



EARN

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## EN 388 - MECHANICAL RISKS

When it comes to work gloves for mechanical risks, CE standard EN 388 measures overall performance against abrasion, cut, tear, puncture, and impact injuries.

EN 388



# 4X43FP

4X43FP

ABRASION PERFORMANCE

4X43FP

BLADE-CUT PERFORMANCE

4X43FP

TEAR PERFORMANCE

4X43FP

PUNCTURE PERFORMANCE

4X43FP

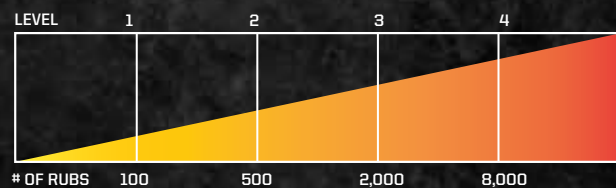
IMPACT PERFORMANCE

### ABRASION PERFORMANCE

4X43FP

#### PERFORMANCE LEVELS 0-4

The abrasion test is performed as the rubbing heads move in an elliptical motion, and the number of cycles required to abrade through the material is recorded. The advertised performance level is the lowest recorded result of 4 complete material tests.

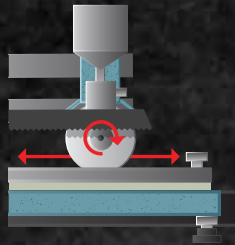


### BLADE-CUT PERFORMANCE

4X43FP

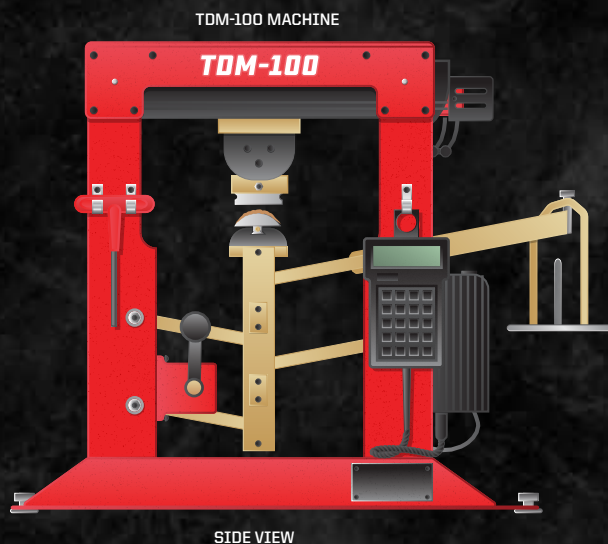
#### COUPE TEST

The Coupe Test uses a circular blade to produce a 1-5 performance rating, but has its limitations when it comes to high-cut composite/aramid fiber material and metal blends, which can cause Coupe Test blades to dull and produce false readings. The circular blade test uses a rotating blade under 5N of contact force that tracks backwards and forwards across the surface of the test material. The number of strokes is recorded until the blade cuts through the test material.



#### TDM TEST

The TDM straight blade travels once across the test material and is only used once. TDM Test rates materials on a scale of A - F and uses an oscillating blade that measures the force necessary to cut through high-cut materials. Materials that test beyond Level 3 or produce a false Coupe Test reading will receive an "X", and the TDM Test is introduced where a letter rating A - F is determined (Example 4X43FP). If the TDM Test isn't required, an "X" is used to state that there's no rating (Example 4243XP).

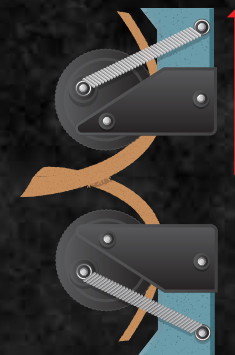


### TEAR PERFORMANCE

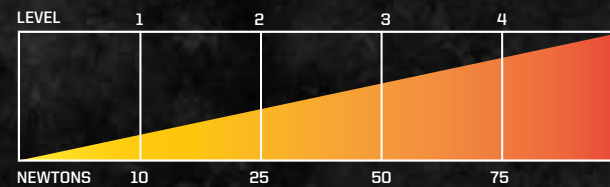
4X43FP

#### PERFORMANCE LEVELS 0-4

Tear resistance is measured with a standard tensile strength machine using pre-cut palm material from four glove samples. The jaws of the machine are fitted with the sample material and tear resistance is measured as the jaws move apart at a constant rate of speed (100mm/min). The force needed to tear the material is recorded and the lowest result of four tests is advertised.



The jaws of the machine are fitted with the sample material and tear resistance is measured as the jaws move apart at a constant rate of speed. The force needed to tear the material is recorded and the lowest result of four tests is advertised.



### PUNCTURE PERFORMANCE

4X43FP

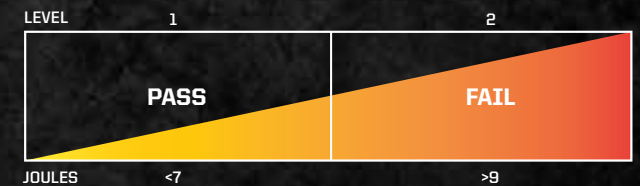
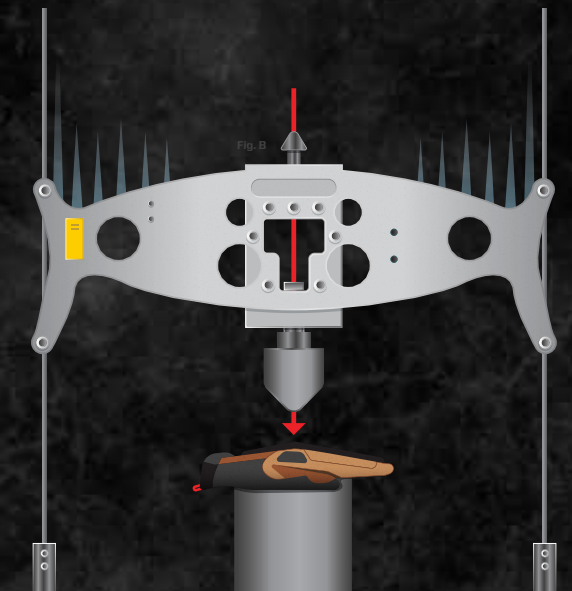
#### PERFORMANCE LEVELS 0-4

Puncture resistance is measured using a rounded stylus, which is pushed 50mm at constant speed of 100mm/min using a compression test machine. The amount of force needed to puncture the material is recorded and the lowest result of 4 tests is advertised.

### IMPACT PERFORMANCE

4X43FP

#### PASS / FAIL



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## EN 388 / ANSI - CUT STANDARD

The American National Safety Institute (ANSI 105) is a global organization that safety professionals can rely on to provide testing results for cut resistant gloves. The standard is followed by Europe, Canada, Australia/New Zealand/Pacific, Mexico, and South America.

EN 388

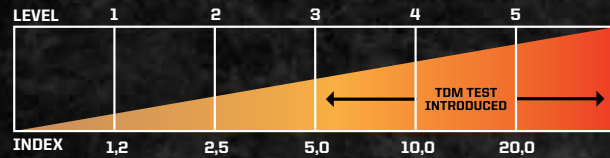


4X43FP

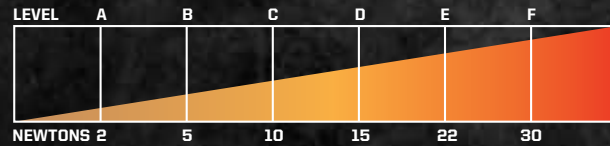
### EN CUT LEVELS DEFINED

The second number – cut-resistance, is based on the Coup test method. Materials that test beyond Level 3 or produce a false Coupe Test reading will receive an "X", and the TDM Test is introduced where a letter rating A - F is determined (Example 4X43FP). If the TDM Test isn't required, an "X" is used to state that there's no rating (Example 4243XP).

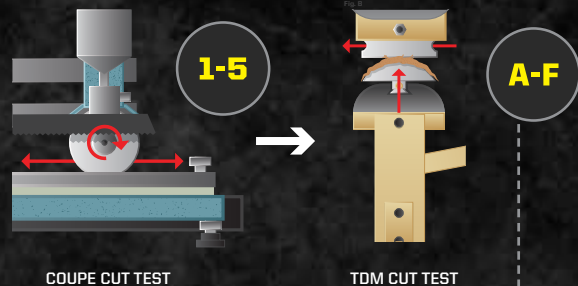
#### COUPE TEST (5N CONTACT FORCE)



#### TDM TEST

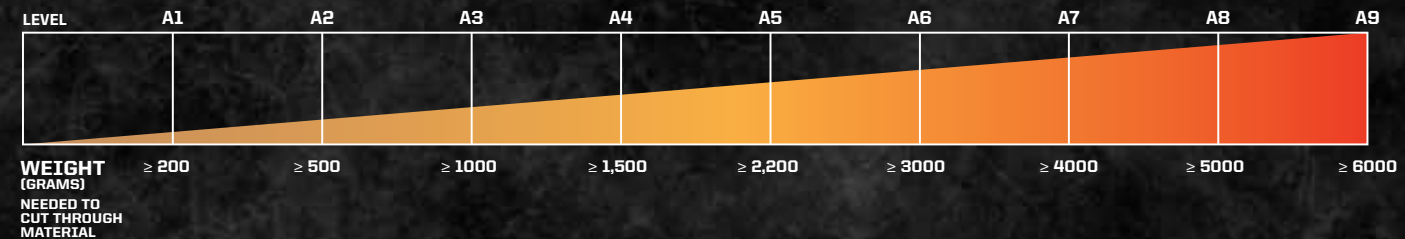
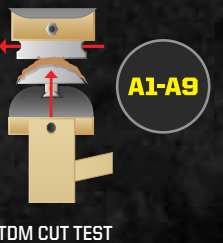


The EN 388 standard continues with its 1-5 numerical rating for cuts that use the Coup test and adds an alpha-identifier (A-F) to align with and provide comparison to the ANSI 1-9 rating, using the ISO test.



### ANSI CUT LEVELS DEFINED

The ANSI cut-resistant gloves are displayed on the glove or tag using an "A" followed by a number, 1-9, such as A3 or A8. The ANSI/ISEA 105 and EN 388 are now synchronized by both organizations following the ISO 13997 standard using the Tomodynamometer machine (TDM 100) test. This allows for the end users to compare cut-resistant levels knowing the testing for each standard is the same.



#### WHAT ARE THE DIFFERENT ANSI CUT LEVELS?

ANSI revised the cut scores from a 1-5 rating (up until 2016) to 1-9, the higher the number, the more cut-resistant the glove. For industries with high risk cut hazards, expanding the cut-level rating allows for greater accuracy in matching the glove to the identified hazard.

In 2016, International Safety Equipment Association (ISEA) and ANSI released an updated scale with nine levels of cut protection to measure performance. These levels indicate the grams of cutting load the gloves can bear from a sharp blade before penetrating.

### TDM CUT LEVELS

<b>A</b>	<b>2 NEWTONS (204gms)</b>	General purpose, light material handling, small part assembly
<b>B</b>	<b>5 NEWTONS (505gms)</b>	Automotive, packaging, warehousing
<b>C</b>	<b>10 NEWTONS (1020gms)</b>	Oil and gas, maintenance, metal handling, light assembly
<b>D</b>	<b>15 NEWTONS (1530gms)</b>	Manufacturing, automotive, electrical installation
<b>E</b>	<b>22 NEWTONS (2243gms)</b>	Metal fabrication, glass manufacturing, automotive assembly, waste management
<b>F</b>	<b>30 NEWTONS (3059gms)</b>	Pulp/paper, heavy metal stamping; glass handling; waste management; recycling

<b>A1</b>	<b>200 - 499 grams</b>	<b>Protects light cut hazards</b> <i>General purpose, warehousing, small parts assembly</i>
<b>A2</b>	<b>500 - 999 grams</b>	<b>Offers light to medium protection from cut hazards</b> <i>General purpose, automotive, plastics injection and moulding, pulp and paper</i>
<b>A3</b>	<b>1000 - 1499 grams</b>	<b>Provides light to medium cut protection</b> <i>Raw material handling, oil and gas, general manufacturing, construction</i>
<b>A4</b>	<b>1500 - 2199 grams</b>	<b>protects against medium-cut hazards</b> <i>HVAC, manufacturing, aerospace, food prep</i>
<b>A5</b>	<b>2200 - 2999 grams</b>	<b>offers medium to heavy protection from cut hazards</b> <i>Metal fabrication, glass or metal sheet handling, automotive assembly, HVAC</i>
<b>A6</b>	<b>3000 - 3999 grams</b>	<b>protects from high cut hazards</b> <i>Metal stamping, glass manufacturing, changing blades</i>
<b>A7</b>	<b>4000 - 4999 grams</b>	<b>covers high cut hazards</b> <i>Meat prep/processing, glass manufacturing, metal stamping</i>
<b>A8</b>	<b>5000 - 5999 grams</b>	<b>gives high cut protection</b> <i>Waste management, recycling, heavy assembly</i>
<b>A9</b>	<b>6000+ grams</b>	<b>offers protection from high cut hazards</b> <i>Sharp metal stamping, recycle sorting, metal fabrication</i>

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## ANSI / ISEA 138 - IMPACT STANDARD

ANSI / ISEA 138 is intended to protect hands where heavy tools and heavy equipment are at work. Construction, oil & gas, mining, automotive, and manufacturing industries will all benefit from this impact standard and its 3 designated performance levels of impact protection.

ANSI / ISEA 138



ANSI / ISEA 138



ANSI / ISEA 138

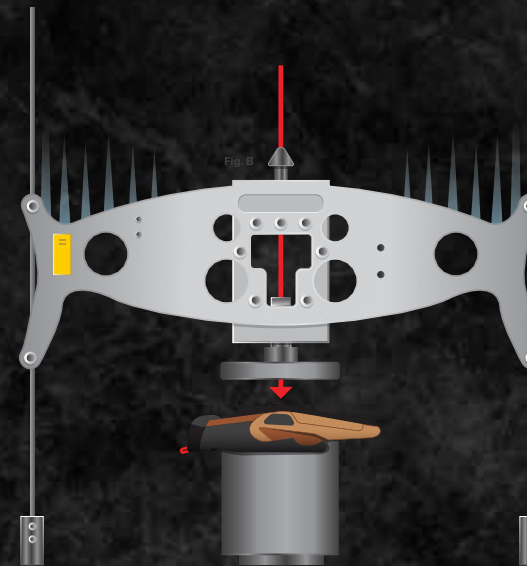


ANSI / ISEA 138 is the American National Standard for Performance & Classification of Impact-Resistant Work Gloves, and is intended to protect hands where heavy tools and heavy equipment are at work. Construction, oil & gas, mining, automotive, and manufacturing industries will all benefit from the new standard and its 3 designated performance levels of impact protection.

ANSI / ISEA 138 compliant impact-resistant gloves are measured by their ability to dissipate impact forces on the knuckles and fingers.

Not all industries encounter the same impact risks, therefore not all industries require the same impact gloves. ANSI / ISEA 138 will require manufacturers to produce hand protection with degrees of impact resistance to reduce bruising, fractures, breakage and pinched fingers in industries where impact energies are experienced.

So how do the folks in the lab do it? When it comes to ANSI/ISEA 138 impact resistance, every focal point is measured for all-around performance testing.



### IMPACT MACHINE

#### HOW IT WORKS

The impact machine is prepared with a 5.5 pound steel striker and released along a vertical path with  $5 \pm .02$  J of force onto the glove sample placed. The sample is placed on a test anvil attached through a force transducer for recorded measurement.

#### FINGER TEST

**1<sup>x</sup>** Per Finger

**10** Total Impacts

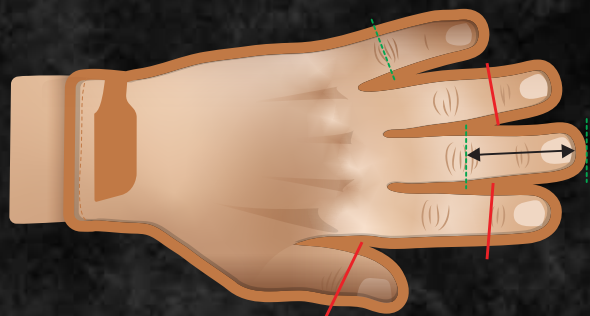
#### KNUCKLE TEST

**1<sup>x</sup>** Per Knuckle

**8** Total Impacts

### PREP FOR FINGER TEST

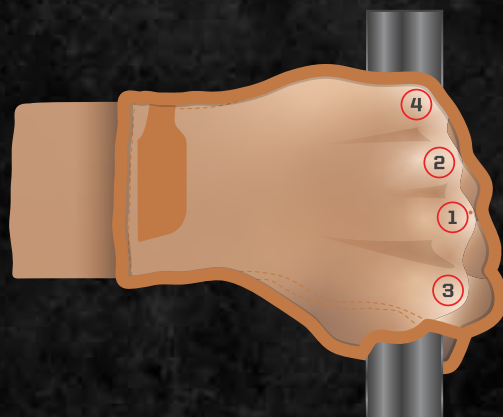
The index, ring finger and thumb impact sites are determined by measuring 25 mm  $\pm$  1.25 mm (0.98 in.  $\pm$  0.05 in.) from the fingertip down the middle of the finger. The pinky and middle finger impact sites are determined by measuring 50 mm  $\pm$  2.5 mm (1.97 in.  $\pm$  0.1 in.) from the fingertip down the middle of the finger.



— 25MM FROM TIP  
 ..... 50MM FROM TIP

### PREP FOR KNUCKLE TEST

The impact sites for testing the knuckle are determined by gripping a bar between 1-1.5 in. in diameter and 4.72 in. in length. The most prominent point of each of the 4 knuckles is marked on the glove by 3 assessors and the triangle between the 3 marked points is centered on the testing anvil.



Performance Level	Mean (kN)	All Impacts (kN)
ANSI / ISEA 138 	$\leq 9$	$< 11.3$
ANSI / ISEA 138 	$\leq 6.5$	$\leq 8.1$
ANSI / ISEA 138 	$\leq 4$	$\leq 5$

### PERFORMANCE + CLASSIFICATION

#### IMPACT-RESISTANT GLOVES

The overall impact performance level of the glove is determined by the lowest recorded performance level. For example, if the fingers and thumb are rated as performance level 1, but the knuckles are performance level 2, then the entire glove is rated as performance level 1.



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## EN 511 - COLD ENVIRONMENTS

Air temperature, wind speed, and moisture present major challenges for working hands in cold environments. EN 511 specifies the requirements and test methods for winter gloves designed to protect against convective and conductive cold down to -50 °C.

EN 511



11X

### CONVECTIVE COLD TEST

11X

#### PERFORMANCE LEVELS 0-4

The glove sample is placed on an electrically heated mannequin hand (Fig. A) that measures the amount of power required to maintain 30°C and 35°C in a controlled environmental chamber.



FIG. A

### CONTACT COLD TEST

11X

#### PERFORMANCE LEVELS 0-4

The glove sample is placed between metal plates which are at different temperatures (Fig. A) in order to measure the temperature drop (Fig. B), also known as thermal resistance.



FIG. A

FIG. B

11X

CONVECTIVE COLD PERFORMANCE

11X

CONTACT COLD PERFORMANCE

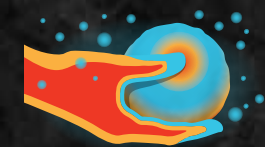
11X

WATER PENETRATION PERFORMANCE



#### CONVECTION

The process of losing heat through the movement of air or water on the skin.



#### CONDUCTION

The process of losing heat through physical contact with another object, such as frozen ball of ice.



#### HEAT RETENTION

Refers to the amount of heat an object or material can store over a period of time.

FIG. B

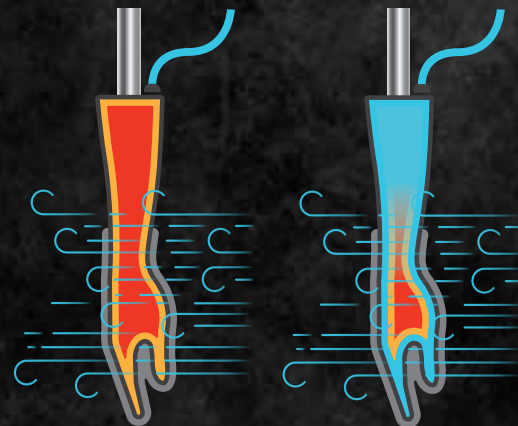
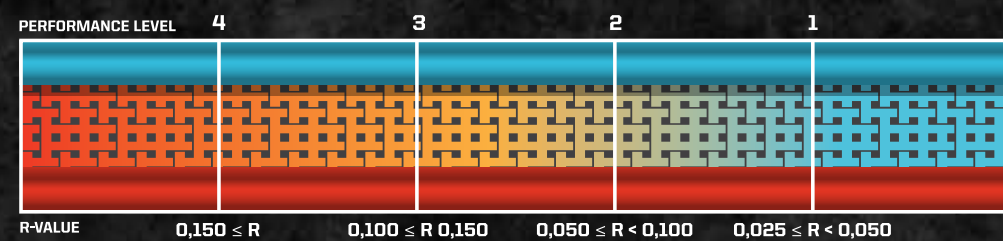
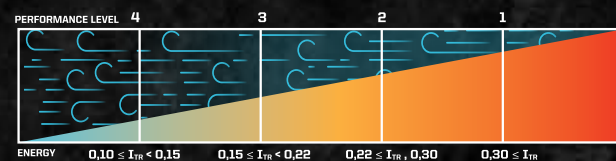


FIG. B

FIG. C

The chamber is cooled down to 20°C below that of the heated hand, and constant air flow is applied (Fig. B). The more electrical power required, the lower the thermal insulation rating of the glove (Fig. C).



\*R-value depends on material resistance to heat conduction, as well as the thickness of the material normalized to the thermal conductivity.

### WATER PENETRATION TEST

11X

#### PERFORMANCE LEVELS 0-1

The glove sample is fully submerged in water for 5 minutes to measure its permeability (Fig. A). If the glove maintains impermeability for the 5-minute duration, it will receive a Level 1 "Pass Rating". If the glove takes on water during the 5-minute duration, it will receive a Level 0 "Fail" rating (Fig. B).

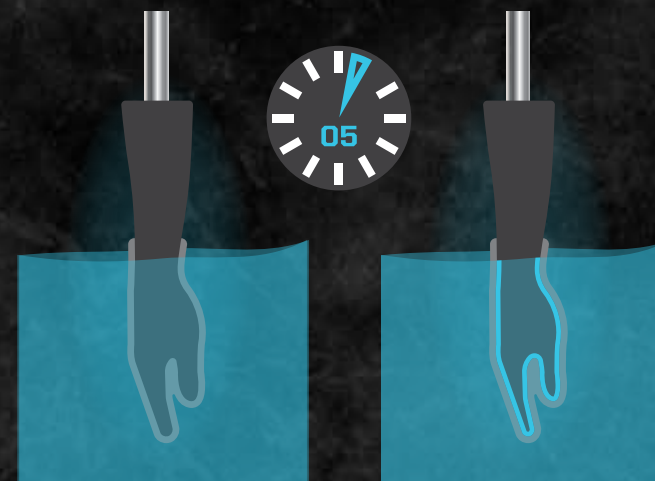


FIG. A

FIG. B

# LEARN

## EN 407 - THERMAL RISKS

EN 407 is an international glove standard that consists of 6 independent performance tests designed to measure and define thermal resistant work gloves.

EN 407



ABCDEF

It's important to understand the varying degrees of EN 407 in order to select the right thermal-resistant work gloves. EN 407 is an international glove standard that consists of 6 independent performance tests designed to measure and define thermal work gloves.

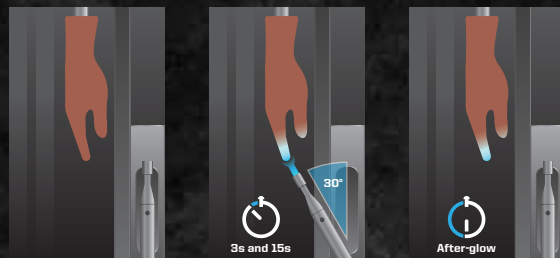
ABCDEF	BURNING BEHAVIOR
ABCDEF	CONTACT HEAT
ABCDEF	CONVECTIVE HEAT
ABCDEF	RADIANT HEAT
ABCDEF	SMALL MOLTEN METAL DROPS
ABCDEF	LARGE QUANTITIES OF MOLTEN METAL

### BURNING BEHAVIOR

ABCDEF

#### PERFORMANCE LEVELS 0-4

Work gloves designed for high-heat exposure must be tested using the vertical flame test to measure both after-burn time and after-glow time for EN 407 certification. This test measures the ability of the material to extinguish itself after being ignited using 4 performance levels.

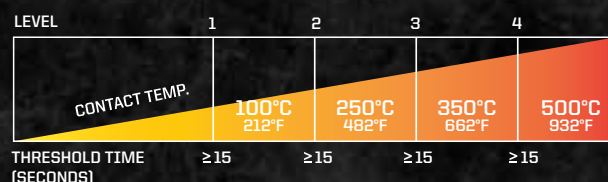
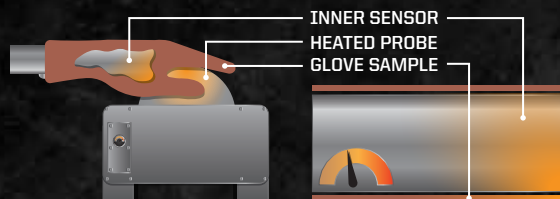


### CONTACT HEAT TEST

ABCDEF

#### PERFORMANCE LEVELS 0-4

Thermal protection from contact heat is determined by measuring a temperature rise of 10° C (50° F) on the inside of the glove. This is achieved by placing sample material on pre-heated plates and recording the temperature rise at each level for at least 15 seconds. When the Contact Heat performance level reaches 3 or 4, the Burning Behavior test must be performed and achieve at least a level 3, otherwise the maximum performance rating for Contact Heat will be reported as level 2.

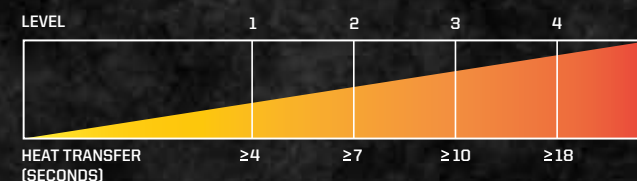
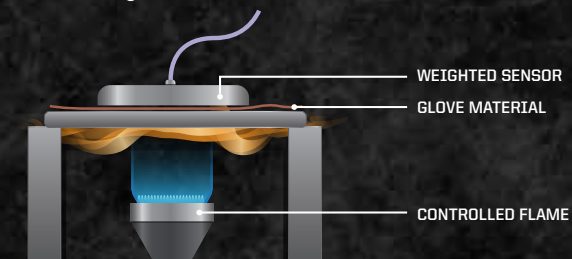


### CONVECTIVE HEAT TEST

ABCDEF

#### PERFORMANCE LEVELS 0-4

Thermal protection from convective heat is determined by measuring the rate of temperature rise inside the glove when put in contact with a controlled gas flame.

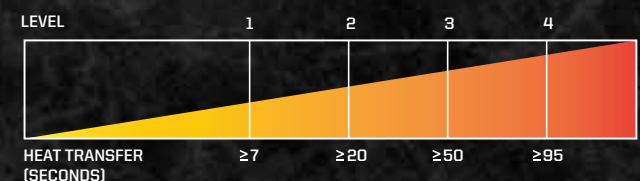
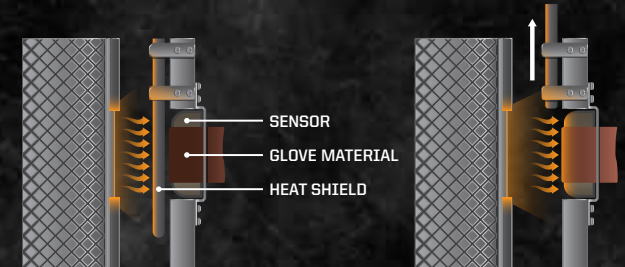


### RADIANT HEAT TEST

ABCDEF

#### PERFORMANCE LEVELS 0-4

Thermal protection from Radiant Heat is determined by measuring a temperature rise of 24°C (75°F) inside the glove when exposed to a defined heat source.

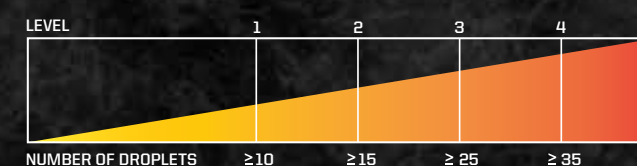
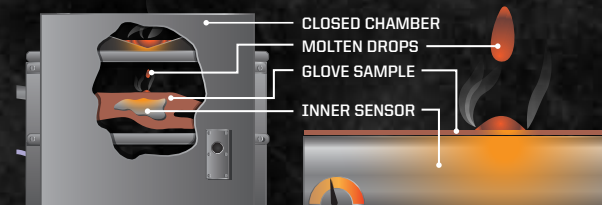


### SMALL MOLTEN METAL TEST

ABCDEF

#### PERFORMANCE LEVELS 0-4

Thermal Resistance to Small Drops of Molten Metal testing is measured by the number of droplets that produce a temperature rise of 40° C (104° F) inside the glove.

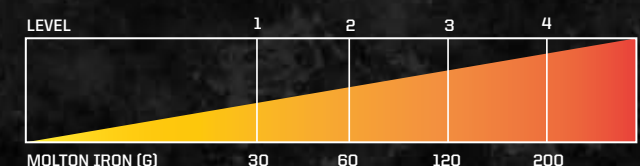
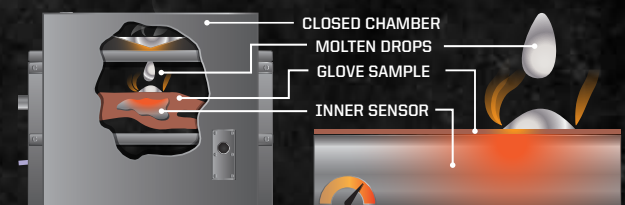


### LARGE MOLTEN METAL TEST

ABCDEF

#### PERFORMANCE LEVELS 0-4

Thermal Resistance to Large Quantities of Molten Metal testing is measured against PVC foil skin to simulate the inside of the glove, and molten metal is poured over the test sample.



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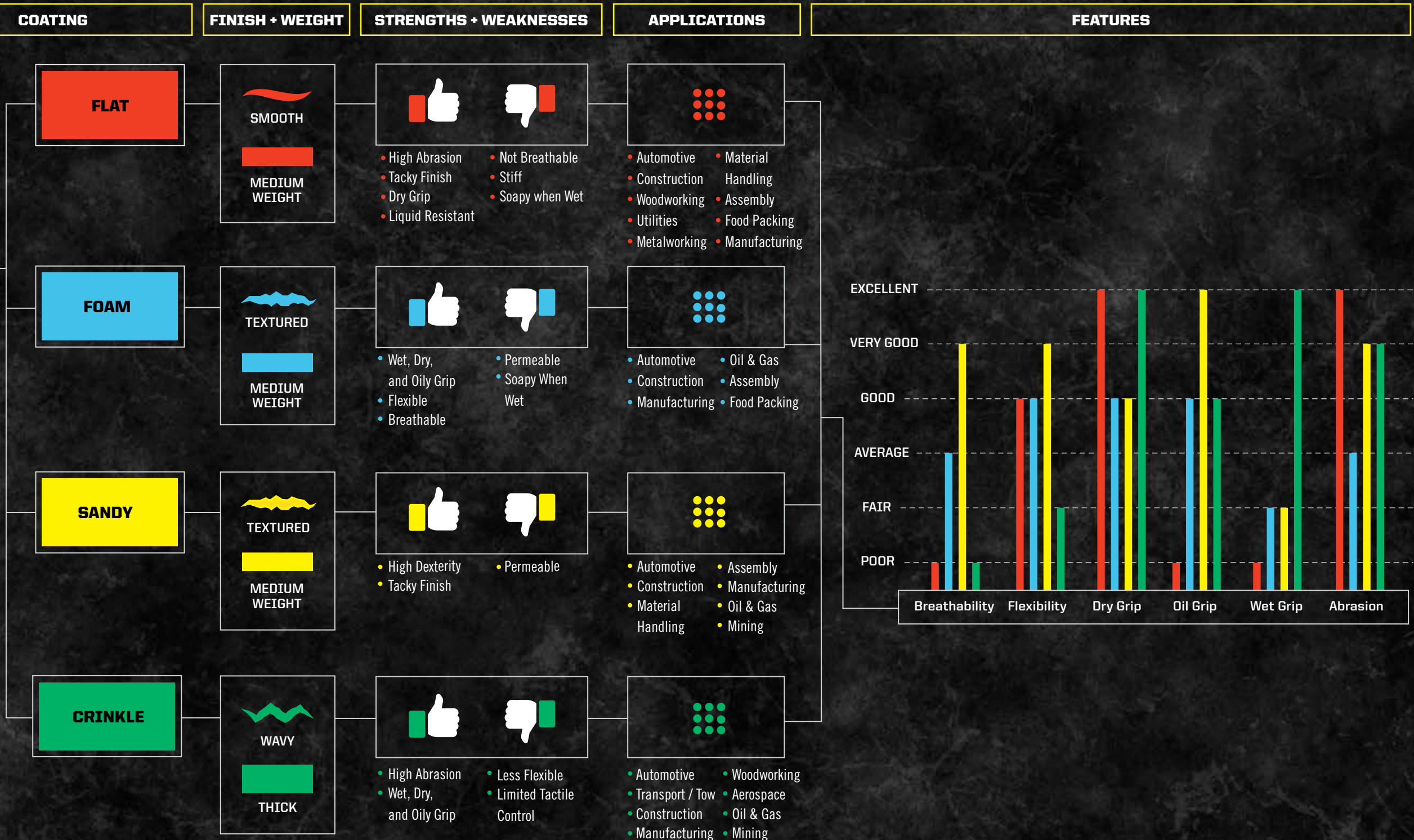
## PALM COATINGS USER'S GUIDE

Choosing the right set of knit gloves for the job also means choosing the right palm coating. Consider the task at hand — from the environment to the tools and materials at work. Dexterity and grip play an integral part in your work performance. The best set of knit gloves not only meets safety standards, but also meet the user's standards for comfort and performance.



### NITRILE

Nitrile has emerged as the most versatile glove coating due to its excellent puncture and tear resistance while maintaining good grip. Although it's not flame-resistant, nitrile can withstand surface contact up to 300°F and remains flexible below freezing temperatures. Nitrile coatings provide robust grip when working with oil, making it ideal for automotive and metal working applications.



COATING

FINISH + WEIGHT

STRENGTHS + WEAKNESSES

APPLICATIONS

FEATURES



**POLYURETHANE**

Polyurethane is ideal for fine mechanical work, but truly is the ultimate general purpose coating. The coating has a non-tacky feel this is softer to bare hands.

**SOLVENT BASED PU**

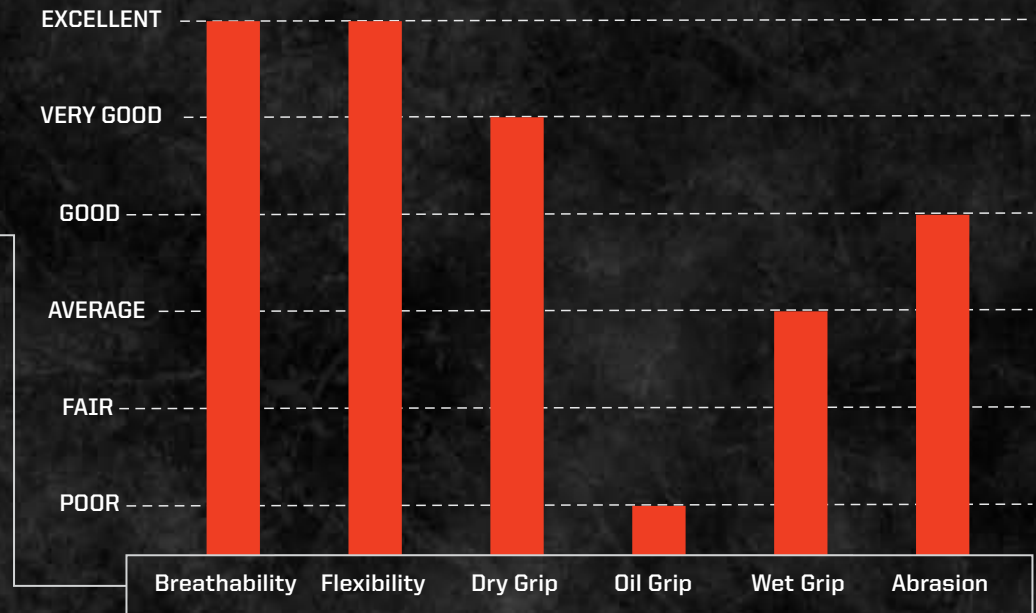
TEXTURED  
EXTRA THIN



- High Dexterity
- Good Abrasion
- Grip for Dry and Basic Liquids
- Porous
- Permeable
- DMF Levels



- Automotive
- Autobody
- Assembly
- Woodworking



**URETHANE**

Water based urethane coating is ideal for mechanical work as it provides similar abrasion resistance and puncture resistance as nitrile, while being thinner, more flexible and ultimately, more dexterous.

**WATER BASED URETHANE**

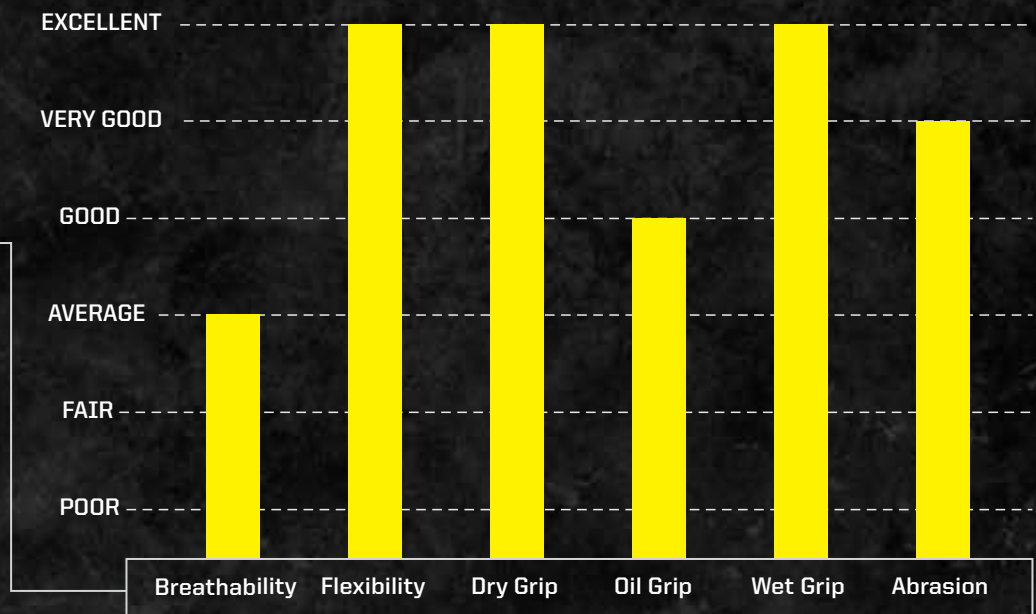
SMOOTH  
EXTRA THIN



- High Dexterity
- Touchscreen Capable
- Wet and Dry Grip
- REACH Compliant
- OEKO-TEX®100 Approved
- Superior Flexibility
- DMF Free
- Silicone Free
- Odor Free
- Heat
- Acids and Caustics



- Metal Fabrication
- Small Parts Handling
- Automotive
- Glass Handling
- Painting
- Inspection
- Aerospace
- Maintenance



COATING

FINISH + WEIGHT

STRENGTHS + WEAKNESSES

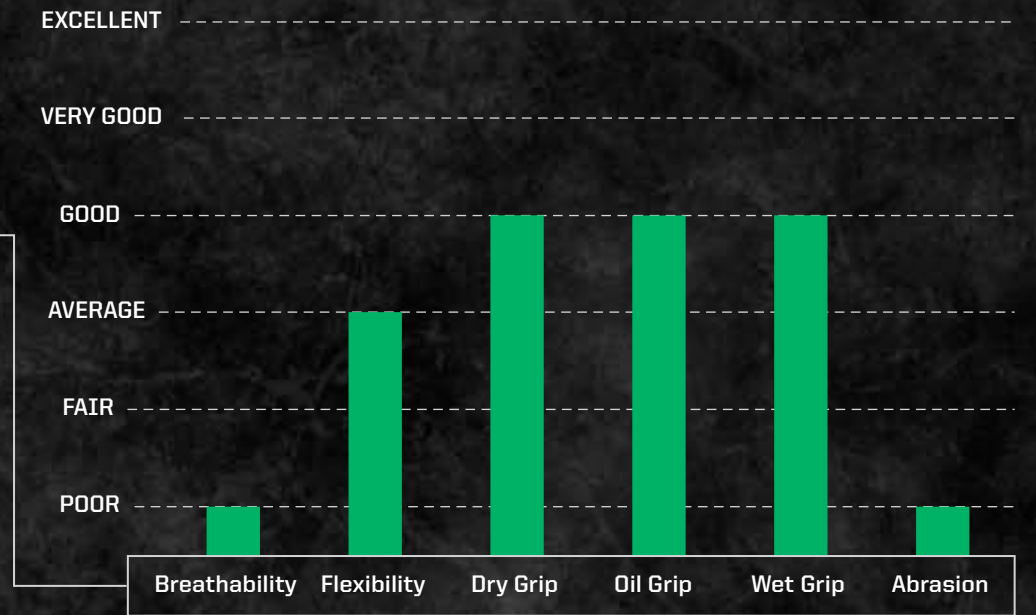
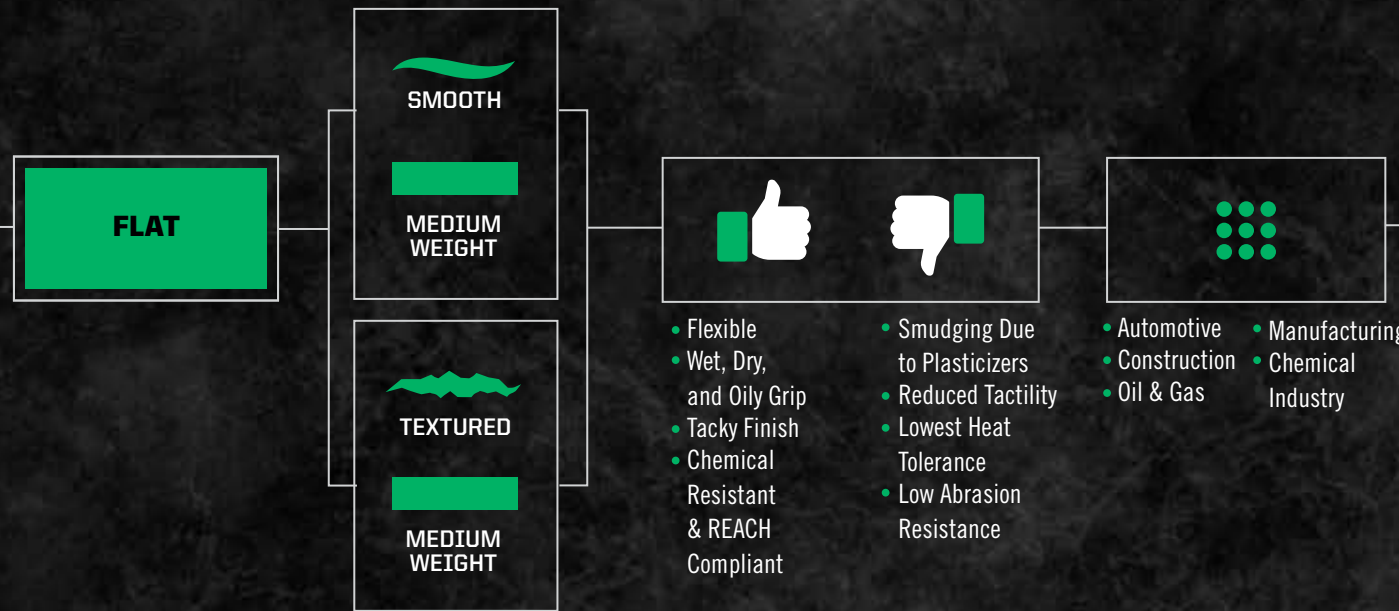
APPLICATIONS

FEATURES



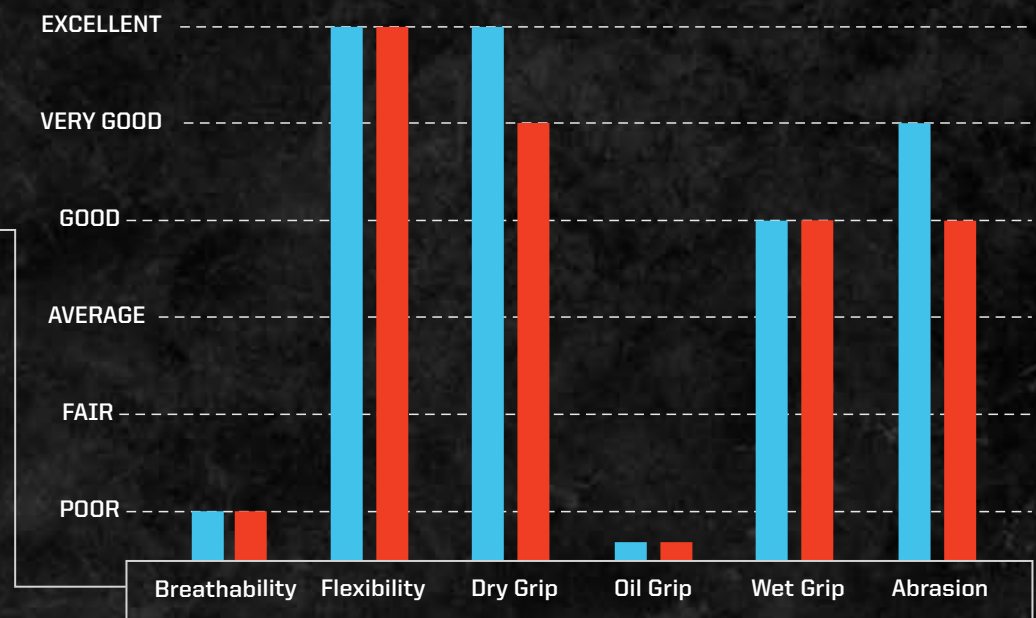
**POLYVINYL CHLORIDE (PVC)**

PVC coating is made with resins and plasticizers that offer good flexibility and basic liquid protection.



**NATURAL RUBBER LATEX**

Natural rubber latex comes from the harvesting of rubber trees. Latex is a sticky, milky fluid drawn off by making incisions in the bark and tapping the tree vessels. The latex is refined into rubber to produce natural rubber latex gloves with excellent flexibility, tactility and highly waterproof.



COATING

EXAMPLE #1

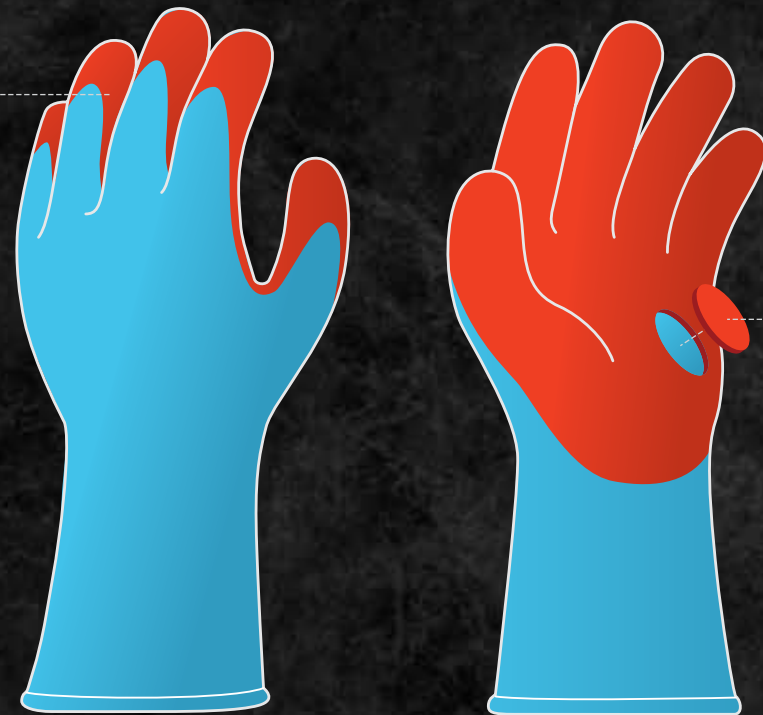
EXAMPLE #2



BI-POLYMER

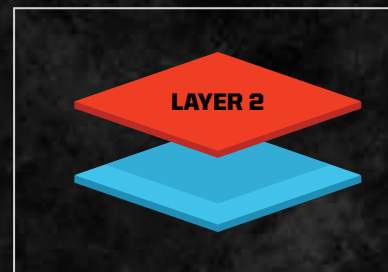
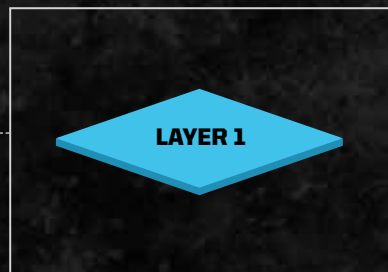
Bi-polymer coatings combine the best properties of multiple polymers to create high performing work gloves to specific industries. By utilizing bi-polymers it minimizes the weakness of different types of coatings while maximizing the performance.

DUAL-COATED BI-POLYMER



TOP COATING

PALM COATING

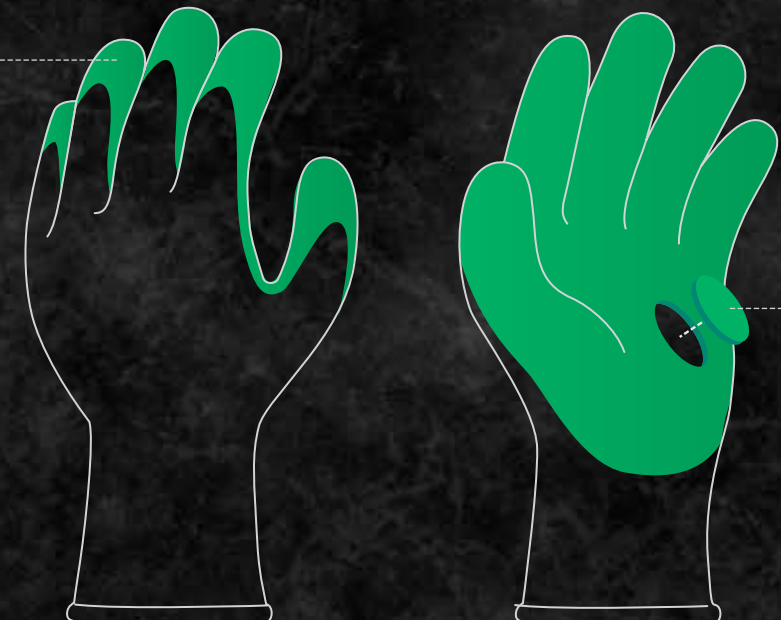


The first coating of PVC is applied and cured to provide chemical and fluid resistance.

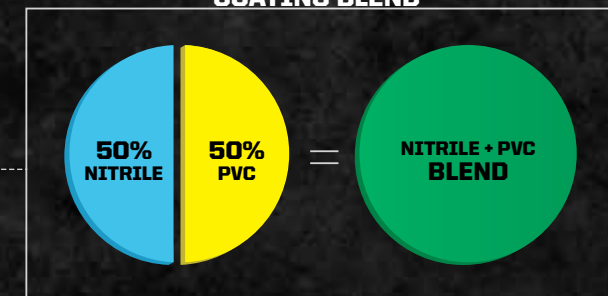
Once the first layer is cured and set, a second coating of foam nitrile is applied to provide ample abrasion resistance and grip performance in wet, dry, and oily conditions.

PERFORMANCE BASED

SOLUTION-BASED BI-POLYMER



COATING BLEND



Solution-based bi-polymer coatings like a 50/50 nitrile/PVC solution, utilizes the abrasion-resistance of nitrile and the flexibility of PVC to create a better-fitting glove option for the worker.

COST EFFECTIVE / ALLOWS YOU TO ACHIEVE SPECIFIC PROPERTIES



Mechanics  
Mechanics  
Mechanics