

GENERAL GRAIN BIN HAZARDS AND SAFETY

(For assistance, please contact EHS at (402) 472-4925, or visit our web site at <http://ehs.unl.edu/>)

Working around grain bins presents unique, and sometimes fatal, hazards which are often overlooked even by the most seasoned farm workers. This SOP highlights those hazards that are of greatest concern and some general safety tips for minimizing these hazards. Supervisors of employees who work in or around grain bins are responsible to ensure that employees are trained in these hazards and associated control measures, as well as proper operation and maintenance of grain bins.

Engulfment/Entrapment

If a person enters a grain bin, particularly during grain removal, there is the potential for engulfment or entrapment. Air pockets or voids can shift and cause the stored grain to flow. Figures 1 and 2 below depict how a person can become engulfed when grain shifts.

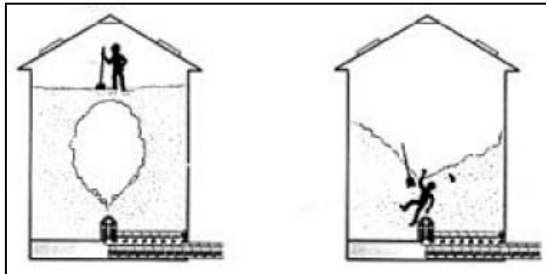


Figure 1

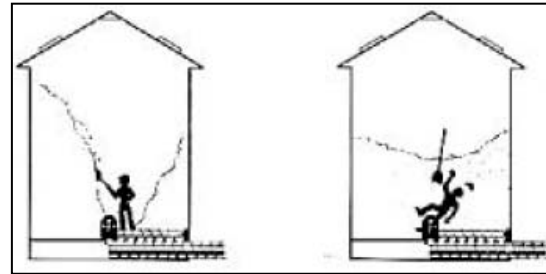


Figure 2

Because of this and other hazards, workers must not enter a bin at all during active filling or removal. Entry during times when grain is not being added or removed should be avoided with alternate work practices utilized (i.e., using a long pole to free crusted areas, etc.). If entry is absolutely necessary and the conditions outlined in the EHS SOP, **Entry Procedure for Flat-Bottom Grain Bins** are not fully met, then the entry must be done in accordance with the UNL Confined Space and Lockout/Tagout Programs; the entrant must be protected with a body harness and a lifeline and remain above the surface of the grain; and all moving parts and automatic loading/unloading devices must be locked out. In addition, implement the following safety measures:

- Label grain bins as Confined Spaces and prohibit entry except within the context of UNL's Confined Space and Lockout/Tagout Programs. This will require pre-planning for communications and emergency rescue, among other things.
- Lock entry points.
- Do not store grain in or enter bins that have visible physical damage.

- Permanently installed ladders inside and outside of the bin are recommended.
- Do not add wet grain to previously stored dry grain.
- Follow all manufacturers' recommendations for grain storage and maintenance/operation of the bin.

Hazardous Atmospheres (Oxygen deficiency, toxic gases, allergens)

The atmosphere inside of a grain bin can be hazardous in a number of different ways. Microbial action (i.e., decay of grains by bacteria, growth of mold, fungi, etc.) can result in production of metabolic gases (i.e., carbon dioxide, nitric oxide, nitrogen dioxide, nitrogen tetroxide, etc.) and consumption of oxygen. Contact with mold and fungi can result in lung ailments and allergic reactions, such as Organic Dust Toxicity Syndrome (ODTS) and Farmer's Lung. ODTS is a fairly common illness affecting farm workers. Symptoms are similar to the common cold or flu and usually appear four to eight hours after exposure to spoiled organic materials. ODTS is usually mild and short-lived (one to ten days) but it may recur.

Testing of the atmosphere and ventilation prior to entry, as well as use of appropriate respirators protects against hazardous atmospheres. Consult EHS on the selection and use of testing equipment and respirators. Other safety procedures include:

- Store only adequately dried, top-quality grain to reduce spoilage.
- Keep insect and animal infestations to a minimum.

Fire/Explosion

Accumulations of grain dusts can create explosive atmospheres. Fire and explosions are another safety hazard commonly associated with grain bins. Grain bin fires are often difficult to fight and result in an explosion. Grain dust explosions often have a cascading effect that causes a secondary explosion after an initial and often smaller explosion. Corn, mixed grains and wheat are all considered to have strong explosive properties. Four conditions must be present for an explosion to occur. First, dusts in the atmosphere must be combustible. Secondly, particles must form a cloud exceeding minimum explosion concentrations. Thirdly, dusts must be confined. Lastly, an ignition source must be present. Welding and the operation of a bucket elevator, which may create static electricity or sparks, are often the direct cause of an explosion.

To minimize the potential for fire or explosion:

- Enclose conveyer belts.
- Make sure the ventilation system is in good working order.
- Conduct hot work (i.e., welding, blazing, torch cutting, etc.) in or around grain bins in accordance with the EHS SOP, **Hot Work**.
- Remove accumulated dusts with a vacuum. Avoid sweeping.
- Ensure that grain dust accumulations are kept to a minimum with regular cleaning, especially near ignition sources (e.g., fans, blowers, motors, etc.).
- Ensure that all electrical connections meet code requirements.

