

large scale evaluations of this course. As part of our formative work, we spoke with OSHA 10 authorized trainers with the objective of understanding more about their teaching approaches, the materials, and activities they use, as well as how they view the strengths and weaknesses of the current OSHA 10 course.

Methods: Interviews were conducted with 14 trainers and 14 trainees. Trainers were asked about their training materials, methods and subjects, their evaluation practices, what does and does not work when effectively teaching the OSHA 10, and what barriers they face in teaching the course, specifically around using participatory methods. Interviews with trainees asked about the training methods used by trainers, their view of the practical application of what was taught, safety topics they would like to see added or removed from the course, and what they view as the most effective and impactful training methods they experienced. Interview recordings were transcribed and then independently coded and analyzed by study team members to identify emerging themes and common topics.

Results: While our analysis revealed several themes, the most prevalent for trainers were: (a) trainers self-identify as being engaged and conduct student led learning and resist lecture-based training, (b) trainers do not develop their own curriculum and use existing training materials developed by others, (c) trainers do not conduct student evaluations or engage in knowledge assessments, (d) when asked to re-imagine an OSHA 10 course from the ground up had difficulty in suggesting any major changes to the program. The most prevalent themes from the trainee interviews were: (a) trainees believed that the trainer was effective at teaching the course (b) engaged, hands-on and student led training is the preference, but is not frequently provided (c) seated classroom lecture training is not preferred but is the norm (d) trainees believed the knowledge gained from the course would help keep them safe at work they have used what they have learned on the jobsite. Participants in both groups agreed that the OSHA 10 training program is important and effective. Many stated an interest for more training time, topics and materials.

Conclusions: OSHA 10 trainers must complete and pass an OSHA 500 course. Adult learning methodology is taught in the course so there may be an expectation by those providing the OSHA 10 curriculum (OSHA, OTIECs, and others) that the trainer is adequately prepared to deliver the training material using appropriate, effective and engaging techniques without added explanation or instructions. But the reality of OSHA 10 training is that (a) trainers are often consultants that come into an organization with limited knowledge of specific hazards

and worksite conditions (b) or have a mixture of trainees from different trades and companies (c) utilize curriculum developed by others without trainer guides or lesson plans (d) curriculum is primarily Microsoft PowerPoint presentations, videos, and handouts (e) the training is not always able to be customized to the audience (f) they are often held in hotel or office conference rooms with little to no opportunity for hands-on training. The trainers strongly desire guidance, material and ideas on how to deliver topic material using more engaging methods beyond what is taught in the OSHA 500 and all trainees prefer more engaging delivery of training material. This provides an opportunity to develop resources on how to convert or make static training material more engaging for trainees that clearly do not prefer to set in a classroom for 10 hours for lecture-based training.

Session B4

Special Topics in Agriculture, Forestry and Fishing

Moderator: KC Elliott

B4.1

Title: [Confined Space: Reducing Grain Bin Related Injuries and Fatalities](#)

Authors: [Linda Fetzer](#), [Stephen Brown](#), [Roderick Thomas](#), [Randall Bock](#), [Michael Dyer](#), [Serap Gorucu](#)

There are approximately 35 (known and additional suspected unreported) grain bin related fatalities per year. The ANSI/ASABE S64 – Grain Bin Access Design Safety standard was published in August 2018. This standard recommends that grain bins manufactured after 2018 be built to accommodate a bin entry lifeline system. The recommended system includes two anchor attachment points with one located near the roof peak and one near the roof access. Each anchor point must support a minimum ultimate load of 2,000 pounds. Through a research grant from the Northeast Center for Occupational Health and Safety, Penn State University combined computer modeling and experimental measurements to examine safe use of anchor points on a pre-2018 grain bin. Vertical roof deflection of the bin was measured using a precision phase-comparison laser while applying incremental dead loads to the retrofitted rescue anchor points. The measured deflections compared well to deflections predicted by finite element analysis (SolidWorks Simulation). The SolidWorks Simulation model may be used to estimate other loading scenarios in a safe and nondestructive way. The model is specific to this grain bin and loading scenarios and is not currently intended for generalization. Based on the research

findings, the project team recommends that the suitability of any bin to safely accommodate a lifeline and anchor point system must be verified on a case-by-case basis. Evaluation by a professional structural engineer and consulting with the manufacturer is recommended. This recommendation extends to all grain bins, including those post-2018. Engineering valuation for safely accommodating a lifeline and anchor point system is essential for bins that are modified, damaged, or have other signs of degradation. The research team developed inspection guidelines to assist professional engineers during their evaluation. Educational efforts will focus on technologies and best practices that can reduce the need for grain bin entry. This presentation will provide an overview of the research approach, recommendations on grain bin inspections for anchor points and lifeline systems, and the use of emerging technologies and best practices to reduce the need to enter grain bins.

Aims/Learning Objectives: 1. Understand the limitations of the ANSI/ASABE S64 – Grain Bin Access Design Safety standard. 2. Understand the need for inspection criteria for new and older grain bins prior to equipping with a lifeline and anchor point system. 3. Understand available technology and best practices to reduce the need for individuals to enter grain bins.

B4.2

Title: [Epidemiology of Diving-Related Fatalities in the U.S. Commercial Fishing Industry](#)

Authors: [Samantha Case](#), [Richard Evoy](#)

Introduction: Commercial fishing involves harvesting fish or shellfish using a variety of methods, gear, and vessels. Some commercial fishermen conduct dives to collect different species such as urchin, sea cucumber, and lobster. Additionally, some fishermen conduct unplanned dives to perform tasks at sea like clearing a fouled propeller. Dive training and certification are generally not required in the commercial fishing industry. Commercial fishing is the most dangerous job in the United States, with a work-related fatality rate over 40 times higher than the average job. A study of commercial fishing fatalities by Lucas and Case (2017) indicated there were 34 total diving fatalities in the industry nationwide during 2000-2014, and while not a leading contributor to fatalities among fishermen, Alaska dive harvesters had one of the highest fatality rates across all fleets during this period. Additional information on these incidents, such as specific characteristics of the dives, divers, or health risk factors, has not been published. The purpose of this study was to provide in-depth information about the circumstances of dive-related fatalities to identify safety and health risk factors and suggest relevant prevention strategies.

Methods: This study used data from the NIOSH Commercial Fishing Incident Database (CFID) to examine diving-related fatalities in the U.S. fishing industry. CFID is a surveillance system that contains detailed information on work-related fatalities among commercial fishermen. Information about diving-related fatalities was extracted from CFID and descriptive statistics were used to explore the circumstances surrounding diving fatalities and contributing factors. Safe diving practices from recreational and commercial diving sources were identified to determine their use in these incidents.

Results: Preliminary findings show that during the 20-year period 2000-2019, there were 42 diving-related fatalities in the commercial fishing industry. These fatalities most often occurred on the East Coast (28.6%), Gulf of Mexico (26.2%), and Alaska (23.8%). The average age of victims was 42.3 years (22-67 years) and all victims were male. Cause of death was most frequently drowning (78.6%), followed by arterial gas embolism (11.9%), carbon monoxide exposure/poisoning (4.8%), and one case each of cardiac arrhythmia and oxygen toxicity. Most fatalities occurred while dive harvesting (73.8%), with the remaining deaths occurring during unplanned dives. Drugs and/or alcohol were contributing factors in seven cases (16.7%). Fourteen victims (33.3%) had pre-existing health conditions that may have affected their ability to dive safely, such as epilepsy, obesity, and coronary artery disease. Other variables that will be examined include diving method/air source used, dive depth, water conditions, and administered treatments.

Conclusions: Diving best practices include training and certification, using proper dive gear, inspecting and maintaining gear and equipment, conducting pre-dive briefings, diving with a partner and/or tender, monitoring sea and weather conditions, and planning for emergency situations. Many of these best practices were absent from the dive operations that resulted in fatalities. Further, diving is physically demanding and requires good respiratory and circulatory health. Chronic health risk factors were identified among many of the victims. Based on these findings, researchers, the US Coast Guard, fishing associations, and marine safety trainers can work with fishermen who dive to increase their awareness of dive-related hazards and adoption of safe diving practices.



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