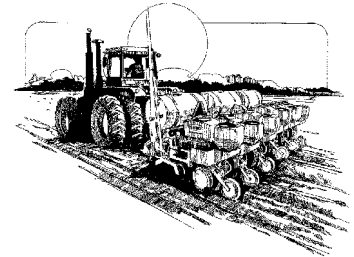




## Grain Handling and Storage Safety

Jill Webster Ph.D.,  
S. Christian Mariger, Graduate Assistant  
Agricultural Systems Technology and Education



There are several hazards that should be considered when working with grain. Storage structures, handling equipment, and the grain itself have all caused serious injuries and deaths.

Storage structures (bins, silos, and granaries), like all confined spaces, have significant hazards associated with them. Because they are enclosed, grain storage structures often accumulate a toxic atmosphere, or become oxygen depleted atmospheres. Common gasses such as methane and carbon dioxide are heavier than air and can accumulate over stored grain, displacing oxygen. Reduced oxygen levels cause a condition called anoxia. Anoxia affects judgment and causes rapid fatigue or nausea, and can overcome and kill a worker. Other more toxic “silo gases” that can form in grain storage structures include: *nitric oxide, nitrogen dioxide, nitrogen tetroxide, ammonia, and hydrogen sulfide*. These gases are poisonous to humans, and can cause symptoms ranging from mild respiratory irritation to death, depending on the concentration of the toxin and the level of exposure. Other respiratory hazards associated with grain storage structures are dusts, molds, fungal toxins (aflatoxin, mycotoxin, endotoxin, etc.), and residual fumigants. Exposure to all of these are both long and short term health risks. Sensitivity to these substances increases with repeated exposure, and their effects may be cumulative.

The importance of ventilating a grain storage structure, and using the correct respirator, before entering, cannot be overstated. In addition, never enter a confined space alone. Always have at least two other people capable of lending assistance, outside the structure. Safety harnesses are also useful, not only as a safe means of rescuing a worker in a storage structure who has been overcome by a toxic atmosphere, but also for arresting falls from the structure. Two people are important because, without adequate help to pull an unconscious or injured worker out, the safety harness is useless. Never enter a confined space where a worker has collapsed to attempt a rescue, without the proper respirator, because the rescuer can quickly become a second victim. If the proper rescue equipment is not available, then a rescue team should be called immediately.

Falls from grain storage structures are a leading cause of injuries and fatalities for farmers. Falling from as little as 12 feet can be fatal. To reduce the risk of falls, keep all ladders in good repair, and avoid climbing a wet or icy ladder. Safety cages should be installed around permanent ladders of 20 feet or more. Hand rails will also greatly reduce the risk of a fall. Use safety ropes, harnesses and fall arresting devices whenever possible.

When handling grain always remember the potential for a grain dust explosion or fire.

Moving grain will put a large amount of highly flammable dust in the air. Be aware of potential ignition sources, such as electric shorts, hot engine or other mechanical parts (bad bearings for example), or open flames. Proper ventilation can help reduce the concentration of flammable dust in the air and lessen the risk of explosion.

Grain handling equipment, like all machinery, has risks. Augers, sweeps, conveyers and elevators, must have exposed moving parts in order to do the job they are intended to do. Workers must be in close proximity to these machines to do their jobs and this creates a risk of serious injuries. The manufacturers of these machines have provided guards, shields and steel mesh covers to improve the safety of the machine. Resist the urge to operate this equipment without these safety devices in place. Quick access or better grain flow are poor trade offs for the increased risk of an amputated hand or foot.

Never enter a storage structure while it is being loaded or unloaded. Electrical and automated equipment can start unintentionally. Ensure your safety by locking out and tagging these controls before clearing a blockage or performing maintenance on this equipment.

Always avoid overhead power lines when moving portable augers and elevators. As with irrigation pipes these objects are electric conductors, if they come into contact with a power line, those in contact with it can be electrocuted.

The grain itself can pose a serious safety threat. Moving or flowing grain cannot support your weight. While one can walk on still grain

and sink only a few inches, moving grain can't develop the support needed to avoid sinking several feet, and becoming trapped. As with moving grain, crusted or bridged grain (grain that has spoiled and then stuck together) will allow hollow spaces or voids to form below, and will not support your weight. Spoiled grain stuck to vertical surfaces such as walls also present a serious hazard. Falling grain can bury and suffocate workers below. This is also true for steeply sloped piles of grain that can avalanche when disturbed.

## **Pertinent Literature**

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Safety Research. Safe Grain and Silage Handling. October 1995 (No. 95-109), Authors: Snyder, Karl, and Bobick, Thomas.

U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health, Division of Safety Research. Health Hazards of Storing, Handling, and Shipping Grain. June 1988. Author: Brown, M.A.

Porter, D.O. (September 1998) Hazard Alert! Handling and Storage of Grain and Silage West Virginia Extension Service. [On Line] [www.wvu.edu/~agexten/resource/binsafe.htm#hazard](http://www.wvu.edu/~agexten/resource/binsafe.htm#hazard)

Utah State University Extension is an affirmative action/equal employment opportunity employer and educational organization. We offer our programs to persons regardless of race, color, national origin, sex, religion, age or disability.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert L. Gilliland, Vice-President and Director, Cooperative Extension Service, Utah State University, Logan, Utah. (EP/05-99/DF)