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Grain Handling Standard

U.S. Department of Labor
Robert B. Reich, Secretary

Occupational Safety and Health Administration
Joseph A. Dear, Assistant Secretary

OSHA 3103
1996 (Revised)

This informational booklet is intended to provide a generic, non-exhaustive overview of a particular standards-related topic. This publication does not itself alter or determine compliance responsibilities, which are set forth in OSHA standards themselves and the *Occupational Safety and Health Act*. Moreover, because interpretations and enforcement policy may change over time, for additional guidance on OSHA compliance requirements, the reader should consult current administrative interpretations and decisions by the Occupational Safety and Health Review Commission and the courts.

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Introduction

The Occupational Safety and Health Administration (OSHA) issued its Grain Handling Standard, Title 29, Code of Federal Regulations (CFR), Part 1910.272, in 1987 to protect workers exposed to fires and explosions. Excessive amounts of grain dust was one of the major causes of these devastating catastrophes that killed or maimed hundreds of workers.

The standard protects workers from hazards faced while walking on or underneath accumulations of grain within a grain storage facility. These hazards include engulfment and entrapment in grain and grain handling equipment, which can result in asphyxiations, crushing injuries, and amputations.

In 1996, OSHA further amended the standard¹ to protect employees whenever they enter a "flat storage structure"² regardless of their point of entry. "walk down" grain to make it flow within or outside of a grain storage structure or stand on grain at a depth that poses an engulfment hazard.

OSHA believes that this technical amendment will prevent from 2 to 4 additional fatalities annually and a similar number of traumatic injuries caused by mechanical devices such as augers.

Employers and employees covered by an OSHA-approved state safety and health plan should check with their state agency, which may be enforcing standards and other procedures "at least as effective as," but not always identical to, federal requirements. See list of state plans at end of this publication. This publication serves as a guide to the standard, discusses the causes of grain dust explosions, and provides the information needed to train employees on ways to eliminate related hazards.

Scope and Application

The requirements of the standard apply to more than 250,000 workers at 24,000 grain elevators and mills that have been and continue to be exposed to fires, explosions, engulfment, and entrapment hazards. Engulfment and entrapment hazards have killed or maimed hundreds of workers.

According to the Bureau of Labor Statistics³. In 1993 and 1994 OSHA estimates that there have been more than 45 workers engulfed in grain and asphyxiated or crushed to death by grain augers.

Provisions of the Standard

There are several provisions employers must follow to comply with the grain handling standard, including a requirements for hot work: entering bins, silos, tanks, and other storage structures: inside bucket elevator legs: preventive maintenance, housekeeping, handling emergencies, and training.

Hot Work

A permit system is required for employees performing hot work. Hot work includes electric or gas welding, cutting, brazing, or similar flame-producing operations.

The permit is to ensure that the employer is aware of the hot work being performed—particularly, when performed by contractors—and that appropriate safety precautions have been taken prior to beginning the work.

The standard does not require a work permit if the hot work is performed in the presence of the employer or the employer's authorized representative, in an employer-authorized welding shop, or when work is conducted out of doors and away from the grain facility.

Entry into Bins, Silos, Tanks, and Other Storage Structures

Employees must be given a work permit before they enter bins, silos, or tanks unless the employer or the employer's representative is present. Such permits will help employers maintain control over employee entry into these areas.

In addition to the permit-system, employees should be thoroughly informed of the hazards associated with entry into bins, silos, tanks, and other structures. For example employees should never enter these areas from the bottom when grain or other agricultural products are hung-up or stuck to the sides. Employees should be made aware that the atmosphere in bins, silos and tanks can be oxygen deficient or toxic. Consequently, employees must be trained in the proper method of testing, the atmosphere procedures to take if the atmosphere is found to be hazardous. The air inside the enclosure must be tested for oxygen content both before and during employee entrance, unless there is continuous natural air movement or forced-air ventilation in the space.

Provide ventilation, supplemented by the use of appropriate respirators, if necessary. If oxygen levels are less than 19.5 percent if concentrations of toxic agents present in the air either exceed ceiling limits in OSHA's health standards or will have health effects that restrict an employee's abilities to effect self-rescue or obtain assistance: or, if there is a combustible gas or vapor concentrations in excess of 10 percent of the lower flammable limit. Ventilation must be provided until the unsafe condition is eliminated and must be continued as long as there is a possibility of recurrence of the unsafe condition while the bin, silo, or tank is occupied by employees.

An employee must wear a body harness with a lifeline or use a boatswain's chair whenever entering a grain storage structure at or above the level of stored grain and the depth of stored grain poses an engulfment hazard. If the employer can demonstrate that the lifeline or boatswain's chair is not feasible or creates a greater hazard the employer must provide an alternative means of protection. Where employees work in a bin, silo, or tank, a trained and equipped observer must be present on the outside maintain communication with employees and provide help if needed.

The standard prohibits "walking down grain" to make it flow within or outside of the storage structure, or standing on moving grain. Also, all mechanical, electrical, and pneumatic equipment that presents a danger to employees inside grain storage structures must be deenergized and disconnected, locked-out and tagged, blocked-off, or otherwise stopped by other equally effective means or methods.

In addition, no employee is permitted to be in any location where an accumulation of grain on the sides of the storage structure or elsewhere could fall and engulf him or her.

Inside Bucket Elevator Legs

Inside bucket elevators are well recognized as potential ignition sources for primary explosions. To lessen these hazards, the standard requires that belts purchased after March 30, 1988, have a surface electrical resistance not exceeding 300 megohms. Bucket elevators must have an opening to the head pulley section and boot section to allow for inspection, maintenance, and cleaning; bearings must be mounted externally to the leg casing or the employer must provide vibration, temperature, or other monitoring of the conditions of the bearings if bearings are mounted inside or partially inside the leg casing.

Also, elevator legs must be equipped with a motion-detection device that will shut down the leg when the belt speed is reduced by 20 percent or more of the normal operating speed. A belt-alignment monitoring device with an alarm to alert employees when the belt is not tracking properly is also required: alternatively, employers must provide a means to keep the belt tracking properly.

Bearing monitors, motion detection devices, and belt-alignment devices need not be installed if the employer equips bucket elevators with a fire and explosion suppression system capable of protecting the head and boot sections of the leg, or with a pneumatic dust control system: that will keep the dust concentrations inside the leg casing 25 percent below the lower explosive limit during operation.

Preventive Maintenance

Preventive maintenance is a very important aspect of any grain industry safety and health program. It is a must for controlling fuel and ignition sources and for keeping equipment functioning properly and safely.

The OSHA standard does not require the employer to have a written preventive maintenance program but states that all mechanical and electrical equipment must be kept in proper operating condition. To do this the employer must annually inspect the mechanical and safety control equipment associated with dryers, grain stream processing equipment, dust collection equipment, including filter collectors, and bucket elevators.

This equipment must be lubricated and maintained according to the manufacturers' recommendations, or as determined necessary by prior operating records. Equipment that malfunctions or operates below designed efficiency must be promptly repaired or removed from service. Inspected or repaired equipment must show the date of inspection.

The standard also requires procedures for locking out and tagging equipment to prevent the inadvertent application of energy or motion to equipment being repaired, serviced, or adjusted. All employees who repair, service, and operate the equipment must be familiar with the employer's locking out and tagging procedures.

Housekeeping

Housekeeping is an important part of any safety and health program especially in facilities where combustible material might accumulate. The standard requests the employer to develop and implement a written housekeeping program to help eliminate these dangers.

The program must include instructions for reducing dust accumulations on ledges, floors, equipment, and other exposed surfaces, and must identify "priority" areas in grain elevators that are known to be potential sources of ignition. These include floor areas within 35 feet (10.9728 meters) of inside bucket elevator legs, enclosed

areas containing grinding equipment, and enclosed areas containing grain dryers located inside the facility. The housekeeping program also must address the methods for removing grain spills from work areas. The use of compressed air to remove dust is permitted only when all machinery that presents a source of ignition in the area is shutdown and all other known potential ignition sources are removed or controlled.

Because grain dust is the main source of fuel for explosions in grain handling facilities, the standard allows a maximum accumulation of more than an 1/8-inch (0.3175 centimeters) in priority housekeeping areas of grain elevators, if dust accumulations exceed the 1/8-inch (0.3175 Centimeters) action level in priority housekeeping areas designated means or methods must be initiated immediately to remove such accumulations. The standard also provides for the employer to use alternative means to the 1/8-inch (0.3175 centimeters) action level where the alternative can be demonstrated to provide equivalent protection from explosions. This may involve additional treatment of the dust and/or the area of dust accumulation, such as spraying with oil or water. In addition, the use of oil additives such as white mineral oil in the grain flow, and changes in materials handling processes can also help reduce the accumulation of dust and make the dust less explosive.

Emergency Action Plan

Employers must develop and implement a written emergency action plan. The plan does not have to be written if there are fewer than 10 employees. This plan must include a distinguishable and distinct alarm system (especially for those employees who work indoors) and evacuation procedures, and must include employee training in emergency procedures.

Employees must know where the nearest escape routes are and must be familiar with workplace maps that clearly show these emergency escape routes. In addition, at least two means of emergency escape from galleries (bin decks) are required in grain elevators.

The employer must also designate a safe area outside the facility where employees can congregate after evacuation and must implement procedures to account for all employees after emergency evacuation has been completed. It is recommended that employers seek the assistance of local fire departments to preplan for emergencies and designate a means of contacting fire and rescue agencies under emergency conditions.

Training and Education

Training employees to recognize hazards associated with their jobs is an effective method for increasing overall safe operations. Employers are required to train employees in their work tasks annually or whenever changes in job assignments expose them to new hazards. New employees are to be trained prior to starting work. Employees assigned special or infrequent tasks, such as bin entry and the handling of flammable or toxic substances, must also be trained to perform these tasks safely.

Training must include the following:

- General safety precautions associated with the grain facility as well as the recognition and prevention of hazards related to engulfment, mechanical devices, dust accumulations, and common ignition sources such as smoking.

- Specific procedures and safety practices applicable to the job tasks including, but not limited to, clearing choked legs, and performing housekeeping, hot work, preventive maintenance, and lockout/tagout and

- Training in emergency procedures.

The information in this Safety Meeting Topic was provided by OSHA.

For more information or training needs, contact **PS Safety & Risk Management, LLC** at (225) 716-0029 or visit us at www.pssafety.net