



Kentucky Injury Prevention and Research Center
Bona fide agent for Kentucky Department for Public Health
333 Waller Avenue, Suite 242 • Lexington, KY 40504 • 859-257-5839

REPORT#: 20KY006

REPORT DATE: 6-9-2020

INCIDENT HIGHLIGHTS



DATE:
March 17, 2020



TIME:
11:00 AM



VICTIM:
Age: 44
Sex: Male
Occupation: Farmworker



INDUSTRY/NAICS CODE:
112111



EMPLOYER:
Beef Cattle Ranching & Farming



SAFETY & TRAINING:
Unknown



SCENE:
Farm Grain Bin



LOCATION:
Kentucky

EVENT TYPE:
Grain Engulfment

Farmworker Dies in Grain Bin Engulfment

SUMMARY

On Tuesday, March 17, 2020, a 44-year-old male farmworker (victim) was unloading corn from a large grain bin using an auger mounted on the bottom when the corn within the bin became lodged. The victim entered the grain bin in an attempt to dislodge the product when the bridged corn collapsed resulting in the employee falling and becoming engulfed.

[READ THE FULL REPORT>](#) (p.5)

CONTRIBUTING FACTORS

Key contributing factors identified in this investigation include:

- Lack of hazard recognition
- Failure to utilize fall protection
- No emergency action plan

[LEARN MORE>](#) (p.5)

RECOMMENDATIONS

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

- Employers should implement a job hazard analysis process.
- Employers should implement an emergency action plan.
- Employers should require employees to utilize adequate fall protection when entering a grain bin is necessary.
- Employers should train employees on the known hazards associated with grain bin entry.

[LEARN MORE>](#) (p.6)

<http://www.mc.uky.edu.kiprc/FACE/index.html>



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Fatality Assessment and Control Evaluation (FACE) Program

This case report was developed to draw the attention of employers and employees to a serious safety hazard and is based on preliminary data only. This publication does not represent final determinations regarding the nature of the incident, cause of the injury, or fault of employer, employee, or any party involved.

This Case report was developed by the Kentucky Fatality Assessment and Control Evaluation (FACE) Program. Kentucky FACE is a NIOSH-funded occupational fatality surveillance program with the goal of preventing fatal work injuries by studying the worker, the work environment, and the role of management, engineering, and behavioral changes in preventing future injuries. The FACE program is located in the Kentucky Injury Prevention and Research Center (KIPRC). KIPRC is a bona fide agent for the Kentucky Department for Public Health.

Email: Kyfaceprogram@uky.edu

Twitter: <http://twitter.com/KYFACEProgram>

Facebook: <https://www.facebook.com/Kyfaceprogram/>

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INTRODUCTION

On Tuesday, March 17, 2020, a farmworker entered a grain bin partially filled with corn in order to dislodge the corn after it bridged and obstructed the flow of product. As the employee worked to free the obstruction, the bridged corn dislodged and the flow of product resumed suddenly, engulfing the employee. The victim succumbed to the injuries sustained in the incident and was pronounced dead at the scene by the county coroner. On April 14, 2020, the Kentucky Labor Cabinet informed the Kentucky Fatality Assessment and Control Evaluation Program of the incident.

EMPLOYERS

The employer is a beef cattle and ranching operation founded in 2010. According to the owner, the company consists of 22 employees. In addition to the ranching operation, the company also has a commercial trucking operation which specializes in the transportation of feed and grain.

WRITTEN SAFETY PROGRAMS and TRAINING

The company's safety program was not provided to the Kentucky FACE Program.

WORKER INFORMATION

The victim was a married 44-year-old Hispanic male with five children. The decedent had a high school education and had worked for the farm for nearly six years.

INCIDENT SCENE

The incident occurred on the company's farm within a large grain bin. The capacity of the bin was 80,000 bushels - approximately 745,000 gallons. At the time the incident occurred, the bin contained approximately 60,000 bushels of corn. The grain bin was equipped with a center, bottom-mounted auger at the base of the bin in the center position.



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Photo 1. Image depicting grain bin configuration similar to involved grain bin. (*Grain Bin Photo.* (n.d.).

WEATHER

The temperature was approximately 57°F at the time of the incident. The humidity was 57% with a northeast wind at 9 mph. There was no precipitation (*Historical Weather 2020*). While humidity can be a factor in grain bridging, the weather conditions could not be determined to be a contributing factor in the accident.

INVESTIGATION

On Tuesday, March 17, 2020, a 44-year-old male farm employee (victim) was unloading corn from a large, 80,000-bushel grain bin via a bottom mounted auger. During the course of the unloading process, the flow of corn seized due to bridged corn. According to OSHA, “*bridging*” occurs when grain clumps together, because of moisture or mold, creating an empty space beneath the grain as it is released. Bridged grain resists the downward pull that normally moves loose grain to the bin outlet and rarely becomes hard enough to support a person” (OSHA, 2011). The farm worker entered the gain bin without utilizing fall protection and used a large PVC-pipe to push and spread the corn. While doing so, the bridged corn unexpectedly collapsed. The victim fell and was engulfed by the corn as it began to flow again. A farm employee working on the exterior of the grain bin stated to authorities that he could no longer hear the victim inside the grain bin. The co-worker climbed to the top of the grain bin to look for the victim, but could not see him due to the collapsed corn.



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After the co-worker descended from the top of the grain bin, he asked a farm employee to contact emergency services to advise that a farmworker had been involved in a grain bin engulfment. In addition to emergency services, a second co-worker at the farm also contacted several members of neighboring farms to assist with the rescue of the victim. Emergency personnel arrived on scene approximately 30 minutes after receiving the call. Upon arrival, local volunteers from surrounding farms were prepared to cut an opening in the grain bin with a torch in an attempt to rescue the engulfed farm employee as quickly as possible. EMS and farm employees discussed the potential risk of fire and it was determined that cutting into the bin was not the best recovery option. EMS worked together with local volunteers to free the victim for several hours by unloading the corn onto trucks. Once the majority of the corn had been unloaded, EMS utilized the Jaws of Life, a hydraulic cutting apparatus, to recover the victim. The recovery lasted nearly four hours and the body was freed at 2:43 PM. Upon recovery, the victim was pronounced deceased at the scene by the local coroner.

CAUSE OF DEATH

The cause of death was suffocation.

CONTRIBUTING FACTORS

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

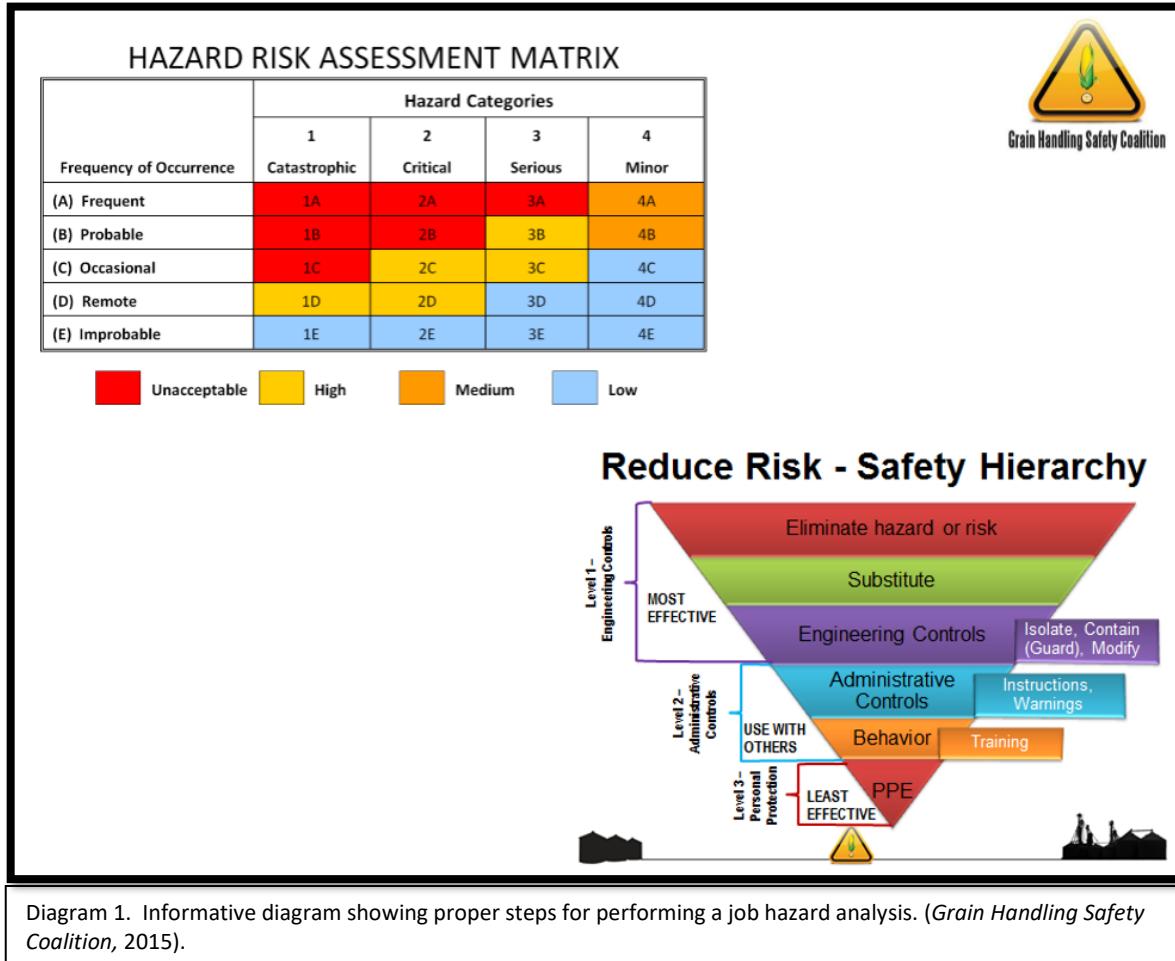
- Lack of hazard recognition
- Failure to utilize fall protection
- No emergency action plan

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Implement Job Hazard Analysis Process

Discussion: The Occupational Safety and Health Administration (OSHA) defines a job hazard analysis (JHA) as a technique that focuses on job tasks to identify hazards before they occur. It focuses on the relationship between the worker, the task, the tools, and the work environment. OSHA states that ideally, after you identify uncontrolled hazards, you will take steps to eliminate or reduce them to an acceptable risk level (OSHA, 2002). Had a JHA been previously performed, the employer would have likely observed the hazards associated with the task of entering a grain bin, including the need for an adequate body harness, rescue line and spotter. OSHA suggests a job hazard analysis be performed when completing the following types of jobs: jobs with the highest injury or illness rates; jobs with the potential to cause severe or disabling injuries or illness, even if there is no history of previous accidents; jobs in which one simple human error could lead to a severe accident or injury; jobs that are new to your operation or have undergone changes in processes and procedures; and jobs complex enough to require written instructions (OSHA, 2002). Companies should implement a job hazard analysis process to assess risk prior to performing work.

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Recommendation #2: Employers should implement an emergency action plan

Discussion: After learning of the incident, the involved company immediately called 911 and local farmers to assist. A local farmer arrived on scene shortly before emergency responders to cut the grain bin open with a cutting torch. EMS and farm employees discussed the potential risk of fire and it was determined that cutting into the bin was not the best recovery option due to potential risk for fire, a risk that had not previously been considered. Having an emergency action plan in place can be instrumental when emergencies arise as it can eliminate confusion when emergencies occur, saving critical time. According to OSHA standard 1910.38, the employer must have an emergency action plan (EAP) whenever an OSHA standard requires one. Although the involved company acted quickly, a written emergency action plan for performing a rescue was not in place. Emergency action plan must be in writing, kept in the workplace, and available to employees for review.



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An emergency action plan must include at a minimum:

- (1) Procedures for reporting a fire or other emergency;
 - (2) Procedures for emergency evacuation, including type of evacuation and exit route assignments;
 - (3) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;
 - (4) Procedures to account for all employees after evacuation;
 - (5) Procedures to be followed by employees performing rescue or medical duties; and
 - (6) The name or job title of every employee who may be contacted by employees who need more information about the plan or an explanation of their duties under the plan.
- (d) Employee alarm system. An employer must have and maintain an employee alarm system. The employee alarm system must use a distinctive signal for each purpose and comply with the requirements in § 1910.165.
- (e) Training. An employer must designate and train employees to assist in a safe and orderly evacuation of other employees.
- (f) Review of emergency action plan. An employer must review the emergency action plan with each employee covered by the plan:
- (1) When the plan is developed or the employee is assigned initially to a job;
 - (2) When the employee's responsibilities under the plan change; and
 - (3) When the plan is changed (OSHA, 2002).

Employers who are required to have an emergency action plan should take the necessary steps to implement an EAP and perform associated training in accordance with the applicable OSHA standard.

Recommendation #3: Employers should require employees to utilize adequate fall protection when entering a grain bin is necessary.

Discussion: Although fall protection harnesses were available, the victim was not utilizing fall protection when the incident occurred. According to OSHA standard 1910.28(b)(1)(i), Employer must ensure that each employee on a walking-working surface with an unprotected side or edge that is 4 feet (1.2 m) or more above a lower level is protected from falling by one or more of the following: Guardrail systems; Safety net systems; or Personal fall protection systems, such as personal fall arrest, travel restraint, or positioning systems (OSHA, 2016).

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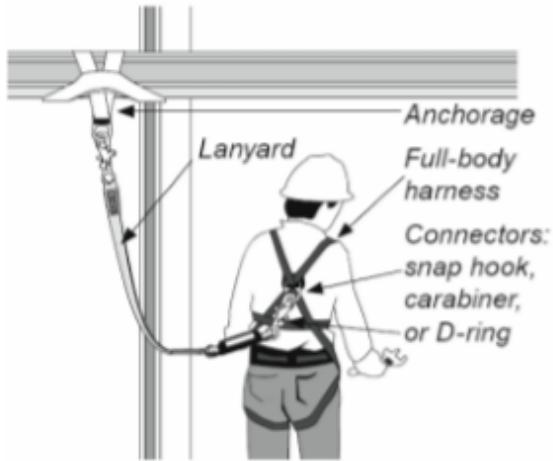
Use at least one of the following whenever workers are exposed to a fall of 6 feet or more above a lower level:

- Guardrails on ladders, roofs and platforms
- Safety Net Systems
- Fall Arrest Systems



Grain Handling Safety Coalition

A personal fall-arrest system



Information adapted from: *OASHA FactSheet. Preventing Falls*

Diagram 2. Informative diagram showing proper guidance on fall protection for grain bin entry. (Grain Handling Safety Coalition, 2016)

Recommendation #4: Employers should train employees on the known hazards associated with grain bin entry.

Discussion: In a study produced by Purdue University's Agriculture Research Program, there were 1,201 documented incidents in grain storage facilities from 1964-2013. Of those incidents, 809 involved entrapment or engulfment of free-flowing grain. Engulfment cases involving corn specifically account for 47% of all grain bin fatalities, which make it the leading grain medium in recorded incidents (Freeman & Hulbert, 2015). According to OSHA, the grain handling industry is a high hazard industry where workers can be exposed to numerous serious and life-threatening hazards. These hazards include: fires and explosions from grain dust accumulation, suffocation from engulfment and entrapment in grain bins, falls from heights and crushing injuries and amputations from grain handling equipment; however, suffocation is a leading cause of death in grain storage bins. Suffocation can occur when a worker becomes buried (engulfed) by grain as they walk on moving grain or attempt to clear grain built up on the inside of a bin. Moving grain acts like "quicksand" and can bury a worker in seconds. "Bridged" grain and vertical piles of stored grain can also collapse unexpectedly if a worker stands on or near it. The behavior and weight of the grain make it extremely difficult for a worker to get out of it without assistance (Grain Handling. (n.d.).

OSHA states the following steps can be taken to reduce hazards when workers enter storage bins, employers must (among other things):

- De-energize (turn off) and disconnect, lockout and tag, or block off all mechanical, electrical, hydraulic and pneumatic equipment that presents a danger, *particularly grain-moving equipment* as required by [1910.272\(g\)\(1\)\(ii\)](#). Grain *should not* be emptied or moved into or out of the bin while workers are inside because it creates a suction that can pull the worker into the grain in seconds.³



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- Prohibit and prevent workers from walking down grain and similar practices where walking on grain is intended to make it flow, required by [1910.272\(g\)\(1\)\(iv\)](#).
- Prohibit and prevent worker entry onto or below a bridging condition, or where grain is built up on the side of the bin, required by [1910.272\(g\)\(6\)](#).
- Train all workers for the specific hazardous work operations they are to perform when entering and working inside of grain bins, required by [1910.272\(e\)](#).
- Provide each worker entering a bin from a level at or above stored grain, or when a worker will walk or stand on stored grain, with a body harness. The body harness should have a lifeline that is positioned and is of sufficient length to prevent a worker from sinking further than waist-deep in grain, required by [1910.272\(g\)\(2\)](#).
- Provide workers with rescue equipment, such as winch systems, that are specifically suited for rescue from the bin, required by [1910.272\(g\)\(4\)](#).
- Station an observer who is equipped to provide assistance and perform rescue operations outside the bin, required by [1910.272\(g\)\(3\)](#).
- Ensure that communications (visual, voice or signal line) are maintained between the observer and the workers who entered the bin, as required by [1910.272\(g\)\(3\)](#).
- Test the air within a bin for oxygen content and the presence of hazardous gases before entry, required by [1910.272\(g\)\(1\)\(iii\)](#).
- Provide and continue ventilation until any unsafe atmospheric conditions are eliminated. If toxicity or oxygen deficiency cannot be eliminated, workers must wear appropriate respirators, required by [1910.272\(g\)\(1\)\(iii\) A and B](#).
- Issue a permit each time a worker enters a bin, unless the employer is present during the entire entry operation. The permit must certify that the above precautions have been implemented before workers enter the bin, required by [1910.272\(g\)\(1\)\(i\)](#) (OSHA, 2011).

Employers should train their employees on the dangers associated with grain bin entry, many free training resources are available through the [Grain Handling Safety Coalition](#). Resources available include videos, picture library, policy templets, posters and handouts like the one below:



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GRAIN BIN ENTRY HAZARDS

Grain Handling Safety Coalition

FACTS:

- When an auger starts you have 2-3 seconds to react
- After 4-5 seconds in flowing grain you are trapped
- After 22 seconds you are completely covered

Flowing Grain



Bridged Grain



Avalanched Grain



NEVER enter grain bins when flowing/bridged grain is present!

ALWAYS keep your head above the grain!

Diagram 3. Diagram depicting dangers associated with grain bin entry (Grain Bin Entry Hazards, 2015).



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PROGRAM FUNDING

The Kentucky Fatality Assessment & Control Evaluation Program (FACE) is funded by grant 5U60OH008483-15 from the National Institute for Occupational Safety and Health (NIOSH).

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INVESTIGATOR INFORMATION

This investigation was conducted by Beau Mosley, Fatality Investigator, Fatality Assessment and Control Evaluation, Kentucky Injury Prevention and Research Center, University of Kentucky, College of Public Health.

ACKNOWLEDGEMENTS

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