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## Grain Bin Entry Safety

Recently Purdue University came out with their 2022 Summary of Confined Space-Related Injuries and Fatalities. There were 42 fatal and non-fatal grain entrapment cases documents in 2022, representing a 44.8% increase from the 29 recorded in 2021 and substantially higher than the five-year average of 34.8 cases per year. The total of combined fatal and non-fatal grain entrapment cases was the highest annual frequency over the past decade.

It is important to note the role of Out of Condition Grain in the grain entrapment incidences. According to Purdue “Nearly all cases examined in 2022 involved grain that was out of condition.” Contributing factors include:

- Attempting to store grain above 14% moisture
- Improper in bin grain drying (farmers rewetting the grain using outside air)
- Leaks in the structure that caused grain to go out of condition



*Rodding grain to unplug the sump while equipment is running is the #1 cause of grain engulfments.*

## Grain bin entry safety starts with Grain Quality Management!

The following are two of the most common types of engulfment incidents:

### Incident #1

An employee was inside trying to unplug a reclaim sump hole. All unloading equipment was locked out and de-energized. The sump hole was the second one from the wall of the bin. It was assumed that there was an out-of-condition chunk of grain plugging the sump hole. The employee had a rod and was attempting to poke in the general area of the sump hole. As the employee was attempting to do this, the grain along the wall broke free and avalanched onto him. It knocked him off his feet and pushed him several feet away. Luckily, he did not get completely engulfed and he was rescued by coworkers. The victim stated that he was amazed by how fast the grain moved upon him. There was no time to the get out of the way.

### Incident #2

An employee was working alone unloading a grain bin (loading trucks). The bin had a capacity of 50,000 bushels. There were an estimated 15,000 bushels remaining in the bin at the time of the accident. The grain quit flowing and it was determined that soybean pods (or chunked grain) had plugged the sump hole. This bin had no tunnel to rod from underneath, so the employee entered through a side door with a rod to unplug the sump hole. He did not notify anyone of the situation. The reclaim conveyor was

still running as the employee entered the bin. While standing above the sump hole the employee “rodded” the plug free and became trapped in the flowing soybeans as the grain began to flow again. The grain was deep enough to totally bury the victim. Luckily, the victim placed his hat over his mouth and nose to keep grain out of his airways, but his foot became entangled in the reclaim auger. After his foot became entangled, the auger stopped. The victim was found after about 45 minutes and rescue services were called. They cut holes in the bin to free the victim of the soybeans. After five hours the victim was finally freed from the auger by amputating his leg below the knee. The victim survived the engulfment and the amputation, but unfortunately he died five weeks after the accident due to complications.



## An Update of GFAI's Safety • Health • Environmental Services Program

**Please follow safe grain storage structure entry procedures required in OSHA 1910.272**  
**Please follow these entry rules and remember – engulfment can happen to any employee regardless of experience.**

### **Provide Training**

Companies are required under the grain handling standard to provide training to employees on the specific procedures and safety practices for entering and working in grain storage structures. The training should include at least the following:

- Engulfment hazards associated with entering and working and how to avoid them (i.e. flowing grain, bridging, out-of-condition grain)
- Lockout/tagout procedures specific for each piece of equipment
- Proper use of an oxygen meter or procedures for ventilating to alleviate oxygen deficient atmospheres/toxic atmospheres or proper use of a respirator
- How and when to use a full body harness and lifeline
- Rescue procedures and how to obtain additional help in emergencies
- How communication will be implemented (between employees entering and the observer) while working in the storage structure
- Informing employee of general unsafe work practices that are prohibited, such as “walking down” grain, standing on moving grain, or entering under bridging or avalanche conditions

### **Issue a Permit**

Employers are required to issue a permit which certifies that bin-entry precautions have been implemented. These include locking out the augers, testing or ventilating the air in the bin, providing a lifeline and a full body harness, and making sure the observer is in place.

### **Lockout/Tagout All Unloading Equipment**

LOTO is required to prevent the unexpected start-up of equipment when someone is inside the structure. This includes all equipment such as augers as well as gravity gates.

### **Atmospheric Testing/Ventilating**

The atmosphere inside a storage structure is required to be tested if it is suspected that combustible gases, vapors, or toxic agents are present. Also, the structure must be tested for oxygen content unless there is continuous natural air movement or forced ventilation (i.e. ventilation fans) before and during the entry. If ventilation cannot remove the toxic atmosphere or low oxygen content, then a respirator must be used.

### **Wear Protective Equipment**

Employees are required to be equipped with a full body harness and lifeline or boatswain's chair whenever entering from a point that is higher than the grain (i.e. entering from above) or when an employee walks on grain that is deep enough to cause an engulfment hazard. OSHA requires that the lifeline be positioned so that it would prevent the employee from sinking further than waist deep in the grain. OSHA states that a lifeline/harness is not needed if the employer can demonstrate that it is not feasible or creates a greater hazard than one posed by engulfment. The employer is then required to provide an alternative means of protection to prevent employees from sinking further than waist deep in the grain.

### **Provide an Observer**

Bin entry requires at least two people (one inside and one outside). The observer must be equipped to provide assistance and must maintain visual, voice or radio contact at all times during the entry. They must also be trained in rescue procedures including procedures for summoning help. Note: they must be trained not to immediately rush in to save someone because this could cause more problems than solutions.

Flat storage buildings are under the same requirements as grain storage structures when employees will be standing on grain deep enough to cause an engulfment hazard. (See “Wear Protective Equipment” for specifics.) If entry is made at ground level through the walk-in doors and employee will not be walking on the grain, no permit is required.