



The Energy Wheel and MSDs

How MSDs Integrate into the Hazard Recognition of Field Employees

Speakers: Dr. Katie Welfare & Dr. Kevin Rindal, DC



Energy Theory

The energy theory is based on the observation that all injuries are the result of some unwanted contact between a person and one or more sources of energy.

→ A hazard is therefore a source of energy that could cause injury, illness or death.

Even the most experienced
construction safety professionals
will only identify

45%

of hazards on a given site!





Temporary Supported Pipe

Mechanical Pulley

Craned Load

TD Lines

Sun
Exposure

Vehicles



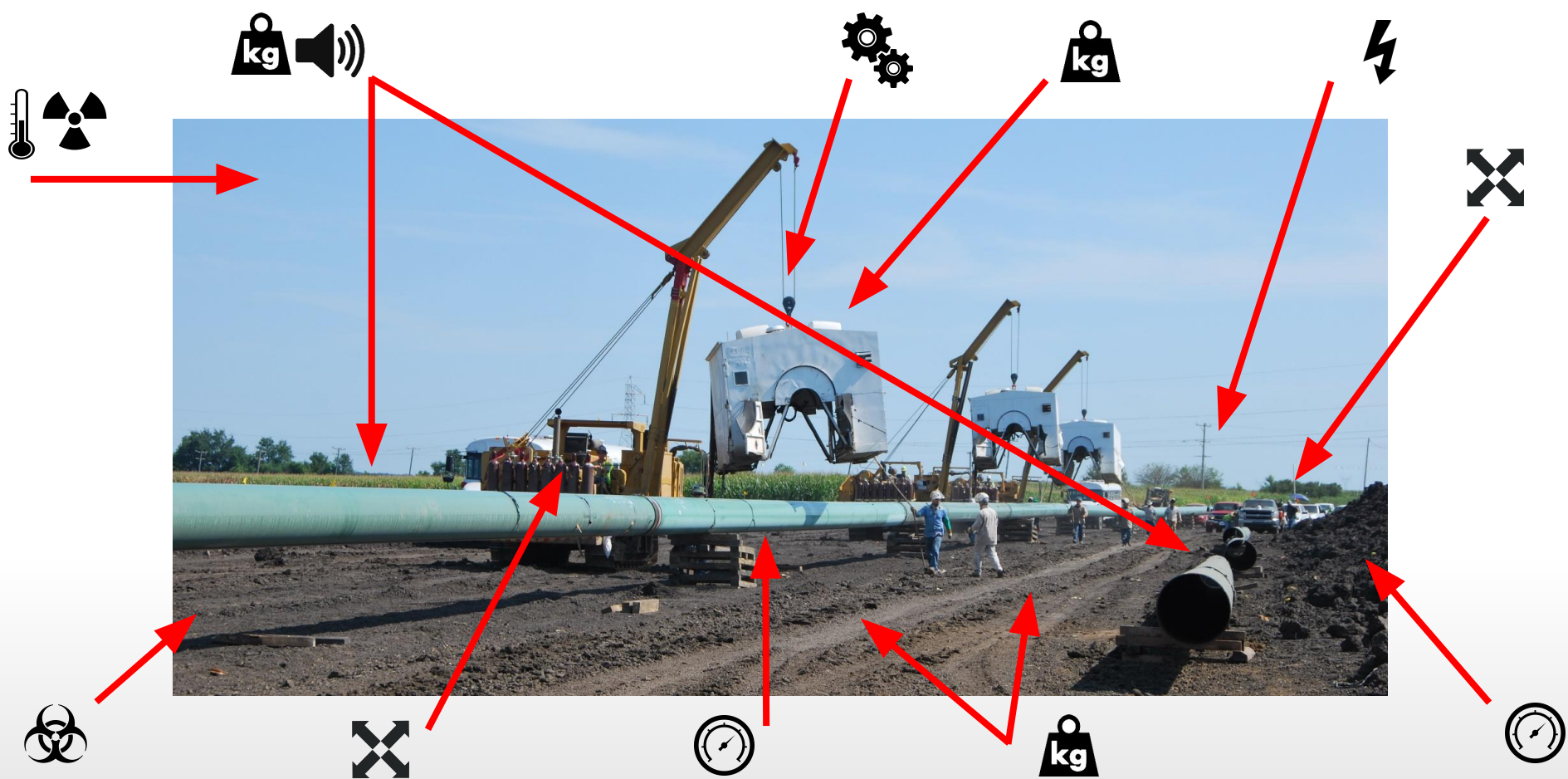
Exposure to
Insects and Animals

Mobile Equipment

Pressure from Pipe Expansion

Uneven Work Surfaces

Unsupported
Soil



Hazard Recognition – Count the Fs

FINISHED FILES ARE THE
RESULT OF YEARS OF SCIENTIFIC
STUDY COMBINED WITH THE
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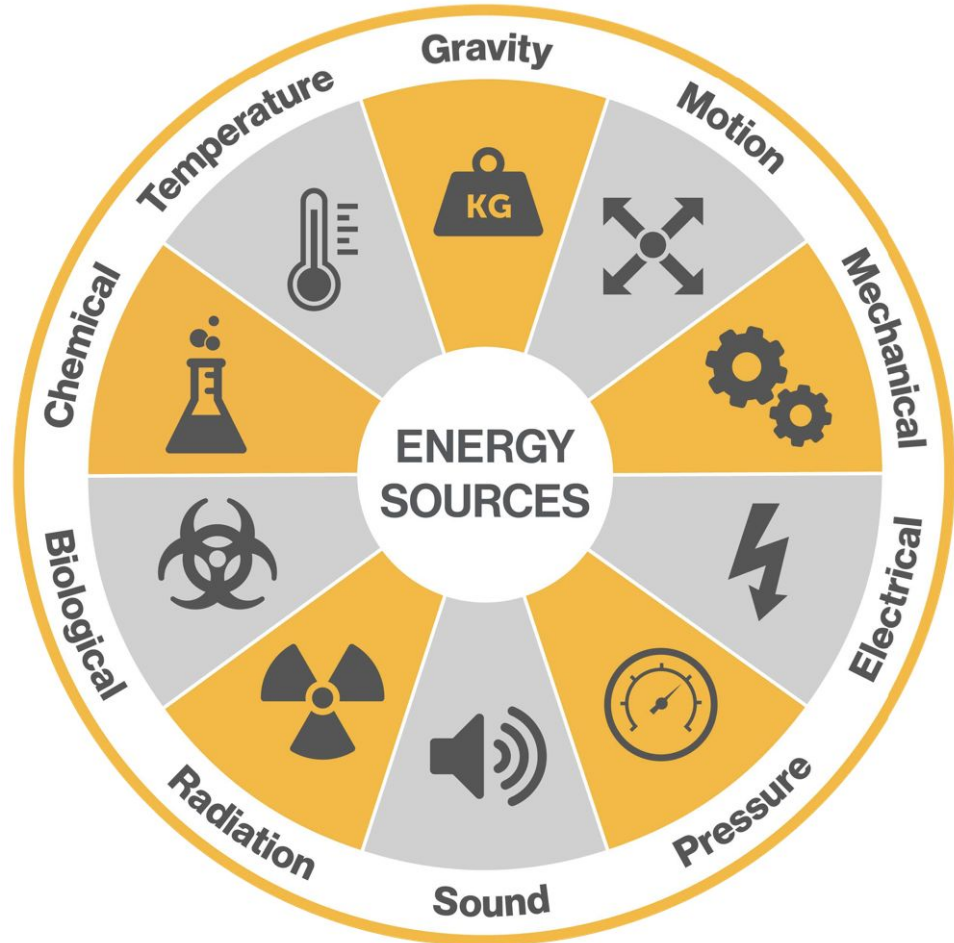
Hazard Recognition – Count the Fs

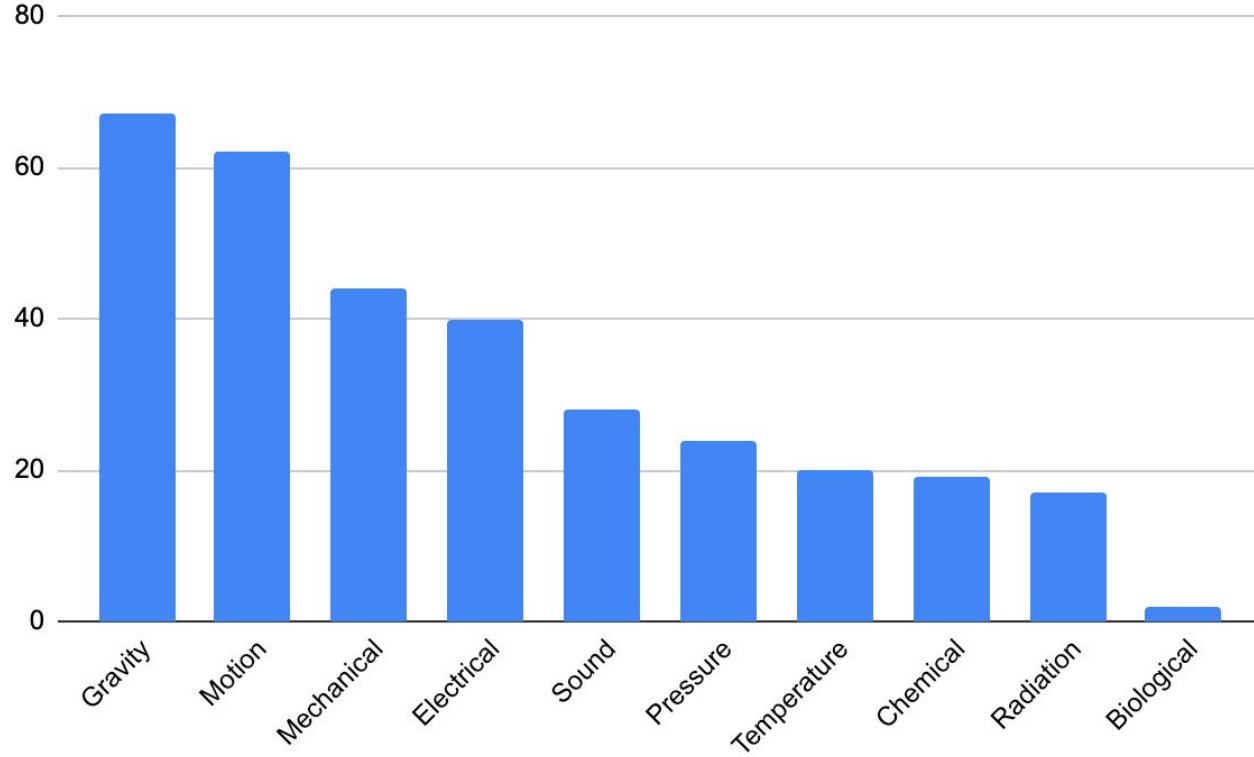
TWO OF THE MOST POWERFUL
OF ALL HUMAN FEARS ARE THE
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Hazard Recognition – Count the Fs

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Energy Key			
Energy Type	Definition	Energy Type	Definition
Gravity 	Force caused by the attraction of all masses to mass of the earth.	Temperature 	Differences in thermal energy of objects or the environment which the body senses as either heat or cold.
Motion 	Change in position of objects or substances.	Chemical 	Reactive elements in the environment.
Mechanical 	Rotation, vibration or motion of equipment, materials or tools.	Biological 	Living organisms that pose health risks.
Electrical 	The presence of an electrical charge or current.	Radiation 	Elements that emit ions or atomic particles.
Pressure 	Liquid or gas compressed or under a vacuum.	Sound 	Audible vibrations cause from the contact of two or more objects.





Percent of Hazards Identified by Type

Key Takeaways

- In pre-job safety briefings, workers identify only about **45%** of the hazards they face during the work period. Hazard recognition blind spots are consistent and predictable, regardless of trade, experience or education.
- Hazards that are easily identified (e.g., gravity, motion) are recognized instinctually and require comparatively low cognitive effort. Hazards that are **most often missed** (e.g., mechanical, pressure, chemical) are processed in the cerebrum and require relatively high cognitive effort.
- Field experiments showed that using the energy wheel improves hazard recognition by approximately **30%**. The energy wheel is effective because it provides a simple set of reminders to search for commonly overlooked hazards

Application

For organizations already using the Energy Wheel:

- Determine common causes of MSDs
- Identify energy sources that cause most MSDs
- Possibly create icon/imagery or guide to highlight certain energy sources that are most related to MSDs

For organizations not yet using Energy Wheel:

- Introduce energy wheel as overall concept including research backing the implementation
- Include specific ways to focus on MSDs



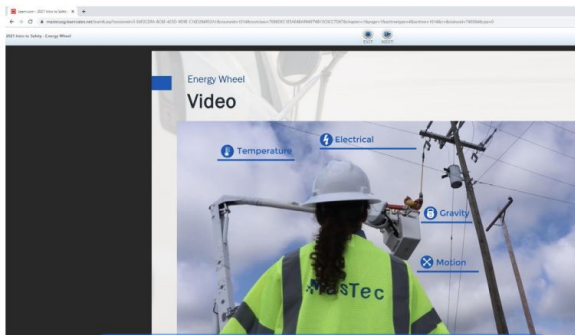
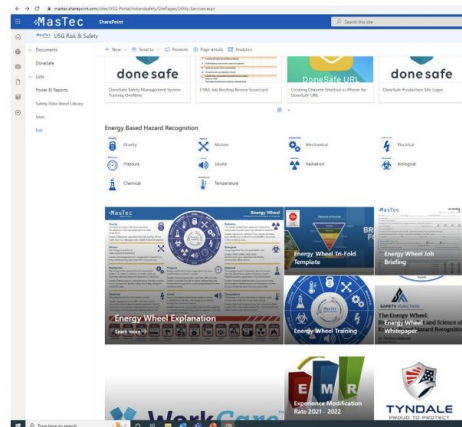
Energy Wheel Material



CORE SAFETY PRINCIPLES

With a vision of eradicating life-threatening or life-altering incidents, we have established our Core Safety Principles. These principles represent those safe work practices that are critical to preventing serious injuries and fatalities (SIF).

Each of these principles contain key components that ensure our work is performed in a safe fashion. Core Safety Principles help our Employees and Supervisors manage the risks associated with the work we do every day, by raising awareness to situations that could likely result in serious injuries & fatalities (SIF).



MasTec SAFETY SERVICES INSIGHTS

06/28/2022

Slip into Shallow Trench w/Fracture

What Happened
Injured EE and a helper were installing an underground service in a new construction job site. A shallow trench (approximately 30-inches deep) had been completed and the service conductor was prepared for laying into the trench. The excavated area was rocky and the terrain was uneven. Injured EE was attempting to get some slack in the wire in order to install it in the meter can. EE slipped/tripped on the uneven ground and slid into the trench. EE landed with extreme force on his left foot, resulting in a fracture to the lower left leg (ankle, tibia & fibula area). EE was transported to a local medical facility and was admitted overnight in preparation for surgery to repair the fractures.

Learning Opportunities
1) When performing work at a job site where rough, rocky or uneven terrain may be present, the job briefing discussion should include the potential risks for this hazard. Communicate to the crew members that a continuous focus without distractions needs to be present while walking and working the job at the site.
2) Job briefing should include the potential risk of hazards of excavations and trenches. Even shallow trenches can present hazards such as collapsing sidewall, rocks falling into the trench or spalling from the sidewalls of the trench. When working inside trenches, ensure tools and spoil piles are kept a safe distance from the sides of the excavations. No walking, climbing or performed on the spoil pile. The soil will be loose, unstable. The working side of the trench should remain clear possible to help prevent the risk of trips and falls. Walk or work away from the sidewalls of trenches for shallow trenches and for more deeper trenches.

Footwear being worn by the employee was not a slip-resistant shoe. It is incumbent on all employees to ensure they are wearing appropriate footwear for the job site or working location. Working in good condition can help a person maintain upright walking and help reduce the potential for twisting ankles on small terrain.

Low Serious Injury/Fatality (LSIF)
Incident with a release of low energy in the absence of a direct control where a serious injury is sustained.

JobSite Trench Involved in this event

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Options for Further Training

- **Virtual Trainings**
 - (30 min short course or 3 hour full course):
<https://www.safetyfunction.com/energy-based-hazard-recognition>
- **Free Monthly Meetings offered by The Construction Safety Research Alliance**
 - Some meetings cover the Energy Wheel and are presented by industry leaders worldwide. Access past recordings here: <https://www.csr.colorado.edu/csracop>
 - Organizations can freely upload and share their own Energy Wheel documentation.
- **Professional Safety Journal - The Energy Wheel:**
 - The Art and Science of Energy-Based Hazard Recognition

Questions?

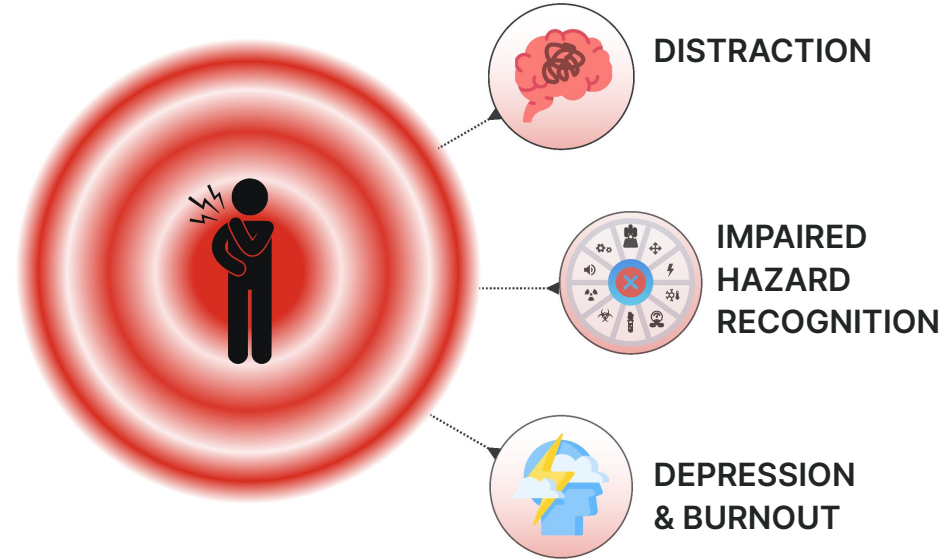


Safe & Reliable Energy Requires a Safe & Resilient Workforce



Why Focus on MSK Pain?

1. Soft-tissue injuries are the most common and costly injury for the utility industry.
2. The cascading effects of pain have negative implications for more serious injuries, productivity and mental health.



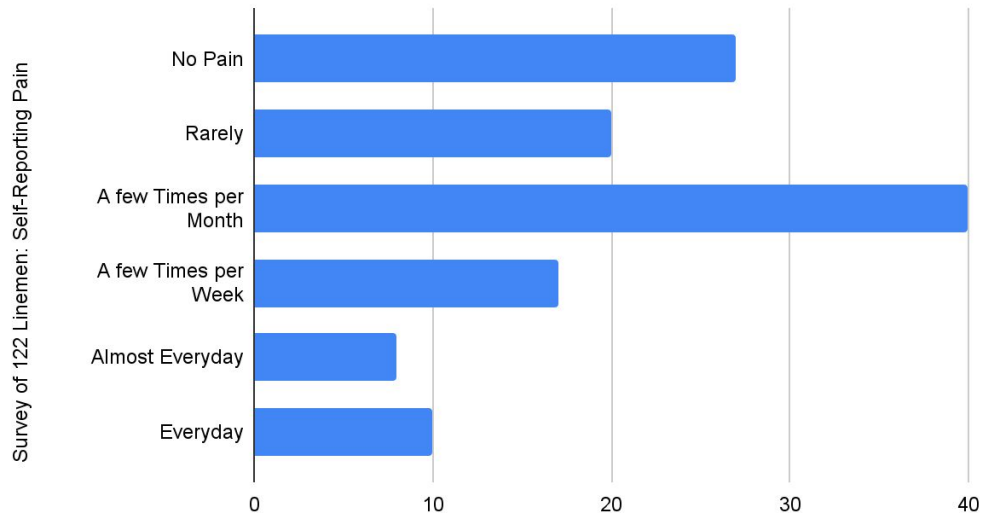
Lineman Study

Frequency of MSK Pain

61%

of those surveyed self-reported
experiencing musculoskeletal pain
at least once a month

Survey of 122 Linemen: Self-Reporting MSK Pain



Human Capacity & Resilience

Load (Energy) > Capacity = Injury

Developing a Safe and Resilient Workforce

- 1. Physical Capacity:**
 - Mobility, flexibility, soft-tissue resilience, balance, strength, and endurance
- 2. Physical Preparedness:**
 - Warm-up (activate and mobilize), micro-breaks, recovery
- 3. Discomfort Management:**
 - Address physical discomfort before activity (e.g. muscle tension)
- 4. Body Mechanics and Ergonomics**
 - Optimize strength and minimize strain
- 5. Mental Stress Management**
 - Recognize and address mental stressors
- 6. Fatigue Management:**
 - Awareness and recognition of fatigue
- 7. Hydration & Nutrition Preparedness:**
 - Prevent: performance decline, cognitive impairment, and increased injury risk

Developing a Safe and Resilient Workforce



**Movement
Health**



**Body Mechanics
& Ergonomics**



**Performance
Optimization**

LEADING INDICATORS OF SUCCESS

Factors That Drive Positive Outcomes

1



Upper Management Engagement

2



Embedded Into the Workday

3

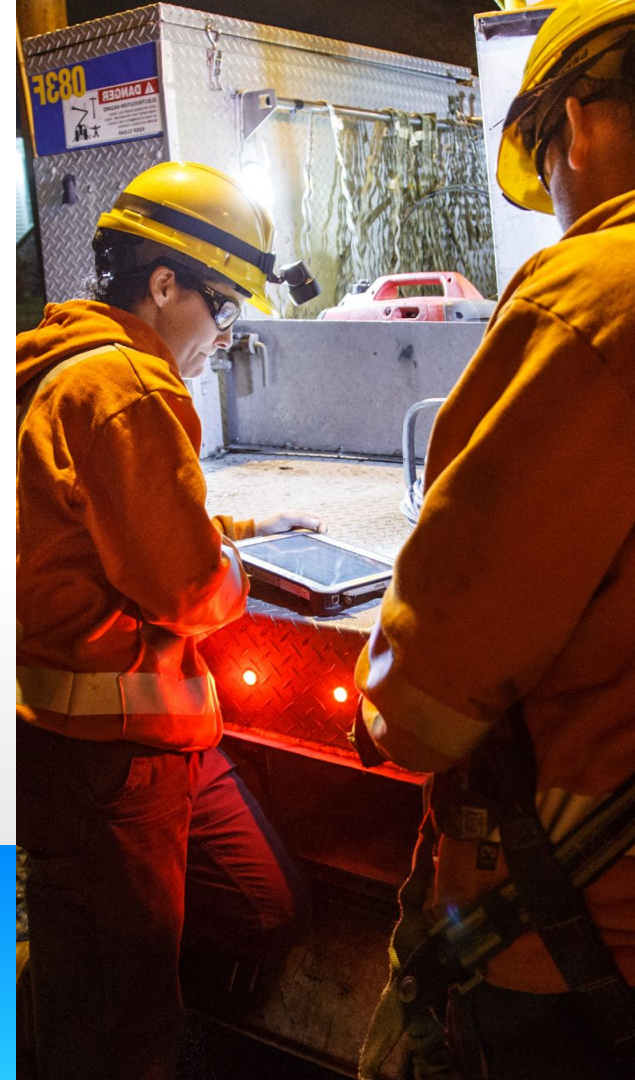
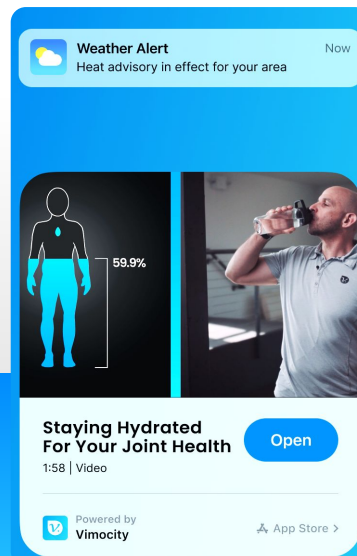
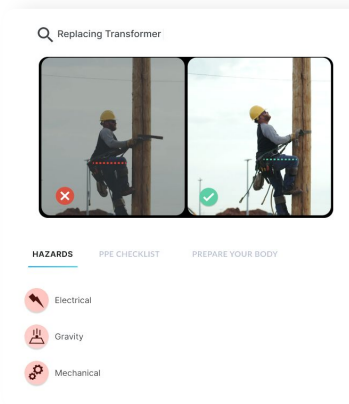


New Hires Onboarded to the Initiative

Integrate into the Normal Workflow

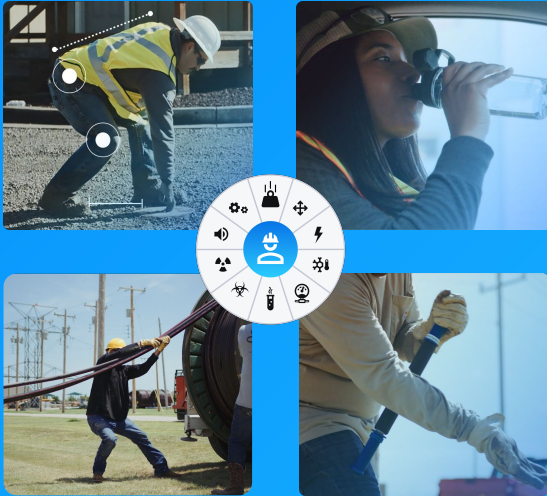
Pre-job Briefings/ Tailboard

- High-Energy Hazards
- Movement Health Action Steps
- Body Mechanics and Ergonomics
- Performance Optimization



Key Factors That Drive MSD & SIF Injury Prevention

Consistency is Key!



1

Resilience Building
Activities Integrated into the Workday

2

Knowledge & Hazard Recognition

Questions?