



**SAFETY**  
**AT HEIGHTS**  
by ISEA



# Conquering Heights in Construction Safety

6 May 2024

# Agenda

01

**Introductions**

02

**Fall Prevention & Protection**

03

**Dropped Objects Prevention & Protection**

04

**Q&A**

# Who We Are



**Ed Valencia**

SAFETY DIRECTOR  
Derr & Gruenewald, LLC



**Allie Thunstrom**

FIELD PRODUCT MANAGER  
Ergodyne

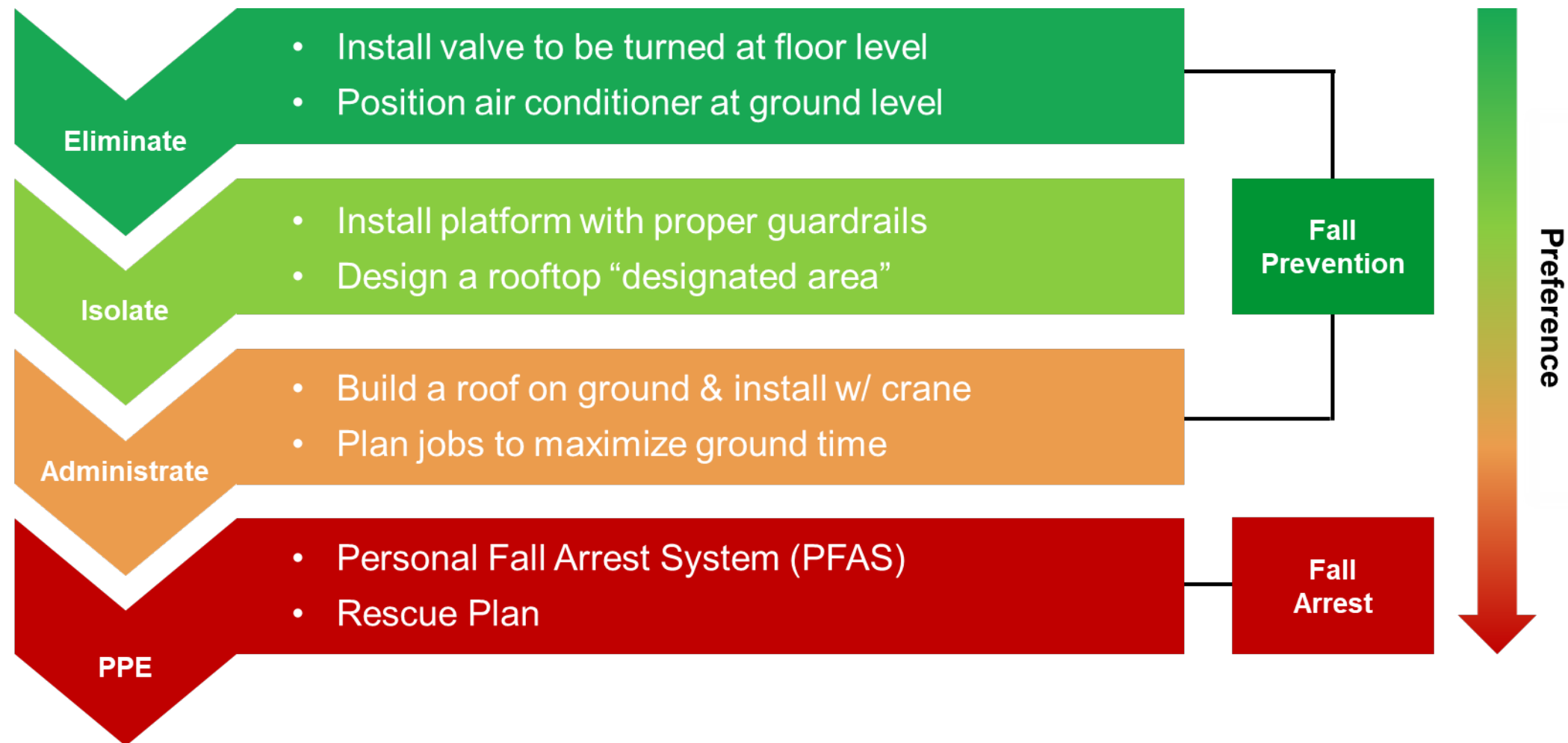


**Rob Willis**

GLOBAL PRODUCT GROUP DIR.  
MSA Safety

# Fall Protection Fundamentals

## Hierarchy of Controls

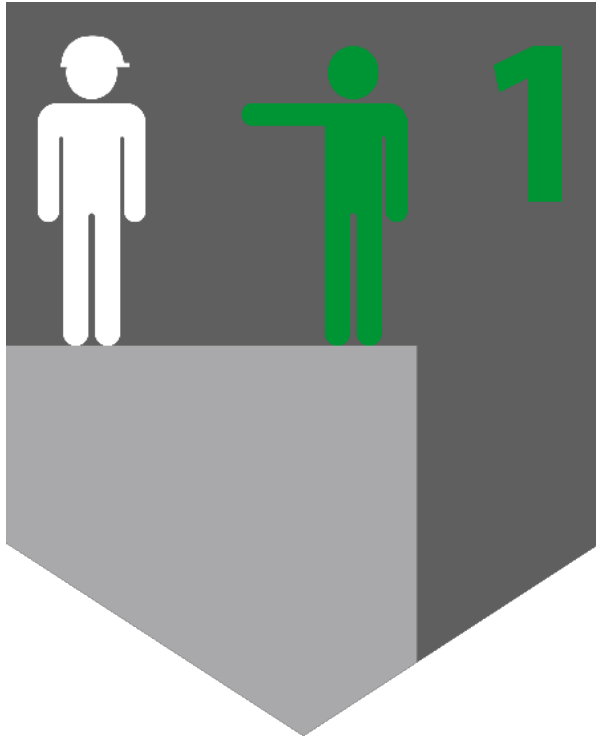




# Fall Protection Fundamentals

Step 1: Understanding the hierarchy of control

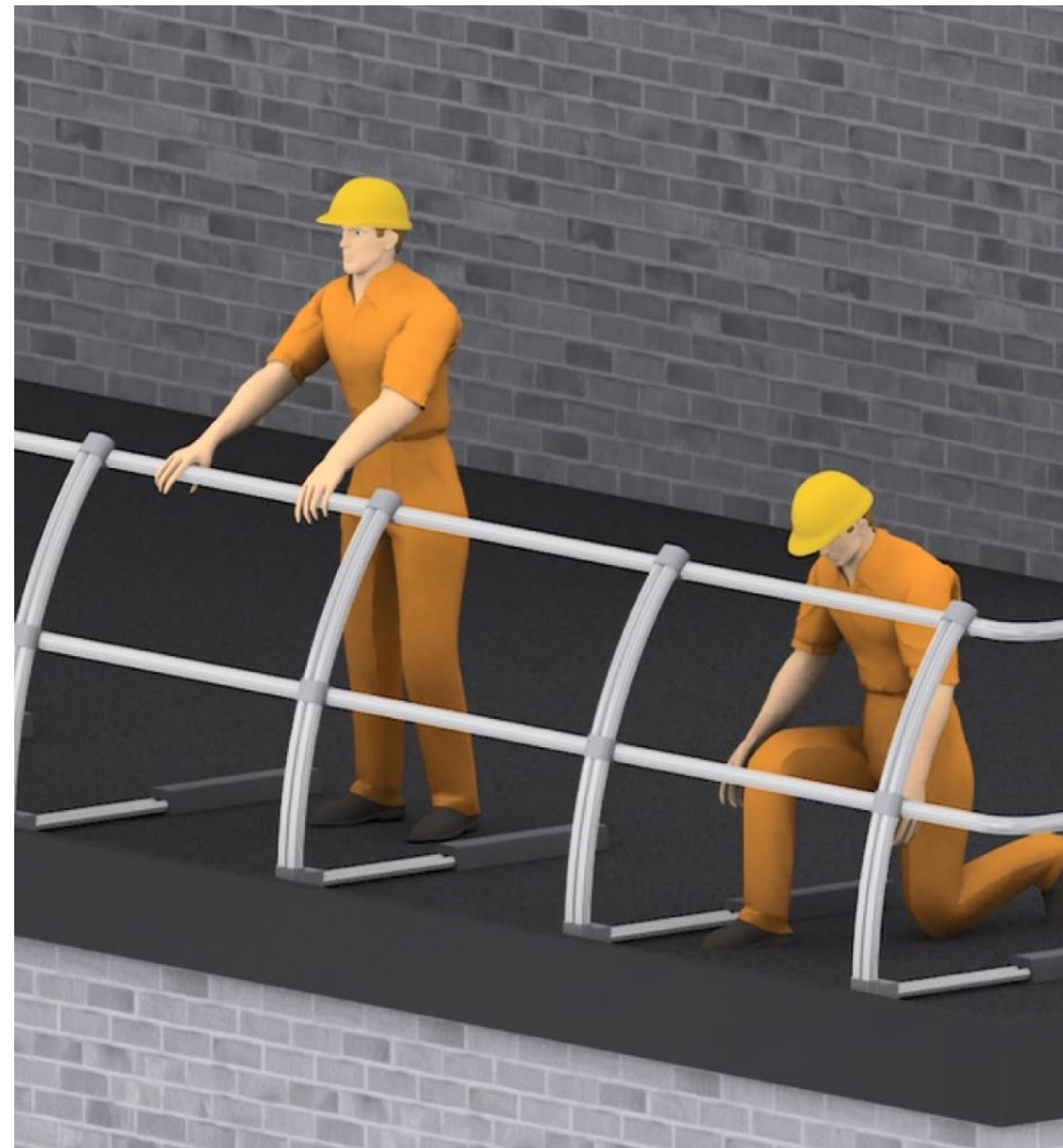
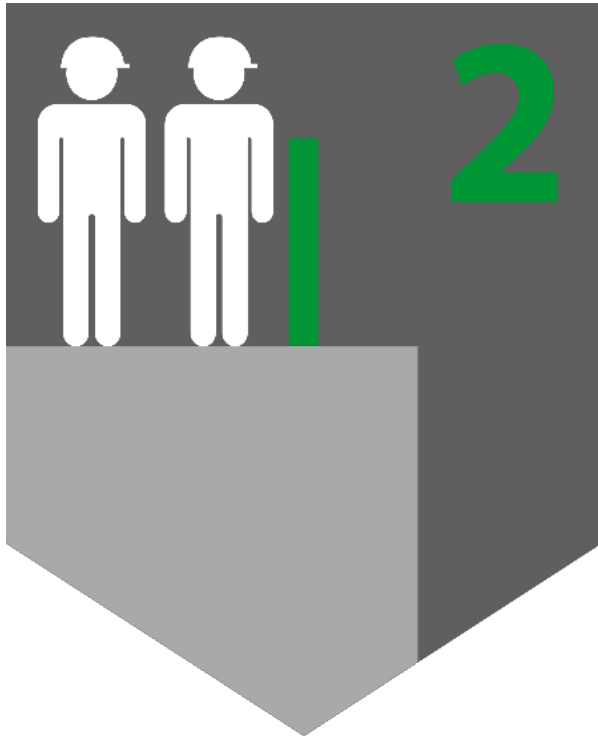
**Eliminate the risk**



# Fall Protection Fundamentals

Step 2: Understanding the hierarchy of control

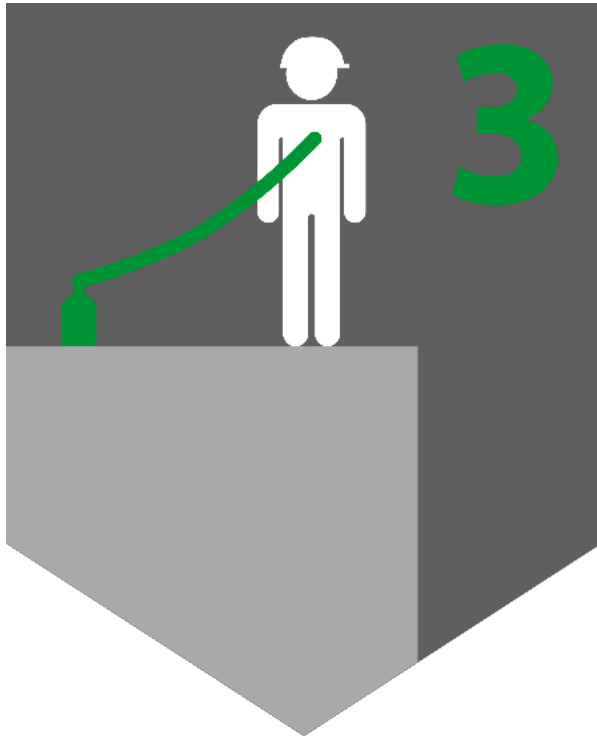
**Isolate the hazard**



# Fall Protection Fundamentals

Step 3: Understanding the hierarchy of control

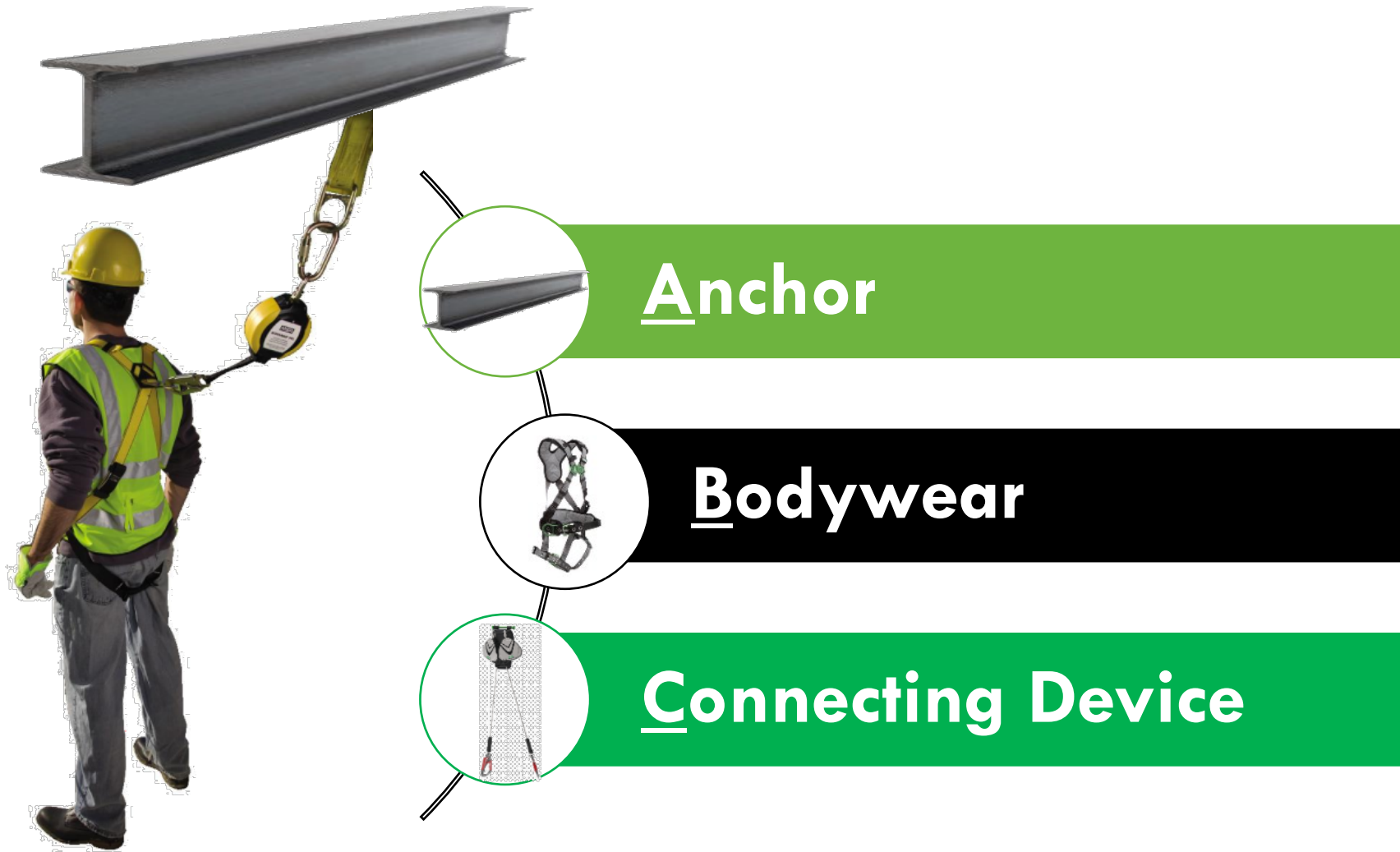
**Protect the worker**







# The personal fall arrest system ABCs





## A - Anchors



**Anchorage Connector Straps / Chain**



**Beam Anchor**



**D-Plate Anchorage Connector**



**Reusable Roof Anchor**



**Removable Concrete Anchorage Connectors**



**Weld-On Puck**

## B – Body Wear



**Universal**



**Welding**



**Arc Flash**



**“Personal Rescue Device” (PRD)**

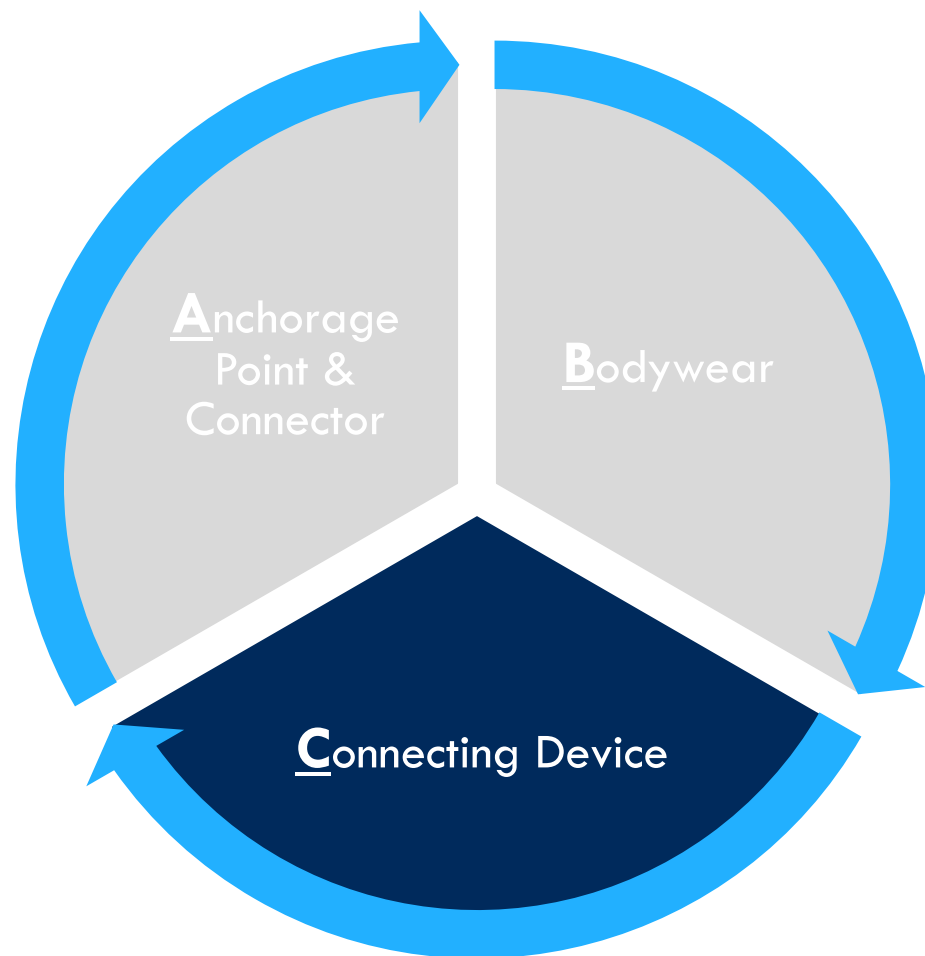
## B – Body Wear

Harness Size Chart for **V-SERIES** Harnesses

ft. (m)														
6'-6" (2.0)														
6'-4" (1.9)														
6'-2" (1.9)														
6'-0" (1.8)														
5'-10" (1.8)														
5'-8" (1.7)														
5'-6" (1.7)														
5'-4" (1.6)														
5'-2" (1.6)														
5'-0" (1.5)														
lb. (kg)	110 (50)	130 (59)	150 (68)	170 (77)	190 (86)	210 (95)	230 (105)	250 (114)	270 (123)	290 (132)	310 (141)	330 (150)	400 (181)	



## C- Connecting Devices





# New Types and Classifications of SRD's

## Types of SRDs

### Previous ANSI Z359.14-2014

SRL	Standard over-head only SRL
SRL-LE	Leading-Edge rate SRL
SRL-R	Standard over-head only SRL with Rescue function



### New ANSI Z359.14-2021

SRL	SRL (non-back mounted) for standard or leading-edge applications
SRL-P	Personal SRL that is back mounted for standard or leading-edge applications
SRL-R	Standard over-head only SRL with Rescue function



SRL-P

# New Types and Classifications of SRD's

**Key Takeaway:** Does this matter to you? In general no, these are groupings for the manufacturer so they know which tests to perform.

# New Types and Classifications of SRD's

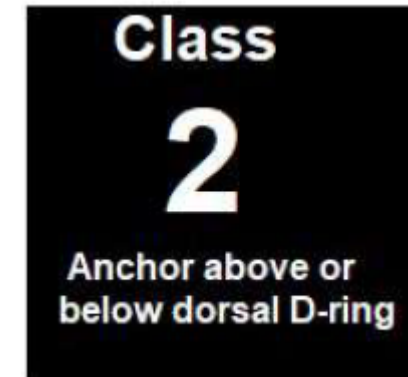
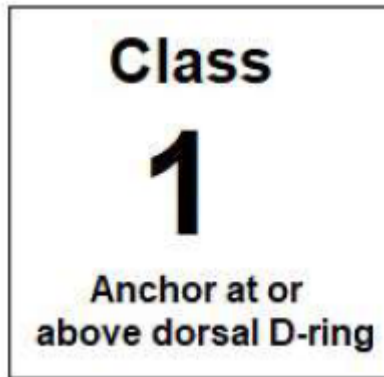
## Classifications of SRDs

### New ANSI Z359.14-2021

#### Previous ANSI Z359.14-2014

Class A: Overhead mounted SRL  
will have max arrest distance of 24"  
or less

Class B: Overhead mounted SRL  
will have max arrest distance of 54"  
or less



Therefore, Class 1 is overhead tie-off and Class 2 is leading-edge

# New Types and Classifications of SRD's

## Examples



Application:

Large 30ft SRL  
anchored overhead  
for ladder climbing

SRL Class 1



Application:

Back-mounted 8ft  
leading edge PFL's fo  
steel erection

SRL-P Class 2



Application:

Tripod mounted SRL  
with rescue function  
for confined space  
access

SRL-R Class 1

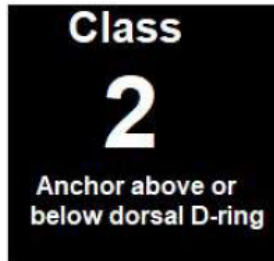
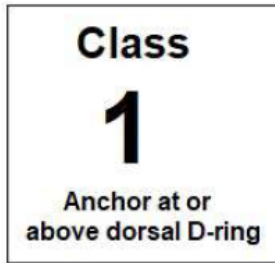


# New Types and Classifications of SRD's

**Key Takeaway:** When selecting your SRL, determine if you need Class 1 for overhead applications or Class 2 for leading edge.

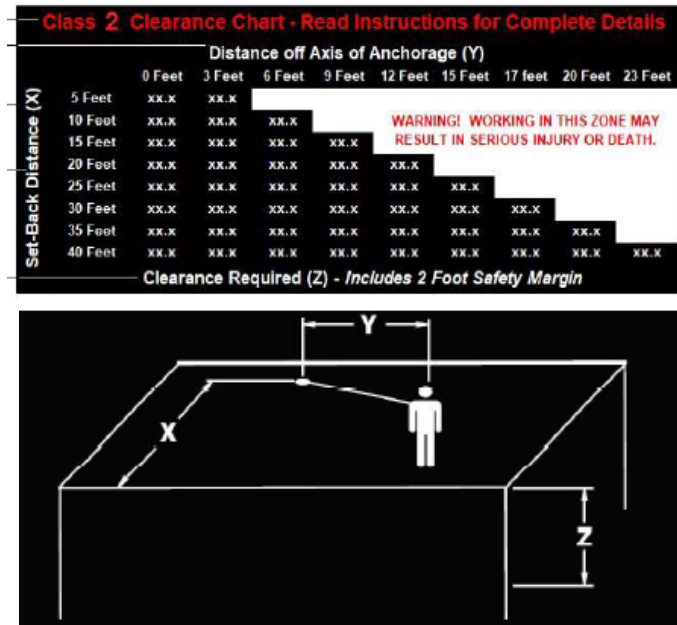
# Changes to Labels

## SRLs Must Show

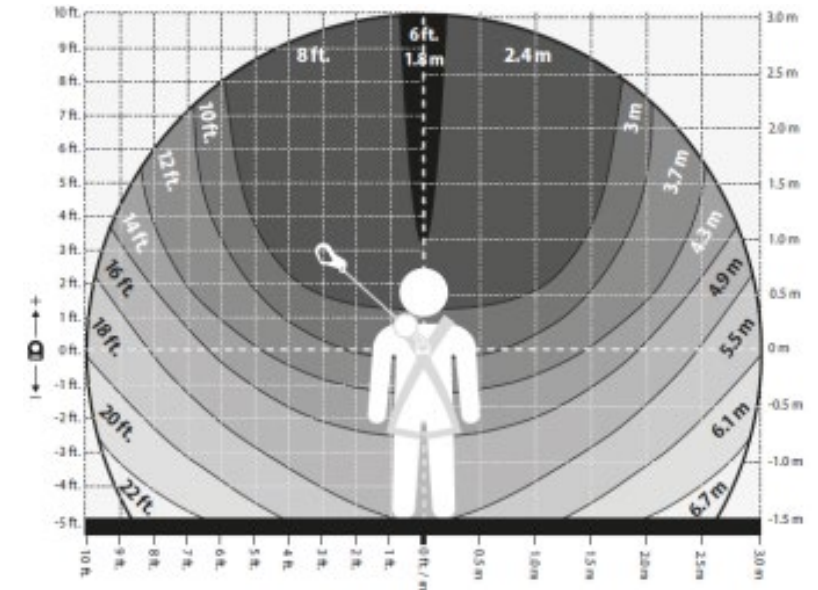


New standard Class labels must be present

## SRL Class 2



## SRL-P Class 2



Example labels showing clearances and position on working surface

# New Types and Classifications of SRD's

**Key Takeaway:** Class A and Class B are no longer applicable. To determine clearances, refer to manufacturer provided clearance charts.



# New Types and Classifications of SRD's

## New Warning Card Requirement

**WARNING: This Class 2 self-retracting device, when attached to a foot-level anchorage, poses significant risk of injury. The user, the competent person and/or qualified person should all acknowledge that normal use of this device MAY NOT PREVENT A SERIOUS INJURY.**

**Failure to follow all manufacturer's instructions and warnings may result in serious injury or death.**

All Class 2 SRLs must have the following card included with the product.

The intent is to remind everyone that leading edge products are not invincible. They have limitations and must be used in accordance with manufacturers instructions.

Additionally, the card is intended to emphasize the hierarchy of controls and continuing to utilize overhead anchor systems when possible.



# What makes Leading Edge products unique?

## *What's required for design?*

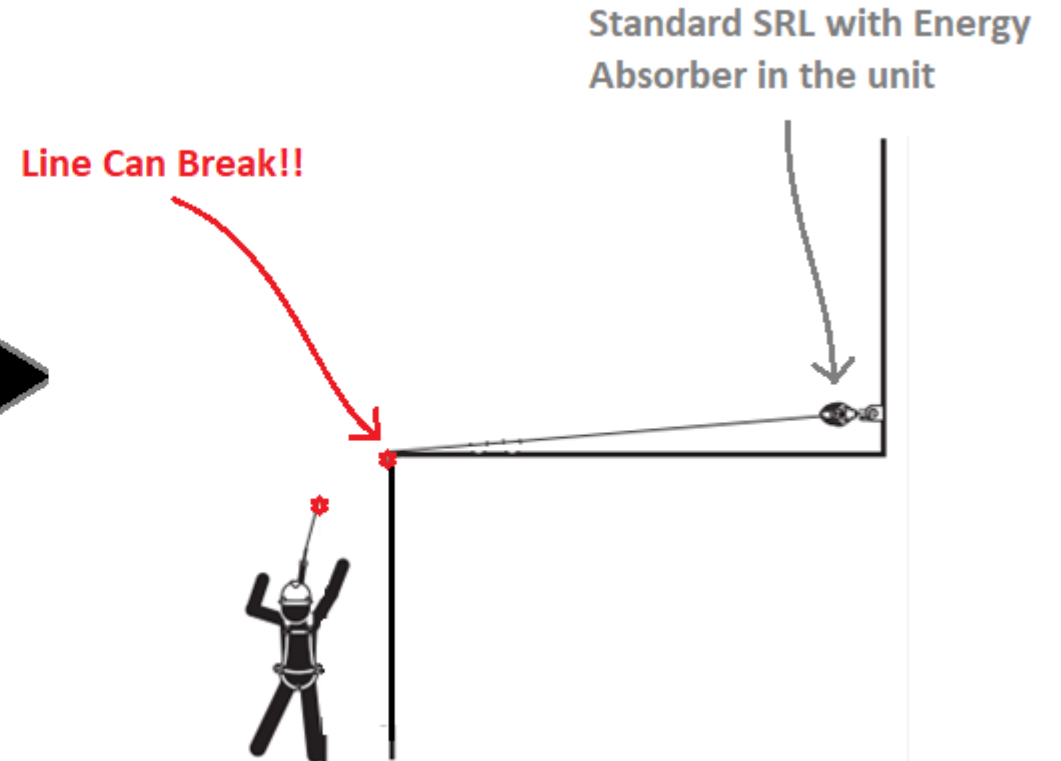
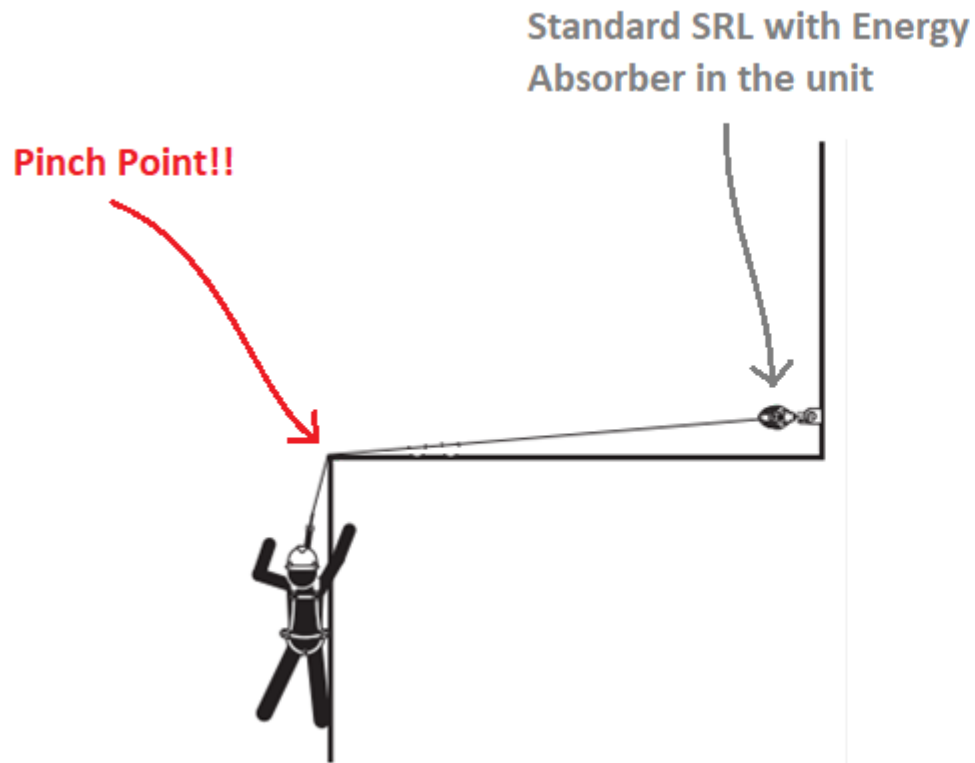
- Leading Edge performance requires the energy absorption to be located near the body.



But why does this matter....

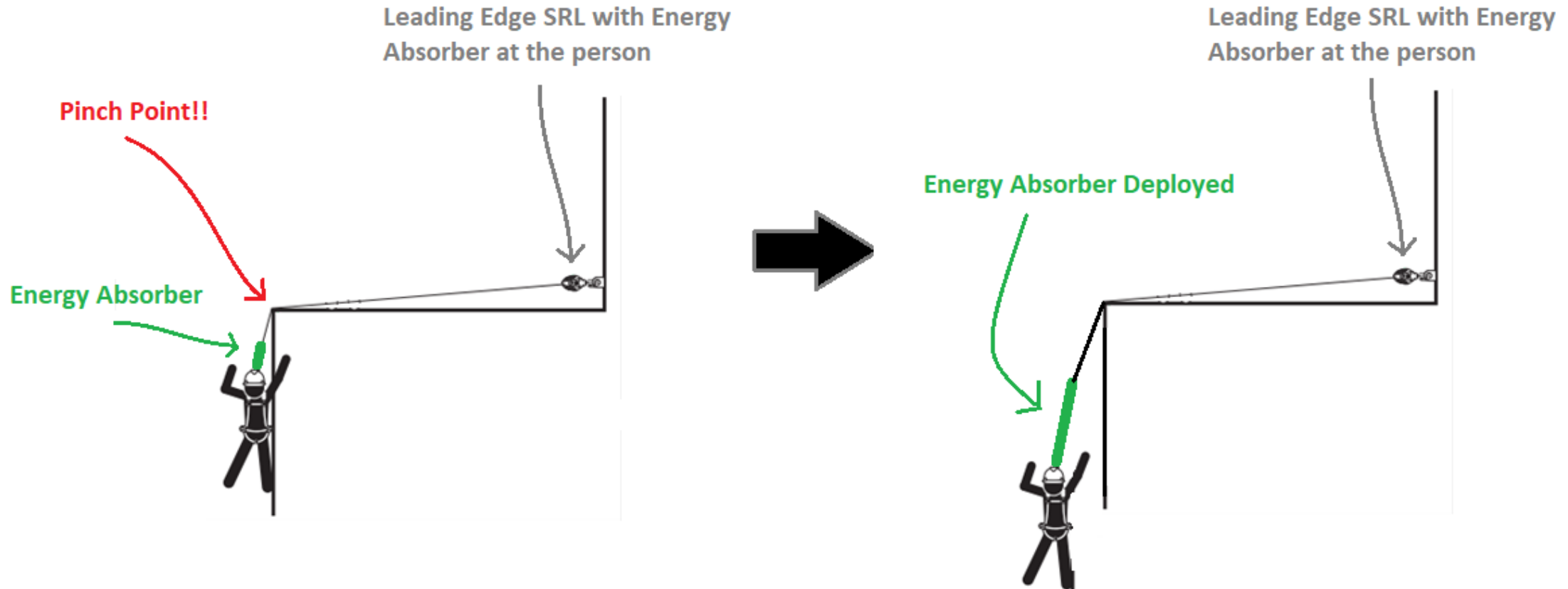
# What happens in a standard SRL?

*Energy absorption capacity is limited over the edge*



# What happens in a Leading Edge SRL?

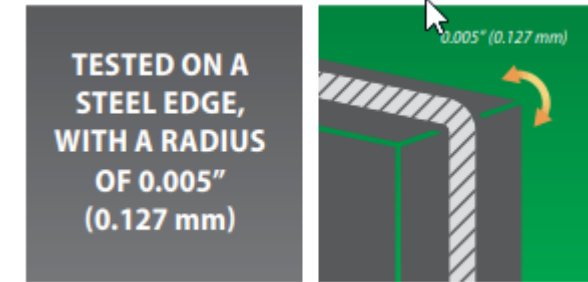
*Energy absorption near the body can arrest the fall*



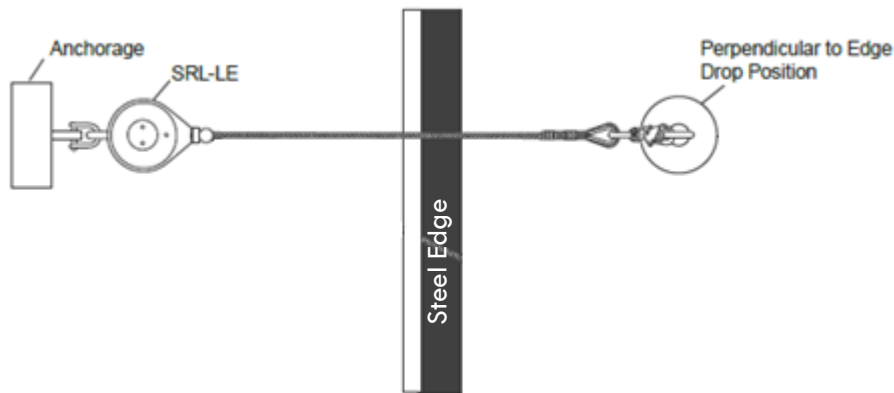
# How are Leading Edge products tested?

## ANSI Z359.14 Review

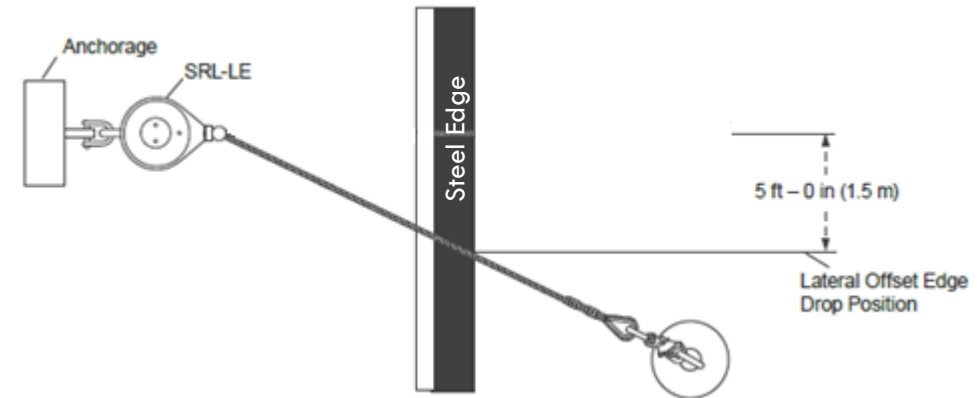
- SRL-LEs are tested perpendicular to the edge, and with an offset over a steel edge



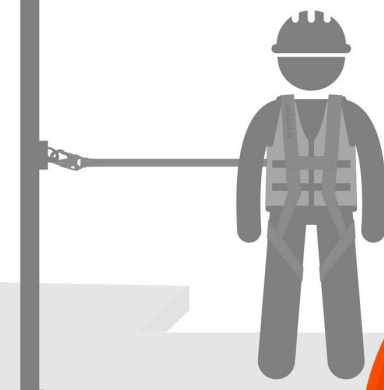
Perpendicular Drop Test



Offset Drop Test



Drop tests completed in Ambient, Cold, Hot and Wet Conditions



**SAFETY AT  
HEIGHTS**

**WORKERS AT  
HEIGHTS**

**OBJECTS AT  
HEIGHTS**

**FALL  
PROTECTION  
SOLUTIONS**

**OTHER  
PPE  
SOLUTIONS**

**ACCESS  
SOLUTIONS**

**DROPPED  
OBJECTS  
SOLUTIONS**

**HOUSE-  
KEEPING  
SOLUTIONS**

**EQUIPMENT  
TRANSPORT  
SOLUTIONS**



# I'M NOT AN OBJECT

## HUMAN FALLS VS. DROPPED OBJECTS

### How 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.





## *Falling Tape Measure Kills Man at Jersey City Construction Site*



**Juan Bonilla**

CONSTRUCTION WORKER





# RISK AWARENESS

## DROPPED OBJECTS CAUSES

### Elements:

- Environmental (wind, rain, snow, sea motion)
- Corrosion or other deterioration
- Vibration
- Body effects (sweaty or numb hands, fatigue)

### Worker or Equipment Generated:

- Mishandling tools
- Poor housekeeping
- Not following procedures
- Miscalculations and poor design
- Missed or inadequate inspections
- Homemade tools and equipment

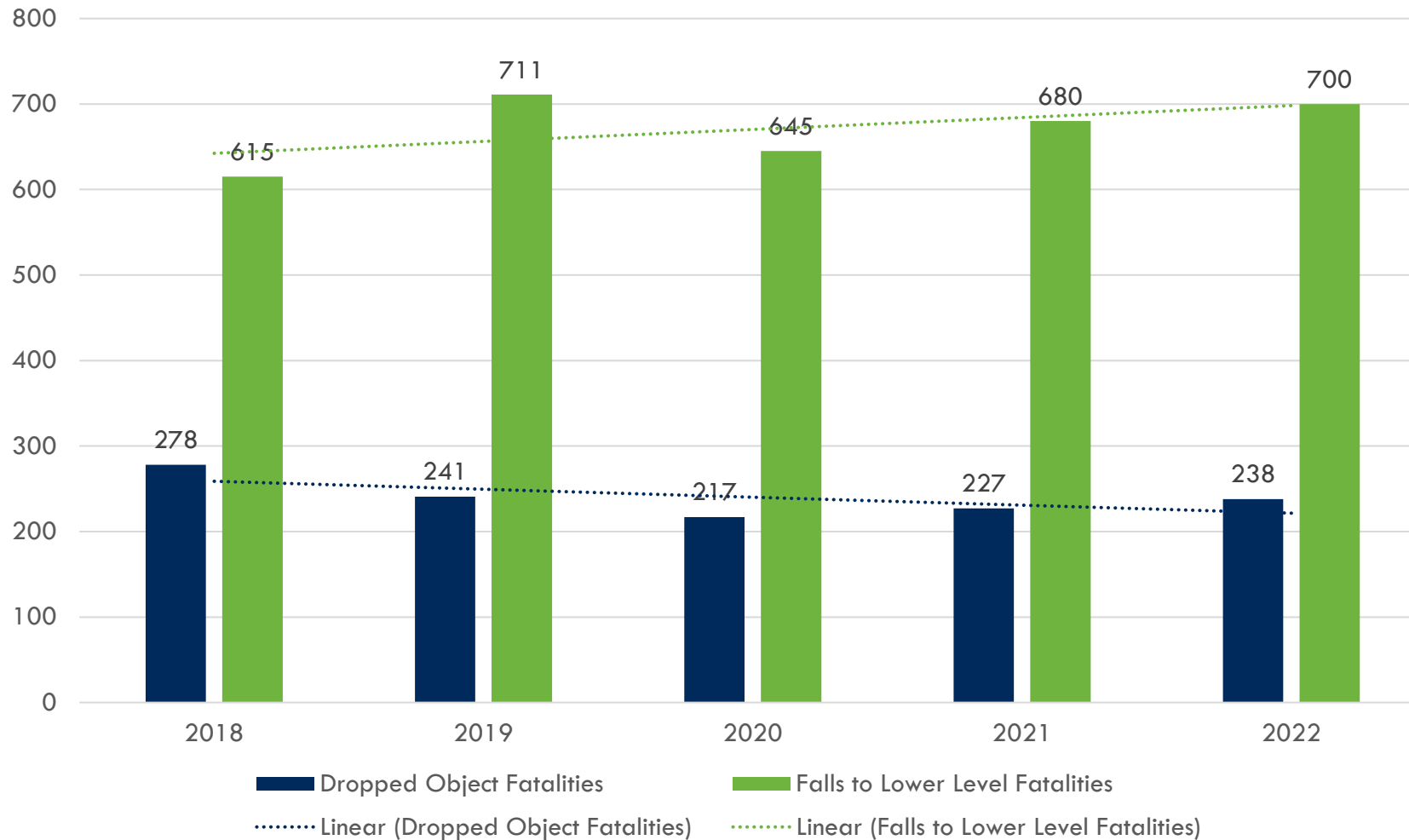


**Debris flies off Chicago high-rise construction site as severe storms hit region**



# TRENDS

## FATAL INJURIES 5-YEAR LOOK



Source: *bls.gov*

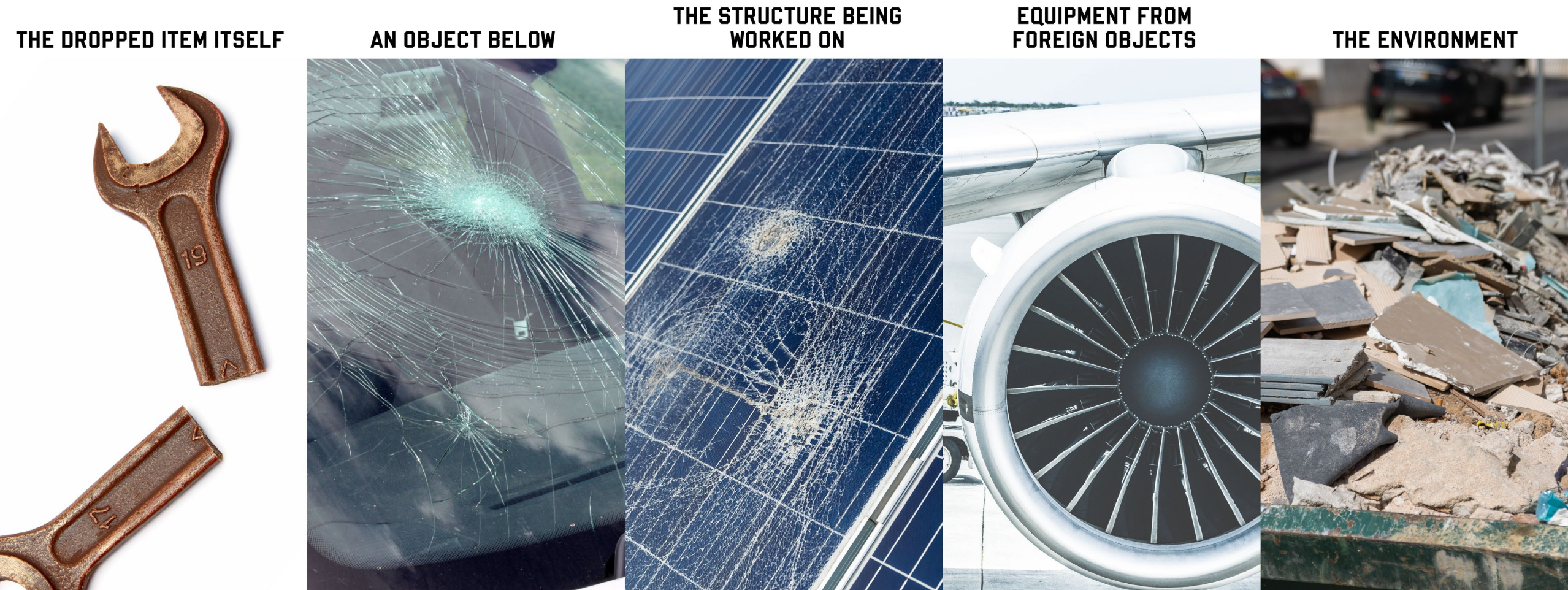




# COSTS

## DAMAGES

# DROPPED OBJECTS CAN CAUSE DAMAGE TO:







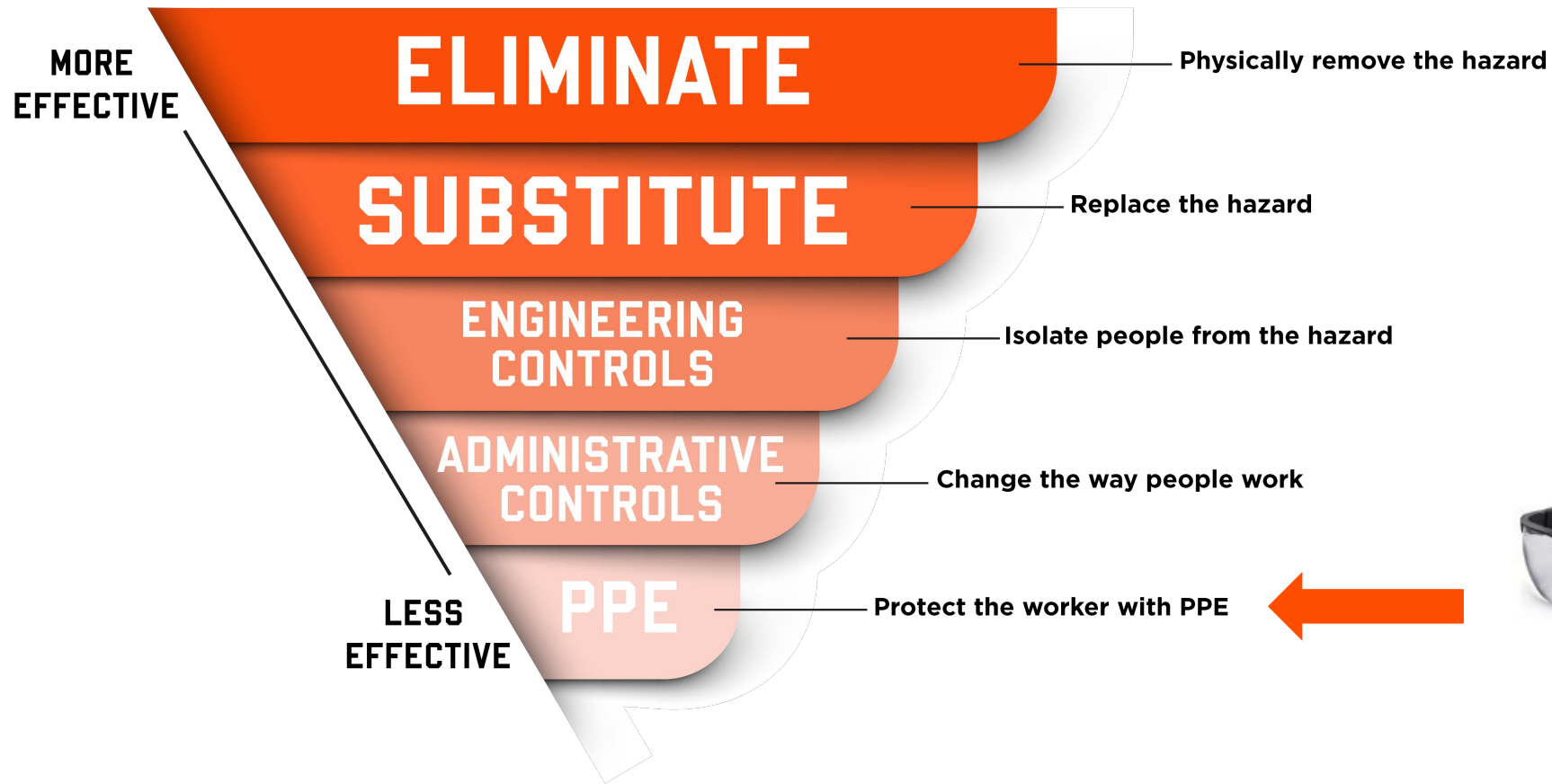
**LOST PRODUCTIVITY:**  
*“I just dropped the tool I needed  
to complete my task up here.”*





# HIERARCHY OF CONTROLS

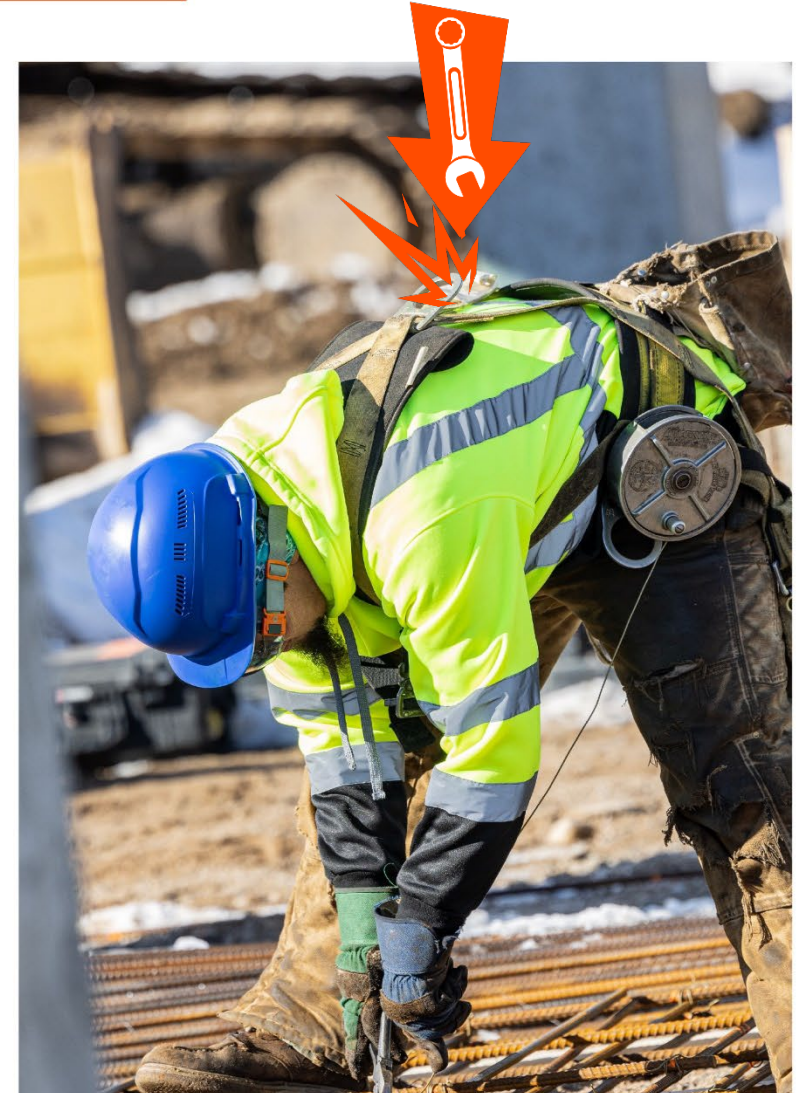
HOW DO YOU TACKLE DROPPED OBJECTS IN YOUR WORKPLACE?





# HIERARCHY OF CONTROLS

## PPE CONTROL LIMITATIONS





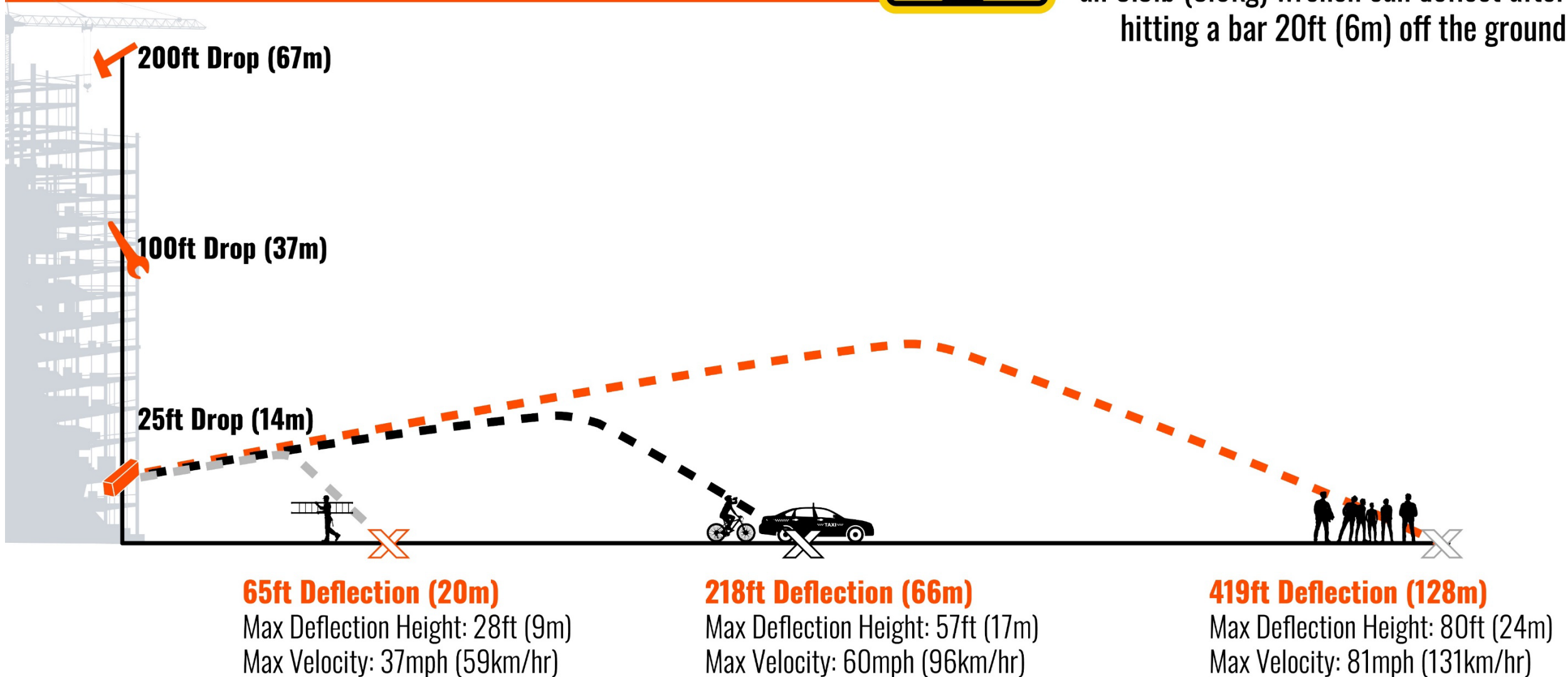
# DROPPED OBJECT DEFLECTIONS

## THE PLINKO EFFECT OF DROPPED OBJECTS



**"Dropped Object Deflection Study"**  
Southern Polytechnic State University

The diagram below illustrates how far an 8.3lb (3.6kg) wrench can deflect after hitting a bar 20ft (6m) off the ground







**PREVENTION**

**SQUIDS® //**

# TOOL TETHERING + DROPPED OBJECT SAFETY

BADGE HOLDERS // GLOVE CLIPS // TOOL LANYARDS // RETRACTABLE LANYARDS //  
TOOL + ANCHOR ATTACHMENTS // TOOL TETHERING KITS // HOIST BUCKETS //  
POUCHES // TOOL BOARDS + BAGS







# THE 3T'S: TRAPPED | TETHERED | TOPPED



# THE 3T'S: **TRAPPED** | TETHERED | TOPPED



## **TRAPPED**

### **CREATING CONNECTION POINTS ON TOOLS & ANCHORS**

Trapping refers to retrofitting a connection point onto a tool or primary anchor for a safer attachment point. Most tools do not come with a secure attachment point built into the tool. In these situations, a secure **attachment point** must be created.

# THE 3T'S: **TRAPPED** | TETHERED | TOPPED

## ANCHOR ATTACHMENTS



ANCHOR STRAP BELT LOOP  
ATTACHMENT FOR TOOL TETHERING  
(2-PACK) - 5LBS / 2.3KG



ANCHOR STRAP HOOK & LOOP  
CLOSURE FOR TOOL TETHERING  
(2-PACK) - 5LBS / 2.3KG



ANCHOR CHOKE STRAP FOR TOOL  
TETHERING - 25LBS / 12KG



LOCKING AERIAL BUCKET HOOK  
WITH TETHERING POINT



ANCHOR CHOKE STRAP FOR  
TOOL TETHERING - 60LBS / 27KG



ANCHOR CHOKE STRAP FOR TOOL  
TETHERING - 40LBS / 18KG





# THE 3T'S: **TRAPPED** | TETHERED | TOPPED

## TOOL ATTACHMENTS



WED TOOL TETHER ATTACHMENT -  
D-RING TOOLS TAILS - 5LBS  
(3-PACK)



WEB TOOL TETHER ATTACHMENT -  
NON-CONDUCTIVE D-RING TOOL TAILS -  
2LBS (6-PACK)



WIRE TOOL ATTACHMENT -  
SCREW GATE TOOL TAIL - 3LBS  
(6-PACK)



SLEEVER/CONNECTING BAR LOCK  
COLLAR WITH TOOL ATTACHMENT POINT



TAPE MEASURE HOLDER - BELT CLIP



POWER TOOL TRAP



# THE 3T'S: TRAPPED | **TETHERED** | TOPPED



## **TETHERED**

### **RETENTION BETWEEN TOOLS/GEAR AND ANCHOR POINTS**

Tethering is the retention of the tools and equipment being used to the anchor points that hold them. This is often achieved through the use of a **tool lanyard**. These lanyards should have the proper connections on each end for the tools and **anchors** being used. They should also be made with a shock absorbing design whenever possible.



# THE 3T'S: TRAPPED | **TETHERED** | TOPPED

TETHERS & LANYARDS



ELASTIC TOOL TAIL LANYARD -  
CARABINER & CONCH LOOP -  
10LBS



TOOL LANYARD - CARABINER AND  
CINCH LOOP - 15LBS



TOOL LANYARD - DETACHABLE  
CARABINER AND CINCH LOOP - 5LBS



TOOL LANYARD - LOCKING CARABINER  
AND LOOP - 15LBS



**F(x)**  
TOOL LANYARD - CARABINER  
AND LOOP - 10LBS



TOOL LANYARD - XL LOCKING CARABINER  
AND SWIVEL CARABINER - 80LBS





# THE 3T'S: TRAPPED | **TETHERED** | TOPPED

COIL, WRIST & HARD HAT



COIL LANYARD SWIVEL HOOK & DETACHABLE LOOP PLUS MINI ADHESIVE MOUNT - 2LB



WEB LANYARD WITH DUAL SCREW GATE CARABINERS



PULL-ON WRIST TOOL LANYARD - CARABINER ANCHOR - 5LBS



COILED TOOL LANYARD WITH DUAL CARABINERS - 2LBS



COILED CABLE TOOL LANYARD - 2LBS



ELASTIC HARD HAT LANYARD WITH CLAMP - 2LBS





# THE 3T'S: TRAPPED | TETHERED | TOPPED

RETRACTABLE TOOL LANYARDS



RETRACTABLE TOOL LANYARD -  
DUAL LOCKING CARABINERS - 2LBS



RETRACTABLE TOOL LANYARD -  
LOCKING CARABINER AND BELT  
LOOP - 2LBS



RETRACTABLE TOOL LANYARD -  
LOCKING CARABINER + SWIVEL CARABINER  
MOUNT - 8LBS



RETRACTABLE TOOL LANYARD -  
STAINLESS-STEEL CARABINER  
AND LOOP - 2LBS



RETRACTABLE TOOL LANYARD  
ACCESSORY PACK - LOOPS (3-PACK)



RETRACTABLE TOOL LANYARD -  
DUAL STAINLESS-STEEL CARABINERS - 1LB



# HIERACHY OF CONTROLS

## ACTIVE ENGINEERING CONTROLS



### Make-Shift Solutions



# HIERACHY OF CONTROLS

ACROSS THE HIERARCHY OF CONTROLS





# IS YOUR LANYARD LEGIT?

## FIVE MUST-HAVES FOR EVERY ANSI/ISEA 121 COMPLIANT TOOL LANYARD



### 2. LOCKING CARABINER GATE

Prevents tool from disconnecting during use

### 1. CAPTIVE EYE

Secures lanyard to carabiner and ensures the webbing will not roll onto the gate or become disconnected

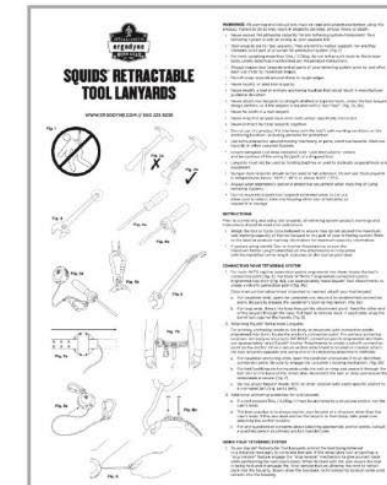
### 3. 121 MARKED LABELING

Clearly states required lanyard information including: maximum weight rating, manufacturer information, warnings, and lanyard length



### 4. PRODUCT INSTRUCTIONS

Includes installation illustrations, as well as use, care and replacement guidelines



### 5. CERTIFICATE OF CONFORMITY

Identifies where and when ANSI/ISEA 121-2018 testing occurred

ANSI/ISEA 125-2014 conformity assessment method: Level 1	
Test Lab: Element St. Paul, MN (Independent 3 <sup>rd</sup> Party)	Product Category: Tool Lanyard
Report #: ESP032153P	Product Capacity: 15lbs / 6.8kg
Date: 12-10-2019	Test Technician: Mike Aylward and William Palmer
Notes: Please refer to test report for detailed information.	

# THE 3T'S: TRAPPED | TETHERED | **TOPPED**



## **TOPPED**

### **SECURE CLOSURE ON CONTAINERS FOR TOOLS AND EQUIPMENT**

Tool pouches, bags and hoist buckets/bags should have a secure closure or "top" that can cover contents and prevent them from spilling if tipped. All containers may have tethering points available to attach tool lanyards, but if a container does not have a secure closure it must have these tethering points available.



# THE 3T'S: TRAPPED | TETHERED | TOPPED

STATIONARY CONTAINERS: AERIAL BAGS, BOARDS & POUCHES



TOPPED TOOL POUCH WITH  
SNAP-HINGE ZIPPER CLOSURE



HAMMER HOLSTER



BUCKET TRUCK TOOL BOARD  
WITH TOOL TETHERING  
ATTACHMENT POINTS



TOPPED BOLT BAG - TALL



TOPPED BOLT BAG TOOL POUCH -  
SHORT, POLYESTER



TOPPED PARTS POUCH -  
TARPAULIN





# THE 3T'S: TRAPPED | TETHERED | TOPPED

PORTABLE CONTAINERS: LIFTING BAGS & HOIST BUCKETS



LARGE NYLON HOIST BUCKET TOOL BAG -  
D-RINGS, ZIPPER TOP



XL NYLON HOIST BUCKET TOOL BAG -  
SWIVELING CARABINER, ZIPPER TOP



LARGE NYLON HOIST BUCKET TOOL BAG -  
SWIVELING CARABINER, ZIPPER TOP



CANVAS HOIST BUCKET AND TOP -  
D-RINGS



XL SWIVELING CARABINER CANVAS  
HOIST BUCKET



XL WEB HANDLE CANVAS  
HOIST BUCKET



**ARSENAL 5937**  
XL HOIST BUCKET TOP





INTERNATIONAL SAFETY  
EQUIPMENT ASSOCIATION

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