



Oregon Fatality Assessment and Control Evaluation:

Surveillance, Investigation, Research and Outreach

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March 9, 2017

Agenda

- **What is OR-FACE**
 - Mission
 - History
- **Surveillance**
 - Occupational fatality data 2003-2014
- **Investigations**
 - Construction cases
 - Group exercise (determining preventive actions)
- **Outreach**
 - Communicating recommendations
 - Toolbox talks
 - Group exercise (create toolbox talk)
- **Research projects**
 - Why research
 - Past and current research studies



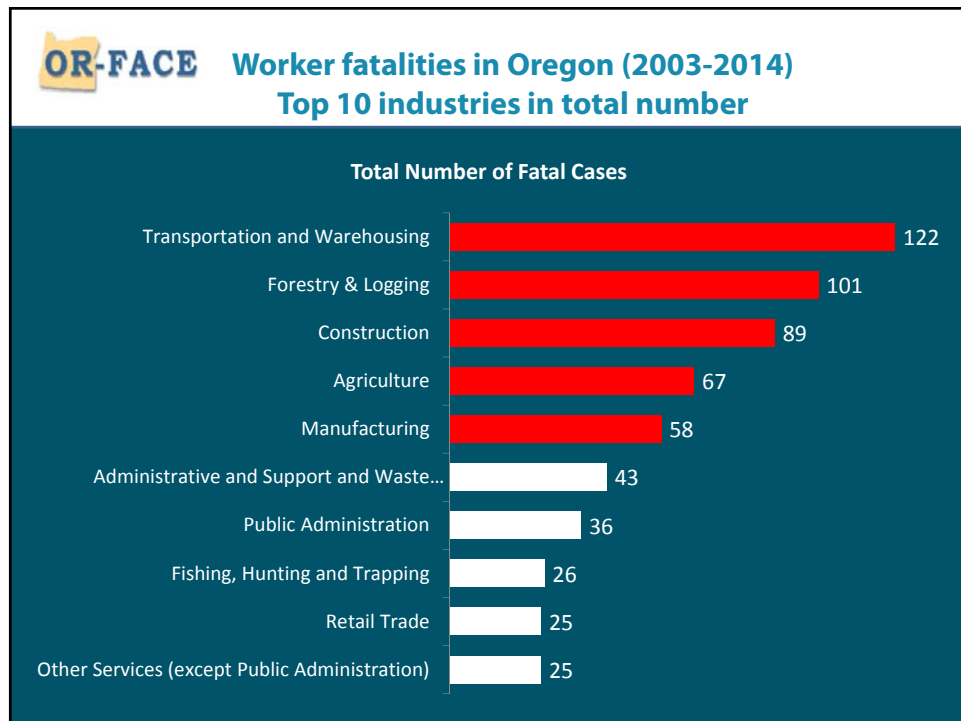
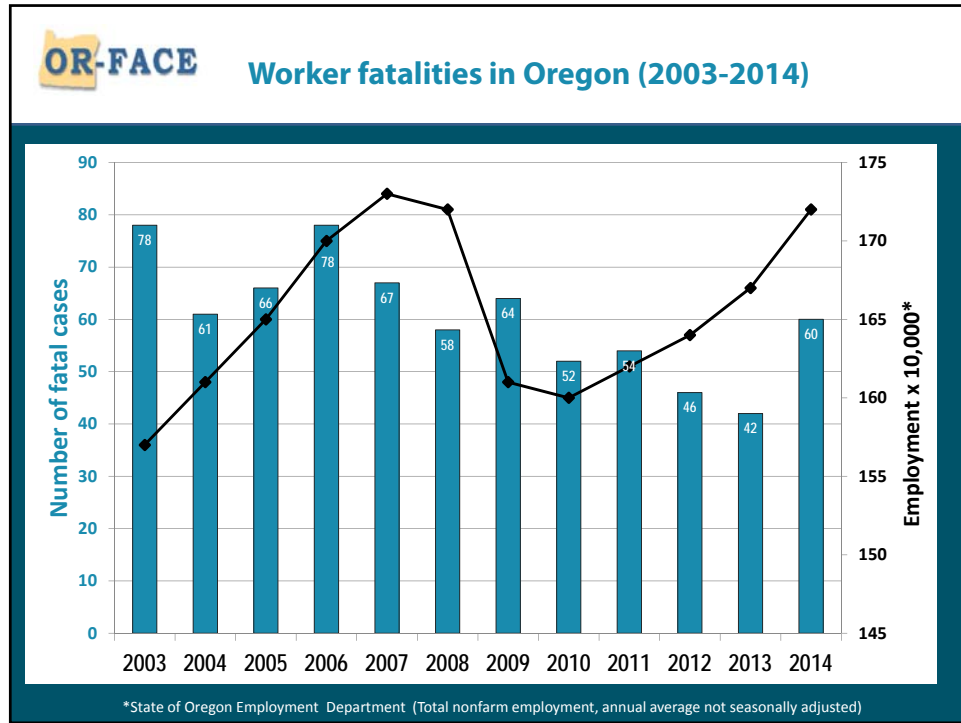
Mission

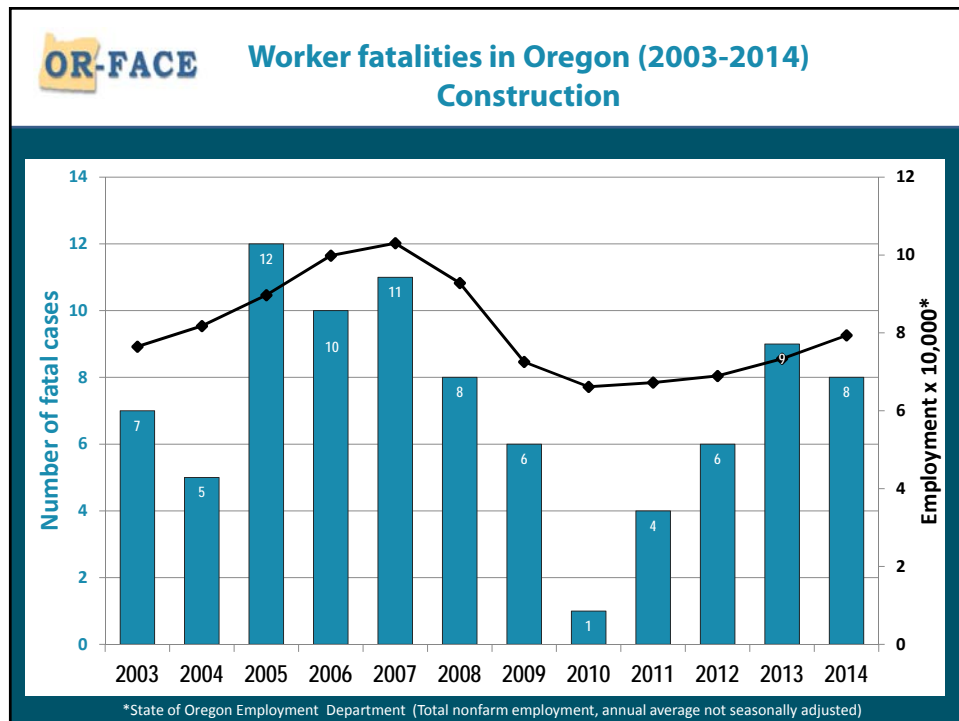
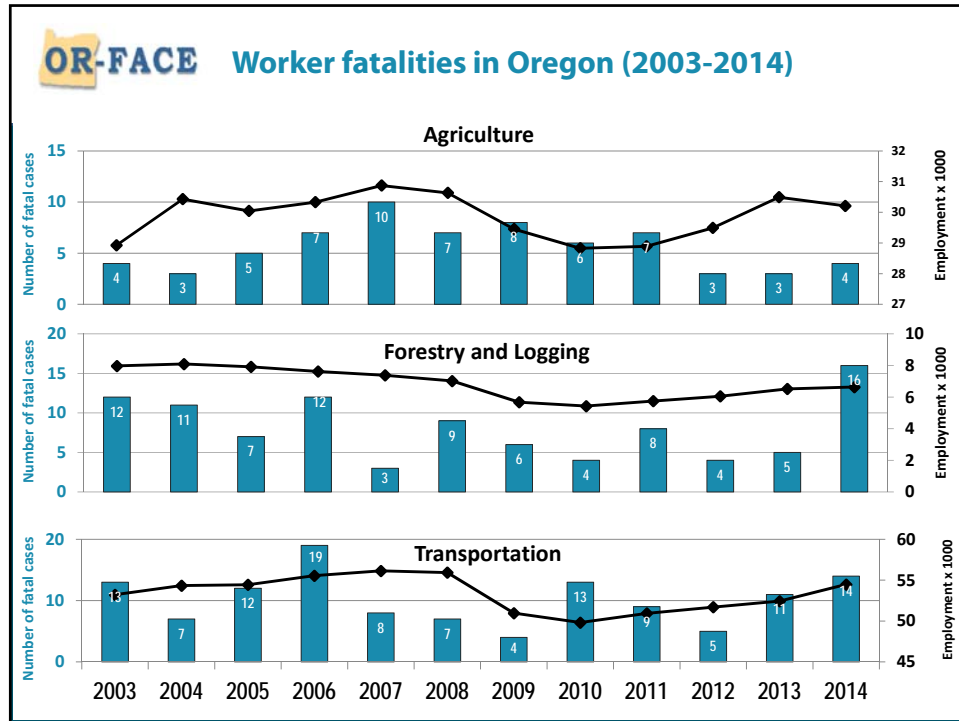
- **Prevent traumatic work-related deaths in Oregon through**
 - Surveillance
 - Targeted investigation
 - Assessment
 - Outreach

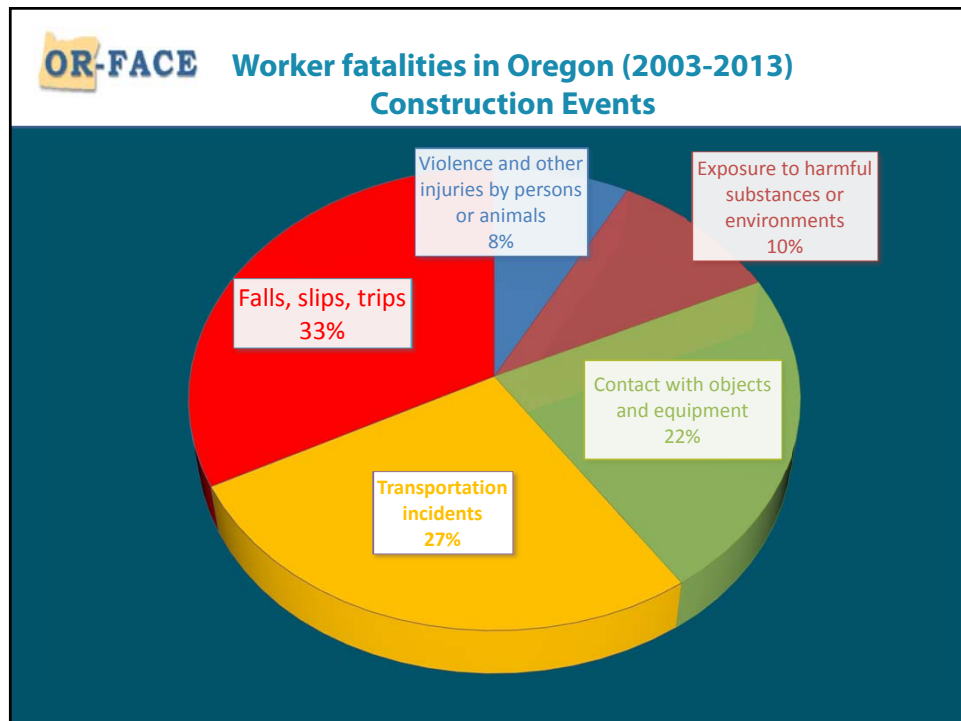
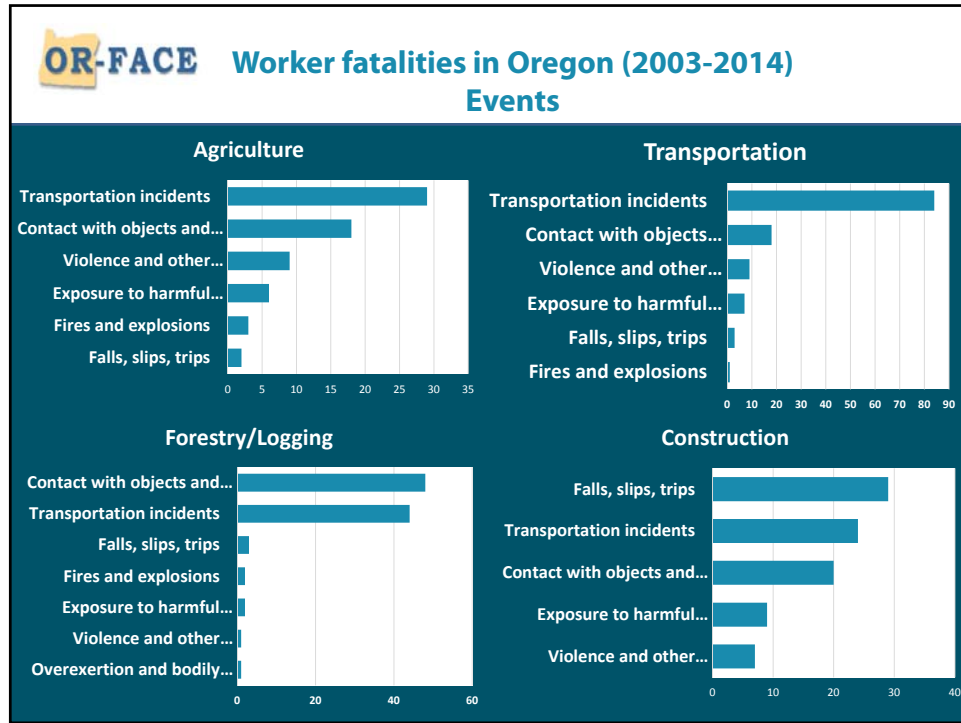
History

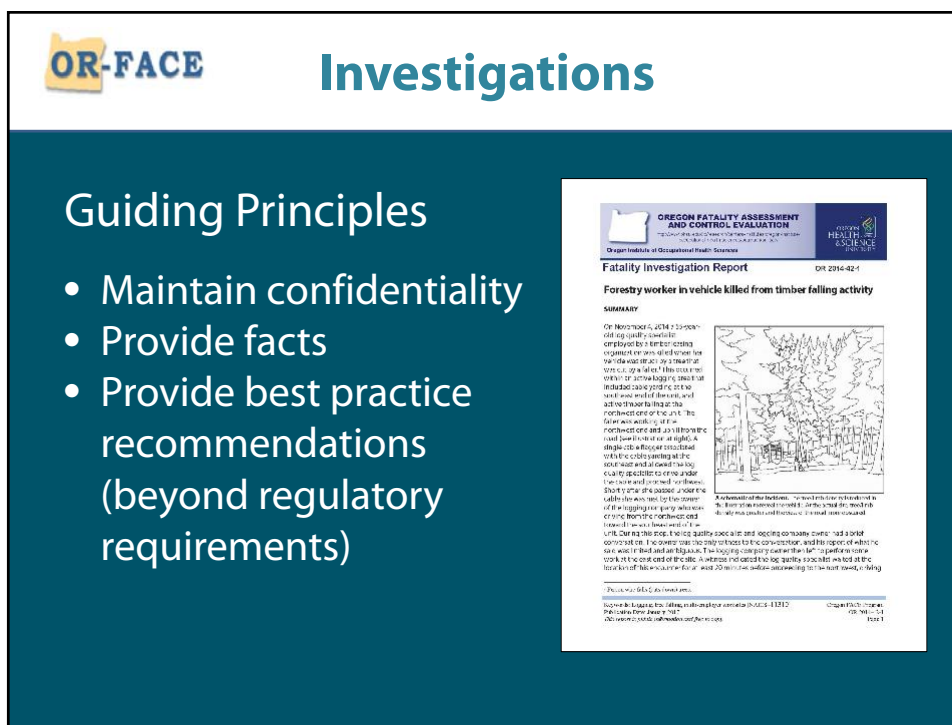
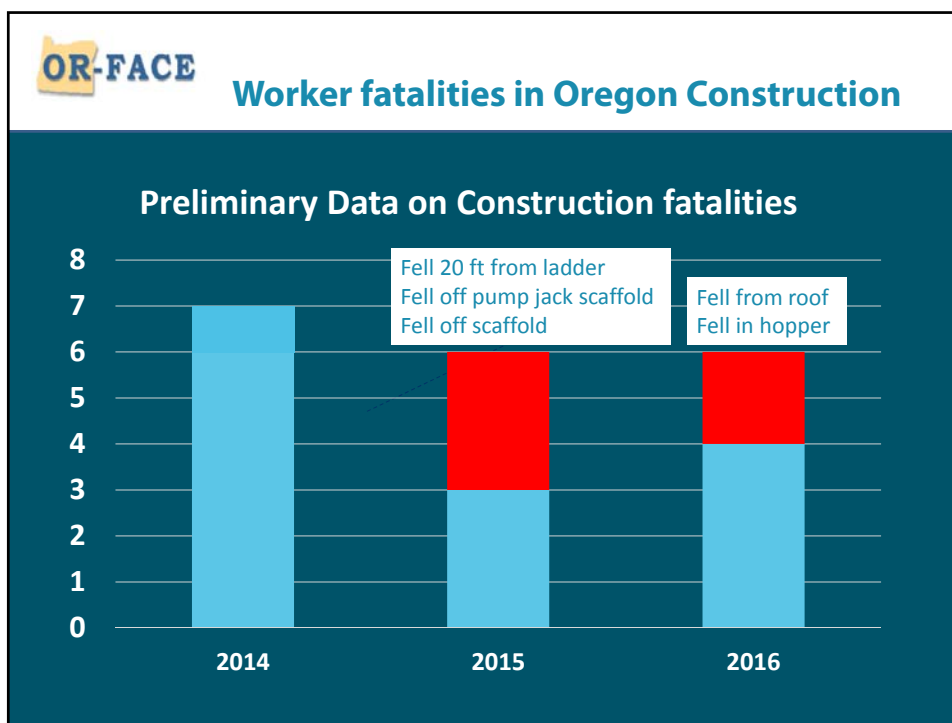
- **NIOSH surveillance research program**
 - Began in 1982
 - Expanded to states in 1992
- **OR-FACE**
 - Joined 14 other state programs in 2002
 - 2010 only 9 states
 - Currently only 7 states









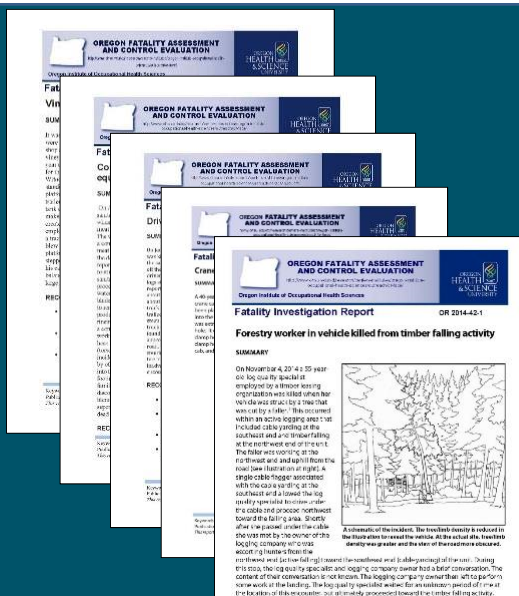




Investigations

Published (2015-2017)

1. Vineyard worker killed in fall from trailer
2. Contract sanitation worker killed cleaning meat blending equipment
3. Driver killed when ejected from logging truck
4. Crane operator killed by falling steel beam
5. Forestry worker killed in vehicle from timber falling activity



OREGON FATALITY ASSESSMENT AND CONTROL EVALUATION

Oregon Institute of Occupational Health Sciences



Fatality Investigation Report

OR 2013-27-1

Collapsed roof trusses kill carpenter foreman



Workers

- Three workers fell
 - one fatal – 33 year-old carpenter foreman
 - two with neck, head and back injuries
- New crew (first job with company)
 - interviewed, selected and hired via telephone

Worksite

- Private property
- Residential shop/ garage building
- 4 Exterior 12-foot walls
- Interior wall separating shop and garage

The incident

- Four days prior 2 workers began framing, sheeting and bracing walls, framed the interior wall
- Two new workers arrived at the job site for the first time
- 20-foot Vertical truss bracing (2x4's) nailed to north and south wall



The incident cont'd

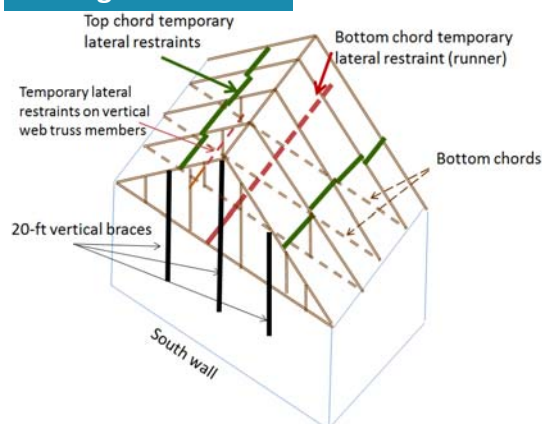
- ~12:30 pm truck-mounted crane with a trailer loaded with trusses arrived
- Truck operator provided foreman with delivery documents (contained in Structural Building Components Association [SBCA] BCSI-B1 Summary Sheet Guide)



The incident cont'd

- Foreman assigned crew
 - 1-on trailer to connect truss to the crane rigging
 - 2-stand on top plates of framed wall
 - 1-on floor to cut lateral restraints
- Gable end truss set in place, toenailed to the plate and nailed to the 3 20-ft vertical braces
- Second truss set in place and nailed to the top plate
- Two 2x4's lateral restraints (~2 feet long) were cut and handed to workers who nailed it to the gable truss and second truss approximately 8 feet from toe
- Process repeated with each additional truss
- Foreman worked in the center span of the trusses and installed bracing and runners then would disconnect truss from rigging
- Crane operator and rigger yelled that bracing was inadequate
- Additional lateral restraints were added.

Bracing installed



BCSI Guide



The incident cont'd

- After the 13th truss was set in place and disconnected from the rigging, the trusses collapsed
- Two workers were knocked off the top plate and fell to concrete floor.
- Foreman fell and was struck on his head by falling truss

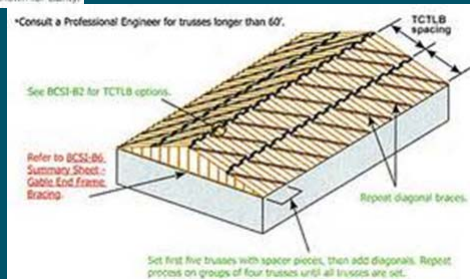
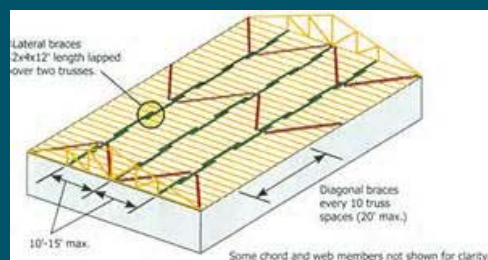
CAUSE OF DEATH

Lacerating and penetrating injuries of neck and chest

Contributing factors

- Training nor protective equipment were provided
- Construction experience may not have included erecting/installing trusses
- SBCA BCSI Summary Sheet Guide not reviewed
- Diagonal braces not added to task

Building Component Safety Information (BCSI) Guide to Good Practice for Handling, Installing, Restraining and Bracing of Metal Plate Connected Roof Trusses



Key Recommendations

1. Employers and supervisors should assess the workplace hazards and plan each stage of construction to comply with manufacturer's recommendations or standard best practice. In this case, the critical elements of standard practice provided in the BCSI-B1 Summary Sheet for adequate bracing prior to and during truss installation were not followed. Comply with manufacturer's recommendations (BCSI-B1 summary sheet)
2. Employers must train supervisors and employees, communicate their expectation for following safe practices and confirm that employees fully understand the hazards and controls required for the task assigned. In this case, training and expectations were lacking and the truss installation did not include a review of standard documents, pre-job assessment, risk mitigation planning or the use of personal protective equipment. Plan each stage of the job to eliminate/mitigate hazards (Prevention through design, PtD)




Ground assembly

- Reduce collapse potential
- Pre-installed anchors and lifelines before lifting
- External and internal bracket scaffolds



Key Recommendations (cont'd)

3. Employers should develop and use a hiring process that is based on established best practices, including a process to determine candidates' qualifications and training needs before they begin work on assigned tasks. Communicate expectations.



OREGON FATALITY ASSESSMENT AND CONTROL EVALUATION
<http://www.ohsu.edu/research/centers-institutes/oregon-institute-occupational-health-sciences/outreach/on-facel/>
 Oregon Institute of Occupational Health Sciences

Fatality Investigation Report OR 2014-42-1


Forestry worker in vehicle killed from timber falling activity

Forestry worker

- 55 years old
- Log quality specialist w/ 30 years' experience incl. work around active logging operations
- Safety training up to date

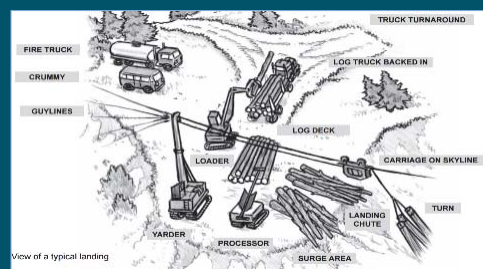
Worksite

- Leased timber land, densely forested
- Multi-employer worksite
- Active logging area
- Tree falling at one end of area; cable yarding at opposite end



The incident

- Log quality specialist participated in a field training exercise about 1 ½ hours from timber sale area (site of fatal incident). She then drove along a winding road that ran diagonally from NW to SE along the length of the timber sale area.
- Yarding activity was underway at SE end; tree falling was underway at NW end.



Typical cable logging landing area



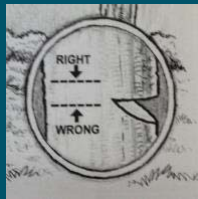
Typical road in area

The incident (cont'd)

- Single flagger/watchman was assigned to control approaching traffic at the SE end (cable yarding).
 - Equipped with radio that did not work; not equipped with required high-vis vest or “stop/slow” paddle signs.
 - Unaware of tree falling work at NW end.
- No warning signs or flaggers were positioned between this entry point and the NW end (tree falling activity).
- Log quality specialist was driving SE-NW and encountered the watchman at the SE entry to the area.
- Watchman allowed her to pass under cable then saw her pull over a short distance away, presumably to allow two oncoming vehicles to pass.
- Driver of the first vehicle was owner of sub-contracted logging company; two hunters were in the second vehicle.

The incident (cont'd)

- Brief conversation took place between log quality specialist and logging company owner; owner reportedly told her wait reports of what was said were limited and ambiguous.
- Logging company owner and hunters then continued on toward the SE.
- Log quality specialist waited at least 20 minutes before proceeding toward the NW (20 min. is normal limit for temporary road closures by logging contractors).
- Not likely she could see or hear cutting activity occurring $> \frac{1}{4}$ mile down the road to the NW. And remember, no flagging or signage in place to warn of tree falling operations ahead.



Proper backcut placement

The incident (cont'd)

- Tree measuring between 140-160 ft. tall, 36 in. in diameter was being felled above road, located about 145 ft. from the road (requirement is minimum two tree lengths from road).
- Ground below stump sloped downward approx. 30% grade.
- Intended lay of the tree was parallel to road; however, it fell downward toward road.
- Unsafe cutting practices noted during investigation (on this and other trees in area) included:
 - insufficient holding wood;
 - low backcuts; and
 - improper cleaning of the face cut.

The incident cont'd

- Tree struck log quality specialist's vehicle as she was driving, crushing the cab of her vehicle.

CAUSE OF DEATH

Traumatic head and neck injury

Contributing factors

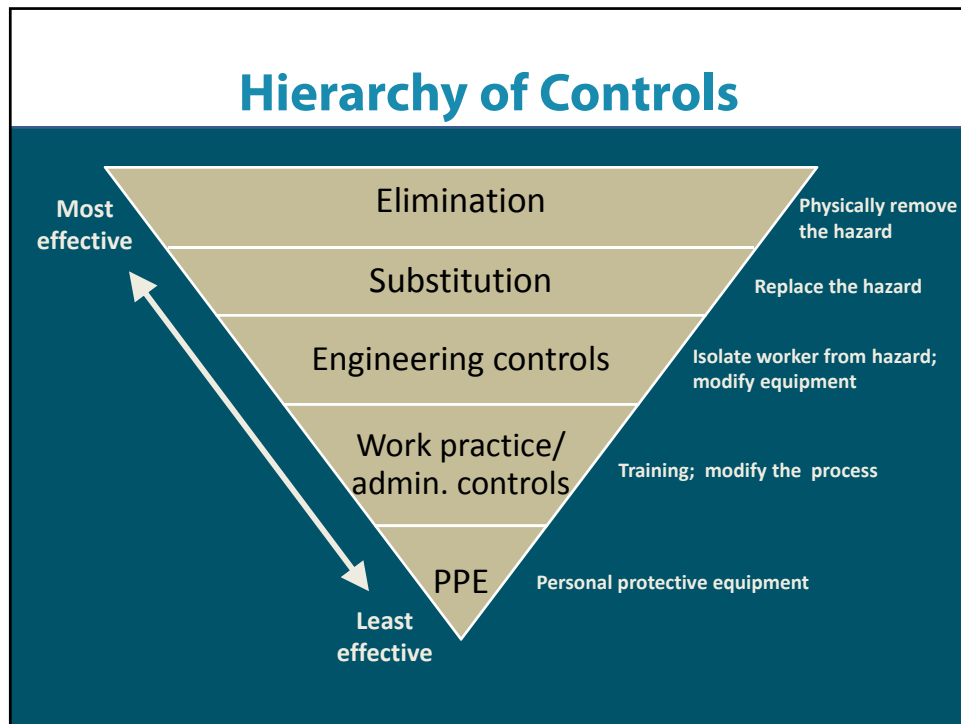
- Tree height and ground slope are important factors when evaluating timber falling activity for potential hazards.
 - In this case tree < minimum safe distance of two lengths from road, with no protective provisions in place.
 - Unsafe cutting practices observed that allowed tree to fall 135° away from intended lay and into the road.
- Inadequate communications channels in place.

Key Recommendations

1. Employers responsible for active logging operations should assure that entry into hazardous logging areas is controlled, including correct placement of flagging, road closures, and adequate and proper signage and warnings.
2. Employers should assess tree fallers skills and require that novice or inadequately performing workers are directly supervised by a qualified person until the faller demonstrates the ability to safely perform these tasks independently, including trees of different types & sizes, and under different ground conditions.
 - Assess subcontractor safety during contract review.

Key Recommendations (cont'd)

3. Employers with employees who work in and around forests who may be exposed to production logging operations should train employees in hazard recognition and reporting, and assure hazards are tracked, documented, and resolved, and their resolution communicated.
4. Incident investigations should be utilized to identify action items to be addressed, and responsibilities assigned to assure their completion.
5. On multi-employer worksites, all employers on site share the responsibility for protecting workers from known hazards, and thus should establish inter-employer safety communication practices involving all employers at a given site.



Recommendations Exercise: Your Turn (Part 1)

- Form teams
- Review investigation report summaries/factors sheets
- Develop recommendations



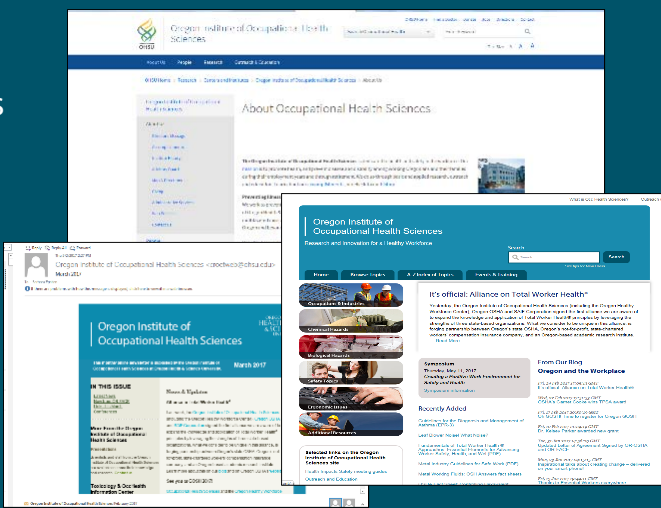
Outreach

- Website
- Publications
- Interventions
- Presentations



Resources

- Oregon Institute of Occupational Health Sciences
 - Education
 - Outreach
 - Publications
 - Newsletter
 - Blog
 - Symposia
 - Online videos



OR-FACE Website

Google OR-FACE

The screenshot shows a Google search for 'OR-FACE' with the top result being the official website. The website's homepage has a blue header with the OR-FACE logo and a navigation menu. The 'Investigation Reports' link is circled in pink. Below the header is a large banner image of a vineyard with the text 'Oregon Fatality Assessment and Control Evaluation'. At the bottom, there are sections for 'Annual Reports' (showing reports from 2008, 2010, and 2012) and 'News and Updates'.

OR-FACE Publications

Annual Reports (since 2003)

- Published 18 months
- Case abstracts, based on document review
 - OSHA investigation
 - Police investigation
 - Medical examiner
 - Pathology
 - Toxicology
 - National Transportation Safety Board
 - US Coast Guard

Publications

Booklets

Publications

Interactive Maps (2003-2013)

Industry

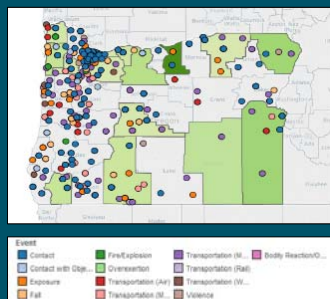
Construction



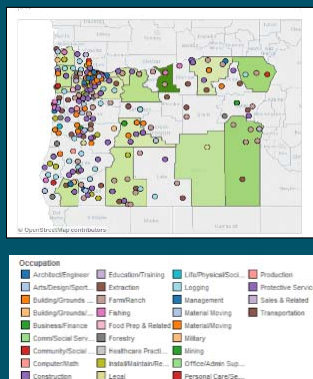
Publications

Interactive Maps (2003-2013)

Event



Occupation



Publications

Hazard Alerts

Fatal Fall Alert

Gravity Kills

In 3 years, 22 Oregon workers died in falls. Risk increases greatly over age 35.

Fall hazards are everywhere. Falls are the leading cause of death in the construction industry.

Please observe the following recommendations:

- Make sure ladder is in good condition and ladders are secure. But before 10 feet, use fall protection.
- Three-point rule. Get a firm grip of two rails, especially in dry or icy conditions.
- Beware losing your balance from unexpected release of a weight, carrying or pulling, or from overexertion.

Fatal Stories, 2003-2005

Case 1: A 35-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 2: A 40-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 3: A 45-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 4: A 50-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 5: A 55-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 6: A 60-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 7: A 65-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 8: A 70-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 9: A 75-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 10: A 80-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 11: A 85-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 12: A 90-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 13: A 95-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 14: A 100-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 15: A 105-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 16: A 110-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 17: A 115-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 18: A 120-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 19: A 125-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 20: A 130-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 21: A 135-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Case 22: A 140-year-old self-employed painter was killed after he was struck by a falling pipe while working on a house.

Snag Hazard Alert

From 2010 to 2013, 10 Oregon workers died after being struck by trees. Hung limbs and snags in forests are a recurring contributing factor to occupational fatalities among tree fallers in Oregon.

Please observe the following safety tips:

- Do not cut hung or snagged trees and limbs in your own and others' paths.
- When faced with a hazardous situation, stop work and seek assistance from a qualified partner, or a more experienced worker.
- If a hanging limb is identified, after receiving assistance, work to identify the best method for removing the limb, limb, limb, or snag working under a lodged tree or the cutting of a tree when another person is in the area.
- Employees should ensure that workers are trained and experienced in managing hanging limbs and other hazardous logging conditions.

Fatal Stories

Case 1: A 35-year-old self-employed logger was killed after he was struck by a falling tree while working in a forest.

Case 2: A 40-year-old self-employed logger was killed after he was struck by a falling tree while working in a forest.

Case 3: A 45-year-old self-employed logger was killed after he was struck by a falling tree while working in a forest.

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Crab Fishing Hazard Alert

From 2010 to 2013, 10 Oregon workers died after being struck by trees. Hung limbs and snags in forests are a recurring contributing factor to occupational fatalities among tree fallers in Oregon.

Please observe the following safety tips:

- Do not cut hung or snagged trees and limbs in your own and others' paths.
- When faced with a hazardous situation, stop work and seek assistance from a qualified partner, or a more experienced worker.
- If a hanging limb is identified, after receiving assistance, work to identify the best method for removing the limb, limb, limb, or snag working under a lodged tree or the cutting of a tree when another person is in the area.
- Employees should ensure that workers are trained and experienced in managing hanging limbs and other hazardous logging conditions.

Fatal Stories

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Case 22: A 140-year-old self-employed logger was killed after he was struck by a falling tree while working in a forest.

- One page
- Bulleted recommendations
- Abstracts of similar cases

OR-FACE ALERT

Fellow manufacturer's instructions

Multiple Oregon construction deaths have been linked to not following manufacturer's instructions for equipment or building materials. These example cases are described below. Using manufacturer's instructions in training, and consulting them before operations, can save lives.

For complete fatality investigation reports visit the OR-FACE website.

Construction Fatal Stories

Case 1: A 35-year-old self-employed logger was killed after he was struck by a falling tree while working in a forest.

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Publications

Blogs



Oregon and the Workplace



Updated Letter of Agreement Signed by OR-OSHA and OR-FACE



National Safety Stand-Down to Prevent Falls in Construction



Oregon and the Workplace




OR-FACE Publishes More Toolbox Talk Guides




Inspirational talks about creating change - delivered on your smart phone!



NOHC short course focuses on sleep and shiftwork




Publications




FATAL HAZARD

- Use hooks
- Don't chat
- Move boy




FATAL HAZARD

- Install guarding
- block opening
- Wear fall arrest
- Know location




FATAL HAZARD

- On hillside, stay
- Make sure the hoist is up
- Make sure work




FATAL HAZARD

- Never exceed load of a lift or crane
- Use a spotter and communication system to prevent
- Never work directly



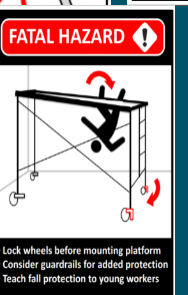
FATAL HAZARD

- Use a crick or table to keep supplies stacked level and flat
- Never place ladder under unstable load
- Consider other access equipment



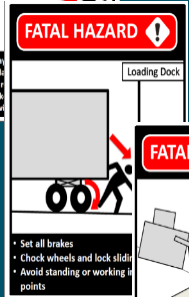
FATAL HAZARD

- Work away from
- Avoid loose cable
- Conduct hazard assessment
- safe work procedure



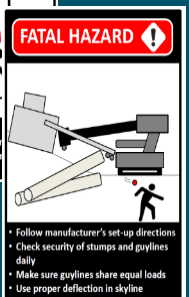
FATAL HAZARD

- Lock wheels before mounting platform
- Consider guardrails for added protection
- Teach fall protection to young workers



FATAL HAZARD

- Set all brakes
- Check wheels and lock slide
- Avoid standing or working in points



FATAL HAZARD

- Follow manufacturer's set-up directions
- Check security of stumps and guylines daily
- Make sure guylines share equal loads
- Use proper deflection in skyline



Tips for Better Safety Communication

- End information overload, increase comprehension
- Increase actual use of info
- Better recall (remember more of it)
- Perform better (improve problem-solving)



Ref: Larkin & Larkin, 2007 www.Larkin.biz



Safety Communication Essentials

- Use pictures
 - Simpler the better (use several if subject complex)
 - Keep it simple (text)
 - Then get technical... *(optional)*

Ref: Larkin & Larkin, 2007 www.Larkin.biz



“Few things in communication research are known with certainty, here is one of them:
Adding crude drawing to text brings huge increases in comprehension.”

Ref: Larkin & Larkin, 2007 www.Larkin.biz

Supervisors Can Use This Communication Immediately

Hanging Like This May Kill Him

Surviving the fall is not the only danger
Hanging in the harness is dangerous too

Hanging like this, it takes about...
5 minutes to go unconscious
Less than 30 minutes to die

Get him down quickly
He's not OK

Legs are the problem:
Blood pools into his legs
If his legs don't move, blood stays there
Heart can't pump blood to his head
First, he faints
Then, he dies

If he's conscious tell him
to keep moving his legs

When he's down...
Don't Do This

His legs are full of too much "blue" blood.
If all that blood, with no oxygen in it,
suddenly pours into his heart, it could kill him.

When he's down...
Sit or Kneel

Don't lay him flat.
Keep him propped up in a sitting position.
No lying down for at least 20 minutes.
Give his heart time to adjust.

Source: Adapted from Seddon

Ref: Larkin & Larkin, 2007 www.Larkin.biz

>200 words, grade level 16
(Maybe useful for safety engineers, but
not for jobsite supervisors!)



Toolbox Talk Exercise: Your Turn (Part 2)

- Form teams
 - Some members do a stick drawing
 - Some members write text to describe



OR-FACE Research

- Why research?
- New/current projects underway
- Previous field studies



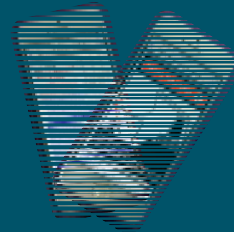
Why Research

- Workplace fatalities: preventable, yet unacceptably common events
 - Globally ~ 350,000 workers killed on the job each year, with nearly 5,000 deaths occurring in US
 - Oregon occupational fatality rate currently 2.6 deaths per 100,000 workers (national US average = 3.5)
- **Targeted research:** important arm of OR-FACE
 - Use knowledge gained through surveillance and investigation, e.g. identify high hazard industries, prevalent injuries, needs for prevention
 - Develop and conduct field studies
 - Ultimate aim: create evidence-based, practical intervention tools & methods



New Projects

- Social network analysis
- Preventing falls in residential construction
- Mobile toolbox talks





Field Study #1 – Social Network Analysis

1° Aim: Conduct social network analysis research to further target communications in high risk industries



- Significant # of fatalities occur in agriculture
 - Fatality rate 800% higher than all US workers
 - Leading cause on farms: mobile machinery (tractors)
 - Oregon home to more than 37,000 family farms
- How does SNA work?
 - Identifies pathways of information and influence flow
 - Who are the Influencers / opinion leaders in the industry
 - How are they connected to followers who look to them for technical and safety information



Field Study #2 – Fall Prevention

The challenge:

- Falls: most common cause of construction fatalities
- At greatest risk: workers in small-to-medium sized residential construction
- Notoriously difficult to engage in research
- We know little about their fall prevention knowledge and practice in Oregon and effective ways to influence adoption of new protective work practices





Field Study #2 – Fall Prevention (cont'd)

Aim: Test novel targeting strategy to engage small residential construction firms in fall prevention surveillance research, and establish fall prevention equipment and training grants

- “Triggering event” hypothesis: serious (non-fatal) fall injury will increase employer readiness to participate in fall prevention research and adopt specific prevention practices
- Two-year surveillance/fall prevention survey to compare trigger event contractors and control contractors
- Small grants pilot to supply equipment and training
- Partnering with SAIF and OHBA to identify participants



Field Study #3 – Mobile Toolbox Talks

Aim: Establish and evaluate a mobile marketing system to promote fatality prevention toolbox talks in construction

- Partners (subscribers)
 - Oregon Home Builders Association
 - Associated General Contractors
- Text messaging/pdf/YouTube videos
- Emails
- Hypothesis: Mobile alert system will increase proportion of supervisors who meet/exceed Oregon OSHA required frequency for safety talks





Preventing Construction Fatalities: The Toolbox Guide Initiative

OR-FACE
PSU Occupational Health Psychology
Hoffman Construction
Fortis Construction
SAIF Corporation



PLAN

ahead to get the job done safely.

PROVIDE

the right equipment.

TRAIN

everyone to use the equipment safely.



Tool Box Talk Guides: Evidence-Based Structure

FRONT: Scripted Story

Toolbox Talk Guide **OR-FACE** www.ohsu.edu/croet/face
Load of Lumber Shifts and Falls on Construction Worker

INSTRUCTIONS: Hold the guide with this side facing you and the other side facing your crew. Then read the story.

Our safety talk today is about a 32-year-old framer from another company who died when a load of lumber fell on him. He was on a ladder to access a stairwell hole to the second level of a house while a rough terrain forklift was lifting a bundle of lumber to the same level. The lumber weighed at least 600-800 lbs more than the maximum possible for the lift arc, and the forklift tipped over. The lumber shifted and dropped on the victim's head and upper body, pinning him against the ladder. The lumber shifted again and he fell to the first floor deck. The worker probably died from being crushed before the fall.



So here are some ways we can prevent something like this from happening where we work.

- Never exceed the load or extension limits of a lift or crane. You should be trained before you operate a lift or crane, and I can make sure you get the training.
- Never work directly under a load, or under the swing radius of a lift or crane, unless you are required to be there as a rigger or guide.
- Use a spotter and communication system to make sure everyone knows about lifts in advance, and to prevent material from passing over workers.

ASK: "Does anyone have more ideas or comments to share?"

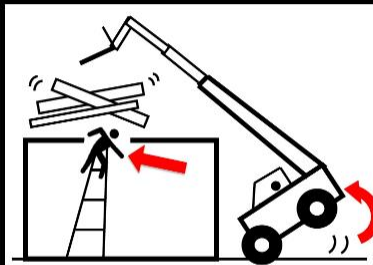
Pause for discussion. Then see if there are ways to take action.

END WITH ACTION PLAN (Ideas for what to ask or say).

- "Are there any operations we do that might cause us to push forklifts too close to their limits?"
- "Does anyone have ideas for improving our communication systems?"
- "What do you all do to make sure people are not under loads being moved?"
- Discuss a similar situation at your current site.
- Express your commitment to training people for each machine they operate.
- Commit to follow-up at the next safety talk.

BACK: Line Drawing

FATAL HAZARD



- Never exceed load or extension limits of a lift or crane
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- Never work directly under a load

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BACK: Line Drawing

Script with instructions in black boxes

Prompts for discussion and correcting hazards

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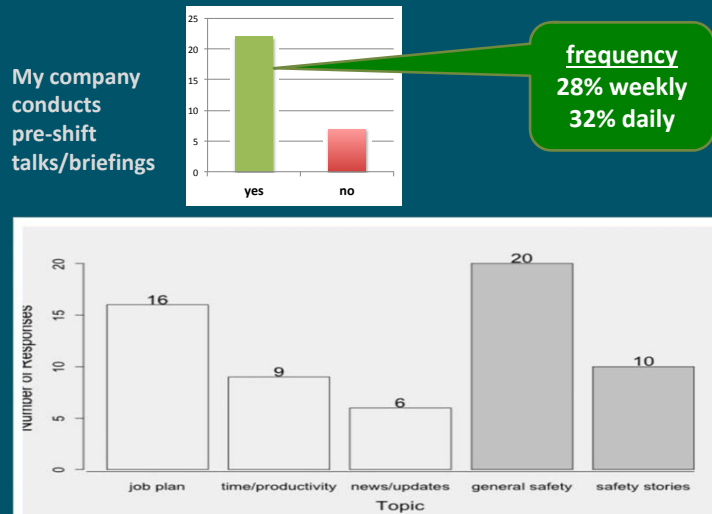
FATAL HAZARD

Top 3 preventive actions in bullets

- Never exceed load or extension limits of a lift or crane
- Use a spotter and communication system to prevent lifts over workers
- Never work directly under a load

3 Field Studies (sample findings)

• Study 1: Current Pre-Shift Practices (n=28)



3 Field Studies (sample findings)

• Study 2: Image Viewing Distances (n=30)



Supervisors

VS.

Preferred
3:1

Workers

- ## Similar positive ratings



Peer-reviewed Publication

- *Safety Science* v.86 (2016) pp.122-131

