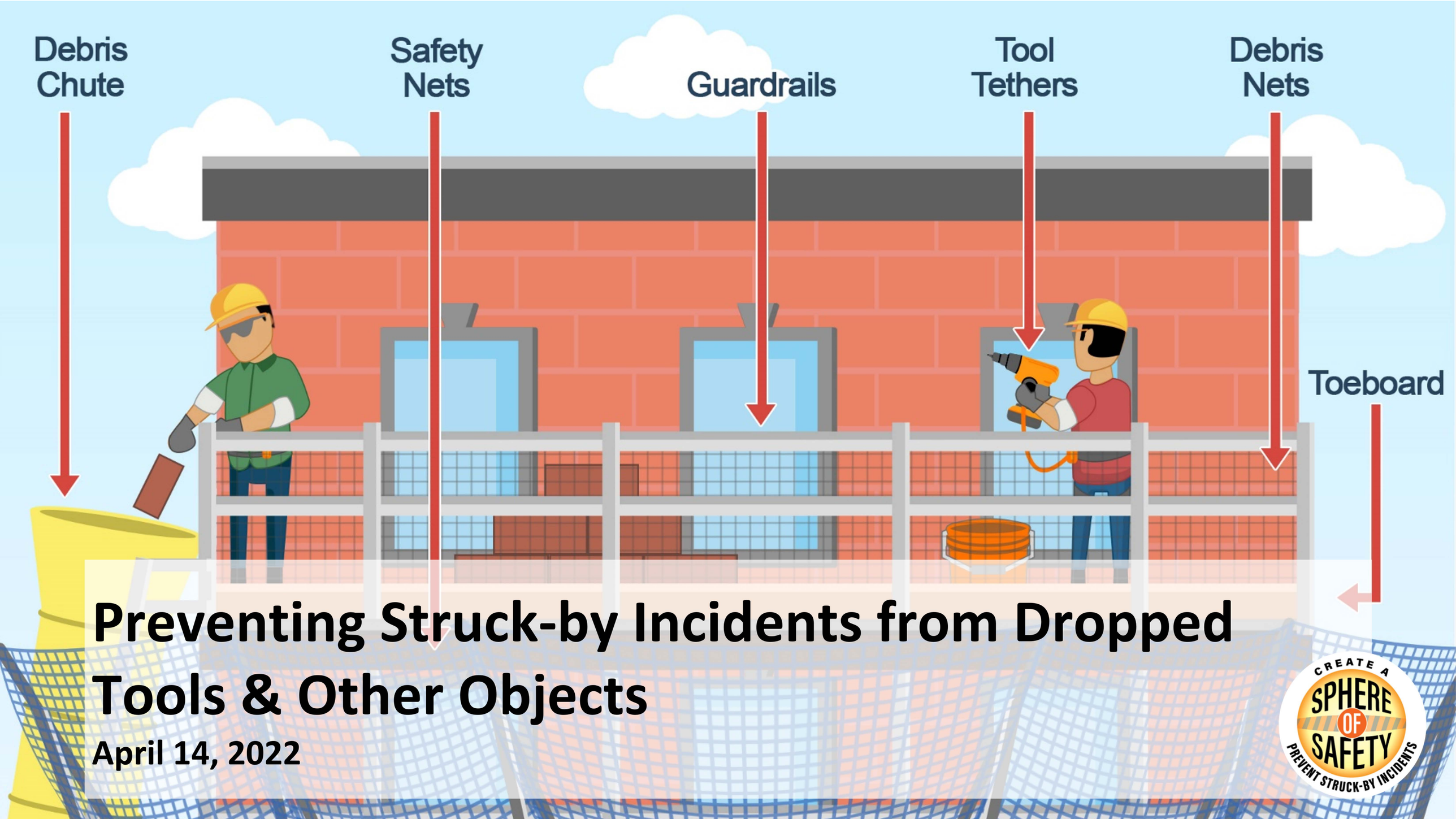

Preventing Struck-by Incidents from Dropped Tools & Other Objects

April 14, 2022

CREATE A SPHERE OF SAFETY
PREVENT STRUCK-BY INCIDENTS

NORA Construction Sector Council Struck-by Work Group Resources

https://cpwr.com/struck-by-hazards

NEW! Preventing Struck-by Incidents Infographic (English PDF & JPEG)

NEW! Dropped Objects

- **Toolbox Talks:**
  - Preventing Falling Objects
  - Challenges Preventing Falling Objects
  - Solutions for Falling Objects and Dropped Tools
- **Infographic:** Stop the Drop (English PDF & JPEG)

Work Zone Safety Resources

- **Toolbox Talks:**
  - Work Zone Safety: Vehicle Operators (English, Spanish)
  - Work Zone Safety: Working Around Vehicles (English, Spanish)
  - Equipment: Falling Objects (English, Spanish)
- **Infographics:**
  - STAY ALERT IN WORK ZONES! (English PDF & JPEG, Spanish JPE
  - OPERATORS! 4 Steps for Work Zone Safety (English PDF & JPEG,
  - CONTRACTORS! Work Zone Safety Starts with Your Internal Traff JPEG)
  - Head Protection (English PDF & JPEG)
  - In 1 Strike You Could Be Out (English PDF & JPEG)

Lift Zone Safety Resources

- **Toolbox Talks:**
  - Cranes: Stability & Tipping (English, Spanish)
  - Lift Zone Safety: Planning a Lift (English, Spanish)
  - Tower Crane Safety (English), (Spanish)
- **Infographics:**
  - Crane and Lift Zone Safety: Planning for a Safe Lift (English PDF & PNG; Spanish PDF & PNG)
  - In 1 Strike You Could Be Out (English PDF & JPEG)
  - Struck-by Incidents Are a Leading Cause of Injury in Construction (English PDF & PNG; Spanish PDF & PNG)
  - Best Practices for Safe Crane Lifts (English PDF & PNG; Spanish PDF & PNG)
  - Struck-by Incidents are the 2nd Leading Cause of Work-Related Death in Construction (English PDF & PNG; Spanish PDF & PNG)

Heavy Equipment

- **NIOSH Science Blog** – Preventing Stuck-by Fatalities Related to Excavator Quick Couplers, Buckets, and Attachments
- **Toolbox Talks:**
  - Equipment: Falling Objects (English, Spanish)
  - Equipment: Getting On & Off (English, Spanish)
  - Equipment Maintenance (English, Spanish)
  - Boom Truck Safety (English, Spanish)
- **NIOSH Workplace Solutions:** *Preventing Worker Injuries and Deaths from Backing Construction Vehicles and*

CPWR TOOLBOX TALK

Preventing Falling Objects

- Use rope pulley systems with brakes for hoisting and lowering tasks.
- Communicate clearly when hoisting and lowering material.
- Provide training which includes hazard recognition and avoidance of unsafe c
- Develop standard operating procedures for lowering objects that include clear
- Barricade fall zones.
- Follow manufacturer specifications for all equipment used.

CPWR TOOLBOX TALK

Solutions for Falling Objects & Dropped Tools

r tools with proper tool lanyards when performing overhead work.
your worksite clean.
sure your work platform is stable.
the proper personal protective equipment like gloves, hard hats, and saf

CPWR TOOLBOX TALK

Challenges Preventing Falling Objects

- Install protections on the roof to prevent objects from falling.
- Tether tools with proper tool lanyards when performing overhead work.
- Make sure you complete all needed training for the job.
- Inspect your worksite for new dangers each day and when conditions change.
- Wear personal protective equipment.

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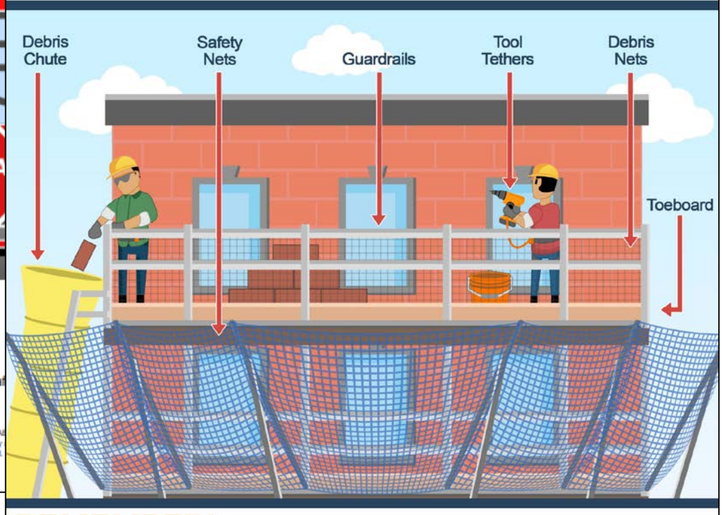
RESEARCH AND TRAINING

STOP THE DROP!

PREVENT DROPPED OBJECTS WHEN WORKING AT HEIGHTS

CREATE A SPHERE OF SAFETY
PREVENT STRUCK-BY INCIDENTS



REMEMBER!

- Secure tools and materials to prevent them from falling on people below. Smaller tools (less than 5 lbs) can be tethered to the worker.
- Use measures such as toeboards, screens, guardrails, debris nets, catch platforms, or canopies to prevent, catch, or deflect falling objects.
- Barricade hazard areas and post warning signs.
- Always wear a hardhat and routinely inspect it for damage.
- Inspect all tools and equipment before use. Hand tools with loose or cracked handles should not be used.
- Keep materials away from floor openings or leading edges.
- Train workers on the hazards and ways to prevent an incident.

STOP. TALK. ACT.

April 2022

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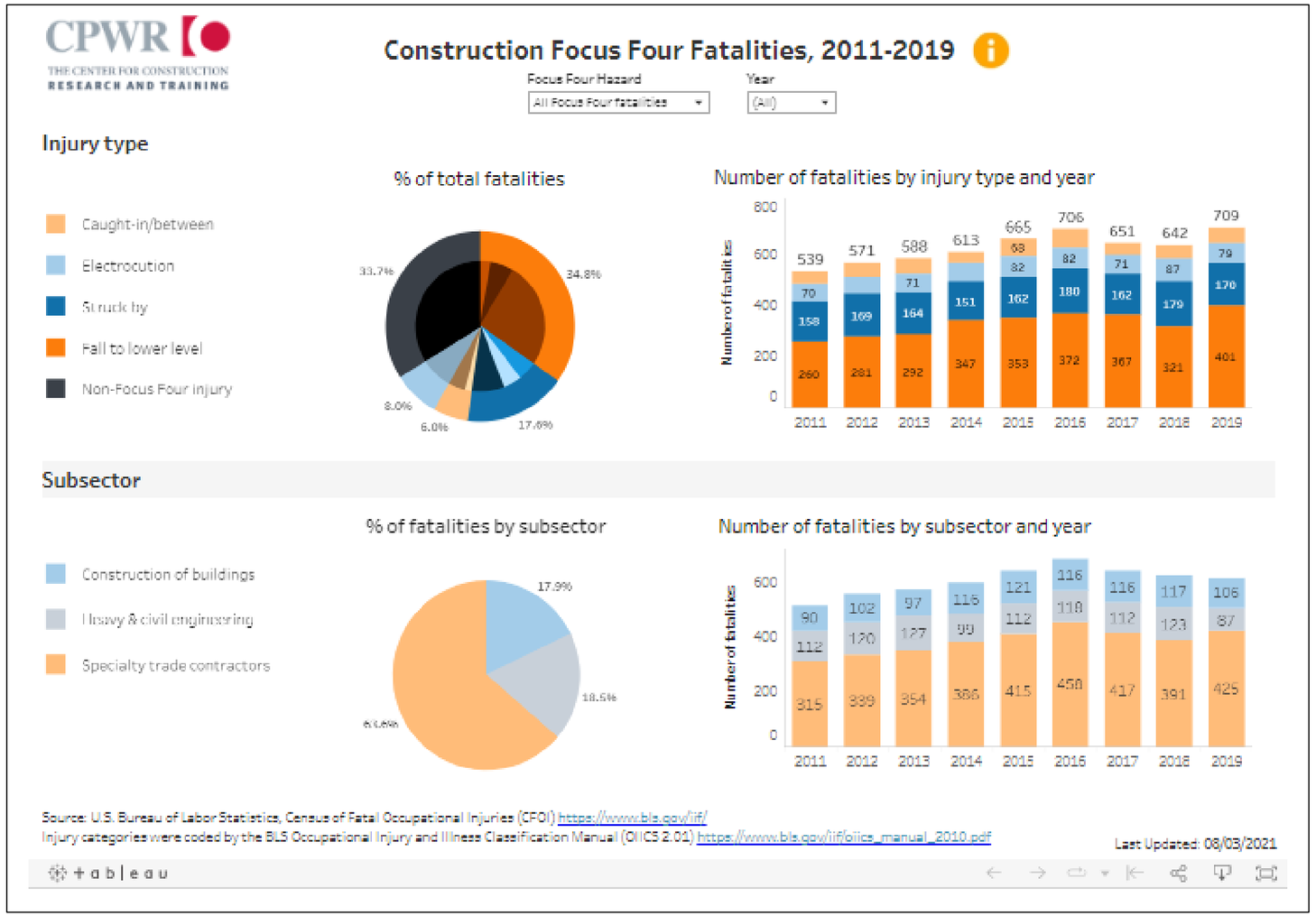
For more information visit:
http://cpwr.com/struck-by-hazards

CPWR Data Center Resources

https://www.cpwr.com/research/data-center/




CPWR THE CENTER FOR CONSTRUCTION RESEARCH AND TRAINING

Data Bulletin

WWW.CPWR.COM

APRIL 2021

Fatal and Nonfatal Struck-by Injuries in the Construction Industry, 2011-2019

Samantha Brown, MPH, William Harris, MS, Raina D. Brooks, MPH, Xiuwen Sue Dong, DrPH*

OVERVIEW

Struck hazards are a leading cause of fatal injuries and the largest contributor to nonfatal injuries in the construction industry. In support of the 2nd annual National Stand-Down to Prevent Struck-by Incidents, this Data Bulletin provides updated data and trends in fatal and nonfatal struck injuries in construction from 2011† through 2019. Numbers for fatal injuries were obtained from the online database of the Census of Fatal Occupational Injuries (CFOI), updated and maintained by the U.S. Bureau of Labor Statistics (BLS). Fatalities in all employment (including self-employed and wage-and-salary workers in private and public sectors in construction) were included in the data analyses. Fatality risk was measured by the number of deaths per 100,000 full-time workers (FTEs; assuming a full-time worker works 40 hours per week, 50 weeks per year). The Current Population Survey (CPS), another BLS data collection, was the source of the denominators for fatal injury rate estimates. Nonfatal injury numbers and rates (per 10,000 FTEs) were obtained from the online database of the BLS Survey of Occupational Injuries and Illnesses (SOII), and include only injuries that resulted in days away from work (i.e., severe injuries, or lost workday injuries) among private, wage-and-salary construction workers. Due to data limitations, detailed analyses are only available for selected subgroups.

There are two types of *struck* hazards: "*struck-by*" (i.e., the object strikes the worker, such as trucks and cranes), or "*struck-against*" (i.e., the worker strikes the object, such as striking against a carpet kicker). The majority of struck injuries were from struck-by incidents. When looking at struck-against incidents, few were fatal, hence those fatalities were not reported.

* Correspondence to: Xiuwen Sue Dong, SDong@cpwr.com.

Numbers in text and charts were calculated by the CPWR Data Center.
†Since 2011, BLS has started to use version 2.01 of the Occupational Injury and Illness Classification System (OIICS). More information is available at https://wwwn.cdc.gov/wisards/oiics

THIS ISSUE

This issue examines fatal and nonfatal struck injuries in construction from 2011 through 2019, identifying trends by subsector and injury cause.

KEY FINDINGS

In 2019, struck-by injuries caused 170 deaths in construction, of which 47% involved transport vehicles.
Chart 1

Between 2011 and 2019, the rate of fatal struck-by injuries in construction from objects/ equipment and transport vehicles declined by 15% and 23%, respectively.
Chart 2

Heavy and Civil Engineering Construction (NAICS 237) accounted for more than two-thirds (68%) of construction struck-by deaths from transport vehicles in 2019.
Chart 4

In 2019, there were 20,600 nonfatal struck injuries in construction, comprising one quarter (26%) of the industry's total nonfatal injuries.
Chart 6

Between 2011 and 2019, the rate of nonfatal struck-by and struck-against injuries in construction declined by 20% and 47%, respectively.
Chart 7

NEXT DATA BULLETIN

Impact of COVID-19 on construction workers and businesses

Stand-Down Webinar Recordings

- **April 11, 2022 at 1 PM EDT** – *Preventing Struck-by Incidents in Roadway Work Zones*
- **11 de abril de 2022 a las 3 PM EDT** – *Prevención de Incidentes por Atropellos: Zonas de Trabajo, Equipos Pesados e Impacto de Objetos*
- **April 13, 2022 at 2 PM EDT** – *What's the risk? Best Practices to reduce the likelihood of struck-by injuries from heavy equipment and crane activities*
- **April 14, 2022 at 2PM EDT** – *Preventing Struck-by Incidents from Dropped Tools & Other Objects*

Preventing Struck-by Incidents from Dropped Tools & Other Objects

Moderator: Ron Sokol, Advocacy Governmental Affairs and Special Projects, Safety Council of Texas City

Panelists:

- **Nate Bohmbach**, Product Director at Ergodyne and Chair of the ANSI/ISEA 121 Product Group
- **Carl Heinlein,** ARM, CSP, CRIS, Sr. Safety Consultant, American Contractors Insurance Group
- **Jason Timmerman**, CSP, Vice President, Environment & Workplace Safety, Pittsburgh International Airport
- **Patrick Marsilio, CSP, CHST, SMS**, Safety Manager, Pittsburgh International Airport
- **Kenneth Piposar**, CEO, Founder, Abseilon USA / Airitas Custom Tethering Solutions

DROPPED OBJECT EQUIPMENT STANDARDS & BEST PRACTICES

Nate Bohmbach – Product Director, Ergodyne

DROPPED OBJECTS LANDSCAPE

I’M NOT AN OBJECT

HUMAN FALLS VS. DROPPED OBJECTS

- Why human fall protection differs from falling object protection.
  - Who is at risk
  - # of tools vs. # of workers
  - No universal harness for tools
  - Humans on different ends of the system
  - Wider variety of industries w/ falling object risks
  - Damage to equipment, etc.

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COSTS OF NOT TAKING ACTION:

INJURY OR FATALITY

DAMAGE

LOST PRODUCTIVITY

468 FATALITIES IN THE US IN 2020

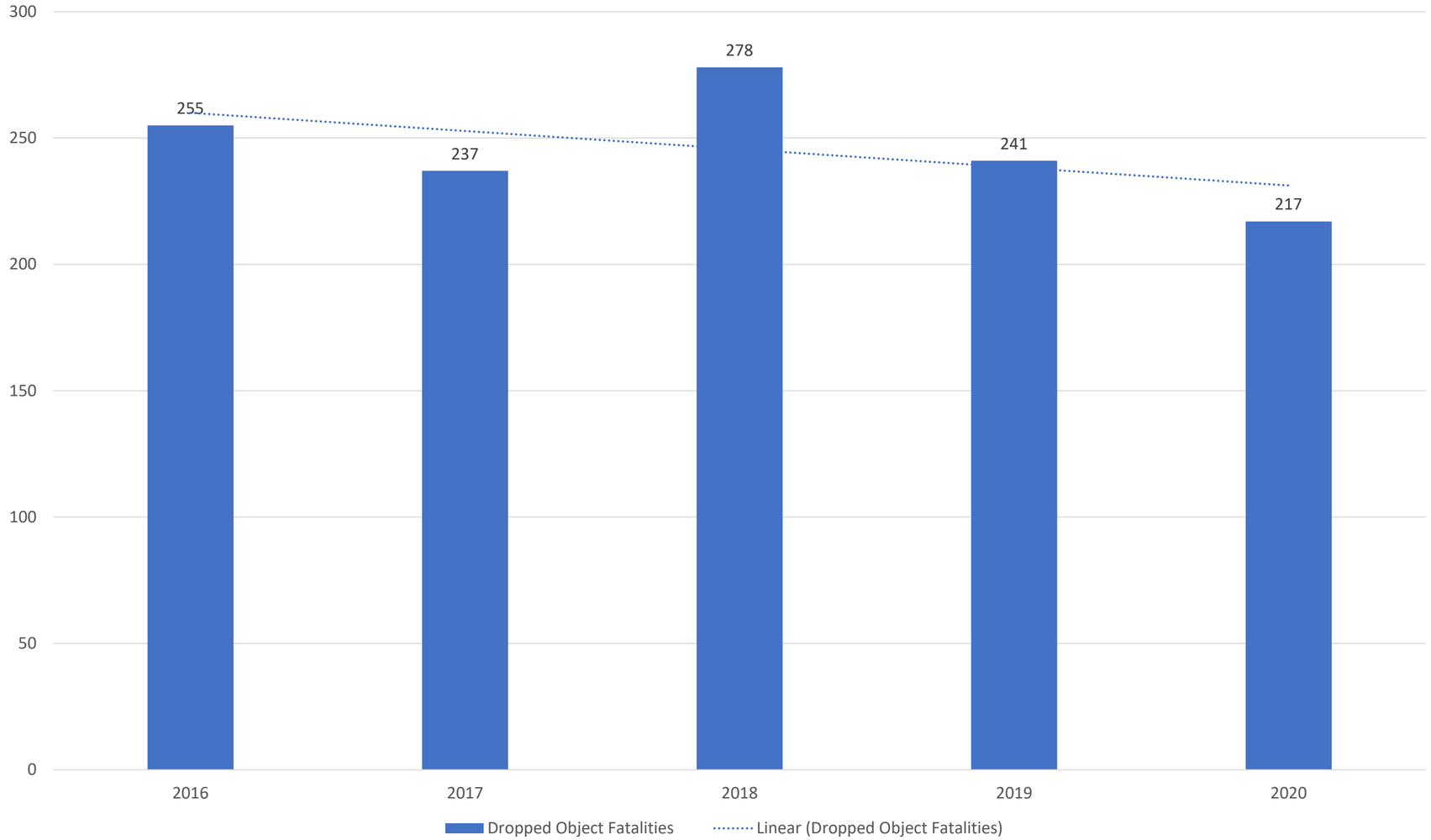
FROM BEING STRUCK BY AN OBJECT OR EQUIPMENT

*BUREAU OF LABOR STATISTICS

217 WERE CAUSED BY A FALLING OBJECT

TRENDS

FATAL INJURIES 5-YEAR LOOK



SOURCE: bls.gov

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44,760 STRUCK BY INJURIES

[FALLING OBJECTS OR EQUIPMENT]

IN 2020 IN THE U.S. PRIVATE SECTOR

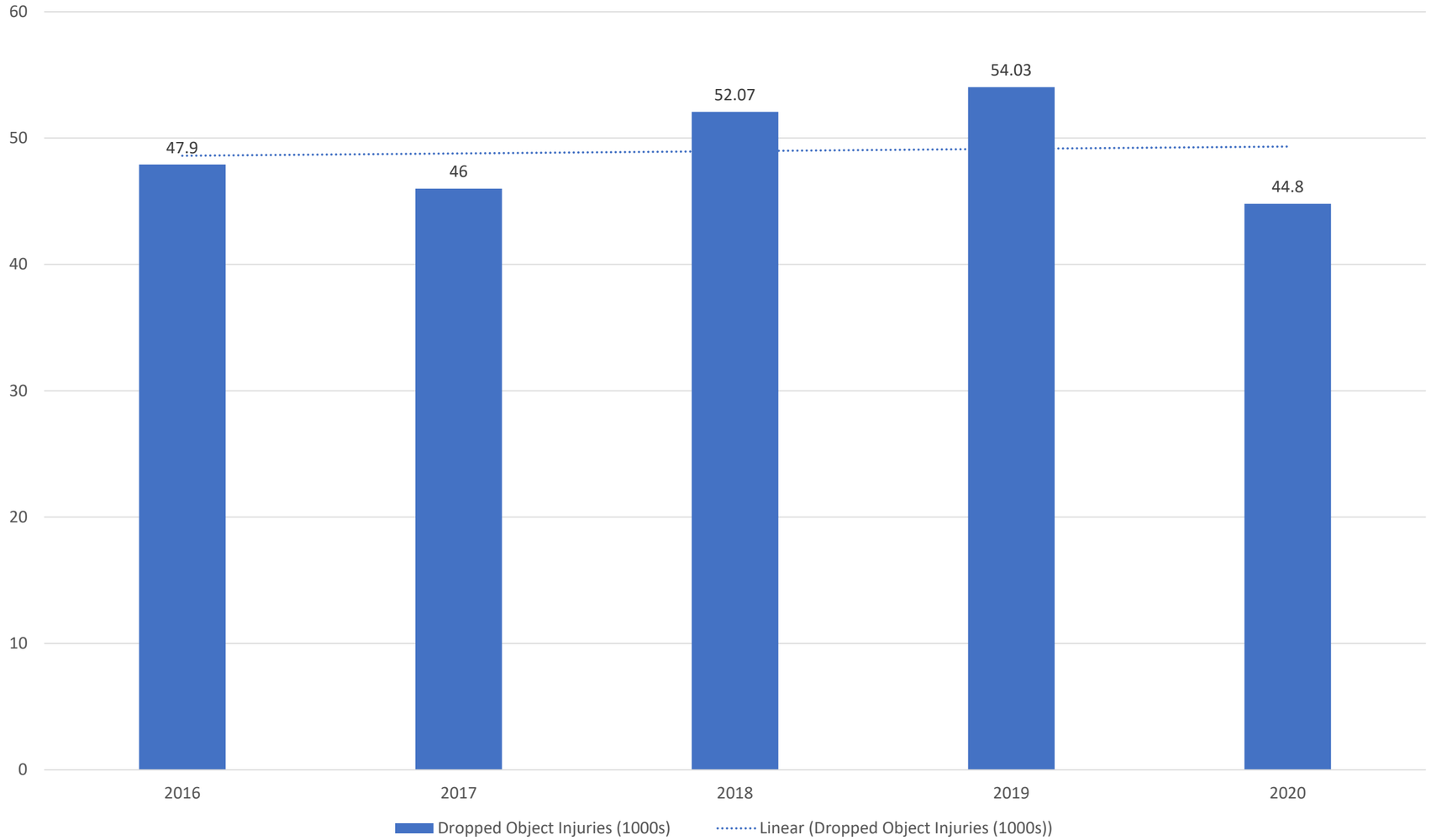
*BUREAU OF LABOR STATISTICS

= 3.8%

OF ALL WORKPLACE INJURIES

TRENDS

NON-FATAL INJURIES 5-YEAR LOOK



SOURCE: bls.gov

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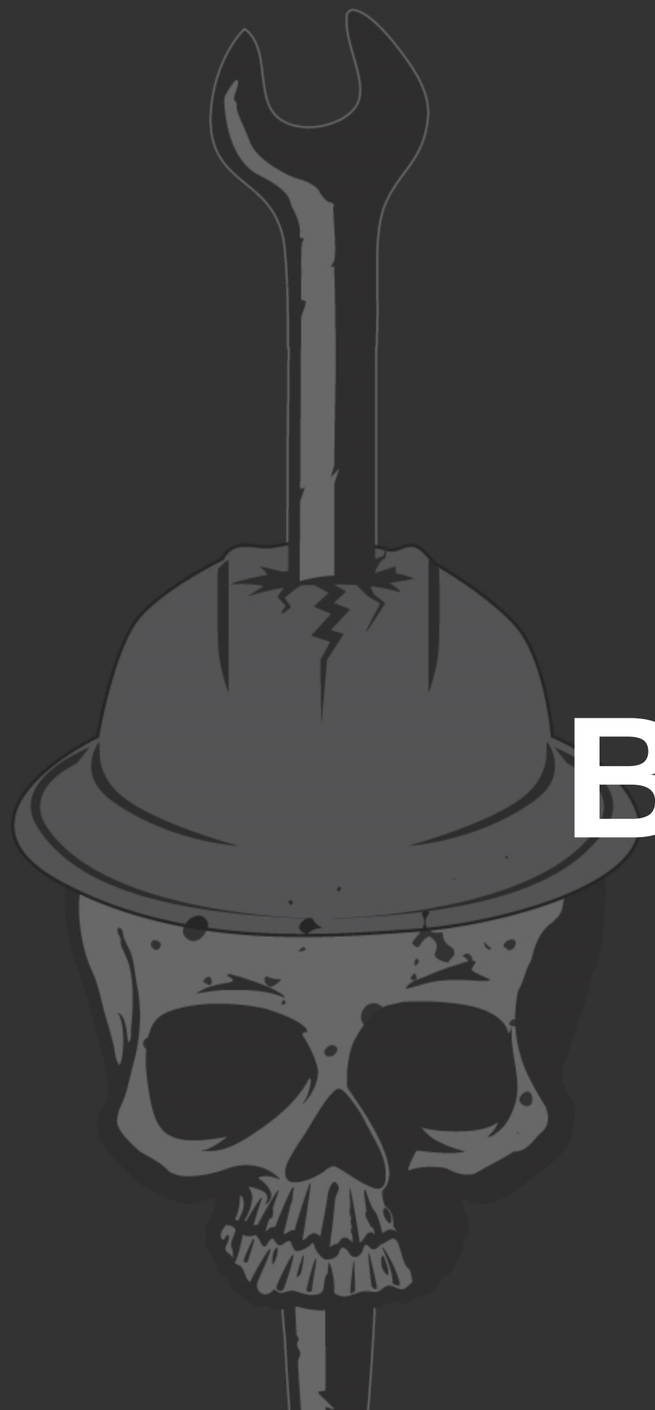
AVERAGE COST FOR A FATAL ACCIDENT:

$1.45M PER FATALITY

217 FATALITIES [IN 2020] X $1.45M=

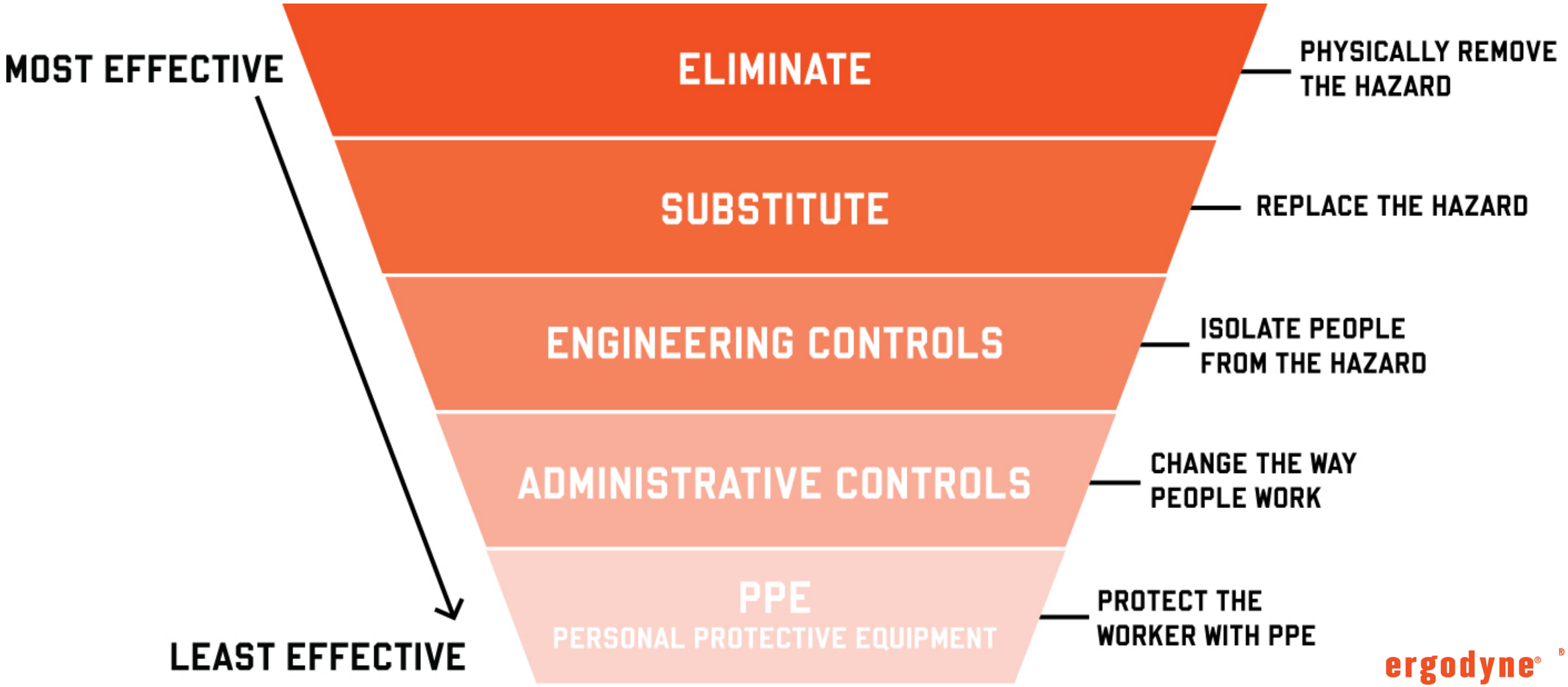
$315 MILLION

*NATIONAL SAFETY COUNCIL INJURY FACTS



CONTROLS & BEST PRACTICE

HOC OVERVIEW



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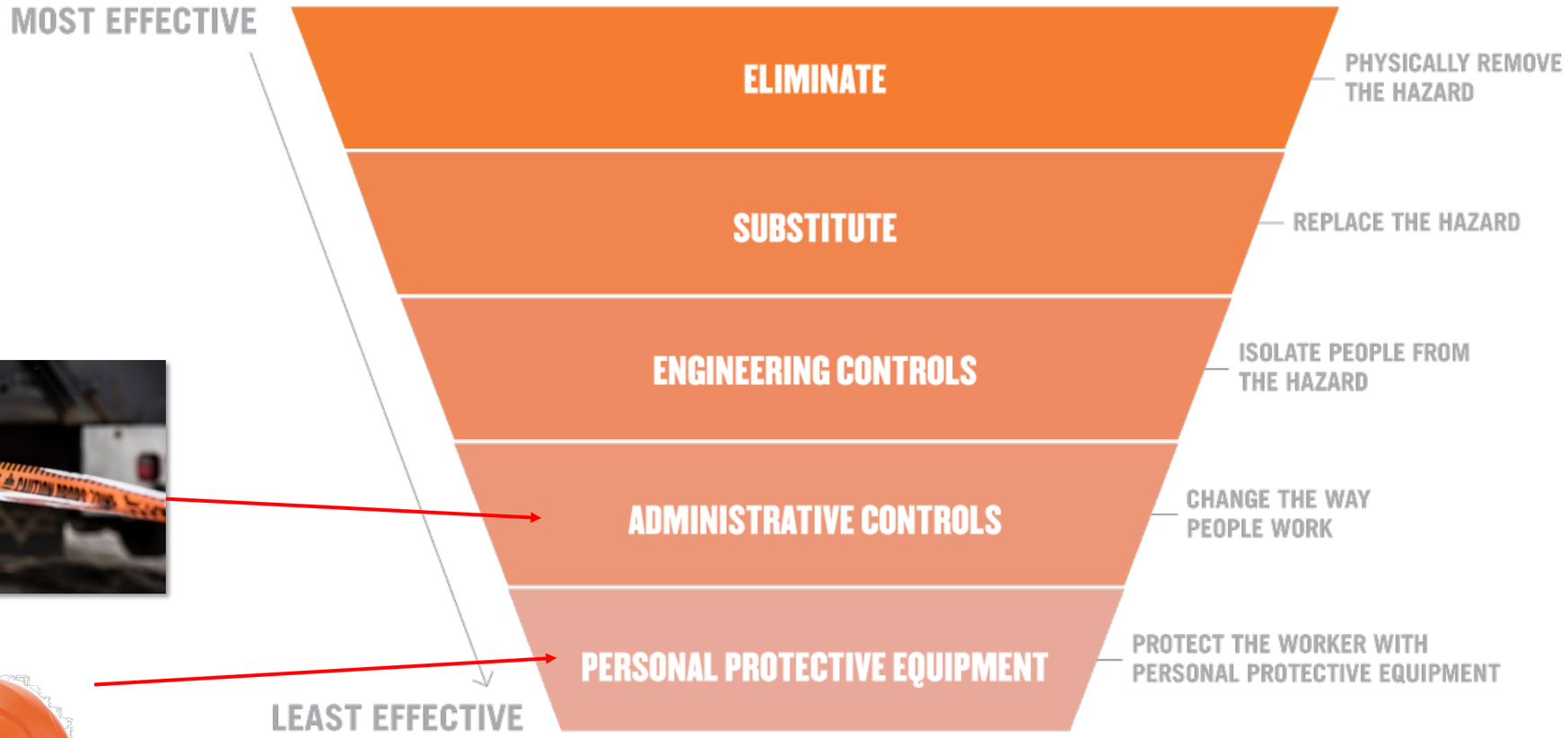
HOC FOR DROPPED OBJECTS



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WHAT IF.....

OR...

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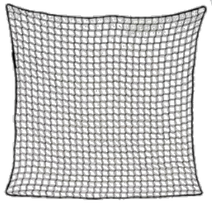
HOC FOR DROPPED OBJECTS

MOST EFFECTIVE



ELIMINATE — PHYSICALLY REMOVE THE HAZARD

SUBSTITUTE — REPLACE THE HAZARD

ENGINEERING CONTROLS — ISOLATE PEOPLE FROM THE HAZARD

ADMINISTRATIVE CONTROLS — CHANGE THE WAY PEOPLE WORK

PERSONAL PROTECTIVE EQUIPMENT — PROTECT THE WORKER WITH PERSONAL PROTECTIVE EQUIPMENT

LEAST EFFECTIVE

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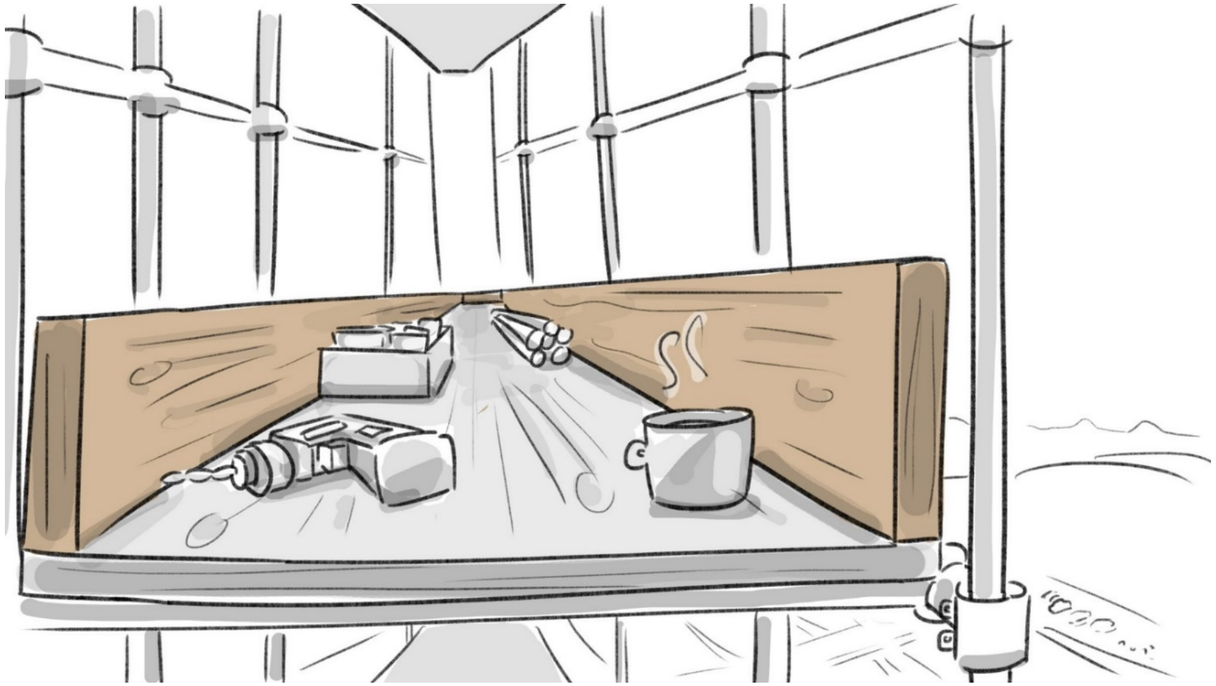
HIERACHY OF CONTROLS

PASSIVE ENGINEERING CONTROLS

Perimeter Netting

Expensive & Time Consuming



Toeboards

False Sense of Security, Encourages Poor Housekeeping

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HIERACHY OF CONTROLS

ACTIVE ENGINEERING CONTROLS

Make-Shift Solutions

Engineered Solutions

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REGULATION & STANDARDS

MYTH:

There is no regulation for dropped objects. We don’t have to do anything.

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REGULATIONS

DROPPED OBJECTS

- United States: OSHA
  - Construction Standard 1926
    - Scaffolds: 1926.451(h) – “falling object protection”
    - Fall Protection: 1926.501(c) – "Protection from falling objects"
    - Steel Erection:1926.759(a) – “Securing loose items aloft”
  - General Industry Standard 1910
    - Walking Working Surfaces: 1910.23 – Climbing with equipment safely
    - Walking Working Surfaces: 1910.28 – “protection for employees exposed to fall and falling objects hazards”
  - General Duty Clause

*USA Department of Labor – www.osha.gov

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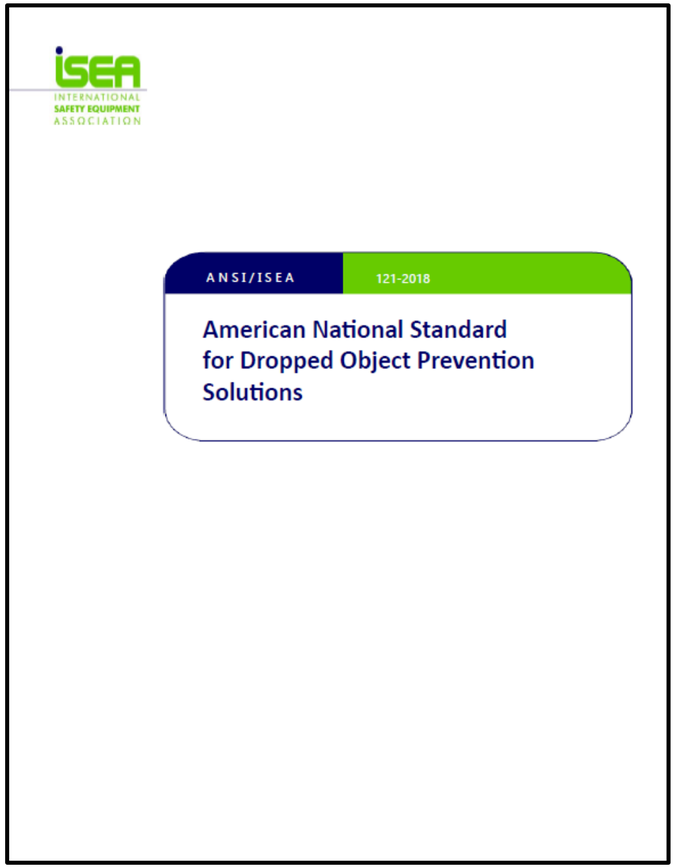
ANSI/ISEA 121-2018

- Standard accepted and adopted by ANSI on July 2nd, 2018
- Available for purchase at www.safetyequipment.org

ANSI
American National Standards Institute



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ANSI/ISEA 121 HIGHLIGHTS

- ANSI/ISEA 121 Standard for Dropped Objects Prevention Solutions
  - Includes active controls
    - Anchor Attachments
    - Tool Attachments
    - Tool Tethers
    - Containers (buckets, pouches)

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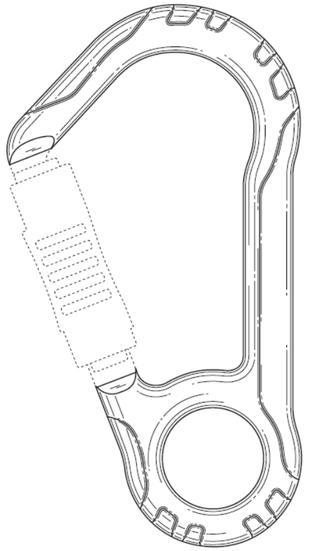
ANSI/ISEA 121 HIGHLIGHTS

- Standard addresses
  - Design criteria
  - Testing criteria
  - Performance requirements
  - Reporting criteria
  - Label and Instruction content
- Appendices



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ANSI/ISEA 121 HIGHLIGHTS

- Does not include:
  - Use (weight to connect to body)
  - PPE (hard hats, etc.)
  - Passive Controls (toe-boards)
  - Material Handling (hoisting)
- Tools
  - Attachments have to be subsequent to original manufacturing.

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STANDARD: APPLYING AT THE JOBSITE

SO WHAT DOES THIS MEAN?

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FIELD IMPLICATIONS

- ANSI/ISEA 121-2018 represents the formalization of ***PREVENTION AS A BEST PRACTICE*** (tethering & containment)
- Allows companies to implement 121 into their safety programs as equipment specification (eliminate duct tape & paracord)
- Reference to the standard may be embraced by other entities
- OSHA may potentially reference these inclusions under the General Duty Clause or write letter(s) of interpretation around the subject

In Summary:

PREVENTION > PPE

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ENGINEERING CONTROLS

ACTIVE SOLUTIONS: THE 3 T'S OF O@H SAFETY

- Trapped
  - Creates an attachment point on anchors & tools that do not have one built in.
- Tethered
  - Prevents object from falling by securing to a worker or other anchor point.
- Topped
  - Cover buckets, pouches, and other containers to avoid spilling their contents.

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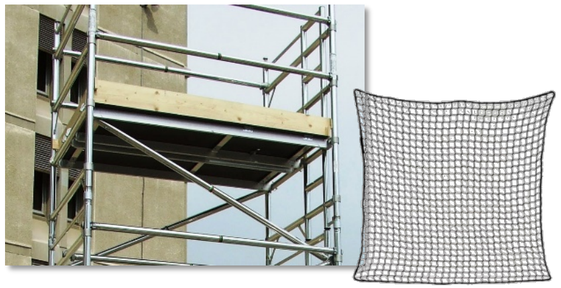
BEST PRACTICE

PPE & Caution Tape not fool-proof



Passive Controls are expensive and misleading

Duct tape and rope are archaic and unsafe

An Unquestioned Best Practice

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THANK YOU!

Apprentice Ironworker Struck by Dropped Steel Wedge

https://lni.wa.gov/safety-health/safety-research/files/2022/71_217_2022_IronworkerStruckByWedge.pdf

WASHINGTON State FACE Program
Fatality Assessment & Control Evaluation

CONSTRUCTION
INJURY NARRATIVE

FACE NIOSH

Apprentice Ironworker Struck by Dropped Steel Wedge

INCIDENT FACTS

REPORT #:
71-217-2022

REPORT DATE:
February 28, 2022

INCIDENT DATE:
May 24, 2017

WORKER:
25 years old

INDUSTRY:
Structural steel and precast concrete contractors

OCCUPATION:
Apprentice ironworker

SCENE:
New construction of cold storage facility

EVENT TYPE:
Struck by

Incident scene where an apprentice ironworker was struck by a dropped a steel wedge.

For a slideshow version, click here.

SHARP Safety & Health Assessment & Research for Prevention

Washington State Department of Labor & Industries

SUMMARY

A 25-year-old apprentice ironworker was seriously injured after he was struck by a dropped steel wedge.

The apprentice was employed by a structural steel and precast concrete contractor. His employer was a subcontractor erecting the steel structure of a new construction cold storage facility. He had worked for the employer for about two months.

Steel wedge that was accidentally dropped 50 feet, striking an apprentice ironworker.

On the day of the incident, two ironworkers were working from the basket of a boom lift to install a beam on a column. This procedure generally took them 30 seconds to a minute before they quickly moved on to the next install. The ironworkers were using a steel wedge between the column and beam to help tighten the bolts securing them. One of the ironworkers was removing the wedge, which was under pressure, using a hammer to knock it loose. As he was doing this, the untethered wedge broke free, but he was unable to hold on to it, and it fell approximately 50 feet.

At this moment, the apprentice was in the area below getting a bottle of water that was being stored there for workers. As he was bending over to pick up the bottle, the wedge struck him in his upper back near his left shoulder. The apprentice suffered injuries to his shoulder, ribs, and lungs that kept him from working for several months.

Investigators found: The employer had not provided workers with a means of securing wedges from falling or being dropped. The employer had not used red caution tape to keep workers out of the area below where the ironworkers were working. There was not a designated water station. The ironworkers did not expect anyone to be working below them because there were no other workers in the area.

RECOMMENDATIONS

FACE investigators concluded that, to help prevent similar occurrences where workers may be in danger of being struck by dropped objects, employers should:

Plan ahead and train

- Use red caution tape and/or have a spotter on the ground to keep workers from entering areas where objects may be dropped.
- Locate employee water stations away from active work areas.
- Provide safety training to new workers to ensure they understand the hazards associated with the work site.

Prepare tools and equipment

- Require that wedges and other tools used by workers at heights have lanyards, tethering devices, holsters, buckets and other devices to secure them.
- Add attachment points to wedges if they do not have them so they can be secured to a tether.
- Ensure that tethering systems are ANSI/ISEA 121-2018 Dropped Object Prevention Solutions compliant.
- Secure wedges and other tools, both when in use and not in use.

RESOURCES

ANSI/ISEA 121-2018 American National Standard for Dropped Object Prevention Solutions

This narrative was developed to alert employers and workers of a tragic incident and is based on preliminary data ONLY and does not represent final determinations regarding the nature of the incident or the cause of the injury. Developed by WA State Fatality Assessment and Control Evaluation (FACE) Program and the Division of Occupational Safety and Health (DOSH), WA State Dept. of Labor & Industries. The FACE Program is supported in part by a grant from the National Institute for Occupational Safety and Health (NIOSH grant# 5U60OH008487). For more information visit www.lni.wa.gov/safety-health/safety-research/ongoing-projects/work-related-fatalities-face.

Terminal Modernization Program

Environmental Health & Safety (EHS)
Dropped Object Protection Plan

04/14/2022

Jason Timmerman, CSP, Vice President, Environment & Workplace Safety, Pittsburgh International Airport

Patrick Marsilio, CSP, CHST, SMS, Safety Manager, Pittsburgh International Airport

Our EHS Policy Prioritizes a Safe and Healthy Work Environment

PITTSBURGH INTERNATIONAL AIRPORT

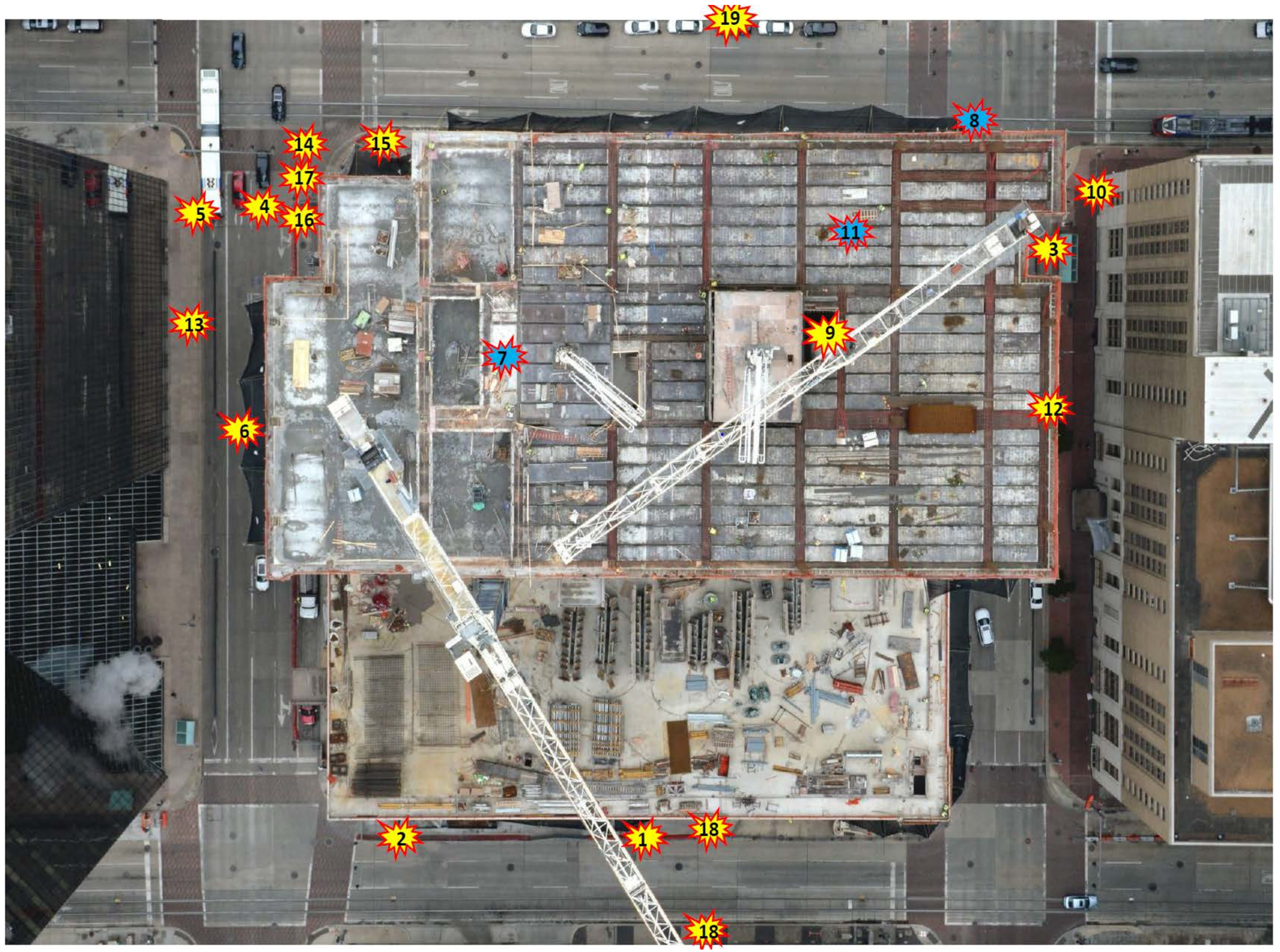
It is the policy of the Allegheny County Airport Authority to foster a safe and healthy work environment where incident-free construction activities are achievable. Exceptional Environmental, Health and Safety (EHS) performance on the Allegheny County Airport Authority (ACAA) Terminal Modernization Program (TMP) is a top priority and a core value that will not be compromised. The ACAA and the TMP participants shall work safely or not at all on the TMP.

The benefits realized by achieving consistent exceptional EH&S performance are the following:

- Protection of the public, our workforce and our investment
- Maximization of safety to maintain continuity of construction, start-up and operations

Capitol Tower – 36 Story High Rise

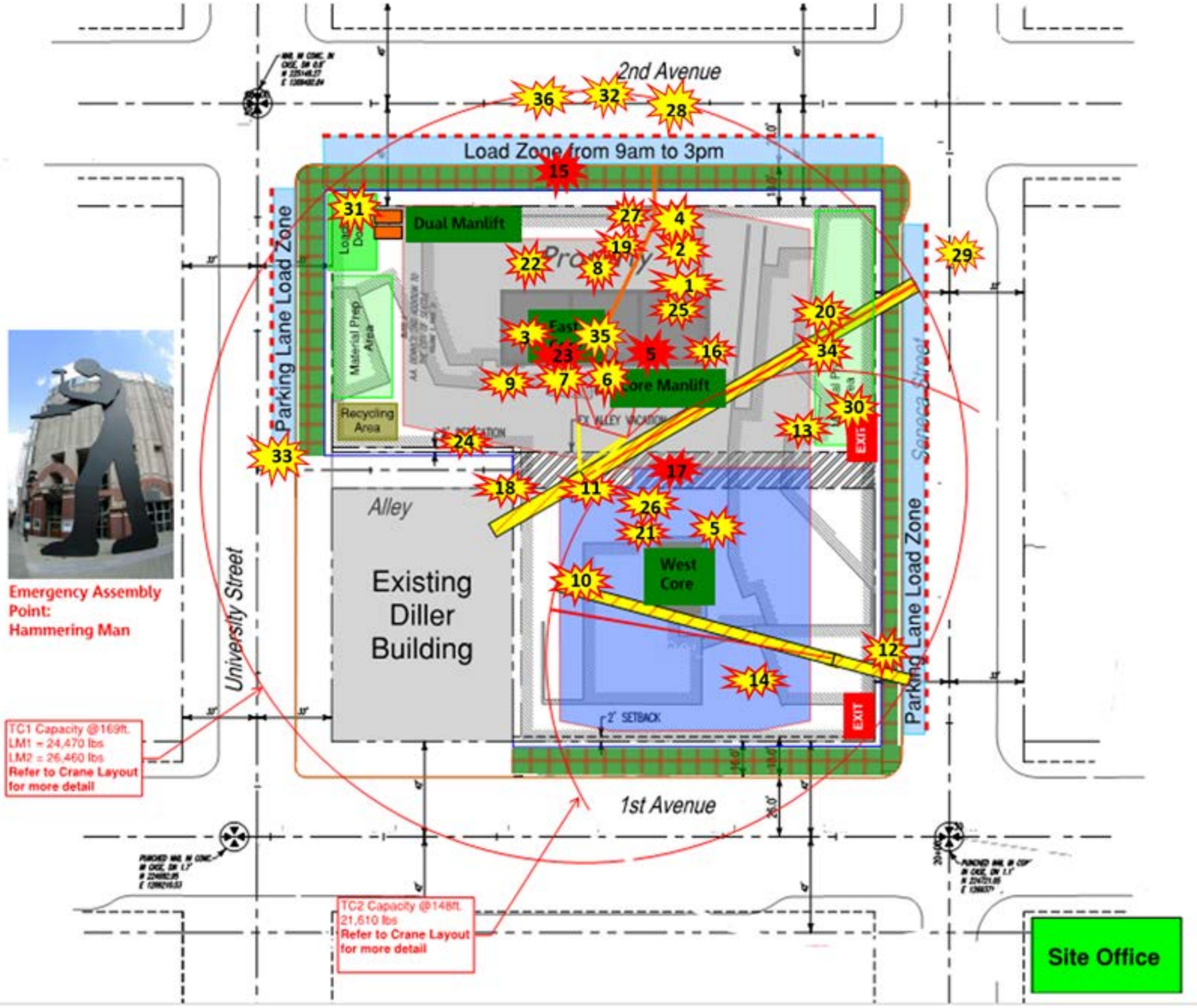
- 20 Dropped Objects Reported in one calendar Year
- Many were Potential Fatalities



2+U – 35 Story High Rise

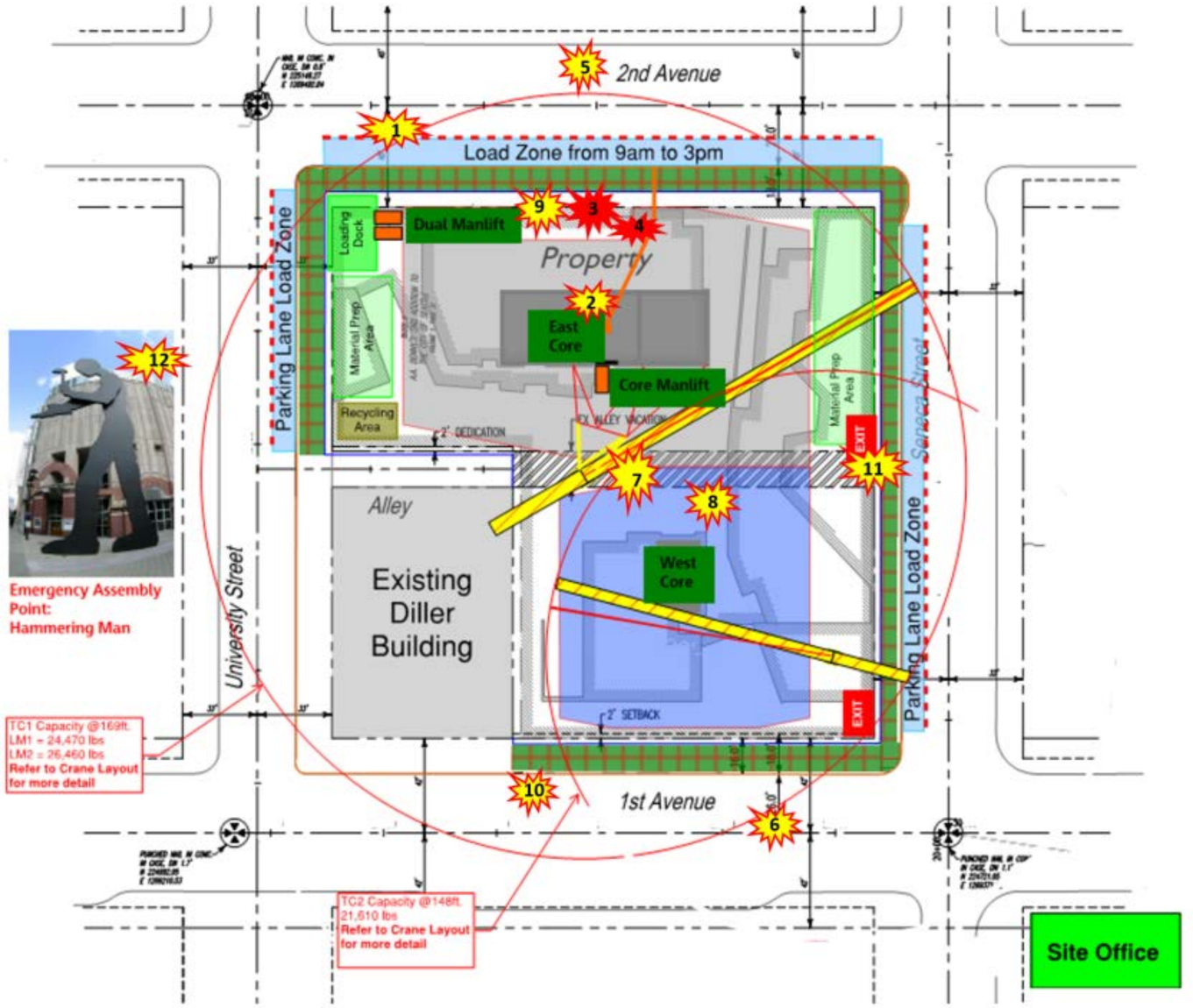
- 2018 – 31 Reported Dropped Object Incidents
- Many were Potential Fatalities
- After drilling down on an investigation process, we realized that:
  - 17 of these incidents could have been prevented with a more robust “Dropped Object Prevention Program”

2018 Dropped Objects (including hot work) Logistics Map



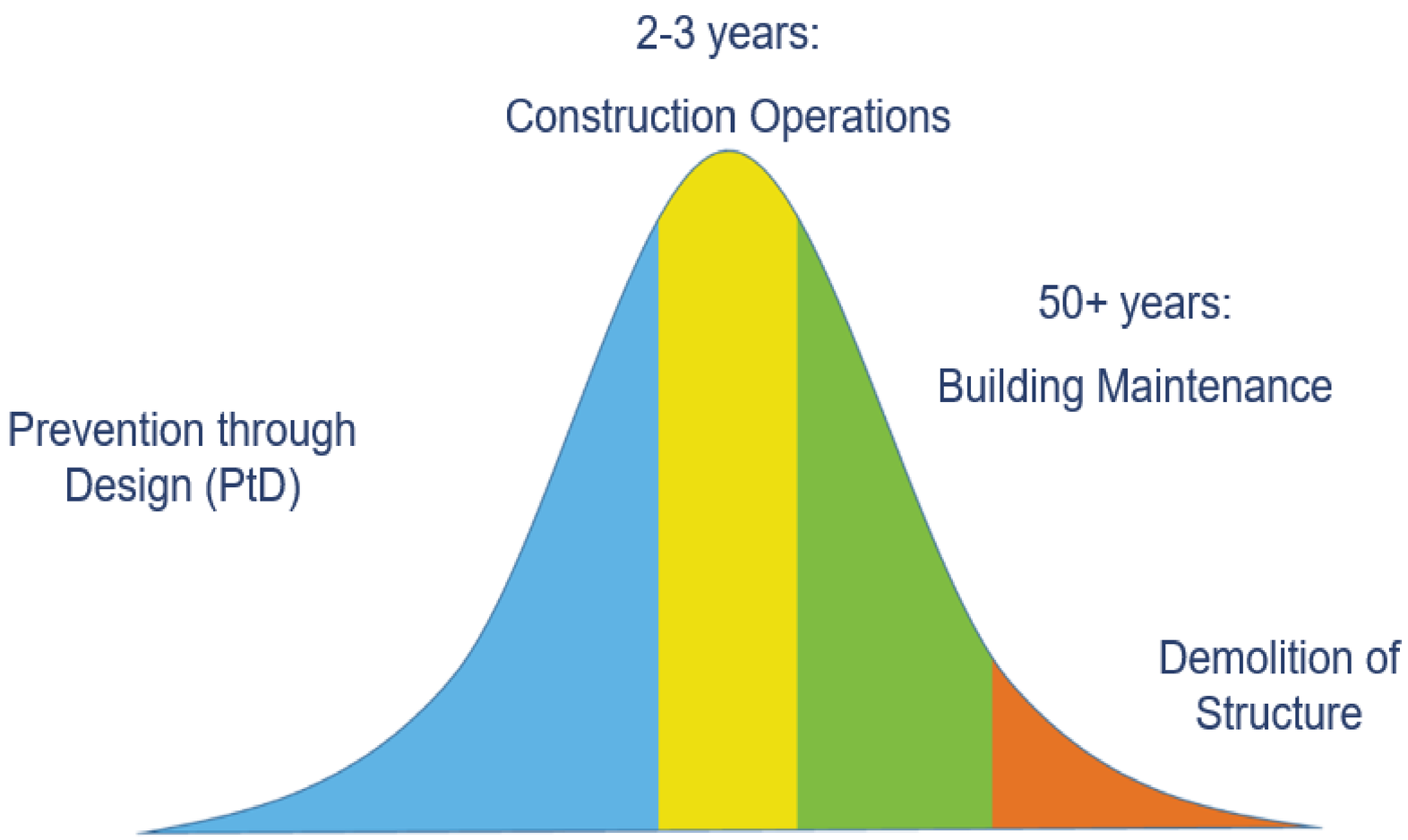
2+U – 35 Story High Rise

- 2019 – 10 Dropped Object Incidents
- Again – Many were Potential Fatalities
  - 03 of these incidents could have been prevented with a more robust “Dropped Object Prevention Program

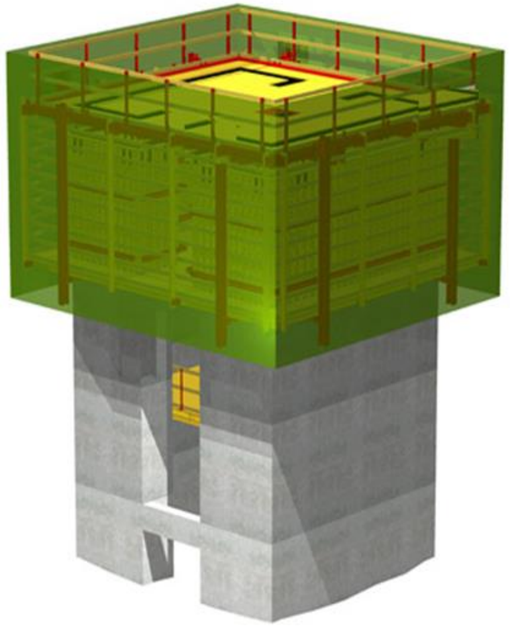


Why do these occur? Potential Dropped Objects

What can we do to prevent these incidents? Early dialogue can help prevent these incidents from occurring.



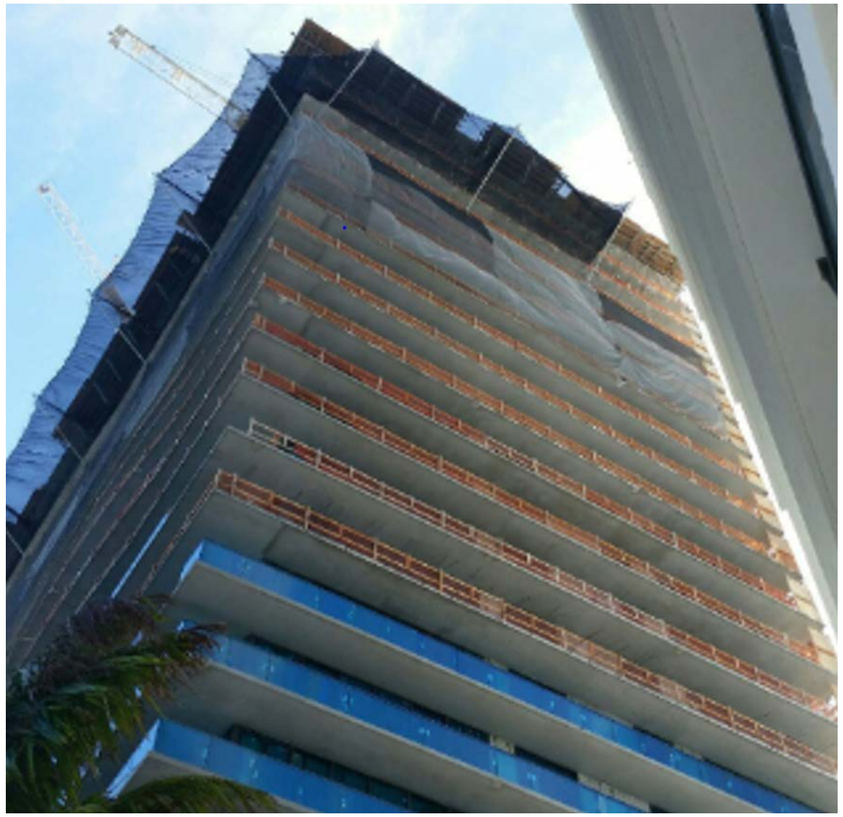
Options to Consider – Building Exterior and Interior Core Cocooning

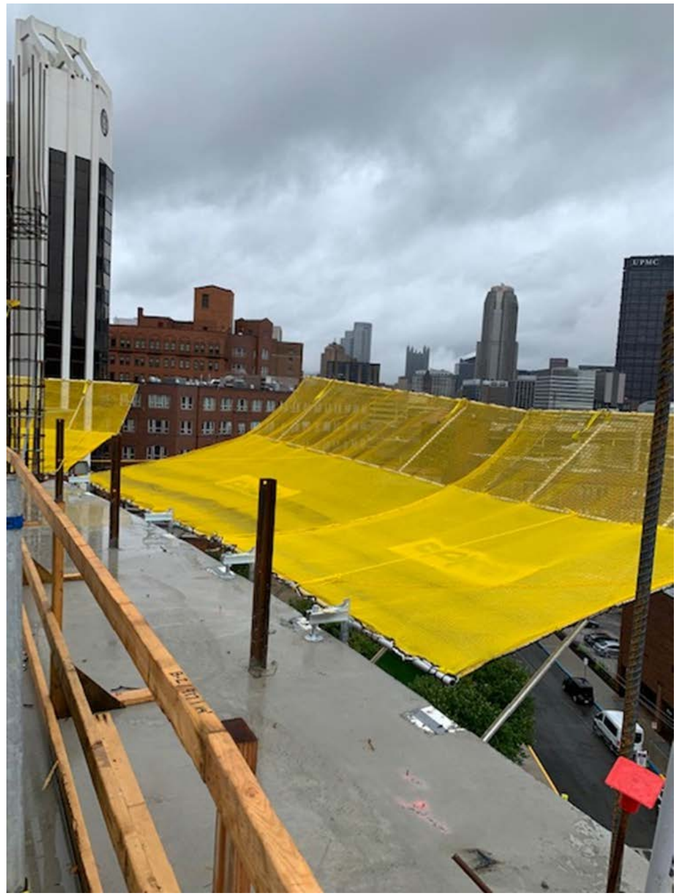


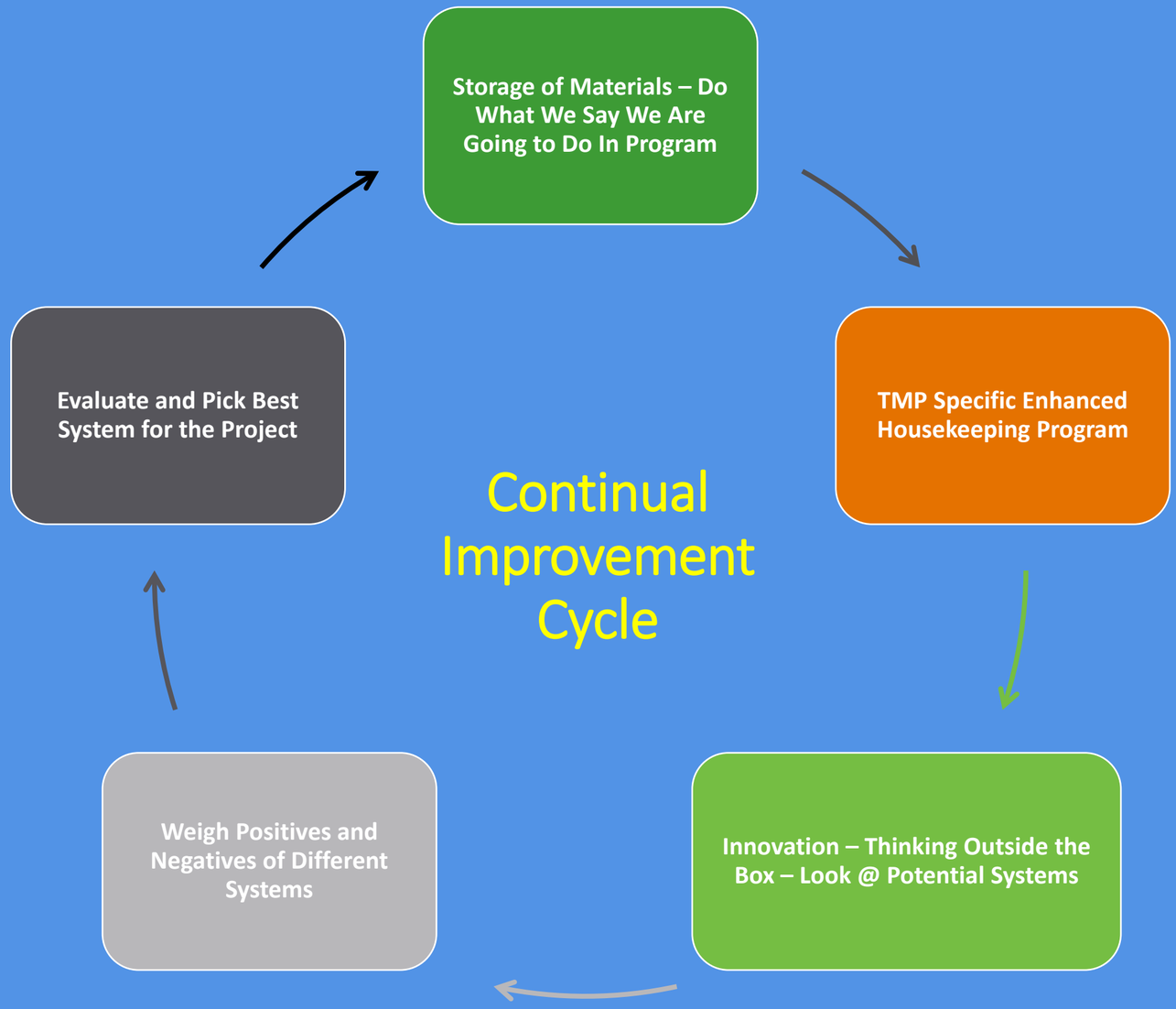
Options to Consider – Exterior Leading-Edge Protection / Inter Shaft Protection

Options to Consider – Exterior Leading-Edge Protection / Inter Shaft Protection

Options to Consider – Netting System – Outrigger Net Systems and Drop Net Systems






Storage of Materials – Do What We Say We Are Going to Do In Program
TMP Specific Enhanced Housekeeping Program
Innovation – Thinking Outside the Box – Look @ Potential Systems
Weigh Positives and Negatives of Different Systems
Evaluate and Pick Best System for the Project
Continual Improvement Cycle

Benefits of Alternate Leading-Edge Protection

1. Safer Product
2. Protection against Foreign Object Debris
3. Protection of Dropped Objects Off the Building
4. More Environmental / More Sustainable
5. Marketing
6. Efficient and Quicker Installation
7. Low Maintenance

Key Elements to a Dropped Object Prevention Plan

- Develop a written procedure including goals
- Define and measure leading indicators
- Establish a method to review leading and lagging indicators
- Investigate all incidents and Implement actions to achieve full compliance

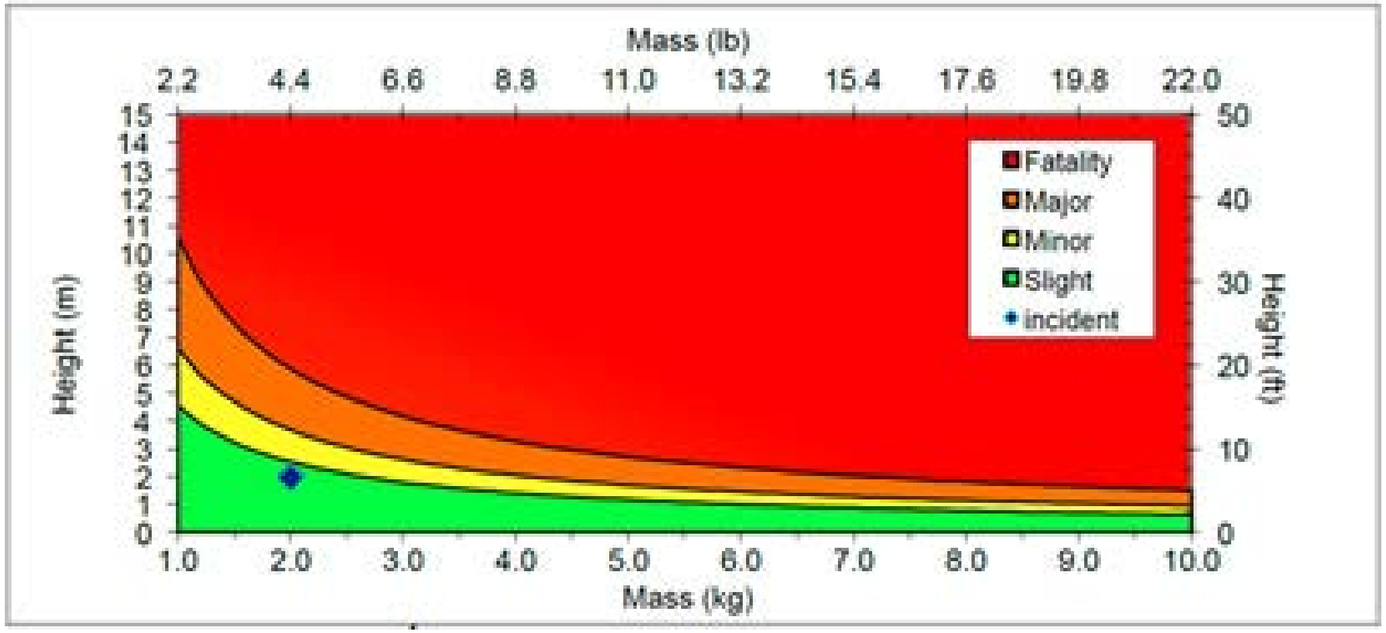
Dropped Object Prevention Procedure Fundamentals

1. Risk Elimination
2. Work Area Control at Heights
3. Tool and Material Management at Heights
4. Ground Controls

Risk Elimination

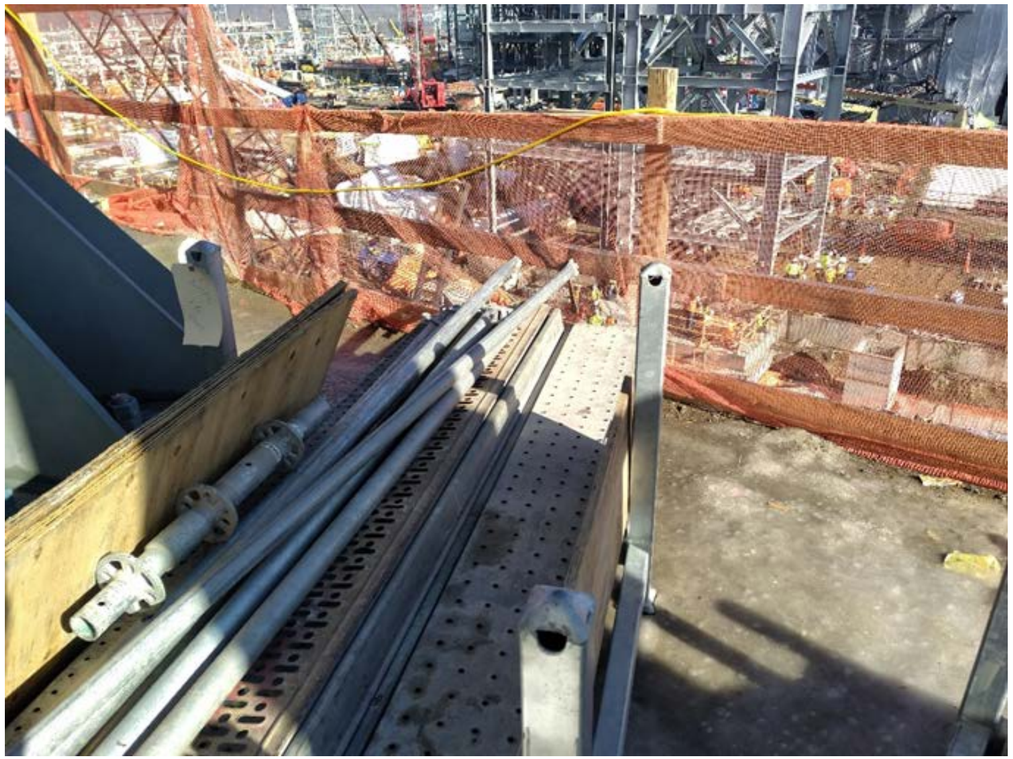
- Complete as much of the work on the ground as possible to eliminate the risk.
- If not possible to complete the work on the ground, work area control, tool and material management, and ground controls shall be examined.

DROPS online
Dropped Objects Prevention Scheme Global Resource Centre



Work Area Control at Heights

- Pre-task planning
- Housekeeping
- Material and tool storage areas
- Securement methods
- Working surfaces



Tool and Material Management at Heights

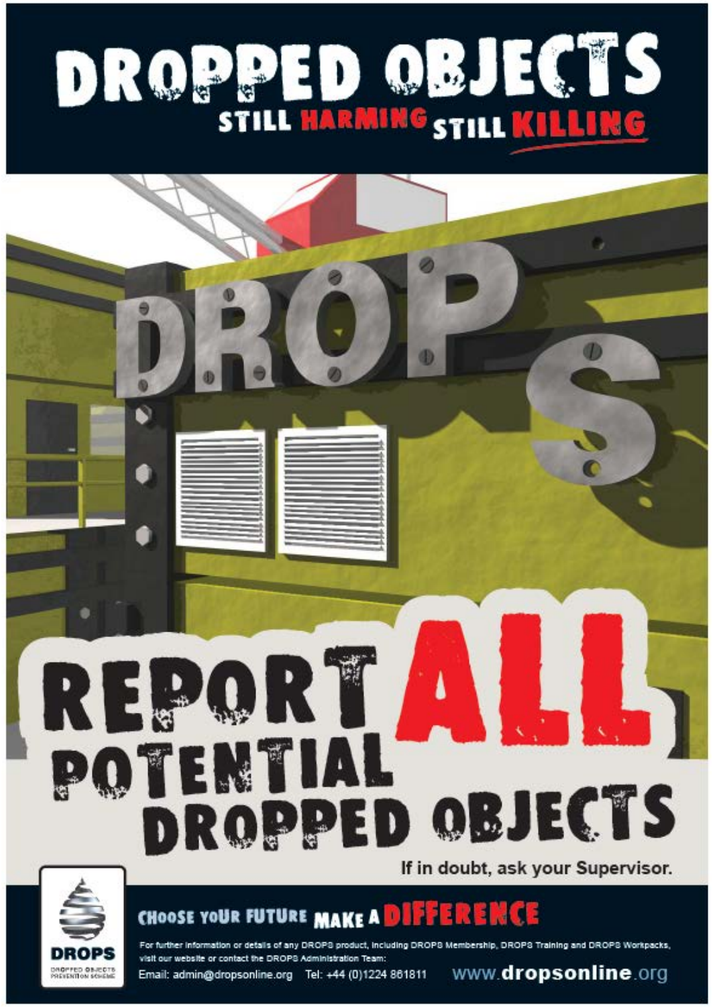
- “If you don’t need it, don’t take it”
- Hoisting tools and materials
- Tool and material bags/buckets
- Tool tethering and material securement

Ground Controls

- Last line of defense
- Imminent danger red barricades
- Sufficiently sized
- Properly maintained

Other Elements of a Successful Program

- Training
- Assessments and Inspections
- Reporting and Investigating
- Accountability



Number One Core Value – Protecting Our Workforce

Never put yourself or others at risk!

Work Safely or not at all!

Speak up if you see others making mistakes or taking chances!

If you see it you own it!


Thank You
The future of travel is here and it’s focused on you.

Unique Challenges of Dropped Object Prevention Involving Communication Towers and Rope Access

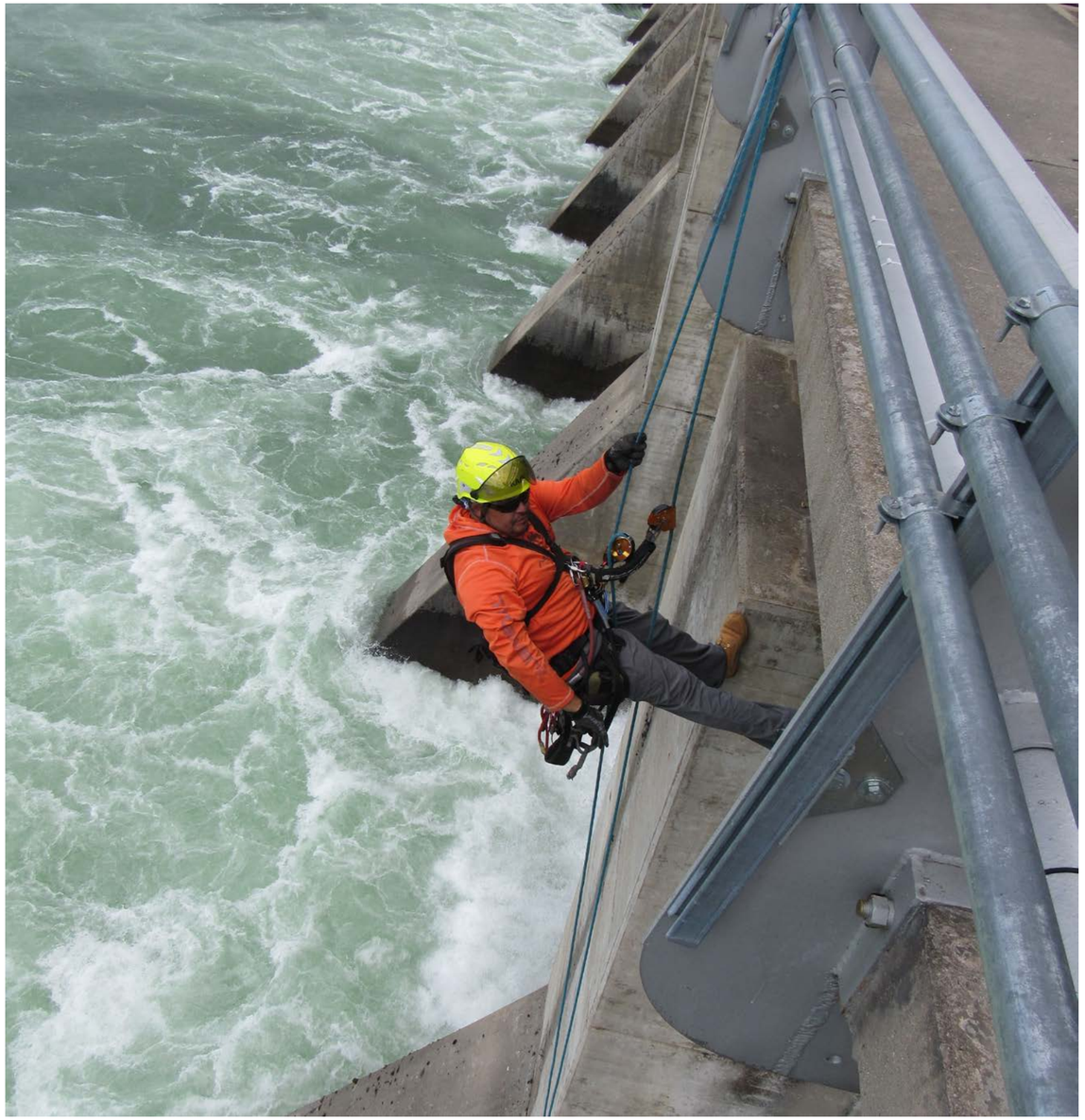
Kenneth Piposar

Your Presenter

ken@airitas.com 623-296-4589

Kenneth Piposar

- CEO – Abseilon – Industrial Rope Access- 2006
- CEO - Airitas Custom Tethering Solutions -2017
- OSHA – SHARP 2013 / 2016 / 2019



Convenience or Safety
Exists in the field

PHOTO #1

PHOTO #2

MISSION STATEMENT

- Safety First
- Core Values
- We are committed to Safety Excellence
- Our Highest Priority is the Safety of our Employees

880 Delta Radiography Camera Weight 52 lbs.

Improvised Contraptions = MacGyversims

Mac·Gy·ver

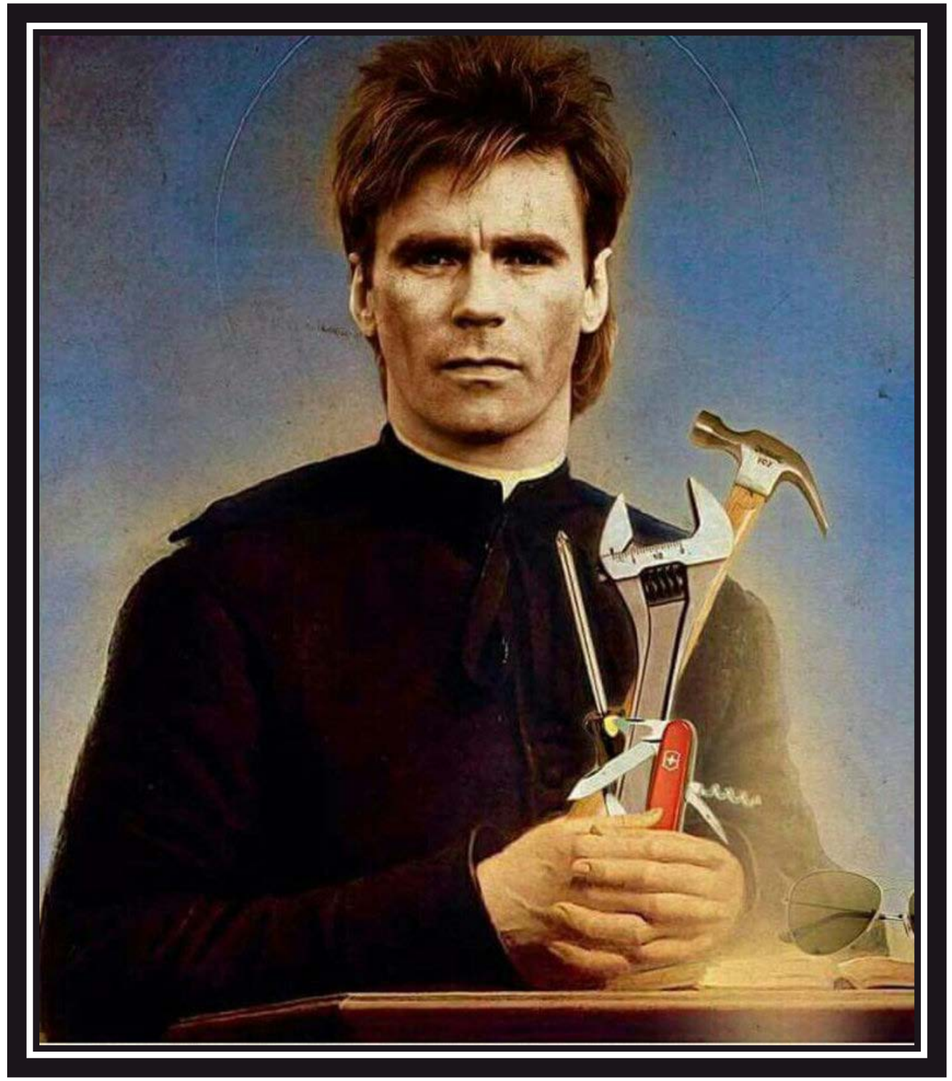
/məˈgīvər/

verb

INFORMAL•US

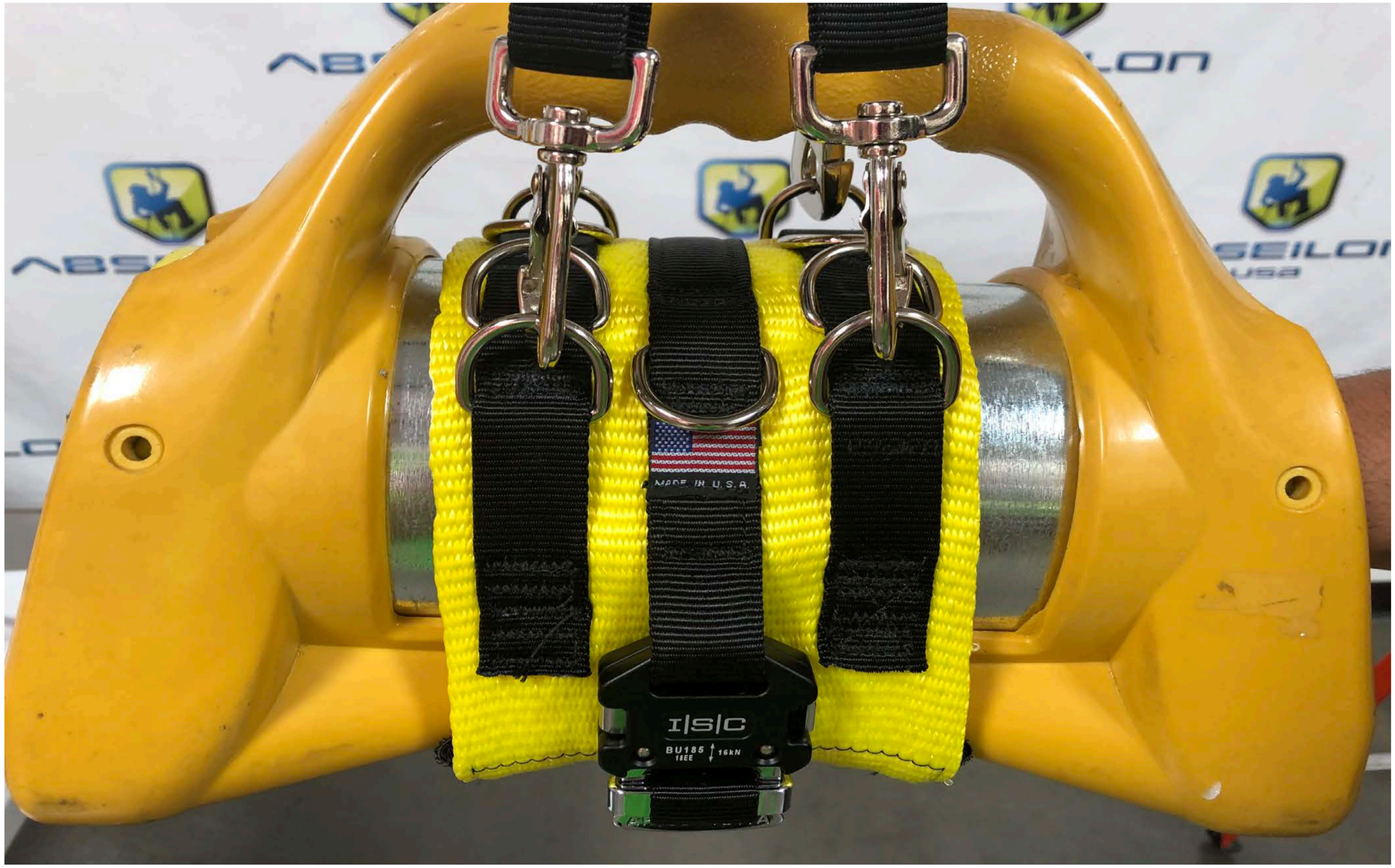
1. make or repair (an object) in an improvised or inventive way, making use of whatever items are at hand.

"he MacGyvered a makeshift jack with a log"



SAME CAMERA DROPPED 40 FEET

The Solution



Custom Tethering for Equipment

Large or Small Tools that meet ANSI/ISEA 121-2018 Standard for Dropped Objects


Debris Chute
Safety Nets
Guardrails
Tool Tethers
Debris Nets
Toeboard
Thank you!
CREATE A
SPHERE OF SAFETY
PREVENT STRUCK-BY INCIDENTS