

AGENDA

- 1 Ergonomics, Reframed
Ergonomics in Utility Work
- 2 Evidence in Action
Case Studies
- 3 Beyond Ergonomics
Exposure & Environment
- 4 Smart Tool Selection
Evaluation & Comparison
- 5 Insights in Action
Next Steps

2026 NECA SAFETY PROFESSIONALS CONFERENCE

ABOUT ME

- 10 years** with Greenlee, working across the electrical and utility industry
 - Pulling & Fishing, Cable Termination, Storage, Bending, BIM
- Bridge** between the field and engineering – turning real jobsite challenges into innovative solutions
- Experience** in product management, marketing, and field research
- Collaborate** with utility crews, contractors, field trainers and safety professionals to deliver solutions

ERGONOMIC-FOCUSED SOLUTIONS

- G1 VERSI-TUGGER™
- REEL-X™ FISH TAPES
- REMOTE PRUNER
- 12T CRIMPER

2026 NECA SAFETY PROFESSIONALS CONFERENCE

ERGONOMICS, REFRAMED

Ergonomics in Utility Work

LET'S TALK ABOUT ERGONOMICS

We all use the word—but don't always mean the same thing

- “Ergonomics” is everywhere right now
- It shows up in safety meetings, tool marketing, and job planning
- Everyone uses the word - but not everyone means the same thing

WHAT WE HEARD

- Most used **comfort-driven language**, emphasizing **reduced strain and fatigue**.
- Most definitions focus on comfort or preference
- Some see it as **optional** or secondary
- It's often associated with “**nice-to-have**” improvements

2026 NECA SAFETY PROFESSIONALS CONFERENCE

THE REAL DEFINITION OF ERGONOMICS

Fit the job to the worker - not the worker to the job

- Ergonomics is about designing work around the worker
- It considers human strength, movement, and limitations
- Focuses on reducing strain, not just improving comfort
- Aims to prevent injury before it happens
- Directly impacts how work is performed

2026 NECA SAFETY PROFESSIONALS CONFERENCE

UTILITY WORK IS PHYSICALLY DEMANDING

Every task. Every shift. Every condition.

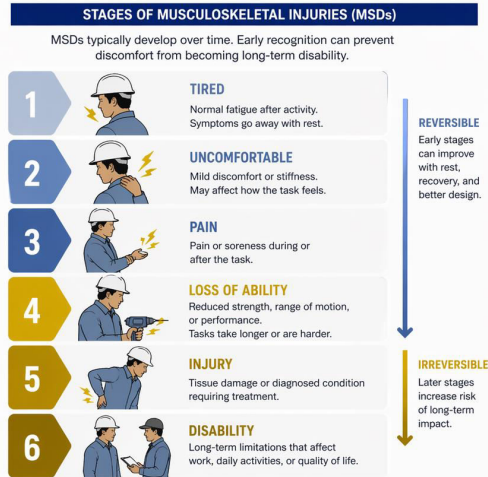
- The job routinely combines force, repetition, posture, and urgency**
- Crews perform high-force tasks such as cutting, crimping, pulling, lifting, and positioning.
- Many tasks are repeated across long shifts, especially during outage restoration or major projects
- Work often happens overhead, at extended reach, in buckets, underground, or in constrained spaces
- Environmental conditions add complexity: weather, terrain, gloves, PPE, visibility, and access limitations
- Fatigue is often normalized as part of the job, even when it is an early signal of preventable risk

2026 NECA SAFETY PROFESSIONALS CONFERENCE

WHAT CREWS ARE ALREADY TELLING US

Listening to the field reveals early signs of risk.

- Fatigue shows up before injury does**
Workers report shoulder, wrist, hand, forearm, and back fatigue long before a formal injury occurs.
- Experienced crews often modify how they work**
to compensate for uncomfortable tools or awkward tasks.
- A common warning sign is when productivity drops later in the shift** because workers are physically spent.
- Delayed reporting is common** because strain-related discomfort builds gradually rather than suddenly.
- These are not simply complaints:** They are field-level indicators of ergonomic exposure.



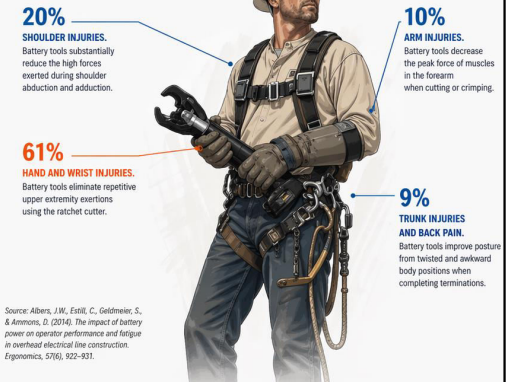
FATIGUE BUILDS – IT DOESN'T HAPPEN ALL AT ONCE

The real problem is repeated exposure over time.

- Injuries don't happen suddenly** – they develop gradually.
- Small physical demands add up** across a shift, a week, a storm season, and a career.
- Workers adapt by changing posture, grip, speed, or body mechanics.**
- Those compensations often shift strain** – not eliminate it.
- If fatigue is predictable,** the injury pathway is also predictable **and** preventable.



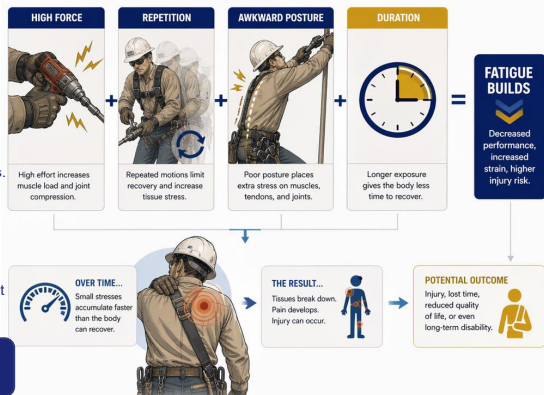
PERCENTAGE OF INJURIES CAUSED BY THE REPETITIVE USE OF MANUAL TOOLS



WHAT DRIVES FATIGUE ON THE JOB?

More exposure. Less recovery. Greater risk.

- HIGH FORCE**
Heavy tools, gripping, lifting, pushing, and pulling increase the load on muscles and joints.
 - REPETITION**
Repeating the same motions throughout the shift limits recovery and increase tissue stress.
 - AWKWARD POSTURE**
Reaching, twisting, bending, and working overhead places extra stress on the body.
 - DURATION**
Long shifts, extended projects, and insufficient breaks reduce the body's ability to recover.
- Individually, each factor adds stress. Together, they increase fatigue and risk of injury.**

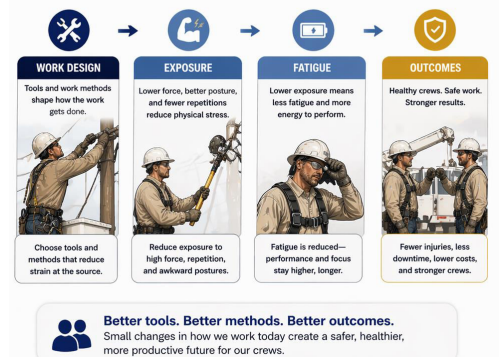


THIS IS WHERE WE CAN CHANGE OUTCOMES

We can reduce exposure, reduce fatigue, and improve safety outcomes.

- If exposure drives fatigue,** We can reduce exposure.
- If fatigue is predictable,** to compensate for uncomfortable tools or awkward tasks.
- A common warning sign is when productivity drops later in the shift** because workers are physically spent.
- Delayed reporting is common** because strain-related discomfort builds gradually rather than suddenly.
- These are not simply complaints:** They are field-level indicators of ergonomic exposure.

BETTER WORK DESIGN LEADS TO BETTER OUTCOMES



EVIDENCE IN ACTION

Case Studies

CASE STUDY PG&E: STARTING POINT

- Large utility workforce** performing repetitive, high-force tasks
- Musculoskeletal injuries** were a leading cause of lost time
- Traditional Tools** required high force and awkward positioning
- Risk was consistent** predictable, and built into the work
- It was time to rethink** how the work was done

THE RISK WASN'T HIDDEN – IT WAS BUILT INTO THE WORK

So, they changed the way they worked

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

PG&E: WHAT WAS HAPPENING IN THE WORK

High-force tasks were creating predictable strain

Manual tools **required high peak force** during crimping and cutting tasks.

Bucket and overhead work **increased shoulder loading** because workers had to control tools away from the body.

Forearm and **hand effort increased** when workers had to grip, squeeze, trigger, or reposition tools repeatedly.

Fatigue accumulated across the shift, especially during repeated or storm-response work.

THESE TASK DEMANDS WERE **NOT SUSTAINABLE** FOR THE ENTIRE WORKFORCE

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

PG&E: SHIFTING PERSPECTIVES

Why is the work creating strain?

The Problem Wasn't Going Away

- Injuries continued** despite training and PPE
- Crews adapted,** but strain remained
- The same tasks** kept producing the same outcomes
- Traditional approaches** weren't addressing the root cause

THE OLD QUESTION: "How do we respond to injuries?"

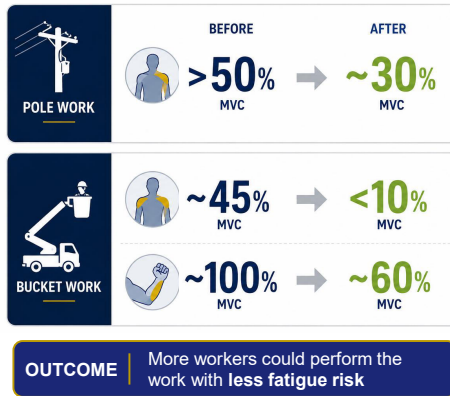
THE NEW QUESTION: "Why is the work creating strain?"

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

PG&E: WHAT IMPROVED

Measured reductions in muscle load changed the story

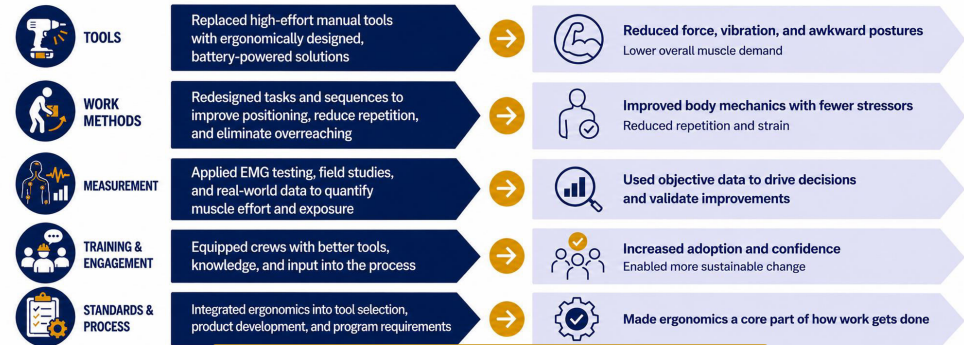
- REVEAL RISK**
Hidden strain became visible
- GUIDE DECISIONS**
Data shaped tool and method choices
- VALIDATE IMPACT**
Improvements could be proven
- RAISE THE STANDARD**
Measurement became part of the process



2026 NECA SAFETY PROFESSIONALS CONFERENCE

PG&E: WHAT CHANGED. WHAT THEY LEARNED

Data revealed the strain. Innovation changed the work.



NUMBERS MATTER BECAUSE WORKERS FEEL THE DIFFERENCE



2026 NECA SAFETY PROFESSIONALS CONFERENCE

PG&E: WHAT THIS PROVED

Better work design delivered measurable results

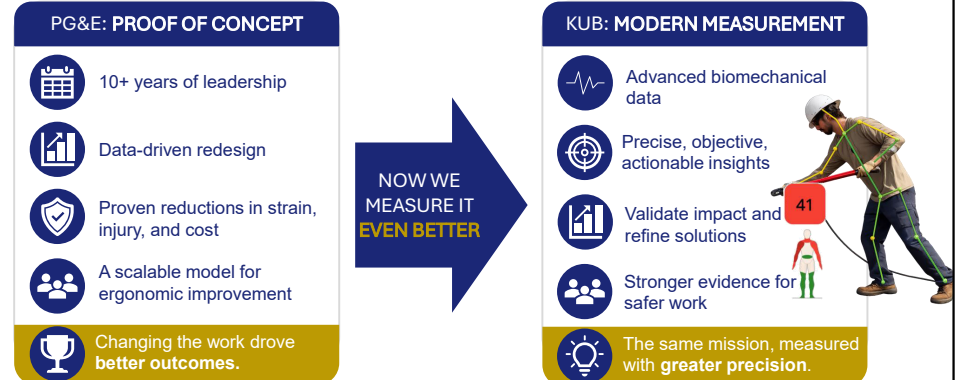
- FEWER INJURIES**
-75% Lost workday cases | -62% OSHA recordables
- LOWER PHYSICAL DEMAND**
Reduced muscle effort across:
Forearm | Shoulder | Lower back
- BETTER PERFORMANCE**
Faster task completion
20-30% Reduced manual effort and fatigue
- BUSINESS IMPACT**
Annualized savings
\$7M+ Improved retention and sustainability



2026 NECA SAFETY PROFESSIONALS CONFERENCE

FROM PROVEN FOUNDATION TO MODERN MEASUREMENT

PG&E showed what's possible. KUB shows how we measure it today



2026 NECA SAFETY PROFESSIONALS CONFERENCE

CASE STUDY KUB: DIFFERENT UTILITY, SAME PATTERN

RISING INJURIES & MEDICAL VISITS
More employees seeking care

CUMULATIVE, NOT ACUTE
Injuries were the result of daily strain and fatigue, not accidents

STRETCHING WAS THE FOCUS
Previous efforts focused on improving your body, not the methods or tools

LACKED DEEPER INSIGHT
Needed data to understand what caused the strain – and how to fix it



2026 NECA SAFETY PROFESSIONALS CONFERENCE

MEASURING THE WORK

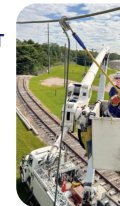
Objective data in the field delivered a path to better decisions

IN-FIELD TESTING
Workers performed tasks normally

EMG SENSORS & VIDEO
Measures muscle activity and body movement

ADVANCED TOOL ASSESSMENT
Data was processed to determine strain scores

SAME BUT DIFFERENT
The same worker, same task using different tools and methods



WHAT POSTURE AND MOVEMENT RISKS ARE PRESENT?

GREENLEE Hot Stick Ground #2
Score: 38

Micro Volt Baseline: 1000µV
µV Peak: #2 - 1879, #3 - 1423
µV Mean: #2 - 153, #3 - 117
Cycles: 2
Time: 70 Seconds

HOW MUCH MUSCLE EFFORT IS THE WORKER USING?



2026 NECA SAFETY PROFESSIONALS CONFERENCE

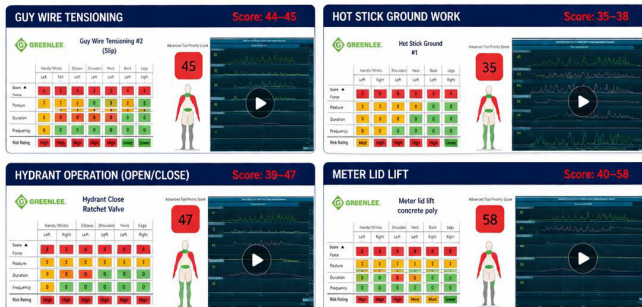
WHAT THEY WERE TRYING TO SOLVE

The issue wasn't one task — it was cumulative exposure across the workday

HIGH, CONSISTENT STRAIN ACROSS DAILY WORK

- Multiple daily tasks scored in the 30s–50s
- Different tasks, tools, and motions — but the exposure stayed high
- Common drivers: force, repetition, posture, and duration
- Stretching helped workers prepare, but did not change the demands of the work

Examples from the 2021 KUB Study – Advanced Tool Priority Scores



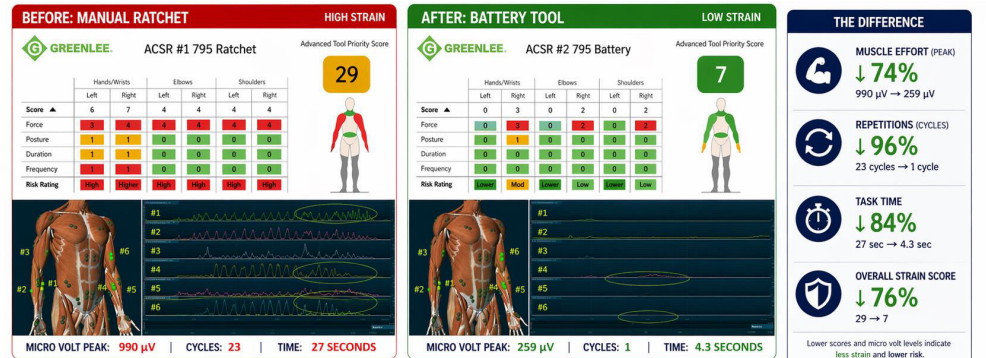
THIS WASN'T ONE BAD TASK – IT WAS PATTERN ACROSS THE SYSTEM



2026 NECA SAFETY PROFESSIONALS CONFERENCE

WHAT THE DATA ACTUALLY SHOWED

Same task. Same worker. Different tool. Different outcome.



LESS FORCE. FEWER REPETITIONS. LESS FATIGUE. BETTER TOOLS. BETTER OUTCOMES.



2026 NECA SAFETY PROFESSIONALS CONFERENCE

ONE MISSION. STRONGER EVIDENCE. BETTER OUTCOMES.

Different work. Same challenges. Measurable improvements.

THE PROBLEM	THE RESULT
HIGH MUSCLE STRAIN Elevated muscle activity leads to fatigue and overuse injuries.	LOWER MUSCLE STRAIN Up to 70% less muscle activity reduces fatigue and physical stress.
REPETITIVE EFFORT High repetition increases cumulative strain on joints and muscles.	FEWER REPETITIONS Up to 50% fewer reps per task with automated and powered tools.
LONGER TASK TIMES More time spent on high-force tasks increases fatigue over the course of the day.	FASTER TASK COMPLETION Up to 84% less time on tasks means less fatigue and more energy for the rest of the shift.
HIGHER RISK EXPOSURE More strain, more fatigue. Greater risk of injury and lost time.	LOWER CUMULATIVE STRAIN Lower strain leads to fewer injuries, less pain, and stronger, more reliable crews.

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

BEYOND "ERGONOMICS"

Exposure & Environment

NSPC
NECA SAFETY PROFESSIONALS CONFERENCE

BEYOND ERGONOMICS: REDUCING EXPOSURE

Some innovations reduce risk by changing where the worker is

Traditional ergonomics focuses on reducing strain on the body.

- Remote-operated tools allow work to be performed from a **safer location** or distance.
- Hot-stick compatible tools **improve reach** and keep workers out of less desirable positions.
- Underground cutting tools **reduce exposure** to the target area during the task.

This is a **complementary risk-reduction strategy**, not a replacement for ergonomic design.

Goal: Reduce exposure: physical, positional, environmental, or hazard-related.

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

THE RIGHT LENS: RISK REDUCTION

Evaluate tools through the lens of risk reduction, not just performance

- What risk the tool is **designed to reduce**?
- Does it **increase distance** from the hazard or target area?
- Does it allow the worker to stay in a **safer** or **more stable position**?
- Does it **reduce time spent** in an awkward, energized, confined, or difficult-access environment?
- Does it improve **visibility, control, and communication** during the task?
- Does it complement ergonomic improvements by **reducing the need** for risky positioning?

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

THE KEY DISTINCTION

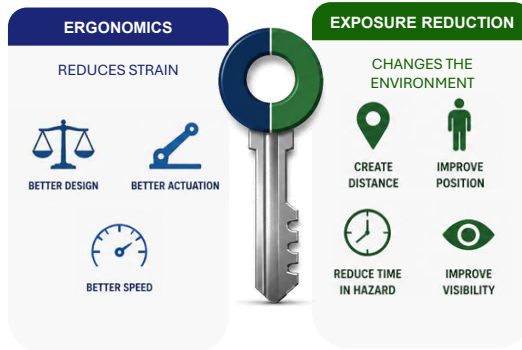
Ergonomics reduces strain; exposure reduction changes the work environment

Some tools **reduce physical effort** directly through better design, balance, actuation, or speed.

Some tools **reduce exposure** by letting the worker stand somewhere safer or access the task differently.

✗ MISTAKE: Treating every tool improvement as the same kind of improvement.

✓ RIGHT APPROACH: defining the problem clearly.



BOTH APPROACHES MATTER BECAUSE THE GOAL IS LOWER RISK, NOT JUST LESS EFFORT



2026 NECA SAFETY PROFESSIONALS CONFERENCE

SMARTER TOOL SELECTION

Evaluation & Comparison



NOT ALL POWERED TOOLS ARE EQUAL

Power source is only one part of ergonomic performance

⚡ A battery-powered tool can reduce **manual force** but still create strain if it is heavy, poorly balanced, or awkward to control.

⚖️ A tool can reduce one exposure while increasing another, such as shoulder load or wrist deviation.

👤 Ergonomic performance depends on **total design**: force, posture, grip, balance, controls, cycle time, and usability.

☀️ **Field conditions matter**: gloves, bucket work, overhead reach, weather, access, and visibility all affect performance.

✗ POORLY DESIGNED TOOL

⚔️ HIGH FORCE
Requires more push, pull, or grip force to operate.

👉 AWKWARD POSTURE
Forces the wrist, arm, or body into stressful positions.

⚖️ POOR BALANCE
Feels front-heavy or unstable, increasing strain and reducing control.

👉 POOR GRIP & CONTROLS
Hard to hold or reach controls, increasing effort and fatigue.

🕒 LOW EFFICIENCY
Takes more time, more steps, and more energy to get the job done.

VS.

✓ WELL DESIGNED TOOL

🌿 LOW FORCE
Requires less push, pull, or grip force to operate.

👉 NEUTRAL POSTURE
Supports natural wrist, arm, and body alignment.

⚖️ WELL BALANCED
Weight is centered and close to the body for better stability and control.

👉 GOOD GRIP & CONTROLS
Comfortable to hold with intuitive, easy-to-reach controls.

🕒 HIGH EFFICIENCY
Gets the job done faster with less effort and less fatigue.

ERGONOMIC PERFORMANCE IS ABOUT TOTAL EXPOSURE - NOT JUST POWER



2026 NECA SAFETY PROFESSIONALS CONFERENCE

WHAT TO LOOK FOR WHEN COMPARING TOOLS

Evaluate the whole task — not just the power source.

- Does it reduce peak and sustained effort?
- Does it keep the worker neutral and closer to the work?
- Is it controllable through the full task?
- Can it be used comfortably with gloves and repeated activation?
- Does it reduce steps, cycles, time under tension, or rework?



BETTER TOOL SELECTION REDUCES TOTAL EXPOSURE.



RED FLAGS DURING TOOL EVALUATION

If you see these, dig deeper. The tool may create more risk than relief

<p>HIGH FORCE REQUIRED</p> <p>Requires significant grip or push/pull force to operate. Look for better leverage or mechanical advantage.</p>	<p>AWKWARD OR EXTREME POSTURES</p> <p>Forces you to reach, twist, bend, or work overhead. Neutral posture should be the standard.</p>	<p>POOR BALANCE OR HEAVY FRONT END</p> <p>Front-heavy tools increase wrist and shoulder strain and reduce control.</p>	<p>POOR GRIP OR FIT</p> <p>Grips that are too large, slippery, or don't fit your hand increase effort and fatigue.</p>	<p>HIGH ACTIVATION FORCE</p> <p>Heavy triggers, stiff buttons, or hard-to-reach controls lead to finger and forearm fatigue.</p>
<p>EXCESSIVE VIBRATION</p> <p>Vibration increases fatigue and long-term risk of injury. Look for lower vibration solutions.</p>	<p>MULTIPLE STEPS OR ADJUSTMENTS</p> <p>Complex setups, multiple steps, or frequent adjustments add time, frustration, and exposure.</p>	<p>LONG CYCLE TIME OR SLOW OPERATION</p> <p>Slow tools keep muscles working longer and increase total exposure time.</p>	<p>POOR VISIBILITY OR ACCESS</p> <p>Limited visibility or hard-to-access work areas increase awkward positions and risk of error.</p>	<p>NOT COMPATIBLE WITH THE WORK ENVIRONMENT</p> <p>Tools that don't perform well in heat, cold, wet, or dirty conditions can compromise safety and durability.</p>

REMEMBER:
If a tool creates discomfort, requires compensation, or doesn't feel better – it probably isn't better



2026 NECA SAFETY PROFESSIONALS CONFERENCE

TWO WAYS BETTER TOOLS REDUCE RISK

Some tools reduce strain. Others reduce exposure. Know which problem you're solving.

REDUCE STRAIN	REDUCE EXPOSURE
<p><i>How the tool works with the worker</i></p> <ul style="list-style-type: none"> LOWER FORCE Less push, pull, or grip force NEUTRAL POSTURE Supports natural body alignment WELL BALANCED Stable and easy to control GOOD GRIP & CONTROLS Fits the hand and is easy to operate CONSISTENT PERFORMANCE Delivers the same output every time 	<p><i>How the tool changes where the worker is</i></p> <ul style="list-style-type: none"> CREATE DISTANCE Work can be done from a safer location IMPROVE POSITION Less need to reach or work in tight spots REDUCE TIME IN HAZARD ZONE Less time exposed to the hazard IMPROVE CONTROL & ACCURACY Stable, predictable tools reduce risk LOWER INJURY RISK Less stress on the body and lower injury risk

BETTER TOOLS MATTER



2026 NECA SAFETY PROFESSIONALS CONFERENCE

INSIGHT TO ACTION

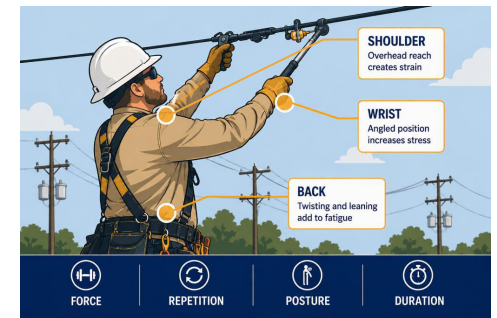
Next Steps



WHAT YOU CAN DO TOMORROW

Start small. Watch the work. Measure what matters.

- Start with one task**
Choose one high-risk job where force, repetition, posture, and duration combine
- Watch the work in the field**
Look for visible risk: force, repetition, awkward posture, and time under load.
- Ask crews what they feel**
Fatigue, discomfort, workarounds, and "normal" pain are early signals.
- Compare the whole task**
Evaluate force, posture, balance, controls, efficiency, and field usability.
- Pilot, measure, and build momentum**
Use one improvement to prove impact and justify the next.



MOST ERGONOMIC RISK IS VISIBLE IF YOU KNOW WHAT TO LOOK FOR



2026 NECA SAFETY PROFESSIONALS CONFERENCE

DESIGN THE WORK AROUND THE WORKER

Lower strain. Lower exposure. Better outcomes.

GOAL: NOT JUST FEWER INJURIES
HEALTHIER WORKFORCE OVER AN ENTIRE CAREER

- FATIGUE IS NOT RANDOM**
It is a signal of exposure, not part of the job.
- ERGONOMIC RISK IS PREDICTABLE**
When we look at force, repetition, posture, and duration.
- NOT ALL POWERED TOOLS ARE EQUAL**
Design determines whether strain is truly reduced.
- NOT EVERY SOLUTION IS ERGONOMIC**
The best safety strategies reduce risk in the right way.

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

Questions?

NSPC
NECA SAFETY PROFESSIONALS CONFERENCE

NSPC
NECA SAFETY PROFESSIONALS CONFERENCE

TOOL SELECTION: FORCE AND EFFORT

Lower force isn't just easier – it's less fatigue over time

- Does the tool **reduce** both peak **effort** and sustained effort?
- Does it **eliminate high-force** manual actions such as squeezing, ratcheting, or repeated repositioning?
- Is the trigger or activation **force low enough** to avoid finger, hand, or forearm fatigue?
- Does the tool **complete the task smoothly** without requiring extra corrective actions?
- Does it **reduce the worker's total effort** across the entire task, not just one moment in the task?

HIGHER FORCE • MORE EFFORT

HIGH FORCE
Greater muscle effort

MORE REPETITIONS
More cycles increase fatigue

LONGER TIME UNDER LOAD
More time under tension

GREATER FATIGUE
Higher risk of strain and injury

LOWER FORCE • LESS EFFORT

LOWER FORCE
Less muscle effort

FEWER REPETITIONS
Fewer cycles reduce fatigue

LESS TIME UNDER LOAD
Less time under tension

LESS FATIGUE
Lower risk of strain and injury

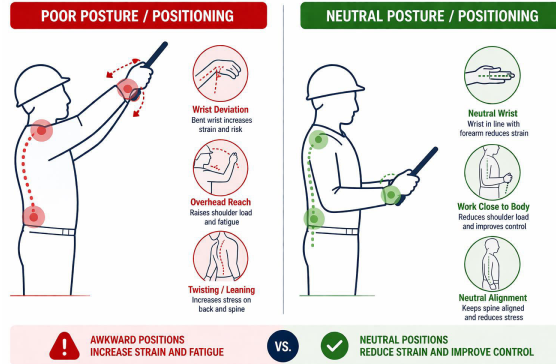
THE GOAL: ↓ REDUCE FORCE | ↓ REDUCE REPETITIONS | ↓ REDUCE TIME UNDER TENSION = LESS FATIGUE. LOWER RISK.

NSPC 2026 NECA SAFETY PROFESSIONALS CONFERENCE

TOOL SELECTION: POSTURE AND POSITIONING

The best tool is the one that lets the worker stay neutral

- Can the task be performed with the shoulder, wrist, and back in a more **neutral posture**?
- Does the tool reduce overhead reach, extended arm work, twisting, or awkward trunk posture?
- Can the worker keep the task **closer to the body** when possible?
- Does the **tool orientation** support the way crews actually work in buckets, trenches, vaults, and poles?
- Does it **reduce the need for workarounds** or compensating body movements?



NSPC

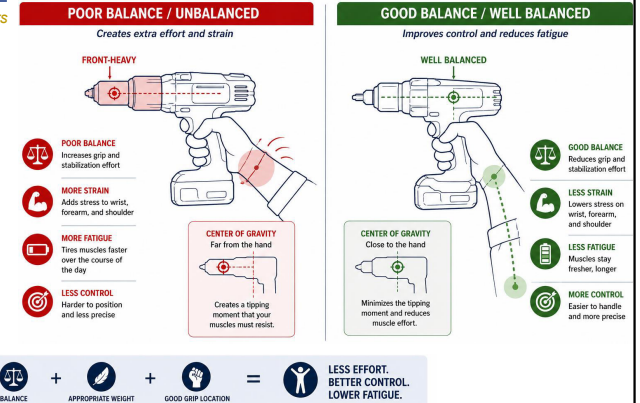


2026 NECA SAFETY PROFESSIONALS CONFERENCE

TOOL SELECTION: WEIGHT AND BALANCE

Weight matters, but balance often matters more

- A lighter tool is not better if the **weight distribution** pulls the wrist or shoulder into strain.
- Front-heavy or rear-heavy** designs can increase fatigue even when the tool is powered.
- The tool should **feel controllable** during positioning, activation, and completion of the task.
- Consider whether **one-handed use** is realistic when the work requires it.
- Ask crews **where they feel the load**: hand, wrist, forearm, upper arm, shoulder, or back.



NSPC

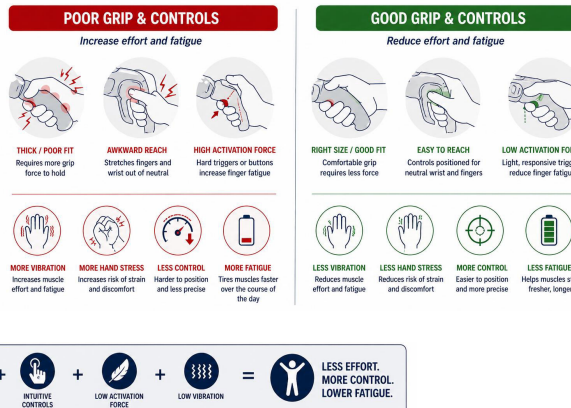


2026 NECA SAFETY PROFESSIONALS CONFERENCE

TOOL SELECTION: GRIP AND CONTROLS

Small design details have big ergonomic consequences

- Grip circumference should work with **gloved hands**, not just bare hands in a lab.
- Controls should be **reachable without shifting grip** or supporting the tool awkwardly.
- Trigger and release design should **avoid repeated thumb strain**, finger strain, or two-hand workarounds.
- The tool should allow the user to **maintain control** throughout the full cycle.
- Comfort ratings, perceived exertion, and user preference are useful because they often reveal design problems quickly.



NSPC



2026 NECA SAFETY PROFESSIONALS CONFERENCE

TOOL SELECTION: EFFICIENCY AND EXPOSURE TIME

Faster is not just productivity; it can be exposure reduction

- A faster cycle can reduce the amount of time the worker spends under load.
- Reduced task duration can **lower cumulative fatigue** across repeated cycles.
- Efficiency should be **evaluated in realistic positions**: horizontal, vertical, overhead, confined, and field conditions.
- A tool that forces extra repositioning, waiting, or two-handed recovery may increase exposure even if it is powered.
- Cycle time** should be viewed as both an operational metric and an ergonomic exposure metric.



NSPC



2026 NECA SAFETY PROFESSIONALS CONFERENCE