

Grain Storage and Handling Operations —



The Deadliest Hazards



There are a number of potentially deadly hazards in grain storage and handling operations. The major cause of fatalities in these operations is from employees entering the bin, becoming engulfed in the grain and suffocating.

However, many people also die from exposure to hazardous atmospheres, combustible dust explosions, getting caught in augers and other moving equipment and falling from elevations. Grain bin deaths continue to occur in Ohio. In recent years, a 26-year-old worker fell 18 feet inside a grain bin, a farmer fell when the grate he was standing on gave way while he was shoveling grain into an auger, a 68-year-old farmer was engulfed in grain and a 20-year-old worker got caught in an auger.

Fatal facts

According to a Purdue University report, there have been more than **498 reported cases of farmers and farm workers suffocating in grain bins during the last 50 years**. In addition, **more than 300 other cases involved people who received serious injuries from grain engulfment** in the United States. Governmental injury reporting agencies do not receive reports on all accidents involving grain storage and handling. Therefore, many more deaths and serious injuries associated with grain engulfment most likely have occurred.

- About **20 percent of the cases involved teenagers**.
- **70 percent** of the cases took place on **small- to medium-sized farms**.

According to the Occupational Safety and Health Administration (OSHA), U.S. grain handling facilities reported **more than 500 explosions since 1978**.

- These reported explosions resulted in **at least 180 fatalities and 675 injuries**.
- Again, the actual number of deaths and serious injuries from grain explosions is likely much higher.

BWC resources

The Ohio Bureau of Workers' Compensation, Division of Safety & Hygiene offers these services to aid in the prevention of injuries, illnesses and fatalities associated with grain storage and handling operations.

On-site consultative services

Our on-site consultative services provide personal assistance with on-site safety consultation and training related to all types of grain bin hazards. To request consultation services go to the following link: <https://www.bwc.ohio.gov/employer/services/safety/secure/safetyHygiene0.asp>.

Video library

Our video library loans educational videos on hazard recognition and injury prevention at no charge. Titles specific to grain bin safety include: 490239 – Grain Bin Safety, 490040 – Good Fight, and 490237 – Your Safety Matters. Other subjects include: Combustible Dust, Confined Space Entry, Respirators, Fall protection, Electrical hazards, Lock-out/Tag-out, Emergency preparedness, Hazardous atmospheres and Ventilation. To borrow videos: <https://www.bwc.ohio.gov/employer/programs/safety/SandHResearch.asp>

For additional assistance, call 1-866-569-7805.

OSHA resources on safe work practices in grain handling facilities

OSHA Fact Sheet: Worker Entry into Grain Storage Bins
<https://www.osha.gov/Publications/grainstorageFACTSHEET.pdf>

OSHA News release on Grain Storage Bin Emphasis Program
https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=NEWS_RELEASES&p_id=24216

OSHA Grain Handling information page
<https://www.osha.gov/SLTC/grainhandling/index.html>

Youth safety in agriculture
www.osha.gov/SLTC/youth/agriculture/index.html

Other resources

Purdue University Report <http://extension.entm.purdue.edu/grainlab/content/pdf/2010GrainEntrapments.pdf>

Grain bin rescue video: http://www.youtube.com/watch?v=_JOUgls6PMM

Engulfment survivor: <http://www.usatoday.com/story/news/nation/2013/07/05/grain-bin-survival/2491889/>

The Ohio State University Agriculture Safety and Health Program website: <http://agsafety.osu.edu/>

The deadliest hazards

Engulfment hazards

Workers sometimes enter grain bins and stand or walk on the grain to help it flow down into the auger or conveyor system. Engulfment can easily occur when a worker stands or walks on grain that has bridged or caked and suddenly begins to flow. The sudden release creates a suction effect. The moving grain acts like quicksand and engulfs the employee in seconds. This causes complete burial or intense pressure on the engulfed body parts. The result is serious injuries or death from suffocation.



Atmospheric and combustible dust hazards

Gases given off by chemicals, used to prevent grain spoilage and control insect infestation, can produce a hazardous atmosphere in grain bins and other storage vessels. The natural fermentation process and development of mold, which can reduce oxygen below safe levels and produce toxins, can also produce a hazardous atmosphere. In addition, grain dust can produce an explosion in a confined area when it becomes airborne and comes in contact with an energy source such as: electrical motors; welding; cutting; open flame; overheated conveyor systems and hot exhaust.

Mechanical equipment hazards

When loading and unloading grain from the bins mechanical equipment such as augers and conveyors are used. Unfortunately, grain sometimes clogs or bridges and prevents continuous grain flow. Employees need to clean or clear the grain manually, exposing them to moving parts that can cause serious injuries, amputations and death.

Fall hazards

Falling inside and outside of grain storage structures can occur when employees are accessing ladders, catwalks and any elevated working/walking surface and bin roof entrances. Falls from elevations are one of the leading causes of fatalities in all types of industries.

Preventive measures

Prohibit workers from entering bins when grain is being loaded or unloaded.

Prohibit walking down grain and similar practices requiring workers to enter a bin and stand or walk on grain to make it flow.

Provide a mechanical raking device or power sweep equipment to ensure grain movement within the bins.

Provide equipment that workers can use to break up surface crusts or clumps from outside the bin.

Treat grain bins as confined spaces and post confined space warning signs.

Require the use of a body harness and lifeline or boatswain's chair, when a worker must enter a grain bin.

Ensure you position a lifeline of sufficient length to prevent a worker from sinking further than waist-deep in grain.

Station an observer outside the bin who is equipped and trained to perform rescue operations.

Make sure the observer and workers who enter the bin maintain communication (visual, voice or signal line).

Conduct a job safety analysis to identify specific hazards and develop an emergency preparedness plan.

Develop a permit-required confined space entry procedure and require issuance of a permit each time a worker enters a bin or storage vessel.

Test the air within a bin for oxygen content and the presence of hazardous gases before entry.

Provide and continue ventilation to remove unsafe atmospheric conditions.

Eliminate all potential sources of ignition from the space.

Provide workers with rescue equipment such as winch systems that are specifically suited for rescue from the bin.

Ensure the observer and workers who enter the bin maintain communication (visual, voice or signal line).

Place signs warning workers about the hazards of confined spaces at all entrances to bins.



Prohibit entry into bins and other storage vessels during loading or unloading operations.

De-energize, disconnect, lockout and tag out all mechanical, electrical, hydraulic and pneumatic equipment.

Ensure all auger, conveyor and moving parts of equipment are properly guarded.



Provide appropriate fall protection/fall arrest devices whenever an employee has to work at elevation.

Train workers in ladder safety and personal protective equipment.

