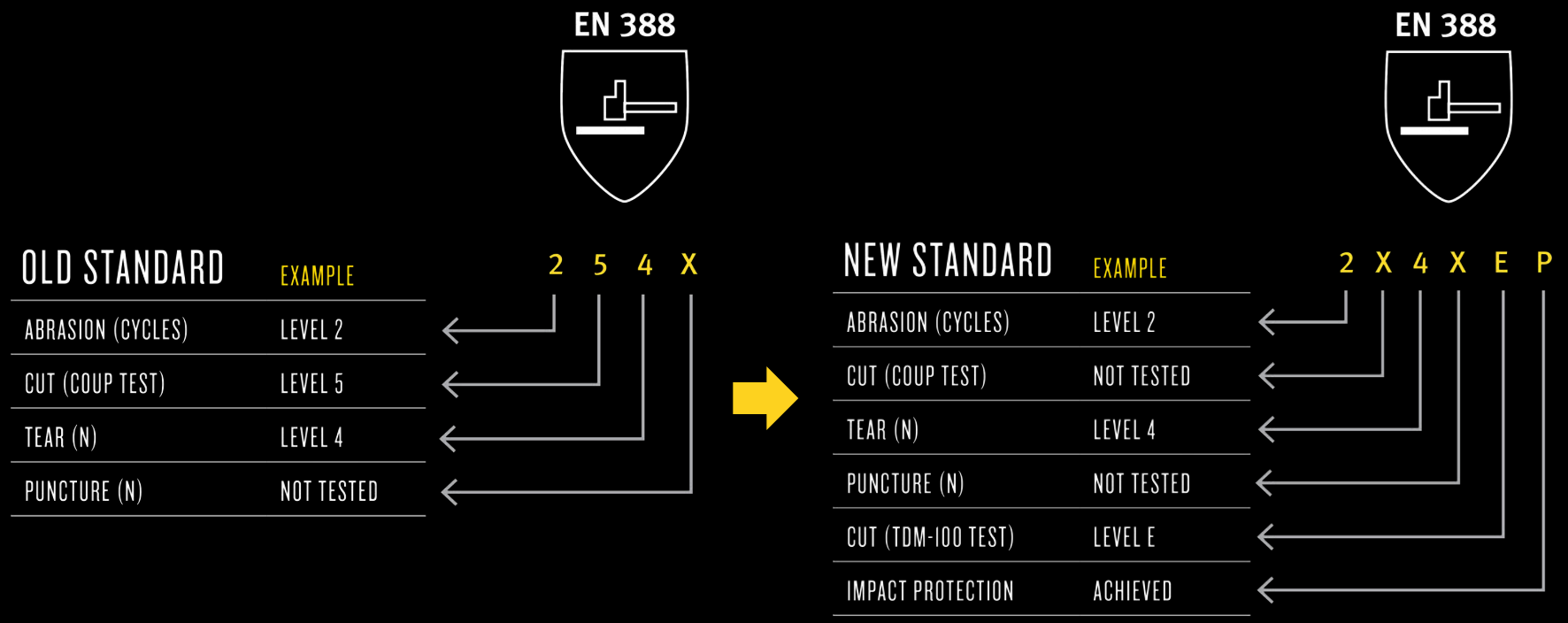
What Are The Changes? – EN 388



If Impact Protection is not measured, that digit is left blank.

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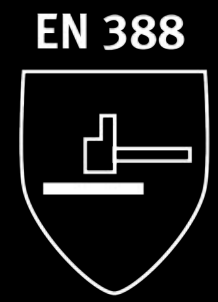
What Are The Changes? – EN 388



NEW STANDARD	EXAMPLE	2 X 4 X E P
ABRASION (CYCLES)	LEVEL 2	2
CUT (COUP TEST)	NOT TESTED	X
TEAR (N)	LEVEL 4	4
PUNCTURE (N)	NOT TESTED	X
CUT (TDM-100 TEST)	LEVEL E	E
IMPACT PROTECTION	ACHIEVED	P

NEW EN LEVEL	LEVEL A	LEVEL B	LEVEL C	LEVEL D	LEVEL E	LEVEL F
TDM CUT RESISTANCE (N)	2	5	10	15	22	30

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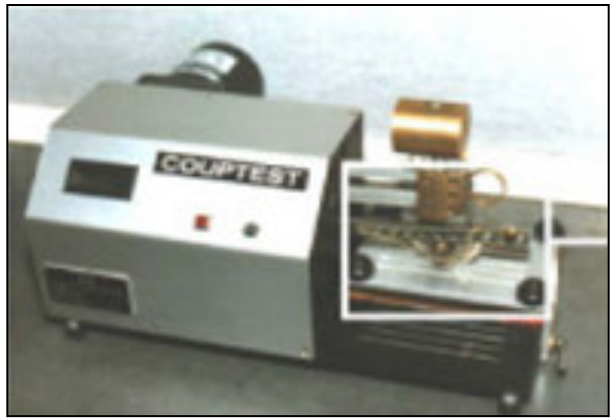
Coupe method cannot be used interchangeably with ASTM & ISO

EN 388 Coup Method



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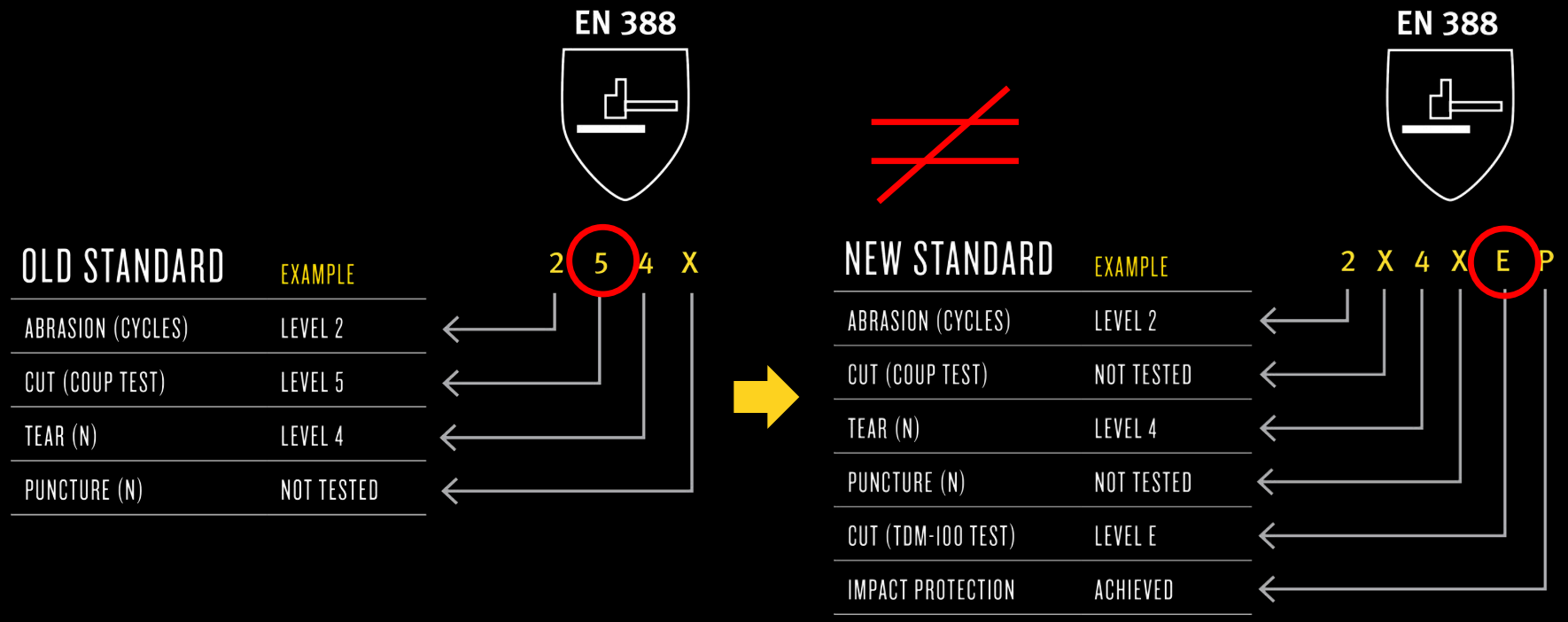
ANSI/ISEA 105-16 & ISO 13997

TDM

What Are The Changes? – EN 388



NO CORRELATION between Coup method and TDM-100 method

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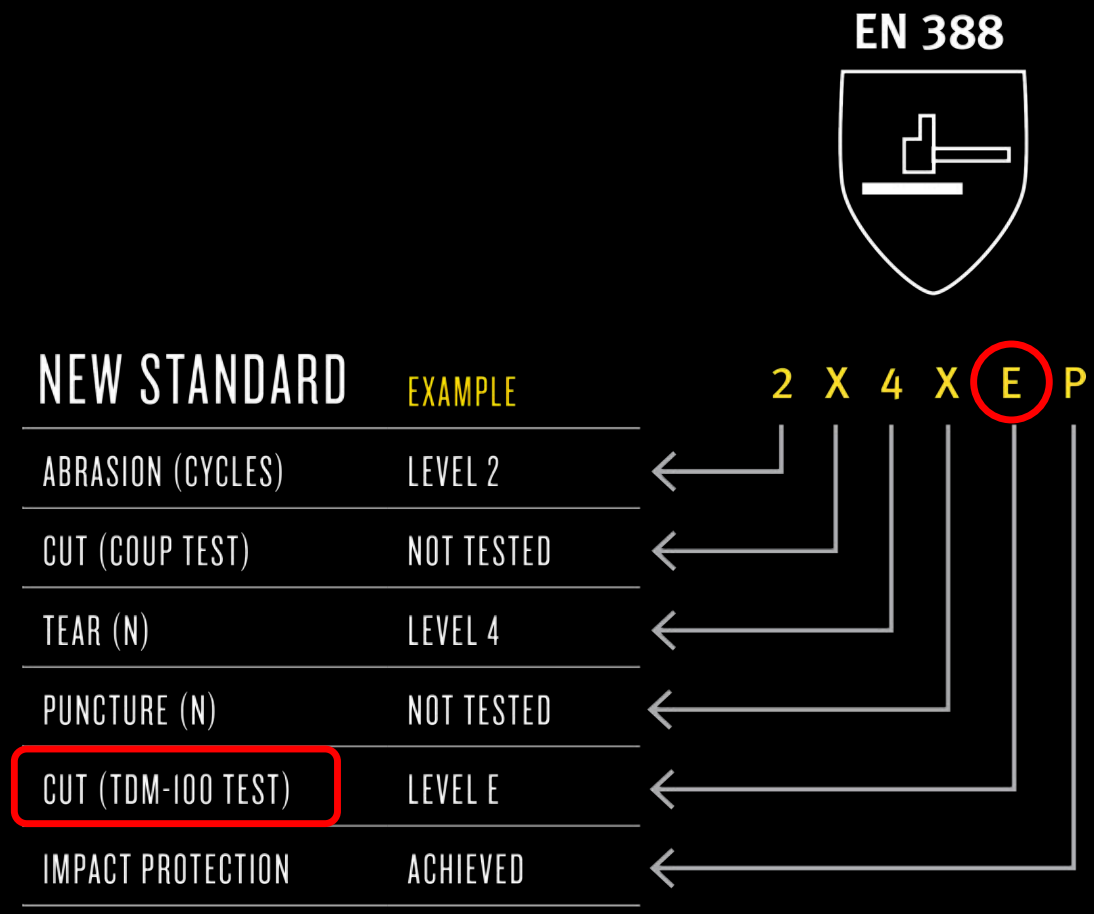
When Can I Compare EN to ANSI?



Only when TDM has been applied to both

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When Can I Compare EN to ANSI?

TDM CUT RESISTANCE (N)	LEVEL
2	A
5	B
10	C
15	D
22	E
30	F

LOAD(GRAMS)	ANSI/ISEA 105-16
<200	–
201-499	A1
500-999	A2
1000-1499	A3
1500-2199	A4
2200-2999	A5
3000-3999	A6
4000-4999	A7
5000-5999	A8
>6000+	A9

Only when TDM has been applied to both

Summary

- Both the ANSI/ISEA 105 and EN 388 Standards for the evaluation of cut-resistant materials have been updated
- Most significant changes will be in regard to the:
  - Expansion of the ANSI/ISEA levels from 5 to 9, with more granularity above the 1500-gram level; new levels are prefaced with an "A"
  - Acceptance and inclusion of the ISO 13997 TDM-100 method in the revised EN 388 Standard; levels achieved through the use of the TDM method will be lettered A through F to avoid confusion with the Coup test method results
- There is a change to the Abrasion section for both ANSI/ISEA and EN
- A new impact-protection threshold will be added to EN 388
- A new method for determination of hypodermic needle puncture has been added to ANSI/ISEA