

NDSU

**FARM EQUIPMENT
OPERATION AND
MAINTENANCE**

July 1996

FARM EQUIPMENT

Safe Operating Procedures

I. Introduction

The grain storage bin along with its accompanying grain movement equipment, has become a common sight on the farms and at NDSU. Though grain bins appear to involve little risk, there are a number of potential hazards employees at NDSU should recognize and guard against.

By outlining and following safe operating procedures we learn to prevent injury and safeguard ourselves and our coworkers against a job related injury or death.

II. Goals

To ensure all employees know and understand the safe operating procedures involved with grain bins and their associated equipment, such as elevators, augers and conveyors.

III. Purpose

To reduce the risk of a work related injury or death by maximizing personal safety during grain handling operations.

IV. Procedure

Employees who are required to use respirators to protect themselves from harmful dust, fogs, fumes, mists, gases, smoke, sprays or vapors, in order to perform their job, shall follow the recommendations outlined in the *NDSU Safe Operating Procedure - Respiratory Protection Standard*.

Environmental Health Office or Loss Prevention Office at NDSU. Copies of the Safe Operating Procedures specific to NDSU may also be obtained at these offices.

Grain handling equipment identified as the most hazardous per hour of use:

1. Elevators, Portable augers, and Conveyors
2. Grain Bins

1. Elevators, Portable augers, and Conveyors

The portable elevator and auger are used to transport large quantities of grain, feed or fertilizer quickly and easily. But, per hour of use, the auger is one of the most dangerous pieces of farm equipment. Auger accidents usually include:

- * Contact with or entanglement in the exposed screw at the intake.
- * Entanglement in a belt drive or chain.
- * Being struck by an uncontrolled spinning crank (used to raise or lower the auger).
- * Entanglement in the PTO or drive shaft.

2. General Safety - Safe Operation

- * Secure all equipment involved to ensure that it cannot be accidentally started or moved.
- * Keep children away from the elevator, whether it's stored or in use. Elevators are not intended as slides or seesaws, and children should never be allowed to climb on them.
- * Replace any worn or broken parts. Check equipment prior to use and periodically as recommended by the supervisor or operators manual.
- * Never wear loose clothing or jewelry when working around elevators or augers.
- * Use extreme care when transporting portable elevators and augers. Always transport the auger in the lowered position with the safety locking device in place.
- * Travel at safe speeds for the road conditions and equipment you are moving.
- * Use a flag to mark the end of the elevator, and follow local traffic regulations concerning the use of lights and reflectors when transporting elevators on public roads.
- * Avoid sharp turns when towing an elevator or auger. If the elevator begins to upend, do not hang on and try to stop it. Get out of the way - YOU MAY BE CRUSHED UNDER A COLLAPSED ELEVATOR.
- * If the auger is in the raised position, watch for overhead power lines. If possible, lower the auger to increase its stability before moving.
- * Do not operate the machine without the guards or covers in place.
- * Never allow the height adjustment crank to be released and spin freely. Do not try to stop a spinning crank.
- * Do not ride or climb up onto the trough of a bail or grain elevator.
- * Disengage the power source before removing chaff or trying to unplug the elevator.
- * Position the elevator so the chaff or bales fall freely away from the ends to eliminate the danger of getting entangled in the chains and sprockets at the end of the elevator.
- * Most elevators and augers are equipped with a safety device to keep the elevator from being raised too high - request these safety measures on all equipment. **DO NOT ALTER ANY SAFETY FEATURES.**

2. Grain Bins

Generally there is little danger from stored grain, but flowing grain presents potential suffocation and entrapment hazards. Grain transport equipment, commercial elevators, and grain processing facilities have also been involved in numerous flowing grain accidents.

a. Basic types of accidents:

- 1) **Engulfment in Flowing Column of Grain** - entrapment or suffocation caused when an individual is drawn into a flowing grain column.

When a grain bin is emptied, the grain flows in a funnel shaped path above the outlet which is normally the center of the bin floor, so the grain flows down the center in a vertical column.

The grain flows down this vertical column near the same rate of the unloading auger, essentially no grain flows in from the surrounding grain mass. The center top has the greatest rate of inflow and is so great, escape is impossible. It is similar to being drawn into a water whirlpool. It takes only seconds to be sucked into the flowing grain.

The condition of the grain appears to play a role in survival. Spoiled grain may be in caked masses and form open air pockets and reduce the grain pressure on the body.

- 2) **Entrapment or Suffocation in Grain Transport Vehicles** - Occurs in trucks equipped with grain beds and gravity dump wagons

Victim becomes buried during the loading operation from a combine or a storagebin, or the victim is drawn into the flow of grain from the vehicle as it is being unloaded. Most accident victims are children under 16 years of age.

- 3) **Collapse of Horizontal Crusted Grain Surface** - The top surface of the grain in a bin has become caked due to spoilage and the surface appears solid. In fact, a thin layer of crusted grain concealing a void created when grain underneath has been removed.

The victim breaks through the crust and is quickly covered by the avalanche of grain collapsing into the cavity.

Survival is reduced in these instances because the unloading equipment is left running and draws the victim even deeper into the grain mass.

- 4) **Collapse of Vertical Crusted Grain Surface** - A wall of free-standing grain will pile at an angle of 30 degrees. If it is spoiled or caked it can stand in an almost vertical pile. As grain is removed from the base of the caked mass, the potential for avalanche and engulfment develops.

b. Rescue - Precautions

- * Stop all equipment as soon as possible.
- * **GET HELP** - Call 911 or the local Emergency Rescue Unit **before** making any attempted rescue efforts.
- * Always assume a victim entrapped in grain is alive. Rescue can still be successful.
- * If engulfment is expected - **DO NOT START** the unloading auger or open the gravity flow grate for any reason. The victim may receive further injury.
- * If the victim is completely submerged, remove the grain from the bin in the most rapid and orderly fashion - by cutting large openings uniformly around the base of the bin.
- * Start the aeration fans if the storage bin has one and someone knows how to operate it.
- * **Do not** attempt to rescue a partially submerged victim by pulling them free using ropes or harnesses. **GET HELP** - Call the Emergency Rescue Unit.

c. General Safety - Safe Operation

FALL PROTECTION SHALL BE USED WHEN THERE IS ENTRY INTO A GRAIN BIN

- * Control access to grain storage facilities to prevent grain entrapment.
- * Children should not be permitted to play or work in an area where there is flowing grain or potential for collapse of grain surfaces.
- * Warning decals should be placed at all bin entrances, on all rail cars, trucks and trailer boxes used for grain hauling, and on all gravity wagons.
- * Never enter a grain bin without stopping the auger first and using “Lock Out/Tag Out” procedures to secure it.
- * Use a key and padlock to secure/lock the switch for the auger in the off position. Attach a tag to the locked switch so other people can see why the machine is not running.
- * If grain “bridges”, shut off the equipment and use a pipe or some other long object to break the bridge and get the grain to flow again.
- * Never enter a grain bin alone; have at least two people at the bin to assist in case of problems.
- * Install ladders and safety ropes in all bins and have them readily available for use upon entering a grain bin.

d. Dust , Molds & Fumes

- * The atmosphere of a bin or silo shall be tested for the presence of combustible gases, vapors and toxic agents when the employee or employer has reason to believe they may be present.
- * Wear a dust filter and/or respirator that will remove fine dust particles when working in or around grain handling activities to protect yourself.
- * If an employee develops an allergic reaction, they should be ordered to leave the area immediately and be kept under observation. Severe reactions to grain dust or molds often require hospitalization or may be delayed for several hours.