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.

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.

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OSHA resources

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**The deadliest hazards**

### 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.

### 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.

### 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 on wheat 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.

### Preventive measures

- **Provide appropriate fall protection/fall arrest devices whenever an employee has to work at elevation.**
- **Train workers in ladder safety and personal protective equipment.**

### 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.

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### Preventive measures

- **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 windchime 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 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.**