

# NIOSH Construction Safety & Health Initiatives

Matt Gillen, CIH, Deputy Director  
NIOSH Office of Construction Safety and Health

2013 Chesapeake Educational Seminar  
Laurel, Maryland  
03.13.13

Preventing Falls in Construction  
**PLAN . PROVIDE . TRAIN**



# OVERVIEW

- Looking at construction
- NIOSH Construction Office and Program
- Examples of research underway
- Making an impact
- NORA Initiatives
  - **Falls campaign**
  - **Integrating safety and health into green construction**

*Disclaimer – The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy*



**“Built  
Environment”  
affects and inspires  
everyone**

Every organization  
sooner or later  
renovates or builds

Everyone sooner or  
later has work done  
on their home

De Young Museum, San Francisco  
Architects: Herzog & de Meuron  
Photo: Matt Gillen

What I see...



**Denver Art Museum**  
**Architect: Daniel Libeskind**  
Photo: Matt Gillen

# Looking at Construction

- ✓ Inherent hazards
- ✓ Mostly small employers
- ✓ High proportion of immigrant workers
- ✓ Highly competitive
- ✓ Hit hard by recession
- ✓ Project vs. employer focus - multiple disciplines and employers
- ✓ Focus on safety.... more than on health

# NIOSH Construction Office and Program

**NIOSH Construction Program:**  
Established in 1990

**NIOSH Office of Construction Safety and Health**  
Established in 2009

**Christine Branche, Ph.D., FACE**

Director and Construction Program Manager

**Matt Gillen, MS, CIH**

Deputy Director and Construction Program Coordinator

**LCDR Elizabeth Garza, M.P.H.**

Public Health Analyst

# NIOSH Construction Page

<http://www.cdc.gov/niosh/construction/>

CDC Home



Centers for Disease Control and Prevention

CDC 24/7: Saving Lives. Protecting People.™

A-Z Index for All CDC Topics

NIOSH

All CDC Topics

Choose a topic above

SEARCH

## CONSTRUCTION

Construction workers and employers build our roads, houses, and workplaces and repair and maintain our nation's physical infrastructure. Construction includes building new structures, renovations involving additions, alterations, or maintenance, and repair of buildings or engineering projects such as highways or utility systems. The NIOSH Construction Program provides national and world leadership to prevent work-related illness, injury, disability, and death by systematically gathering information, conducting targeted scientific research, and translating the knowledge gained into products, solutions and services tailored to meet construction needs. In collaboration with industry and labor partners and stakeholders, including OSHA, we are dedicated to improving safety and health conditions for all construction workers.

In 2010, there were 774 fatal on-the-job injuries to workers in the construction industry – more than in any other industry sector and representative of 17% of all work-related deaths in the U.S. that year. Construction is a large, dynamic, and complex industry sector, putting nearly \$800 billion of construction in place in 2011. Construction worksites are organizationally complex multi-employer sites and present numerous health and safety challenges.



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Centers for Disease Control and Prevention

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New Hours of Operation  
8am-8pm ET/Monday-Friday  
Closed Holidays

Contact CDC-INFO

### Spotlights

- Nail Gun Safety: A Guide for Construction Contractors -- (Spanish) Seguridad con las pistolas de clavos
- Safety Pays, Falls Cost. Campaign to Prevent Construction Falls Launched
- New on NIOSH FACE: Search Residential and Commercial Construction Falls
- Follow us @NIOSHConstruct on Twitter!

### Construction Topics

- Abrasive Blasting
- Adult Blood Lead Epidemiology and Surveillance (ABLES)
- Asbestos
- Asphalt Fumes
- Bird & Bat Waste Removal (Histoplasmosis)
- Carbon Monoxide
- Cold Stress
- Confined Spaces
- Construction Safety and Health
- Construction—Indoor Environmental Quality
- Electrical Safety
- Engineering Controls
- Engineering Controls for Silica in Construction
- Ergonomics
- Eye Safety
- Falls from Elevations
- Green Jobs
- Heat Stress
- Hexavalent Chromium
- Highway Work Zones
- Lead
- Machine Safety
- Mold—Indoor Environmental Quality
- Motor Vehicle Safety
- Nail Guns
- Noise and Hearing Loss
- Outdoor Workers
- Prevention Through Design
- Pneumoconioses
- Skin Exposures & Effects
- Tick Borne Diseases
- Welding and Manganese
- Silica
- Small Business
- Trenching and Excavation
- Take Home Toxins
- Vermiculite
- West Nile Virus
- Young Workers

### Construction Resources

- Health Hazard Evaluation Program
- Electronic Library of Construction Safety and Health
- Fatality Assessment and Control Evaluation (FACE) Program

# NIOSH Construction Program on Twitter

## @NIOSHConstruct

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- Jeb Bush
- #HIMSS13
- HIV
- #tcot
- #FictionalCharactersIWantToMarry
- Gina McCarthy
- White House

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**Construction @ NIOSH** ✓  
@NIOSHConstruct

Follow us to learn more about Construction Safety and Health (Our RT, lists or following doesn't mean endorsement)  
<http://www.cdc.gov/niosh/construction>

<b>2,108</b> TWEETS	<b>79</b> FOLLOWING	<b>7,489</b> FOLLOWERS	
------------------------	------------------------	---------------------------	---

Tweets All / No replies



**Construction @ NIOSH** @NIOSHConstruct 30 mins  
Improving Worker Safety on 'Green' Construction Projects  
[is.gd/feVdtN](http://is.gd/feVdtN) @CPWR  
Expand



**Construction @ NIOSH** @NIOSHConstruct 4 hrs  
Prevention of injuries from nail guns in residential Construction  
[is.gd/lltvbw](http://is.gd/lltvbw) #construction  
Expand



**Construction @ NIOSH** @NIOSHConstruct Mar 1  
OSHA's Construction Digest spells out summary of OSHA standards (available free in English & Spanish) [go.usa.gov/2YUe](http://go.usa.gov/2YUe) #construction  
Expand



**Construction @ NIOSH** @NIOSHConstruct Mar 1  
New fact sheets help construction employers minimize exposure to silica when using construction equipment [go.usa.gov/2YQJ](http://go.usa.gov/2YQJ) #silica  
Expand



# **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 - Center for Construction Research and Training**





# Additional resources: ELCOSH



Electronic Library of Construction  
Occupational Safety & Health

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Developed and maintained by CPWR - The Center for Construction Research and Training.

## Hazards



## Trades



## Jobsites



### Media

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### Documents

[Toolbox Talks](#)  
[Training Materials](#)  
[Handouts](#)  
[Research Reports](#)

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## What's New

[ILO Guidelines for Health and Safety Management Systems 2001](#)

[Warning About Fake Hard Hats](#)

[Product Inspection Advisory Notice from FallTech](#)

[Criteria for a Recommended Standard: Occupational Exposure to Hexavalent Chromium](#)

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CPWR THE CENTER FOR CONSTRUCTION  
RESEARCH AND TRAINING

# Additional resources: Construction Solutions



Designed for owners, contractors, & workers, Construction Solutions is a database of work hazards, & practical control measures to reduce or eliminate hazards.

Search

Find a safety option by:

Type of Work

Task

Hazard



## Roofing Remover

A roofing remover uses pneumatic power to remove roofing materials and is operated while standing.

[View Solution](#)



## Radio-Controlled (RC) Concrete Finisher

A radio-controlled concrete finisher is lighter than a traditional walk-behind power trowel and can be operated from up to ¼ mile away.

[View Solution](#)



## Door Dolly

A door dolly moves doors or other materials around a worksite without lifting and carrying.

[View Solution](#)

# Additional resources: Silica

## Work Safely with Silica

A ONE-STOP SOURCE OF INFORMATION ON  
HOW TO PREVENT A SILICA HAZARD AND PROTECT WORKERS



[Home](#) • [About](#) • [Know the Hazard](#) • [Regulations & Requirements](#) • [What's New](#) • [Create-A-Plan](#)

Search

GO

### Know the Hazard

**Workers** may be exposed to dangerous levels of silica dust when cutting, drilling, grinding, or otherwise disturbing materials that contain silica. These materials and tasks are common on construction jobs. Breathing that dust can lead to serious, often fatal illnesses. This section contains information that workers – and contractors – need to know to [recognize the hazard](#), understand the risk factors, and work safely with silica.

### Control the Dust

There are ways **contractors** can reduce the dust and reduce the hazard. This easy to use planning tool takes you step-by-step through conducting a **job hazard analysis for silica**, selecting appropriate controls, and creating a job-specific plan to eliminate or reduce silica hazards. You can save as a pdf, print and/or email your plan.

[CREATE-A-PLAN](#)



### Training & Other Resources

Find silica-related handouts, fact sheets, videos, toolbox talks and other resources for workers and contractors.



### What's Working

Contractors, workers, manufacturers, and researchers are on the lookout for the best ways to control silica dust. Learn what is happening in the field and share what you are doing.



### Ask a Question

Get answers to commonly asked questions about silica and ask one of your own.

# NORA

## National Occupational Research Agenda

15 Strategic goals on  
top construction problems

- ✓ Steer research to problems
- ✓ Go for IMPACT
- ✓ Sector-based solutions



National Construction Agenda – October 2008



**NATIONAL OCCUPATIONAL RESEARCH  
AGENDA (NORA)**

10/27/08 REVISION

**NATIONAL CONSTRUCTION AGENDA**

FOR OCCUPATIONAL SAFETY AND HEALTH  
RESEARCH AND PRACTICE IN THE U.S.  
CONSTRUCTION SECTOR

Developed by the NORA Construction Sector Council

[http://www.cdc.gov/niosh/nora/comment/agendas/  
construction/pdfs/ConstOct2008.pdf](http://www.cdc.gov/niosh/nora/comment/agendas/construction/pdfs/ConstOct2008.pdf)

# NORA Construction Goals

## 1) Falls to a lower level

2) Contact with electricity

3) **Struck-by incidents** (objects, vehicles, and collapsing materials)

4) Hearing loss

5) **Silica**

6) Welding fumes

7) Musculoskeletal disorders

OUTCOMES

## 8) **Construction safety and health culture/climate**

9) Safety and health management programs

10) Construction industry organization factors

11) Training

12) **Health and safety disparities**

13) **Construction hazard prevention through design**

14) Surveillance

15) Engage the Media

CONTRIBUTING  
FACTORS

**GOALS IN RED – SPECIAL FOCUS**

# Examples of Research Underway

Many different NIOSH-funded projects

- Get short description and investigator contact info at <http://www.cdc.gov/niosh/programs/const/noragoals/main.html>

## NIOSH Program Portfolio

[NIOSH Programs](#) > [Construction](#) > [Strategic Goals](#) > [Main Goals List](#) > **Goal 1.0**

### Construction

#### NORA Construction Sector Strategic Goals

**Goal 1.0: Reduce Construction Worker fatalities and serious injuries caused by falls to a lower level**

Intermediate Goal Number	Goal Description	Status
1.1	Partner with construction stakeholders and safety professionals to identify the top three fall-related problems requiring technical engineering solutions and develop and evaluate options to fill these gaps.	●
1.2	Partner with Construction stakeholders to expand awareness and use of existing effective fall prevention and protection solutions by construction employers and workers	●
1.3	Partner with Construction stakeholders to provide the industry with the information and tools to reduce portable ladder fall injuries.	●
1.4	Partner with architects, engineers, and construction organizations to expand the use of "safe-by-design" practices for fall prevention via demonstration projects and guidance.	▲
1.5	Work with construction partners to develop and implement a national campaign to reduce fatal and serious injuries associated with construction falls to a lower level.	●

#### Other Projects for Goal 1.0

#### NIOSH Program: Construction



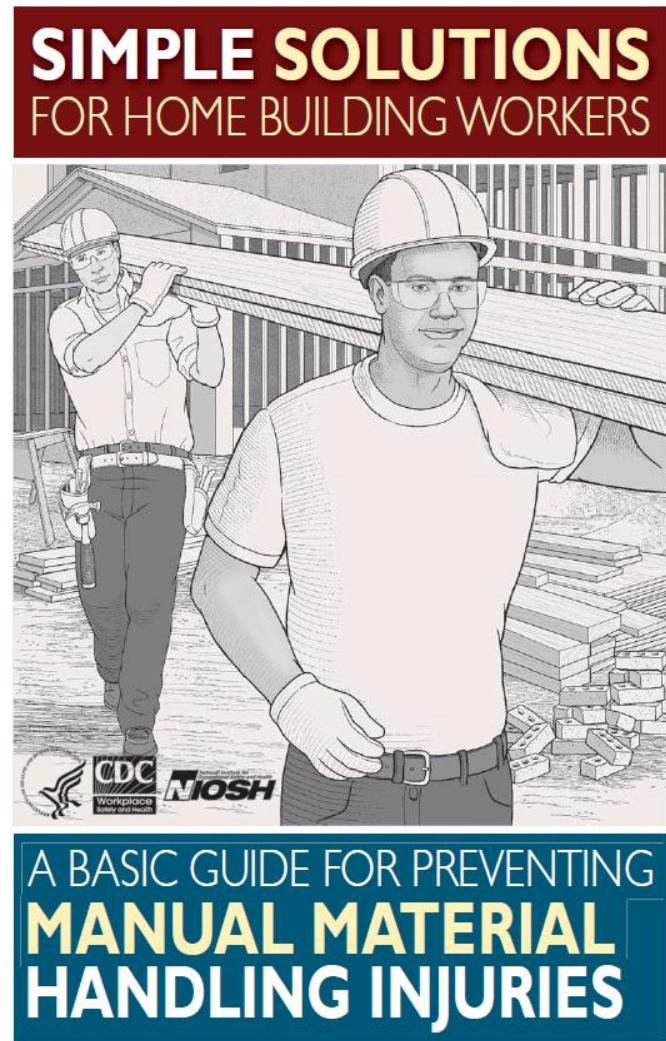
- [Program Description](#)
- [NORA Construction Activities](#)
- [NIOSH Strategic Goals](#)
  - [About NORA Construction Sector Strategic Goals](#)
  - [Main Goals List](#)
  - ▶ **Goal 1.0**
    - 1.1
    - 1.2
    - 1.3
    - 1.4
    - 1.5
  - [Goal 2.0](#)
  - [Goal 3.0](#)
  - [Goal 4.0](#)



***Translate  
Musculoskeletal  
Disorder (MSD)  
Intervention  
Research for  
Residential  
Construction***

**Jim Albers, DART**

**Publication finishing up  
final review**



# ***Injury Assessment for Emerging Mast Scaffold Technology***

**Chris Pan, DSR and team**

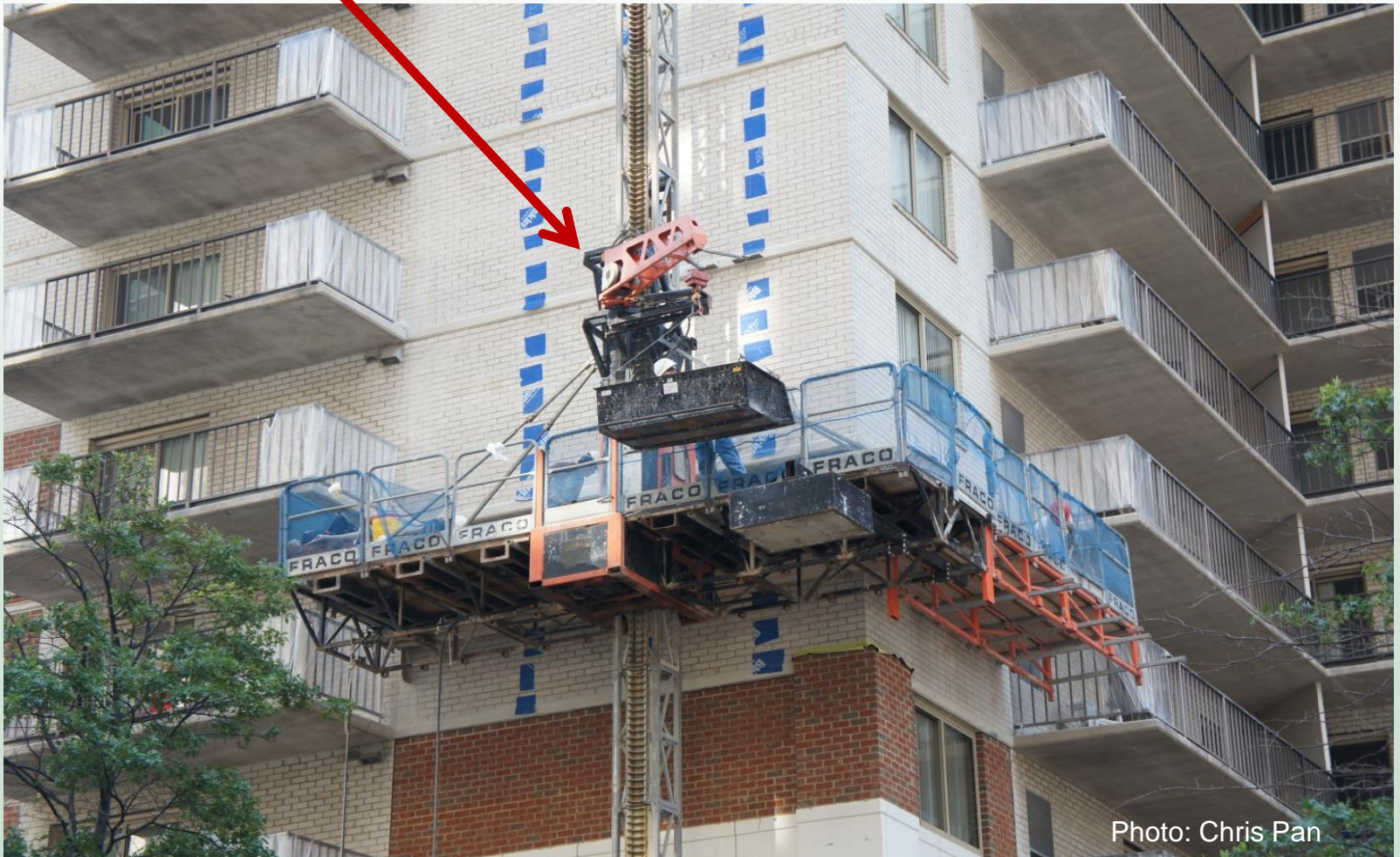


Photo: Chris Pan

# Ladder Safety application for smart phones

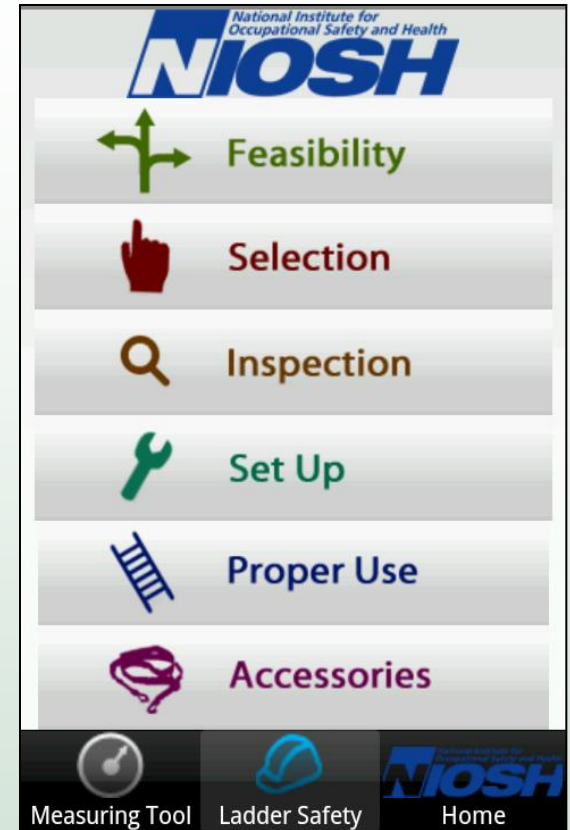
Peter Simeonov, DSR  
and team

Developed APP to  
quickly and easily  
position extension  
ladder at correct  
angle

Finishing up final  
review of APP



Inclination indicator



Graphic-oriented aid

# ***Engineering control partnership for dowel-pin drills***

Alan Echt, DART

Developing and improving dust controls to reduce silica exposures



Without Local Exhaust Ventilation



With Local Exhaust Ventilation

# Noise Control: Web-based Outreach to Construction & Mining

Chuck Hayden, DART  
and team

Piloting “Buy Quiet”  
webpages for  
contractor use

**Hearing Loss Prevention**  
Your Resource for Workplace Sound Safety

Home About Power Tools Database Buy Quiet Program Contact Wiki

**Messer**  
WeAreBuilding.

**BUY QUIET PROGRAM**

- Advocacy
- Policy
- Inventory
- Product Research
- Cost Benefit Analysis

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**Current Inventory**

Your company's current power tools and equipment inventory is available below. As you select a specific tool type, additional details will be displayed. You can use this to identify items that may need to be replaced or to compare with the information about newer tools contained in the Product Research section.

*Inventory last updated on 2/24/2012 at 3:18 PM* [Update Inventory](#)

Tool Type	Manufacturers	Quantity	Oldest In Years
Bandsaw	DeWalt, Milwaukee, Porter Cable	6	14
Biscuit Joiner	DeWalt, Porter Cable	3	13
Circular Saw	DeWalt, Milwaukee	37	6
Drill 1/2in	DeWalt, Milwaukee	30	8
Drill 3/8in	Milwaukee	20	7

Page size: 5 24 items in 5 pages

Type	Model	Tech Specs	Mfg	Wt/Stage (Electric) or CFM (Pneumatic)	Sound Power Level - Loaded Test
<a href="#">Details</a>	Circular Saw	6370-20 8-inch metal cutting blade	Milwaukee	1560	102
<a href="#">Details</a>	Circular Saw	345 6-inch saw blade	Porter Cable	1080	103
<a href="#">Details</a>	Circular Saw	5680 7 1/4-inch saw blade	Skel	1680	103

**Hearing Loss Prevention**  
Your Resource for Workplace Sound Safety

Home About Power Tools Database Buy Quiet Program Contact Wiki

**Messer**  
WeAreBuilding.












**BUY QUIET PROGRAM**

- Advocacy
- Policy
- Inventory
- Product Research
- Cost Benefit Analysis

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**Product Research**

Choose one of the tools below to view sound specifications.

 Belt Sanders	 Circular Saws	 Drills	 Grinders
 Hammer Drills	 Impact Wrenches	 Jig Saw	 Miter Saws
 Rotary Sanders	 Reciprocating Saws	 Screwdriver	

<http://niosh.tier1performance.com/hip/PowerToolsDB/Results.aspx?ttu=2>

# Fatality Assessment and Control Evaluation (FACE) Project

Nancy Romano, DSR  
Improving search capabilities and information products

## Workplace Safety & Health Topics



NIOSH Home

**Workplace Safety and Health Topics**

- ▶ **Fatality Assessment and Control Evaluation (FACE) Program**
- What's New - 2012
- NIOSH FACE Reports
- State FACE Reports
- Program Description
- Mission, History, Objectives
- Publications Related to FACE
- National and State Contacts

**Related Topics**

- Traumatic Occupational Injuries
- Fire Fighter Fatality Investigation and

[NIOSH > Workplace Safety and Health Topics](#)

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## FATALITY ASSESSMENT AND CONTROL EVALUATION (FACE) PROGRAM

Each day, between 12 to 13 U.S. workers die as a result of a traumatic injury on the job. Investigations conducted through the FACE program allow the identification of factors that contribute to these fatal injuries. This information is used to develop comprehensive recommendations for preventing similar deaths. This web page provides access to NIOSH investigation reports and other safety resources.



**Fatality Investigation Reports Indexed by Program**

- [NIOSH FACE Reports](#)
- [State FACE Reports](#)

**Search FACE Reports**

**Contact FACE**

**Nancy Romano, M.S., CSHM**  
FACE Project Officer  
Fatality Investigations Team  
Division of Safety Research  
NIOSH  
[ndr4@cdc.gov](mailto:ndr4@cdc.gov)

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# Search FACE

## Workplace Safety & Health Topics

### Workplace Safety and Health Topics

Fatality Assessment and Control Evaluation(FACE) Program

What's New - 2012

#### ► NIOSH FACE Reports

State FACE Reports

Program Description

Mission, History, Objectives

Publications Related to FACE

National and State Contacts

#### NIOSH Homepage

NIOSH A-Z

Workplace Safety & Health Topics

Publications and Products

Programs

NIOSH > Workplace Safety and Health Topics > Fatality Assessment and Control Evaluation(FACE) Program

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## FATALITY ASSESSMENT AND CONTROL EVALUATION (FACE) PROGRAM

NIOSH FACE Reports

FACE Reports Conducted by NIOSH

- All NIOSH FACE Reports

NIOSH FACE Reports Indexed by Industry or Cause of Fatality

Location	Industry	Cause	Populations
<a href="#">Highway Work Zones</a>	<a href="#">Agriculture</a>	<a href="#">Confined Spaces</a>	<a href="#">Foreign Born</a>
	<a href="#">Commercial Fishing</a>	<a href="#">Electrocution</a>	<a href="#">Hispanic</a>
	<a href="#">Construction</a>	<a href="#">Falls (All)</a>	<a href="#">Youth</a>
	<a href="#">Energy Production</a>	<ul style="list-style-type: none"><li>• <a href="#">Falls-Construction-Commercial</a></li><li>• <a href="#">Falls-Construction-Residential</a></li></ul>	
	<a href="#">Logging</a>	<a href="#">Machine Related (All)</a>	
	<a href="#">Youth Agriculture</a>	<ul style="list-style-type: none"><li>• <a href="#">Machine-Manufacturing</a></li><li>• <a href="#">Machine-Farming</a></li><li>• <a href="#">Machine-Construction</a></li><li>• <a href="#">Machine-General</a></li></ul>	
		<a href="#">Motor Vehicles</a>	
		<a href="#">Other</a>	



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TTY: (888) 232-6348

New Hours of Operation  
8am-8pm ET/Monday-Friday  
Closed Holidays

cdcinfo@cdc.gov

2012 North American Industry Classification System (NAICS) Search

Search NIOSH FACE Reports

Select 2 Digit NAICS Code...

Search State FACE Reports

Select 2 Digit NAICS Code...

# FACE includes NIOSH & STATE reports

**FACE reports are very  
useful for training and  
toolbox talks**



**California - House Painter Dies When  
He Falls Through a Roof Opening**



**California - A Roofing Supervisor Dies  
When He Falls Through a Skylight**

FACE WA  
Fatality Assessment  
and Control Evaluation

## FATALITY NARRATIVE

**Carpet Installer Dies After Falling from Window Opening \***

<p><b>Industry:</b> Flooring contractors <b>Task:</b> Unloading carpet rolls from box raised by forklift <b>Occupation:</b> Carpet installer <b>Type of Incident:</b> Fall</p>	<p><b>Release Date:</b> August 5, 2012 <b>Incident Date:</b> November 12, 2009 <b>Case No.:</b> 09WAG5101 <b>SHARP Report No.:</b> 71-112-2012</p>
--	--

On November 12, 2009, a carpet installer died when he fell from the fourth floor window opening of a building. The 45-year-old victim had worked as a carpet layer for over 20 years. He was hired by a flooring contractor to install carpeting in a new hotel. The victim was unloading carpet rolls from a three-sided wooden box through the unfinished window opening. The box was raised to the window on a reach forklift. The window opening was approximately 5 feet wide by 5 feet high with a sill height of 26 inches. The 2x4 top rail had been removed in order to get the carpet through the window. Each roll weighed 60 lb. and stuck out about 30 inches from the work box. While attempting to unload a roll of carpet, the victim put one foot on the window sill and one foot on a roll of carpet. He then put both feet on the carpet roll, causing him to fall along with the carpet to the ground 32 feet below.



Three-sided skip box used to elevate carpet rolls to window opening.

**Requirements**

- Ensure that employees exposed to a hazard of falling 4 feet or more in height from a wall opening are protected by an approved fall protection system. (See WAC 296-155-505(5)(a)).
- Develop and implement a written fall protection work plan including each area where employees are assigned and where fall hazards of 10 feet or more exist. (See WAC 296-155-24505(1)).
- Train employees to recognize and avoid fall hazards. (See WAC 296-155-100 and 296-155-24505(4)).

**Recommendations**

- Use a safe and approved method to elevate, handle, and deliver materials at elevation.
- If possible, arrange to use the building's elevator when moving construction materials to upper floors.
- Conduct a task hazard analysis to identify potential hazards and determine how to address them so that the task can be completed safely.

**State Wide Statistics:** This was number 48 out of 65 work-related fatalities in Washington State during 2009, and was number 5 out of 7 construction-related fatalities.

\*This bulletin was developed to alert employers and employees of a tragic loss of life of a worker in Washington State and is based on preliminary data (OEL) and does not represent final administrative judgments by the Bureau of the Incident or construction regarding the cause of the fatality. 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). For more information, contact the Safety and Health Assessment and Research for Prevention (SHARP) Program, 1-866-487-4277.

Please help us improve FACE publications by taking a 1-minute survey at [WA.FACE.survey.com](http://WA.FACE.survey.com)



SHARP-Research for Safe Work



Washington State Department of  
Labor & Industries



# FACE includes chemical fatalities

**California** - Maintenance Worker Dies from  
Methylene Chloride While Stripping a Baptismal  
Font in a Church



**Massachusetts Alert** - Bathtub  
Refinisher Dies from Exposure  
to Methylene Chloride



# Encouraging more “Digital Story” videos

YouTube



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## CDPH/FACE: Preventing falls in the solar industry

CAPublicHealth

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90 videos ▾



1:38 / 4:30

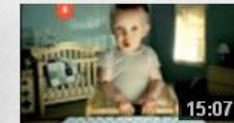
Like Add to Share

5,236

Published on Apr 10, 2012 by [CAPublicHealth](#)

As the use of solar energy continues to grow in California and the U.S., an increasing number of solar installation workers are exposed to fall hazards that can cause injury or death.

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### The 25 Best Super Bowl Commercials of All Time

by list25

1,694,318 views FEATURED



### Miller Fall Protection Basics of Fall

by MillerbySperian

23,495 views



### Ladder safety C.L.I.M.B. ACADEMY Step and

by LouisvilleLadder

14,246 views



### OSHA Fall Protection - Reese Tips-Part I -

by ReeseWholesale

9,829 views



### Installing a Fall Protection System

by alliedbuildingprod

7,538 views



### NASA UPGRADES 2012 SOLAR STORM

by SolarStormWarning

304,366 views



### HOW I MADE A SOLAR POP CAN FURNACE /

# MAKING AN IMPACT

Research → journal articles to share science findings

BUT...

- ✓ These are not written for end users
  - ✓ Typically qualify findings
  - ✓ Do not provide “how to” detail on interventions
- ✓ Findings scattered over different journals

**NEED to combine findings and convert into accessible, relevant, and practitioner-friendly products**

ORIGINAL ARTICLE

# Nail gun injuries in residential carpentry: lessons from active injury surveillance

H J Lipscomb, J M Dement, J Nolan, D Patterson, L Li

*Injury Prevention* 2003;9:20-24

**Objective:** To describe circumstances surrounding injuries involving nail guns among carpenters, calculate injury rates, identify high risk groups and preventive measures.  
**Methods and setting:** Active injury surveillance was used to identify causes of injury among a large cohort of union residential and dry-wall carpenters. Injured carpenters were interviewed by experienced journeymen; enumeration of workers and hourworked were provided by the union. The combined data allowed definition of a cohort of carpenters, their hours worked, detailed information on the

RESEARCH ARTICLES

## How Much Time Is Safety Worth? A Comparison of Trigger Configurations on Pneumatic Nail Guns in Residential Framing

HESTER J. LIPSCOMB, PhD<sup>1</sup>  
JAMES NOLAN<sup>2</sup>  
DENNIS PATTERSON<sup>3</sup>  
DIMITRIOS MAKROZAHOPoulos,

SYNOPSIS

**Objective:** Nail gun injuries are among the most common in wood frame construction. Despite evidence that the majority of injuries from unintentional fires could be prevented with a sequential trigger mechanism on the tools,

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE 51:719-727 (2004)

## Prevention of Traumatic Nail Gun Injuries in Apprentice Carpenters: Use of Population-Based Measures to Monitor Intervention Effectiveness

Hester J. Lipscomb,<sup>1,1\*</sup> James Nolan,<sup>2</sup> Dennis Patterson,<sup>2</sup> and John M. Dement<sup>1</sup>

**Introduction** Nail guns are responsible for a significant injury burden in residential construction. Risk, based on hours of work, is particularly high among apprentice carpenters due in part to more frequent exposure to tool use.  
**Methods** Nail gun injuries were evaluated over 3 years among carpenters enrolled in two apprenticeship programs in the Midwest (2.3 million residential work hours observed)

*The Journal of TRAUMA® Injury, Infection, and Critical Care*

## Nail Gun Injuries to the Hand

Keith Hussey, MB, ChB, David Knox, MB, ChB, Alex Lambah, MB, ChB, Alain P. Curnier, MB, ChB, John D. Holmes, MChir, and Michaela Davies, MB, ChB

**Background:** Aberdeen Royal Infirmary is a teaching hospital serving a population of over 500,000. A number of nail gun injuries to the hand prompted a review of our management of these injuries and a review of the literature. These are deep penetrating injuries, often contaminated by particles of skin, oil, paper or glue, or caused by nails that are barbed.

**Methods:** Fifty-five cases of nail gun injury to the hand were reviewed in a retrospective study of injuries presenting to the hospital between January 2000 and June 2004.  
**Results:** The population at risk is almost entirely men and involved in the construction industry. Twenty-five percent of cases were found to have tendon, nerve or joint involvement at operation.

None of the injuries required anything more than meticulous wound toilet.  
**Conclusions:** To our knowledge, this is the first large study to clinically document the actual hand injuries caused by nail guns. An analysis of our treatment patterns suggests a low risk from surgical exploration with several potential benefits.  
**Key Words:** Nail gun, Nailier, Hand, Tendon, Nerve, Injury.

*J Trauma.* 2008;64:170-173.



# Dissemination to residential construction industry

Emails to key stakeholders and industry publications

Web-posting, tweets, Quick-Takes, Webinar with ASSE, Spanish version

 @NIOSHConstruct  
Construction @ NIOSH

Did you know? Nail gun injuries cause 37,000 emergency room visits/yr. Protect yourself:  
[go.usa.gov/ouU](http://go.usa.gov/ouU) #construction #safety

23 Sep via web

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Retweeted by CIRSA\_News and 20 others



## NailGunSafety: TheFacts



New website: <http://www.nailgunfacts.org/>  
Developed by Hester Lipscomb and team



→ SÉCURITÉ DES OUTILS, DES MACHINES ET DES PROCÉDÉS  
 VEILLE SCIENTIFIQUE DE L'INRSST | MODÉRATEUR: DENIS TURCOOT

SST BRUIT ET VIBRATIONS CONTAMINANTS CONTEXTE DE TRAVAIL ÉQUIPEMENTS DE PROTECTION READAPTATION AU TRAVAIL SÉCURITÉ DES MACHINES

ACCUEIL CONTACT A PROPOS RSS CONDITIONS D'UTILISATION

## New NIOSH Publication - Nail Gun Safety: A Guide for Construction Contractors 2011-202

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From: BUILDER 2011 | Posted on: September 28, 2011 10:40:00 AM

### OSHA Offers New Nail-Gun Safety Guide

Training and equipment knowledge are keys to preventing injuries.

By: John Caulfield

Every year, some 37,000 contractors and consumers end up in emergency rooms because of injuries caused by nail guns. A recent study of apprentice carpenters found that two out of five were injured using a nail gun during their four years of training, one in five was injured twice, and one in 10 was injured three or more times.

In light of those statistics, The Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety and Health (NIOSH) last week issued a 20-page nail gun safety guide for construction contractors.

The guide does not include new regulations for manufacturers or jobsite supervision. Instead, in the spirit of encouraging companies to provide a safe and healthful workplace environment (as they are mandated to do under the Occupational Safety and Health Act of 1970), the guide discusses common causes of nail gun injuries and offers practical steps to prevent them.

Given that many experienced carpenters have left the housing industry or went out of business during the recession, the guide arrives at a time when builders and framing contractors might be reconsidering how best to retain their remaining field workers.

OSHA concedes that it's difficult to quantify the breadth of nail gun injuries because a certain percentage goes unreported. But using different field studies as its measures, the agency estimates that 66% of all nail gun-related occupational injuries occur in residential construction. It also notes that 66% of all nail gun-related occupational injuries occur in residential construction.

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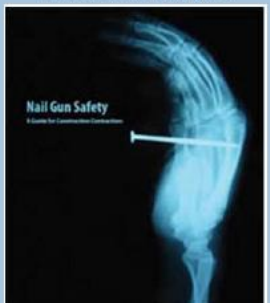
**Nail Gun Safety Guide**  
 Posted by [Zafskyguy08](#) on September 29, 2011 at 8:15am  
[View Blog](#)

Lethal Weapon Three (I believe)... Danny Glover is being suffocated by the plastic addition that he's having built over his grasp so he grabs the nail gun that's laying! While it makes for exciting movie viewing, it's anything but fun when it happens for year by nail guns.

OSHA & NIOSH, in response to this growing safety hazard have now published a "Contractors."

According to the CDC website:

"The guidance was developed in response to a unanimous motion by industry, the Committee for Construction Safety and Health (ACCSH) on the need to develop and NIOSH worked together to make sure the guidance reflects the most current known about nail gun injuries, including the parts of the body most often injured. It describes the common causes of nail gun injuries and provides six practical steps. The guidance includes actual workplace cases along with a short section on other information. Our hope is that by working together with tool gun manufacturers, we can improve nail gun safety on the job site."



## Montana Contractors' Association Newsletter | September 23, 2011



### Safety Alert: Nail Guns

The Occupational Safety and Health Administration and the National Institute for Occupational Safety and Health have developed new guidance, [Nail Gun Safety - A Guide for Construction Contractors](#), to help construction employers and workers prevent work-related nail gun injuries.

**Quick Links**

- [MCA Newsletter](#)
- [MCA Training Page](#)
- [MCA Website](#)

**Calendar**

- Sep 27-28 SWPPP Administrator Certification

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Free nail gun safety guide 09/25/2011

The National Institute for Occupational Safety and Health (NIOSH) and the Occupational Safety and Health Administration (OSHA) have recently released "Nail Gun Safety: A Guide for Construction Contractors." Nail guns are widely used on many construction jobs — especially in residential construction. While nail guns may boost productivity, they also cause tens of thousands of painful injuries each year. This new publication is intended to provide a resource for residential home builders and construction contractors, subcontractors, supervisors and workers to prevent these kinds of injuries.

You can download "Nail Gun Safety: A Guide for Construction Contractors" as a PDF file, by clicking here. Hard copies also are available by calling OSHA's publications office at 800-321-OSHA (6742).

Government Affairs  
 OPEI challenges EPA's E15 rule

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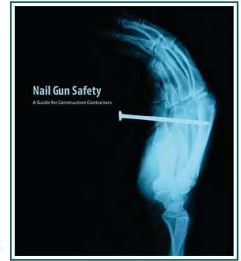
WIBuildingSupply.com

FRIDAY, SEPTEMBER 23, 2011

### Nail Gun Safety: A Guide for Construction Contractors

The National Institute for Occupational Safety and Health (NIOSH) and Occupational Safety and Health Administration (OSHA) just released new guidance for residential home builders and construction contractors, subcontractors, and supervisors to prevent nail gun injuries.

Nail Gun Safety: A Guide for Construction Contractors outlines types of triggers, describes key terms, highlights what is known about nail gun injuries, discusses common causes of nail gun injuries and gives six practical steps you can take to prevent these injuries:



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## USING POWER TOOLS THE HANDYMAN'S TOOL TIPS

### The Blog

**Nail Gun Safety Tips**

In everything we do, it's always important to make precaution our top priority. Maintaining safety in the work environment enables a lot of benefits. Whether you're doing a chore at home or doing your job in the office, it always pays to be extra careful especially when working with a dangerous machine, like that of a nail gun, to prevent injuries. Nail guns can allow you to finish your work in a snap of a second but if this tool is not used carefully, it can also do harm on you as quick as it performs its work.

Nail gun injuries are the most commonly reported injuries in a workplace involving construction. Unintended firing, ricocheting nails, airborne nails and unsafe practices are the common causes of nail gun injuries. However, take note that injuries can be prevented, thus, to help you not be included in the increasing rate of people who experienced these injuries, bear in mind the following [nail gun safety](#) tips:

- Look for a nail gun that has a [power-assist trigger mechanism](#). This trigger mechanism requires the nose piece of the nail gun to be pressed down before the trigger can be pulled.
- Never press the trigger unless the nose of the gun is firmly positioned on the work material.

**POWER TOOL REVIEWS**

- Circular Saw Reviews
- Table Saw Reviews
- Sand Sander Reviews
- Wood Lathe Reviews
- Cordless Drill Reviews
- Nail Gun Reviews
- Air Compressor Reviews

**RECENT POSTS**

- Five Uses of a Portable Air Compressor
- Welcome To Using Power Tools
- Nail Gun Safety Tips
- Built To Deliver: A Samba MACE400 Big Box Router
- Starter (Brush) CAP112-0F Compressor
- Small Mfg In Output

Examples of uptake

# NORA Initiatives

NORA Construction Sector Council identified two goal-related topics for special attention

- 1. Develop and Implement a “campaign” to reduce falls**
- 2. Integrate safety and health into green construction and green rating system**

NORA committees help coordinate these initiatives

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

Work safely. Use the right equipment.



Safety Pays. Falls Cost.

**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

# 1) Falls Prevention Campaign

Most fatal injury hazard in the construction industry

**Target: Residential contractors and workers**

Focus on:

- ✓ Falls from ladders, scaffolds and roofs (top causes)



# Construction Falls Prevention Campaign

¡LAS CAÍDAS DESDE ESCALERAS PUEDEN SER PREVENIDAS!

- ✓ Escoja la escalera correcta para el trabajo
- ✓ Mantenga tres puntos de contacto
- ✓ Asegure la escalera
- ✓ Siempre dé la cara a la escalera



- National in scope
- Launched on Workers' Memorial Day 2012 by DOL Secretary Hilda Solis
- Two-year span
- Materials informed by focus group research
- Focus on falls from roofs, scaffolds, ladders



HOME > CONSTRUCTION > ASSE SUPPORTS NEW EFFORT TO PREVENT CONSTRUCTION WORKER FALLS

## ASSE Supports New Effort to Prevent Construction Worker Falls

The American Society of Safety Engineers, OSHA, NIOSH and others support education and training efforts to reduce construction falls.

Aug. 24, 2012

Sandy Smith

COMMENTS (0)

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Each year, thousands of workers are injured and 225 die from construction-related falls. In order to provide additional tools to prevent worker injuries...

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## ASSE, OSHA, and NIOSH Join Forces On Fall Prevention

Written by Anne Vazquez. Posted in Facility Blog, Featured Post  
Tagged: ASSE, Construction Safety, NIOSH, OSHA

Published on August 24, 2012 with No Comments

The American Society of Safety Engineers (ASSE) has joined with the Occupational Safety and Health Administration (OSHA) and the National Institute of Occupational Safety and Health (NIOSH) to support a new "Fall Prevention Campaign" aimed at raising awareness about how to prevent construction-related falls.

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## Construction Fall Prevention Campaign Provides Contractors Prevention And Training Materials

Source: American Society of Safety Engineers  
Created: August 24, 2012

The new...

## CONCRETE CONSTRUCTION

NEWS PRODUCTS ON THE JOB DECORATIVE CONCRETE SURFACES BUSINESS  
Associations Safety Events

Hot Topics: World of Concrete | Polished Concrete Awards | Most Innovative Products

From: Concrete Construction 2012 | Posted on: August 27, 2012

## American Society of Safety Engineers Support New Effort to Prevent Construction Worker Falls

Be the first to comment Share

Each year the additional to Safety Engineers National Institute of Occupational Safety and Health focuses

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## New industry campaign to prevent construction worker falls

August 24, 2012

More than 10,000 U.S. construction workers were injured as a result of falling while working from heights and another 225 were killed in 2010. In order to provide additional tools to prevent worker injuries and fatalities in the construction industry, the American Society of Safety Engineers is joining with the Occupational Safety and Health Administration and the National Institute of Occupational Safety and Health to support a new Fall Prevention Campaign (stopconstructionfalls.com).

# Main campaign website (National Construction Center)

<http://www.stopconstructionfalls.com>



*Falls are the #1 cause of work-related deaths in construction and a leading cause of injuries.  
They can be prevented. Plan. Provide. Train.*



[Click here](#) to access Four Fact Sheets that reinforce the video's message on the safe use of ladders

## Construction Fatalities Due to Falls & More



Click on the map above to access interactive maps with detailed information about construction fatalities in your area.

## About the Campaign

- [Who We Are](#)
- [What's New](#)
- [Get Involved!](#)
- [In the News](#)
- [Success Stories](#)

## Training & Other Resources

[For contractors, workers...](#)

## Learn More

[Research reports, data, links to other resources, etc.](#)

# OSHA Campaign Page



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**OSHA**



## PLAN . PROVIDE . TRAIN .

*Three simple steps to preventing falls.*

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Photo by Karalle Hill

## Welcome to OSHA's Fall Prevention Campaign

**FALLS ARE THE LEADING CAUSE OF DEATH IN CONSTRUCTION.** In 2010, there were 264 fall fatalities (255 falls to lower level) out of 774 total fatalities in construction. **These deaths are preventable.**

[en español](#)

### Highlights

#### Prevention Videos (v-Tools)

- Falls in Construction
  - [Floor Openings](#)
  - [Fixed Scaffolds](#)
  - [Bridge Decking](#)
  - [Reroofing](#)
  - [Leading Edge Work](#)
  - [Falls prevention](#). California Fatality Assessment and Control Evaluation (FACE).

#### Campaign Partners

- [National Institute for Occupational Safety and Health \(NIOSH\)](#)
- [The National Occupational Research Agenda \(NORA\)](#)

### PLAN

*ahead to get the job done safely.*

### PROVIDE

*the right equipment.*

### TRAIN

# NIOSH Campaign Page

<http://www.cdc.gov/niosh/construction/stopfalls.html>

CDC Home



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

- NIOSH
- All CDC Topics

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## CONSTRUCTION



NIOSH Home

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NIOSH Program Portfolio: Construction

NORA Construction Research Agenda

NORA Construction Sector Council

About the NIOSH Office of Construction Safety and Health

The National Construction Center

#### ► Campaign to Prevent Falls in Construction

Calendar of Events

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## Campaign to Prevent Falls in Construction

This national campaign to prevent construction-worker falls was launched on April 26, 2012. The Campaign encourages everyone in the construction industry to work safely and use the right equipment to reduce falls. Special emphasis and activity will focus on residential construction contractors and workers.

### FACT - FALLS KILL!

Falls are the number one cause of construction-worker fatalities, accounting for one-third of on-the-job injury deaths in the industry.<sup>1</sup> To turn this problem around, we need to promote the use of fall prevention practices by contractors and construction workers.

The Campaign to Prevent Falls in Construction grew out of multi-stakeholder discussions under the NIOSH [National Occupational Research Agenda \(NORA\) program](#). The [NORA Construction Sector Council](#), a government-labor-management partnership, conceived the Campaign to reduce falls from roofs, ladders, and scaffolds.

### Campaign Messages

The Campaign uses a variety of strategies to reach key construction audiences with three main messages:

1. Contractors and workers can plan together, before every job, to work safely at heights.
2. Contractors must provide the right equipment for working at heights, and workers need to use that equipment.



### On this Page

- [Campaign Messages](#)
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### Contact Us:

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(800-232-4636)  
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New Hours of Operation  
8am-8pm ET/Monday-Friday  
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## So far....

- >300,000 people “touched” via OSHA regional and area office outreach and training sessions
- 39 organizations have joined the campaign
- Key organizations: ABC, AGC, NAHB, Labor and Government → working together on this effort
- Campaign won a Public Relations Society of America award:  
**2012 Thoth Award in the Research and Evaluation Category**

Facebook page [www.facebook.com/pages/Stop-Construction-Falls/215070198597124](http://www.facebook.com/pages/Stop-Construction-Falls/215070198597124)

Campaign posters and fact sheets <http://www.osha.gov/stopfalls/>

NIOSH Science blog about campaign <http://blogs.cdc.gov/niosh-science-blog/>

# **Campaign Re-launch: Workers Memorial Day 2013**

**Strategy: Going Local**

**Partner with several state and  
local groups to reach contractors  
at the local level**

**Evaluate efforts to learn what  
works best**

**To get involved  
in the Campaign:**

**[falls@cpwr.com](mailto:falls@cpwr.com)**

## 2) Integrate Safety & Health into Green Construction

- **GREEN** building is on the increase
- Rating systems (e.g. LEED) are driving best practices
- How do SAFETY and SUSTAINABILITY relate?

**Target:**            **Safety and Health community**  
                         **US Green Building Council (USGBC)**  
                         **Architects and Designers**  
                         **Owners**

***LEED = Leadership in Energy and Environmental Design***



## ISSUES

- How safe is green construction?
- How do rating systems address safety & health?



## OPPORTUNITIES

- Can we promote worker safety and health as a fundamental dimension of true sustainability?
- Can we encourage Prevention through Design (PtD)?



# 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

# Disconnect between Green and Safety?

arch  daily

Have you seen our interviews in High Definition?

## City Center Las Vegas: 6 LEED Gold certifications

25 FEB 2010

By David Basulto — Filed under: Hotels and Restaurants , City Center, Daniel Libeskind, KPF, Las Vegas, LEED, Norman Foster, Pelli Clarke Pelli Architects, Rafael Vinoly Architects, Rockwell Group, USA



CityCenter Crystals Veer Aria and Harmon

LAS VEGAS SUN

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### WORKER SAFETY:

## After 6 die, OSHA finds violations

### Summer sweep by federal, state agencies uncovered dozens of serious problems



REMEMBERING DUSTIN TARTER OPERATORS LOCAL 12  
IRONWORKERS 4331

**IMPORTANT: No indication that environmental certifications were connected to poor safety record on this project**

**Wake-up call**

# Blind spots?

## Coal Tars and Coal Tar Pitches\*

Known to be human carcinogens

First Listed in the *First Annual Report on Carcinogens* (1980)

### Carcinogenicity

Coal tars and coal tar pitches are *known to be human carcinogens* based on sufficient evidence of carcinogenicity in humans. Numerous studies, mostly case reports, have found that occupational exposure to coal tars or coal-tar pitches (coal-tar distillates) is associated with skin cancer, including scrotal cancer; workers in these studies have included patent-



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## Thinking Green? Consider Coal Tar Pitch

*By Joe Mellott*

Coal tar remains a desired and strong source of technology within the roofing industry, as innovative coal tar products significantly reduce associated health hazards and environmental impact.

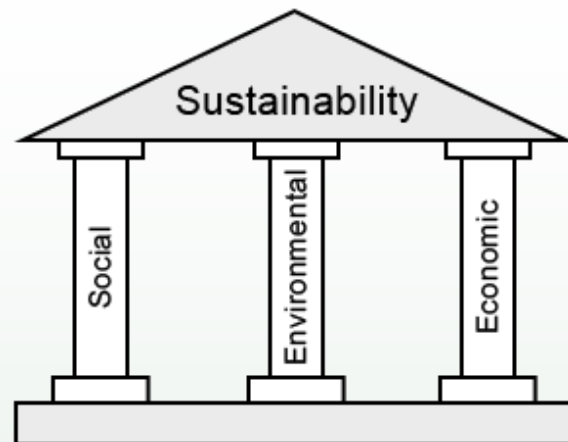
[Download Full Article \(PDF\)](#)

Coal tar remains a desired and strong source of technology within the roofing industry, as innovative coal tar products significantly reduce associated health hazards and environmental impact. To help you better understand the role that coal tar continues to play in the commercial roofing market, this article will explore:

- The history of coal tar
- Its associated hazards

# NIOSH Perspectives

Sustainability → broader term than green.  
Encompasses **social equity** ...  
including occupational safety and health



**“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*, 1/4/2010

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

# Health in the green economy

## Co-benefits to health of climate change mitigation

### OCCUPATIONAL HEALTH *Initial findings – discussion draft*

#### Key messages

- **Health and safety at work are among the fundamental pillars of decent work<sup>1</sup>; these are also essential for a green economy.** Those values must therefore be given high priority and visibility as core components of just transition.

Transition to a green economy has the potential to reduce many aspects of workers' exposures to workplace hazards and pollution risks. But "green jobs" are not automatically or necessarily decent, safe or healthy unless clear policies, programmes and actions support social sustainability in a given workplace, enterprise, and sector.<sup>1,2,3</sup>

#### Potential health gains for workers in a green economy

- **Occupational health and environmental protection measures can be mutually reinforcing.** The reduction of environmental pollution as result of green technologies may also improve the quality of the work environment. Conversely, certain measures that improve the work environment, such as encapsulation, automatization, and substitution of hazardous materials would also improve



diseases, bronchial obstruction, asthma and other respiratory conditions).<sup>6</sup>

- **Greener, more energy-efficient building and transport infrastructure also can produce co-benefits for workers' health.** For example, low-energy office buildings and workplaces that offer good daylighting and natural ventilation can often improve workers' productivity as well as their health. Prioritizing public transport systems and promotion of non-motorized transport (cycling, walking, etc.) contribute to commuters' health by improving road safety and providing more opportunities for physical exercise, which is especially important for sedentary workers. Organized workplace transport plans and incentives may further enhance these dimensions of health for reduced morbidity, disability and mortality.<sup>7,8,9</sup>

# Activities: Outreach and Awareness

- Dr. Howard met with President of the USGBC in 2011 to kick off efforts
- Regular NIOSH/USGBC meetings and briefings since then
- Outreach to the Safety & Health community
  - ACCSH
  - AFL-CIO BCTD
  - AIHA Roundtables 2010 - 2012
  - ASSE – Planning 2013 Key Issue Roundtable



## Integrating Safety and Health into Green Construction Rating Systems

Matt Gillen, MS, CIH<sup>1</sup>; Brian Kleiner, PhD<sup>2</sup>; and Mike Behm, PhD<sup>3</sup>

<sup>1</sup>NIOSH Office of Construction Safety and Health  
<sup>2</sup>Myers-Lawson School of Construction, Virginia Tech  
<sup>3</sup>East Carolina University

CIB W099 Conference 2011 - Washington, DC

CDC NORA NIOSH East Carolina University VirginiaTech Washington, DC 2011

## Integrating Safety and Health into Green Building Rating Systems: NORA-developed "Enhanced" Credit Examples

**Matt Gillen**  
Deputy Director,  
NIOSH Office of Construction Safety and Health

1. Situation
2. Actions
3. Results
4. Lessons Learned

AIHCE June 21, 2012  
Green Buildings and the Industrial Hygienist

NIOSH CDC

# Activities: “Credit by Credit” review of 2009 LEED Construction Credits.

**Positive:** likely activities, if coupled with additional safety design and planning measures, could REDUCE construction (C) and maintenance (M) worker exposures and risks. → **7 credits**

**Negative:** likely activities, if NOT coupled with additional safety design and planning measures, could INCREASE C & M worker exposures and risks. (+1 both positive and negative) → **11 credits**

**Neutral:** While safety hazards cannot be ruled out, the likely activities appear less likely to either increase or reduce C & M worker exposures and risks, regardless of safety design and planning measures. → **38 credits**



# Activities: develop safety-enhanced credits

Six LEED 2009 credits (2 positive + 4 negative) were selected to explore how additional language might be added to address safety & health

Credit	Potential	Key OSH issue
Sustainable Sites 7.2 Vegetative and Cool roofs	Negative	Injury: Falls
Indoor Env. Quality 8.1 Skylights and atria	Negative	Injury: Falls
Indoor Env. Quality 3.1 Construction IEQ	Positive	Health: Dust, chemicals
Indoor Env. Quality 4.1 Low-Emitting adhesives	Positive	Health: chemicals
Materials and Resources 1.1 Maintain existing walls, floors, roof	Negative	Injury & Health: Falls, cave in, hazardous materials
Materials and Resources 2 Divert 50% of waste from disposal	Negative	MSD & Injury: Strains, punctures

**FOCUS ON DESIGN INTERVENTIONS**

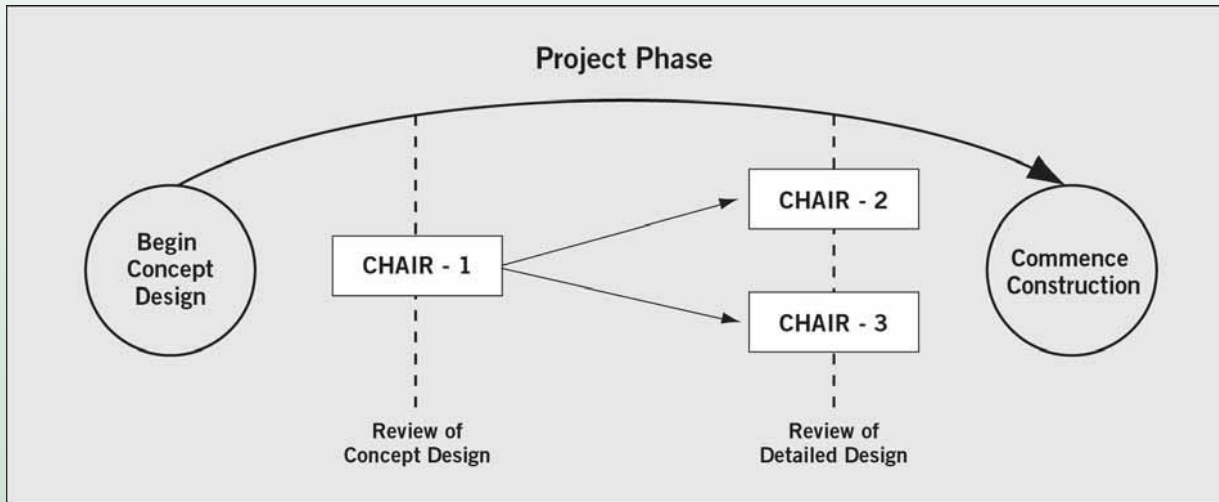
# Importance of Design

**Research Example:** 42% of 224 construction fatalities included some link to design (US 1990-2003). [Behm, 2005]

**Practice Example:** Australian use of CHAIR

**C**onstruction **H**azard **A**ssessment **I**mplication **R**eview

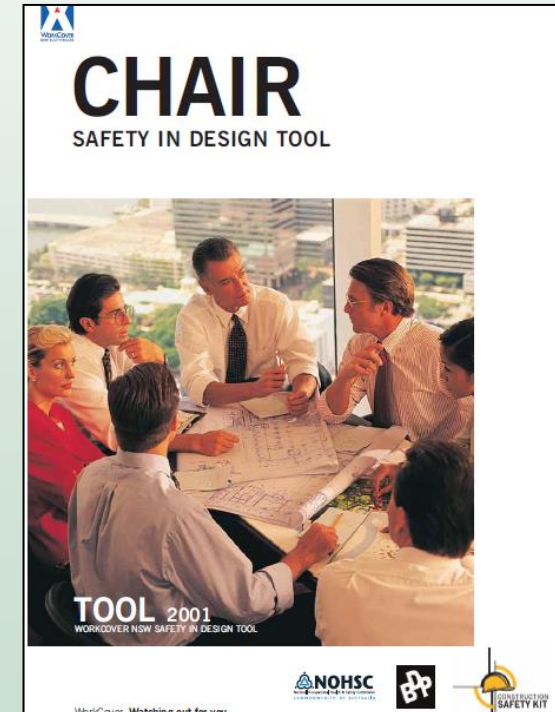
Integrates 3 **Safety Design** reviews



CHAIR 1: General

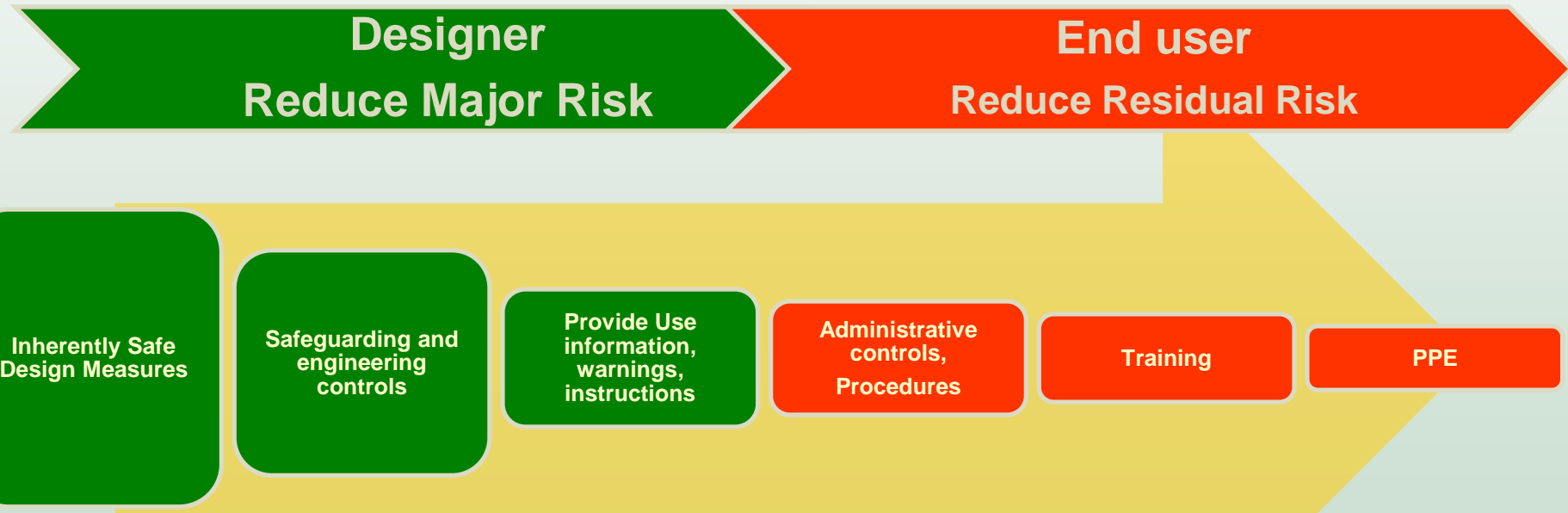
CHAIR 2: Construction

CHAIR 3: Maintenance and Repair



# Addressing energy and environmental performance at the DESIGN stage is key to Green Building

Eliminating hazards by DESIGN is also first for the “Hierarchy of Controls”



Order of Preference and Effectiveness from high to low →

# Design example

**LEED Daylight Credit:** Skylights and atria reduce energy needs and enhance occupant well-being.

**Safety issue:** Fall exposures to construction and maintenance workers who install and clean them.



## A Hispanic Maintenance Worker Dies after Falling Through a Skylight

California Case Report: 07CA007

### Summary

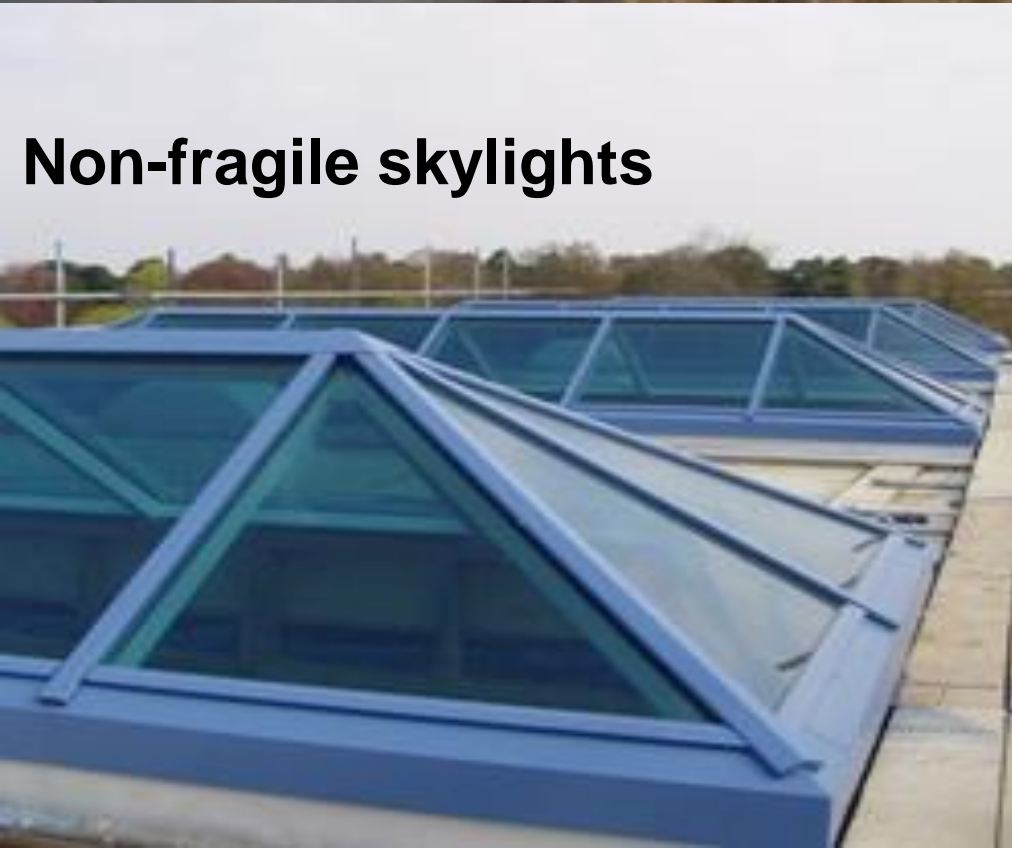
A 39-year-old Hispanic maintenance worker died from injuries received after a fall through a skylight. The victim was using a broom to clean the debris off the skylight. As the victim was applying pressure to the broom, the broom handle broke. The victim lost his balance and fell through the skylight cover.

25 Fall-through-Skylight Fatalities/year

# Safety Design Solutions



**Skylight guards**



**Non-fragile skylights**



**Safe access and guardrails  
for skylight banks**

# Message to Architects:

...PtD does NOT mean overriding aesthetic choices  
...it means addressing safety during design.



# Example 1: Heat Island Reduction Credit 7.2 for Vegetative Roofs



**Weeds growing on green roof.  
No access or fall protection for plant maintenance work.  
No language in credit about fall prevention**

Photo: Mike Behm



## **Vegetative Roof**

**Wind has blown soil and vegetation off 46<sup>th</sup> floor green roof.  
Eight inch high parapet with no fall protection.  
Workers must “be careful”.**

Photo: Mike Behm





**Add requirement for  
“Safe Roof Plan”:**

**Provide for safe access**

**Provide for fall protection via:**

- Parapet**
- or Guard rail**
- or Roof-edge fall restraint system**
- or Horizontal lifeline fall arrest system**



Photo: Matt Gillen

# Safety-enhanced credits

## Example 1

ORIGINAL (Excerpt)

### ***Sustainable Sites Credit 7.2 Heat Island Effect –Roof***

#### ***OPTION 2***

*Install a vegetated roof that covers at least 50% of the roof area.*

*Develop and implement a safe roof plan to prevent falls and other vegetative roof installation and maintenance hazards.*

## **Example 2: Construction Indoor Air Quality Credit**

**Construction generates contaminants. Credit provided for sealing ductwork and other measures during construction.**

**Construction worker exposures are orders of magnitude higher than those for occupants...but they get no benefit from duct sealing.**

**Using plastic to seal and protect duct work from contamination at LEED Platinum building.**  
Photo: Matt Gillen

## Add language on use of source reduction and control measures as preferred option

Measures that “**control at the source**” reduce exposures for both construction workers... and ductwork.



Figure 1. Grinder in use with the control in place.

# Safety-enhanced credits

## Example 2

ORIGINAL (Excerpt)

### ***IEQ 3.1: Construction Indoor Air Quality Management Plan – During Construction***

- *During construction, use source reduction and control methods to minimize contaminant generation. Restrict all cutting, drilling, grinding, sanding, or disturbance of materials to tools equipped with either local exhaust ventilation or wet suppression controls.*
- *During construction, meet or exceed the recommended control measures of the SMACNA IAQ 008-2008 Guidelines for Occupied Buildings Under Construction*
- *Protect stored on-site and installed absorptive materials from moisture damage*
- *If permanently installed air handlers are used during construction, use filtration media with minimum MERV of 8 at each return air grill as determined by ASHRAE 52.2-1999 . Replace all filtration media immediately prior to occupancy.*

NOTE: SMACNA IAQ 008 does mention source control... but as one of several choices versus a required approach

# Evaluating green practice risks

**NIOSH VIEW: “Sustainable practices and green technologies, products and processes need to be evaluated for worker safety and health just like any other new job, product or practice.”**

NIOSH Science Blog: *Going Green: Safe and Healthy Jobs*, 1/4/2010

**RISK = HAZARD X EXPOSURE**

## **Construction context for risk evaluation**

**Conventional construction already involves risks....  
and already requires precautions to manage and control risks....**

**So how are green projects different?**

# How do green practices create risk?

**GREEN  
CONSTRUCTION...**  
recycling the wood forms

**CONVENTIONAL  
CONSTRUCTION...**  
not recycling  
the wood forms

For this task,  
**STRUCK BY**  
hazards and  
exposures  
are identical

LEED Gold Project, Washington, DC  
Photo: Matt Gillen



# Three helpful questions for evaluating green technologies/practices:

## 1. Do they introduce **NEW** or **different** hazards compared to conventional approaches?

If yes, then assess both the **hazard** and **exposures**.

- Use design, then safe procedures to prevent or control.
- Integrate these new precautions into the green practice.

### EXAMPLE

Photovoltaic Panels:

**New type of hazard because electrical energy source cannot be switched off unlike other electrical installations.**



## 2. Do they involve **KNOWN** hazards? EXAMPLE:

If yes, assess the **exposures** and compare to conventional practice

### Increased exposures

- Use design, then safe procedures to reduce exposures
- Integrate safer designs and precautions into green practice

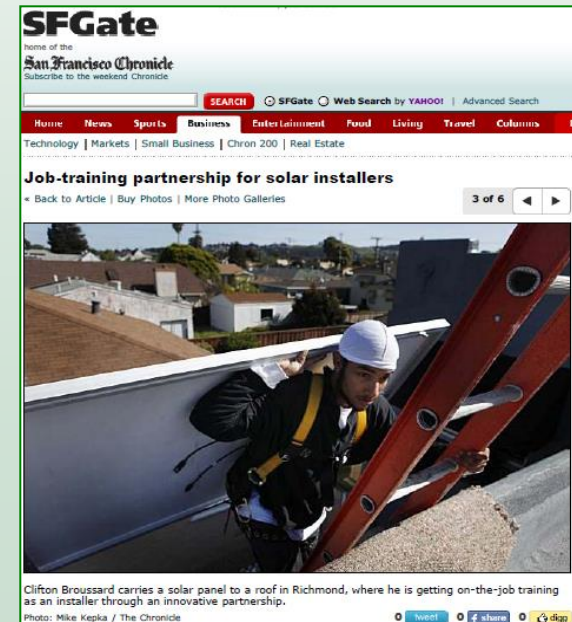
### Equivalent exposures

- Consider reducing further
- Integrate known precautions into green practice.

### Lower exposures

- Recognize value as “Co-Benefit”
- Integrate precautions into green practice.

**Photovoltaic Panels:**  
**Increased exposure to known fall hazards from ladders and roofs because installation and maintenance involve new work at height.**



### 3. Are the practices **NEW** to these employer and worker communities?

**When familiar** → more likely that existing work procedures already incorporate S&H precautions.

- Check to insure current precautions are adequate. Improve if needed.

**If novel** → lack of familiarity makes it less likely that trades and groups are aware of S&H precautions.

- Communicate and train; highlight and integrate precautions into green practice

#### **EXAMPLE:**

**Photovoltaic panels:**

**Most electrical installation work is done inside the building. Electrical contractors may be less familiar with extensive roof work. They need training on fall protection and use of harnesses and other equipment.**

# Green Construction Risks: Contributing Factors

- Some green practices and technologies are “NEW”
  - Established safe practices less likely.
- Tendency to assume that green is safer
  - Architects, Engineers, and Green Professionals less likely to request a review of hazards & exposures.
- Still uncommon for S&H staff to be included in the design and planning process
  - OSH input/precautions not provided early in process.

**Lag time for recognizing hazards and exposures**  
**Lag time for development and routine use of precautions**

# LEED does include some “CO-BENEFITS” for worker health and well-being

## Building Occupants

Major LEED focus

Largest worker group – lowest risk

## Custodial

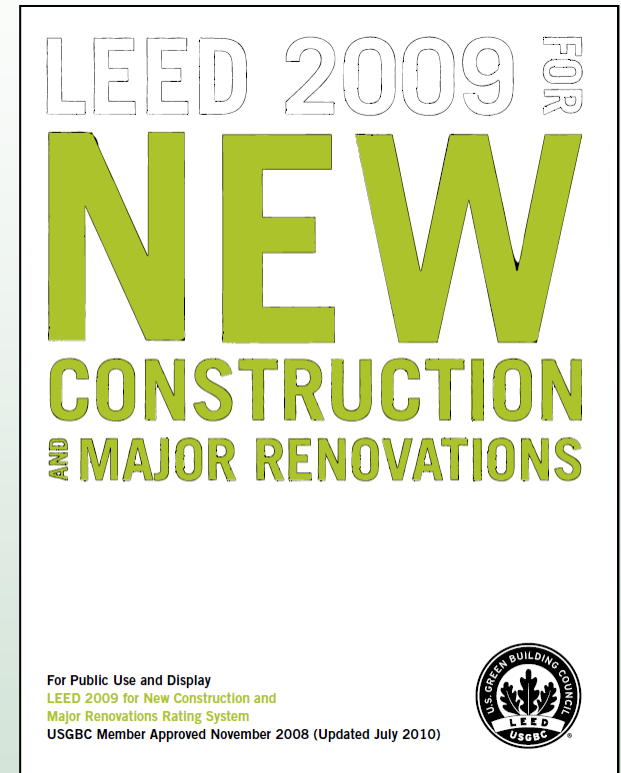
Minor LEED focus

Smaller worker group – medium risk

## Construction/Maintenance

Minor LEED focus

Smaller worker group → **highest risk potential**



For Public Use and Display  
LEED 2009 for New Construction and  
Major Renovations Rating System  
USGBC Member Approved November 2008 (Updated July 2010)



**Focus for NIOSH Office of Construction Safety and Health**

# For Building Occupants

**Well-being** – variety of credits addressing better lighting, views and daylight, thermal comfort, bike facilities

**Health** – Enhanced indoor air quality: commissioning, low-emitting paints and coatings, adhesives and sealants, flooring systems, composite wood products, furniture, ceiling and wall systems, and indoor chemicals.



# For Custodial workers

LEED Existing Buildings:  
Operations and Maintenance Credits

## Health

### Prerequisite: Green Cleaning Policy

*“To reduce levels of chemical, biological and particulate contaminants that can compromise air quality, human health, building finishes, building systems, and the environment”.....Develop guidelines addressing the safe handling and storage of cleaning chemicals used in the building, including a plan for managing hazardous spills or mishandling incidents”*

### Credit: Green Cleaning –Products and Materials

*“At least 30% of total annual purchases must meet...Green Seal GS-37 or others.*  
[Note: these limit toxics, carcinogens, mutagens, reproductive toxins, asthmagens]

### Credit: Green Cleaning –Equipment

*“To reduce chemical, biological and particulate contaminants from powered cleaning equipment....“Powered equipment is ergonomically designed to minimize vibration, noise and user fatigue.”*

# For Construction/Maintenance workers

## Health and Well-Being

### Credit: Low emitting materials

*“To reduce the quantity of indoor air contaminants that are odorous, irritating, and/or harmful to the comfort and well-being of **INSTALLERS** and occupants.”*

(See also LEED 4.2, 4.3, 4.4)

### Credit: Construction Indoor Air Quality Management Plan – During Construction

*“To reduce IAQ problems resulting from construction or renovation and promote the comfort and well being of **CONSTRUCTION WORKERS** and building occupants.”*

# Big Picture

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



# LEED Gaps and Limitations

- Safety (injury) not addressed
  - Important for construction/maintenance
- Scant mention of need for S&H planning & precautions
- IEQ Credit limitations ←
  - Only 7 of the total of 110 points for 2009 LEED have the primary intent of limiting hazardous chemicals within the built environment.
  - It is possible to attain LEED PLATINUM without earning any of these credits.

NOTE:  
Effectiveness of  
IEQ credits and  
air quality  
testing  
requirements is  
an active topic  
for AIHA Green  
Building  
Working Group

See Wargo et al. [2011] *LEED Certification: Where Energy Efficiency Collides with Human Health* <http://www.ehhi.org/reports/leed/> for additional discussion on IAQ credit limitations and pesticides, smoking, and toxics.

## LEED Updating – possible S&H Co-benefits from new draft credits?

- Material Ingredient reporting
- Avoidance of Chemicals of Concern
- PBT Source Reduction: Mercury
- PBT Source Reduction: Lead, Cadmium, Copper
- Furniture and Medical Furnishings
- New credits to further improve IAQ

LEED Building Design & Construction, 4<sup>th</sup> Public Comment draft

PBT= Persistent Bioaccumulative Toxic

LEED v4 due  
out in 2013

# Reference Guide materials

## LEED Credits:

Short (1/2 to several pages)

Focus → “What to do”

## LEED Reference Guide:

Longer (multiple pages)

Focus → “How to do it”

A “user guide” containing relevant technical information such as: definitions, benefits and issues to consider, approaches to achieve credits, examples, calculations, documentation, operations and maintenance considerations, and resources.

Safety and health content for the Reference guide was developed for the six safety enhanced credits described above.



# Reference Guide content example

## Credit 7.2: REFERENCE GUIDE

### 1. Benefits and Issues to Consider

*Vegetated roofs present fall hazards to construction workers building the roof; landscaping workers installing the vegetation; and landscaping or maintenance workers providing periodic care for vegetated roofs.*

### 4) Implementation

*Elements of a Safe Roof Plan*

*1. Structural Integrity.*

*2. Fall prevention / protection. (5 options described)*

*3. Safe access. (2 options described)*

*4. Unique building hazards. (Glare, heat stress, toxics, & electrical hazards)*

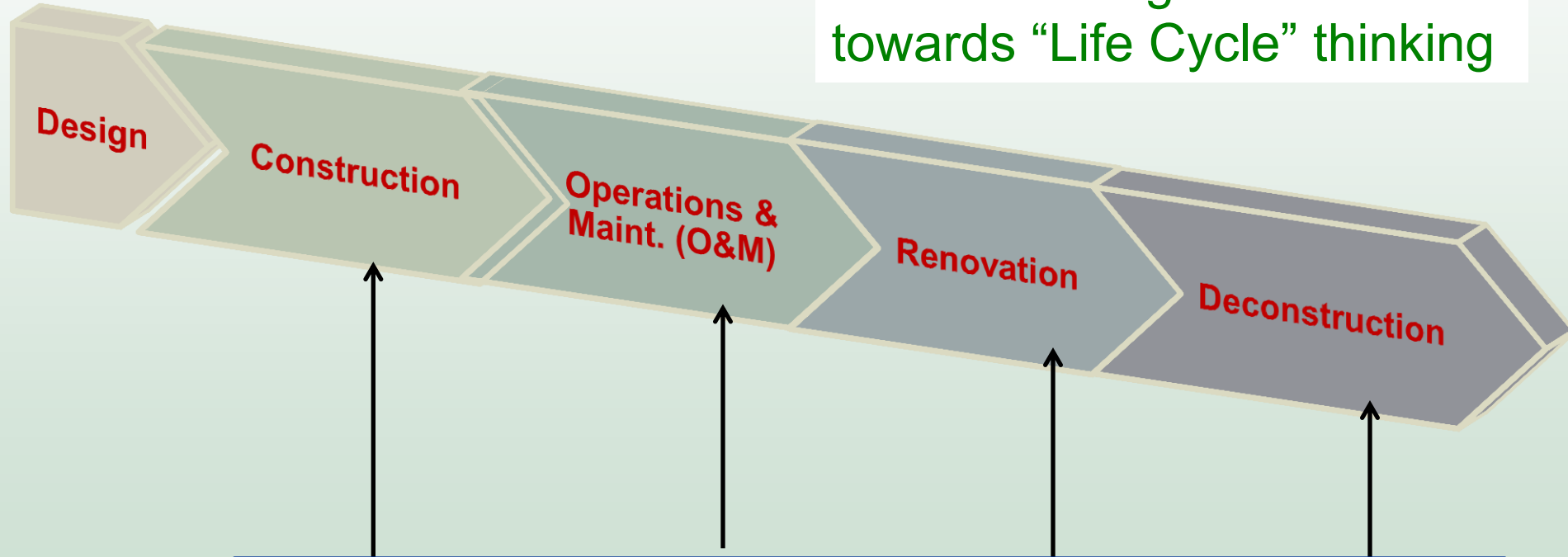
### 7) Documentation Guidance

*Include description of safe roof plan design features and document implementation. Describe provisions for safe maintenance of vegetative roofs over the Building Life Cycle.*

# Four Strategies for integrating safety and health into Green Building

## 1) “Life Cycle Safety”

Green building is oriented towards “Life Cycle” thinking



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

# Operations & Maintenance

## EXAMPLE:

**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

# Life Cycle Safety Benefits

## Appeals to Facility Owners

- ✓ Improved safety & health for O&M workers
- ✓ More cost-effective O&M.
- ✓ Lower renovation costs.
  - ✓ Example: if have permanent fall protection, do not need to pay to install and remove temporary fall protection.

**Aligns with efforts to improve facility operational efficiency over the long term.**

## *Total cost of ownership*

Design and construction

→ typically 5 to 10%

Operation and maintenance

→ as much as 80% [NRC]

“Reduced Operating Costs” cited as top (77%) reason for client interest in green design. [McGraw Hill]

NRC. [1998] Stewardship of Federal Facilities: A Proactive Strategy for Managing the Nation's Public Assets. Washington, D.C.: National Academy Press.

McGraw Hill. [2012] Construction Industry Workforce shortages: Role of Certification, Training, and Green jobs in Filling the Gaps. SmartMarket Report

## 2) Target Falls from Roofs

### Rationale:

- A. Falls → leading killer of construction workers
  - Falls from roofs → leading source of construction falls.
  
- B. Several relevant LEED credits
  - **Daylighting (skylights)**
  - **Heat Island reduction (vegetative and reflective roofs)**
  - **Energy production (rooftop solar and wind installations)**
  
- C. Good safety issue to start with: risks are easy to grasp



D. Fall hazards are amenable to prevention by **DESIGN** and **PLANNING** interventions to improve access and fall protection.

- Parapets
- Guardrails
- Folding guardrails
- Fall-restraint systems
- Fall-arrest systems
- Equipment location setback approaches

Various solutions  
are on the market

## Rationale cont.

- E. Green roofs involve a variety of Life cycle steps: from inspection to maintenance to replacement. Some examples:

### Vegetated roofs:

“Some vegetated roofs are actual gardens and **require significant plant care**; others have grasses and other plants that require no maintenance or irrigation. **All types of vegetated roofs require semi-annual inspection**”  
(LEED Reference Guide p 122)

### Reflective (cool) roofs:

“**Materials with high reflectivity must be cleaned to maintain their heat island reduction properties.** These surfaces should be cleaned at least every 2 years to maintain good reflectance.  
(LEED Reference Guide, p125)

### F. Trend → Increasing use of roofs

- Recreational amenity for occupants
- Popularity of Green roofs
- Location for Photovoltaic (PV) solar panels
- Access for maintenance of high efficiency HVAC equipment and communications equipment.

Planning to develop a “**Safe Roof Design Guide**” to describe roof-related Life Cycle safety issues and design and planning options.

# 3) Integrated Project Planning and Design

→ Opportunity for PtD “Safety Design Review”

LEED (4<sup>th</sup> public comment draft)

*Intent: Maximize opportunities for integrated, cost-effective adoption of green design and construction strategies, emphasizing human health as a fundamental evaluative criterion for building design, construction, and operational strategies....*

Credit calls for Integrated Project team and design charette

**Lists 27 different professionals to consider ....**

**but occupational safety and health not mentioned.**

## 4): Increase use of “Source Reduction” and “Source Control”

- LEED already includes health focus.
- Source reduction is at the top of the environmental hierarchy.
- Existing credits/prerequisites could benefit construction and O&M workers.
  - Construction Activity Pollution Prevention
  - Construction IAQ Management Plan
- Double benefit
  - Reduces both construction worker exposures and the contaminant levels available for public exposure or building contamination.



# Summing Up:

## **NIOSH VISION: Get S&H recognized as a fundamental dimension of true sustainability**

- Support dialogue → *“Making Green Jobs Safe”* workshop
- NORA evaluation and outreach activities
- Engaging USGBC → pilot credits and reference guide materials, awareness materials
- Support for research
- Targeting green jobs for FACE investigations

# Comprehensive SCSH Rating System



SUSTAINABLE CONSTRUCTION  
SAFETY & HEALTH

[About](#) [News](#) [Links](#) [Contact Us](#) [Support](#)



## SAFE. HEALTHY. GREEN.

*Help us build worker well-being into sustainable design & construction*

### Sustainability, Safety, and Health

#### **Welcome to the SCSH rating system**

The Sustainable Construction Safety and Health (SCSH) rating system evaluates construction worker safety and health on construction projects. SCSH enables a project team to plan and assess safety and health performance throughout a project's lifecycle.

By working together, owners/developers, designers, constructors, and other project team members can positively impact construction worker safety and health.....**which improves project sustainability as well!** [Read more...](#)

#### ASSESS A PROJECT

Use the online calculator

#### REQUEST AN AUDIT

Certify your project

#### SCSH OVERVIEW

#### CASE STUDIES

#### CALCULATOR TUTORIAL

#### SCSH ROUNDTABLE

Developed by Sathy Rajendran and  
John Gambatese at Oregon State  
University

<http://sustainablesafetyandhealth.org/>

LEAVE A NOTE

# Research: New publications

## Safe design of skysrise greenery in Singapore

Michael Behm

Occupational Safety Program, East Carolina University, Greenville, North Carolina, USA, and

Poh Choon Hock

CGUE Research, Centre for Urban Greenery and Ecology, Singapore, Singapore

### Abstract

**Purpose** – Singapore is transforming from a “garden city” to a “city-in-a-garden”. Designing for safety is recognized by researchers and some governments as a best practice in facilitating eventual worker safety within the built environment. The purpose of undertaking this research was to understand

and design observations. Findings principles found. Original green Key Paper

## Safety Risk Quantification for High Performance Sustainable Building Construction

Katherine S. Dewlaney, S.M.ASCE<sup>1</sup>; Matthew R. Hallowell, A.M.ASCE<sup>2</sup>; and Bernard R. Fortunato III<sup>3</sup>

**Abstract:** A recent study found that Leadership in Energy and Environmental Design (LEED) certified buildings have a recordable injury rate that is 9% higher than traditional, non-LEED buildings. A follow-up study showed that there are distinct aspects of the design elements and means and methods of construction used to achieve LEED certification that have negative impacts on worker safety. The research described in this paper builds on previous knowledge by quantifying the percent increase in base-level safety risk resulting from the design

strategies and conducted with 18 years of experience in environments. 24% increase in eye strain wastewater treatment awareness, and Society of Civil

### Technical Note

## Safe Design Suggestions for Vegetated Roofs

Michael Behm<sup>1</sup>

**Abstract:** Rooftop vegetation is becoming increasingly popular because of its environmental benefits and its ability to earn green-building certification credits. With the exception of one international guideline, there is little mention of worker safety and health in vegetated-roof codes and literature. Observations and field investigations of 19 vegetated roofs in the United States revealed unsafe access for workers and equipment, a lack of fall-protection measures, and other site-specific hazards. Design for safety strategies and the integration of life-cycle safety thinking with green-building credits systems are the preferred methods to reduce risk to workers on vegetated roofs. Design suggestions have been developed to add to the body of knowledge. The findings complement several National Institute for Occupational Safety and Health (NIOSH) construction and prevention through design (PtD) goals and are congruent with NIOSH's Safe Green Jobs initiative. Organizations that install and maintain vegetated roofs can utilize the findings to understand hazards, take precautions, and incorporate safety into their bids. DOI: 10.1061/(ASCE)/CO.1943-7862.0000500. © 2012 American Society of Civil Engineers.

**CE Database subject headings:** Vegetation; Roofs; Design; Safety.

**Author keywords:** Vegetated roof; Safe design.

## Are Green Building Features Safe for Preventive Maintenance Workers? Examining the Evidence

Mohamed Shamun Omar, scd,<sup>\*</sup> Margaret M. Quinn, scd,  
Bryan Buchholz, PhD, and Ken Geiser, PhD

**Background** Many newly constructed green buildings (GB) are certified using the United States Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) rating system for new construction and major renovation which focuses on architectural and mechanical design to conserve energy, reduce environmental harm, and enhance indoor quality for occupants. This study evaluated the preventive maintenance (PM) worker occupational safety and health (OSH) risks related to the design of GB.

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### Construction Safety

Peer-Reviewed



## LEED Credits

### How They Affect Construction Worker Safety

By John Gambatese and Nicholas Tynmios

The number of buildings certified by the U.S. Green Building Council's (USGBC's) Leadership in Energy and Environmental Design (LEED) rating system continues to grow. According to USGBC (2010), more than 34,600 LEED-certified and -registered construction projects have occurred as of August 2010. An increasing number of federal, state and local agencies are augmenting their policies to mandate that the design and construction of public buildings in their jurisdiction be LEED certified or equivalent (Environment and Human Health Inc. 2010).

To achieve LEED credits, owners, designers and contractors incorporate green features into site selection and project design, and complete the construction work using green materials and practices. Examples of green elements are the use of reclaimed materials from demolished buildings, the implementation of green roofs and the use of alternative sources of energy to power the facilities. For example, one site used temporary protection of HVAC ducts during construction as part of the LEED ef-

orts on a project to eliminate contaminants within the HVAC system and improve indoor air quality. The intent is to reduce the project's energy and environmental impacts.

As the number of LEED-certified projects grows, there has been increasing awareness and concern about the potential effect that green features have on occupational safety and health (OSH). Compared to traditional design and construction practices, green features may pose additional or new risks to worker safety and health through the introduction of alternate materials, as a result of different or additional work, or by creating an expanded or unintentionally hazardous work environment.

Based on practical experience, Walsh (2011), indicates that some aspects of buildings related to LEED, such as increased use of windows and skylights, installing photovoltaics on roofs, and recycling building materials that are heavy or contain protruding rebar or sharp edges, have the potential to increase safety hazards. Research corroborates this experience with regard to skylights and installing photovoltaic panels (Gerhold, 1999).

The potential green features to create OSH hazards also came to light during the construction of the City Center project in Las Vegas, NV. While the project attained multiple LEED certifications for its design and construction efforts, it experienced numerous fatalities along with concerns about safety and health related to the construction methods designed to achieve LEED credits (Gittleman, Halle, Stafford, et al. 2009; Silms, 2009). The extent to which green design and construction has expanded throughout the construction industry in-

**IN BRIEF**  
There is a growing awareness that green design and construction practices may affect construction worker safety.  
An in-depth review of the LEED-NC rating system for new construction found that many of the credits do not influence construction worker safety, while other credits may produce either a positive or a negative effect.  
In some cases, attaining the LEED-NC credits may increase the amount of exposure to, or extent of, hazards that already exist on the construction site.  
Suggested modifications to the LEED-NC credits have been developed to mitigate their effect on construction worker safety and aid in ensuring that green buildings are also safe to construct.

John Gambatese, Ph.D., P.E., is a professor in the School of Civil and Construction Engineering at Oregon State University. He earned a B.S. and an M.S. in Civil Engineering from the University of California at Berkeley and a Ph.D. in Civil Engineering from the University of Washington. He has worked in industry as a structural engineer and as a project engineer for construction. He started his current position in 2001 after 13 years on the faculty at University of Nevada, Las Vegas, and 1 year as an acting assistant professor at the University of Washington. Gambatese has taught courses on construction contracts and specifications, construction safety and productivity improvements, planning and scheduling, structural analysis and design, temporary construction structures and engineering economics. He has performed research and published numerous articles on construction worker safety, sustainability,

constructability, innovation, construction contracting and life cycle properties of civil engineering facilities. He is a member of the American Society of Civil Engineers (ASCE) and ASSE, and actively participates on ASCE's Prevention through Design Committee, Construction Site Safety Committee, Constructability Committee, and Construction Research Council.

Nicholas Tynmios is a Ph.D. student in the School of Civil and Construction Engineering at Oregon State University. His educational background includes a B.S. and an M.S. in Civil Engineering from Purdue University with emphasis in structural engineering. After completing his M.S., he worked at a steel fabrication company in Cyrena, for 4 years.



# Get involved....

- ✓ **Have a “Green” or “Sustainability” program?**
  - Embed safety and health into it.
- ✓ **Building or renovating?**
  - Get involved in “**Integrated Project Planning**” so that S&H is considered at the design stage. Ensure that a “**Safety Design Review**” is done to consider “**Life Cycle Safety**”.
- ✓ **Have green features?**
  - Share information about good experiences (“Co-benefits”) or any problems.
- ✓ **Member of USGBC?**
  - use your influence to address S&H.
- ✓ **Got ideas? Or like to pilot new ideas?**
  - contact us to pilot test new credit and guidance ideas

# Thanks!

**Matt Gillen**

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**NIOSH Office of Construction Safety and Health**

**395 E St SW, Washington, DC 20201**

Thanks also to:

Christine Branche, Director,  
NIOSH Office of Construction Safety and Health

Brian Kleiner and Mike Behm, NORA Green Construction Co-Chairs  
NORA Green Construction Coordinating Committee members

**<http://www.cdc.gov/niosh/topics/construction/>**

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