

# *Beware of Flowing Grain Dangers*





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**G**enerally, stored grain presents few hazards, but flowing grain increases the risk of entrapment and suffocation. Over the years, hundreds of deaths have occurred in bins that appeared to pose no danger.

Few people realize the hazard from flowing grain. An unsuspecting farmer who enters a grain bin with the unloader running may be caught in the grain flow before realizing what has happened. It takes only 4 or 5 seconds to be submerged to the point of becoming helpless. And it takes less than 20 seconds to be completely submerged in flowing grain. A child is engulfed even more quickly.





## ***Bins Hold Many Hazards***

Major risk factors associated with grain handling include:

- out-of-condition grain due to improper grain-management practices
- faster grain-handling procedures
- larger storage facilities
- year-round storage of grain
- a lack of awareness of the great danger in handling flowing grain

These case histories illustrate some of the dangers:

- A farmer found the flow to his unloading auger plugged when he started to unload his bin. Working alone, he let the auger run as he poked with a pipe while standing on the surface of the grain. When the pipe broke through the grain caked over the auger intake, he was almost immediately submerged to his waist in the flowing grain. Luckily, the pipe jammed the intake, but he was trapped in the bin until late in the day when he was discovered by family members.

- A father and son found an unbroken surface crust in a bin after removing several loads. The son walked across it safely, but the heavier father broke through and plunged into the cavity and flowing grain. He was submerged and suffocated before his son could stop the equipment.
- A grain farmer entered the wet holding bin that feeds his grain dryer. The dryer started automatically, and he was drawn into the wet grain and suffocated.
- An elevator worker entered a bin to break up a vertical pile of grain that would not flow. When he dug into the base of the pile, he was covered in an avalanche. He suffocated under only 12 inches of grain. He could not get up, since each square foot of his body was covered by a cubic foot of grain weighing nearly 50 pounds.
- A farm employee was using a high-capacity grain vacuum to suction grain from a grain-storage structure. He placed the vacuum hose inlet at his feet and was soon drawn into the grain as the grain was removed from beneath his feet. He was engulfed and suffocated before the machine could be shut off.



**WARNING:** Improper use of a grain vacuum machine can result in rapid entrapment.

## *Four Primary Types of Entrapments*

### **1. Engulfment in a Flowing Column of Grain**

Entrapment or suffocation most often occurs when an individual enters a bin during the unloading process and is drawn into a flowing column of grain. As the bin empties out the bottom, a rapidly moving column of grain forms over the outlet. This vertical column of grain acts somewhat like a fluid, and it flows down through the grain mass at nearly the rate of the unloading auger.

The rate of inflow at the center top of a bin is so great that once a person is trapped in the flow, escape is impossible. Once engulfed, the victim is rapidly drawn to the floor of the bin. The potential of entanglement with the bottom-unloading auger is also a possibility.

### **2. Collapse of Horizontal Crusted Grain Surface**

Entrapments and suffocations are possible when an individual enters a bin in which the surface of the grain has become caked because of spoilage. The surface appears solid, but can, in fact, be a thin crust concealing a void that forms as the grain is removed. The victim breaks through the crust and is quickly covered by the avalanche of grain collapsing into the cavity. Often the unloading equipment is still operating, which causes the victim to be pulled even deeper into the grain mass.

### **3. Collapse of Vertical Crusted Grain Surface**

On occasion, farmers have been buried beneath a collapsed wall of freestanding grain. Dry grain in good condition will pile at a 30-degree angle, but spoiled or caked grain can stand almost vertical. As grain is removed from the base of a caked mass, the potential for an avalanche and engulfment increases. This type of engulfment also can take place inside bins where the spoiled grain is clinging to the bin walls. Attempting to remove these chunks of grain from below using a long pole can be extremely dangerous.

### **4. Entrapment or Suffocation in Grain Transport Vehicles**

The risk of engulfment also is present around any grain transport vehicles such as wagons and trucks. Most cases involve trucks equipped with grain beds or gravity dump wagons in which the victims were riding. With the high-volume capacity of many on-farm storage facilities, it is not difficult to imagine someone being covered over in seconds during an unloading operation. A 12-inch auger on a typical 6- to 8-row combine can unload a 200- to 250-bushel grain tank in less than 2 minutes. Many of the victims of this type of suffocation, historically, have been children.

Some of the reported deaths involved a wagonload of grain that flipped over onto the operator during unloading. This resulted when crusted grain stacked up on one side of the wagon, causing the unit to become unbalanced.

## ***You Can Prevent Suffocation***

Flowing-grain suffocation and entrapments are preventable. Follow these safety rules to protect yourself and others:

- Never enter a bin when unloading equipment is running, whether or not grain is flowing. In some settings, lockout/tagout rules may apply.
- Keep children off grain vehicles and out of bins while unloading and loading. Forbid them to play in hopper wagons and truck grain beds. Grain flow can cover them quickly, before they realize what is happening.
- Always be cautious when working with grain that has gone out of condition. Stay alert to dangers that can result from airborne molds, blocked flow, cavities, crusting, and grain avalanches.
- Beware of steep or crusted piles of grain. Dislodge them from above, if possible, with a long pole, rather than with a short shovel.
- Always use a rope and safety harness when entering a dangerous bin situation. Have two people who are capable of lifting you standing by outside. One can go for help while the other gives preliminary aid.
- Don't assume that a person outside the bin can hear you. Equipment noise may block your calls for help. Consider the use of two-way radios to aid communications.
- Install ladders inside and outside all bins.
- Don't rely on a rope, chain, or pipe ladder hanging from the roof. They are not reliable and may obstruct flow during filling or increase drag during unloading.





**WARNING:** Use proper safety equipment and never work alone when entering grain storage.

## ***Emergency Response***

In the event of a flowing-grain entrapment, the following steps should be taken:

- Shut off all unloading equipment.
- Call 911 or emergency rescue services.
- Prevent anyone from entering the scene until trained emergency first-response personnel arrive.
- If the bin has an aeration blower, turn it on to increase the air flow through the bin to help the entrapped person breathe.
- Assemble equipment for assistance with a rescue, including front-end loaders, shovels, plywood for coffer dams, and portable augers.
- If you should become trapped in a grain bin or silo, stay near the outer wall and keep moving. If necessary, you can walk until the bin is empty or the flow stops.

## ***Respiratory Hazards***

In addition to entrapments, some grain can pose respiratory hazards. Even a small amount of spoiled grain can produce millions of tiny mold spores that can easily become airborne when disturbed. Airborne mold spores can be inhaled into the lungs through the nose and mouth, irritating sensitive tissue and causing reactions so severe in some individuals that hospitalization is necessary. Farmers working without respiratory protection inside a bin or other grain-storage facility in which moldy grain is present are especially vulnerable to mold reactions.

- Always wear a respirator capable of filtering fine dust particles to avoid unnecessary exposure to mold dust. Your tolerance may be reduced with each repeated exposure, which can lead to an acute reaction from any contact.
- Change clothes after exposure to mold spores to avoid exposing family members and living areas to mold.
- Seek medical attention if you become ill after exposure to moldy grain.





## ***Restrictions for Youth under the Age of 16***

Federal farm labor laws place restrictions on youth under the age of 16. Unless they are working on a farm owned or operated by their parent or guardian, they are restricted from operating or helping to operate (including starting, stopping, adjusting, feeding, or any other activity involving physical contact) certain farm machinery, including an auger conveyor, feed grinder, crop dryer, forage blower, or the unloading mechanism of a non-gravity-type self-loading wagon. However, they may perform these jobs at age 14 if they receive special training.

Under no circumstances can a youth under the age of 16 be employed to work inside of a confined space or space that contains a suffocation hazard or toxic environment, including grain-storage structures. For additional information on restrictions on the employment of youth, visit:

[agsafety4youth.info](http://agsafety4youth.info)



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