

# Grain bin accidents and deaths rising due to poor crop conditions

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Wet and cold weather in 2019 have created a dangerous situation this year for South Dakota farmers who store grain in bins, heightening a risk of entrapment or death that has existed on farms for generations.

The number of reported grain entrapments across the country rose by 27% from 2018 to 2019, and deaths rose by 53% that year.

South Dakota in 2020 has already seen the death of a 27-year-old father of three in Brookings County in February and the entrapment of a farmer who was rescued from a grain bin in Hughes County in March.

Heavy rainfall and brisk harvest conditions throughout 2019 across the 10-state “corn belt” that includes South Dakota led many farmers to harvest grain crops later than usual and produce grain that was immature or damper than normal.

Those factors from the 2019 harvest, in addition to the use of old, leaky bins on some farms, have combined to reduce the quality of grain being stored and result in a product known as “out-of-condition” grain.

The lack of consistency and low quality of the grain make it more likely to clump, stick to the sides of a bin or form a crust over the top. Those conditions make the grain flow less freely from the bins and make it more likely farmers will have to enter the bins to keep the grain moving, said Jeff Adkisson, a farmer who is vice president of the Grain and Feed Association of Illinois and also serves on the board of the national Grain Handling Safety Council.

“Grain quality is directly linked to safety,” Adkisson said. “This particular crop is not storing well. It came in wet, it didn’t dry down very well and there’s a lot of broken material in the bins. As a result, we have seen an uptick in situations where people have become engulfed and trapped or have died in grain bins.”

The U.S. Occupational Safety and Health Administration has taken note of the dangerous conditions in handling grain harvested in 2019.

In late February, the Chicago regional office of OSHA sent a letter to commercial grain-storage operators with an urgent warning to increase safety measures to reduce accidents.

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In bold lettering, the warning began with the statement, “Grain bin deaths spike as farmers rush late harvest!” The letter provided safety

recommendations and links to OSHA guidelines, and noted that due to recent heavy rains, fatalities began rising starting in August 2019.

The letter warned that “similar weather conditions in 2009 resulted in the industry’s highest number of injuries and fatalities.”

Grain bins — and risk of entrapment — common on farms

Farmers typically store grains such as corn and soybeans in elevated bins from the time of harvest in the fall or early winter to use as feed or to sell in the spring or summer. The gray metal structures, often cylindrical in shape and holding from 1,000 bushels to up to 2 million bushels, are ubiquitous on farms in South Dakota and across the country.

In a typical year, the grain is air-dried during storage and, when needed, an auger stirs the dry grains so they flow steadily from the bottom of the bins onto a conveyor.

Farmers sometimes must enter the bins to break up clumps or clogs in order to get the grain to flow out freely — a practice that is inherently dangerous owing to the risk of entrapment or suffocation within the grain, which can move or settle almost like quicksand.

Even when stationary, grain can settle beneath someone who is inside the bin, entrapping or engulfing the person. The risk becomes extreme when machinery such as an auger is running and the grain is flowing, making it more likely that someone in the bin will be pulled down into the moving grain and suffocate.



Once entrapped, it is nearly impossible for a person to pull him- or herself out to safety, and very difficult for someone else to lift the person from the grain, experts say.

One foot of grain in a bin can create about 300 pounds of pressure, so even with just two feet of grain surrounding a body, it takes an enormous amount of pull strength to lift someone out.

Entrapment and full engulfment can occur very quickly when an auger is running or grain is flowing for any other reason. According to OSHA, a person in a bin has only two seconds to react once grain starts flowing beneath him. Entrapment can occur in four to five seconds, and full engulfment can result in only 22 seconds.

The United States averaged about 35 reported grain-handling incidents per year from 2005 to 2015, about 60% to 70% of which were fatal, according to Purdue University. The actual number of entrapments is likely a third higher because many non-fatal incidents are never reported.

After wet weather in 2009 led to a dangerous year in 2010 (59 grain entrapments; 29 fatalities), the number of reported grain entrapments fell during the mid-2010s, according to data compiled by Purdue professor Bill Field, who has tracked confined-space accidents and deaths on farms for the past 40 years.

Grain entrapments are one type of the “confined-space” incidents tracked by Field, who also collects data on falls, entanglements, manure pit incidents and asphyxiations outside grain bins. The number of total confined-space incidents has risen steadily over the past few years. In 2017, 54 confined-space incidents led to 23 fatalities; in 2018, 61 incidents resulted in 26 deaths; and in 2019, 67 confined-space incidents led to 39 deaths.

In recent years, grain entrapments and fatalities have risen. In 2017, 23 grain entrapments and 12 deaths were recorded; in 2018, 30 grain entrapments and 15 deaths were recorded; and in 2019, 38 grain entrapments led to 23 deaths. Total grain entrapments rose by 65% over that 3-year period.

Field said early data collection for 2020 shows that the year is off to a dangerous start, particularly in regard to grain bin entrapments.

“The grain is wet or has gotten moldy or is harvested in an immature state and they have to go in there and fight to get it out,” Field said. “That’s when they are at risk.”

## **Safety rules not enforced on small farms**

The long-range decrease in entrapments is due to larger bins that make clogs less likely, increased awareness of the risks of entering grain bins, and

adoption of strict rules for grain handling by OSHA, Field said. Federal safety rule 1910.272 has several subsections and says that before anyone enters a grain bin, an observer must be present, a body harness with a lifeline is required, all moving equipment must be turned off, two means of emergency escape must be maintained and an emergency plan and safety training must be in place.

OSHA has made grain-handling safety a priority and has levied severe fines on companies where deaths have taken place. A Colorado firm was fined \$1.6 million in 2009 after the death of a 17-year-old who was cleaning a grain bin; a Kansas company was fined \$500,000 after two workers were fatally engulfed in 2018; and a Nebraska company was fined \$230,000 in March 2020 after a worker died in a grain bin in September 2019.

However, the OSHA rules apply but are not enforced on farms with 10 employees or fewer, meaning that small family farms that make up the majority of farms in South Dakota and elsewhere are not subject to upholding safety rules or tracking incidents. Field's research shows that 70% of entrapments happen on farms that are exempt from OSHA rules.



“It’s kind of interesting that you have a farmer with a million bushels in storage and he has no safety rules to comply with,” Field said. “You cross the street and you have a facility owned by Cargill and they have a million bushels in storage and they have a whole pile of rules to comply with.”

Agriculture is perennially among the most dangerous jobs in America (loggers have the highest death rate, followed by fishery workers), and grain-suffocation deaths lag far behind the number of deaths due to transportation accidents on the farm, including tractor rollovers.

Yet grain-bin deaths carry a level of horror that make them particularly devastating for farmers, Field said. The fear of suffocation is deeply entrenched in humans, and often a person who has become engulfed in a grain bin is discovered missing or sometimes found dead by a family member,

neighbor or colleague. Many people known to the victim are often present when emergency workers cut open the bin to discover a body inside.

Still, it is common for farmers to take risks that can lead to entrapment, Adkisson said.

Before a bin accident occurs, it is likely that a farmer has climbed inside a bin dozens of times without incident, leading to a false sense of safety.

“They think, ‘I’m young enough, fast enough, strong enough, or I’ve done this a thousand times before, so nothing will happen to me,’” Adkisson said. “They know there is danger afoot, but they’re still telling themselves nothing will happen.”

Furthermore, many farmers do not like to ask for help when handling grain, and some enter a bin without letting anyone know or without having a spotter on hand.

“We know that farmers are fiercely independent, and we understand a farmer may be embarrassed that their grain has gone out of condition,” Adkisson said. “But we’d rather have a farmer call for help from a neighbor or a grain operator than have to go to their funeral.”

Efforts are underway to improve grain-bin safety, including educational programs that urge farmers never to go into a bin when machinery is running, to have someone else present before entering a bin and to wear protective gear such as a safety harness or lifeline.

Adkisson’s group provides safety materials online and hosts safety-training sessions. Field has hosted hundreds of training sessions for emergency responders over the years to teach them rescue techniques, including in South Dakota. OSHA scheduled an effort called “Grain Safety Stand-Up” from April 13 to 17 to call attention to safety guidelines and implementation.

And with one in six grain-bin fatalities resulting in the death of a child under age 16, an increased focus has been placed on improving safety among young people.

Jerry Mork, a South Dakota corn, soybean and wheat farmer who is president of the Day County Farm Bureau, hosted a grain-bin safety night for youths in Webster this spring. The event, held prior to the COVID-19 pandemic, included a screening of the movie “Silo” that tells the story of a teenager who gets trapped and then rescued from a grain bin after a community-wide effort.

Mork said farmers sometimes take chances in grain handling due to stress to get things done quickly when market conditions are right. He said it is important to educate young people about grain-bin risks early so they carry safety forward throughout their lives.

“I think it’s stress and I think it’s time and the pressure to get the grain out in a hurry rather than stopping and thinking, ‘You know what, it’s not worth it,’” Mork said. “We want to start getting our youth to understand the risks involved, to get it implanted in their minds.”

## **Recent incidents highlight risks**

On March 7, a farmer on a Hughes County property about 30 miles southeast of Pierre became trapped in a grain bin to mid-torso depth for about six hours before being rescued by rescue workers from three fire departments and a grain company. The man entered the bin and became trapped in the corn, at which time another person on the scene was able to secure a rope around the man’s chest to prevent further slippage into the grain.

Attempts to build a temporary “tube” around the man to lift him out from above failed, so responders had to use saws to slowly cut holes in the bin to drain the corn and reach the man with a stretcher. The man suffered non-life-threatening injuries.

But several other farmers in the Great Plains have suffered a worse fate this year and in late 2019, according to news reports.

In September, a 32-year-old worker suffocated after becoming trapped in a 10,000-bushel grain elevator at a commercial plant in Fremont, Neb. In late January, a 35-year-old farmer in Albany, Minn., died after entering a bin to break up frozen corn and becoming engulfed in grain.

A 66-year-old farmer from Urbana, Ind., died after being sucked into a bin full of soybeans while trying to break up clumped beans. A frantic attempt to get to him by numerous neighbors and emergency workers was unsuccessful. And an 80-year-old farmer was discovered dead after falling into a grain bin in Webster, N.D., on Feb. 27.

In South Dakota, the February death of farmer Christopher Bauman has resonated with the entire state agricultural community.



Though Christopher's death was not believed to be related to out-of-condition grain, the tragedy has served as a reminder of the risks associated with storing and handling grain.

Christopher, 27, was one of two sons of Don and Sherry Bauman, and both boys grew up on the family farm near Elkton in eastern Brookings County. Both Christopher and his brother, Justin, 29, graduated from Lake Area Technical Institute before returning to work on the farm with their father.

From a young age, Christopher was entranced by farm life and work, his father said.

“That’s all he wanted to do, from the time he could play with toy machinery to when he was running the real machines,” Don Bauman, 59, told News Watch. “He couldn’t wait to get home and be involved in the farm.”

Christopher married his wife, Cecily, in 2013 and they had three children, now ages 5, 3 and 18 months.

Christopher, Justin and their father ran a 110-head dairy operation and produced corn, soybeans, wheat and alfalfa.

Christopher had a reputation for being involved in his community and supporting his neighbors.

“He would stop and help any neighbor whether they needed help or not,” Bauman said. “He would just stop by, and he would stay there and help them until everything was done.”

On Feb. 17, the three men were out on the farm together, and Don and Christopher were removing corn from a bin for Christopher to take into town to satisfy a prior contract sale. Justin was grinding corn from another bin nearby.

The corn was in good shape and was being held in a 12,000-bushel bin that stands about 25 feet tall and 30 feet across, Bauman said. As the auger inside ran, the corn flowed out onto a conveyer that would carry it to a truck for transport.

A couple of minutes after the corn started flowing, Bauman noticed that Christopher was no longer with him.

“He walked around one side of the building, and I thought he was going to come around the other side to talk to me,” Bauman said. “When I realized he didn’t come around, we shut everything off.”

Bauman called Justin over and after a quick check around the outside, Bauman climbed a ladder to the top of the bin and looked inside, feeling around for any sign of Christopher.

He saw a slight downward cone in the middle of the bin but no sign of his son. After 911 was called, the pair opened a door at the bottom of the bin to begin letting out the grain.

A short time later, emergency workers arrived and cut holes in the bin to remove the corn, and eventually Christopher’s body was found inside.

“It was just horrifying,” Bauman said.

Looking back, Bauman has no idea why Christopher would have entered the bin from the top. He and his sons talked often about safety on the farm and had never had an accident. They specifically discussed grain-bin safety and that in no circumstance should they ever climb in when alone or if the auger was running.

“We had talked about that hundreds of times ... so I don’t know why he did and I can’t speculate about that,” Bauman said.

Christopher’s death has devastated Bauman and their extended family, especially Christopher’s wife and children.

“They do as best they can,” Bauman said. “We told the kids that daddy’s not coming home, but they keep asking about it.”

Bauman said he knows the accident has shined a light on the need to be safe while working grain, and he's heard that some farmers in the area are being extra cautious as a result.

But there is no solace for the family at this point. Bauman's sorrow and sense of loss are palpable, even in a phone interview long after the incident.

"I just don't know how we're going on day to day without him," he said.