Working at height - What can we learn from previous incidents?

Hosted by: Energy Institute
Presented by: Work to Zero, National Safety Council
GET ENGAGED!

1 Introduce yourself
   Please use the chat
   Name, company

2 Ask us questions
   Please use the Q&A tab
Agenda

Risk Controls
Case studies
Innovation
Eliminating fatality risk with technology
What are the most hazardous situations with greatest potential for fatalities?

<table>
<thead>
<tr>
<th>Situation</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Hot Work</td>
<td>1%</td>
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<tr>
<td>Confined Space Entry</td>
<td>3%</td>
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<td>Workplace Violence</td>
<td>13%</td>
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<td>Work At Height</td>
<td>23%</td>
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</tbody>
</table>
**Work to Height:**
Leading Cause of Non-Roadway Fatality

23% of non-roadway fatalities

Slips, trips, falls in 2020:
- 211,640 nonfatal injuries
- 805 fatal injuries
Falls from heights is the single most hazardous injury within the construction industry, representing 38% of all construction fatalities.

Fatality rate in the construction & utilities industries is 3.5 per 100,000 worked.

52% of fatal occupational falls occur in construction and utility industries.
Work to Height: Leading Cause of Non-Roadway Fatality

**Situational risks**
80% of deaths were falls to lower level
17% falls on same level
Work to Height: Leading Cause of Non-Roadway Fatality

Contributing factors
- Fatigue
- Worker/leadership failure
- Scaffolding/platform failure
- Lack of proper training
POLL

What work at height contributing factors are you most concerned about?

a) Fatigue
b) Worker/leadership failure
c) Scaffolding/platform failure
d) Lack of proper training
What can we learn?
Lessons learned: Falls to lower level

What happened?
• Crew member painting the side of a ship from a bosun chair. The rope failed and the member fell into the water, drowning.

Why did it happen?
• A flotation device was not provided and fall protection was not tied off. Work was completed unsupervised.

What was learned?
• Ensure all necessary PPE is provided and properly used.
Lessons learned: Fatigue

What happened?
• Foremen missed a rung on ladder while descending and fell approximately 15 ft.

Why did it happen?
• Rushing through task and lack of concentration, three points of contact not maintained.

What was learned?
• Do not carry tools while using ladders, take regular breaks when completing tasks, implement a fatigue management program.
Lessons learned: Worker/Leadership failure

What happened?
• Worker on the ground attempted to change the position of the scaffold by pushing it, resulting in scaffold falling with workers on board.

Why did it happen?
• The job was not carried out as planned - scaffolding not approved, contractor personnel not qualified, workers not wearing PPE.

What was learned?
• Verify all safety measures are in place according to work plan, ensure personnel is qualified.
Lessons learned: Scaffolding/platform failure

What happened?
- Numerous incidents resulting due to failure of scaffolding stairs

Why did it happen?
- Inadequate welds, supports not installed correctly

What was learned?
- Inspect stairs regularly, use additional locking systems, follow codes associated with maximum gaps/spacing
Lessons learned: Lack of proper training

What happened?
• Two workers were unloading pipes from a trailer. Worker A was at the rear securing a load. Worker B completed task and signaled crane operator to lift. Load was lifted with Worker A still on truck, so he jumped.

Why did it happen?
• Lack of knowledge and training. The workers had little training. No work permit completed.

What was learned?
• Employees should be trained on task prior to completion, with a plan and permit in place.
In Summary

Risks
Poor maintenance and housekeeping
Lack/improper use of PPE
Unauthorized work

Controls
Robust training program
Pre-work safety reviews
Provide PPE or devices needed

What can we learn?
WORKtoZERO

Eliminating fatality risk with technology
What technologies can eliminate or mitigate work at height risk?

- Drones
- Lone Worker Monitoring
- Virtual or Augmented Reality
- Video Behavior Analytics
- Proximity Sensors
- Location Geofencing
- Permit To Work
- Vital Signs Monitoring
- Downed Worker Devices
- Robotics
- Fatigue Monitoring & Wearables
Drones Can minimize or eliminate risk.

Hazardous situations they mitigate:
- Confined space entry
- Inspections
- Work to height

Aerial
- Surveying and mapping
- Monitoring
- Emergency response

Terrestrial
- Aquatic
In 2021, the FAA reported nearly _______ drones registered in the U.S. alone.

a) 250,000
b) 400,000
c) 650,000
d) 900,000
Drones

Solving for:
• Fatigue, heat stress, and dehydration
• Ergonomic injury
• Respiratory ailments
• Falls or other injuries from scaffolding

Currently using:
• Aerial drones
• Unmanned vehicles
• Wall-climbing robots

Case study on AES
Drones

Case study on AES

Impact:
• Prevention of 60,000+ hours of high-risk work activity
• Improved productivity and reduction in overall job time
• Curation of strategic partnerships with technology vendors
• Estimated savings of at least $10 million
Drones

Case study on AES

Lessons Learned:
• Regional task forces responsible for scaling up use of the technology
• The importance of vendor feedback and tailoring technology for specific use-cases
• The impact of measuring safety impacts through man-hour exposure
• The versatility of technology as a means to improve operations, performance, and safety as a linked process
Drones

Case study on Nutrien

Solving for:
- Falls from heights
- Slips, trips, and falls
- Gas exposure
- Environmental stress

Currently using:
- Aerial drones
Impact:
• Reduced risk exposure
• Reduced time needed to perform visual inspections
• Cost avoidance of roughly $10,000-$15,000 annually
• Reasonable cost investment, especially as the technology continues to improve and costs are reduced
Drones

Case study on Nutrien

Lessons Learned:
• Understand the laws governing airspace and drone licensing; hire a consultant if necessary
• Engage with your IT department from the start to consult on compatibility and integration
• Consider the cost of the technology compared to the cost avoidance of SIF events
Immersive Media  AR/VR for enhanced training

Hazardous situations they mitigate:

- Construction and installation
- Machinery operation
- Work at height

More effective trainings
- Accessible options in hard & software
- Access to information on demand
- Fewer risks
Immersive Media

Case study on
Boeing & AR

Solving for:
• Traversing work area with risks of falls, trips, lacerations, head injuries

Currently using:
• Microsoft HoloLens
Immersive Media

Case study on
Boeing & AR

Impact:
• Reduced risk of SIF events, cognitive overload, and fatigue
• Improved productivity and work quality
• Increased rate of “first-time pass quality” (50% to 97%)
• Reduction in the overall job time
• Ability to project other safety messages and reminders
Immersive Media

Case study on Boeing & AR

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Immersive Media

Case study on

Boeing & AR

Lessons Learned:
• Trainings should address the safe operation of AR on-site
• Necessity of cross-departmental AR policies and procedures (e.g. length of use, cleaning, storage, data privacy, etc.)
• Leverage the trial process to identify and correct unforeseen consequences (e.g. interactions with PPE, IT compatibility, etc.)
• Adoption of off-the-shelf technologies requires significant flexibility and resources, industry-wide collaboration can help streamline this process
Fatigue Monitoring and Wearables

Hazardous situations they mitigate:

- Logging equipment operation
- Machinery operation
- Work at height
- Heavy equipment operation
- Excavation

3 types:
- Measures brain activity
- Visual cues and microsleeps
- Tracks sleep and activity data
Fatigue Monitoring and Wearables

Case study on Exelon

Solving for:
• Chronic fatigue due to harsh shift schedules

Currently using:
Readi, wearables to measure sleep patterns and predict who might experience fatigue on duty, and at what time
Fatigue Monitoring and Wearables

Case study on Exelon

Impact:
• Successful pilot
• Employees express better understanding of their sleep health
• Supervisors expect to see reductions in near misses and other safety-critical events
Fatigue Monitoring and Wearables

Case study on Exelon

Lessons Learned:
• Start with small pilot, work through barriers
• Work to labor to develop data privacy guidelines and set limits on access to data and data usage
• Share trends to get buy-in
Downed Worker Devices

Hazardous situations they mitigate:

- Emergency Response
- Work at Height
- Workplace Violence

Detect falls or impact
Immediate alerts
Downed Worker Devices

Solving for:
- Falls
- Electrocution
- Chemical Exposure
- Fires and Explosions
- Sprains, Strains, and Fractures
- Environmental Stress

Currently using:
- Blackline Safety’s wearable
- Has deployed 1,500 devices, with additional 1,300 by the end of 2022

Case study on Utility company
Downed Worker Devices

Success stories:
• An employee was locked in a basement and used the device to call for help
• A leakage inspector was getting elevated readings from the device; after reporting they found a boiler was improperly exhausting
• An Ohio crew used the device to call for help after witnessing a motorcycle accident
Downed Worker Devices

Case study on Utility company

Lessons learned:

• The company leveraged “Super Users” who trialed the technology, collected input, helped with change management
• Continue reiterating the benefits to employees and ensure messaging is coming from your leaders, rather than the vendor
• Begin discussions with leaders, who will ultimately be the ones pitching new technology to employees
• Gather and listen to feedback
• Engage with the vendor on configuration and sensitivity settings
Permit to Work

Hazardous situations they mitigate:

- Electrical Work
- Hot Work
- Repair and Maintenance
- Work at Height

Mobile apps for:

Authorization and clearance Procedures to request and authorize
Prioritizing job tasks for workers
Camera Analytics

Hazardous situations they mitigate:

- Work at Height
- Workplace Violence
- Vehicle Pedestrian Interaction

Utilizes machine learning and AI to:

Monitor for workplace abnormalities
Detect patterns of movement
Identify protective equipment
POLL

What technology interests you most?

a) Drones
b) Immersives (AR/VR)
c) Fatigue monitoring and wearables
d) Downed worker devices
e) Permit to work
f) Camera analytics
Making Innovation Accessible
What challenges are there to innovation?

30% Our ability to identify the right technologies
25% Our organization’s mindset and readiness toward technologies
22% Our competency to adopt new technologies for safety innovations
17% Our ability to build the business case
12% Our competency to handle the unforeseen tech issues/hidden risks
Making Innovation Accessible
Safety Innovation Journey

www.nsc.org/WorktoZero
Assess your risk

1  
Assess Your Risk

www.nsc.org/WorktoZero
Which hazardous situations are your workers exposed to? How often? Select all that apply.

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<th>Situation</th>
<th>Once Per Month</th>
<th>Once Per Week</th>
<th>Once Per Day</th>
<th>Up To 5 Times Per Day</th>
<th>&lt; 4 Hours Spent Per Shift</th>
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Safety Innovation Journey

Tech Solutions

- Digital Gas Monitors
- Drones
- Lone Worker Monitoring
- Virtual or Augmented Reality
- Video Behavior Analytics
- Proximity Sensors
- Location Geofencing
- Workzone Intrusion Detection
- Permit To Work
- Vital Signs Monitoring
- Downed Worker Devices
- Robotics
- Fatigue Monitoring & Wearables

Technology Solutions
Hover over each technology for a summary, and click for more, including webinars, white papers and case studies when available.

www.nsc.org/WorktoZero
Determine your Readiness

3 Determine Your Readiness

Safety Innovation Journey

www.nsc.org/WorktoZero
Safety Innovation Journey

Determine your Readiness

Phases of Digital Readiness for Embracing Safety Technologies

Observing
- Passively exploring safety technology
  - Collect stakeholder feedback
  - Gather information on digital solutions and top hazards

Experimenting
- Evaluating proof of concept for safety technology
  - Identify digital champions
  - Establish a roadmap for safety innovation

Adopting
- Investing in safety technology
  - Employer Actions
    - Continuously improve by aligning digital mindsets, skillsets and toolsets
  - Consider incorporating digital solutions more broadly

Integrating
- Using technology to maximize the value for safety
  - Employer Actions
    - Evaluate the integrity of data and digital outputs
    - Obtain more input and modify processes

Transforming
- Driving new safety innovations
  - Employer Actions

Identify where you are and progress to the next phase
Make the Business Case

Safety Innovation Journey

www.nsc.org/WorktoZero
Implementing safety technology for high-risk tasks can lead to

- Decreased workplace injuries and fatalities
- Reduction in claims and fines
- Lower total medical costs

Business-as-usual can cost more
A lack of effective change management can easily lead to the failure of technology adoption.”
What is your organization’s biggest challenge to innovating?

a) Our ability to identify the right technology
b) Our organization’s mindset and readiness
c) Our ability to build the business case for innovation based on ROI
d) Our cyber security competencies and concerns about data privacy
Safety Innovation Challenge

Accelerating technology to solve for top risks
4 steps

1) Identify risk
2) Source tech solutions
3) Pilot technology
4) Publish results
4 steps

1) Identify risk: work at heights
4 steps

1) Identify risk: work at heights

2) Source tech solutions:

- Wall climbing robots shared by HausBots
- Next-generation AI-enabled video analytics shared by IronYun
- Easy-to-deploy computer vision that improves detectors from Matroid
- Drones for onshore, shipping, offshore oil rigs and wind turbines shared by Upteko
- Drones for performing automated visual inspections of large structures from Prenav
4 steps

1) Identify risk: work at heights
2) Source tech solutions: robots or camera analytics
3) Pilot technology: aluminum manufacturer
4 steps

1) Identify risk: work at heights
2) Source tech solutions: robots or camera analytics
3) Pilot technology: aluminum manufacturer
4) Publish case studies: 2023
Accelerating technology to solve for top risks

Watch our technology showcase

Apply to be a future pilot site
Let’s Discuss!

What does the innovation journey look like in your organization?

What issues are you dealing with that WTZ could help with?

What is important to you when you’re thinking about innovating?
Working at height - What can we learn from previous incidents?

Emily Whitcomb, Emily.Whitcomb@nsc.org
Sarah Ischer, Sarah.Ischer@nsc.org