# Silo Storage Safety Meeting Kit

## WHAT'S AT STAKE

Falls, engulfment, entanglement in machinery, and exposure to silo gases, dusts, and molds are some of the main causes of silo injuries, illnesses, and deaths. Silos can be used to store a wide variety of materials, but when hundreds or thousands of tons of material are stored in one place, safety needs to be a priority.

## WHAT'S THE DANGER

**MAIN HAZARDS OF SILO STORAGE**

**Suffocation.** Suffocation in grain bins usually occurs when a person is buried while the bin is being emptied. Flat-bottomed grain bins are usually emptied through the center of the bin floor. Shortly after the grain starts flowing, a funnel-shaped flow pattern develops in which grain from the surface flows to the center, then down to the floor.

Caked or frozen grain or silage is also a suffocation or crushing injury threat. If a bin has been partially emptied below a crust of grain, someone who steps on the crust while attempting to break it up can fall through and become buried. Workers should always assume all surfaces are bridged.

A suffocation hazard also exists from the gases given off from spoiling grain. For example, the carbon dioxide ($CO_2$) given off is heavier than air and will collect above the grain surface. You cannot smell, see, or taste the $CO_2$. If enough gas has collected to decrease the oxygen concentration from the normal 21 percent to less than 19.5 percent, you will think less clearly, become drowsy, lose consciousness, or even die.

**Silage Structures.** Fermenting silage produces nitric oxide ($NO$), nitrogen dioxide ($NO_2$), and nitrogen tetroxide ($N_2O_4$). $NO_2$ and $N_2O_4$ are respiratory irritants. Low concentrations of $NO_2$ can

cause coughing, difficulty in breathing, or nausea. Higher concentrations may cause the lungs to fill with fluid, which can result in death.

**Bunker Silos.** When tractors or other vehicles are used to pack silage into bunker silos, overturns are a definite possibility. The vehicle chosen for this task should have a rollover protective structure and a seat belt.

**Falls.** Falls from machinery and structures were the second largest single cause of grain- and silage-handling fatalities. Falls can occur as workers move from the vertical exterior ladders on grain bins to the bin roof or through a bin entrance.

**Fires, Explosions, and Electrocutions.** There are not as common as falls but can have equally severe results.

# OTHER SILO STORAGE HAZARDS

- Goods stored within silos may create a toxic, flammable, oxygen deficient or explosive atmosphere.
- Oxygen limiting silos or controlled atmosphere silos have a greater risk of backdraft or explosion.
- When involved in a fire or suspected fire, opening any doors or hatches could result in a heat blast.
- Applying water or foam into a silo may result in the contents swelling to lead to structural collapse of the silo.
- Gaining access to a silo may involve working at height, with a hazard of fire and rescue service personnel or their equipment falling inside or outside of the silo.

# HOW TO PROTECT YOURSELF

**BEST SILO STORAGE SAFETY MEASURES TO PROTECT WORKERS**

**Before Entering A Silo**

- Open all lids and ventilation points well before entering to allow as much free-flowing air as possible. Damp grain,

especially canola, will produce carbon dioxide and carbon monoxide at toxic levels. Monitors are available to test for these gases.
- Ensure all augers or conveyers filling or emptying the silo are stopped and cannot be started by someone else while you are in the silo.
- Stop and think if there is any way the job can be done from outside the silo.
- If entry is not through an access door at ground level, ensure the ladder has an appropriate safety cage. If not, a certified safety harness must be worn.
- Ensure you are well hydrated and wearing suitable clothing to do the job (for example, sturdy, enclosed footwear).
- Avoid heat stress by carrying out the job during a cool time of the day so the internal silo temperature is more comfortable.

**Entering a Silo**

- Only enter a silo when absolutely necessary.
- Always have three people. One person to perform work inside, another to monitor the worker, and a third to call for help if needed.
- Be sure to strap up with a rope and harness before entering, don’t solely rely on ladders.
- If you find yourself trapped inside, keep moving and try to swim through the product to get to a ladder.
- When entering an empty silo, use an oxygen-supplying respirator. Fermented feeds can create nitrogen and carbon dioxide that displaces oxygen.

**While working inside a silo:**

- Wear an appropriate dust mask to prevent fine dust particles entering your lungs.
- Stay on the ladder above the level of compacted or bridged grain while dislodging it.
- If you become trapped under grain, avoid movement, and don’t panic as this will worsen the problem – try to remain calm and call for help.

**Additional Silo Tips**

- Keep silos locked and barricaded to prevent unauthorized access.
- Never allow people inside or near the silo when it is being loaded or unloaded.
- Ladders up the side of the silo should be at least 7 feet off the ground and kept in good condition.
- Don’t keep portable ladders used to access the silo in the immediate area.

**Filling and emptying**

- Always fill and empty silos from the middle. Filling or emptying a silo from the sides will cause uneven loading on the silo, potentially causing a structural failure.
- Wear high-visibility clothing while working around moving machinery to reduce the chance of being run over. Ensure all workers are trained to safely operate the grain storage facilities and equipment.
- Ensure all operators get enough rest or downtime to avoid fatigue and stress-related accidents.

# FINAL WORD

Silos are an important part of many farming operations. However, they are also the cause of many accidents. These accidents include falls, electrocution, entanglement in augers and silo gas inhalation.