



Glovedia Series: **IMPACT**

Ironclad

PERFORMANCE WEAR

KONG®

WWW.IRONCLAD.COM



ironCLAD
#1 IN OIL AND GAS

L

ID:

KONG

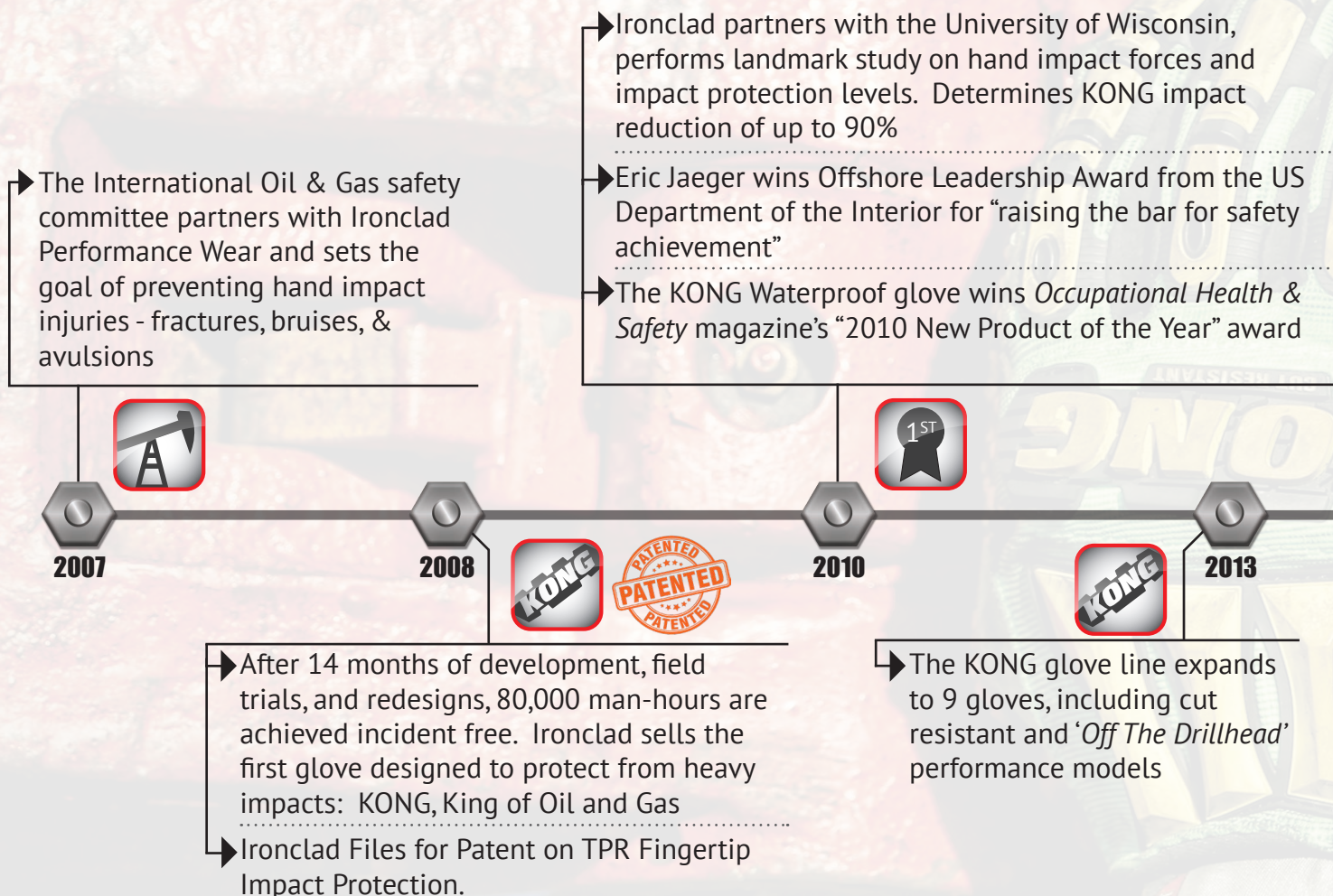
KONG

KONG
ORIGINAL



**IMPACT
PROTECTION
STARTED
HERE**

► Ironclad History & Milestones



In 2007 the Oil & Gas Safety Committee, represented by ExxonMobil, ConocoPhillips, Halliburton and other industry leaders, put out a call to action to the industrial safety market asking them to solve their industry's biggest problem: hand safety. Eye, head, and foot safety had been addressed, but hand injuries still represented more than 70% of all jobsite injuries. These injuries not only caused serious harm to their employees, but they also cost significant amounts of money and lost productivity. Ironclad Performance Wear and the Oil & Gas Safety Committee joined forces to solve this problem. The KONG® glove line is the result of that collaboration. Ironclad continues to be a technology leader in hand impact protection. We developed impact testing methods and ratings as early as 2010, nine years before ANSI issued their impact testing standard. We have continually expanded our glove range and options for impact gloves, including models with cut protection, weather protection, chemical protection, enhanced grip, enhanced visibility, etc. Today we have a wide range of impact glove styles, 21 US and international patents on impact glove technology, and have protected over 6 million hands from impacts.

► Ironclad partners with the U of W for the second time, expanding hand impact analysis to cadaver hands and new glove styles. Determines peak impact forces that cause bone fractures, and creates impact glove rating system.

► Ironclad introduces 18 new impact glove styles utilizing revolutionary IVE™ impact protection, designed to enhance hand visibility and awareness at greater distances and low light conditions



PEAK IMPACT PROTECTION

3X	150-50 lbs
10X	1000-100 lbs
6X	500-75 lbs

2015



2016

► Ironclad awarded US patent # for “Glove designed for use in oil and gas extraction”, U.S. Patent No. 9,241,519, January 26, 2016

► CE releases EN388 impact testing procedure & standards

► Patented I.V.E. impact technology is utilized on the Limitless Leather Impact Cut 5 glove, wins 2018 ‘New Product of the Year’ award from Occupational Health and Safety magazine.



2018



2019

► ISEA releases ANSI 138 impact testing procedure & standards

► Ironclad’s KONG impact protection glove line contains 23 active styles & has protected over 6,000,000 hands to date.

THE AVERAGE WORKPLACE HAND INJURY COSTS \$23,247.*
THERE WERE 121,860 RECORDED HAND INJURIES IN 2017.**

DEMAND THE BEST. DEMAND IRONCLAD.

**National Safety Congress InjuryFacts Database, 2015-2016*

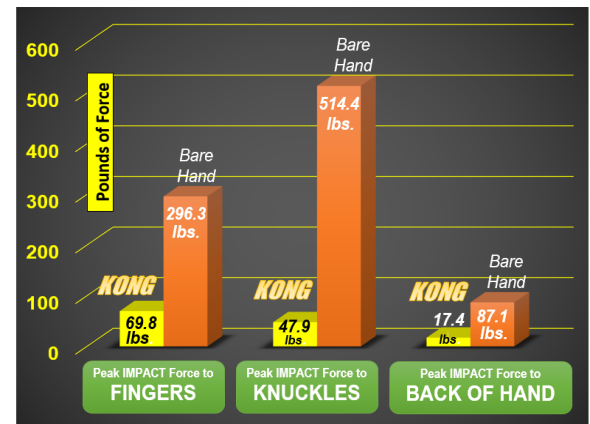
***US Bureau of Labor Statistics, 2017*

Ironclad Impact Studies



▶ In 2008, Ironclad introduced the world's first Heavy Impact protection glove, the KONG Original. As several other impact gloves came to market in 2010, with varying levels of impact protection and hand coverage, large drilling companies began asking for a way to evaluate the protection levels offered by different impact glove styles. Although glove standards existed for abrasion, cut, and puncture resistance, none existed for impact protection.

To address this, Ironclad's resident biomedical engineer, Eric Jaeger, teamed up with Dr Naira Campbell-Kyureghyan of the Biomechanics Laboratory at the University of Wisconsin-Milwaukee and set out to create a reliable, repeatable glove impact test. The requirements for this test included, simulation of real world impact forces, simulation of the biomechanical response of the human hand, measurement of impact forces at different zones covering the entire hand, establishing the determinant factor of blunt force trauma, and the determination of the protection level offered by a glove. Final results of this landmark study included complete impact testing protocols for weight, drop height, impact locations, sensor locations and force measurement techniques, creation of a biomechanically true 'ballistic manikin' hand, testing of the KONG Original glove at three zones - fingers, knuckle joints and metacarpal bones, determination that 'peak impact force' causes blunt force trauma, and the first-ever calculation of hand impact protection offered by a glove.

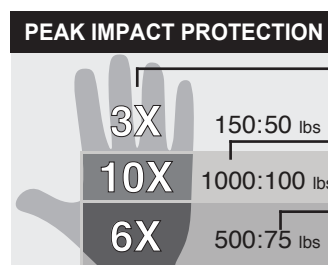


Ironclad introduced 18 impact glove styles between 2010 and 2015, and in the continuing effort to lead the hand impact protection field Mr. Jaeger and Dr. Campbell-Kyureghyan partnered again on a new impact testing study in 2015. In this study, testing was expanded to 18 different glove styles as well as human cadaver hands, which lead to the determination of the specific impact forces that cause bone fractures in the human hand. To summarize the results a new Impact Protection Symbol was created, which specifies the levels of impact protection provided to the hand when wearing a specific glove.

IMPACT PROTECTION SYMBOL

Peak Impact Forces resulting in a human hand bone fracture:

- **Fingers & Thumb:** 50 lbs
- **Knuckles:** 100 lbs
- **Metacarpal:** 75 lbs



Multiplication Factor - The additional impact protection provided by the glove

Peak Impact Force required to cause a fracture when wearing gloves

Peak Impact Force required to cause a fracture when *not* wearing gloves

2019 Standards Comparison

The European Union and the United States have developed independent testing standards and rating methods for hand impact protection. The international community relies on the CE EN388 Impact standard, while the United States and North America typically reference the new ANSI 138 Impact standard. These tests offer a good starting point when comparing hand impact protection offered by different glove models and manufacturers. The Ironclad Impact Standard and rating system goes above and beyond these two standards, providing full hand impact testing, real world simulation, and ratings that are relative to hand trauma. The section below explains these three testing standards, allowing you to compare their testing methodology, hand impact locations, data outcome and rating systems. We have also provided pros and cons for each standard.

CE/EN 388:2016 - International Standard

Four different specimens of the glove back-of-hand are tested. Each specimen is tested once, each at a different knuckle (total 4 knuckles). Each specimen is a flat piece of the glove, which is placed on a rounded anvil. A 2.5 kg (5.5 lbs) striker with a flat face is dropped on the specimen to create a 5 J impact energy. The transmitted force is recorded and the mean of the four tests is the rating. Thumb protection is not required.

Pros:

- Global/EU Acceptance
- Simple Pass/Fail Rating

Cons:

- Only Tests Knuckles
- Results Lack Resolution
- Does Not Simulate Real Hand
- Does Not Simulate Heavy Impact Hazards
- Difficult to Quantify Protection Value

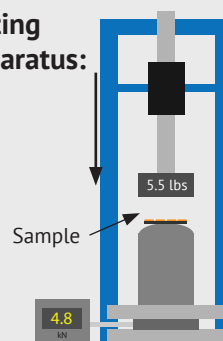
Data Outcomes:

Pass: $\leq 7\text{ kN}$
Fail: $> 7\text{ kN}$

EN 388:2016



Testing Apparatus:



Impact Zone:

- Knuckle



ANSI/ISEA 138 - United States Standard

Similar to EN 388 impact test. A 2.5 kg (5.5 lbs) flat faced striker is used and dropped onto the specimen with an impact energy of 5 J. The specimen is a piece of the back-of-hand of the glove, which is placed onto a rounded anvil. Both left and right hand pieces of the glove are tested. 18 different points within two zones between the pair of gloves are tested. Zone 1 being the fingers (5 tests per hand, one on each finger), Zone 2 being the knuckles (4 tests per hand, one on each knuckle). The mean is calculated based on each zone and a rating is provided based on the zone with the lowest result.

Pros:

- Tests 18 Points across Multiple Zones on Hand
- Detailed Rating System

Cons:

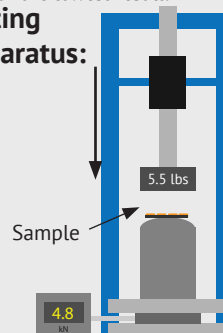
- Excludes Metacarpal Testing
- Does Not Simulate Real Hand
- Does Not Simulate Heavy Impact Hazards
- Difficult to Quantify Protection Value

Data Outcomes:

Level Force

ANSI / ISEA 138	1	$\leq 9\text{ kN}$
ANSI / ISEA 138	2	$\leq 6.5\text{ kN}$
ANSI / ISEA 138	3	$\leq 4\text{ kN}$

Testing Apparatus:



Impact Zone:

- Knuckle
- Fingers



Ironclad Global Standard

Minimum bone fracture levels are determined by dropping a 7.6 kg (16.8 lbs) flat rectangular mass onto fresh cadaver hands from a range of heights, creating 15 to 37 J of impact energy. Whole glove testing is performed by fitting gloves onto a custom ballistic manikin hand, with sensors located between the glove and hand at the fingers, thumb, knuckles and metacarpal bones. A 7.6 kg (16.8 lbs) flat rectangular mass is dropped onto the glove-hand combination, resulting in 15 J of impact energy at each zone. Baseline testing is performed by dropping the same mass onto the ballistic manikin hand without a glove. Peak impact forces are recorded by the sensors at the glove-hand interface. Reduction in peak impact force and the impact protection factor at each zone are calculated.

Pros:

- Tests all 3 Zones of the Hand
- Tests on Ballistic 3D Hand
- Rating System Provides Actual Impact Protection Factor
- Rating System is relative to Bone Fracture

Cons:

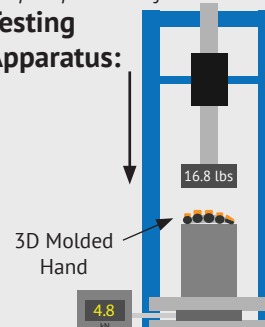
- Limited Testing Availability
- Cost Prohibitive
- Independent Studies

Data Outcomes:

PEAK IMPACT PROTECTION

3X	150:50 lbs
10X	1000:100 lbs
6X	500:75 lbs

Testing Apparatus:



Impact Zone:

- Knuckle
- Fingers
- Metacarpal



KONG® Original Impact

Born on the job site in 2008, our KONG® line was a direct response to a call to action from the Oil & Gas Industry Safety Committee to address impact related injuries on oil platforms. By using strategically and ergonomically placed TPR's and padding, KONG® gloves reduce impacts in the 3 most critical areas: Fingertips, Knuckles, and Metacarpals. Our patented design offers protection that extends from the back of the hand all the way to the tips of the fingers, which are sloped to better deflect impacts and pinches of the fingertips.

While originally designed for Oil & Gas, KONG® gloves are used in a variety of high impact industries, including extrication, construction, demolition, and mining.



Guaranteed Quality

We ensure that each pair of KONG® gloves performs as it should by measuring the durometer (hardness) of each TPR during the production process to ensure consistent impact protection for every pair of KONG® gloves.

Patents:

US: 9,241,519

US: D756,039



66%

Patented Fingertip Protection

Our patented sloped fingertip design extends all the way to the tip of the finger and **reduces impact by up to 66%.**

80%

Triple Padded Knuckle

By combining TPR protection and gel foam padding, KONG® impact protection **reduces knuckle impacts by up to 80%.**

80%

Ergonomic Metacarpal

Our patented metacarpal TPR design **reduces impacts by up to 80%**, while allowing for full range of motion & dexterity.

IVE™ Impact Technology



Expanding on our patented impact technology, we sought to improve hand protection by reducing the occurrence of impacts and lacerations, utilizing increased visual awareness. We created the Ironclad Visual Engineering (IVE™) protection system, which is comprised of a patented high visibility impact design. This design maximizes hand and finger visibility at a distance through increased contrast, brightness, fluorescence, and pattern recognition. Knowing where your hands are is the first step in avoiding impacts and associated recordable injuries.

Patents:

US: 9,241,519

US: D771,901



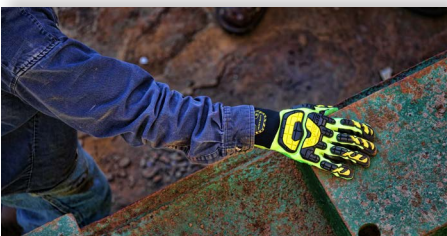
Patented IVE™ Fingertip Design

Our unique hazard stripe finger tips are designed to make fingers instantly recognizable, allowing for faster reaction times in avoiding potential hand impact hazards.



How Much Impact Do You Need?

IVE™ Impact Protection is available in Standard and Low Profile (LPI) variations. LPI offers more dexterity, while Standard offers more impact protection.



Patented IVE™ Back of Hand

Our unique but familiar pattern is easily recognizable at a distance, even when dirty or in low light environments, improving overall hand awareness and safety.



► Impact Gloves

KONG®



SDX2

EN388: 4242AP

ANSI: Impact 2 / Cut A1

IRONCLAD: Impact 3x/5x/5x



KRIG

EN388: 3122AP

ANSI: Impact 2 / Cut A2

IRONCLAD: Impact 3x/5x/5x



SDXG2

EN388: 3131 P

ANSI: Impact 2

IRONCLAD: Impact 3x/5x/5x



SDXO2

EN388: 4131 P

ANSI: Impact 2

IRONCLAD: Impact 3x/5x/5x



SDX2W

EN388: 4222XP

ANSI: Impact 2 / Cut A1

IRONCLAD: Impact 3x/5x/5x



SDXW2

EN388: 4242 P

ANSI: Impact 2

IRONCLAD: Impact 3x/5x/5x



SDX2WC

EN388: 4X43DP

ANSI: Impact 2 / Cut A5

IRONCLAD: Impact 3x/5x/5x



SDXC

EN388: 3X44CP

ANSI: Impact 2 / Cut A3

IRONCLAD: Impact 3x/5x/5x



KDC5

EN388: 4X44EP

ANSI: Impact 2 / Cut A4

IRONCLAD: Impact 3x/5x/5x



KRC5

EN388: 4X43EP

ANSI: Impact 2 / Cut A5

IRONCLAD: Impact 3x/5x/5x



KKC5B

EN388: 4X43CP

ANSI: Impact 1 / Cut A4

IRONCLAD: Impact 2x/5x/4x



MKC5

EN388: 4543 P

ANSI: Impact 1 / Cut A3

IRONCLAD: Impact 2x/5x/4x

WANT TO KNOW MORE?
VISIT WWW.IRONCLAD.COM



SDX2-HAD

EN388: 4331BP

ANSI: Impact 1 / Cut A2

IRONCLAD: Impact 3x/10x/6x



INDI-CCP

EN388: 1142BP

ANSI: Impact 2

IRONCLAD: Impact 3x/10x/6x



INDI-RIG

EN388: 3142 P

ANSI: Impact 2

IRONCLAD: Impact 3x/10x/6x



INDI-CCPW

EN388: 2343CP

ANSI: Impact 2 / Cut A2

IRONCLAD: Impact 3x/10x/6x



INDI-RIW

EN388: 3242 P

ANSI: Impact 2 / Cut A2

IRONCLAD: Impact 3x/10x/6x



INDI-RC5

EN388: 4544 P

ANSI: Impact 2 / Cut A5

IRONCLAD: Impact 3x/10x/6x



LPI-CC5

EN388: 3X44D

ANSI: Impact 1 / Cut A3



LPI-OC5

EN388: 3X44D

ANSI: Impact 1 / Cut A3



ULD-IMPC5

EN388: 4X42FP

ANSI: Impact 2 / Cut A5

IRONCLAD: Impact 3x/10x/6x



KKCA5

EN388: 4X43EP

ANSI: Impact 2 / Cut A5

IRONCLAD: Impact 3x/10x/6x



INDI-KC5

EN388: 4544 P

ANSI: Impact 2 / Cut A3

IRONCLAD: Impact 3x/10x/6x



INDI-KC5G

EN388: 4544 P

ANSI: Impact 2 / Cut A3

IRONCLAD: Impact 3x/10x/6x

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