

# PERSONAL PROTECTIVE EQUIPMENT HEAD PROTECTION

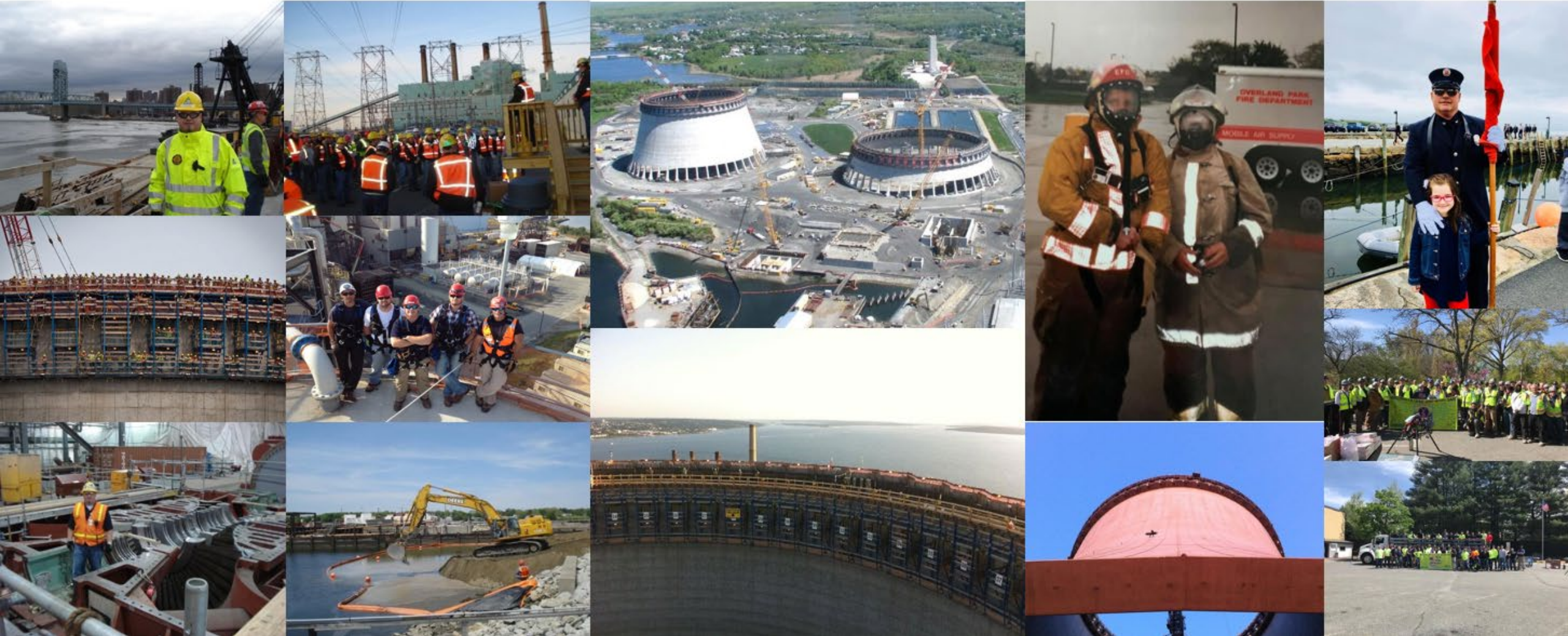
Justin Azbill  
Director, National EHS / Milwaukee Tool

**NIA** | National Insulation  
Association®

THE VOICE OF THE INSULATION INDUSTRY™

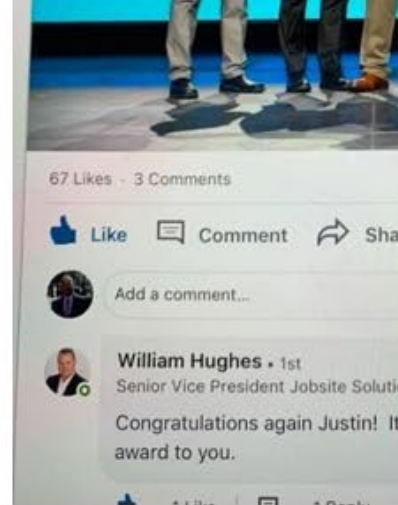
# Career Path

29 Year Career Path – Accomplishments, Awards, and What Safety Means to Me.



# Career Path

## 29 Year Career Path – Accomplishments, Awards, and What Safety Means to Me.



**Congratulations to all of our 2021 National Safety Council Award Winners!**



# Safety Helmets/Head Protection

Slips, trips, and falls are the cause of over 1/3<sup>rd</sup> of all construction fatalities per year

The Construction Industry Has the Greatest Number of Both Fatal and Nonfatal Traumatic Brain Injuries (TBIS)

FALLS LED TO **>50%** OF FATAL WORK RELATED TBIS

TBIS ARE **25%** OF ALL CONSTRUCTION FATALITIES

IN 2020 THERE WERE **23K** NONFATAL HEAD INJURIES RESULTING IN MISSED DAYS OF WORK IN THE CONSTRUCTION INDUSTRY

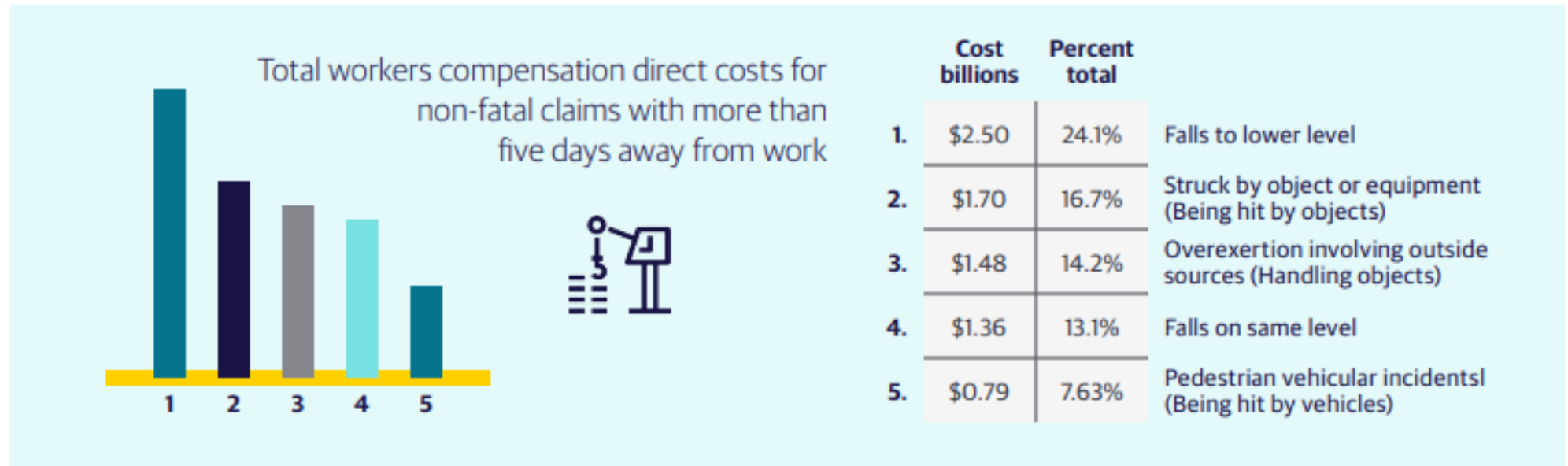
IN 2020 THERE WERE **393** FATALITIES IN THE CONSTRUCTION INDUSTRY FROM SLIPS, TRIPS AND FALLS

# Safety Helmets and Head Protection

## Looking for more comprehensive safety information?

As a policyholder, you have exclusive access to risk control tools and resources through Liberty Mutual SafetyNet™

visit [lmi.co/safetynet](https://lmi.co/safetynet)



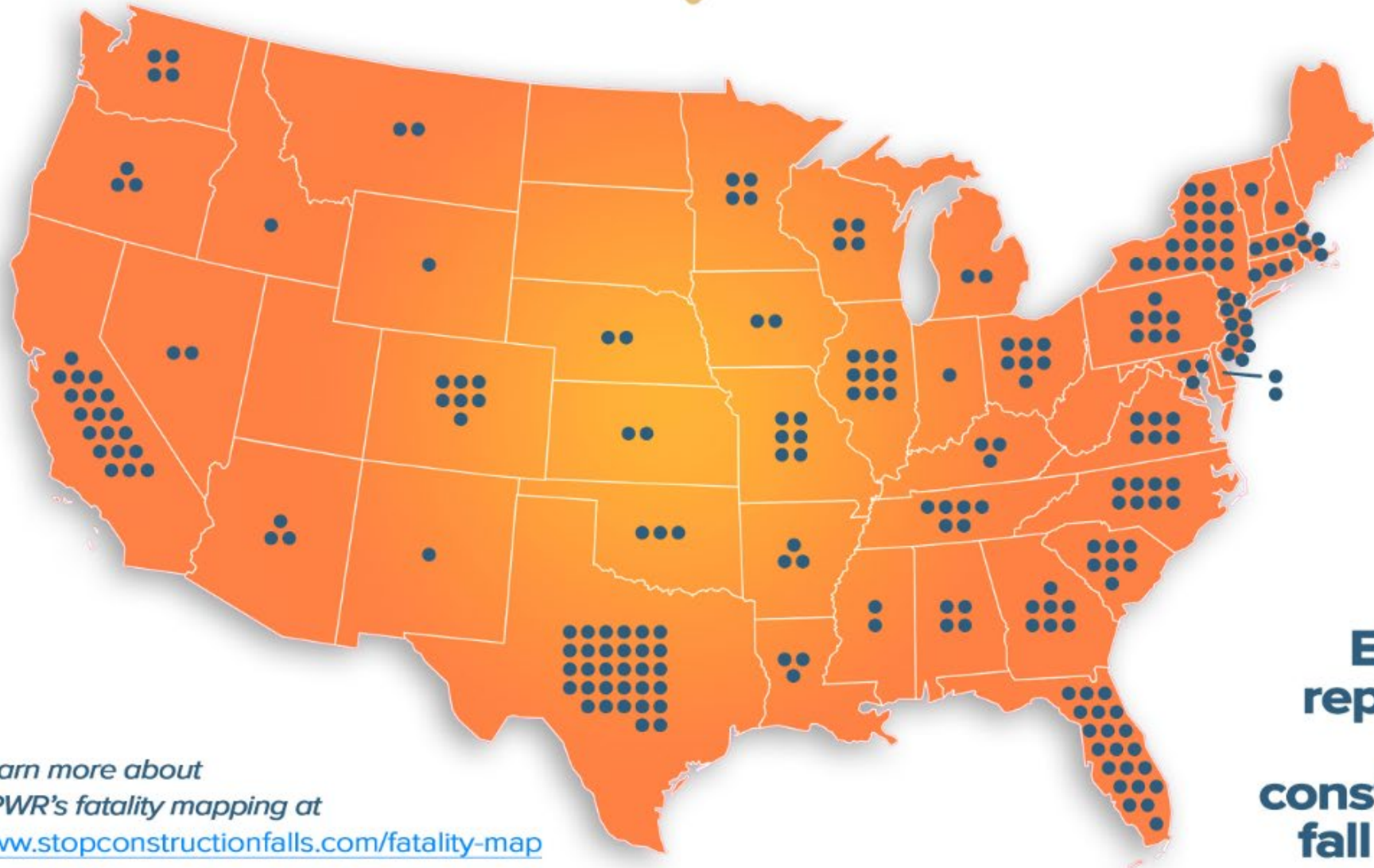
The top five injury causes account for over \$7.87 billion in costs and represent 75.8 percent of total workers compensation direct costs for non-fatal claims with more than five days away from work in the construction industry.

Understanding top risks in the workplace is the first step to protecting your business. Did you know: Liberty Mutual SafetyNet™ has sophisticated technical resources to help prevent falls, overexertion, and many other construction-related exposures.

**Scientific methodology:** The 2020 Liberty Mutual Workplace Safety Indices are based on 2017 data from Liberty Mutual, the U.S. Bureau of Labor Statistics (BLS), and the National Academy of Social Insurance. BLS non-fatal injury data are analyzed to determine which events caused employees to miss more than five days of work, and then rank those events by total workers compensation costs.

**Note:** Falls to lower level as a top driver of loss is unique to construction. Ladder falls likely represent a common scenario for these falls, and their cost is generally high because they lead to fractures or multiple-body-part injuries.

# Safety Helmets and Head Protection



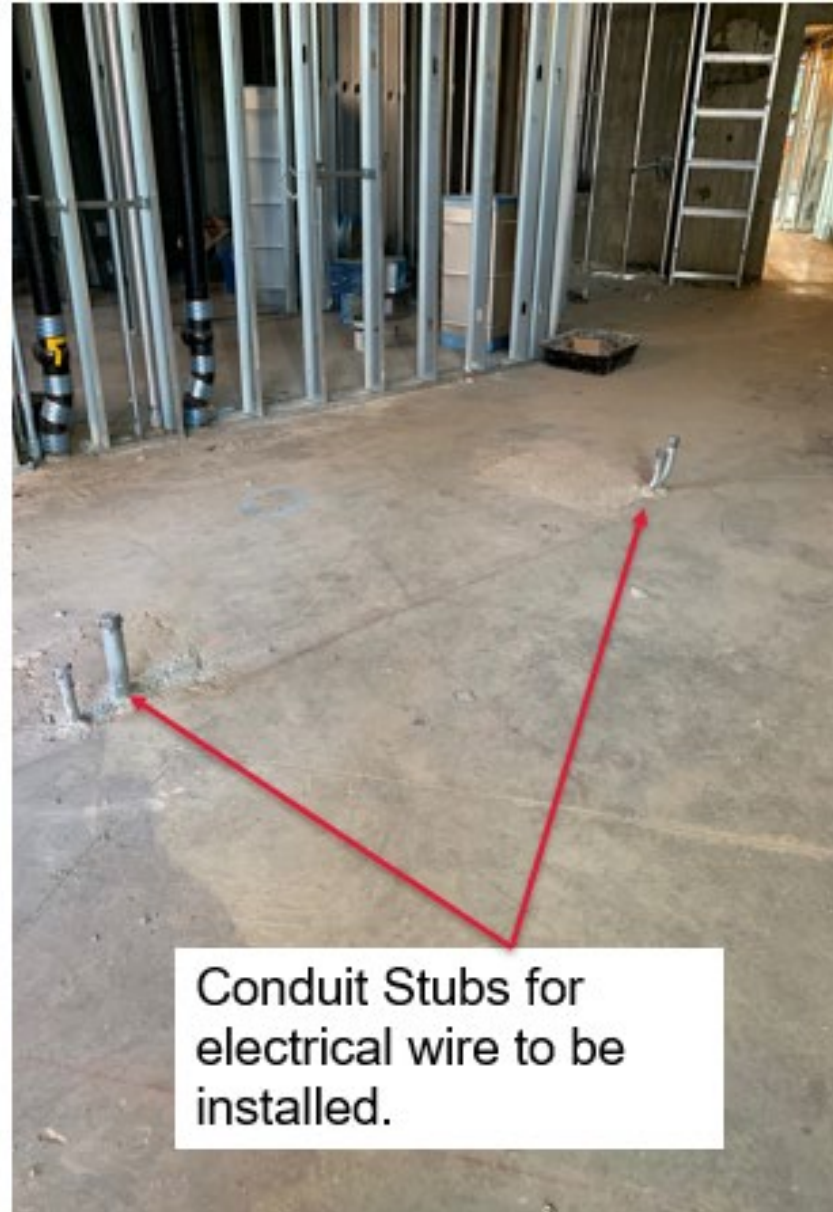
**Each dot  
represents  
a fatal  
construction  
fall in 2021**



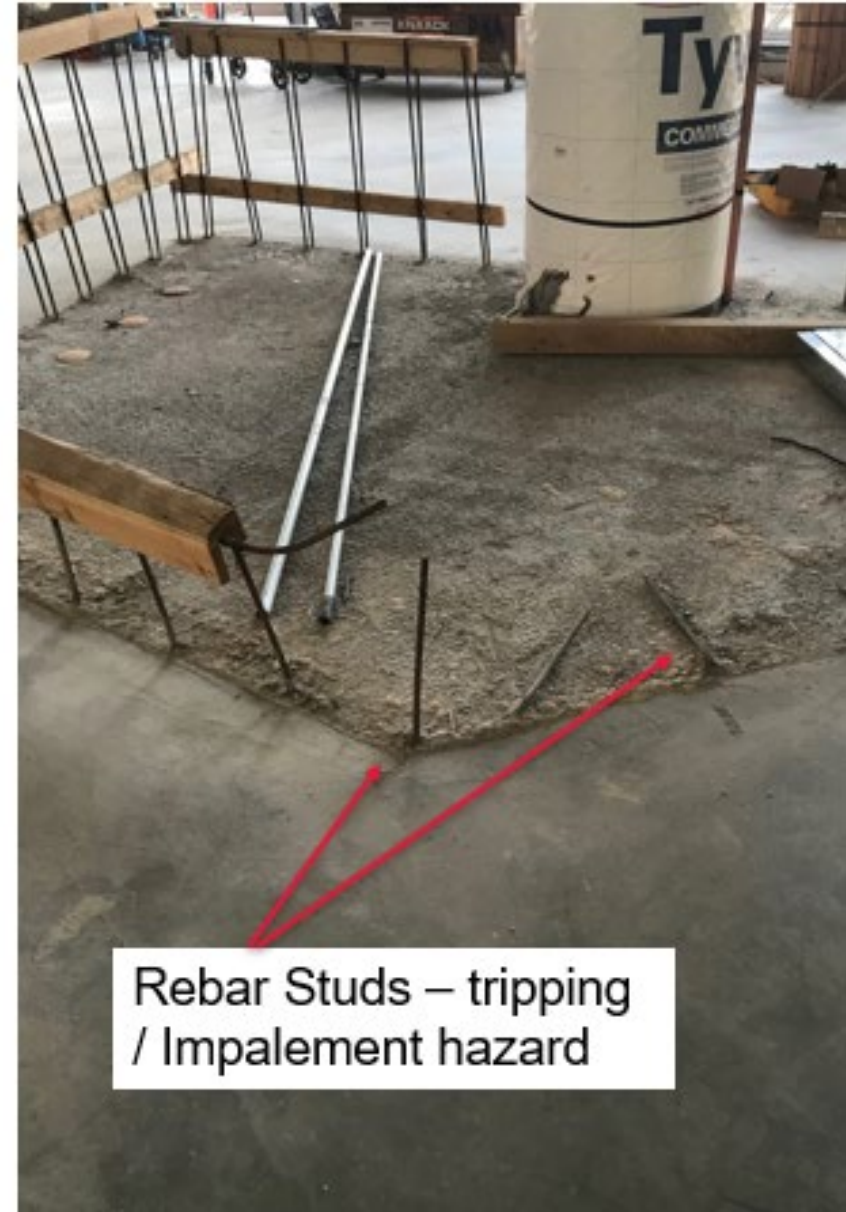
Learn more about  
CPWR's fatality mapping at  
[www.stopconstructionfalls.com/fatality-map](http://www.stopconstructionfalls.com/fatality-map)

# Slips / Trips / Falls

All Thread from pipe hanger installation.



Conduit Stubs for electrical wire to be installed.

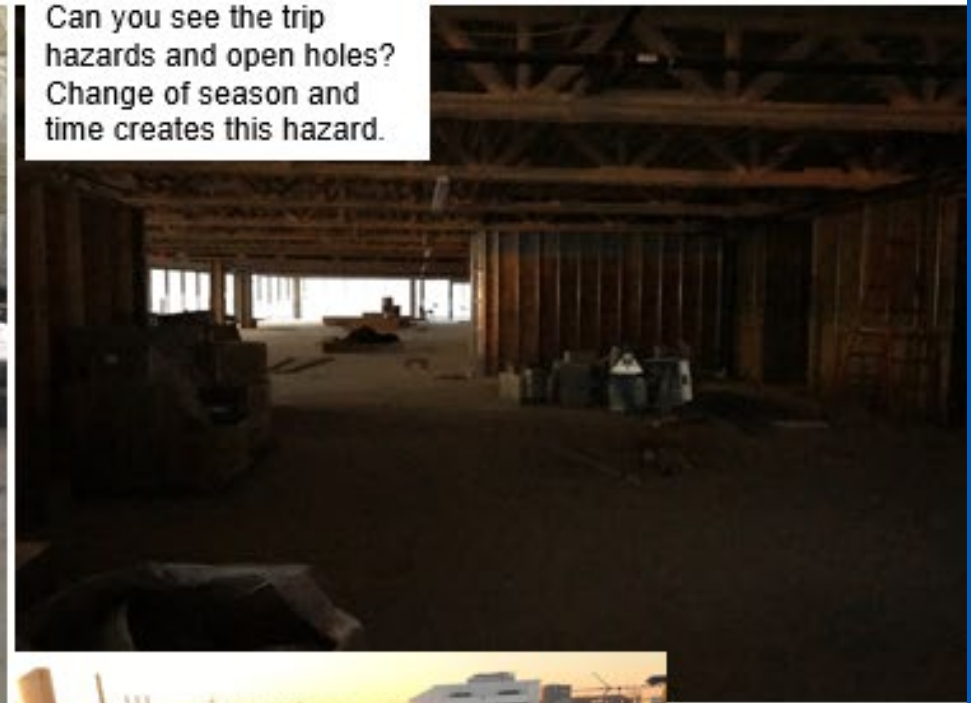


Rebar Studs – tripping / Impalement hazard

# Slips / Trips / Falls



Can you see the trip hazards and open holes?  
Change of season and time creates this hazard.

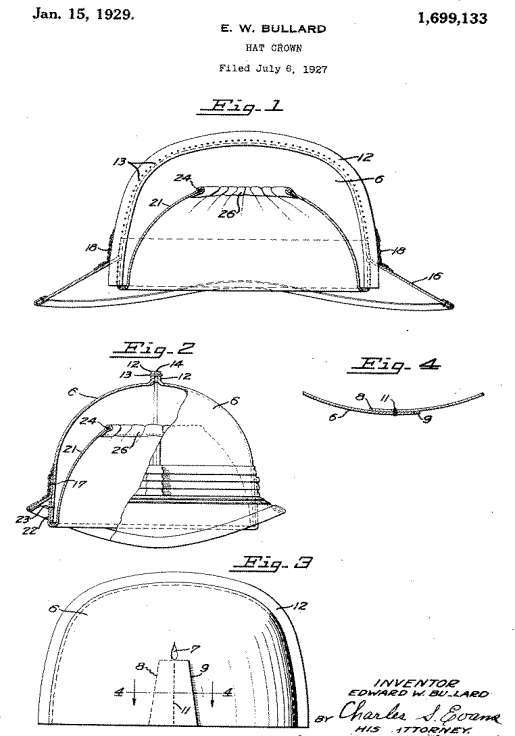




# History

With some canvas, leather, shellac and black paint, inventor Edward Bullard helped America usher in a new era of workplace safety

- In 1919, Edward W. Bullard came home from war to the family business in San Francisco and began developing a safety hat for peacetime workers.
- Called the Hard Boiled Hat, this canvas and leather headgear was the first commercially available head protection device.
- Now worn by millions of workers, Bullard's hard hat revolutionized the safety-product industry, earning him a spot in the National Inventors Hall of Fame.



# Hard Hats vs. Helmets



## Hard Hats

- Traditional style worn by construction trades
- Provides protection only to top of head – ANSI Type I
- May not stay on the user during slips, trips, and falls
- Available in Front Brim or Full Brim style
- Available in Vented (Class C) or Unvented (Class E)



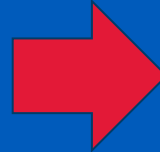
## Helmets

- Newer style and design, growing in popularity
- Provides top and side head protection – ANSI Type II
- Chinstrap keeps helmet on user during fall
- Available in Front Brim or No Brim style
- Available in Vented (Class C) or Unvented (Class E)

### User Frustrations



Users need greater side of the head protection

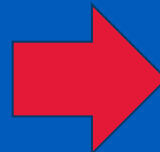


### MILWAUKEE® Solutions

**PROTECTS TOP AND SIDE IMPACT**  
ANSI Type II rated,  
EN12492 Impact  
Clauses



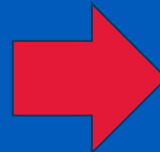
Users need to modify their helmets to use multiple PPE accessories



**4 BOLT™ ACCESSORY SLOTS, 2 UNIVERSAL SLOTS, 2 BOLT™ MOUNTS**  
Allows use with additional PPE and accessories



Helmet suspensions are uncomfortable and hot



**COMFORTABLE PADDED SUSPENSION**  
Moisture wicking and anti-microbial sweatband and liner

## Safety Helmets

### PROTECTS SIDE & TOP IMPACT




### COMFORTABLE PADDED SUSPENSION



### ADJUSTABLE SWINGING RATCHET



- Better Protection. More Comfort.
- Protects Side and Top Impact
- Adapt to Your Jobsite – BOLT™ Compatible
  - 4 BOLT™ accessory slots & 2 universal slots
  - Includes BOLT™ Headlamp Mount for use with most headlamps
  - Includes BOLT™ Marker Clip allows for easy access
  - Easily integrates additional PPE and accessories
- Comfortable Padded Suspension
- Comfortable Fit – 5 Adjustable Buckles Chin Strap
- Adjustable Swinging Ratchet – Better Comfort
  - Better security and improved fit
  - Quick adjustment – 6.5”-8.5”
- Moisture Wicking & Anti-Microbial Sweatband and Helmet Liner
- Machine Washable Sweatband, Liner, and Chin Strap
- Made in USA with Global Materials 
- Includes 2 MILWAUKEE® logo stickers & contact cards
- ANSI Type II Rated
- Meets Energy Absorption Capacity clauses 4.2.1.2 (Front), 4.2.1.3 (Side), & 4.2.1.4 (rear), and Retention System clauses 4.2.3 (Strength) & 4.2.4 (Effectiveness) of EN12492:2012
- Available in 8 Different Colors



ANSI/ISEA Z89.1  
TYPE I, TYPE II, CLASS C

ANSI/ISEA Z89.1  
TYPE I, TYPE II, CLASS E

Meets Energy Absorption Capacity clauses 4.2.1.2 (Front), 4.2.1.3 (Side), & 4.2.1.4 (Rear), and Retention System clauses 4.2.3 (Strength) & 4.2.4 (Effectiveness) of EN12492:2012



# Safety Helmets

## Understanding the Real-World Scenarios and ANSI vs EN testing

- ANSI Z89.1 Type II  
Force Transmission: 30ft  
Penetration: 12ft
- EN12492  
Force Transmission: 24ft



## Milwaukee Tape Measure Dropped From:



ANSI and EN use different testing methods. ANSI drops the head form, EN is static head form.

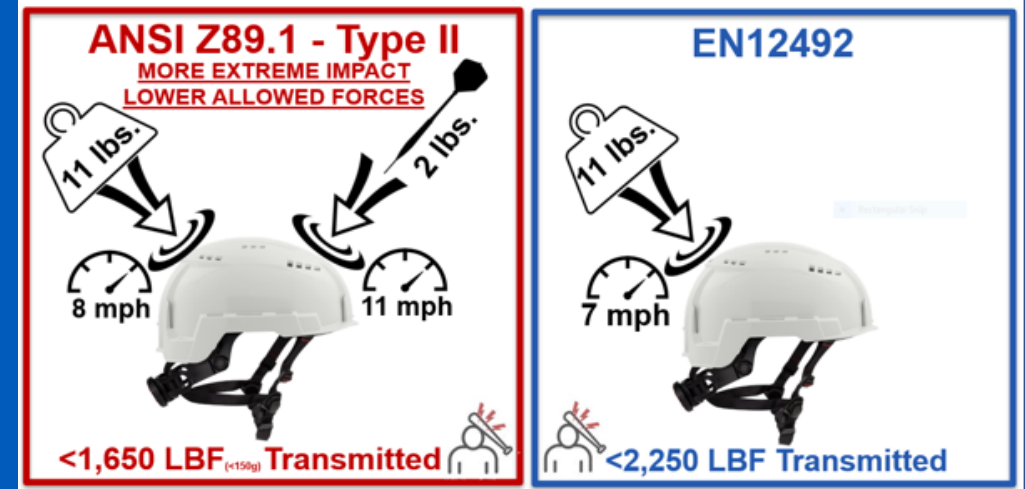
### ANSI Testing

- ANSI testing drops the head form onto an anvil
- ANSI is 150 g-force side → Type II
- ANSI is 85 g-force top → Type I
- CSA is 85 g-force top, 150 g-force side

### EN12492 Impact Clauses Testing

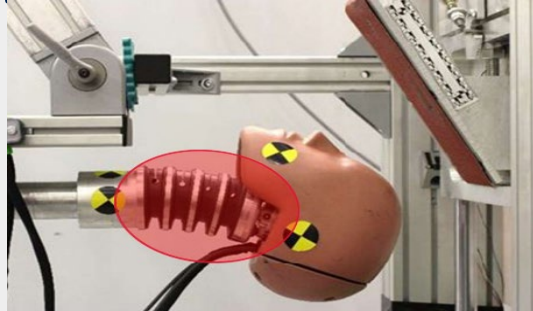
- EN drops the anvil onto the head form
- Front, side, rear, (less than 10,000 Newtons) (drop height is different between area of helmet) (500 mm)
- EN top is also 10,000 Newtons (4x height of the side drop) (2000 mm)
- Retention system strength (buckle pull) (minimum 500 newtons at less than 25mm of elongation)
- Retention system effectiveness (roll off) must not come off under 10 kg load)

## ANSI Z89.1 7.2.1 Type II vs EN12492 – Off Center Test Comparison



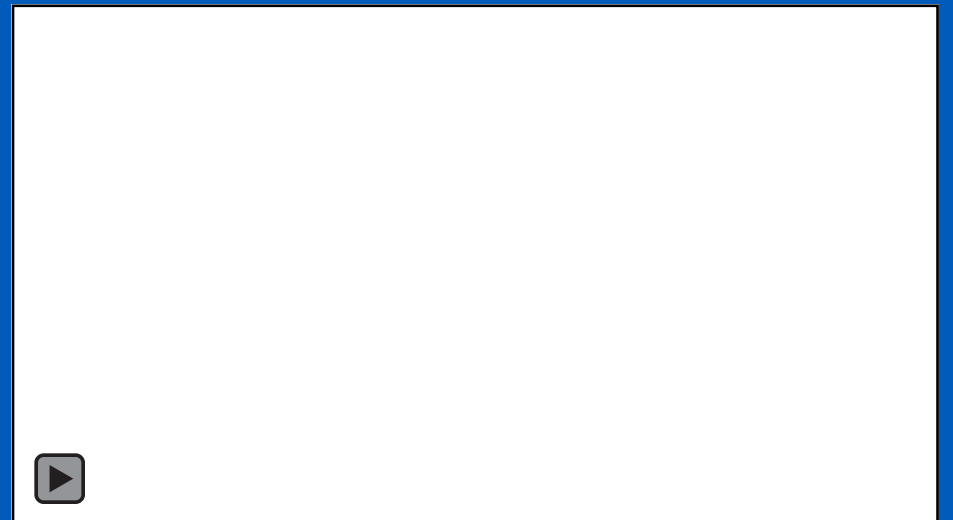
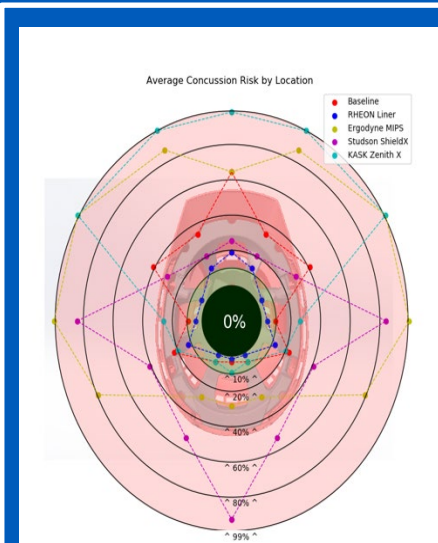
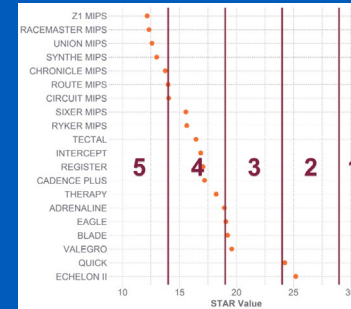
# Safety Helmet Testing

## ROTATIONAL IMPACT PROTECTION



## 3<sup>rd</sup> Party tested

- Accredited source helping research rotational impacts
- Drop test for measuring rotational impacts at low velocity
- Developing star rating system



Standard High Temp Requirement Low Temp Requirement	Force Transmission (Top)	Force Transmission (Side, Front, Rear)	Impact Energy Attenuation (Top)	Impact Energy Attenuation (Side)	Penetration (Top)	Penetration (Side)
<b>ANSI Type I</b> 40C optional 50C -18C optional -30C	<b>7.1.2</b> 3.6kg Max Force: 3780 N 1.55m (55J)	x	x	x	<b>7.1.3</b> 1kg 2.5m (25J)	x
<b>ANSI Type II</b> 40C optional 50C -18C	<b>7.1.2</b> 3.6kg Max Force: 3780 N 1.55m (55J)	x	<b>7.2.1</b> Max Accel: 150g 0.625m (55J)	<b>7.2.1</b> Max Accel: 150g 0.625m (31J)	<b>7.1.3</b> 1kg 2.5m (25J)	<b>7.2.2</b> 1kg 1.25m (12.5J)
<b>EN 397</b> 50C optional 150C -10C optional -20C, -30C	Max Force: 5000 N 1.0m (49J)	x	x	x	3kg 1.0m (29J)	x
<b>EN12492</b> 35C -20C	<b>4.2.1.1</b> 5kg Max Force: 10,000 N 2m (100J)	<b>4.2.1.2.3.4</b> 5kg Max Force: 10,000 N 0.5m (25J)	x	x	<b>4.2.2</b> 3kg 1m (30J)	x



**ANSI Z89.1 Chin Strap**

ANSI Z89.1-2014 performance requirements for Type II helmets

- Section 7.2.3 does not dictate chin strap breakaway/release.
- Per our UL Certification, we conform to ANSI Z89.1-2014, Section 7.2.3
  - (Test Procedure 10.6) Chin Strap Retention (Type II only).

**EN 12492 Chin Strap**

4.2.3 EN12492 chin strap retention system strength clause – 25mm

- When a helmet is tested by the method described in 5.7, the maximum elongation of the whole system shall not exceed 25mm
- Test requires minimum force to be 30-500N and taken to failure

**Penetration Test Set Up**

	ANSI Z89.1	EN12492	
Impactor Mass (kg)	1	3	
Drop Height (m)	2.8	1	
Impact Energy (J)	24.5	29.4	<-- +20%

EN test is roughly 3x the mass dropped from 1/3 the height.

**→**

	N	Lbs
<b>Test piece</b>	660.6	148.5
1	700.5	157.47
2	750.4	168.69
3	695.8	156.42
Avg	715.5667	160.864





ICS is the contracted testing lab that is affiliated with UL



Test Report # T16242-01-1 Issue 1  
ANSI/ISEA Z89.1-2014 (R2019)  
UL LLC

Milwaukee Tool® 48-73-1300 (Front Brim Series) – Industrial Safety Helmet  
UL File Number: MH6740  
UL Project Number: 4789950477  
2021 July 01



Approved by:

A handwritten signature in black ink that reads "Sarah Henderson".

Sarah Henderson  
Head Protection, Hand Protection &  
Athletic Equipment - Laboratory Manager

Prepared by:

A handwritten signature in black ink that reads "Shelley Brady".

Shelley Brady  
Head Protection, Hand Protection & Athletic  
Equipment - Laboratory Administrator



Test Report # T16239-01-1 Issue 1  
ANSI/ISEA Z89.1-2014 (R2019)  
UL LLC

Milwaukee Tool® 48-73-1300 (Cap Series) – Industrial Safety Helmet  
UL File Number: MH6740  
UL Project Number: 4789950477  
2021 July 01



Approved by:

A handwritten signature in black ink that reads "Sarah Henderson".

Sarah Henderson  
Head Protection, Hand Protection &  
Athletic Equipment - Laboratory Manager

Prepared by:

A handwritten signature in black ink that reads "Shelley Brady".

Shelley Brady  
Head Protection, Hand Protection & Athletic  
Equipment - Laboratory Administrator

# Accessories for Helmets



## HEAD PROTECTION INSTALLATION & MAINTENANCE GUIDE

### GUÍA DE MANTENIMIENTO E INSTALACIÓN DE PROTECCIÓN PARA LA CABEZA

#### INSTALLATION AND ATTACHMENT / INSTALACIÓN Y FIJACIÓN

Sun Protection and  
Earrest Attachment Video  
Video del accesorio de  
oreja y protección solar



or visit <https://qr.mke.lt/266xn>

Eye Visor Lens  
Replacement Video  
Video del reemplazo de  
lentes de visor



or visit <https://qr.mke.lt/2664d>

Face Shield Lens  
Replacement Video  
Video del reemplazo de  
lentes de careta



or visit <https://qr.mke.lt/26826>

Face Shield  
Attachment Video  
Video del accesorio de  
careta



or visit <https://qr.mke.lt/272qt>

Headlamp  
Attachment Video  
Video del accesorio de  
lámpara para cabeza



or visit <https://qr.mke.lt/26c5q>

All Installation and  
Attachment Videos  
Todos los videos de instalación  
y fijación de accesorios



or visit <https://qr.mke.lt/26vcj>

#### STACKING ORDER / ORDEN DE ESTIBA

**1** Sun Protection  
Protección solar

**2** Ear Protection  
Protección auditiva

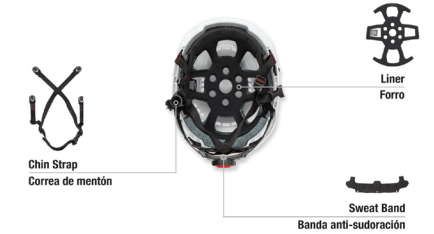
**3** Eye & Face Protection  
Protección ocular y facial

**4** Personal Lighting  
Iluminación personal



#### CLEANING / LIMPIEZA

**1** REMOVE / QUITAR



**2** WASH / LAVAR

**Washing Machine**  
Gently wash liner, sweat band, and chin strap  
with mild soap and cold water.

**Lavadora**  
Lave suavemente el forro, la banda anti-  
sudoración y la correa de mentón con agua fría  
y jabón neutro.

**Hand Wash**  
Gently wash liner, sweat band, chin strap,  
helmet shell, and suspension with mild soap  
and cold water.

**Lávete a mano**  
Lave suavemente el forro, la banda anti-  
sudoración, la correa de mentón, la concha y  
la suspensión con agua fría y jabón neutro.

**3** DRY / SECAR

Air dry at room temperature.  
Séquese con aire a temperatura ambiente.

#### INSPECTION AND REPLACEMENT / REVISIÓN Y CAMBIO

Inspect the helmet, suspension, and accessories before and after each use. Always use MILWAUKEE® replacement parts and accessories. The helmet works as a system, and unauthorized parts can reduce the protection you receive.

##### Replace Immediately When:

- You see signs of wear include breakage, gouges, cracks, dents, chalky appearance, discoloration or loss of color, or craze pattern.
- The helmet has sustained an impact. Dispose of it immediately, even if damage is not visible.
- The suspension or accessories show signs of wear, cracks, or loss of flexibility, fraying, or other damaged.
- It is recommended that the product be replaced after 5 years of service.

##### Immediately Retire Any Equipment If:

- It fails to pass inspection (inspection before and during use and the periodic in-depth inspection).
- It has been subjected to impact from falling objects.
- You do not know its full usage history.
- It is at least 10 years old.
- You have any doubt as to its integrity.

Revisar el casco, la suspensión y los accesorios antes y después de cada uso. Siempre use accesorios y piezas de repuesto MILWAUKEE®. El casco funciona como un sistema, por lo que las piezas no autorizadas pueden reducir la protección con la que cuenta.

##### Cambio de inmediato cuando:

- Note signos de desgaste, incluida la ruptura, picadas, cuarteaduras, abolladuras, apariencia turbia, decoloración o pérdida de color o patrones de grieta.
- El casco ha sufrido un golpe. Deséchelo de inmediato, aunque el daño no sea visible.
- La suspensión o accesorios muestran signos de desgaste, cuarteaduras o pérdida de flexibilidad, deshilachado u otro daño.
- Se sugiere que el producto se cambie después de 5 años de servicio.

##### Retire de inmediato todo tipo de equipamiento si:

- No aprueba la inspección (inspección antes y durante su uso, así como la inspección periódica profunda).
- Ha sufrido un golpe de un objeto que cae.
- Desconoce su historial de uso completo.
- Tiene más de 10 años.
- Tiene dudas acerca de su integridad.

# Brain Injury: How to Best Protect Your Brain

Brain injuries  $\neq$  skull  
fracture

90% of brain injuries  
occur without skull  
fracture

*Munoz-Sanchez, et al., Brain Inj. 23:1, 2009*

Master title style

# How Does a Fall Impact a Trade Professional?

Effective Head/Neck Weight: 31lbs



If a person weighing 200 ILBS, walking 3 MPH trips forward hitting their head – it is the same as

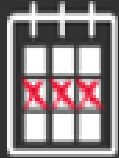
Being hit by a 95 MPH Slap Shot



Being hit by a 101 MPH Fast Ball Pitch.



# Hand and Arm Injury Prevention: Subject visuals for training – 2019 Analytical Information



**12,128**  
lost time HAND  
INJURIES in 2020

**70%**  
of hand injuries  
occur when the  
user was NOT  
WEARING  
GLOVES



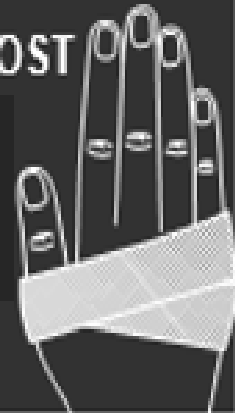
**7**  
Median  
days AWAY  
FROM WORK

**AVERAGE HAND INJURY CLAIM COST**

Avg loss per claim: **\$44,000**

Stitches: **\$6,800**

Avg Extremity Trauma: **\$1M+**



**150K** require  
LT Annually

**MSDs** account  
For 33% of all WC.

## LEVEL 1



**Liner Material:** Nylon/Lycra  
**Grip Material:** Nitrile  
**Grip Finish:** Sandy  
**Gauge:** 13 Gauge

## LEVEL 3



**Liner Material:** Nylon & HPPE  
**Grip Material:** Nitrile  
**Grip Finish:** Comfort Web  
**Gauge:** 15 Gauge

## LEVEL 5



**Liner Material:** Nylon & HPPE  
**Grip Material:** Nitrile  
**Grip Finish:** Sandy – Double Dip  
**Gauge:** 13 Gauge

TEXTURED GRIP



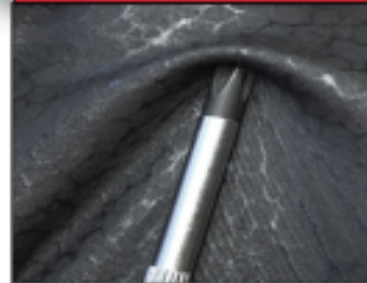
SMARTSWIPE™



WEB GRIP



PUNCTURE RESISTANCE



DOUBLE DIPPED GRIP



PUNCTURE RESISTANCE



# LEVEL 2

**HIGH DEXTERITY.  
BETTER FIT.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Crag Test)	1	2	3	4	5	X*
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the crag test provides a 3 or above it is marked as an "X" for not applicable and uses the TDM test instead

SMARTSWIPE™  
Touch Screen  
Compatible Palm &  
Finger Tips

Reinforced Nitrile  
Coating

Polyurethane  
Better fit



18 Gauge Knit  
Total mobility

Light &  
Breathable Back

Color-Coded Bands  
Easy cut level  
identification

# LEVEL 3

**HIGH DEXTERITY.  
BETTER FIT.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Crag Test)	1	2	3	4	5	X*
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the crag test provides a 3 or above it is marked as an "X" for not applicable and uses the TDM test instead

SMARTSWIPE™  
Touch Screen  
Compatible Palm &  
Finger Tips

Reinforced Nitrile  
Coating

Polyurethane  
Better fit



18 Gauge Knit  
Total mobility

Light &  
Breathable Back

Color-Coded Bands  
Easy cut level  
identification

# LEVEL 4

**HIGH DEXTERITY.  
BETTER FIT.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Crag Test)	1	2	3	4	5	X*
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the crag test provides a 3 or above it is marked as an "X" for not applicable and uses the TDM test instead

SMARTSWIPE™  
Touch Screen  
Compatible Palm &  
Finger Tips

Reinforced Nitrile  
Coating

Polyurethane  
Better fit



18 Gauge Knit  
Total mobility

Light &  
Breathable Back

Color-Coded Bands  
Easy cut level  
identification

# LEVEL 7

**HIGH DEXTERITY.  
MORE DURABLE.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Coap Test)	1	2	3	4	5	P
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the coap test provides a 3 or above it is marked as an "L" for not applicable and uses the TDM test instead

SMARTSWIPE™  
Touch Screen  
Compatible

Reinforced Nitrile  
Coating  
Between Thumb  
& Forefinger

Long-Lasting  
Nitrile Grip



18 Gauge Knit  
Total mobility

Light &  
Breathable Back

Color-Coded Bands  
Easy cut level  
identification

# LEVEL 8

**HIGH DEXTERITY.  
MORE DURABLE.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Coap Test)	1	2	3	4	5	P
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the coap test provides a 3 or above it is marked as an "L" for not applicable and uses the TDM test instead

SMARTSWIPE™  
Touch Screen  
Compatible

Reinforced Nitrile  
Coating  
Between Thumb  
& Forefinger

Long-Lasting  
Nitrile Grip



18 Gauge Knit  
Total mobility

Light &  
Breathable Back

Color-Coded Bands  
Easy cut level  
identification

# LEVEL 9

**HIGH DEXTERITY.  
MORE DURABLE.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Coap Test)	1	2	3	4	5	P
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the coap test provides a 3 or above it is marked as an "L" for not applicable and uses the TDM test instead

SMARTSWIPE™  
Touch Screen  
Compatible

Reinforced Nitrile  
Coating  
Between Thumb  
& Forefinger

Long-Lasting  
Nitrile Grip



18 Gauge Knit  
Total mobility

Light &  
Breathable Back

Color-Coded Bands  
Easy cut level  
identification



# LEVEL 5

**COMFORTABLE FIT.  
ALL DAY PROTECTION.**



EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Coap Test)	1	2	3	4	5	1*
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F

\*If the coap test provides a 3 or above it is marked as an "X" for not applicable and uses the TDM 100 test instead



# LEVEL 3

**COMFORTABLE FIT.  
ALL DAY PROTECTION.**



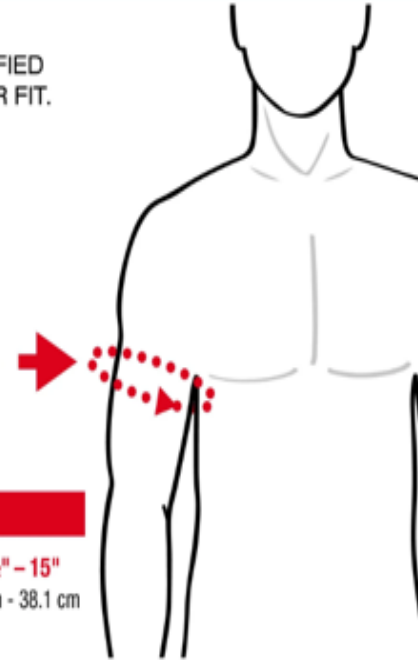
EN388 STANDARDS						
Abrasion	1	2	3	4	-	-
Cut Resistance (Coap Test)	1	2	3	4	5	-
Tearing	1	2	3	4	-	-
Puncture	1	2	3	4	-	-
Cut Resistance (TDM Test)	A	B	C	D	E	F



## CUT RESISTANT SLEEVE SIZE GUIDE

MEASURE BICEP AT SPECIFIED  
POINT TO ENSURE PROPER FIT.

CIRCUMFERENCE  
OF BICEP



### SIZE

**CIRCUMFERENCE** 12½" - 15"  
31.8 cm - 38.1 cm

STAY SAFE.  
STAY PRODUCTIVE.



**Justin Azbill**

Director - National EHS at Milwaukee Tool



***Justin.Azbill@Milwaukeeetool.com***

***857-636-2307***