



## HEALTH & SAFETY



Nothing but **HEAVY DUTY**™

### REDUCE INJURIES

- Decrease Muscle Effort
- Decrease Muscle Fatigue

### IMPROVE SAFETY

- Increase Productivity
- Decrease Risk Factors of Injuries

### SAVE MONEY

- Calculate ROI
- Validate Payback Period

## HEALTH & SAFETY LEADERSHIP

### RESEARCH

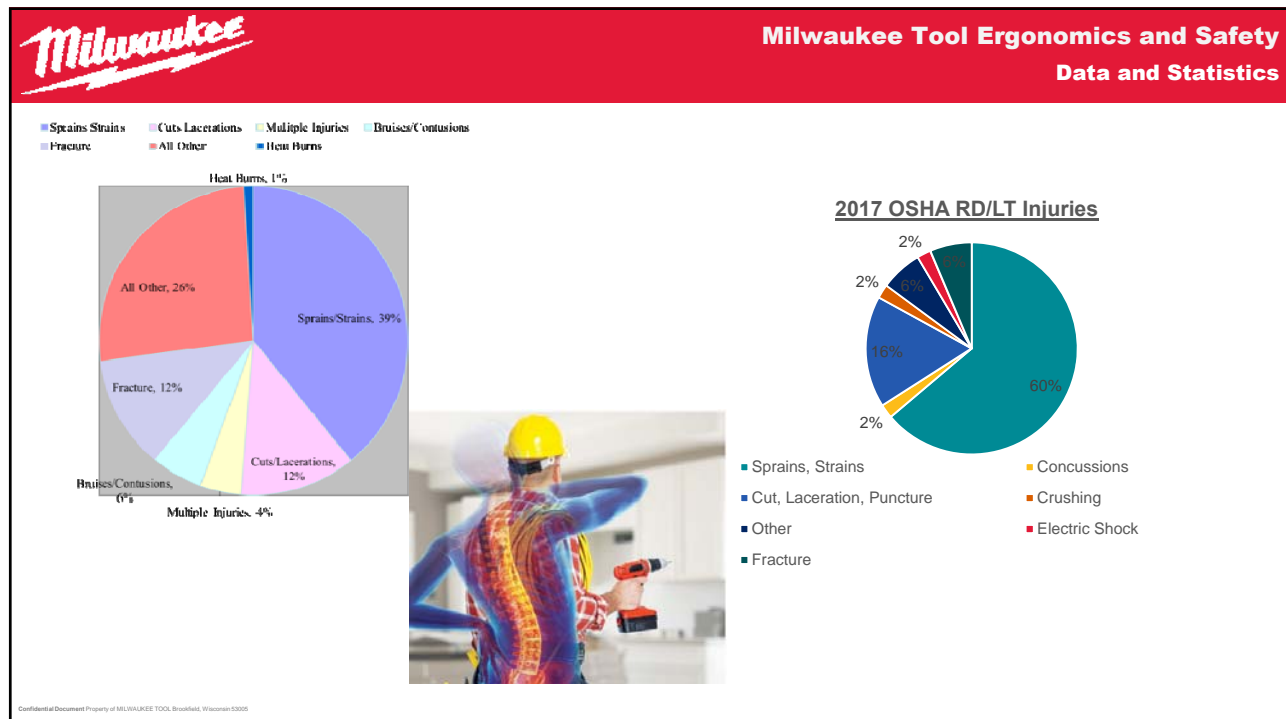
### TEST

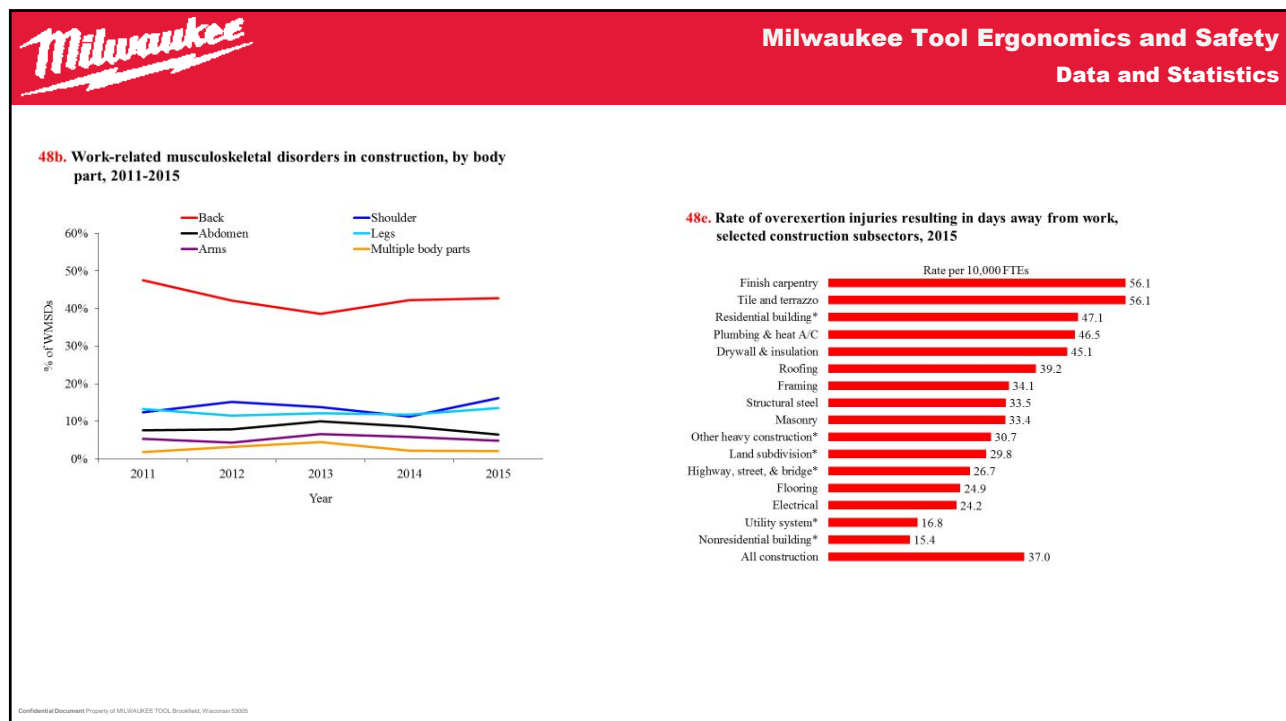
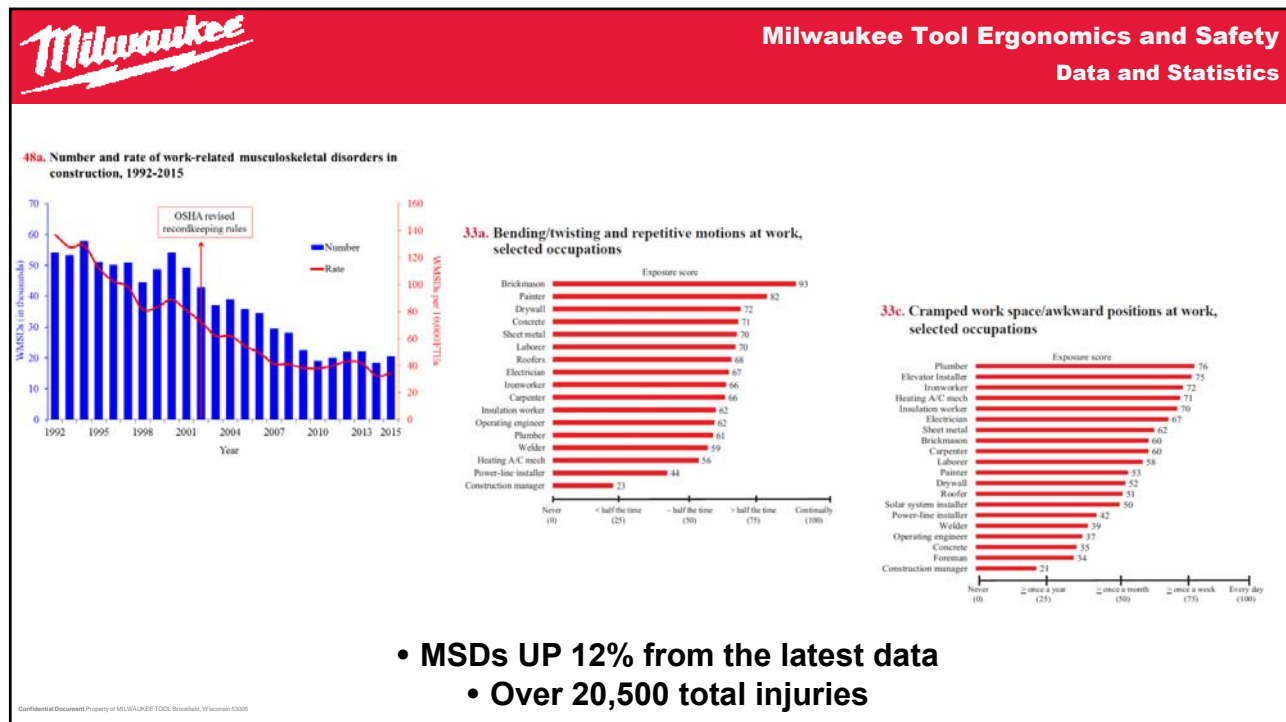
### DEVELOP

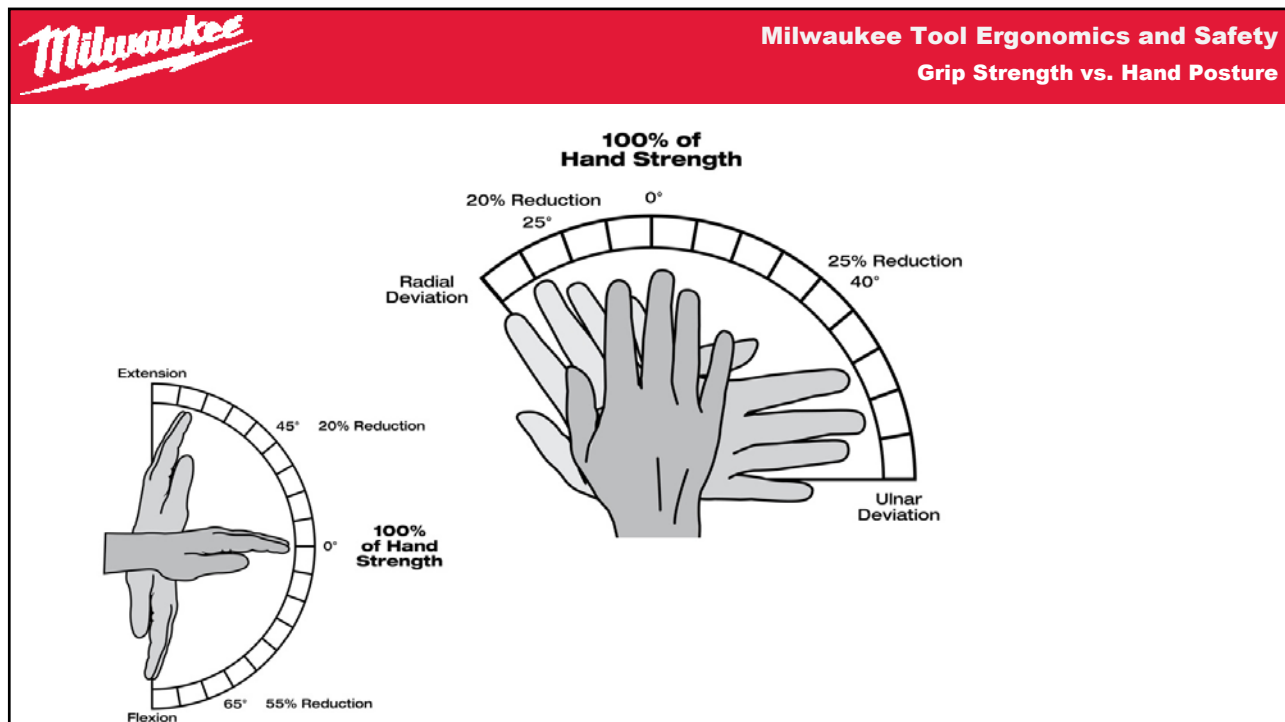
### EDUCATE

- Data & statistics of injuries on the jobsites
- Step by step process to reduce and recognize ergonomic injuries.
- Preparing for tooling tasks to minimize risk for injury
- Identify tools that help you achieve that goal

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**Milwaukee**

**Milwaukee Tool Ergonomics and Safety**  
**What is Ergonomics?**

### Ergonomics

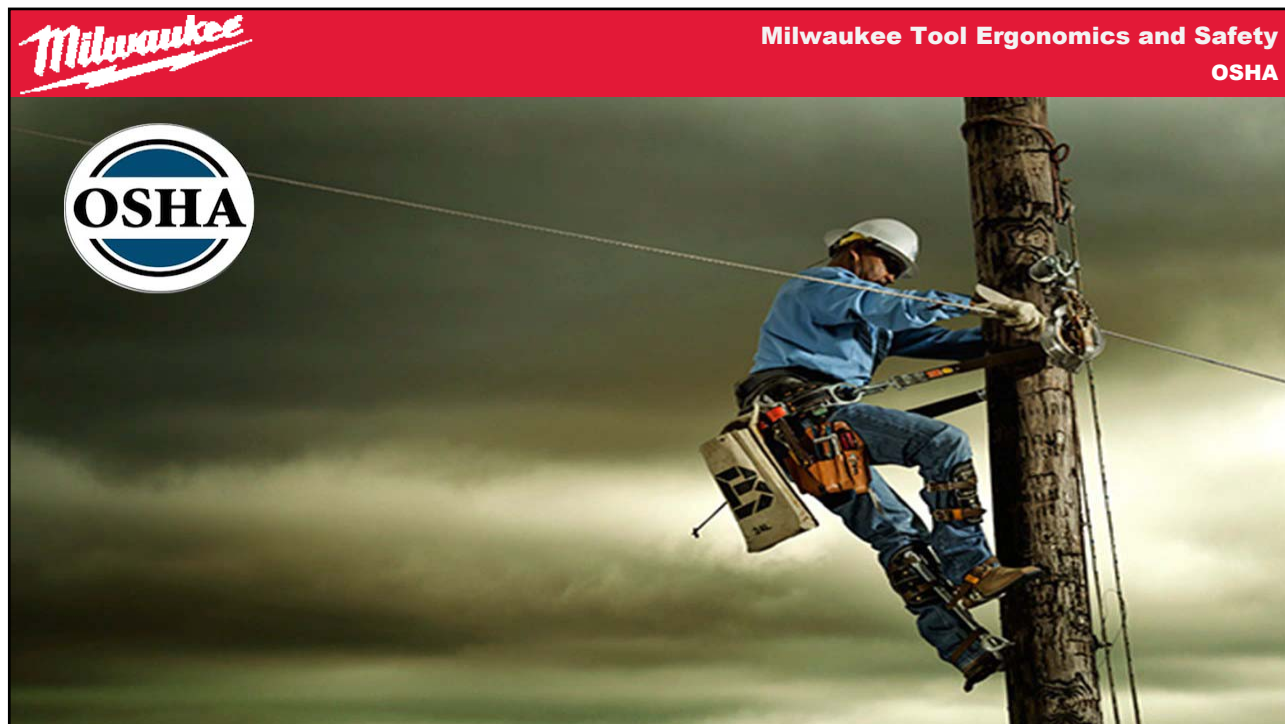
The science of evaluating and designing products and work environments around the strengths and limitations of the human user in order to:

- Maximize occupational health
- Maximize ease of use
- Maintain productivity

*Marklin, 2012*

### Wrist Angle

Reducing/Eliminating strain on the users wrist greatly enhances the degree of comfort. Strain and fatigue increase as the users wrist strays from its ideal position. The wrist in line with the forearm is the ideal position.



**Milwaukee**
**Milwaukee Tool Ergonomics and Safety**  
**Common Injuries**

**Musculoskeletal Disorders (MSDs) or Ergonomic Injuries on the Jobsite**

- Common areas injured pictured below are due to:
  - Heavy lifting, bending, reaching overhead, pushing & pulling loads, working in awkward postures, repetitive tasks.

**Tools designed to fit the hands of all works for the application**

- Decrease muscle effort and fatigue
- Increase safety and productivity
- Decrease risk factors of ergonomic injuries

**How does it relate to tool users?**

- Awkward posture
- Repetitive tasks
- High force tasks



**Knee Bursitis**

**Carpal Tunnel Syndrome**

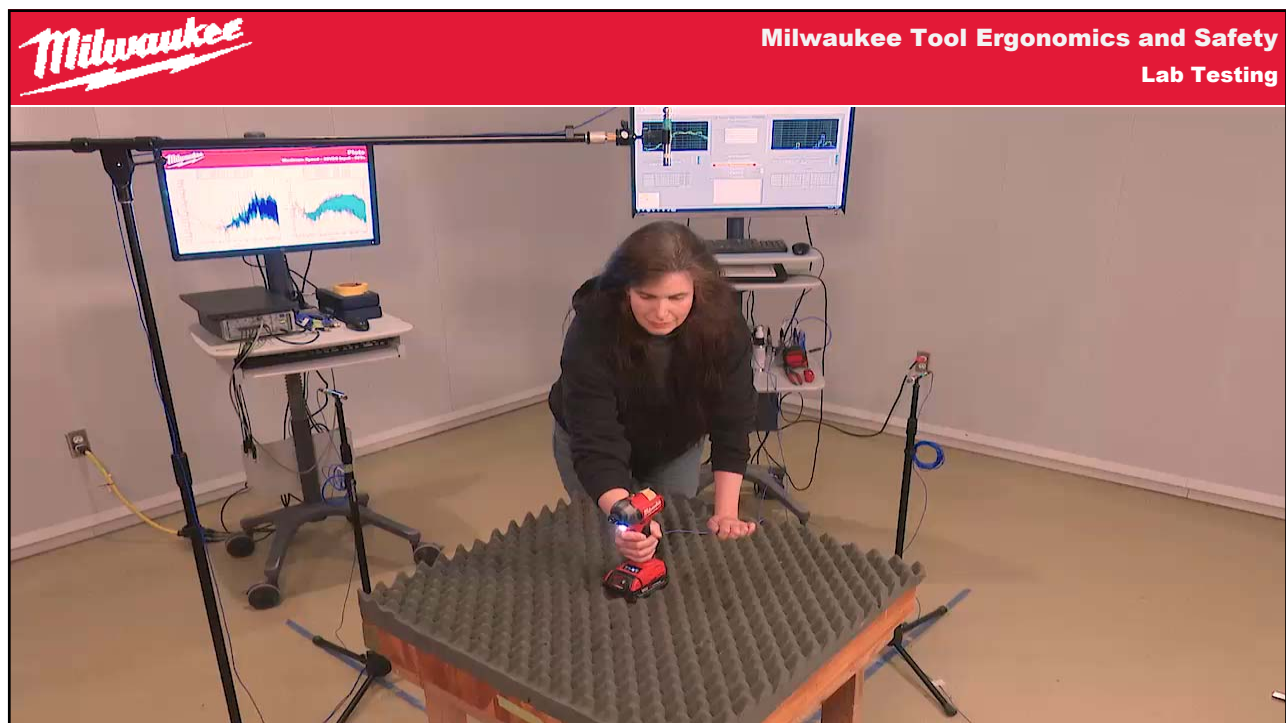
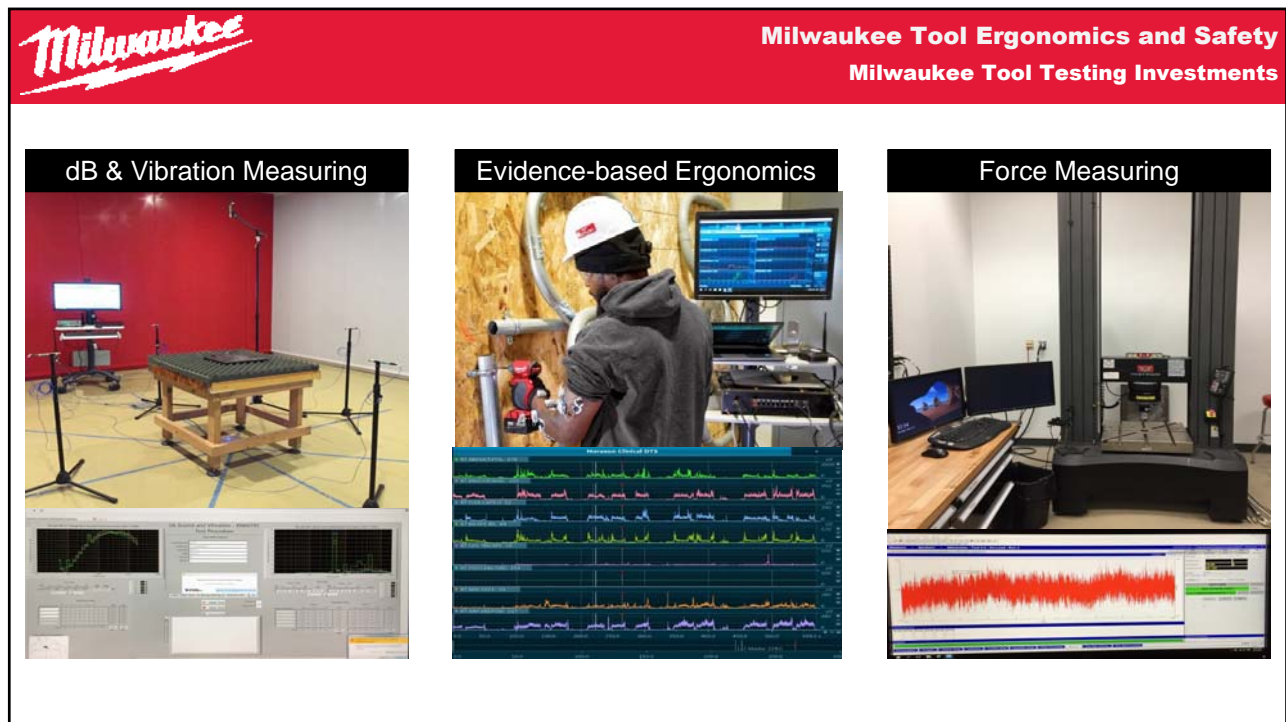
**Trigger Finger Tendonitis**

**Rotator Cuff Tendonitis**

**Elbow Epicondylitis**

**Low Back Injuries**





**Milwaukee**

## Milwaukee Tool Ergonomics and Safety Testing / Applied Results

**Current Market**



➔

**Future Market**



Benefits	User Frustrations	Benefits	Milwaukee Solution
<ul style="list-style-type: none"> <li>Light Weight</li> <li>Compact</li> <li>Optimized for Driving Fasteners</li> </ul>	<ul style="list-style-type: none"> <li><b>Loud</b></li> <li><b>Vibration</b></li> <li><b>Lifetime</b></li> </ul>	<ul style="list-style-type: none"> <li>Light Weight</li> <li>Compact</li> <li>Optimized for Driving Fasteners</li> </ul>	<ul style="list-style-type: none"> <li>✓ <b>50% Quieter</b></li> <li>✓ <b>3X Less Vibration</b></li> <li>✓ <b>Longer Life</b></li> </ul>


**LESS NOISE**



**76 dBA**

M18 FUEL™ SURGE™ Hydraulic Driver

\*#10 5-1/2" deck screw in PT



**86+ dBA**

Standard Impact Driver

**50% QUIETER THAN STANDARD IMPACT**

- Reduced Noise Creates a Quieter Work Environment
- OSHA Requires Hearing Protection for Tools that Operate Above 85dBA\*
  - SURGE™ operates at 76dBA, below the required level\*
  - Standard Impacts operate at 86+ dBA, users should be wearing hearing protection\*

\*Reference Appendix, Slide 31

**OSHA**

**SMOOTHER PERFORMANCE**





**3X LESS VIBRATION**


- FLUID-DRIVE™** Hydraulic Powertrain Reduces Metal on Metal Contact Creating a *Smooth* Experience resulting in:
  - Less Cam out
  - Less fatigue
  - Less Strain

**Milwaukee**

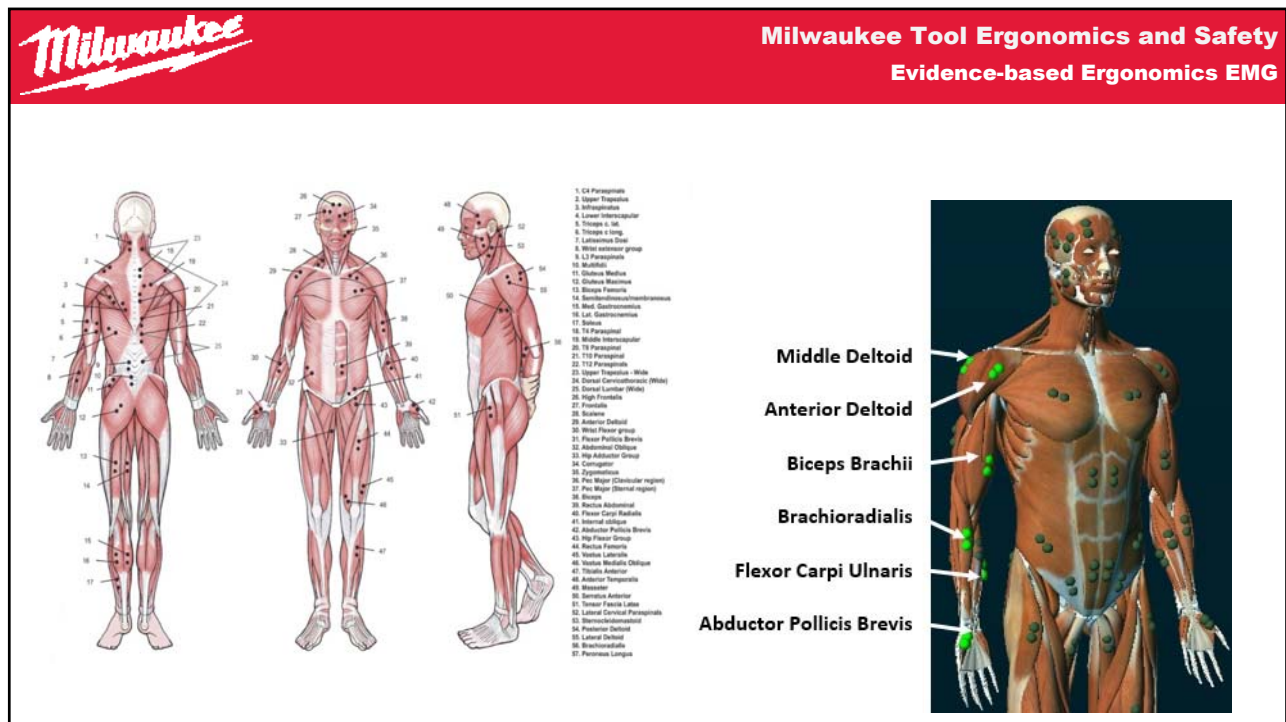
## MEASURE THE MUSCLE EFFORT OF UP TO 108 MUSCLES







**M18® FORCE LOGIC™**  
12T Utility Crimper







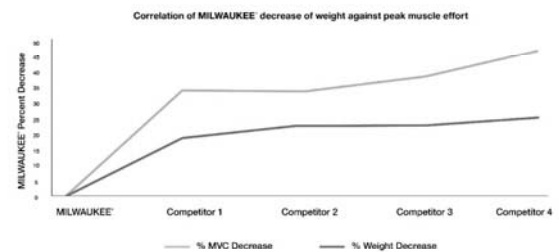
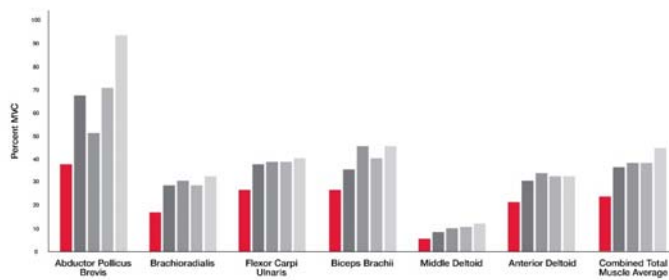
Work Piece:

Work orientations are pictured below:



## Milwaukee Tool Ergonomics and Safety Current 12T Product Assessment

≈ 1 lb of Total Weight Reduced Decreases Muscle Effort By 11%



MILWAUKEE



Competitor 1



Competitor 2



Competitor 3



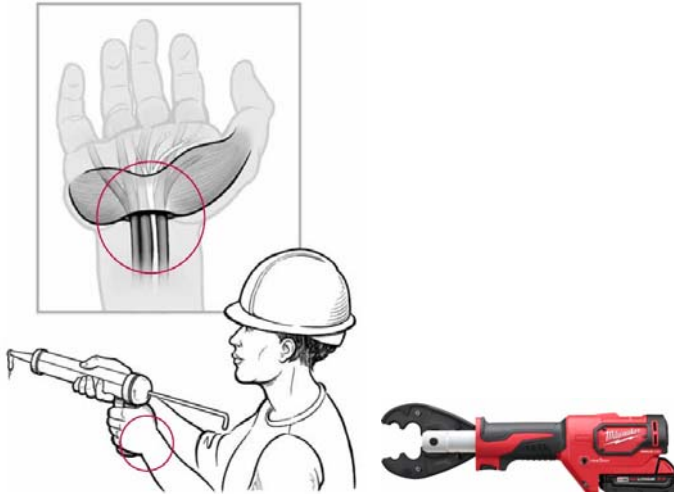
Competitor 4

### 12T Crimper Evaluation



## Milwaukee Tool Ergonomics and Safety Carpal Tunnel Syndrome

### Carpal Tunnel Syndrome **Tip #1: Keep wrist straight (Neutral)**

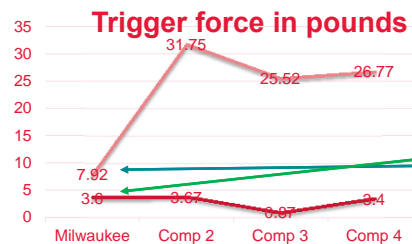
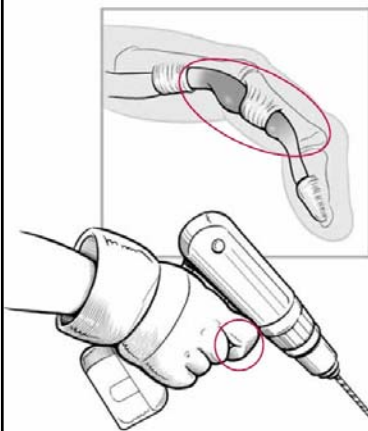


**M18™ FORCE LOGIC™ 6T Utility Crimper**



## Milwaukee Tool Ergonomics and Safety Trigger Finger Tendonitis

### Trigger Finger Tendonitis **Tip #2 : Use low force trigger engagements**

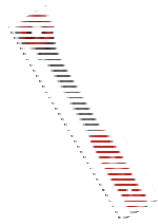


**M18™ FORCE LOGIC™ 12 Ton Crimper**



Milwaukee Tool Ergonomics and Safety  
Tendonitis

**Tendonitis** **Tip #3: Use only the amount of force necessary for the task and Keep wrist straight (Neutral)**



Lineman's High Leverage Ratcheting Wrench



Milwaukee Tool Ergonomics and Safety  
Elbow Epicondylitis

**Elbow Epicondylitis**

**Tip #4: Use power tools when available and select the correct handle orientation**



M18 FUEL™ 7/16" Hex Utility High Torque Impact Wrench

**Milwaukee**
**Milwaukee Tool Ergonomics and Safety**  
**Rotator Cuff Tear/ Bursitis**

### Rotator Cuff Tear/ Bursitis





**Tip #5: Work near elbow height**










**M18™ FORCE LOGIC™ 15T Crimper Kit**


**Milwaukee**
**Milwaukee Tool Ergonomics and Safety**  
**Crimping Comparison**

Problem	Solution
<ul style="list-style-type: none"> <li>Amount of handle force required to compress a 1/0-#2 wire pair is approximately 70 lbs. at the outer die location of the manual press               <ul style="list-style-type: none"> <li>— Only 1% capable of the general population has the peak force to make this connection</li> </ul> </li> <li>High shoulder force exertions working from a bucket of 45% Maximal Voluntary Contraction (MVC)</li> <li>Peak forces of flexor muscle in forearm from working in a bucket of 100% MVC</li> </ul>	<ul style="list-style-type: none"> <li>Nearly all workers are capable               <ul style="list-style-type: none"> <li>— A few lbs. of force to pull trigger</li> </ul> </li> <li>Reduced to less than 10% MVC (Over 80% relative reduction)</li> <li>From 100% MVC to 60% MVC (a 40% relative decrease)</li> </ul>
	

(Seeley, 2003)



Milwaukee		Milwaukee Tool Ergonomics and Safety Crimping Cutting	
Problem		Solution	
<ul style="list-style-type: none"><li>High upper extremity force exertions to close cutter handles<ul style="list-style-type: none"><li>Operating a cutter is similar to operating a manual press</li></ul></li></ul>		<ul style="list-style-type: none"><li>Substantially reduced</li></ul>	
<ul style="list-style-type: none"><li>Arms raised above the shoulder level (shoulder abduction)</li></ul>		<ul style="list-style-type: none"><li>Substantially reduced</li></ul>	
<ul style="list-style-type: none"><li>Jarring action from quick drop in force when wire is cut</li></ul>		<ul style="list-style-type: none"><li>Eliminated</li></ul>	
<ul style="list-style-type: none"><li>Repetitive upper extremity exertions using the ratchet cutter</li></ul>		<ul style="list-style-type: none"><li>Eliminated</li></ul>	
			
(Seeley, 2003)			

Milwaukee		Milwaukee Tool Ergonomics and Safety Total Solution	
Problem	Hypothesis WE Energy 2.5 Year Study	Results (2013 – 2015)	
Manual Tools	Vs.	Battery Operated Tools	
<ul style="list-style-type: none"> <li>Medical and Workers' Compensations costs: Upper extremity only</li> <li>Replacement worker</li> <li>Retraining</li> <li>Injury late reporting</li> <li>Productivity Improvement</li> </ul>	<ul style="list-style-type: none"> <li>50% reduction and <b>\$198 per worker, annually*</b></li> <li>50% reduction and <b>\$68 per worker, annually*</b></li> <li>10% reduction and <b>\$123 per worker, annually*</b></li> <li>2 case reduction and <b>\$108 per worker annually*</b></li> <li>47 hours a year or <b>\$2,355 per worker annually*</b></li> </ul>	<ul style="list-style-type: none"> <li>61% reduction and <b>\$500 per worker, annually (OR)</b></li> <li>100% reduction and <b>\$500 per worker annually (LWD)</b></li> <li>13 hours saved or <b>\$2,750 per worker annually</b></li> </ul>	
		<b>TOTAL</b> WE Energies saved <b>\$2,852 saved per worker annually</b> <ul style="list-style-type: none"> <li>At \$50/labor hour</li> </ul>	
		<b>TOTAL</b> <b>\$3,650 saved per worker, annually</b> <ul style="list-style-type: none"> <li>At \$200/labor hour</li> </ul>	



## Milwaukee Tool Ergonomics and Safety Ergonomics Evaluation



	Milwaukee Tool 12T Crimper	Leading Competitor
Weight	12.2 lbs.	15.85 lbs.
Speed	21.5 seconds	24 seconds
Balanced Center of Gravity	Yes	No
Maneuverability	350°	350°
Length	15.9 inches	16.5 inches
Trigger Activation	Two	Two
Muscle Effort	23% MVC	37% MVC



## Milwaukee Tool Ergonomics and Safety Ergonomics Evaluation

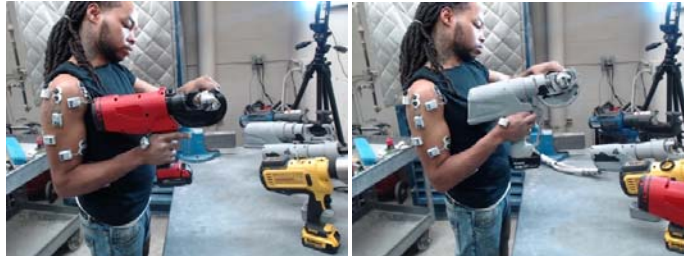


Raw uV/ % MVC	Milwaukee Tool 12T Crimper	Leading Competitor
Abductor Pollicis Brevis (Hand)	532.375 (38%)	1007.75 (71%)
Brachioradialis (Forearm)	127.5 (17%)	213.25 (28%)
Flexor carpi ulnaris (Forearm)	203 (27%)	292.667 (39%)
Biceps brachii	225.4 (27%)	340.8 (40%)
Middle Deltoid (Shoulder)	64.75 (6 %)	109.5 (11%)
Anterior Deltoid (Shoulder)	163.2 (22%)	247.4 (32%)
<b>Total</b>	<b>23% MVC</b>	<b>37% MVC</b>



## Milwaukee Tool Ergonomics and Safety Ergonomics Evaluation

**47% less muscle effort in the thumb\* and  
Improved wrist postures decrease risk for carpal tunnel syndrome**



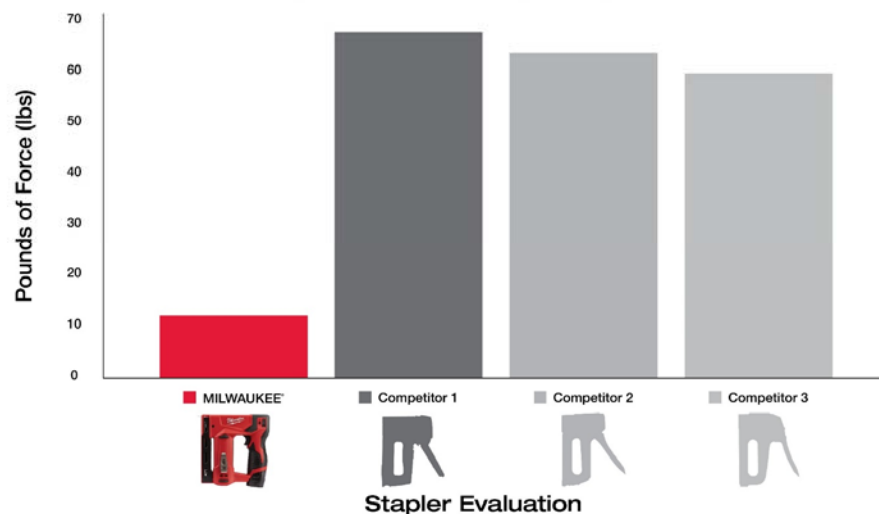
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\* Average peak microvolt reduction of the Abductor Pollicis Brevis (APB) from Bundy PAT 750 to Milwaukee 12T Utility Crimper












## Milwaukee Tool Ergonomics and Safety Complete Product Portfolio Focus

### Handle Force In Pounds




 <b>Milwaukee Tool Ergonomics and Safety</b> <b>Progression of Safety</b>						
<u>ISSUE</u>	DUST	VIBRATION/ NOISE	ERGONOMICS	CONTROL	VISIBILITY	PPE
<u>INJURY</u>	SILICOSIS	VIWF/EARDRUM DAMAGE	MSDs	ACUTE INJURIES	TRIPS	ACUTE INJURIES
<u>SOLUTION</u>	<b>DUST COMPLIANCE MADE SIMPLE</b> 	<b>WAS SURGE</b> 			<b>HIGH OUTPUT LIGHTING</b> <small>ADAPTS. PERFORMS. SURVIVES.</small> 	<small>STAY SAFE. STAY PRODUCTIVE.</small> 

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 <b>Milwaukee Tool Ergonomics and Safety</b> <b>Drops</b>		
<p> In the United States there is one INJURY caused by a DROPPED OBJECT</p> <p><b>EVERY 11 MIN</b></p> <p> <b>DROPPED OBJECTS</b> account for over <b>5%</b> OF WORKPLACE FATALITIES™</p> <p> <b>\$42,000</b> is the Average Cost for a MEDICALLY CONSULTED INJURY™</p>	<p><b>Regulation</b></p> <p></p> <p>OSHA requires that tools and materials be secured to prevent drops. Toe boards and safety nets are commonly used to catch dropped objects but tool lanyards can prevent drops before they occur.</p> <p>OSHA's General Duty Clause mandates that employers provide a jobsite that is "free of recognized hazards that are causing or are likely to cause death or serious physical harm to his employees."</p> <p><small>-OSH Act of 1970</small></p>	<p><b>OSHA'S Fatal Four</b></p> <ul style="list-style-type: none"> <li> <b>1. Falls</b></li> <li> <b>2. Electrocutions</b></li> <li> <b>3. Struck by object</b> (includes dropped objects)</li> <li> <b>4. Caught in or between</b></li> </ul>
<p><b>Tool lanyards are used to prevent dropped objects. They are most commonly used when working at height, near open edges, or around sensitive equipment. Tool lanyards can be used by any trade working in these situations.</b></p>		

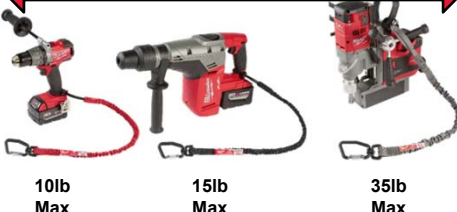
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**Milwaukee Tool Ergonomics and Safety**  
**Lanyards**

**LANYARDS RATED FOR TOOLS UP TO 35 POUNDS**

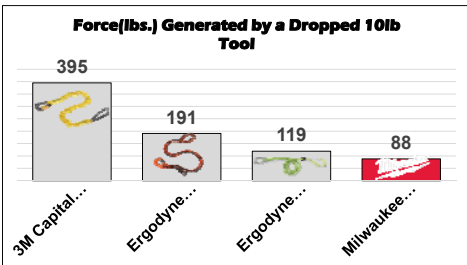


10lb Max      15lb Max      35lb Max


**STAY SAFE.  
STAY PRODUCTIVE.**

**BEST SHOCK  
ABSORPTION**



Lanyard Brand	Force (lbs.)
3M Capital...	395
Ergodyne...	191
Ergodyne...	119
Milwaukee...	88

Shock absorption is critical for tool lanyards. If a tool is dropped, Milwaukee® Tool Lanyards will gently slow the tool, reducing the amount of force on both the user and anchor point.



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**Milwaukee Tool Ergonomics and Safety**  
**Hand Injuries**

- **143,000+ lost-time hand injuries occurred in the construction industry in 2015\*\***
- **70% of hand injuries occur when the user was not wearing gloves\*\***
- **Average hand injury claim cost\***
  - Average loss per claim: \$22,384
  - Median cost of a laceration: \$6,000
  - Stitches: \$2,000
  - Butterfly: \$300
  - Severed Tendon: > \$70,000
  - Average Extremity Trauma: \$730,000
- **Median days away from work\*\* - 5**







\*Information provided by the nation safety council  
\*\* Information provided by the U.S. Bureau of Labor Statistics


**Hand Injuries Cost Companies Millions Yet are Easy Avoidable**



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**Milwaukee Tool Ergonomics and Safety**  
**Dipped Gloves**


### LEVEL 1





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


### LEVEL 3





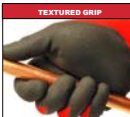
**Liner Material:** Nylon & HPPE  
**Grip Material:** Nitrile  
**Grip Finish:** Comfort Web  
**Gauge:** 15 Gauge


### LEVEL 5









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


















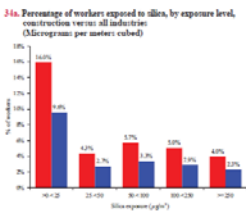
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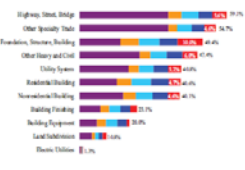
**Milwaukee Tool Ergonomics and Safety**  
**Silica Dust**

## 2.3 million workers are exposed to silica hazards **2 million – work in construction**

**34a. Percentage of workers exposed to silica, by exposure level, construction versus all industries (Micrograms per meter cubed)**



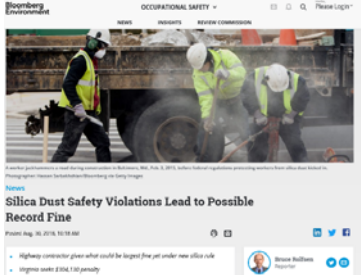
**34b. Percentage of construction workers exposed to silica, by exposure level and construction subsector (Micrograms per meter cubed)**




### BREAKING THE RULES IS DANGEROUS AND COSTLY

**Lanford Brothers fined over \$300K for 5 violations between February and May 2018**

[Link](#)




September 2017




Regulation enforcement begins

January 2018




OSHA increases daily fines from \$7,000 to \$12,934  
Repeat violations increase to \$126K

May 2018



U-Haul facility fined over \$108K for silica related exposure during renovations  
[Link](#)

September 2018



Lanford Brothers fined over \$300K for 5 violations between February and May 2018  
[Link](#)

**January 2018 – July 2018**  
**produced 116 silica fines**

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**Milwaukee**
**Milwaukee Tool Ergonomics and Safety**  
**Dust Compliance**

## DUST COMPLIANCE MADE SIMPLE

**Sub-Panel 1: Saw Features**

- Sub-Panel 1: Saw Features
- Sub-Panel 1: Saw Features
- Sub-Panel 1: Saw Features
- Sub-Panel 1: Saw Features
- Sub-Panel 1: Saw Features

**Sub-Panel 2: Grinder Features**

- Sub-Panel 2: Grinder Features
- Sub-Panel 2: Grinder Features
- Sub-Panel 2: Grinder Features
- Sub-Panel 2: Grinder Features
- Sub-Panel 2: Grinder Features

**Sub-Panel 3: Saw Features**

- Sub-Panel 3: Saw Features
- Sub-Panel 3: Saw Features
- Sub-Panel 3: Saw Features
- Sub-Panel 3: Saw Features
- Sub-Panel 3: Saw Features

**UNIVERSAL CORDLESS SOLUTIONS  
FITS ALL BRANDS**

OSHA COMPLIANT	COMPATIBLE

**UNIVERSAL CORDLESS SOLUTIONS  
FITS ALL BRANDS**

OSHA COMPLIANT	UNIVERSAL FIT

**POWERFUL CONSISTENT SUCTION  
CLEANER AIR**

OSHA COMPLIANT	CLEANER AIR

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**Milwaukee**
**Milwaukee Tool Ergonomics and Safety**  
**Slips, Trips, Falls**

**“Fall injuries can also be prevented through design features, such as slip-resistant flooring, planned pedestrian routes that are separated from moving machinery, and adequate lighting. ~CPWR**

**45a. Number of nonfatal injuries due to falls, slips, and trips involving days away from work in construction, by cause, 2011-2015**

Year	Number of Injuries
2011	8800
2012	9440
2013	11570
2014	11570
2015	11600

— Slips, Trips,...

**45b. Distribution of nonfatal injuries due to falls, slips, and trips on the same level resulting in days away from work in construction, 2015**

Category	Percentage
Fall from slipping	32.9%
Fall from tripping	20.2%
Other fall on same level	14.0%
Slip without fall	16.4%
Trip without fall	15.0%
Other slip or trip without fall	1.5%

Total = 12,100 fall injuries

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## Milwaukee Tool Ergonomics and Safety Lighting and Cords

### Slips, Trips, and Falls from Inadequate Lighting

**1926.56(a)** "Construction area, ramps, runways, corridors, offices, shops, and storage areas shall be lighted not less than the minimum illumination intensities listed in Table D-3 while any work is in progress"



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### Slips, Trips, and Falls from Extension Cords

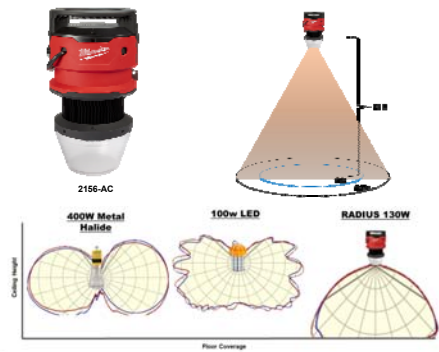
**1910.305(g)(1)(iv)** "Flexible cords and cables may not be used through holes in walls, ceilings, or floors or in doorways, windows, or similar openings"



## Milwaukee Tool Ergonomics and Safety Lighting Solutions

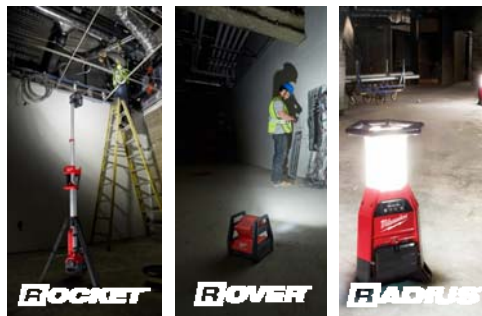
### TEMPORARY SITE LIGHT

Obtain 5fc with more floor coverage and less lights



### JOB SITE LIGHTING

Cut the cord with the industry's only full offering of cordless lighting solutions



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## Milwaukee® POWER TOOLS



### SDS MAX ROTARY HAMMER

- Electromagnetic Clutch that prevents over rotation in case of lock up
- Competitive Tools will Rotate 360 Degrees



### BANDSAW DUAL ACTUATION TRIGGERS WITH BLADE GUARDING

- For enhanced control and productivity
- Proprietary composite material and Crush Zone Barriers absorb impacts and protect the tool



### SURGE IMPACT DRIVER

- REDUCES VIBRATION by up to 3X
- REDUCES dB output by 50%

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## Milwaukee® POWER TOOLS



### SMALL ANGLE GRINDER

- Rapid stop break in under 3 seconds
- Slimmest grip on the market for increased user comfort and control
- Guards, side handles, dual actuation switch, & Clutch



### PIPE THREADER

- Industry 1<sup>st</sup>: Auto-Stop Kickback Control
- Side-Grip Thread Starts
  - Eliminates Need to Contact Spinning Die Head



### THREADED ROD CUTTER

- No Chips, No Sparks, No Vibration: • Safer solution than a grinder, cut-off saw, and reciprocating saw
- One-handed centered grip allows for easier overhead reach

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## Milwaukee® POWER TOOLS



### MAG DRILL

- Delivers the strongest magnetic hold on 1/4" steel providing a safer drilling environment
- Auto-Stop lift-off detection, power to the motor is automatically cut if excess rotational motion is detected while drilling



### 12T CRIMPER

- Decreases muscle effort by up to 44%
- Reduces the risk factors of common ergonomic injuries
- Designed to reduce weight and improve balance, it is the lightest and only fully balanced 12T crimper, with a 350° rotating head



### 3" UG CUTTER

- Delivers a safer way to cut remotely.
- Removes the physical connection to the tool allowing Linemen to cut up to 1500MCM Copper 15kV WIRELESSLY

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## Milwaukee® POWER TOOLS



### M12 RIVET TOOL

- Decreases muscle effort by up to 60%
- Reduces force to engage tool by 72.8 lbs



### 1/2" DRILL/ DRIVER W/ ONE-KEY

- Anti-Kickback technology increases your control in bind-up situations



### M12 CROWN STAPLER

- Easy to squeeze trigger design significantly reduces fatigue associated with traditional hand staplers.
- Reduces muscle effort over 80%

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Milwaukee

## STAY SAFE. STAY PRODUCTIVE.

PPE

### LANYARDS

In the United States there is one INJURY caused by a DROPPED OBJECT every

11 MIN

DROPPED OBJECTS account for over




5%

of workplace fatalities

\$42,000

is the Average Cost for a MEDICALLY CONSULTED INJURY

LANYARDS RATED FOR TOOLS UP TO 35 POUNDS


**10lb  
Max**

**15lb  
Max**


**35lb  
Max**



### GLOVES



143,000+ hand injuries occurred in 2015.





70% of hand injuries occur when the user was NOT wearing gloves.\*\*









### WHAT'S NEXT

<p><b>Safety Glasses</b></p> 	<p><b>Hard Hats</b></p> 	<p><b>High Vis Vests</b></p> 
<p><b>Hearing Protection</b></p> 	<p><b>Expanded Gloves and Lanyards</b></p> 	<p><b>Dust Masks</b></p> 

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## Nothing but HEAVY DUTY.

### REDUCE INJURIES

- Decrease Muscle Effort
- Decrease Muscle Fatigue

### IMPROVE SAFETY

- Increase Productivity
- Decrease Risk Factors of Injuries

### SAVE MONEY

- Calculate ROI
- Validate Payback Period

