

Grain Handling Safety

HS94-041E (6-09)

Goal

This program provides information on reducing hazards to people working in grain handling facilities.

Objective

Employers and employees will learn precautions to protect themselves against potentially hazardous conditions in grain handling facilities.

Background

The Occupational Safety and Health Administration (OSHA) Grain Handling Facilities Standard defines grain handling facilities to include grain elevators, feed mills, flour mills, rice mills, dust palletizing plants, dry corn mills, soybean flaking operations, and the dry grinding operations of soycake. Many safety and health hazards are associated with grain handling operations. Suffocation and falls are the two leading causes of death at grain handling facilities. The men and women who work in this industry are also endangered by potential flash fires and explosions as a result of excessive amounts of airborne grain dust as well as electrocutions and injuries from improperly guarded machinery. Exposures to grain dust and associated airborne contaminants can present health and respiratory hazards. OSHA issued the grain handling facilities standard (29 CFR 1910.272) to reduce injuries and deaths in the grain handling industry. The standard requires workers to be trained in the identification and control of grain handling hazards.

Procedures

Training – OSHA requires employers to provide annual training to their employees. Training must also be provided:

- When changes occur in work assignments that expose employees to new or unfamiliar hazards
- Prior to new employees starting work
- When employees are assigned to special, infrequent, or suspected hazardous tasks (such as bin entry or handling toxic or flammable substances)



photo courtesy USDA

Employee training must include:

- General safety precautions associated with grain handling facilities
- Recognition and preventive measures for hazards associated with grain dust and common ignition sources such as smoking, overheated equipment, and static electricity
- Specific procedures and safety practices associated with job tasks including but not limited to clearing choked legs, performing housekeeping, hot work, lockout/tagout, and preventative maintenance

Emergency Operations Plan

Each facility must develop and implement a written emergency operation plan. If there are fewer than 10 employees, OSHA does not require a written plan. However, it is still a good idea to have one on file. If the business has 10 or more employees, the employer must create emergency action plans for those contingencies found in 29 CFR 1910.38.

OSHA requires that the plan include a distinguishable and distinct alarm system to alert employees. The alarm must be audible and visible throughout the facility and identifiable above background noise. The plan must include evacuation procedures, escape routes, assembly areas, provisions for accounting for all personnel, and training for all employees. Workplace maps must be prominently displayed and clearly show the escape routes. In grain elevators, there must be two means of emergency escape from galleries or bin decks.

The plan must designate safe areas outside the facility where employees can assemble after evacuation.

Your local fire department and EMS are sources of information and support in preparing for emergencies. Familiarizing both departments with your facility can save valuable time when fighting fires, conducting rescues, and responding to injuries.

Housekeeping

OSHA requires grain handling facilities to have a mandatory written housekeeping program to prevent the accumulation of combustible grain dust. The housekeeping program must address methods of removing spilled grain from work areas and identify areas in grain elevators known to be potential sources of ignition. These priority areas include floor space within 35 feet of the inside bucket elevator legs, and enclosed areas containing grain drying equipment. The program must also include methods for reducing dust accumulations on ledges, floors, equipment, and other exposed surfaces. Cleaning with compressed air is discouraged except when all potential sources of ignition are removed or controlled.

The OSHA standard allows "...a maximum accumulation of no more than 1/8 inch of dust in priority housekeeping areas of grain elevators..." When this amount of grain dust accumulates, steps must be taken immediately for its removal.

Dust accumulations may be reduced by:

- Spraying with oil or water
- Using oil additives such as white mineral oil to the grain flow
- Making changes in the material handling process

Preventative Maintenance

OSHA does not mandate a written preventive maintenance program. However, all electrical and mechanical equipment must be kept in good operating condition. An overheated bearing or a slipping belt can be the ignition source of a catastrophic dust explosion. Annual inspections of mechanical and safety control equipment, such as dryers, steam processing equipment, and dust collecting equipment including filter collectors and bucket elevators, are required. When maintenance has been completed, the equipment is tagged. The inspector signs, dates and documents all work done.

Additionally, all lockout/tagout procedures required by 29 CFR 1910.147 and the OSHA standard should be observed when entering grain elevators or silos for maintenance.

Hot Work

Grain handling facilities are required to implement a hot work permit system. Hot work includes electric or gas welding, cutting, grinding, brazing, or any similar activity that produces a flame or spark. The permit ensures that the employer and operating personnel are aware that hot work

is being performed and that appropriate safety precautions have been taken.

The OSHA standard does not require a hot work permit under the following circumstances:

- When performed in the presence of the employer or the employer's authorized representative
- When occurring in the facility designated welding shop
- When conducted out of doors, away from the facility

Confined Space Entry into Silos, Bins, & Tanks

This section gives some general information about entering confined spaces. For specific information, consult 29 CFR 1910.146 for confined space entry, 29 CFR 1910.272(g)(5) for training and permit requirements, and 29 CFR 1910.272(g)(1)(i) for confined space entry not requiring a permit.

Permits help employers maintain control over personnel entry into confined spaces. Employees and contractors must be thoroughly informed of the hazards associated with entry into bins, silos, and tanks.

Atmospheric testing in confined spaces is mandatory. Tests must be conducted prior to entry and continued until work is completed even if there is continuous natural air movement or forced air ventilation of the space. Only trained specialists should make the tests, interpret the results, and specify appropriate procedures when the atmosphere is hazardous.

Ventilation, supplemented by the use of appropriate air supplied respirators, shall be provided when:

- Oxygen levels are less than 19.5%
- Concentrations of toxic agents exceed OSHA's permissible exposure limit (PEL)(CFR 1910.1000 Table Z1)
- The American Conference of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV) is exceeded
- Exposure will cause health effects that would restrict a person's ability to self-rescue or obtain assistance

Forced ventilation is needed if combustible gas or vapor concentrations are greater than 10% of the lower flammable limit (this should preclude entry until the area has been ventilated). Ventilation should continue until the unsafe condition is eliminated, and then maintained as long as the space is occupied.

Personnel entering a bin, silo, or tank from the top, must wear a full parachute-type body harness with a lifeline. This type of harness holds the body vertical and in case of an



accident, makes easier removal of the victim through small access hatches. A trained and properly equipped attendant is required to maintain communication with the personnel in the confined area and to provide help if needed.

Inside Bucket Elevator

Standard bucket elevators must have an opening (inspection port) to the head pulley and boot section to allow for inspection, cleaning, and maintenance. Bearings must be mounted externally on the leg casing or, if mounted inside or partially inside the leg casing, they must be equipped with vibration, temperature, or other sensors.

These sensors monitor the condition of the bearing and permit timely shut down before critical temperature is reached or sparking is produced. The interiors of bucket elevators are recognized industry-wide as potential ignition sources for primary explosions.

Elevator legs must be equipped with a motion detection device that will automatically shut down the leg when the belt speed is reduced by 20% or more. The belt must be equipped with a belt alignment monitor that sounds an alarm when the belt is not tracking properly or the pulleys need adjustment. Two optional methods for protecting the head and boot sections of the bucket elevator are: fire and explosion suppression systems and a pneumatic dust control system which keeps dust inside the bucket elevator at 25% below the lower explosive limit during operation.

Conclusion

Grain handling workers face serious dangers of suffocation, falling, entanglement, fires, explosions, electrocutions, and injuries from improperly guarded machinery. These dangers

can be eliminated if employers implement a safe grain handling program, train their employees on the safe handling of grain, and both employer and employee carefully follow the procedures to ensure the safe handling of grain.

Review

1. What are the two leading causes of death at grain handling facilities?
 - a. Electrocution and improperly guarded machinery
 - b. Weather and unguarded machinery
 - c. Carelessness and horseplay
 - d. Suffocation and falls
2. Training for grain handling employees must include
 - a. General safety precautions associated with grain handling facilities
 - b. Recognition and preventive measures for hazards associated with grain dust and common ignition sources
 - c. Specific procedures and safety practices associated with job tasks
 - d. All of the above
3. Grain handling facilities must have written housekeeping rules to:
 - a. Prevent accumulation of combustible grain dust
 - b. Address methods of removing spilled grain from work areas
 - c. Identify areas in grain elevators known to be potential sources of ignition
 - d. All of the above
4. Silos, bins, and tanks are considered confined spaces in the grain handling industry. To enter without respiratory protection, the oxygen level must be:
 - a. 19.5%
 - b. 23.5%
 - c. 16.5%
 - d. 11.5%

Answer Key 1.(d) 2.(d) 3.(d) 4.(a)

Resources

The Texas Department of Insurance, Division of Workers' Compensation (TDI-DWC) Resource Center offers a workers' health and safety video/DVDs library. Call (512) 804-4620 for more information or visit our web site at <http://www.tdi.state.tx.us/wc/safety/employers.html>.

Disclaimer: Information contained in this training program is considered accurate at time of publication.