Investigating Fall Fatalities and Injury Claims on Prevention Efforts

Moderator:

Scott P. Breloff, Ph.D
Detailed as the Coordinator for the NIOSH Office of Construction Safety and Health
Biomedical Research Engineer

Panel:

Characteristics of Workers and Employers Involved in Construction Falls
Dr. Todd Schoonover, Washington State Department of Labor & Industries, SHARP Program
Washington FACE

Does Experiencing an Injury Claim Impact Small Construction Company Leaders' Participation in a Fall Protection Survey?
Dr. David Hurtado, Oregon Health & Science University, Oregon FACE

Fatal Construction Falls in Michigan: Tracking and Outreach for Prevention
Dr. Anthony Oliveri, Michigan State University, Department of Medicine, Occupational and Environmental Medicine, Michigan FACE

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Characteristics of Workers and Employers Involved in Severe Construction Falls

Dr. Todd Schoonover, Randy Clark, Eva Glosson - Washington FACE

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Definition of severe fall injury in construction

- Worker Injury claim
  - Source: WA State workers' compensation system
  - Worker hospitalized within one day of injury.
  - Compensable claim: Injury involving wage replacement for missed work, disability, or death.
- Construction industry
  - All NAICS 23 because risk classes are not restricted to a single industry
- Falls
  - Includes OIICS V1.01 10: fall, unspecified; 11: fall to lower level. Use most detailed level.
- Injury date
  - 2015-2019

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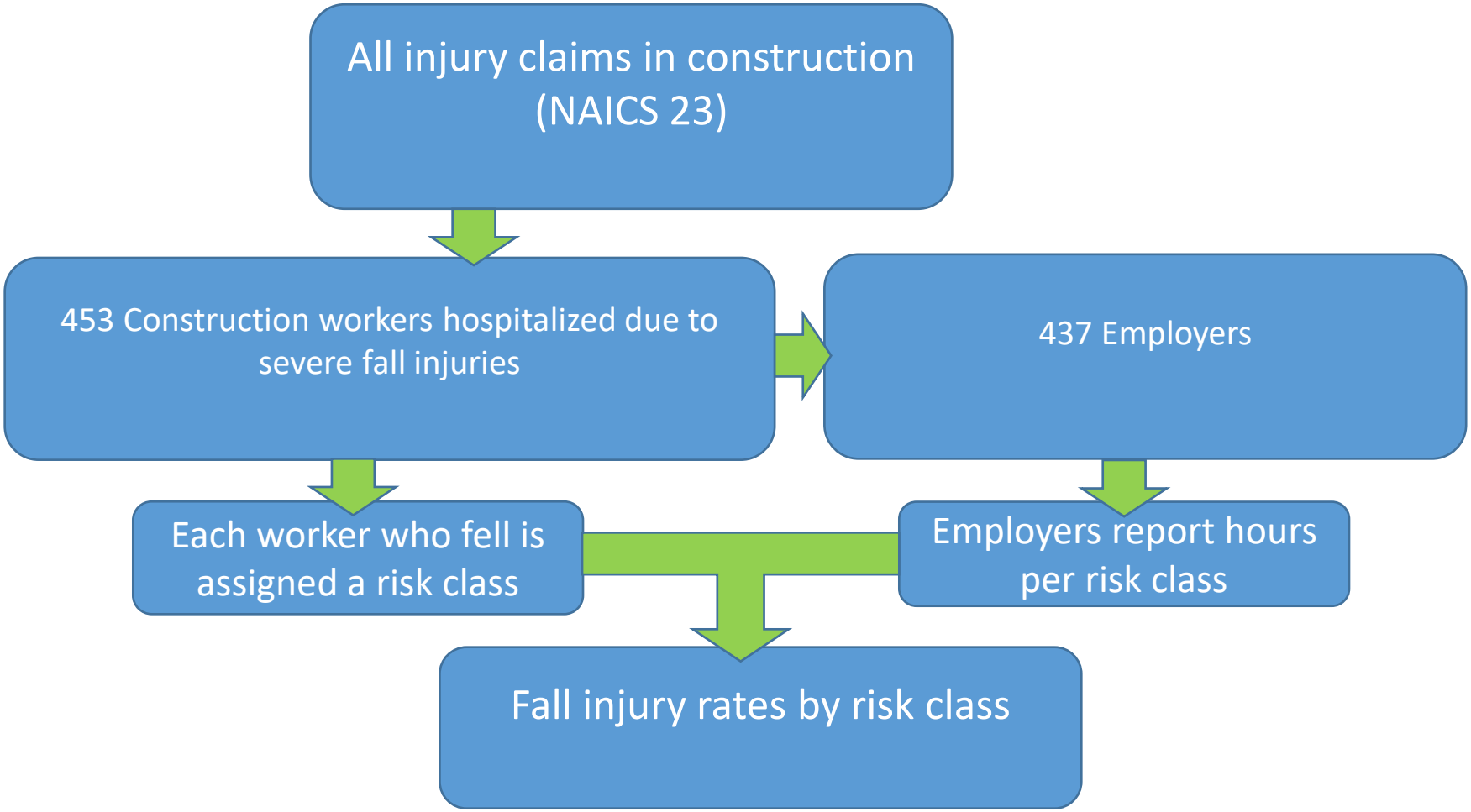

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What are risk classes and why use them?

WA Risk Class compared to NAICS Industries

	WA Risk Classes	NAICS Industries
Purpose	Describes the risks workers face	Describes the economic activity
Number	Most employers have multiple risk classes	Single classification
How assigned	By risk specialist during visits or record reviews	By employer services during licensing
Use	Determine an employer's workers' compensation insurance rates	No influence on employer's workers' compensation insurance rates
Accuracy	Updated periodically	Rarely updated

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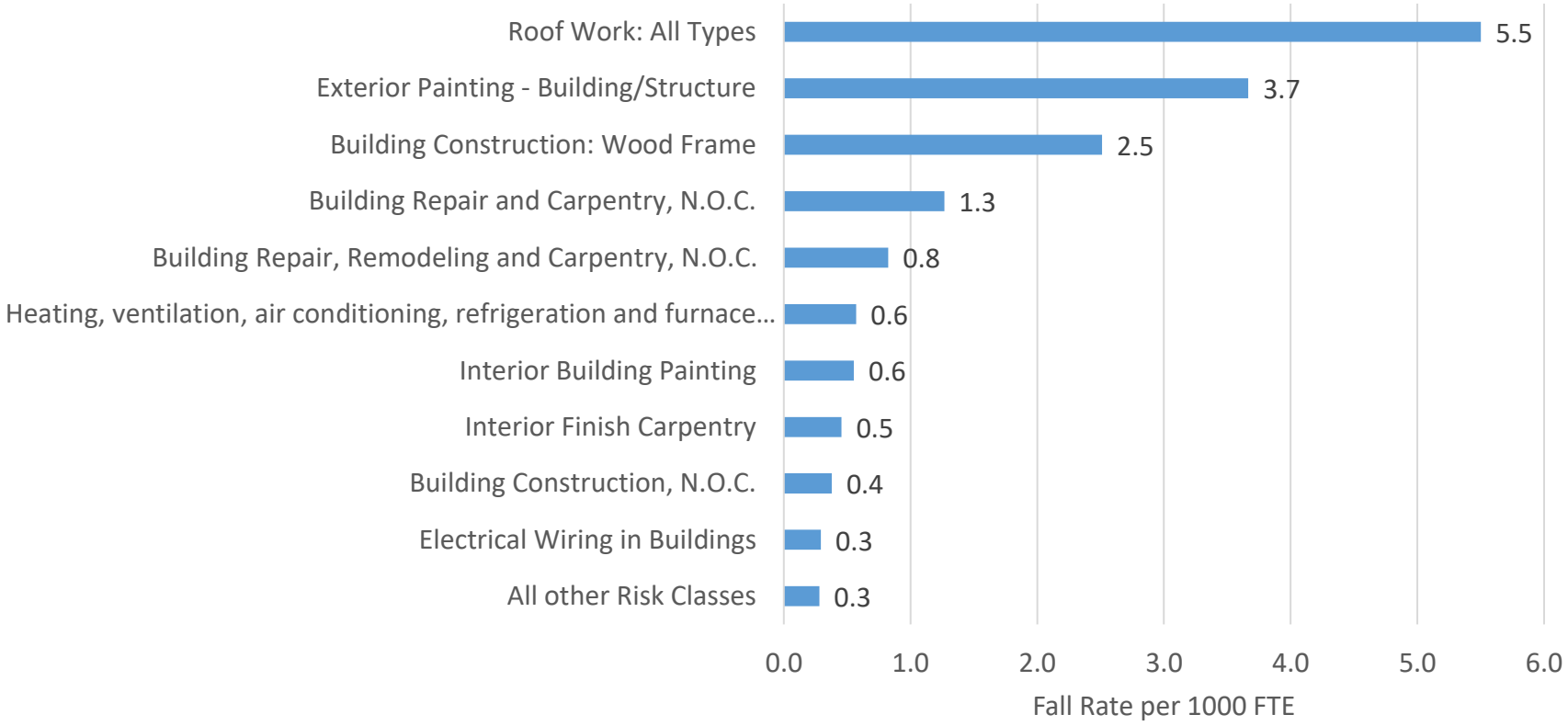
Fall Rates by Risk Class

WA WC claims data, 2015-2019



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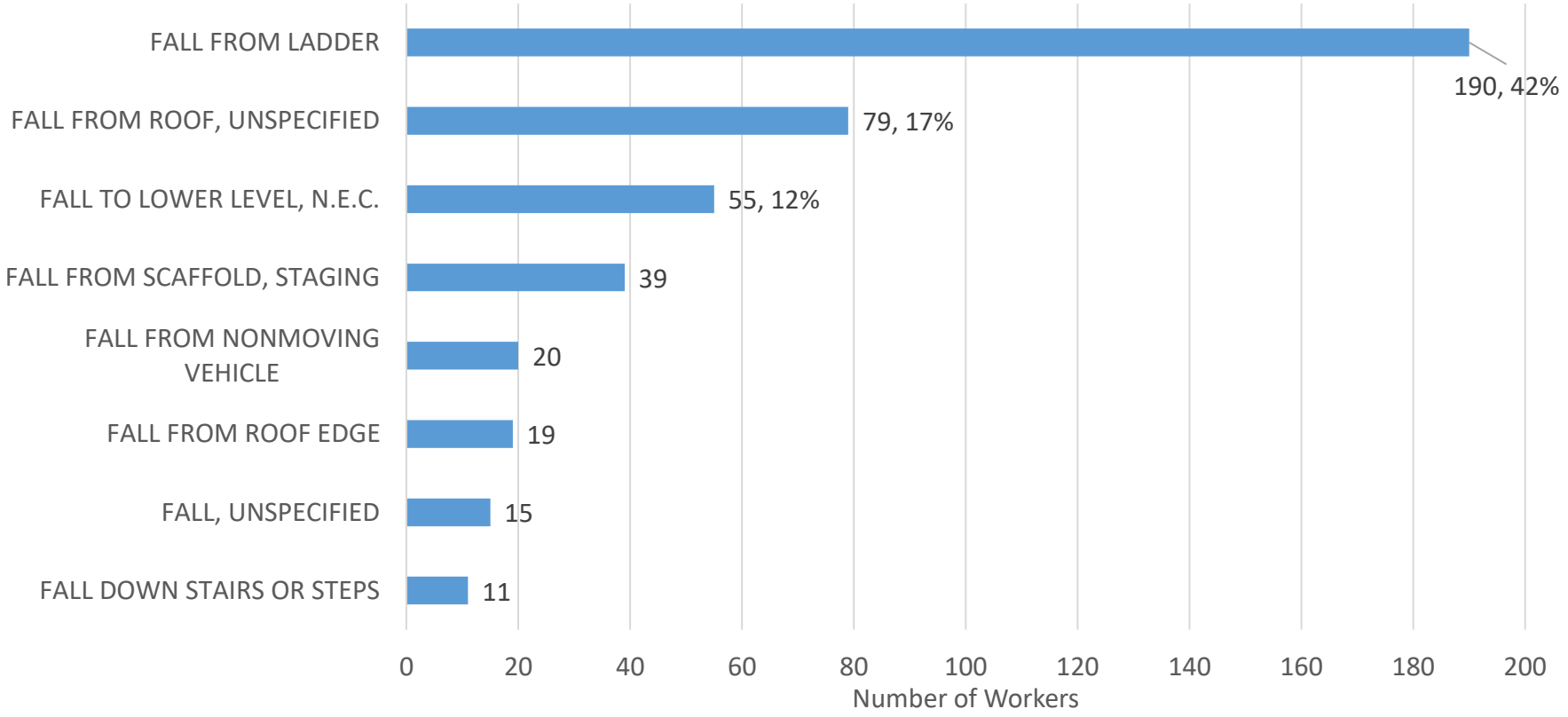
Number of Falls by Event Type

WA WC claims data, 2015-2019



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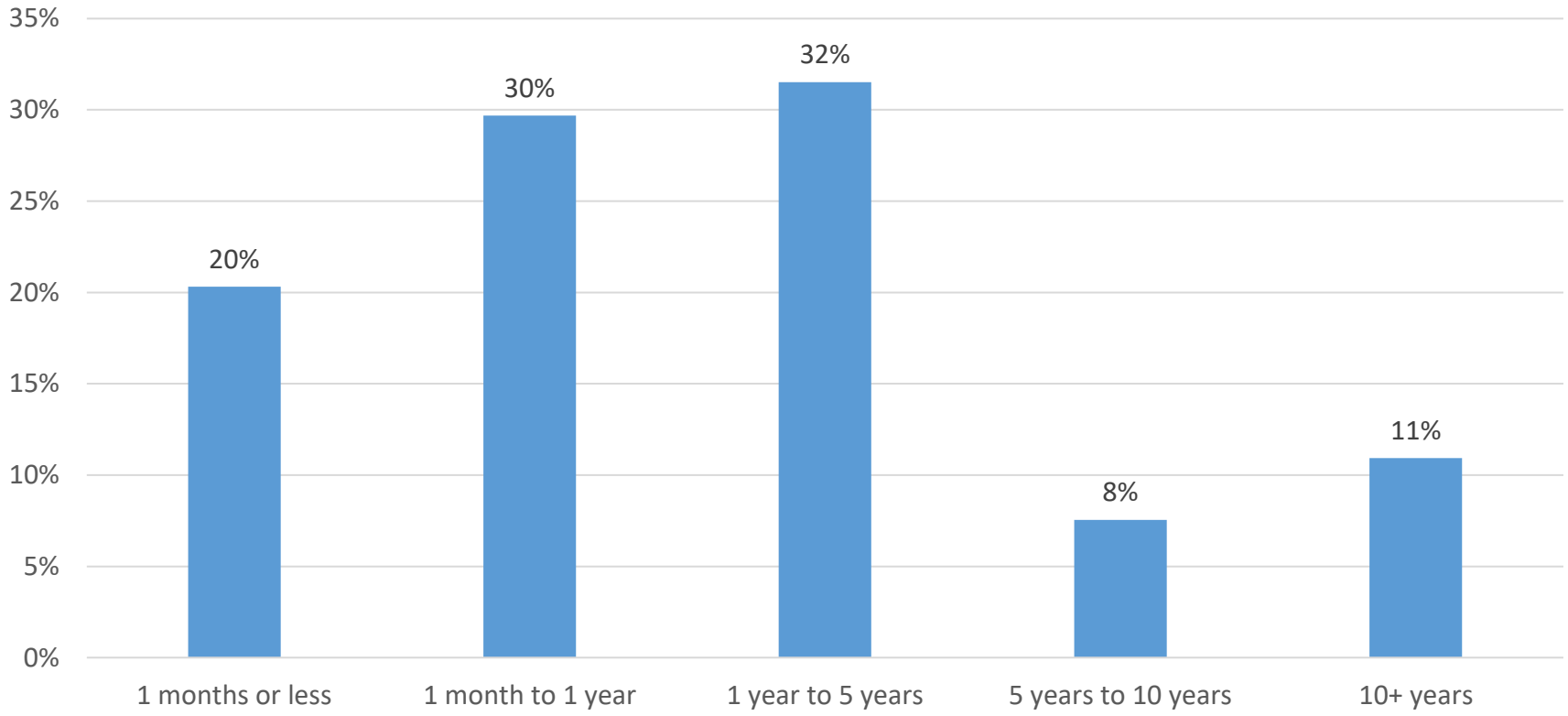
Worker Time with Employer

WA WC claims data, 2015-2019



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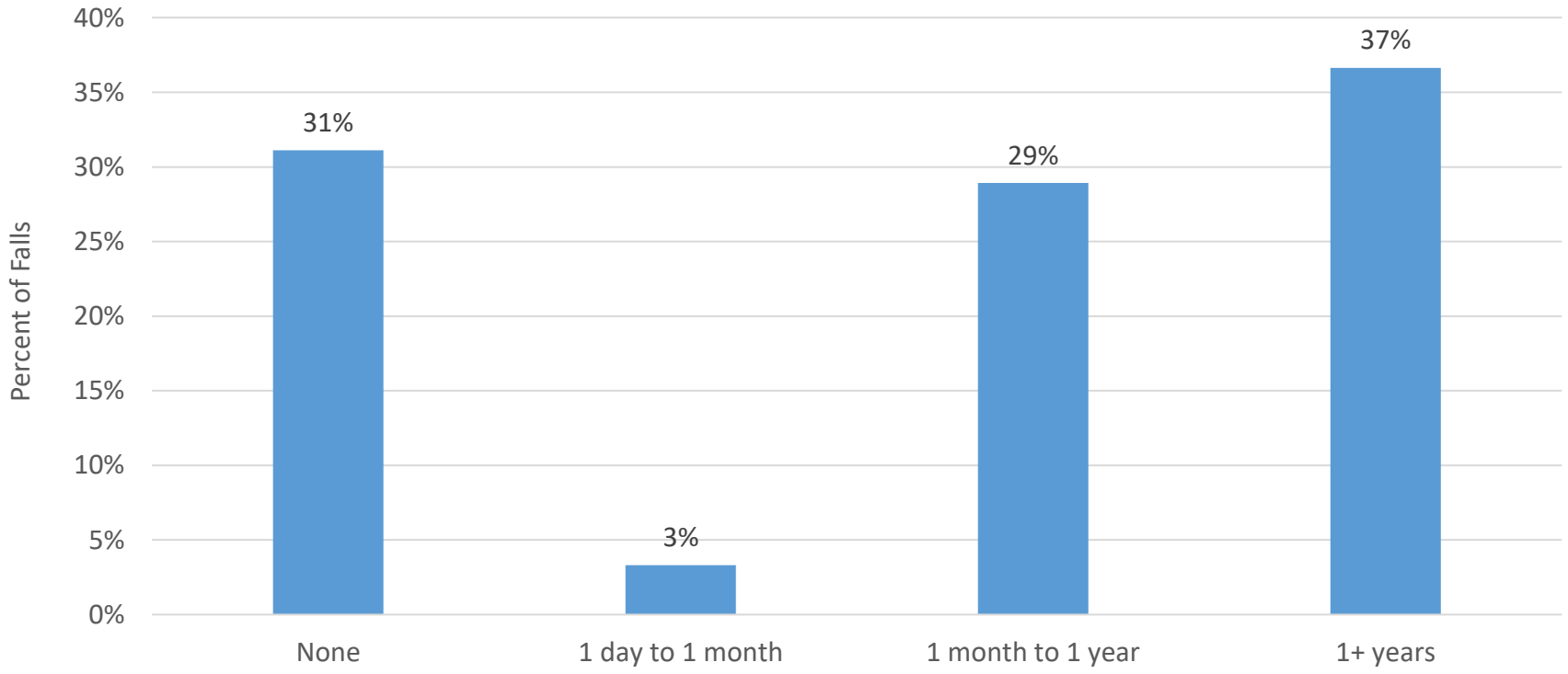
Paid Time Away from Work

WA WC claims data, 2015-2019



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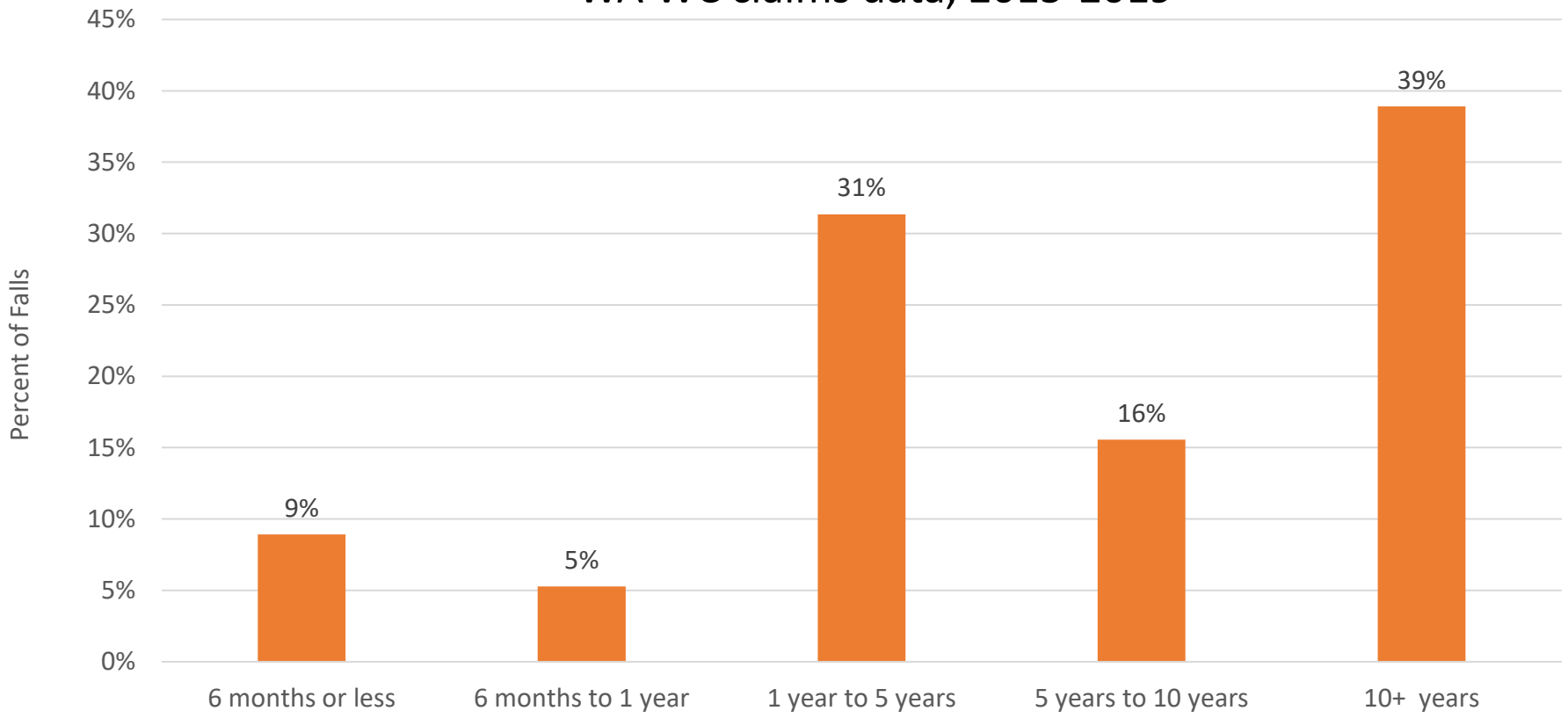
Employer Time in Business

WA WC claims data, 2015-2019



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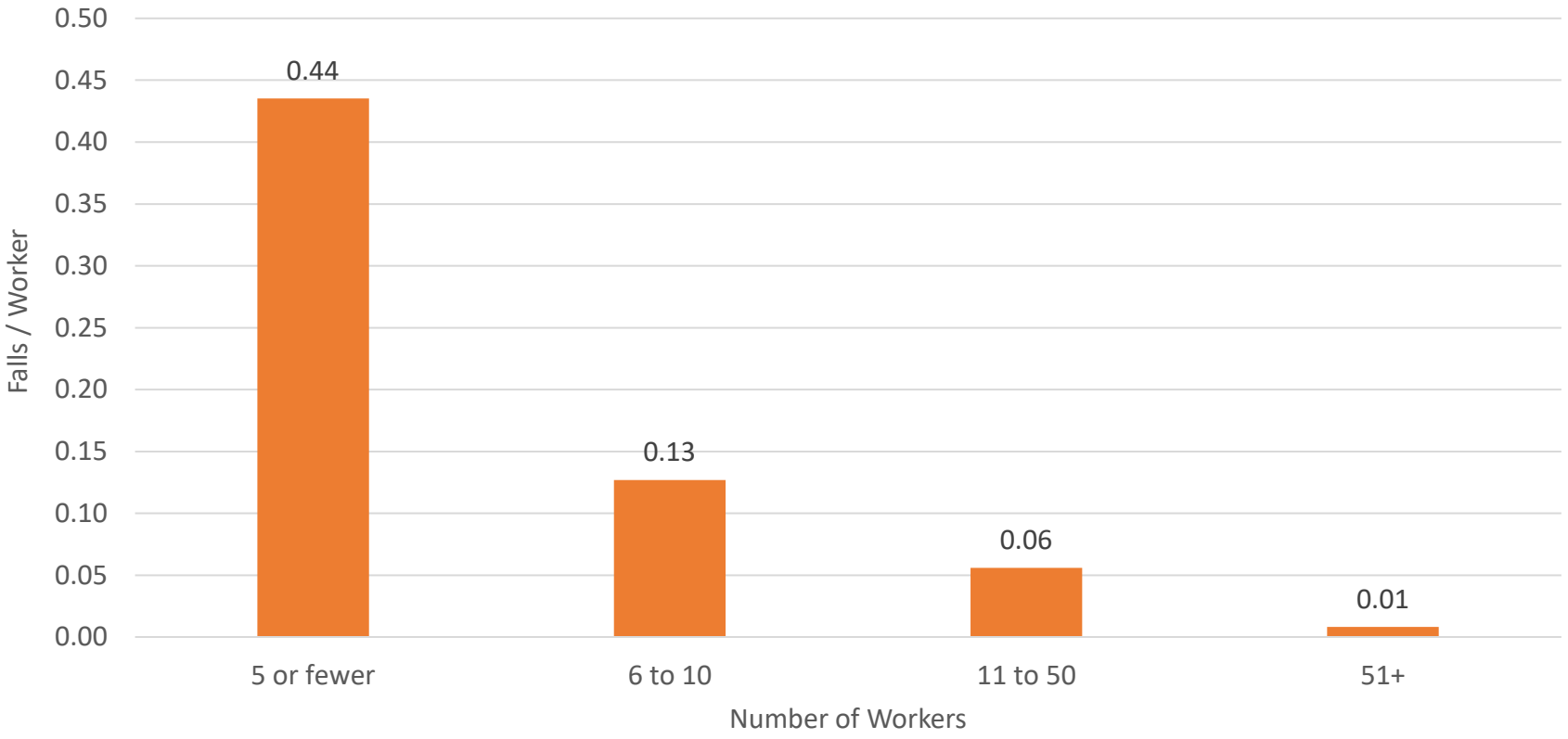
Falls / Worker

WA WC claims data, 2015-2019



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Summary

- Workers classified in roof work, exterior painting, and wood frame construction risk classes suffered falls at the highest rates.
- Workers fell from ladders and from and through roofs most frequently.
- Half of the workers experienced a fall within the first year with the employer.
- 37% of workers who fell were away from work for a year or more.
- Fall rates were highest among smaller employers and consistently lower as employer size decreased.

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Actions

- Communicate information about severe falls by risk class, event, worker tenure, and employer size to WA OSHA and construction apprentice programs.
- Focus more fall prevention efforts toward:
  - Employers doing roof-related work.
  - Interior and exterior painters.
  - Small construction employers.

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Limitations

- Fall rates by risk class are not reproducible by others and difficult to compare.
- Mismatch between assigned risk class and task that was being done when worker fell.
- Worker tenure is self-reported and not all workers reported.

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Does Experiencing an Injury Claim Impact Small Construction Company Leaders' Participation in a Fall Protection Survey?

David Hurtado, Leah Greenspan, Michael Vogt, Layla Mansfield, Ryan Olson

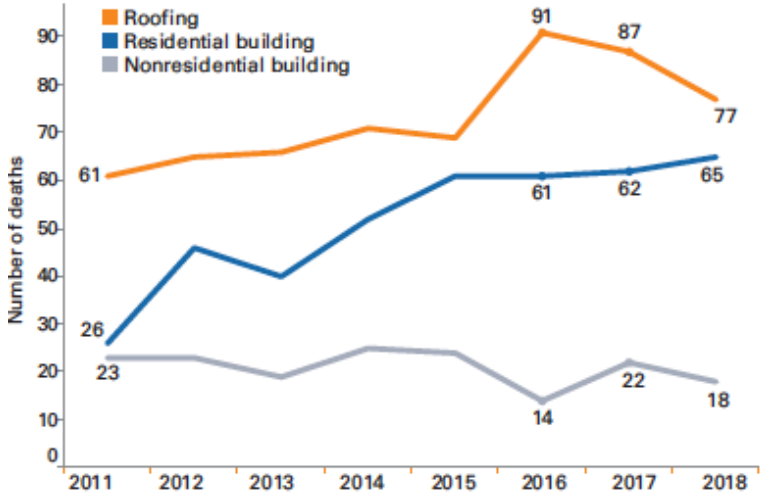
Background

Small and medium construction companies (≤50 employees) accounted for 74% of fatal falls from elevation (2011- 2015) (Dong et al., 2018).

Need to determine effective ways to engage with this subsector for research and training.

- Hard to reach --survey response rates that range from 10.0 to 35.7% (Baruch and Holtom, 2008; Choi and Carlson, 2014).
- Employment of a immigrant and/or low literary workforce

Number of fatal falls to a lower level among construction subsectors with high fall risk, 2011-2018



CPWR, Data Bulletin 2020

Objectives

1. **To test whether recent insurance-documented fall-related claims increase engagement with a fall protection survey**
2. **Describe fall protection equipment familiarity among leaders of residential construction companies**

- Motivating Operations (MO) Theory
  - Environmental events/stimuli may motivate change of certain behaviors to avoid such events in the future (Laraway et al., 2014).
  - Ho: Injury associated with higher survey engagement because the adverse trigger may motivate protective behaviors to avoid negative consequences

Methods

- Stratified random sample (from N=~7,000) of
  - Policyholders with an injury claim between Jan. 2016 and March. 2018 (n = 197)
  - Policyholders without a claim (n = 195)
- SAIF mailed policyholders a link to the online survey
- Survey responses kept confidential from SAIF and company identity kept confidential from researchers (double blinded)
- Incentive: fall protection equipment and training raffle

saif
Work. Life. Oregon.

Analysis

- Survey engagement: binary variable (1, 0) indicating completion of half of the survey items (Courser, 2008)
- Familiarity with and use of fall protection 10 pieces of equipment (Kaskutas et al., 2010).
  - Safety boots, wall walker, safety bar, pump jack, power pole, anchor, choker strap, truss anchor, yo-yo, and rope grab

22) This is a picture of a Truss Anchor. This anchor is used with a harness and lanyard during sheathing and truss installation. Please note your familiarity with this type of anchor.
a) Have used often at work
b) Have used several times
c) Have seen it but never used it
d) Never seen it before

Safety boots

Wall walker

Pump Jack System

Power pole

Anchors

Choker strap

Truss anchor

Rope grab

Results: Participants

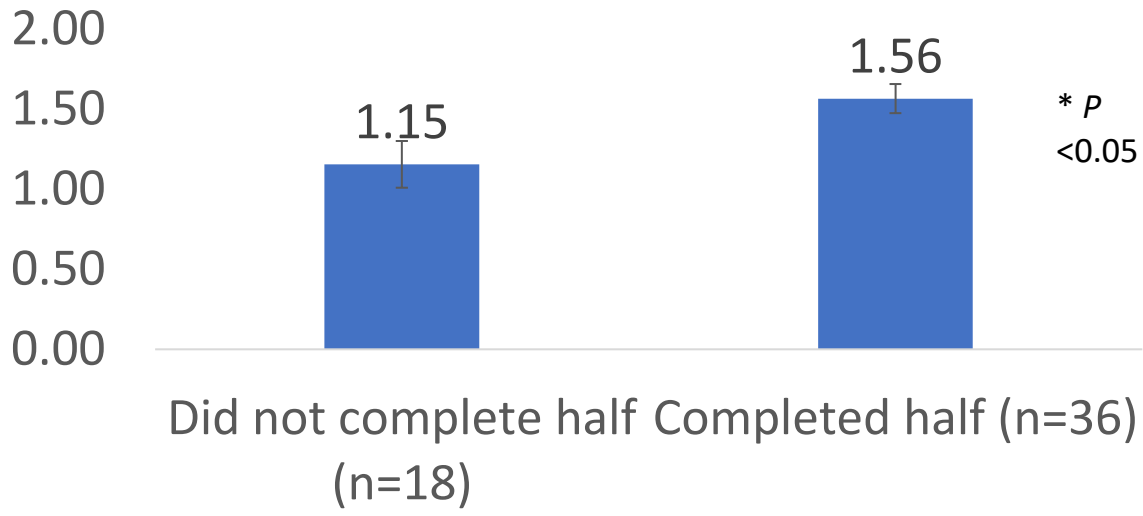
- Surveys mostly completed by owners/presidents (34.1%) and managers/leaders (20.5%)
- Average age of respondent = 51.1 years
- Average tenure = 24.6 years
- Average company size = 11.6 employees
- Average homes serviced or built in past year = 42.5

Results: Survey engagement by injury claim

- 22% response rate (88/392)

	Injury Claim	
	Yes	No
Emailed	197	195
ID link	33	30
50% survey completion	19	12
Survey Engagement (%)	**57**	**40**

Results: Equipment familiarity by survey engagement



M= 1.42, where 1= "Seen it but never used it" and 2= "Used several times at work"

Anchors, choker strap, rope grabs all significantly higher, $p < .05$

Main Findings

- A recent fall claim may act as a triggering event
- Fall protection equipment familiarity/use low across entire sample
- Representatives from companies with less equipment familiarity also engaged less with the survey

Implications for Research and Practice

- Many small residential construction companies in Oregon could benefit from increased training/access to fall protection equipment
- Outreach strategies could first engage with more established companies
- Need to re-think tactics for harder to reach companies
  - Community-based recruitment strategies need to be evaluated
- Engagement may improve if recruitment occurs shortly after incident
  - Future research can evaluate timing of recruitment after a fall claim is filed

Strengths & Limitations

- Strengths:
  - Partnership with a leading workers' compensation insurer
  - A stratified, random, and double-blinded sampling method
- Limitations:
  - Small sample size
  - Missing data
  - Survey did not collect historical fall records of companies
  - Potential for selection bias (companies with least safe practices avoided participation due to SAIF recruitment)
  - No financial incentive outside of raffle entry

Raffle Progress

- Raffle for a small grant valued at $1,000
  - Fall protection equipment
  - OSHA Competent Person Training
- ACME Construction Supply Co. (Portland) created equipment package
- Portland Fasteners will provide training
- 3 companies won grants
  - 1 had fall claim
  - All located in Portland
  - Average company has 19.33 employees and services 75 homes a year
  - Most unfamiliar with safety boots, safety bar, wall waker, and power pole

Thanks for your attention

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Annals of Work Exposures and Health, 2020, 1–6
doi: 10.1093/annweh/wxaa060
Short Communication

Short Communication

Does Experiencing an Injury Claim Impact Small Construction Company Leaders' Participation in a Fall Protection Survey?

David Hurtado[1,2,*], Leah Greenspan[1], Michael Vogt[3], Layla Mansfield[1] and Ryan Olson[1,2]

NIOSH -- OR-FACE program (grant number U60OH008472). Oregon Institute of Occupational Health Sciences at Oregon Health & Science University via funds from the DCBS (ORS 656.630).

Fatal Construction Falls in Michigan: Tracking and Outreach for Prevention

Anthony Oliveri, PhD, MPH
Michigan FACE
Michigan State University Division of Occupational and Environmental Medicine

The MIFACE program

- Track and investigate work-related fatalities in Michigan
- Overlapping but not exactly same scope as MIOSHA
- Create tools for use in safety training, education, and outreach

Investigation Reports (most detailed)

- In-depth look at a single incident
- Only for select incidents, voluntary participation
- Background info, incident narrative, contributing factors, and recommendations

Investigation Reports

MICHIGAN State FACE Program
Fatality Assessment & Control Evaluation

Michigan State University
Department of Medicine • Occupational and Environmental Medicine
909 Fee Road, 117 West Fee Hall • East Lansing, MI 48824 • 1-517-353-1846 • https://oem.msu.edu

REPORT#: **17MI045** REPORT DATE: 10/22/19

Plasterer/Drywall Installer Dies From 30-Foot Fall Through Skylight

INCIDENT HIGHLIGHTS

- **DATE:** Spring, 2017
- **TIME:** Approximately 5:30 p.m.
- **VICTIM:** Laborer in his 20s
- **INDUSTRY/NAICS CODE:** Construction/23
- **EMPLOYER:** Plaster/Drywall Installation
- **SAFETY & TRAINING:** On-the-Job
- **SCENE:** Water Treatment Plant
- **LOCATION:** Michigan
- **EVENT TYPE:** Fall

SUMMARY

In Spring 2017, a 20-year-old male plasterer/drywall installer died from an approximate 30-foot fall through a 24-inch by 48-inch plastic bubble-covered skylight. The decedent was working on the flat roof next to the skylight. His work area was cluttered with demolition debris. The decedent applied adhesive to the back of a 2-foot by 4-foot expanded foam board and took the prepared board to the firm owner, who was working in a boom lift for installation. After handing the board to the owner, the decedent walked back to the prep area to prepare another board. The firm owner heard a "crushing" sound, and when he looked over towards the sound, he saw the decedent sitting on the skylight cover. The skylight cover then "gave out"..... READ THE FULL REPORT> (p.3)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- No guarding for skylight
- Fall protection not utilized near unguarded skylight
- Lack of employer and employee experience working with, identifying, and training for skylight hazards
- LEARN MORE> (p.9)

RECOMMENDATIONS

MIFACE investigators concluded that, to help prevent similar occurrences, employers should:

- Develop, implement, and enforce a comprehensive, written health and safety program that includes safety requirements when working near/around roof openings and skylights.
- LEARN MORE> (p.9) https://oem.msu.edu

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REPORT#: **18MI105** REPORT DATE: 7/7/20

Construction Firm Owner Dies From Fall From 8-Foot Step Ladder Or Overhead Platform

INCIDENT HIGHLIGHTS

- **DATE:** Fall, 2018
- **TIME:** Approximately 12:00 p.m.
- **VICTIM:** Construction Firm Owner in his 60s
- **INDUSTRY/NAICS CODE:** Construction/23
- **EMPLOYER:** Plaster/Drywall Installation
- **SAFETY & TRAINING:** On-the-Job
- **SCENE:** Warehouse Renovation
- **LOCATION:** Michigan
- **EVENT TYPE:** Fall

SUMMARY

In Fall 2018, a construction firm owner in his 60s died when he fell from either an 8-foot step ladder or an elevated platform to a concrete floor. While standing on the ladder, the decedent was using a compressor-powered saw, cutting foam panels and a wood platform/overhead truss system. The incident was unwitnessed. His son, who was working outside, heard a "crash" and ran inside of the building to find the source of the noise. When he arrived, he saw the ladder had tipped over and the decedent face down on the concrete floor .....READ THE FULL REPORT> (p.3)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- Working from a ladder rather than an appropriate work platform
- Improper ladder selection and use
- Appropriate personal protective equipment not worn

LEARN MORE> (p.7)

RECOMMENDATIONS

MIFACE investigators concluded that, to help prevent similar occurrences, employers should:

- Develop and implement an accident prevention program, including a job safety analysis to identify and minimize hazards.
- Minimize the use of ladders as a work platform.

LEARN MORE> (p.7) https://oem.msu.edu

Investigation Reports

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CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. The following hazards were identified as key contributing factors in this incident:

- *No guarding for skylight*
- *Fall protection not utilized near unguarded skylight*
- *Lack of employer and employee experience working with, identifying, and training for skylight hazards*
- *Written fall protection program did not address skylights hazards*
- *General contractor, city, engineering firm and other firms working on roof did not provide safety training for skylights*

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers working on roofs should develop, implement, and enforce a comprehensive, written health and safety program that includes safety requirements when working near/around roof openings and skylights. This should include fall protection measures such as skylight screens or covers, guardrails, or a personal fall protection system.

Discussion: Most skylight covers, unless specifically designed to do so, are not meant to bear the weight of a worker. When employees work around skylights and roof and floor openings, employers must ensure the use of an appropriate fall prevention system. Options available to employers include covers or screens capable of supporting, without failure, at least twice the maximum intended load) OR railings or guardrails OR a personal fall arrest system (PFAS), including a full-body harness, lanyard, connectors, and appropriate anchorage points (tie-offs). Maximum intended load means the total load (weight and force) of all employees, equipment, vehicles, tools, materials, and other loads the employer reasonably anticipates being applied to a walking-working surface at any one time. In general, it is better to provide fall prevention systems, such as guardrails, than fall protection systems, such as safety nets or fall arrest devices, because they provide more positive safety means.

MIOSHA Part 1. General Rules, Rule 114 requires an Accident Prevention Program at every construction work site which must address fall hazards. MIOSHA, Part 45. Fall Protection, addresses minimum requirements and criteria for fall protection at construction workplaces. MIOSHA Construction Safety & Health Division Fact Sheet: Falls – Unprotected Sides, Wall Openings, and Floor Holes lists the following to avoid fall hazards:

- Use at least one of the following whenever employees are exposed to a fall of 6 feet or more above a lower level: Guardrail Systems; Safety Net Systems; Personal Fall Arrest Systems.
- Cover or guard floor holes as soon as they are created during new construction.
- For existing structures, survey the site before working and continually audit as work continues. Guard or cover any openings or holes immediately.
- Construct all floor hole covers so they will effectively support two times the weight of employees, equipment, and materials that may be imposed on the cover at any one time. Covers must be secured and color coded or marked with the words "HOLE" or "COVER."

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CAUSE OF DEATH

The death certificate listed the cause of death as brain death, due to or as a consequence of closed head injury due to or a consequence of a fall from ladder onto a concrete floor. No post-mortem toxicology was procured.

CONTRIBUTING FACTORS

Occupational injuries and fatalities are often the result of one or more contributing factors or key events in a larger sequence of events that ultimately result in the injury or fatality. The following hazards were identified as key contributing factors in this incident:

- *Working from ladder rather than an appropriate work platform*
- *Improper ladder use and selection*
- *Appropriate personal protective equipment not utilized*
- *Did not perform a job hazard analysis*

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Employers should try to minimize the use of ladders as a work platform.

Discussion: Firms should try to minimize the use of ladders as a work platform. Working from ladders can pose a fall hazard; therefore, ladders should be used for accessing higher and lower levels. If the task to be performed requires the worker to push, pull, or pry, then the use of scaffolding or aerial work platforms rather than a ladder is strongly recommended. The use of a ladder inherently limits the possible work area of a worker to an arm's length on either side of the ladder. Safe ladder use requires a worker to maintain a three-point connection (two hands/one foot or two feet/one hand) and his/her shoulders within the side rails. If the decedent was working from the ladder, he had to work outside the ladder rails to cut the foam-covered plywood and would have had to use both hands to operate the saw.

In general, when possible, use a scaffold or an aerial work platform, such as a scissor lift rather than a ladder to work from. Both a scaffold (not applicable in this incident) or a scissor lift (applicable in this incident) provide a larger work area, a more stable work platform, and reduced physical stress. In this incident, a scissor lift would enable the decedent to walk small distances safely and reduce the need for re-positioning the ladder to access a new work area. Because a worker can stand fully upright and use both hands for work procedures while having some protection from a fall due to the work surface railing, an additional safety factor is obtained with this type of equipment. Also, a larger work surface is available for the safer storage or positioning of tools and materials.

Recommendation #2: Ensure proper ladder selection and safe ladder use.

Discussion: Proper ladder selection includes, not only ladder material, type of ladder, length/size of ladder, and the environment in which the ladder will be used, but also its duty rating. The duty rating is an indication of the maximum weight capacity the ladder can safely carry. The ladder user should determine the total amount of weight the ladder will be supporting, including the user's weight, weight of clothing and any protective equipment, weight of the tools and supplies, and the weight of any items stored on the ladder.

The decedent selected a Type 1 (Heavy Duty) step ladder from which to work. The maximum weight the ladder was designed to carry was 250 pounds. The decedent weighed more than 250 pounds. Overloading a ladder can result in ladder instability. A safer ladder selection for the decedent would have been a Type 1A step ladder, which has a maximum carrying capacity of 300 pounds or a Type IAA (Extra Heavy Duty) ladder capable of supporting 375 pounds.

Summaries of MIOSHA Inspections (less detailed)

- Based on interview of compliance officer and review of case
- Some go on to become full MIFACE investigations, but not all

Summaries of MIOSHA Inspections

Case 527. 51-year-old male commercial drywall installer fell 9-10 feet from a second-floor loft in a condominium building under construction to a concrete floor.

A 51-year-old male commercial drywall installer fell 9-10 feet from a second-floor loft in a condominium building under construction to a concrete floor. Another firm had previously installed a guardrail that was missing the mid-rail; the decedent and/or his coworkers had removed the guardrail so the drywall could be installed. The decedent worked for a family member who owned the company. The decedent was working with another family member who told the company owner that they had been drywalling the second floor when the decedent stepped backward off the floor after cutting a piece of drywall and attempting to hang it.

MIOSHA Construction Safety and Health Division issued the following Serious citations at the conclusion of its investigation.

Serious: 408.40114(1): CS Part 1 General Rules - An employer shall develop, maintain, and coordinate with employees an accident prevention program, a copy of which shall be available at the worksite.

Workers hanging drywall without a developed accident prevention program.

Serious: 1926.501(b)(13): CS Part 45 Fall Protection REF 408.44502 - Each employee engaged in residential construction activities 6 feet (1.8 m) or more above lower levels shall be protected by guardrail systems, safety net system, or personal fall arrest system unless another provision in paragraph (b) of this section provides for an alternative fall protection measure. Exception: When the employer can demonstrate that it is infeasible or creates a greater hazard to use these systems, the employer shall develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.

Workers not using fall protection while hanging drywall on the 2nd floor.

Annual Reports (trends)

- Summary of all deaths in a given year
- Discussion of trends within that year, some trends across years
- Short narrative of each death in Appendix

Annual Reports (trends)

Construction (NAICS 23)

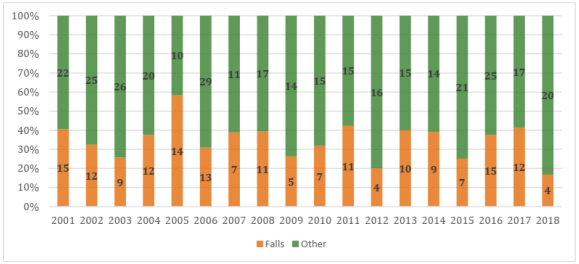
The number of deaths in Construction decreased by 5 (24 deaths in 2018 compared to 29 deaths in 2017) despite an increase of 5 deaths in the Heavy & Civil Engineering Construction (NAICS 237) subsector (7 deaths in 2018 compared to 2 deaths in 2017). The overall decrease in Construction occurred because of the decreased in the number of deaths of the Specialty Trade group subsector (NAICS 238), which encompasses roofers, painters, drywall installers, carpenters, etc., with 13 deaths in 2018 compared to 20 in 2017.

Struck by incidents were the primary cause of death in Construction (10 of 24 deaths, 41.7%) in 2018. Five of the ten struck-by deaths occurred at road construction sites; four individuals were struck by vehicles and one individual was struck by a backing asphalt truck; the other individual who was struck by a vehicle was running across a roadway to access his work building. The remaining four struck by incidents involved an electrical meter bank that came loose from a wall, an unsecured scaffold plank that was blown off a building roof, a cast iron plate while dismantling a traveling grate spreader stoker chain and a water pump pinning an individual against a road grader tire.

There were only four fatal falls in Construction in 2018. Two falls occurred in the Construction of Buildings subsector (both were the owner of the business) and two occurred in Specialty Trade group subsector (one roofer and one construction laborer). **Figure 6** shows the number of fatal falls in Construction by year and the percentage of Construction work-related deaths the fatal falls represent.

Both the number of fatal falls in Construction, and the proportion of all Construction fatalities comprised of fatal falls, reached or matched their lowest levels since 2001. Between 2001 and 2018, the number of fatal falls in Construction ranged from a low of four falls in 2012 and 2018 to a high of 15 falls in 2001 and 2016. The percentage of fatalities in Construction secondary to a fall ranged from16.7% in 2018 to 58.3% in 2005.

Figure 6. Fatal Falls as Percent of Total Construction Deaths by Year, 2001- 2018



Fall

33. A roofer in his 40s died after he fell approximately 18 feet through an unguarded roof skylight to a concrete floor. The decedent's employer had been contracted to remove the existing roof and install a new roof. The decedent and a coworker were on the roof, preparing for the work to be performed that day. They used a ladder positioned at the back of the building to access the roof. There were 72 skylights on the roof; a green X was spray-painted on 42 of the skylights signifying the skylight was to be removed and then decked. Thirty skylights were in the process of being replaced (having new lenses placed on them). The decedent's coworker saw him winding up an extension cord. When the decedent took a step backward, he tripped over the edge of the unguarded skylight and fell approximately 18 feet to the concrete floor below. His coworker ran over to the skylight and after seeing the decedent not moving, ran to the ladder, descended from the roof, got in his car and drove to the front of the building. He ran to the decedent and then called for emergency response. The decedent was breathing, but weakly. Emergency responders arrived and assumed care. The decedent was transported to a nearby hospital where he died the next day. MIFACE Summary of a MIOSHA Inspection Case 497.

34. A male in his 50s died from complications 36 years after a construction-related fall that had paralyzed him.

35. A construction firm owner in his 60s died when he fell from an 8-foot step ladder to a concrete floor. The decedent was a subcontractor renovating a building. While standing on the ladder, the decedent was using a cordless electric saw, cutting foam panels and a wood platform/overhead truss system. His coworker, who was working outside, heard a "crash" and ran inside of the building to find out the source of the noise. When he arrived, he saw the ladder had tipped and the decedent face down on the concrete floor. The decedent had landed on his head and was trying to rise from the floor. The coworker called for emergency response. The decedent was transported to a nearby hospital where he died several days later from complications of his injury. MIFACE Summary of a MIOSHA Inspection Case 510 and MIFACE Investigation Report 18MI105.

36. A remodeler in his 60s died from complications of a head injury sustained when he slipped on ice in a driveway as he was getting out of his pickup truck. The decedent was a subcontractor for another firm (Firm 1) subcontracted by a big box store (Firm 2) to install tile in a customer's bathroom. The decedent drove to the customer's home and as he exited his truck, he slipped on the ice and struck his head. He called Firm 1 and told personnel that he was going to purchase some sand for the driveway. He drove to Firm 2 to buy the sand. The decedent's head began to hurt to such a degree that he drove himself to a local hospital. Upon examination, hospital personnel airlifted him to another hospital, where he died several days later from complications of the head injury. MIOSHA Construction Safety and Health Division investigated the fatality and deemed it non-program-related because an

Hazard Alerts (long-term trends)

- ID hazards that appear repeatedly across years
- Summarize a couple of cases
- Offer preventative tips and resources for further information

Hazard Alerts (long-term trends)

Fatal Falls In Construction

Falls continue to be the leading cause of death for construction workers nationwide. In Michigan, 173 out of the 485 work-related deaths in the construction industry from 2001-2017, or 36%, were due to falls. Figures 1 and 2, below, show the number of falls by working surface at the time of the fall and by fall height, respectively. **Roofs and ladders were the two most common work surfaces from which workers experienced fatal falls**, and the largest number of falls were from 10-25 ft, followed by 25-50 ft. **Fatal falls can occur from any heigh**t, with 24 fatal falls having occurred from heights of less than 10 ft.

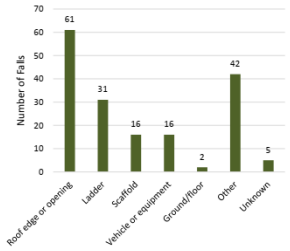


Figure 1: Fatal construction falls by working surface

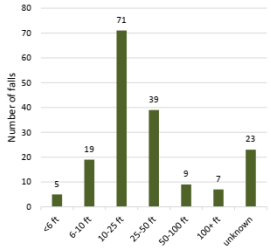
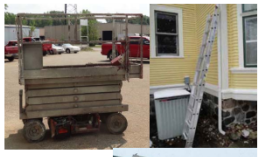


Figure 2: Fatal construction falls by fall height

Fatal Construction Fall Examples from MIFACE

- A roofer died after he lost his balance and fell from the peak of a 10/12-pitch roof while installing a metal drip edge near a dormer.
- A construction laborer was killed when he fell 7 feet from an unsecured fiberglass ladder without safety feet.
- A brick mason died after falling from a scaffold from which he and his partner were placing brick on the front of a new residential building.
- An electrician died after falling from a vehicle-mounted elevated work platform while attempting to remove a flagpole.
- A demolition laborer died when the 2nd-story floor collapsed underneath him.
- An ironworker died after falling 120 feet while erecting a monopole cell tower.
- A painter fell 120-130 feet from a water tower he had been painting.



Preventing Fatal Falls in Construction

The Occupational Safety and Health Administration (OSHA) recommends a three-step process to preventing fatal falls in construction:

1. Plan

- ✓ **PLAN ahead to get the job done safely**. This means identifying potential fall hazards and what safety equipment is needed during the planning stage of the project.

2. Provide

- ✓ **PROVIDE the right equipment.** Safety equipment only protects workers if the employer provides it at the worksite. It must be the right safety equipment for the job.

PLAN
ahead to get the job done safely.

PROVIDE
the right equipment.

TRAIN
everyone to use the equipment safely.

3. Train

- ✓ **TRAIN workers to use the equipment safely.** Every worker must be trained on how to set-up and use safety equipment properly. They must also be trained on identifying fall hazards on the jobsite.

Resources

- OSHA's Stop Falls website provides educational materials, training resources, and prevention videos for workers and employers, covering ladders, scaffold, aerial devices and elevated work platforms, fall protection, and more for a wide variety of construction sectors and project types. https://www.osha.gov/stopfalls/
- Michigan OSHA (MIOSHA) provides numerous publications and videos pertaining to construction falls, as well as guidance pertaining to MIOSHA fall- and construction-related standards. https://www.michigan.gov/lara/0,4601,7-154-89334_11407_15317-402966--,00.html
- The National Institute for Occupational Safety and Health (NIOSH) also provides resources, as well as their Ladder Safety App for smartphones and an Aerial Lift Hazard Recognition Simulator. The NIOSH FACE database houses numerous in-depth investigations into fatal falls, their contributing factors, and prevention recommendations. https://www.cdc.gov/niosh/construction/stopfalls.html
- The Center for Construction Research and Training (CPWR) provides materials for an 8-hour Fall Protection Program, as well as guides and handouts for instructors and students. https://www.cpwr.com/training/fall-protection
- The website for the annual National Safety Stand-Down to prevent falls in construction contains training and resources organized by topic, including many in Spanish. https://stopconstructionfalls.com/prevent-falls-training-other-resources/

Did You Know?

According to a 2008 study, the average total cost of a fatality in construction was **$3.9 million**, while the average cost for an injury involving days away from work in construction was **$42,093/injury**.

However, the average cost of a **fall to a lower level** leading to an injury was **$58,019** and was ranked the costliest type of injury in construction.

A different report by OSHA estimates the **cost of a fall to range from $62,000-$106,000 each**

Sources:

"Cost of Occupational Injuries in Construction in the U.S." https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2491397/

"OSHA adds up the high cost of construction falls" https://www.ishn.com/articles/92384-osha-adds-up-the-high-cost-of-construction-falls

Hazard Alerts (long-term trends)

Roof Safety – Prevent Fatal Falls

Hazard Alert Roof Fall Prevention 7/29/20

From 2001-2018, 82 workers died in Michigan after falling from a roof, roof decking, or the roof trusses. These falls were the cause of 21.2% of all work-related fatal falls. Figure 1 shows the location of the 82 fatal roof falls. Half of the fatal roof falls occurred at a commercial building and half at a residential building. **No worker who died was wearing fall protection.** Falls from ladders and/or scaffolds are the next leading cause of worker deaths from falls from a height (75 falls). Two hazard alerts, Work-Related Fatalities and Injuries from Using Ladders in Michigan and Falls from Scaffolds Can Be Deadly identify fall prevention strategies for ladder and scaffold falls. Figure 2 shows the number of fatal roof-related falls in the industry where the fatal fall occurred.

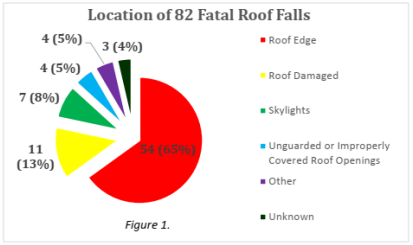


Figure 1.

Causes in Michigan of fatal falls from a roof:

- **Near an unprotected edge** (e.g., roof edge, holes, roof curbs, skylights, low parapet heights, or other standing surfaces without guardrails or similar barriers);
- **Lack of awareness of an opening or an unprotected edge** (e.g., hidden edge or opening (corrugated fiberglass skylights installed in line with metal roof panels), loss of situational awareness (e.g., stepping backward while performing a task));
- **Performing a task** (e.g., roof slope, building design, roof material, forceful exertions and long reaches that result in instability; limited foot positions that do not accommodate movement to maintain balance; ice or materials that affect footing; unstable movements to enhance lines of sight or visual acuity, fatigue, footwear, work experience, worksite housekeeping, weather); and
- **Failure of a supporting structure** (e.g., supporting surface failed or when the worker misjudged the supportive capacity of a surface (e.g. skylight dome)).

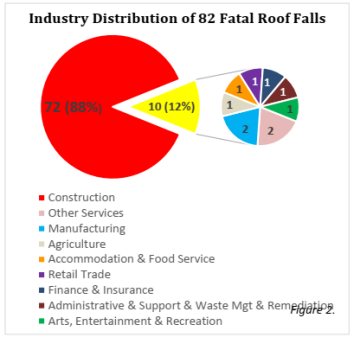


Figure 2.

Preventing Work-Related Fall Fatalities From Roofs

- **Employers must provide fall protection when employees work on a roof with unprotected sides and edges six (6) or more feet above a lower level.**
  - Low-slope roofs (slope less than or equal to 4 in 12): must utilize guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, warning line system and personal fall arrest system (PFAS), or warning line system and safety monitoring system. When roofs are 50-feet (15.25 m) or less in width the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.
  - Steep roofs (slope greater than 4 in 12): must have guardrail systems with toeboards, safety net systems, or personal fall arrest systems.
  - If a roof has holes (a gap or void 2 inches (5.1 cm) or more in its least dimension), it must have a guardrail or a cover capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on it, appropriately secured, and color coded or marked with the word "HOLE" or "COVER".
  - Skylights must have appropriately designed and installed skylight guard, guardrails, or a PFAS must be used.
  - **NOTE**: If the employer can demonstrate that it is infeasible or creates a greater hazard to use guardrail systems, a safety net system, or personal fall arrest system when employees are working six or more feet above a lower level during leading edge work, precast concrete erection or residential construction activities, the employer must develop and implement a fall protection plan which meets the requirements of paragraph (k) of Part 45. *Regulators presume that fall protection systems are feasible and will not create a greater hazard.*
- **Inspect and analyze the roof for potential physical hazards, including the condition and strength of structural items**. Damage may be caused by UV radiation, physical strike damage, wind, snow and water/ice loads, temperature extremes, new roof structures without commensurate structural upgrades, etc.)
  - Look for roof deck holes by physically accessing the attic or below-roof area. If access is unavailable, try "sounding" the roof surface to determine if damaged: drop the flat surface of a sledge head 6 inches onto the roof area ahead to approximate the impact area and force of a foot fall. If a "dead zone" is sounded, further inspection should be performed.
- **Develop a site-specific, task-specific, worker-specific job safety analysis** before work begins.
  - When performing a pre-task analysis, consider weather, building type, tasks being performed, materials and equipment in use, and training and experience of workers.
- **Provide and document fall protection training to employees.**
  - Provide communication training to foremen in addition to site-specific training to improve their abilities to influence the safety behaviors of workers on site.
  - Worker training should address, but not be limited to, Part 2 or Part 45 requirements (as appropriate): fall hazards, fall protection systems erecting, inspecting, etc., personal protection equipment, including personal fall arrest system use, inspection, etc., preventative measures (e.g. housekeeping), and "risk compensation" behaviors (e.g. workers should not engage in greater risk-taking behaviors just because fall protection is in place.

Did You Know?

- A NIOSH study demonstrated that shoes with a tight fit, good motion control of the rear, high flexibility of the front, moderate torsional stiffness, and a very flexible high-cut upper are a better choice than casual shoes to minimize the risk of a loss of balance when working on elevated and narrow surfaces.
- Roofing slide guards are not considered fall protection.
- Employers need to have a plan for rescuing workers in the event of a fall.
- Nationally, nearly 20% of all fatal falls occur when the worker falls 11- to15-feet.

Resources

MIFACE: www.oem.msu.edu

MIOSHA
- General Industry Safety Standard Part 2: Walking Working Surfaces
- Construction Safety Standard Part 45: Fall Protection
- A-Z Topic Index: Fall Protection

NIOSH FACE: www.cdc.gov/niosh/face/

OSHA Fall Protection webpage

CPWR Stop Construction Falls webpage.
Resources in English and Spanish
- Roofs Resource webpage

Hazard Alerts (long-term trends)

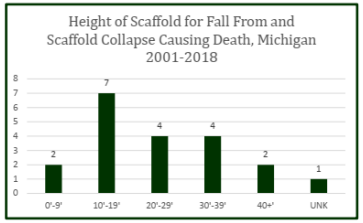
FALLS FROM SCAFFOLDS CAN BE DEADLY – PREVENTION IS KEY!

Hazard Alert Scaffolds 3/13/19

From 2001-2018, **26 Michigan workers have died while erecting or working on or near a scaffold***. Nine workers fell from a scaffold edge, nine workers died when the scaffold collapsed due to improper construction/securement, three workers were electrocuted when erecting/working on the scaffold, two workers on the ground were killed when they were struck by sections/product after the scaffold collapsed, one individual died when he fell while climbing the scaffold frame, one individual, while working in the scaffold was knocked off the scaffold when struck by ductwork he was removing, and one individual committed suicide by jumping from a 50-foot high scaffold. All but one death was in Construction; the one other was in Wholesale Trade.
*(Another fifteen Michigan workers died in incidents involving roof bracket scaffolds or scaffolds/platforms lifted by rough terrain forklifts and powered industrial trucks.)

Plan Ahead. Provide Proper Scaffold. Train Everyone.

WORK-RELATED FATALITY NARRATIVE EXAMPLES SCAFFOLD FALLS IN MICHIGAN



- A laborer was killed when the scaffold platform he was working from collapsed, and the 183-pound hoist motor, which he had been using to raise and lower a corner of the platform, fell on him.
- A journeyman mason/foreman died as a result of falling 35 feet from an unguarded working surface of a Hydro Mobile 2 scaffold. The scaffold had been repositioned without reinstalling the guardrails at the ends of the working platform and without proper planking. He was working in a backward direction and fell from the unguarded edge to the concrete surface below.
- A masonry company co-owner was on a 10-foot high scaffold when he stepped off the scaffolding onto an aluminum extension ladder. The ladder slid away as he was taking his first step, causing him to lose his balance and fall 10 feet to the concrete below.
- A scrap metal hauler fell 15-18 feet from a scaffold while performing building demolition to procure HVAC ductwork. When using a sledgehammer to break the straps holding the duct work, a 20-foot long piece of duct work struck him, causing him to fall from the scaffold.
- A painter fell 120 to 130 feet from a water tower that he had been painting. He had moved the cable supporting the single-point adjustable scaffold "spider" he was working from to the other side of a post on the top of the tower. When he reassembled his equipment, he placed only one eye of the two-eyed chocker into the shackle on the cable that secured the spider to the supporting equipment on the tower. He was not using a lifeline with a harness and rope grab.

PREVENTING WORK-RELATED FATALITIES FROM SCAFFOLD

- **Train! Train! Train!**
  - **Employees who erect, disassemble, move, operate, repair, maintain, or inspect a scaffold must be trained by a competent person** to:
    - ✓ Recognize nature of scaffold hazards,
    - ✓ The correct procedures for erecting, disassembling, moving, operating, repairing, inspecting, and maintaining the type of scaffold in question,
    - ✓ The design criteria, maximum intended load-carrying capacity and the scaffold's intended use.
  - **Employees who perform work while on a scaffold must be trained by a person *qualified* in the subject matter** to recognize the hazards associated with the type of scaffold being used and to understand the procedures to control or minimize those hazards. The training must include (at a minimum) the following areas, as applicable:
    - ✓ The nature of any electrical hazards, fall hazards and falling object hazards in the work area;
    - ✓ The correct procedures for dealing with electrical hazards and for erecting, maintaining, and disassembling the fall protection systems and falling object protection systems being used;
    - ✓ The proper use of the scaffold, and the proper handling of materials on the scaffold;
    - ✓ The maximum intended load and the load-carrying capacities of the scaffolds used;
  - **Retraining is required in at least the following situations**:
    - ✓ Where changes at the worksite present a hazard about which an employee has not been previously trained; or
    - ✓ Where changes in the types of scaffolds, fall protection, falling object protection, or other equipment present a hazard about which an employee has not been previously trained; or
    - ✓ Where inadequacies in an affected employee's work involving scaffolds indicate that the employee has not retained the requisite proficiency.
- **Ensure a qualified person designs the scaffold and** that it is **constructed** and **loaded in accordance with that design.**
- **Ensure a competent person inspects** the scaffold for visible defects **before each work shift** as well as after any occurrence that could affect its structural integrity.
- **Ensure a competent person qualified in scaffold erection, moving, dismantling or alteration supervises/directs these activities** using only experienced and trained employees selected by the competent person.
- **When working on a scaffold 10 feet or more above the floor or ground:**
  - **Construction:** Provide guardrail system and/or personal fall arrest systems (Part 12)
  - **General Industry:** Provide guardrail system, safety net, travel restraint, personal fall arrest system (Part 2)
- **Maintain appropriate clearances from power lines.**

Links

- MIFACE investigation reports for construction falls
- Summaries of MIOSHA inspections for construction falls
- 2018 MIFACE annual report (annual reports from previous years)
- Hazard alert – Fatal Falls in Construction
- Hazard alert – Fatal falls from roofs
- Hazard alert – Fatal falls from scaffolds

Thank you!

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Investigating Fall Fatalities and Injury Claims on Prevention Efforts

QUESTIONS?