



The Office of Construction Safety and Health

At the National Institute for Occupational Safety and Health—NIOSH

# Construction Activities at NIOSH



**Western States Occupational Network (WestON)**

**Eighth Annual Meeting**

**September 17, 2015, Denver, Colorado**

Christine M. Branche, Ph.D., FACE

Principal Associate Director, and Director, Office of Construction Safety and Health

National Institute for Occupational Safety and Health



# Presentation Outline

NIOSH's Construction Program

Products from NIOSH Research Outcomes

Preventing Falls in Construction

Prevention through Design and Sustainable Construction



# Mission - NIOSH Construction Program

“Provide ... leadership to prevent work-related illness, injury, disability, and death by ... gathering information, conducting ... research, and translating the knowledge gained into products, solutions, and services tailored to meet construction needs.”



# Program Structure and Focus Areas

## NIOSH Construction Safety and Health Program

### Intramural Research

Basic Research  
Surveillance  
Methods Research  
Exposure Assessment  
Controls Development  
Applied Research  
Research to Practice

### National Construction Center

Industry Characterization  
Applied Research  
Industry Liaison  
Intervention  
Research to Practice

### Extramural Investigator- initiated Grants

Innovative Ideas  
Opportunities  
State Initiatives

**CPWR**

The Center for Construction Research and Training

CPWR  THE CENTER FOR CONSTRUCTION  
RESEARCH AND TRAINING  
**Research to Practice Roadmap**

### Part 1: Purpose & Destination of your dissemination journey

- Cargo (intervention/findings)
- Directional heading (health & safety goals)
- Point of departure (dissemination already conducted)
- Recipient of cargo (target audiences)



### Part 2: Plan your Route

- Audience type (end user or intermediary)
- Desired action
- Local guides (partners)
- Types of vehicles (dissemination strategy)
- Transmission of message (communication channel(s))



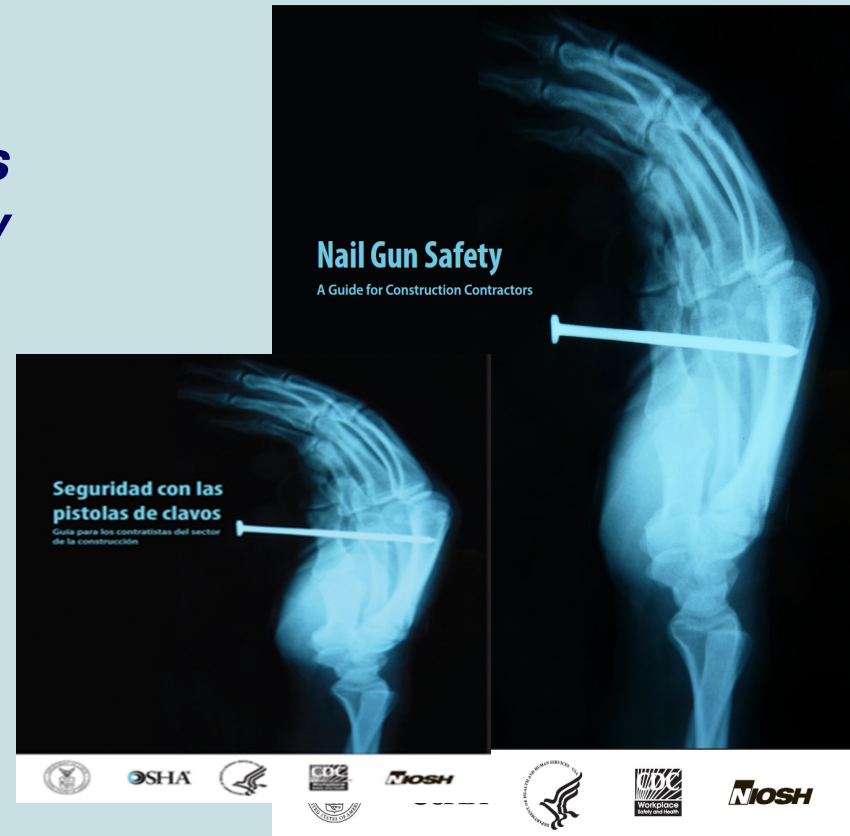
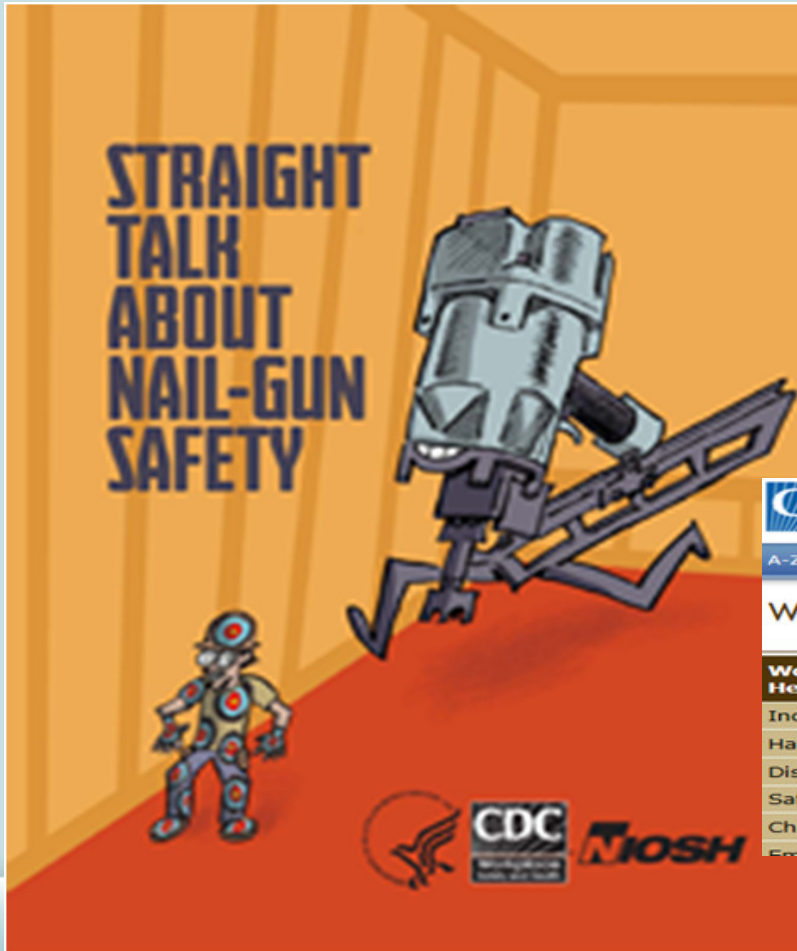
### Part 3: On the road: rest stops, detours and mile markers

- Rest stops (dissemination efforts)
- Relief drivers (next steps for others)
- Fuel (resources)
- Potential roadblocks (barriers)
- Detours (addressing barriers)
- Mile markers (measures & indicators of success)



# Nail Gun Safety:

- *Guide for Construction Contractors*
- *Straight Talk About Nail Gun Safety*
- Online topic pages



**CDC** Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People.™

A-Z Index for All CDC Topics

### Workplace Safety & Health Topics

- Workplace Safety and Health Topics
- Industries & Occupations
- Hazards & Exposures
- Diseases & Injuries
- Safety & Prevention
- Chemicals
- Emergency Preparedness

**NIOSH**

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### Nail Gun Safety

Nail guns have replaced hammers in wood frame construction. They are powerful, easy to operate and boost productivity for nailing tasks. Nail guns are a leading cause of injury among residential carpenters and responsible for an estimated 37,000

# *Overlapping Vulnerabilities: The Occupational Health and Safety of Young, Immigrant Workers in Small Construction Firms*

May 2015

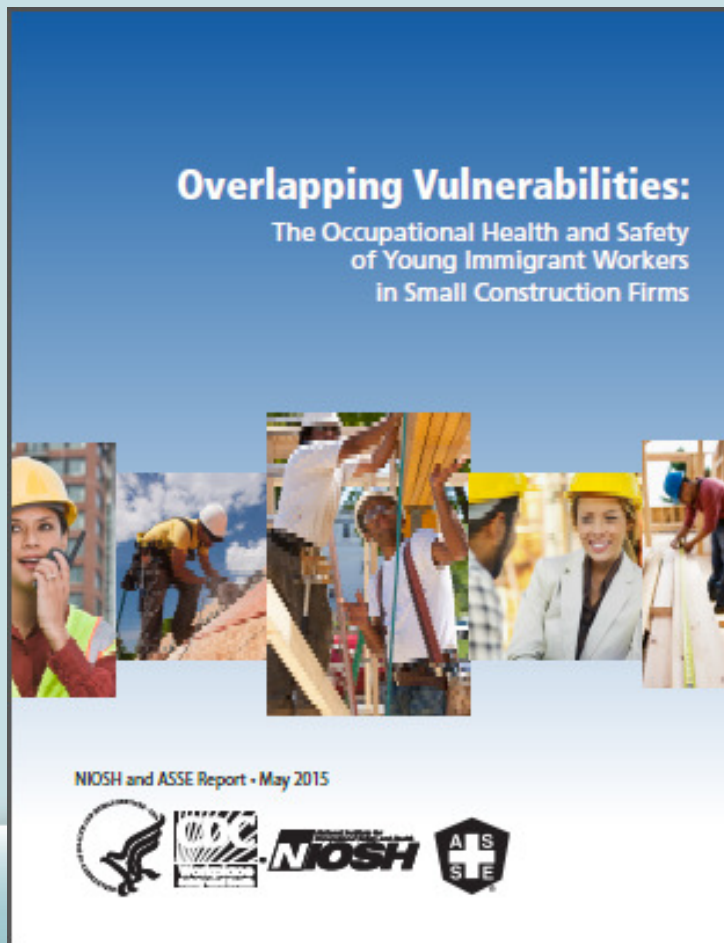
A joint effort with the American Society of Safety Engineers (ASSE)

PIs: Mike Flynn and Tom Cunningham at NIOSH

“overlapping vulnerabilities” = the combination of risk factors

Change in data collection

Identify and significantly improve their outreach and intervention efforts

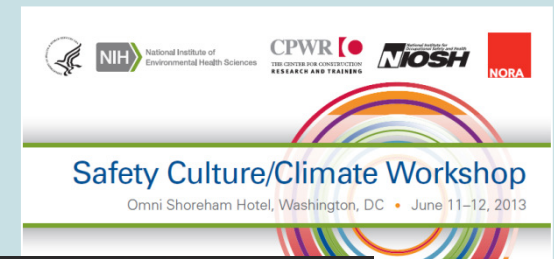


# Construction Safety Culture and Safety Climate

June 11-12, 2013 Workshop

*Safety Culture and Safety Climate in Construction: Bridging the Gap Between Research and Practice*

<http://www.cpwr.com/publications/safety-culture-and-climate-construction-bridging-gap-between-research-and-practice>



..... Palladian Foyer
..... Palladian Room
..... on Research and Training
CPWR ..... Safety culture into perspective, and a look at ..... climate.
..... Investigation Board (CSB)
..... Palladian Foyer
.....
.....
<b>CONSTRUCTION TRACK</b> ..... Safety Culture and Climate in Construction: ..... Bridging the Gap Between Research and Practice ..... Hampton Room
Framing Session: Safety Culture and Climate—Defining and Framing the Issues for the Construction Industry ..... Presentations and multivoting ..... Palladian Room
Lunch ..... Palladian Room



# Buy Quiet

Nearly

# 50%

of construction workers suffer hearing loss

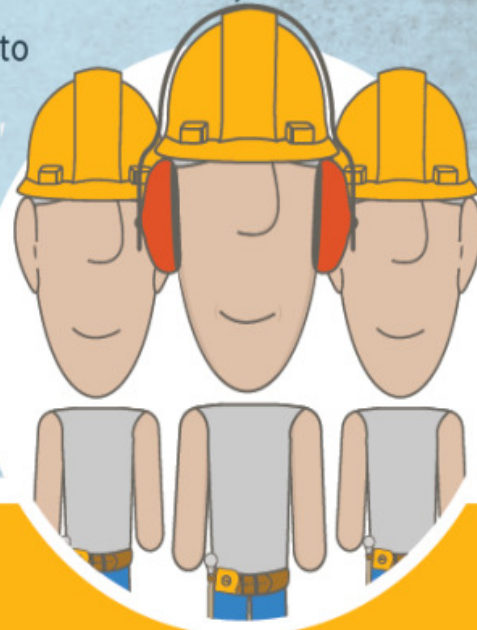
## HEARING LOSS IS PREVENTABLE

and you can do something about it...

# BUY QUIET

A commitment to buying quieter equipment:

- Reduces your risk of hearing loss
- Reduces the noise impact on our community
- Encourages manufacturers to design quieter equipment

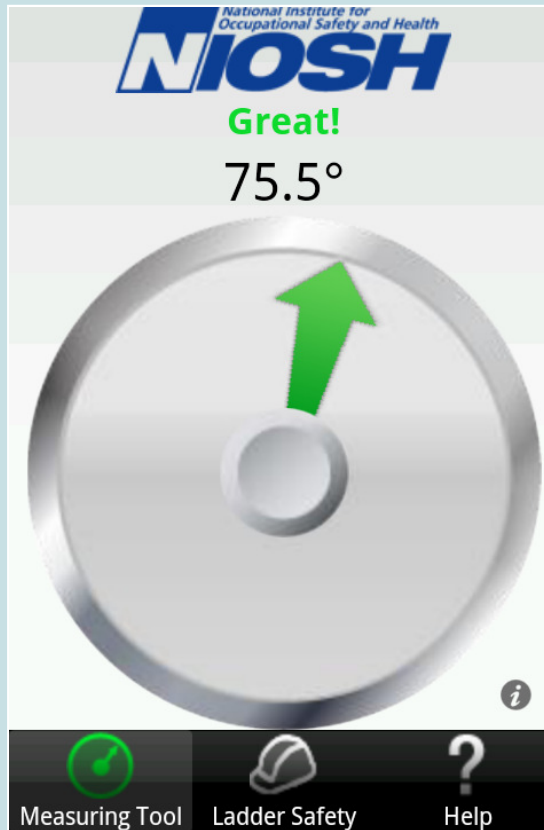


## What You Can Do

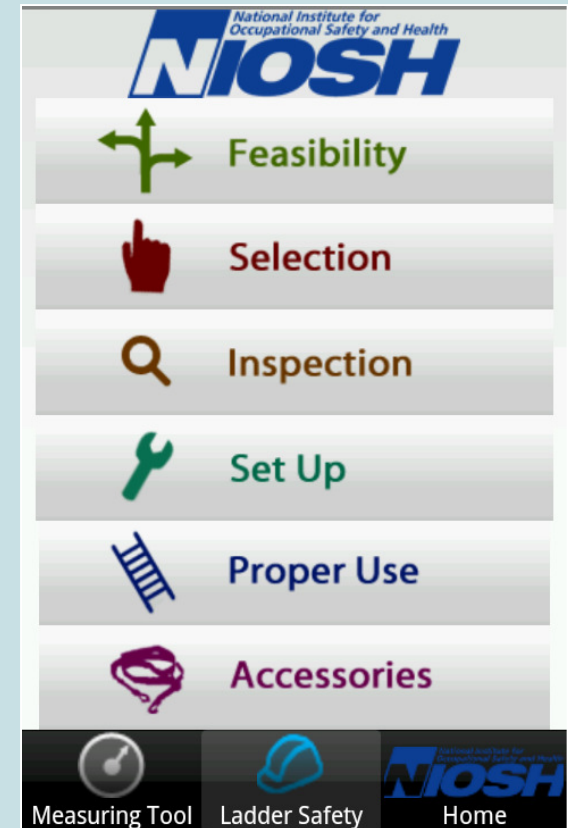


# Ladder Safety Application for Smart Phones

The free APP quickly and easily positions extension ladder at correct angle



Inclination indicator



Graphic-oriented aid



[stopconstructionfalls.com](http://stopconstructionfalls.com)



Safety Pays. Falls Cost.

**I worked construction for 10 years  
before my fall. It shattered my body  
and my livelihood.**

**Work safely. Use the right equipment.**

**FALLS FROM LADDERS, SCAFFOLDS AND ROOFS CAN BE PREVENTED!**



U.S. Department of Labor

**PLAN** ahead to get the job done safely.

**PROVIDE** the right equipment.

**TRAIN** everyone to use the equipment safely.

[www.osha.gov/stopfalls.gov](http://www.osha.gov/stopfalls.gov)

1 (800) 321-OSHA (6742) • TTY 1-877-889-5627

**OSHA**® Occupational  
Safety and Health  
Administration



NIOSH 2012-141 / OSHA 3531-04 2012



# National Safety STAND-DOWN

TO PREVENT FALLS IN CONSTRUCTION

**MAY 4-15, 2015**

## Stop Falls Stand-Down

- Plan a toolbox talk or other safety activity
- Take a break to talk about how to prevent falls
- Provide training for all workers

For more information:  
[www.osha.gov/StopFallsStandDown](http://www.osha.gov/StopFallsStandDown)  
 #StandDown4Safety | (800) 321-OSHA (6742)

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# Embedded Safety Features



## Preventing Falls from Heights through the Design of Embedded Safety Features

### Prevention through Design (PtD)

PtD addresses worker exposure to hazards during the design stages of a project. For example, when a building or other structure is designed or redesigned, risks of fall-related injuries and fatalities to construction workers and users of the completed facilities could be minimized by following a PtD approach. NIOSH recommends that facility designers, owners, contractors, and safety and health professionals collaborate to perform one or more safety design reviews to explore and address hazards likely to occur over the life cycle of the facility.

This approach would incorporate safety features into the building's design, address fall hazards in construction plans, establish safety criteria for buying equipment, and communicate risks to building owners and facilities personnel [Behm 2005] rather than rely on other forms of protection such as personal protective equipment (PPE) or administrative controls.

### Contents

- ▶ Description of Exposure
- ▶ Standards
- ▶ Design Solutions
- ▶ Cost Savings/Advantages of Permanent Features
- ▶ Case Study
- ▶ Recommendations
- ▶ Acknowledgments
- ▶ References

### Description of Exposure

Construction is one of the most dangerous industries [Toole and Gambatese 2008], and falls are a frequent cause of fatal injuries in this industry. Of the 4,693 fatal work injuries that occurred in 2011, 553 (12%) were the result of falls to a lower level. Fatal falls in construction accounted for 46% of all work-related fatal falls in 2011 [BLS 2012]. OSHA estimates that each fall from an elevated position in construction (both fatal and nonfatal) costs between \$50,000 and \$106,000 [OSHA 2012]. Workers are at risk of falling during initial construction, and after completion during operation, maintenance, renovation, and demolition of buildings. Facility features associated with falls include floor and roof edges, elevated platforms, ledges, atria, skylights, machine rooms, and ladders and stairways. Falls can occur from temporary structures used in construction and maintenance such as scaffolds or ladders, or from permanent locations such as roofs.

### Standards

OSHA Standard 29 CFR 1926.502 covers requirements for fall protection systems. One of the following is always needed to protect workers from falls:

- ▶ Job-built or commercially available guardrails that meet OSHA height and strength requirements [29 CFR 1926.502(b); Bobick et al. 2010].
- ▶ Properly designed anchor points with appropriate personal fall arrest systems and lifelines [Bobick et al. 2010].
- ▶ Other forms of fall protection such as safety netting [29 CFR 1926.502(c)].

The American National Standards Institute (ANSI) Standards [2007] ANSI Z359.0 through Z359.18 describe safety requirements for fall arrest systems. ANSI Standard Z590.3 addresses prevention through design guidelines for hazards in the design and redesign processes.

\*Code of Federal Regulations. See CFR in References.

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Centers for Disease Control and Prevention  
National Institute for Occupational Safety and Health



Recommendations for building owners and designers  
For retrofits, renovations, new construction  
Connecting point for fall protection systems.



# LEED Certification Levels



Image Source: Green Building Alliance. LEED Certification. <http://www.go-gba.org/resources/leed/>



# Is Green Construction Better?



# Not Always





# NIOSH Perspectives on Sustainability

*“As green and sustainable practices become more common in the U.S, there is an opportunity to promote worker safety and health as a fundamental dimension of true sustainability. ...*

*A sustainable product, process or technology should not only protect the environment and the consumer but also the worker. Green jobs must be safe jobs.”*

NIOSH Science Blog: *Going Green: Safe and Healthy Jobs*, January 4, 2010

<http://blogs.cdc.gov/niosh-science-blog/2010/01/green-2/>



# Design as a Risk Factor: Australian Study, 2000–2002

Main finding: design contributes significantly to work-related serious injury.

37% of workplace fatalities are due to design-related issues.

In another 14% of fatalities, design-related issues may have played a role.

**From Driscoll et al., 2008**



Photo courtesy of Thinkstock



# Las Vegas CityCenter—The Wake Up Call



**Development wins 6 coveted design certifications** (Las Vegas, NV)  
- More than three months before it opens, the \$8.5 billion CityCenter development has received six Leadership in Energy and Environment Design (LEED) gold certifications from the U.S. Green Building Council. . . .(Las Vegas Review Journal, September 14, 2009)

**Six deaths during 2007-2008 construction phase**  
(Las Vegas, NV) - MGM Mirage's CityCenter



# It is common to assume that green building projects are inherently safer for workers...

**EXAMPLE: “Attention to environmental issues during construction leads to a safer and healthier work site”**

**Los Alamos National Lab Sustainable Design Guide, p64**

# ...and common to overlook safety and health

**EXAMPLE: “There currently is a **blind spot** in sustainable design practice when it comes to worker safety and health... Tremendous focus is placed on materials, energy and the environment, but designers typically give little, if any, consideration to the safety and health of the people who install the green features or build the projects”**

**John Gambatese, “Don’t Leave Safety Out of Sustainability” ENR Editorial, 11/18/2009**



# But What is Missing?

Type of OUTCOME →	HEALTH & WELL-BEING	SAFETY	ERGONOMICS
↓ Type of WORKER	Illness	Injury	MSD Musculoskeletal Disorder
Building Occupant	Major focus via IEQ credits	Not addressed	Pilot Credits
Custodial Worker	Minor focus	Not addressed	Minor focus
Operations, Maintenance (O&M), and Construction Worker	Minor focus	Not addressed	Not addressed



## Why Construction Workers?

Fatalities: **751** most of any industry

Injury rate: **203/10,000** non-fatal injuries and illnesses with days away from work



Construction Injury at LEED Gold site Photo: Matt Gillen

## Why Maintenance Workers?

Fatalities: **226**

Injury rate: **307/10,000** non-fatal injuries and illnesses with days away from work



Atrium Maintenance work: fall hazards Photo: Mike Behm



# Prevention through Design (PtD)

**Mission:** Design out hazards and minimize risks associated with:



**Facilities**



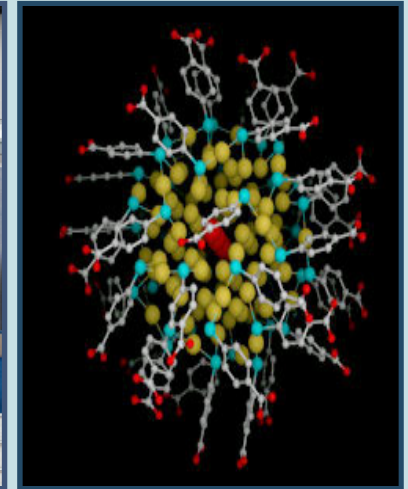
**Work  
methods**



**Processes**



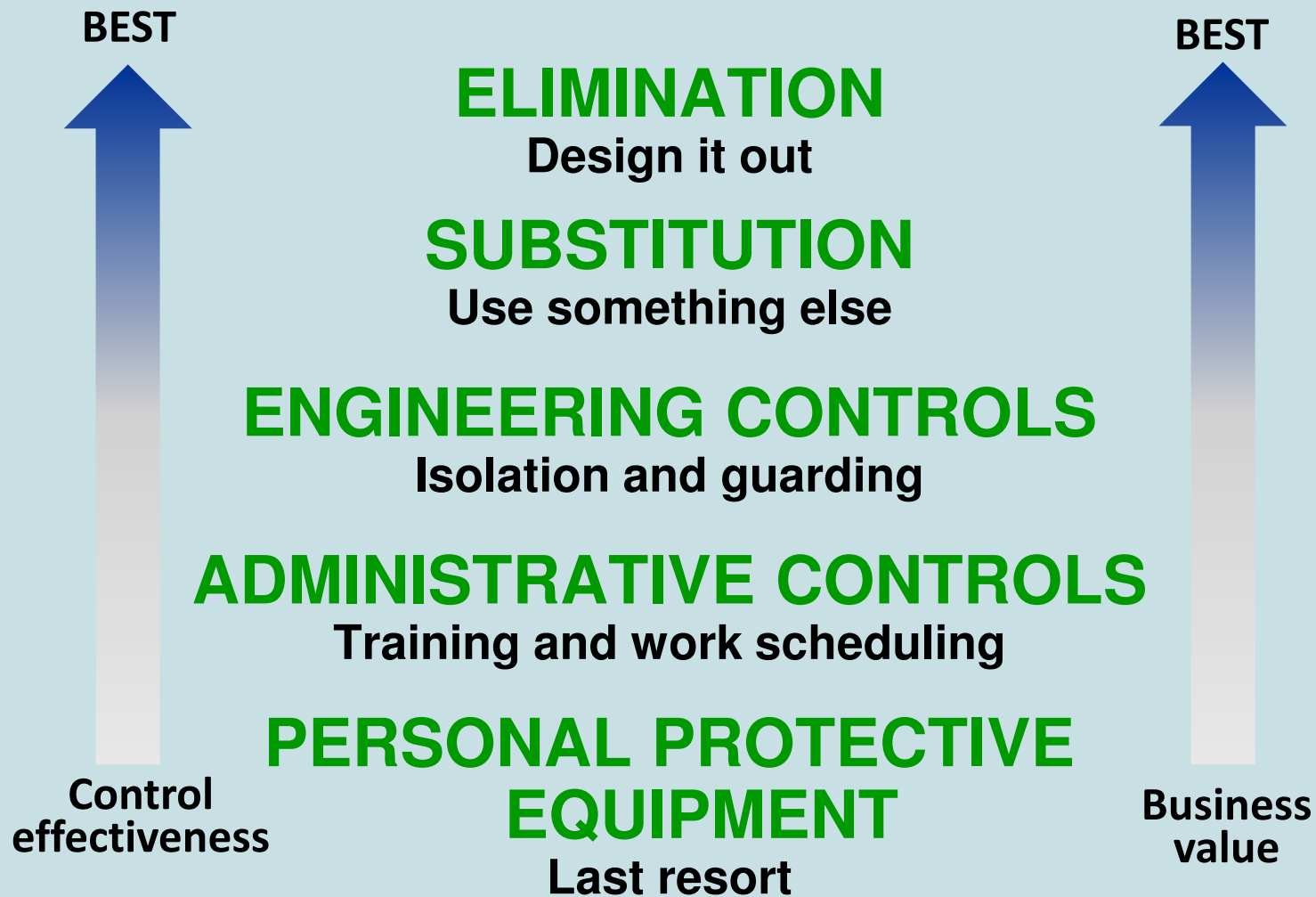
**Equipment**



**Products & new  
technologies**

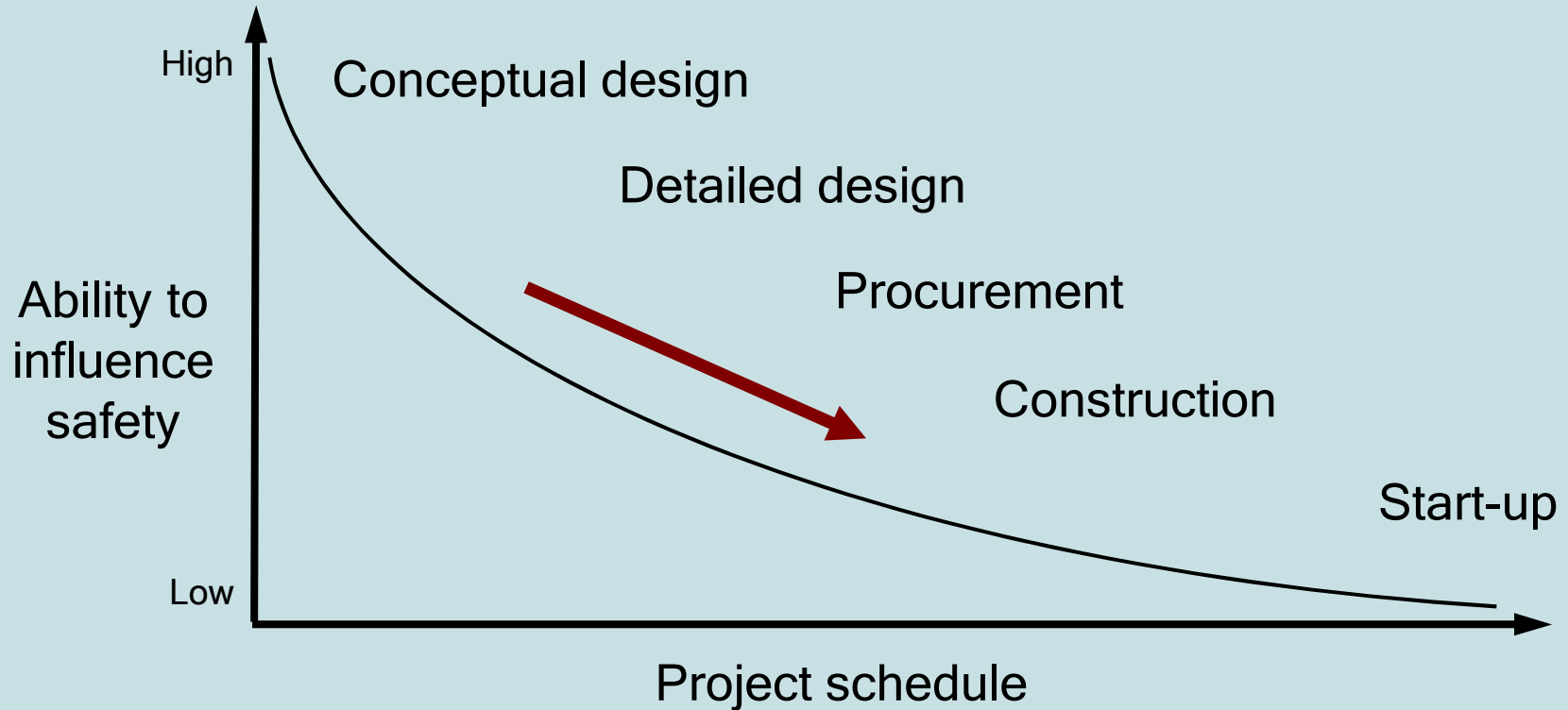


# Hierarchy of Controls





# Safety Payoff during Design



Adapted from Szymberski 1997



# Operations & Maintenance

## Servicing rooftop HVAC equipment

Fall exposures

“Error trap” for workers

Design issues?

No access  
No power  
No equipment setback from edge  
No fall protection

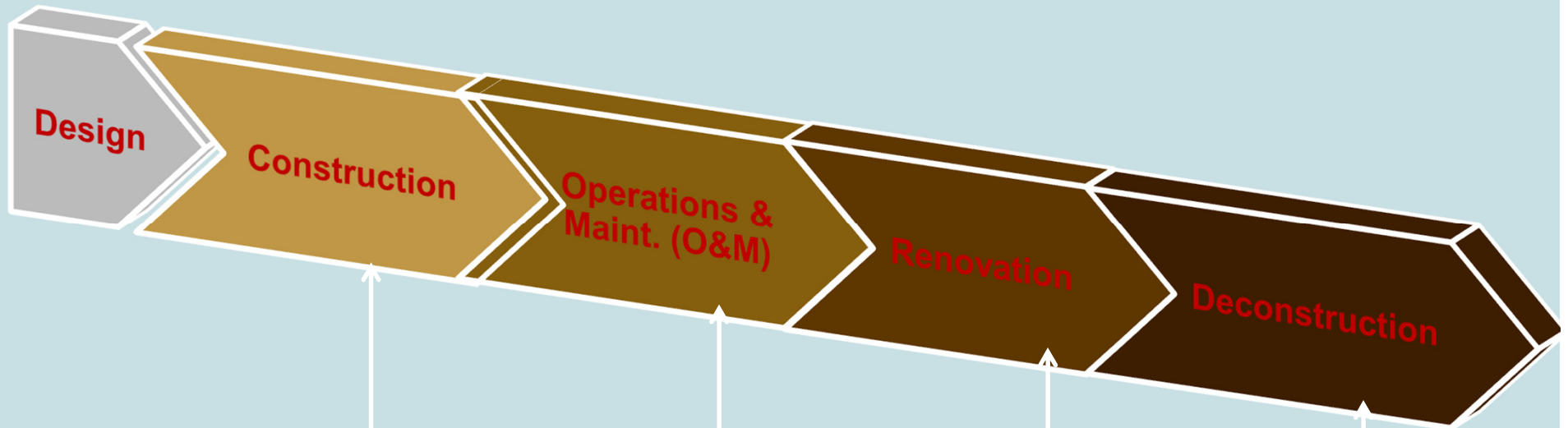
Photo: Matt Gillen

HVAC= Heating, Ventilation, and Air Conditioning



# Strategies for Integrating Safety and Health into Green Building

Green building is oriented towards “life cycle” thinking



**Construction and Maintenance workers play key roles in the built environment “Life Cycle”**

# Realities and Barriers



Safety and health professionals are not designers

Architects and engineers do not always have safety in mind

There are costs

There are concerns about liabilities

**A collaborative effort is needed to accomplish PtD → a “safety design review”**



# Integrating OSH into Green Construction



In February 2015, the U.S. Green Building Council (USGBC) posted a new pilot credit entitled: “Prevention through Design” to its LEED (Leadership in Energy and Environmental Design) Pilot Credit Library!

<http://www.usgbc.org/credits/preventionthroughdesign> (v4)

<http://www.usgbc.org/credits/preventionthroughdesign2009> (v2009)



# PtD LEED Pilot Credit

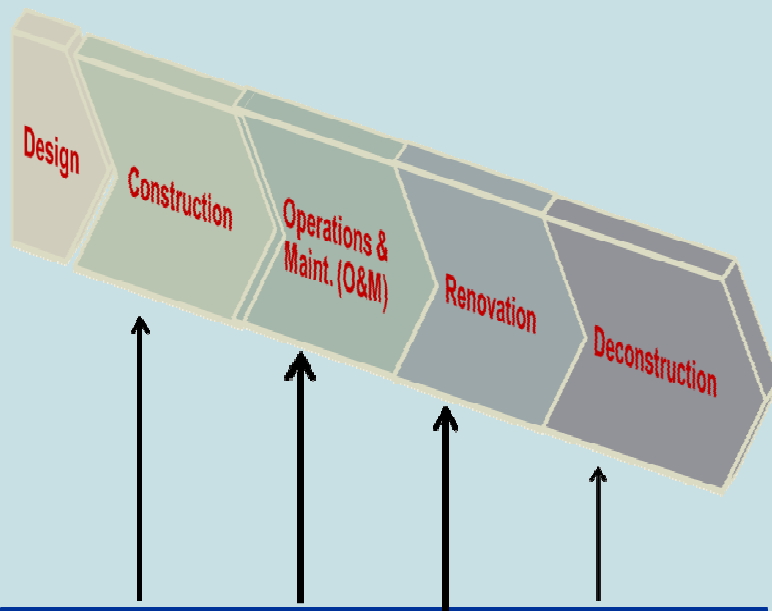
## Why the pilot credit?

- Reduce illnesses and injuries
- Support high-performance, cost-effective OSH outcomes
- Design structures that reduce or eliminate potential safety and health hazards across the building life cycle



# PtD LEED Pilot Credit

## “Life Cycle Safety”



**Construction and Maintenance workers play key roles in the built environment “Life Cycle”**

The pilot credit addresses two building life cycle phases that are important for safety and health:

- (1) Operations and Maintenance (O&M)
- (2) Construction

The pilot credit complements the existing LEED Integrative Process credit

Photo by Roberto Carlos Vergara



# NIOSH topic page

## Safe, Green, and Sustainable Construction

Links to USGBC pilot credits

NIOSH White Paper on sustainable buildings and life cycle safety

CPWR pub on green construction

CDC Home  
**CDC** Centers for Disease Control and Prevention  
CDC 24/7: Saving Lives. Protecting People.™

NIOSH  
All CDC Topics  
SEARCH

A-Z Index for All CDC Topics

### Workplace Safety & Health Topics

**Workplace Safety and Health Topics**

- Industries & Occupations
- **Safe, Green, and Sustainable Construction**
- Hazards & Exposures
- Diseases & Injuries
- Safety & Prevention
- Chemicals
- Emergency Preparedness & Response

**Related Topics**

- Directory of Construction Resources
- Construction Safety and Health
- Green Jobs
- Prevention Through Design

**NIOSH Homepage**

- NIOSH A-Z
- Workplace Safety & Health Topics

NIOSH > Workplace Safety and Health Topics > Industries & Occupations

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### Safe, Green, and Sustainable Construction

#### Overview

Builders and designers interested in creating safe, green, and sustainable commercial and residential buildings face many challenges in the United States. The NIOSH Construction and Prevention through Design (PtD) programs are collaborating on efforts to increase the use of building designs and construction practices that address safety and health hazards during all the stages of a building: pre-design; design; construction; occupancy and maintenance; and demolition.



#### What is Prevention through Design?

The aim of Prevention through Design is to prevent occupational injuries, illnesses, fatalities, and exposures by eliminating hazards and minimizing risks to workers in the design and re-design of facilities, work methods, processes, equipment and tools, and products. Eliminating hazards and control risks to workers "at the source" or as early as possible in the life cycle of items or workplaces is the goal. This includes the *design, redesign and retrofit* of work premises, structures, tools, facilities, equipment, machinery, products, substances, work processes and the organization of work

#### What is green construction?

The U.S. Environmental Protection Agency (EPA) defines green construction as "the practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building's life cycle, from siting to design, construction, operation, maintenance,





# Thank you!

Christine Branche, Ph.D., FACE  
Principal Associate Director, NIOSH  
Director, Office of Construction Safety and Health, NIOSH  
[cbranche@cdc.gov](mailto:cbranche@cdc.gov) | 202.245.0625



## NIOSH Directory of Construction Resources

[www.cdc.gov/niosh/construction/](http://www.cdc.gov/niosh/construction/)

### Twitter

<http://twitter.com/NIOSHConstruct>

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