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## Safety Training in Construction: Do Toolbox Trainings Work?

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### KEYWORDS

Safety  
Toolbox talk  
Knowledge retention  
Construction  
Training

### ABSTRACT

Toolbox training has become common practice in the construction industry. With the continued high numbers of fatalities and injuries plaguing the construction industry, the investigative team designed a quasi-experimental pilot study to evaluate the effectiveness of toolbox training. The study took place in Butte, MT with a small, heavy civil construction company. The lead investigator conducted six weeks of toolbox training sessions. A 23-question pre-test examination was administered to establish the baseline knowledge. At the end of the six training sessions, participants were reevaluated with a final post-test to determine if the information was retained. Statistically significant ( $p = .009$ ) gains in performance were observed suggesting that toolbox trainings did have a positive impact on worker knowledge retention. The study has a number of limitations discussed in the article that influence inferences.

## 1. INTRODUCTION

The construction industry will persist in society whether focused on new projects, remodels, clean-ups, or scheduled improvements. Safety is typically a high-priority a priority on the civil construction worksite. A positive company safety record is a competitive edge when bidding for projects against companies that do not prioritize safety. Technological advances are continuously evolving and have reduced some hazards and risks associated with construction methods, work practices, and environments however, significant hazards and associated risks persist. The Occupational Safety and Health Administration (OSHA) and the Mining Safety and Health Administration (MSHA) mandate that employees receive training prior to beginning work on construction sites as well as refresher training on an annual basis. Safety training is not only a requirement but also a major factor in promoting a positive work climate and safe work practices. Training may take many forms including traditional classroom presentations, onsite toolbox talks, to newer micro training using mobile technology. Toolbox or training is a common practice but their remains a paucity of research on its effectiveness. Investigators designed a quasi-experimental study in heavy civil construction to evaluate effectiveness of tailgate trainings over a six-week period.

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## 2. THE EXTENT OF THE PROBLEM

The U.S. Bureau of Labor Statistics (2020) reported the number of fatal work injuries in the construction industry continued to surpass all other sectors. While the rate of nonfatal injuries has dropped nearly 57% from 2003 to 2019, the injury rate remained significantly higher than all other industries combined (“Nonfatal injury,” 2021). Research by Wilkins (2011) revealed that poor training and retention of relevant knowledge are two possible factors responsible for this high incidence of injury. The 2019 injury rates among construction employers with 11 to 49 employees were five times higher than those employers with 1,000 or more employees (“Nonfatal Injury,” 2021). Just over 80% of construction companies have fewer than 10 employees (Dong, Wang, and Katz, 2018). The U.S. Small Business Administration (2021) defines organizational size for construction by the sum of annual receipts the business generates. A company may appear to be large based by this definition but the actual number of employees may influence whether or not a company allocates reserves for human resource and/or safety professionals. Safety training is likely to be overlooked or pushed onto unqualified or less qualified employees. Limited human and economic resources, up-to-date technology, equipment, industry best practices, and training capabilities become major factors in effective risk management (Hasle & Limborg, 2006; Masi & Cagno, 2014).

## 3. SAFETY TRAINING

Training on various construction sites presents unique sets of challenges because a dynamic and rapidly changing nature of the work. A common practice among construction companies, for compliance measures, is yearly training in which employees receive all of their training in one organized session, typically lasting the course of an entire workday. While this may satisfy requirements set by OSHA and MSHA, it does not assess whether the information and the delivery methods were effective for improving safe work behaviors, choices, and accomplishing knowledge gains. Long-term memory could be better accessed through more frequent training. A learning technique, referred to as spaced learning, has shown to help facilitate the storage of information in long-term memory (Noor et al., 2021). Spaced learning techniques refer to revisiting information in repeated separate time periods (Noor et al., 2021).

The most common training methods found by Hallowell (2012) were orientation, toolbox talks, informal safety communication among workers, and formal presentations by safety managers. Toolbox talks have also been referred to as tailgate meetings, safety moments, safety minutes, safety shares, microtrainings, and other terms. The primary focus is its short-delivered nature, usually lasting 15 minutes or less. It is a unique training technique that aids in the development of increased knowledge and skills which helps foster and reinforce safe behaviors and choices. This style of training provides exposure to small amounts of material delivered in short timeframes which can improve active learning and help increase knowledge retention capacities (Stober & Putter, 2013). Other benefits of repeated training include the ease of fitting training into the busy work schedule and supporting the spaced learning techniques (Stober & Putter, 2013). Toolbox talks can be given at any time but are commonly administered at the beginning of the work shift, week, or before a new phase of a project begins. Occupational safety and health (OSH) knowledge can be increased through the use of toolbox trainings (Olson et al., 2016).

A literature review was conducted and revealed several other toolbox training retention studies were conducted using surveys as a way to evaluate worker preference of training style, interest in the material, and safety climate (Eggerth et al., 2018; Freschet, 2018; Kaskutas et al., 2016). While toolbox talks tend to be delivered verbally, combining training delivery with visual information could lead to a

better understanding and retention of the material (Mehany et al., 2021). In a study conducted by Olson et al. (2016), nine articles were reviewed related to perceived importance, effectiveness, and current quality of toolbox talks. It was concluded that there is evidence showing toolbox talks as an effective component of safety programs in construction but visual aids were either lacking or not effective (Olson et al., 2016). The study conducted by Olsen et al. (2016) focused primarily on the development and evaluation of visual toolbox talks related to fatal construction incidents.

The goal of a toolbox talk training is to repeatedly deliver a specified dose of safety information effectively to the workers frequently enough so that they remember it subconsciously and manifest the desired behavior. However, the increased safety knowledge and improvements highly depend on the willingness of the workforce to engage in the trainings (Wilson, 1989). The “one size fits all” approach to training is not practical in any industry. This pilot project was designed to gather short-term retention outcomes of the participant’s pre-and post-training safety knowledge. The objective of this research was to explore whether weekly toolbox training sessions had an effect on safety knowledge retention.

## **4. MATERIALS AND METHODS**

### **4.1 Study Location**

This research was conducted at a waste mine removal project located in the Northwest United States. One of the construction company’s managing personnel provided written approval for the research project to be conducted on this site. All toolbox trainings were conducted outside, the first workday of the week (typically Monday’s), beginning at 7:00 am.

### **4.2 Participants**

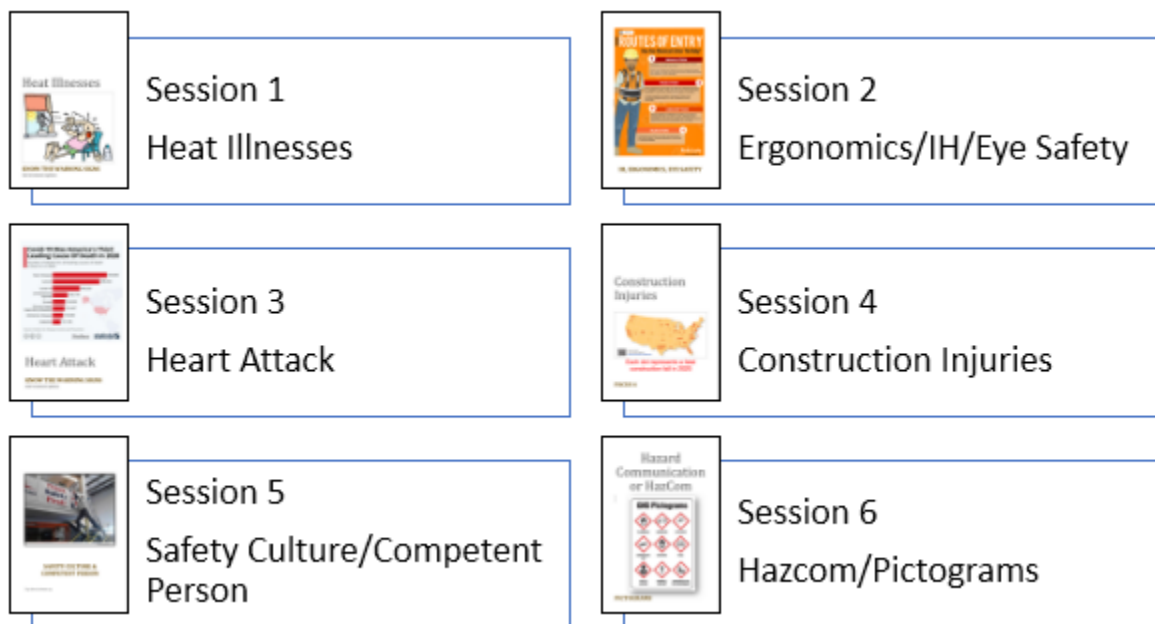
The majority of the participants for this study were employees from one small heavy civil construction company. Other onsite personnel present during the weekly toolbox talks were also invited to participate. The additional personnel consisted of professional engineers, soil samplers, and environmental specialists. All of the participants were informed of the main objective of the project and participated voluntarily. Due to the company having several worksites, there was a fluctuating number of personnel at the study site each week. In total, twenty-five workers participated in toolbox training sessions and assessments with approximately 60% attending all sessions. All participants were required to hold current HAZWOPER training certifications due to the nature of the project being performed at the construction site. The construction crew had completed their 8-hour HAZWOPER, MSHA, and first aid/CPR refresher trainings at the end of February 2021, which was approximately five months prior to beginning the project at the end of July 2021.

### **4.3 Materials and Experimental Design**

The time frame for this study was primarily focused on short-term outcomes measured with repeated testing. Training using mobile technology with cell phones was determined to not be completely achievable with this group of participants due to technology limitations. There was also no reasonable way to use training technology such as PowerPoint or videos to administer this training. Formatted paper tests, quizzes, and pamphlets were developed due to the lack of available training technology. Questions were developed and administered through tests and quizzes in order to have a quantitative means of evaluating baseline knowledge and subsequent knowledge retention. The questions and visual materials were adapted from several online sources that included: The Center for Construction Research and Training (CPWR), the Occupational Safety and Health Administration (OSHA), the American Red Cross Association, and the National Institute for Occupational Safety and Health

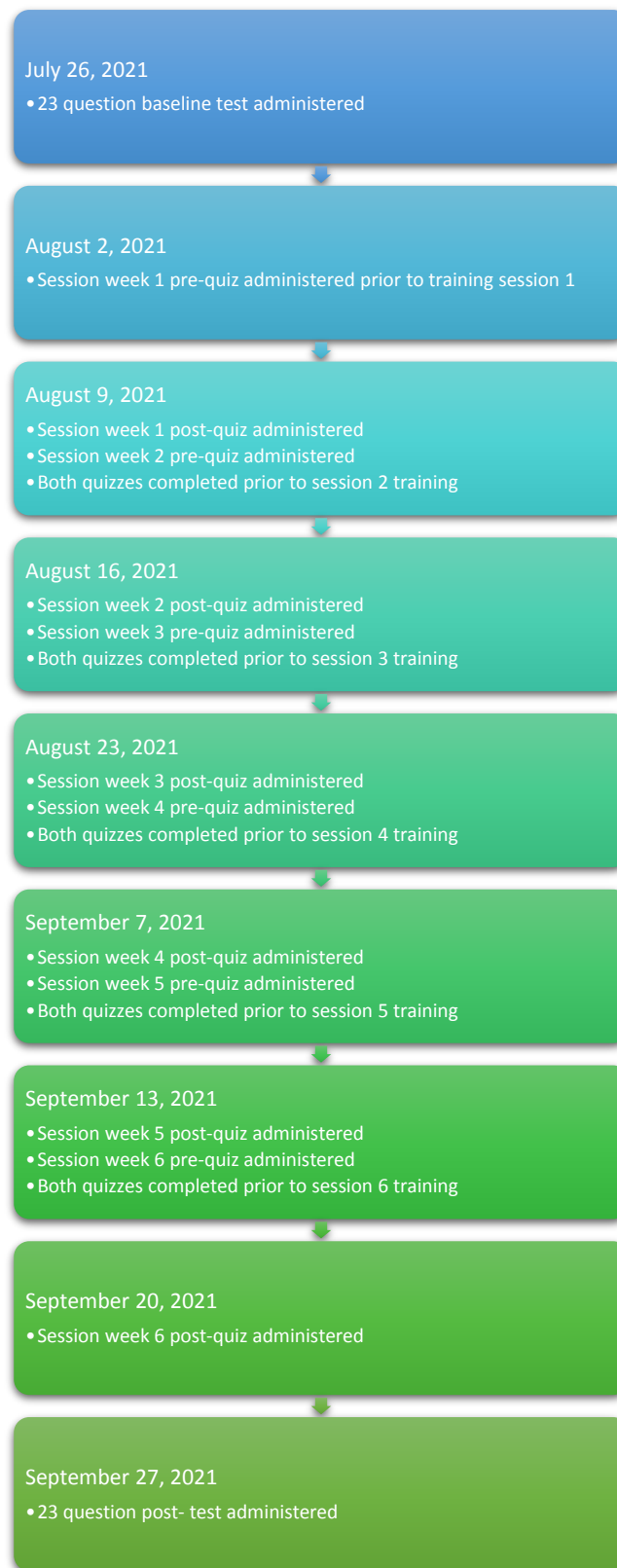
(NIOSH). A pre-test with 23 questions was developed and administered to the participants to establish a baseline of knowledge. Pretests were not coded to match individual performance for comparison to post-tests. Pre- and post-test results were aggregated to evaluate performance of the entire group rather than individuals.

In this study, performance results relate only to the first and last 23-question tests. Weekly pre-and-post two to four question quizzes were administered but data were not collected or analyzed. The 23-question tests or weekly quizzes were not coded to match individuals. The 23-question pre-and-post tests are located in Appendix A. The weekly quiz examples are located in Appendix B. These safety questions primarily focused on first aid/CPR, HAZWOPER, and construction safety. There were six questions related to first aid, ten questions related to HAZWOPER, four questions related to construction, and three questions related to general safety. Quiz questions were grouped so the training session could easily cover the material in the allotted fifteen minutes. Figure 1 displays the toolbox talks training session layout. Most of the questions were multiple choice with four response options.



**Figure 1.** Weekly toolbox training topics

Each week the construction crew, plus additional site personnel, would gather outside for the weekly toolbox training. The first toolbox training session began the week following the initial 23 question pre-test. A visual timeline of the project administration by date is shown in Figure 2. At the start of training session one, participants were first provided with a paper format pre-quiz prior to receiving the training. In the subsequent weeks following the first training session, a post-quiz was added but not linked to the individual workers. The post-quiz tested the knowledge retention from the previous week's toolbox training content. Participants continued to complete both quizzes prior to beginning the training session.



**Figure 2.** Timeline of project administration to participants

No names were written on any testing documents, no codes were used to identify individuals, keeping the study completely anonymous. The protocol was approved by the Institutional Review Board (IRB) at the university. As each participant completed and handed their quizzes back to the trainer, they received a folded one-sheet pamphlet with the day's training topic. The training pamphlets for all six training sessions are located in Appendix C. The pamphlet design approach used strategically placed bold and italic fonts, colored lettering, training content-related images, and bullet-pointed lists to reaffirm important points. The training would begin by discussing the pre-quiz questions and answers. Then training continued using the pamphlets as a guide and visual tool. The trainer overlooked discussing the post-quiz question and answers with the participants for the first two training sessions. The decision was made to continue not discussing the post-quiz questions and answers to maintain training consistency throughout the project.

#### **4.4 Data Collection**

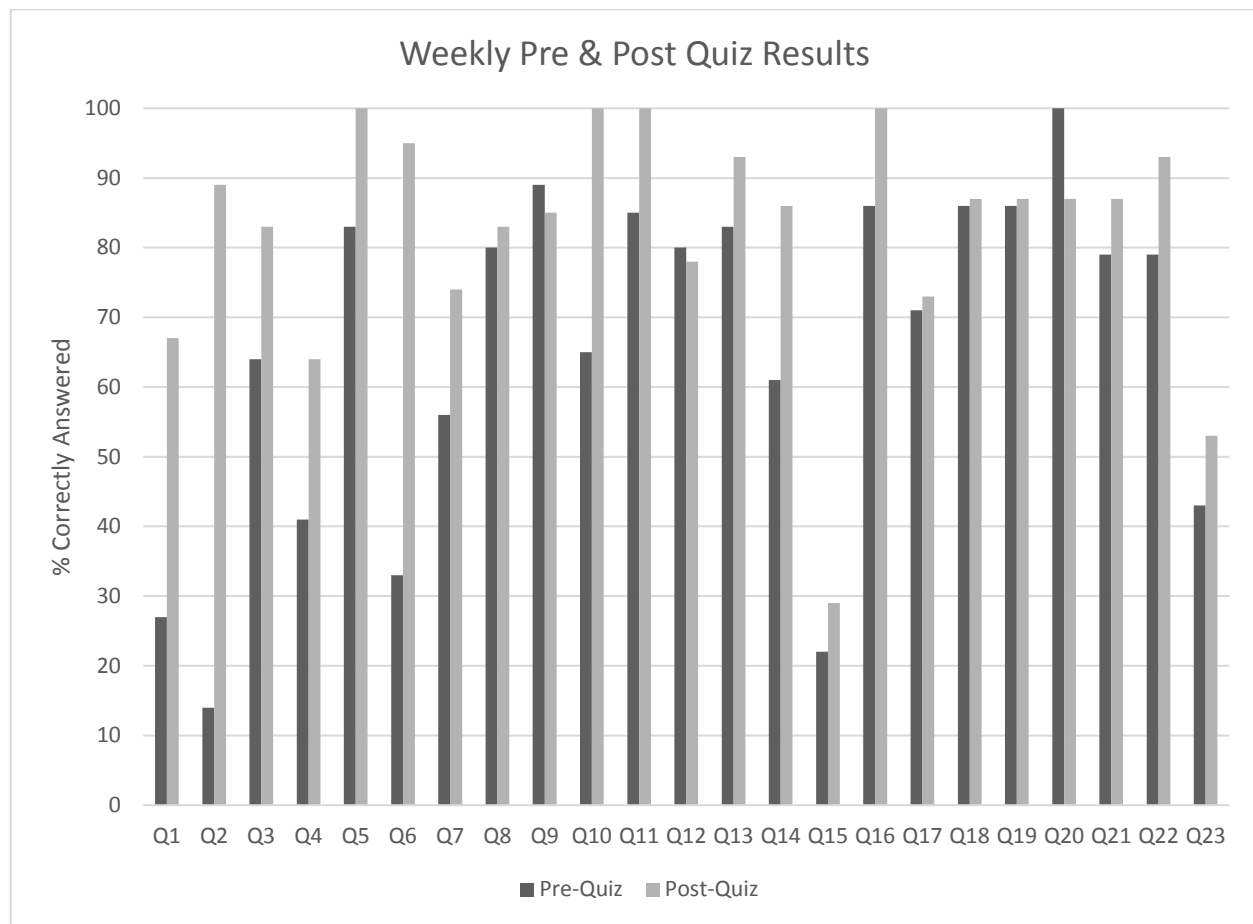
The 23-question pre- and post-test and weekly quiz results were entered into an excel spreadsheet and organized by question and date of administration. Answers were coded as either correct or incorrect and were worth one point each except for one question. One question required the participants to circle the four correct answers making this question worth four points. This brought the maximum possible points to 26. Some participants would circle multiple answers demonstrating uncertainty in their answer selection. Even if one of the multiple circled answers was a correct answer, the determination was made to mark the question as wrong due to the overall uncertainty of the participant's answers indicating they did not know the correct answer.

#### **4.5 Statistical Analysis**

Data analysis was completed using MiniTab© statistical software 20.4 (Minitab, 2021) to evaluate the potential effects of the toolbox training sessions on the entire group for retention of safety knowledge. Basic descriptives and frequencies were computed. Differences between pre- and post- scores were evaluated for the group using the Mann-Whitney test statistic. Individual responses were not coded and could not be matched for final analysis to test individual knowledge gains. The participant's completed their tests and quizzes without any form of tracking added for comparisons. Data were non-normal with unequal variances. The nonparametric Mann-Whitney test was chosen for data analysis for these reasons.

### **5. RESULTS**

Of the 23 questions, number nine, 12, and 20 were the only three that the group did not demonstrate improvement during the week-to-week quiz completion. Figure 3 displays the group pre- and post-quiz questions as a side-by-side comparison. Questions two and six showed the greatest increase of group knowledge retention at a 75% and 62% increase respectively. Questions 18 through 23 represent the pre- and post-quiz questions from training session six, Hazcom and pictograms. The overall group results for those questions suggested that the participants possessed a high level of understanding regarding the pictogram meanings from the Hazcom standard prior to the training session.



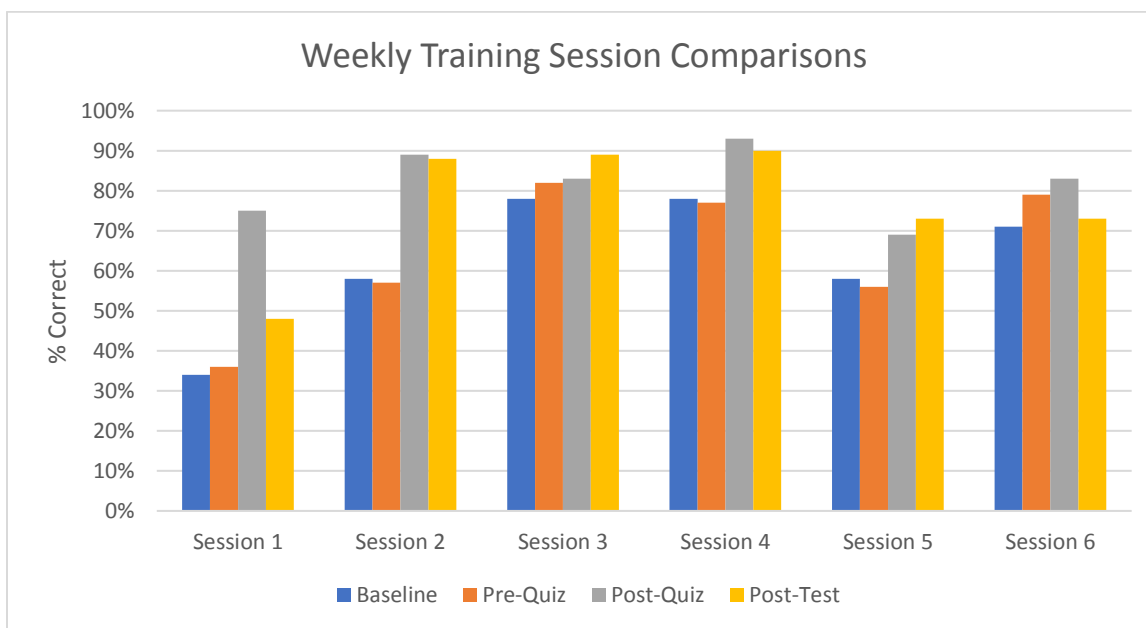
**Figure 3.** Weekly pre- and post-quiz comparisons

Test question groups are categorized by session in Table 1. The percent correct were recorded for each pre-test and post-test and aggregated for quizzes as well as for full 23-question test results. The pre- and post-quiz results for each weekly session all showed increased knowledge retention improvements for the group. By comparing the baseline with the post-test results, all six sessions display positive knowledge retention results for the group with session two having the greatest increase of 30%.

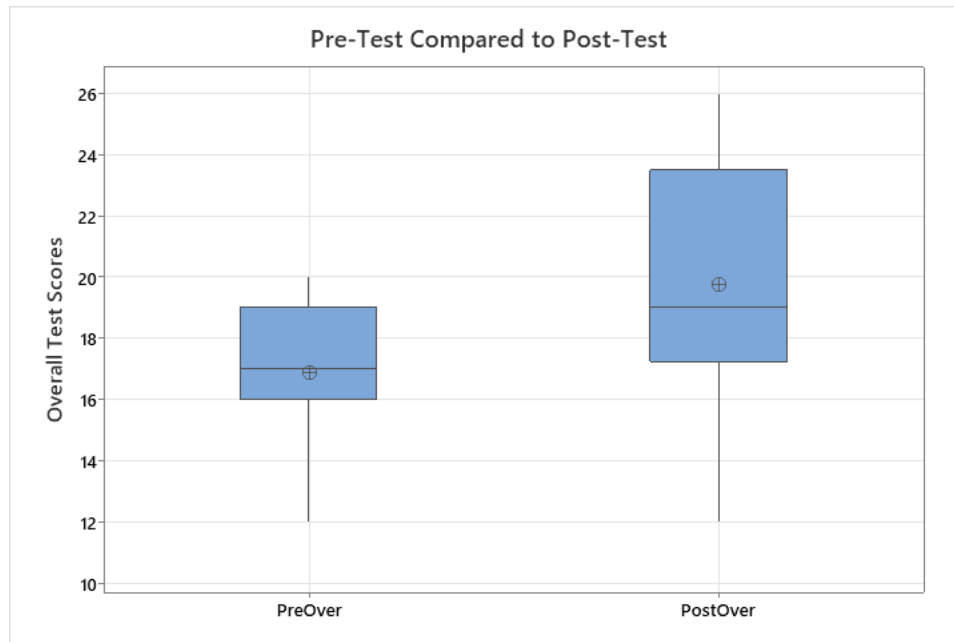
The aggregated group post-test results were higher than the initial aggregated group baseline scores as presented in Figure 4. The group baseline and pre-quiz results are very similar for all six training sessions, suggesting that the participants were not purposely trying to answer the questions incorrectly to skew the results. Session six showed very little increase in possible knowledge retention between the baseline and post-test. Results were similar indicating more uniform knowledge levels among the group at the end of the six trainings.

**Table 1.** Test question groupings

Training Session	N	% Correct
Pre-Test (Questions 1-4)	20	34%
Session 1 Pre-Quiz (Pre-Training)	22	36%
Session 1 Post-Quiz (Post-Training)	18	75%
Post-Test (Questions 1-4)	16	48%
Pre-Test (Questions 5-7)	20	58%
Session 2 Pre-Quiz (Pre-Training)	18	57%
Session 2 Post-Quiz (Post-Training)	19	89%
Post-Test (Questions 5-7)	16	88%
Pre-Test (Questions 8-9)	20	78%
Session 3 Pre-Quiz (Pre-Training)	19	82%
Session 3 Post-Quiz (Post-Training)	20	83%
Post-Test(Questions 8-9)	16	89%
Pre-Test (Questions 10-12)	20	78%
Session 4 Pre-Quiz (Pre-Training)	20	77%
Session 4 Post-Quiz (Post-Training)	18	93%
Post-Test (Questions 10-12)	16	90%
Pre-Test (Questions 13-15)	20	58%
Session 5 Pre-Quiz (Pre-Training)	18	56%
Session 5 Post-Quiz (Post-Training)	14	69%
Post-Test (Questions 13-15)	16	73%
Pre-Test (Questions 16-23)	20	71%
Session 6 Pre-Quiz (Pre-Training)	14	79%
Session 6 Post-Quiz (Post-Training)	15	83%
Post-Test Questions 16-23)	16	73%

**Figure 4.** Training session testing comparisons

The overall group test scores of the 23 question pre- and post-tests revealed significant differences between the groups, p-value of 0.009. Figure 5 shows the pre-test population median compared to the post-test population median.



**\*Pre-test vs post-test results, p-value 0.009**

**Figure 5. Pre-test compared to post-test**

## 6. DISCUSSION

This pilot research project revealed statistically significant gains in knowledge retention when comparing aggregated group scores from pre- to post-test results. Our results suggest that short-term safety knowledge and retention gains are possible using toolbox training methods. We acknowledge that only 60% of the study participants completed all trainings. This raises concerns about the confidence of our assertion. While our raw group scores were significantly improved, p-value 0.009, it could be due to other factors as well. We were not able to extract the subgroup of the 60% that attended all six toolbox sessions for a more rigorous matched comparison. We do not know the background of those onsite workers that by happenstance were invited to participate in the trainings and tests. Many may have been professional engineers, soil samplers, environmental specialists, or other workers who had significant safety training in their past. If these types of participants were not assessed early in the study but came along later in the study, their test results would have driven up the final group scores.

One other similarly designed toolbox training retention study (Mehany et al., 2021) was found in our literature review. However, this study conducted only one training session with the baseline testing being conducted immediately before and follow-up testing immediately after the training. The training environment for this study characterized a typical outdoor construction setting in that there was limited indoor or formal training space. These conditions are exactly the dilemma facing the larger overall construction industry. Training needs to become more versatile and adaptive so that it can be conducted in any worksite setting.

Some training needs are appropriate for the classroom setting and can be conducted over a longer time frame. The 40-hour HAZWOPER course and first aid courses are designed with this intention. Traditional classroom training approaches are becoming a training method of the past as we transition

to virtual and other technology-based training (Barrett, 2010). Additional on-site job training should be conducted so that the safety regulations are more immediately applicable (Wilkins, 2011). The practical applications of frequent repeated trainings are positive reinforcement of day-to-day safety issues, attention to new safety updates, improved awareness of workplace hazards, and reinforcement of relevant job information such as HAZWOPER material. Toolbox trainings can be delivered daily, weekly, biweekly, or even monthly. If documented properly, the majority of the annual training requirements for HAZWOPER and MSHA can be met through toolbox training sessions. An important consideration to examine is whether or not the training practically applies to the construction workers' day-to-day jobs. It is difficult to conduct group training that applies to the whole group. For example, excavator operators do not have the same safety risks as haul truck operators and so forth.

Some limitations of this study included fluctuating workforce participation, and quizzes potentially given to participants who had not received the previous week's training. The lead investigator estimated that approximately 60% of those trained were present for all sessions. The fact that tests and quizzes were not coded for matching was a design flaw. Had investigators coded quizzes and tests for a matched comparison using the paired t-test or repeated measures analysis, the results would be more meaningful and provide a stronger inference. This was a quasi-experimental design without a control group. The participants were meant to be their own controls. Future investigations should look at the performance of individuals as well as the group.

Another study limitation was the recruiting from one construction company rather than many. This was a convenience sample. The small civil construction company used in this study may be different than other companies and results should not be externalized to other small heavy civil companies. The company workers may have been safer than the average company doing the same type of work. On the other hand, if the workers were less aware of safety and safe work practices, this could also bias the results.

Some of the participants would often try to converse with each other to discuss what the correct answers may be during the quiz time. The last few weeks of training and quiz taking were done in near-dark conditions. This posed a new problem for the participants being able to see while taking their quizzes and during the training with the pamphlets. Some factors hindered training such as lack of interest among the group, potential literacy, comprehension issues, and topic relevance for each participant. These factors would have likely biased the result toward the null hypothesis.

## 7. CONCLUSION

Future research should repeat this study with random selection of small civil construction companies. It could be beneficial to further space the time gaps between training sessions to help avoid testing fatigue. It is also clear that coding each respondent's test and quiz is important for a rigorous matched analysis to determine knowledge gains week to week and from the beginning to the end. Larger time gaps should be used between the initial pre-test and future post-tests. Testing retention immediately after training, one week later, or six weeks as in this study, is not as revealing at 90- or 180-days post training. Long term knowledge assessment could further investigate whether or not toolbox training information is being retained and if work safe practices have been adopted.

It would also be beneficial to discuss the post-quiz questions and answers each week to reinforce the correct answers and provide feedback. There cannot be too much OSH knowledge in the workplace. The more often safety is discussed, trained, and reinforced, the more it is likely to become a subconscious part of workers everyday actions and translate to safe work practices with reduced injuries and fatalities. The realistic hope for continuous training is to aid workers in those moments

when an internal negotiation has to be made between timely completion of a task and completing the task safely. No worker should ever have to choose between putting themselves at risk and making money for a company. Continuous education is vital in the workforce. The only thing that stays the same is nothing at all.

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## APPENDIX A: 23-QUESTION PRE- AND POST-TEST

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1. Which of the following could indicate that someone is having a heart attack? (only 4 correct answers)
  - a. sweating
  - b. hunger
  - c. pain in arms
  - d. loss of vision
  - e. breathlessness
  - f. nausea
  - g. itchy skin
2. Which of following causes the most construction site fatalities?
  - a. Electrocution
  - b. Trench collapses
  - c. Falls
  - d. Contact with chemicals
3. How can someone tell if a pair of glasses are safety-approved?
  - a. They have "safety glasses" stamped on them
  - b. By the brand
  - c. They were bought at a safety store such as A&M Fire and Safety
  - d. They have "Z87" stamped on them
4. A safety culture is:
  - a. The common and generally accepted way people behave in the workplace as it relates to safe practices.
  - b. Defined by printed safety rules and posted signs.
  - c. Described in negotiated agreements between unionized workers and management.
  - d. Determined by the attitude that workers display each day.

5. If a person is suffering from heatstroke, which symptoms would they **least** likely experience?
- Severe headache
  - Profuse sweating and cool moist skin
  - Loss of consciousness
  - Rapid temperature-rise and hot dry skin
6. How many points of contact should you have when getting on and off of equipment?
- One
  - Two
  - Three
  - Four
7. The correct treatment for heat stroke is:
- Have the worker chug a bottle of ice-cold water
  - Have the worker eat a banana
  - Cover the worker with ice bags
  - All of the above
8. There are four major routes in which chemicals can enter your body. Which is the **most** common?
- Injection
  - Absorption
  - Ingestion
  - Inhalation
9. Which of the following is **not** important to the development of an effective safety culture?
- Safety managers must directly control worker behavior.
  - Front-line supervisors initiate corrective measures for unsafe behaviors.
  - Employees desire to be safe and work as a team.
  - Unions take responsibility for ensuring safety as part of their role in protecting members.
10. The **best** drink(s) to give someone experiencing heat cramps or heat exhaustion are:
- Coffee with creamer or iced latte
  - Caffeine free soda
  - commercial sports drink, coconut water or milk
  - Water
11. Which of the following describes a competent person?
- A person assigned by an employer to perform specific duties or to be at a specific location on a jobsite
  - A person who by education or experience has successfully demonstrated the ability to solve or resolve problems related to a particular work or subject matter.
  - A person who is capable of identifying existing and predictable hazards in the working conditions which are unsanitary, hazardous, or dangerous to employees and who has the authority to take corrective measures to eliminate them.
  - A person who has passed a certification exam from an accredited organization.

12. Which of these is **not** one of the Fatal Four - OSHA's term for the four deadliest construction site hazards?
- caught between objects
  - silica
  - struck by object
  - falls
13. In order from **least to most** severe, the heat-related illnesses are heat exhaustion, heat cramps, and heat stroke.
- True
  - False
14. Where is the power zone?
- From the ground to about the top of the thighs
  - From about mid-thigh to about mid-chest
  - From the knees to the neck
  - From the ankles to the collarbone
15. Dale is showing classic signs of a heart attack. Mike makes Dale sit down while Logan calls 911. What is the next best lifesaving step to take?
- Give Dale some ice-cold water
  - Have Dale chew a 325mg aspirin
  - Have Dale eat something sugary
  - Have Dale take a short nap

	<b>1</b> <input type="checkbox"/> Explosives Self-reactives Organic peroxides	<b>5</b> <input type="checkbox"/> Skin corrosion/burns Eye damage Corrosive to metals
	<b>2</b> <input type="checkbox"/> Carcinogen Mutagenicity Reproductive toxicity Respiratory sensitizer Target organ toxicity Aspiration toxicity	<b>6</b> <input type="checkbox"/> Oxidizers
	<b>3</b> <input type="checkbox"/> Flammables Pyrophorics Self-heating Emits flammable gas Self-reactives Organic peroxides	<b>7</b> <input type="checkbox"/> Acute toxicity (fatal or toxic)
	<b>4</b> <input type="checkbox"/> Gases under pressure	<b>8</b> <input type="checkbox"/> Irritant (skin and eye) Skin sensitizer Acute toxicity (harmful) Narcotic effects Respiratory tract irritant
		
		
		
		

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## APPENDIX B: QUIZ QUESTIONS BY TRAINING SESSION

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### Training Session 1:

1. In order from least to most severe, the heat-related illnesses are heat exhaustion, heat cramps, and heat stroke.
  - a. True
  - b. False
2. The best drink(s) to give someone experiencing heat cramps or heat exhaustion are:
  - a. Coffee with creamer or iced latte
  - b. Caffeine free soda
  - c. Commercial sports drink, coconut water or milk
  - d. Water
3. If a person is suffering from heatstroke, which symptoms would they least likely experience?
  - a. Severe headache
  - b. Profuse sweating and cool moist skin
  - c. Loss of consciousness
  - d. Rapid temperature-rise and hot dry skin
4. The correct treatment for heat stroke is:
  - a. Have the worker chug a bottle of ice-cold water
  - b. Have the worker eat a banana
  - c. Cover the worker with ice bags
  - d. All of the above

### Training Session 2:

1. How can someone tell if a pair of glasses are safety-approved?
  - a. They have “safety glasses” stamped on them
  - b. By the brand
  - c. They were bought at a safety store such as A & M Fire and Safety
  - d. They have “Z87” stamped on them
2. Where is the power zone?
  - a. From the ground to about the top of the thighs
  - b. From about mid-thigh to about mid-chest
  - c. From the knees to the neck
  - d. From the ankles to the collarbone
3. There are four major routes in which chemicals can enter your body. Which is the most common?
  - a. Injection
  - b. Absorption
  - c. Ingestion
  - d. Inhalation

**Training Session 3:**

1. Which of the following could indicate that someone is having a heart attack?  
*(only 4 correct answers)*
  - a. Sweating
  - b. Hunger
  - c. Pain in arms
  - d. Loss of vision
  - e. Breathlessness
  - f. Nausea
  - g. Itchy skin
2. Dale is showing classic signs of a heart attack. Mike makes Dale sit down while Logan calls 911. What is the next *best* lifesaving step to take?
  - a. Give Dale some ice-cold water
  - b. Have Dale chew a 325mg aspirin
  - c. Have Dale eat something sugary
  - d. Have Dale take a short nap

**Training Session 4:**

1. Which of the following causes the *most* construction site fatalities?
  - a. Electrocution
  - b. Trench collapses
  - c. Falls
  - d. Contact with chemicals
2. How many points of contact should you have when getting on and off of equipment?
  - a. One
  - b. Two
  - c. Three
  - d. Four
3. Which of these is *not* one of the Fatal Four – OSHA's term for the four deadliest construction site hazards?
  - a. Caught between objects
  - b. Silica
  - c. Struck by object
  - d. Falls

**Training Session 5:**

1. A safety culture is:
  - a. The common and generally accepted way people behave in the workplace as it relates to safe practices.
  - b. Defined by printed safety rules and posted signs.
  - c. Described in negotiated agreements between unionized workers and management.
  - d. Determined by the attitude that workers display each day.









## 2. Which of the following describes a competent person?

- e. A person assigned by an employer to perform specific duties or to be at a specific location on a jobsite
- f. A person who by education or experience has successfully demonstrated the ability to solve or resolve problems related to a particular work or subject matter.
- g. A person who is capable of identifying existing and predictable hazards in the working conditions which are unsanitary, hazardous, or dangerous to employees and who has the authority to take corrective measures to eliminate them.
- h. A person who has passed a certification exam from an accredited organization.

## 3. Which of the following is not important to the development of an effective safety culture?

- e. Safety managers must directly control worker behavior.
- f. Front-line supervisors initiate corrective measures for unsafe behaviors.
- g. Employees desire to be safe and work as a team.
- h. Unions take responsibility for ensuring safety as part of their role in protecting members.

### Training Session 6:

 	<b>1</b> <input type="checkbox"/> Explosives Self-reactives Organic peroxides	<b>5</b> <input type="checkbox"/> Skin corrosion/burns Eye damage Corrosive to metals
 	<b>2</b> <input type="checkbox"/> Carcinogen Mutagenicity Reproductive toxicity Respiratory sensitizer Target organ toxicity Aspiration toxicity	<b>6</b> <input type="checkbox"/> Oxidizers
 	<b>3</b> <input type="checkbox"/> Flammables Pyrophorics Self-heating Emits flammable gas Self-reactives Organic peroxides	<b>7</b> <input type="checkbox"/> Acute toxicity (fatal or toxic)
 	<b>4</b> <input type="checkbox"/> Gases under pressure	<b>8</b> <input type="checkbox"/> Irritant (skin and eye) Skin sensitizer Acute toxicity (harmful) Narcotic effects Respiratory tract irritant

## APPENDIX C: TRAINING PAMPHLETS

**Take care of yourself & your coworkers**

- ✓ Take regular breaks out of the sun
- ✓ Stay hydrated – don't wait until your thirsty
- ✓ Wear lighter colored clothing
- ✓ Wear loose-fitting, lightweight clothing



Know the warning signs  
[Street Address]  
[City, ST ZIP Code]

# Heat Illnesses



## KNOW THE WARNING SIGNS

And treatment options

FIRST AID – Cooling is Key

Heat Cramps

- ✓ Drink fluids every 15 to 20 minutes
- ✓ Eat a snack
- ✓ Avoid salt tablets

Note: If cramps continue over an hour, get further help.

Heat Exhaustion

- ✓ Leave hot area and drink fluids
- ✓ Remove unnecessary clothing, including shoes and socks
- ✓ Cool with water, cold compresses and/or fans
- ✓ Drink frequent sips of cool water or other appropriate fluids

Heat Stroke

- ✓ **This is an emergency.** Get emergency care immediately.
- ✓ Move worker to a cool area and remove outer clothing
- ✓ Circulate air around worker
- ✓ Place cold, wet cloths or ice on head, neck, armpits, and groin

**Note:** Symptoms can occur in any order. For example, a person will not always experience heat cramps before they suffer from heat exhaustion.

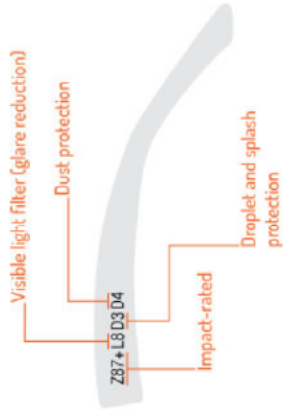


### Power Zone

- ✓ Close to the body, between mid-thigh and mid-chest
- ✓ Whenever possible, work in your power zone
- ✓ This is where the arms and back can lift with the least amount of effort

### Safety Glasses or Goggles

- Must meet the Z87.1-2010 ANSI standard
  - ANSI stands for American National Standards Institute
- Eye PPE must be worn when hazards such as flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors or potentially injurious light radiation are present.
- The permanent marking of “Z87” on eye protectors means the basic Z87 standard has been passed
- “Z87+” means the eyewear meets a higher impact standard



WINHEIS 2015

# PRIMARY ROUTES OF ENTRY

## How Can Chemicals Enter The Body?

1

### INHALATION

Inhalation is one of the most common ways in which chemicals can enter your body.

Dust, mist, fumes and vapours can be inhaled through your nose or mouth and travel into your lungs where they can begin to cause damage.

2

### INGESTION

Some hazardous chemicals can easily be absorbed through your digestive system. This can occur if you have hazardous materials on your hands while you're eating or smoking.

It's also possible to swallow chemicals if food is left uncovered where there is a risk of exposure to the chemicals.

3

### ABSORPTION

Some hazardous materials can enter your body by passing through your skin or eyes. Abrasions and punctures in your skin's surface will increase the rate at which the chemical is absorbed into your body.

4

### INJECTION

Chemicals can enter your body and particularly the blood stream, through lacerations, punctures or syringe needles.

everSafe  
www.eversafe.ca

What are the four major routes in which chemicals can enter your body?

- |            |           |
|------------|-----------|
| Inhalation | Ingestion |
| Absorption | Injection |

**Inhalation**

- ✓ Most common route of entry
- ✓ Chemical and/or particle is either exhaled or deposited in the respiratory tract

**Absorption**

- ✓ Can occur through skin or eyes
- ✓ Some chemicals can pass through the skin and get into the blood stream

**Ingestion**

- ✓ Chemicals can get into the mouth and be swallowed
- ✓ Can be absorbed through the gastrointestinal tract and enter the blood stream

**Injection**

- ✓ Not as common
- ✓ Can occur from contaminated sharp object

The dose makes the poison.

Ergonomics

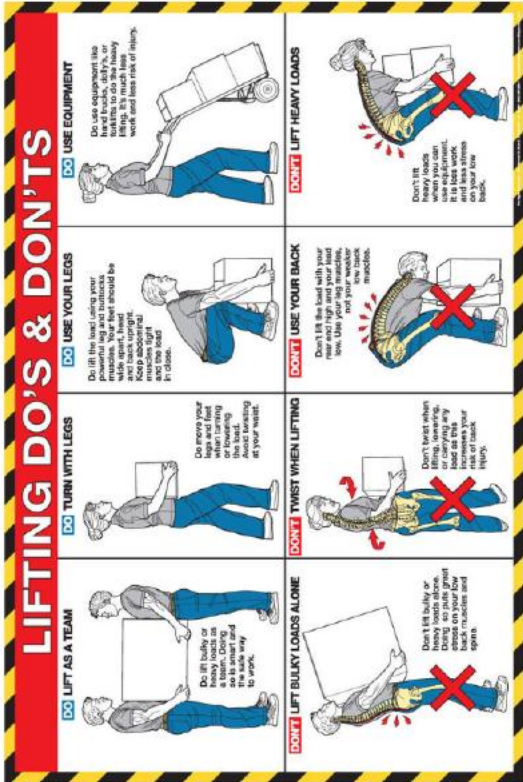
- The study of work and the relationship of work to the physical and cognitive capabilities of people

**Cumulative Trauma Disorders (CTD's)**

- Tennis Elbow
- Carpal Tunnel Syndrome
- Raynaud's Phenomenon (white finger syndrome)

**Strains / Sprains**

- Caused by a single forceful event such as lifting heavy objects in an awkward position
- Back, legs and shoulders are the most common



If you lift don't twist!!

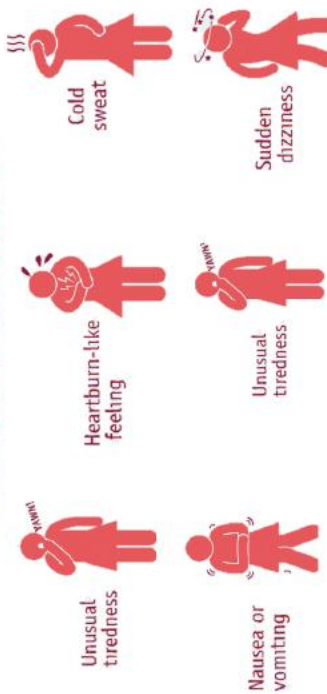
**Fact**

- ✓ The average person waits 3 hours before seeking help for symptoms of a heart attack.
- ✓ Chewing aspirin helps get the medication into the blood stream faster

**Most Common**



*Women have also reported*



## Covid-19 Was America's Third Leading Cause Of Death In 2020

Number of deaths for all leading causes of death in the U.S. in 2020



Source: Centers for Disease Control and Prevention



Forbes

statista

# Heart Attack

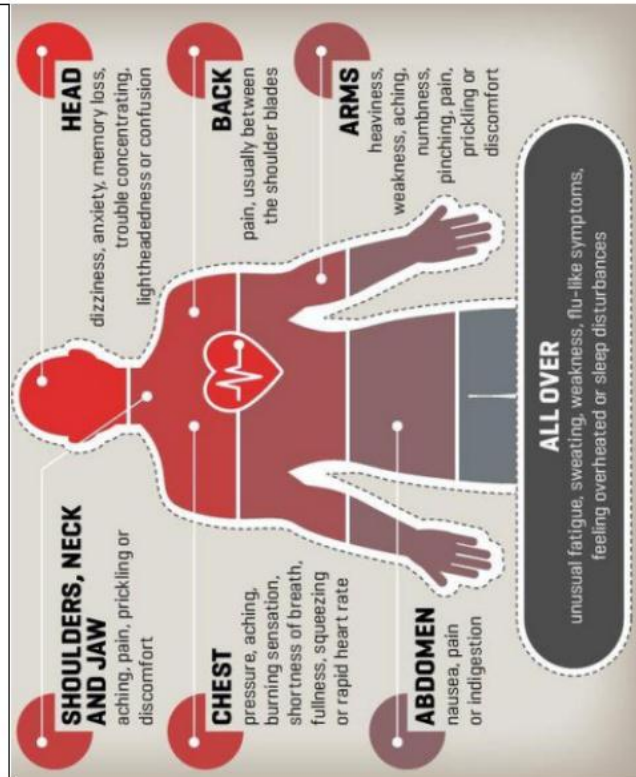
# KNOW THE WARNING SIGNS

## And treatment options

- ✓ Hands-only CPR can be as effective as CPR with breaths.
- ✓ You can double or even triple a person's chance of survival
- ✓ **Remember:**
  - **Ah. ha. ha. ha. stavin' alive. stavin' alive**

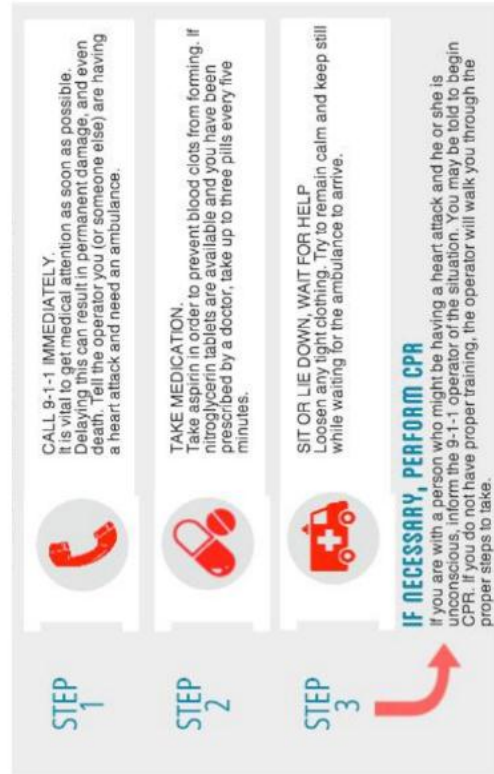
### What is the difference between a heart attack and cardiac arrest?

- Heart Attack
  - Blood flow to the heart is blocked
  - Circulation problem
  - Aspirin and possibly CPR is the best treatment
- Cardiac Arrest
  - The heart malfunctions and suddenly stops beating
  - Electrical problem
  - CPR & AED is the best treatment



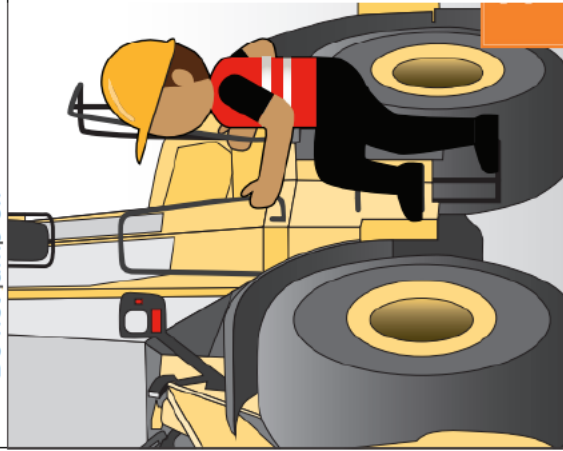
### **FIRST AID – Call 911 immediately**

- ✓ Have the person rest in a comfortable position to reduce the heart's need for oxygen.
  - Many people find it easier to breathe while sitting.
- ✓ Loosen any tight or uncomfortable clothing
- ✓ If the person has a history of heart disease and takes a prescribed medication such as nitroglycerin, offer to get it and help the person take it
- ✓ If the person is responsive, able to chew and swallow, offer two loose dose (81mg) or one regular strength (325mg) aspirin

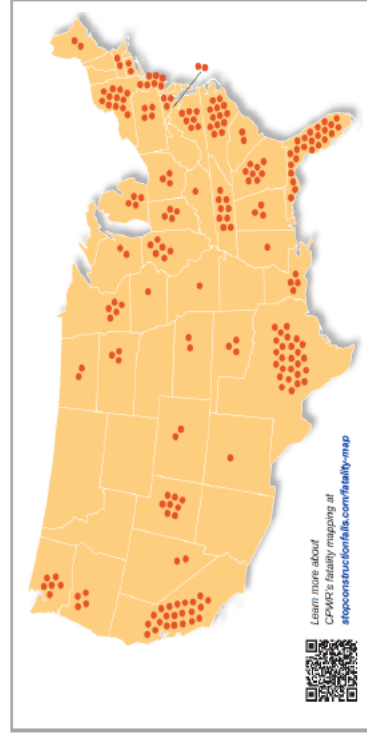


### When climbing on/off equipment

- ✓ Use hand and step holds – keep one foot and two hands, or both feet and one hand, in contact with equipment at all times.
- ✓ Avoid carrying materials and tools when climbing on or off.
- ✓ Keep step and hand holds clear of mud, snow, grease and other fluids
- ✓ Do not jump off



# Construction Injuries



Each dot represents a fatal construction fall in 2020

**FOCUS 4**

OSHA’s Fatal Four Campaign

Falls

- ✓ Falls from heights are the leading cause of fatalities in construction
- ✓ Falls on the same level are one of the leading causes of injuries
- ✓ Fall protection is required when working 6 feet or more above a lower level

Struck By

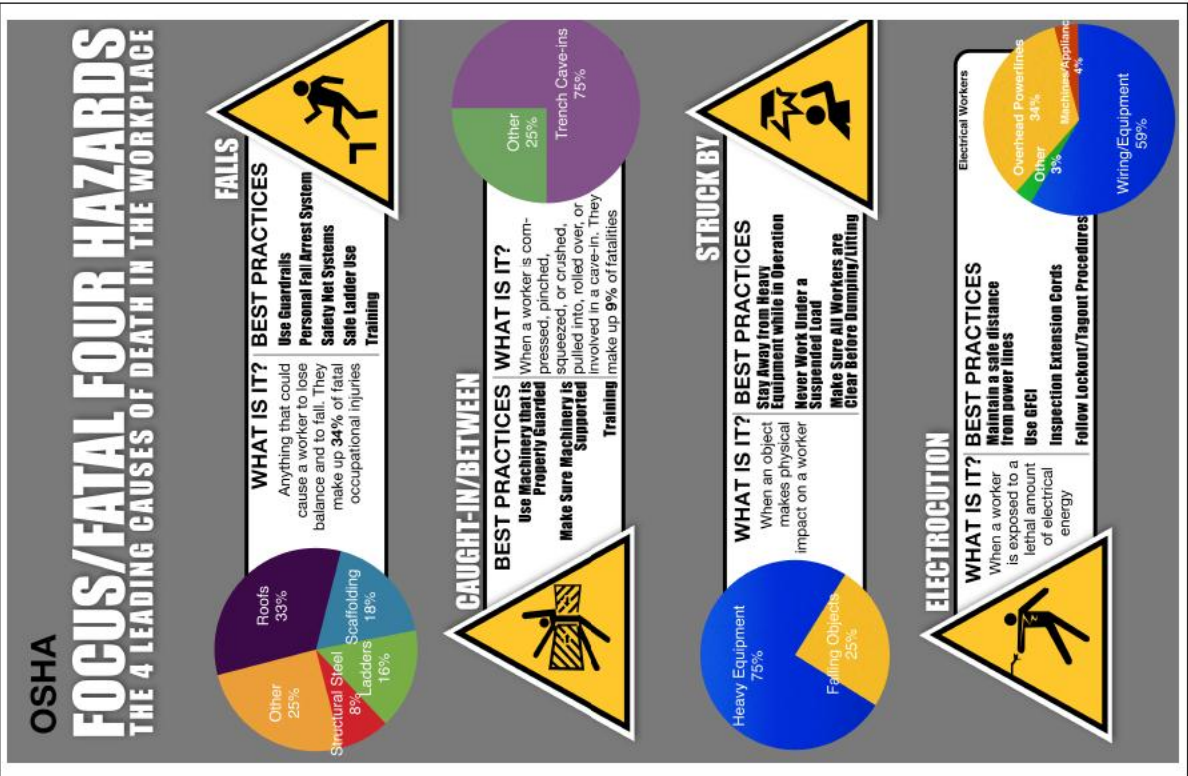
- ✓ Contact with objects and equipment to include being caught in or between objects/equipment.
- ✓ Most common hazards include: flying objects, falling objects, swinging objects, and rolling objects (vehicles/heavy equipment).

Caught-In or Between

- ✓ A struck-by injury is when the injury is a result of crushing injuries rather than the initial impact.
- ✓ Common causes include: unprotected trenches and excavations, heavy equipment, getting caught in moving parts of machinery and power tools.

Electrical

- ✓ Electrocutation occurs when a person is exposed to a lethal amount of electrical energy.
- ✓ Common causes include: improper extension cord use, contact with energized sources, and contact with live overhead power lines.



### Qualified vs. certified vs. authorized

- **Qualified** – A person who – by education or experience – has successfully demonstrated the ability to solve or resolve problems related to a particular work or subject matter. **Example** – journeyman electricians
- **Certified** – An employee who has passed a certification exam from an accredited organization. **Example** - A certified safety professional (CSP) or a professional engineer (PE).
- **Authorized person** – A person assigned by an employer to perform specific duties or to be at a specific location on a jobsite.

A person can be considered the competent person through training and/or experience.



## SAFETY CULTURE & COMPETENT PERSON

Top down, bottom up

Safety Culture

- The common and generally accepted way people behave in the workplace as it relates to safe practices.

**Key Aspects of an effective culture**

Management commitment  
*Value safety and health at least as much as productivity*

Visible management  
*Lead by example*

Good communications between all levels of employees  
*Safety is a part of everyday work conversations and planning*

**Benefits**

- ✓ *Morale is high*
- ✓ *Higher productivity*
- ✓ *Low insurance costs*
- ✓ *Good company reputation*
- ✓ *Low employee turn-over & absenteeism*
- ✓ *Fewer injuries*

Competent Person

**What does competent mean?**

- “Having suitable or sufficient skill, knowledge, experience, etc. for some purpose; properly qualified”
- Workers may only perform tasks which they are competent to perform safely.

**OSHA’s Competent Person Definition**

- “One who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.”

**What would an inspector look for on a job site?**

- Do the employees appear to have been trained properly?
- Do the employees know who the competent person is?
- What does the culture, attitude, and behavior of the employees look like?

# Hazard Communication or HazCom

Environment



> Aquatic toxicity

> Not regulated by OSHA

Facts

✓ Sugar dust is explosive in the right conditions




✓ Chloramine gas is produced when mixing bleach and ammonia (diaper pails; litter boxes)

✓ Chlorine gas is produced when mixing bleach and an acid (vinegar; drain cleaners)



**Pictograms**  
[Street Address]  
[City, ST ZIP Code]




GHS Pictograms



FLAMMABLE

CORROSIVE




EXPLOSIVE



COMPRESSED GAS

OXIDIZING

TOXIC



HEALTH HAZARD

HARMFUL/IRRITANT

DANGEROUS FOR THE ENVIRONMENT

**PICTOGRAMS**

<u>Exploding Bomb</u>		<ul style="list-style-type: none"> <li>Explosives</li> <li>Self-reactives</li> <li>Organic peroxides</li> </ul>	
<u>Skull &amp; Crossbones</u>		Acute toxicity (fatal or toxic)	
<u>Flame</u>		<ul style="list-style-type: none"> <li>Flammables</li> <li>Pyrrophorics</li> <li>Self-heating</li> <li>Emits flammable gas</li> <li>Self-reactives</li> <li>Organic peroxides</li> </ul>	
<u>Gas Cylinder</u>		Gas under pressure	

<u>Health Hazard</u>		<ul style="list-style-type: none"> <li>Carcinogen</li> <li>Mutagenicity</li> <li>Reproductive Toxicity</li> <li>Respiratory Sensitizer</li> <li>Target Organ Toxicity</li> <li>Aspiration Toxicity</li> </ul>	
<u>Flame over circle</u>		Oxidizer	
<u>Corrosion</u>		<ul style="list-style-type: none"> <li>Skin corrosion/burns</li> <li>Eye damage</li> <li>Corrosive to metals</li> </ul>	
<u>Exclamation Point</u>		<ul style="list-style-type: none"> <li>Irritant (skin &amp; eye)</li> <li>Skin sensitizer</li> <li>Acute toxicity</li> <li>Respiratory tract irritant</li> <li>Hazardous to ozone layer</li> </ul>	

## MAIN AUTHOR



**Nicki O'Connell** is currently a Safety Professional with Alloy Group based in Anaconda, MT, USA. She is also an Adjunct Professor at Montana Technological University in Butte, MT, USA. Nicki earned her Bachelor of Science in Occupational Safety and Health and a Master's in Industrial Hygiene from Montana Technological University. She is a Certified Safety Professional (CSP) and a First Aid / CPR Instructor for the American Red Cross. Nicki recently retired from the Montana Army National Guard with over twenty years of service. Nicki has years of field experience in the healthcare, manufacturing, heavy civil construction, and environmental remediation industries.