

# **The use of close call reports in the construction industry to identify leading indicators**

**Emily J. Haas, PhD  
Research Health Scientist  
NIOSH/NPPTL**

**NORA Construction Sector Council Meeting  
November 18, 2020**



# Objectives

- Frame close calls as a leading indicator within a health and safety management system
- Provide a case example using close call incidents to identify areas of risk; engage the workforce; and develop tailored interventions
- Summary and next steps



LEADER SAFETY AU POLICIE  
PRE-TASK RISK ASSESSMENTS INTERACTIONS  
MAINTENANCE MANAGEMENT SAFETY EQUIPMENT MAINTENANCE INCIDENT INVESTIGATION  
SAFETY TRAINING MANAGEMENT HAZARD REMEDIATION  
RISK MANAGEMENT HAZARD COMMUNICATION MISSING PARTS SYSTEMS STOPWORK AUTHORITY  
OPERATING PROCEDURES

**Causation has been established between close calls and future incidents, positioning such reports as leading indicators within an OSH management system**



# However, methods to both reliably collect and quickly respond to close call reports are underdeveloped

- What is the relationship between risk type (i.e., low, moderate, high, and critical) and corrective action implemented?
- How can close call reporting inform leading indicators within a safety and health management system?

| Probability        | Consequence – could cause:           |                                 |                                 |                                      |                         |
|--------------------|--------------------------------------|---------------------------------|---------------------------------|--------------------------------------|-------------------------|
|                    | 1 – first aid injury or minor damage | 2 – minor injuries (recordable) | 3 – moderate damage (lost time) | 4 – permanent disability or fatality | 5 – multiple fatalities |
| 1 – Rare           | 1                                    | 2                               | 3                               | 4                                    | 5                       |
| 2 – Unlikely       | 2                                    | 4                               | 6                               | 8                                    | 10                      |
| 3 – Moderate       | 3                                    | 6                               | 9                               | 12                                   | 15                      |
| 4 – Likely         | 4                                    | 8                               | 12                              | 16                                   | 20                      |
| 5 – Almost Certain | 5                                    | 10                              | 15                              | 20                                   | 25                      |

15 – 25: CRITICAL RISK

9 – 12: HIGH RISK

5 – 8: MODERATE RISK

1 – 4: LOW RISK

# Companies record close calls in several ways, often using either paper/pencil forms or electronic forms

## NIOSH has collected close call observations using both methods

Company: \_\_\_\_\_ Date occurred: \_\_\_\_\_  
Region: \_\_\_\_\_ Time occurred: \_\_\_\_\_  
Division: \_\_\_\_\_ Name: \_\_\_\_\_  
Product group: \_\_\_\_\_ Employee submitting form: \_\_\_\_\_  
Classification: \_\_\_\_\_

Description of the close call: \_\_\_\_\_

Corrective action: \_\_\_\_\_

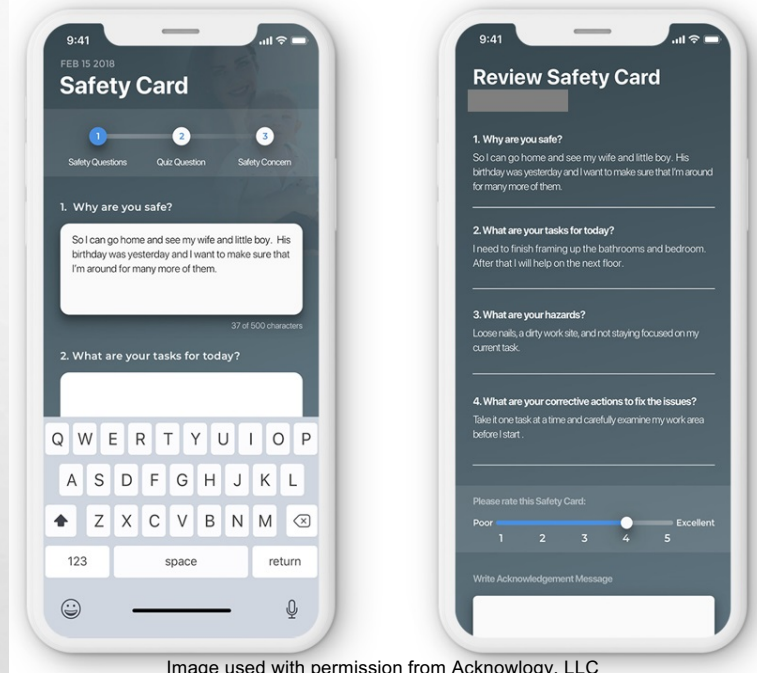


Image used with permission from Acknowlogy, LLC

## A collaborative study with NIOSH and CRH/OMG

Started with 249 close call incidents over a 3-month period

58 *third party/public driving* close-call classifications recorded

- 36 occurred on public roads off work
- 22 also happened off the job, usually at home

15 were not reported in enough detail to provide guidance on finding or mitigating a hazard

Some were reassigned to classifications that were more populated.

Ended with 167 close calls in 12 hazard classification categories



**Oldcastle<sup>®</sup>**  
**Materials**



## 167 close calls remained and fell into 12 hazard classifications

“Maintenance guy was standing on handrail using a grinder to cut metal out of head shoot without a harness.”

“A contractor was at the plant getting a load of water when I saw him standing on his water tank. He was not wearing fall protection.”

| Company Classification   | Frequency | Percent |
|--|-----------|---------|
| Electrical hazard  | 8         | 4.8     |
| Employee in/under/near equipment   | 7         | 4.2     |
| Equipment failure  | 15        | 9.0     |
| Lack of proper RA  | 17        | 10.2    |
| Housekeeping   | 10        | 6.0     |
| Plant hazard   | 17        | 10.2    |
| Slip/Trip hazard   | 14        | 8.4     |
| Use of PPE   | 17        | 10.2    |
| Process/procedure related  | 13        | 7.8     |
| Traffic control  | 14        | 8.4     |
| Work zone intrusion  | 6         | 3.6     |
| Vehicle rules (e.g., pedestrian segregation, alarm/reversing, load securement) | 29        | 17.4    |
| Total  | 167       | 100     |

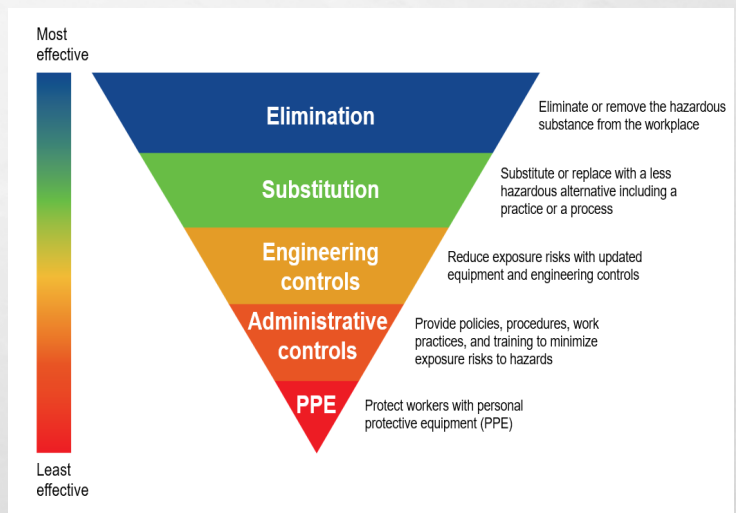
## A 5x5 matrix was used to guide a qualitative risk assessment (RA) of each close call\*

| Probability        | Consequence – could cause:           |                                 |                                 |                                      |                         |
|--------------------|--------------------------------------|---------------------------------|---------------------------------|--------------------------------------|-------------------------|
|                    | 1 – first aid injury or minor damage | 2 – minor injuries (recordable) | 3 – moderate damage (lost time) | 4 – permanent disability or fatality | 5 – multiple fatalities |
| 1 – Rare           | 1                                    | 2                               | 3                               | 4                                    | 5                       |
| 2 – Unlikely       | 2                                    | 4                               | 6                               | 8                                    | 10                      |
| 3 – Moderate       | 3                                    | 6                               | 9                               | 12                                   | 15                      |
| 4 – Likely         | 4                                    | 8                               | 12                              | 16                                   | 20                      |
| 5 – Almost Certain | 5                                    | 10                              | 15                              | 20                                   | 25                      |

Used ANSI's Z590.3 prevention through design (PtD) risk reduction standard

\* **Industry subject matter expert and regional site manager also reviewed 10% of our coding to make sure we were accurately assessing the consequences and probabilities of the close calls.**

## The hierarchy of controls was used to code corrective actions reported



| Classification    | Description of Event  | Consequence | Probability | Risk Score | Risk Type | Corrective Action   | Action Type (hierarchy of controls) |
|-------------------|---|-------------|-------------|------------|-----------|---|-------------------------------------|
| Plant Hazard      | Low berms were noticed in the sand dump and stockpile areas   | 4           | 3           | 12         | High      | Berms were raised.  | 2 - Engineering Control             |
| Equipment Failure | While working on a conveyor and using a 4' step ladder one leg sunk in the sand and cracked the leg.  | 3           | 4           | 12         | High      | Tagged the ladder out and later threw it away.  | 1 - Elimination                     |
| Housekeeping      | Ladder was left in the roadway  | 1           | 2           | 2          | Low       | Pulled over and pla   | 1 - Elimination                     |
| Slip/Trip Hazard  | I was climbing the ladder to check the metal detector, as I stepped on the ladder my boot was muddy and I slipped off as I put pressure on it to climb. | 3           | 3           | 9          | High      | Cleaned boots, used 3 points of contact. Also told the plant man to try and keep mud away from the ladder access. | 3 - Change in work process          |

## Consequence – could cause:

### Probability

| 1 first aid     | 2 minor injuries | 3 lost time     | 4 disability or fatality | 5 multiple fatalities |
|-----------------|------------------|-----------------|--------------------------|-----------------------|
| n = 19<br>11.4% | n = 28<br>16.8%  | n = 44<br>26.3% | n = 63<br>37.7%          | n = 13<br>7.8%        |

**1 – Rare**  
n = 6, 3.6%

**2 – Unlikely**  
n = 46, 27.5%

**3 – Moderate**  
n = 56, 33.5%

**4 – Likely**  
n = 46, 27.5%

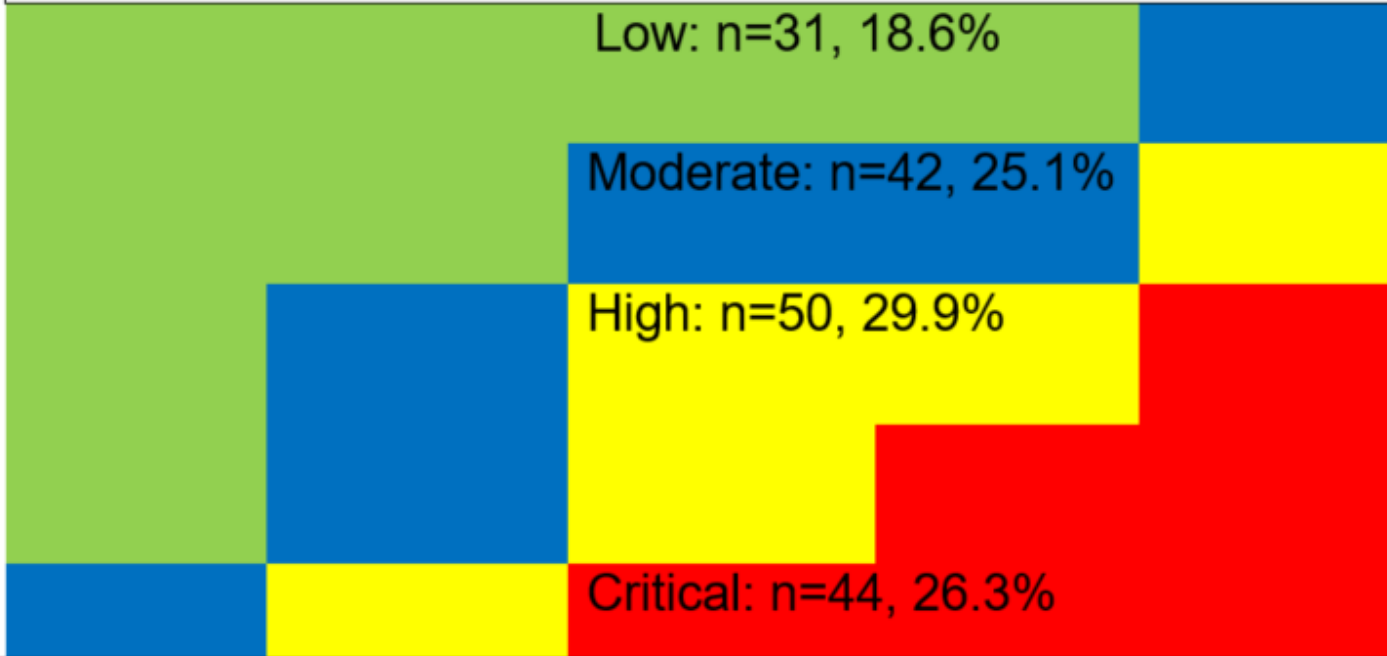
**5 – Almost Certain**  
n = 13, 7.8%

Low: n=31, 18.6%

Moderate: n=42, 25.1%

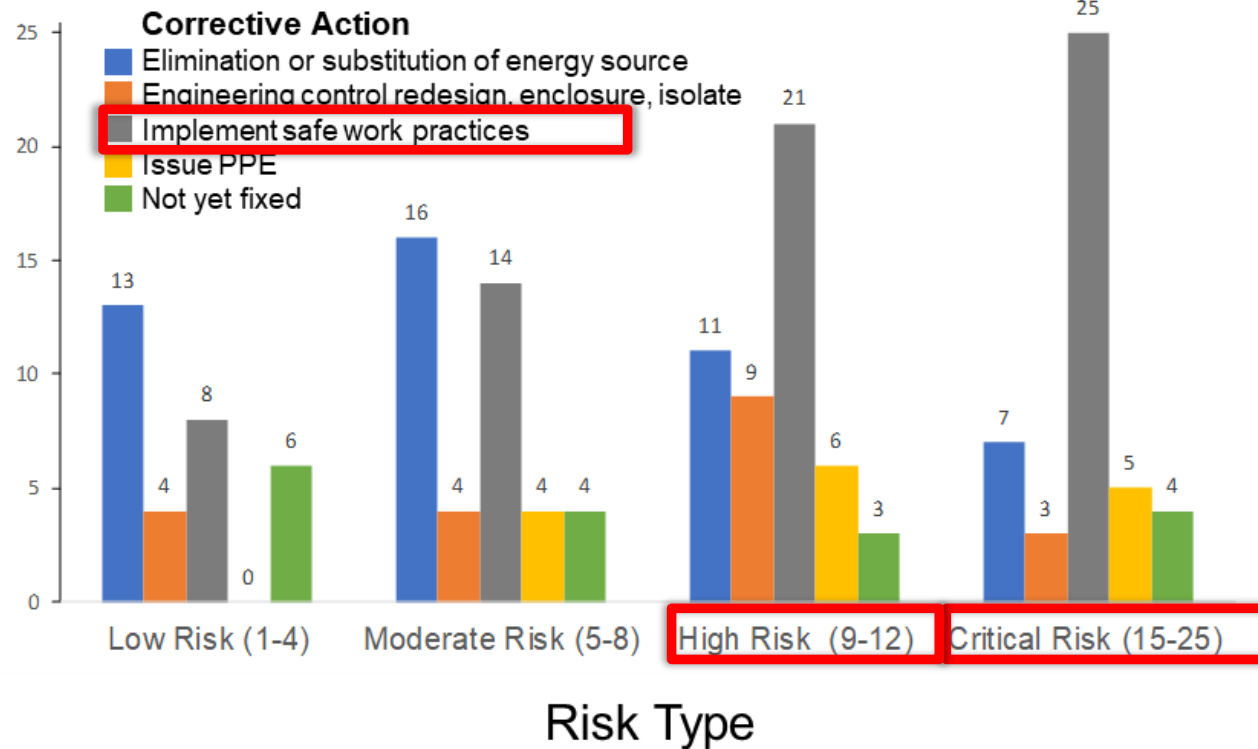
High: n=50, 29.9%

Critical: n=44, 26.3%



# Safe work procedures were found to be the corrective action needed to mitigate close call hazards in 40% of the reports

Frequency



# Where do we go from here?

It takes organizational leadership and worker participation and engagement to develop practical intervention methods to implement, evaluate, and to continuously improve.



**Examining this gap in corrective actions revealed some critical leading indicators to help prevent incidents...and warned management that there is important work to do!**



- Proactive approaches to OHS management
- Risk tolerance
- Communication and prioritization
- Leadership follow-up
- Worker participation and engagement

## **Worker participation:**

***Organizations must do more than encourage reporting – must involve employees in planning efforts prior to execution***

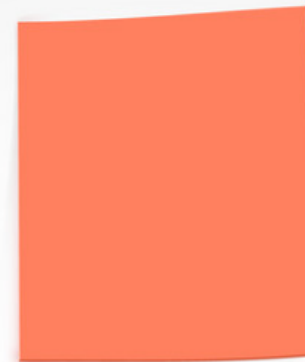
- Workers must be able to participate in continuous improvement activities on site-specific close calls.
- No-fault reporting is essential to creating an atmosphere of trust.
- Inform a comprehensive plan around identifying, ranking, and mitigating risks.
- Make suggestions to improve the deficiencies in company plans and processes.

## **207 employees participated in brainstorming activities to identify problems**

- 89 employees from an asphalt operation
- 118 employees from several road construction crews

**What are the biggest safety-related issues or problem areas which might be having a negative effect on safety culture?**

Cast your vote for the 5 biggest issues affecting OHS at work



write on Post-it notes why you feel these are the most important issues



Attach Post-it notes to bigger sheets on walls...Tallied votes



# Top 10 Issues Affecting Company OSH

---

| Des Moines Asphalt Paving        | Omni Engineering              |
|----------------------------------|-------------------------------|
| Poor/inadequate communication    | Poor/inadequate communication |
| Lack of training                 | Lack of Training              |
| Spotter related issues           | Bad attitudes                 |
| Repairs/equipment/tools          | Lack of teamwork              |
| Safety programs/awareness        | Pressure to produce           |
| Failure to speak up              | Subcontractor issues          |
| Supervisor/manager/leader issues | Complacency                   |
| PPE (lack of or quality)         | Failure to speak up           |
| Insufficient reinforcement       | Supervisor/management issues  |
| Pressure to produce              | Inconsistent discipline       |

---

MAY 15, 2017

## SAFETY VIDEO BLOG SEASON 1 ROUNDUP - TOP 10 FACTORS INFLUENCING RISK TOLERANCE



Risk Tolerance Introduction

- Sought to understand risk tolerance
- Incorporated training pieces and factors that contribute to risk tolerance for pre-shift safety talks
- Created 10 individual risk tolerance videos, using real employees to showcase factors that contribute to taking risks and causing incidents on site

## Leading indicator checklists were needed to provide goals of the plan, behaviors that contribute to incidents, and actions to manage them

- Checklist for Workers
- Checklist for Managers
- Checklist for Site/Equipment
- Checklist for Worker Preparedness



**Adapted NIOSH's communication cards.**

**See Rock Products articles:  
McGuire et al., 2019  
Haas and McGuire 2019**

These measurements provided a reminder and incentive for management and co-workers to communicate with each other about possible risks during pre-shift checks and during shifts to minimize hazards.

| Checklist for workers                            | Scorecard  |      |                                  |
|--|--|------|----------------------------------|
| Pre-shift Objectives                             | Measurement  | Done | List                             |
| Inspect and prepare equipment, self for job task | • Identify blind spots                                       |      | List blind spots:                |
|  | • Clean all windows and mirrors prior to operating equipment |      | Areas cleaned:                   |
|  | • Audits before starting equipment/pre-shift inspections     |      | Audits/inspections conducted:    |
|  | • Identify known hazards on shift                            |      | List possible hazards:           |
|  | • Wear proper PPE  |      | PPE needed:                      |
|  | • Participate in T5's  |      | Issues brought up:               |
|  | • Put on seatbelt  |      |                                  |
| Task Objectives                                  | • Effectively use radios/communication channels              |      | Communication issues:            |
| Maintain situational awareness during job task   | • Get out and look when needed                               |      | Scenarios when needed:           |
|  | • Call for spotter when needed                               |      | Scenarios when needed:           |
|  | • Establish eye contact with other workers                   |      | Scenarios when needed:           |
|  | • Conduct risk assessments throughout workday                |      | Risks identified? How addressed? |
|  | • Do I need a break?   |      | Breaks taken to prevent fatigue: |
|  | • What are my distractions?                                  |      | Distractions noted:              |
|  | • Remember to LO/TO  |      | Scenarios when needed:           |
|  | • Are berms adequate?  |      | How addressed:                   |
|  | • See something, say something                               |      | Scenarios when needed:           |



# **If management supports a culture of reporting, it is incredible what can be learned, prevented, and, if necessary, enforced**

- Several ironworkers on the roof and not following 100% requirements. The supervisor has not been enforcing this OSHA required rule. The main area of work yesterday had no barriers/warning lines in place.
- Sent 2 guys home for improper use of ladder next to a 50'+ fall hazard.
- Iron worker walking outside post barrier on roof not tied off.
- Observed scaffolding guys remove a guard rail into a pit to lower down material without fall protection. Work was stopped and we went over requirements needed to have the rail down. The rail was re-installed.



**Personal protective  
equipment must be  
worn at all times**

## OSHMS key elements to help system execution, evaluation, and improvement

- The success of policies developed; objectives determined; and processes put in place depend on:
  - Risk management and commitment to eliminate hazards
  - Leadership commitment to consult with and include workers in these processes
  - Culture of safety and health as a priority





# Thank You!

[Ejhaas@cdc.gov](mailto:Ejhaas@cdc.gov)

## Acknowledgements:

- CRH Americas Materials – Joe McGuire and Chad Ferguson
- Acknowlogy, LLC – Jon Wickizer
- Great River Industries – Kenny Lawson and Greg Bauer
- Pittsburgh Mining Research Division Colleagues – Brendan Demich and Cassandra Hoebbel

**Disclaimer:** the findings and conclusions in this report are those of the authors and do not necessarily represent the views of the national institute for occupational safety and health. Mention of any company or product does not constitute endorsement by NIOSH.