



#113 – Sweep auger safety

Joe Hochstettler, Duane Staats, Greg Lowe and Steve Queen

Wednesday, March 30, 2011
11 a.m. to Noon

Speakers

- Joe Hochstettler
 - Risk Coordinator, Blanchard Valley Farmers Co-op
 - Legal issues, statistics, impact to industry
- Greg Lowe
 - Risk Coordinator, Sunrise Co-op
 - Sweep auger basics & why people get injured
- Steve Queen
 - Risk Coordinator, Trupointe Co-op
 - Modifications, safety & cost effectiveness
- Duane Staats
 - Risk Coordinator, Town & Country Co-op
 - Alternatives, costs, safety advantages

SWEEP AUGER SAFETY

Joe Hochstettler
Greg Lowe
Steve Queen
Duane Staats

Target Audience

- Commercial Grain Elevators
 - Owners
 - Managers
 - Workers
- On-Farm Grain Operations
 - Owners
 - Managers
 - Workers

SPEAKERS
TARGET AUDIENCE

INTRODUCTION

Sweep Auger Safety

What's the big fuss?

By Joe Hochstettler
Risk Coordinator
Blanchard Valley Farmers Cooperative

History

1996 OSHA Letter of Interpretation (LOI)

- “Employees may enter a grain storage structure while machinery is running if the employer can demonstrate that *appropriate protection* has been provided to prevent employees from being exposed to the hazard/danger of the moving machinery”

Appropriate Protection?



1996

Appropriate Protection?

- Employees *must not* be positioned in front of any energized and/or operating equipment at *any time*
- Employees must stay 6' feet behind any partially guarded or unguarded energized equipment in grain storage areas.



1996

History - 2009

2009 OSHA Letter of Interpretation

Question 1: Can an unguarded sweep auger be in operation (energized) in a grain storage bin while a worker is inside the bin?

Response: No. OSHA's standard at 29 CFR 1910.272(g)(1)(ii) states:

“All mechanical, electrical, hydraulic, and pneumatic equipment which presents a danger to workers shall be deenergized and shall be disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by other equally effective means or measures.” [emphasis added].

Also, with respect to entry into flat storage structures, covered by paragraph (h), Section 1910.272(h)(2)(i) provides:

“Whenever an employee walks or stands on or in stored grain or grain products of a depth which poses an engulfment hazard, all equipment which presents a danger to the employee (such as an auger or other grain transport equipment) shall be deenergized, and shall be disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by other equally effective means or methods.”

Appropriate Protection?

- If employees must work closer than 6' feet to any unguarded or partially guarded equipment, then employees must implement positive procedures to assure the equipment is de-energized and there will be no chance of unexpected start-up (ie. LO/TO).
- An observer shall maintain direct visual contact of all employees working in grain storage areas at all times while equipment is operating. The observer shall be located at the doorway of bins being emptied and shall have control of the on/off switch.

1996

Numbers

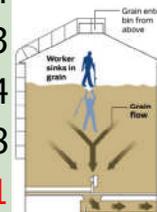
- 1993 – 42
- 2006 – 24
- 2007 – 33
- 2008 – 34
- 2009 – 38
- 2010 – 51
- 2011 – ??

Grain bin deaths

Many workers are killed each year while helping to move grain out of tall storage bins. Below are some common accident types.

FLOWING GRAIN BURIES WORKER

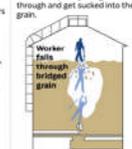
As grain swirls at the bottom of the bin, it creates a suction that draws the worker in like quicksand in about 20 seconds the worker is buried.



Auger at bottom of bin aids flow of grain to the outside.

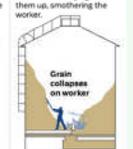
BRIDGED GRAIN COLLAPSES

Grain can clump together at the top of the pile, allowing a gap to form beneath. A worker walking on this temporary bridge can fall through and get sucked into the grain.



STEEP GRAIN COLLAPSES

Large piles of grain that accumulate on the side of the bin can collapse on top of a worker who is trying to break them up, smothering the worker.



U.S. GRAIN ENTRAPMENTS

Year	Fatal	Nonfatal	Total
2006	10	14	24
2007	10	23	33
2008	10	24	34
2009	10	28	38
2010	10	41	51
2011	10	20	30

SOURCES: OSHA, Agricultural Safety and Health Program at Purdue University

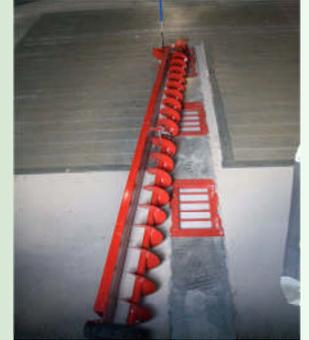
JERALD R. BERKSON AND ADAM SKILL/TWIRLUM

Impact

- Industry is attempting to keep workers away from operating sweep augers.
- OSHA is inspecting grain facilities and citing those not complying.
- Older, smaller grain bins are difficult to retrofit.

Sweep Augers

- How They Operate?
 - Self Propelled
 - Some may be moved from bin to bin depending on size
 - Run off a explosion proof electric motor



Sweep Auger Safety

What is a sweep auger?

By Greg Lowe
Risk Coordinator
Sunrise Cooperative

Sweep Augers

- Why do people get injured and killed by sweep augers?
 - Not understanding the equipment
 - Loose fitting clothing
 - Carelessness



Sweep Augers

What is a sweep auger?

A sweep auger is an apparatus within a circular bin for moving a free-flowing granular material across the floor of the bin towards the center of the bin.



Sweep Auger Safety

What can we do?

By Steve Queen
Safety & Risk Coordinator
Trupointe Cooperative

OSHA Rule

OSHA states that an employee cannot work inside a bin while an unguarded sweep auger is in operation.

An example of guarding

Many companies are coming up with great ideas.



OSHA Rule

OSHA does not define what is meant by *guarded* or *unguarded*.

Another great example of guarding.



OSHA Rule

How can we guard the sweep auger to protect employees while in a grain bin with the sweep auger in operation?

The Metal Stamping industry uses electronic means to safeguard employees.

Terms used within that industry:

- **Safeguarding device** – A device used to protect the operator from point of operation.
- **Holdouts** – A device that does not allow the press operator to enter the point of operation at any time.
- **Barrier guard** – A type of safeguarding device that forbids entry into the point of operation.
- **Foot switch** – An operator control that requires press operators to insert their foot into a guard and press a button in order to operate the press.
- **E-stop** – Another name for the red stop button. "E-stop" is short for "Emergency Stop".

The employee can push the sweep auger to increase the flow of grain or pull it back if the sweep auger starts to choke or plug.



SASH

Sweep Auger Saf Handle

"an electronic means of guarding
a
sweep auger"

An electronic switch is wired to a pull up bar.



This concept allows the employee to operate the sweep auger from a safe distance.



When engaged, the sweep auger starts just as a push lawn mower or roto tiller we use at home.



As long as the bar is engaged, the sweep auger continues to run.



The Emergency Stop Button and Sweep Auger Safety Handle (SASH) is easily moved from bin to bin.



As soon as the bar is released or disengaged, the sweep auger stops.



Does the Sweep Auger Safety Handle (SASH) meet the following?...

- A Safeguarding device – protecting the operator from the point of operation?
- A Holdout – not allowing the operator to enter the point of operation?
- A Barrier guard – forbidding entry into the point of operation?



An additional feature

An "E-stop" or Emergency Stop Button is interfaced into the Sweep Auger Safety Handle (SASH) that allows the attendant to stop the sweep auger, if necessary.



YES!
It Sure Does!

Sweep Auger Safety

The Grain Vac Alternative

By Duane Staats
Risk Coordinator
Town & Country Co-op

GRAIN RESCUE INITIATIVE



SAFER DRY BULK MATERIAL HANDLING SYSTEM



OPTIONAL USES

- BULK MATERIAL ENGULFMENT RESCUE
- ROAD WAY ACCIDENT CLEAN UPS
- HARD TO REACH DRY BULK MATERIAL RECOVERY
 - PITS
 - TUNNELS
 - BIN TOPS



SAFER PROCESS

- EMPLOYEES NOT EXPOSED TO MOVING PARTS
- NO ELECTRICAL CONNECTIONS
 - SHOCK HAZARD ELIMINATED
 - DUST EXPLOSION IGNITION SOURCE ELIMINATED
- REDUCES DUST INHALATION FOR EMPLOYEES WHILE INSIDE GRAIN BIN

GRAIN RESCUE TUBE



EFFICIENCIES

- SAVE TIME, SAVES MANPOWER COSTS, SAVING MONEY
- SALVAGE MATERIAL NORMALLY LOST OR GOING TO WASTE
- ELIMINATES THE MAINTENANCE & PURCHASE OF BIN SWEEPS
- ELIMINATES ELECTRICAL CONNECTIONS FOR BIN SWEEPS

The Grain Vac Alternative



ADDITIONAL EFFICIENCIES

- UNIT IS MOBILE MAKING IT MORE FLEXIBLE FOR DIFFERENT SITUATIONS
- ONE SYSTEM FOR MULTIPLE BINS OR MULTIPLE LOCATIONS
- YOU DON'T NEED A BIN SWEEP FOR EACH DIFFERENT SIZE BINS OR MOVE THE BIN SWEEP FROM BIN TO BIN

The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



The Grain Vac Alternative



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Sweep Auger Safety

THE END



SWEEP AUGER SAFETY

QUESTIONS AND ANSWERS

substitute for compliance with the provisions of the OSHA standard.

ANSI/SIA A92.2-1990, American National Standard for Vehicle-Mounted Elevating and Rotating Aerial Devices.

ANSI C2-1993, National Electrical Safety Code.

ANSI Z133.1-1988, American National Standard Safety Requirements for Pruning, Trimming, Repairing, Maintaining, and Removing Trees, and for Cutting Brush.

ANSI/ASME B20.1-1990, Safety Standard for Conveyors and Related Equipment.

ANSI/IEEE Std. 4-1978 (Fifth Printing), IEEE Standard Techniques for High-Voltage Testing.

ANSI/IEEE Std. 100-1988, IEEE Standard Dictionary of Electrical and Electronic Terms.

ANSI/IEEE Std. 516-1987, IEEE Guide for Maintenance Methods on Energized Power-Lines.

ANSI/IEEE Std. 935-1989, IEEE Guide on Terminology for Tools and Equipment To Be Used in Live Line Working.

ANSI/IEEE Std. 957-1987, IEEE Guide for Cleaning Insulators.

ANSI/IEEE Std. 978-1984 (R1991), IEEE Guide for In-Service Maintenance and Electrical Testing of Live-Line Tools.

ASTM D 120-87, Specification for Rubber Insulating Gloves.

ASTM D 149-92, Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies.

ASTM D 178-93, Specification for Rubber Insulating Matting.

ASTM D 1048-93, Specification for Rubber Insulating Blankets.

ASTM D 1049-93, Specification for Rubber Insulating Covers.

ASTM D 1050-90, Specification for Rubber Insulating Line Hose.

ASTM D 1051-87, Specification for Rubber Insulating Sleeves.

ASTM F 478-92, Specification for In-Service Care of Insulating Line Hose and Covers.

ASTM F 479-93, Specification for In-Service Care of Insulating Blankets.

ASTM F 496-93b, Specification for In-Service Care of Insulating Gloves and Sleeves.

ASTM F 711-89, Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools.

ASTM F 712-88, Test Methods for Electrically Insulating Plastic Guard Equipment for Protection of Workers.

ASTM F 819-83a (1988), Definitions of Terms Relating to Electrical Protective Equipment for Workers.

ASTM F 855-90, Specifications for Temporary Grounding Systems To Be Used on De-Energized Electric Power Lines and Equipment.

ASTM F 887-91a, Specifications for Personal Climbing Equipment.

ASTM F 914-91, Test Method for Acoustic Emission for Insulated Aerial Personnel Devices.

ASTM F 968-93, Specification for Electrically Insulating Plastic Guard Equipment for Protection of Workers.

ASTM F 1116-88, Test Method for Determining Dielectric Strength of Overshoe Footwear.

ASTM F 1117-87, Specification for Dielectric Overshoe Footwear.

ASTM F 1236-89, Guide for Visual Inspection of Electrical Protective Rubber Products.

ASTM F 1505-94, Standard Specification for Insulated and Insulating Hand Tools.

ASTM F 1506-94, Standard Performance Specification for Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards.

IEEE Std. 62-1978, IEEE Guide for Field Testing Power Apparatus Insulation.

IEEE Std. 524-1992, IEEE Guide to the Installation of Overhead Transmission Line Conductors.

IEEE Std. 1048-1990, IEEE Guide for Protective Grounding of Power Lines.

IEEE Std. 1067-1990, IEEE Guide for the In-Service Use, Care, Maintenance, and Testing of Conductive Clothing for Use on Voltages up to 765 kV AC.

[59 FR 4437, Jan. 31, 1994; 59 FR 33658, June 30, 1994, as amended at 59 FR 4458, Jan. 31, 1994; 59 FR 40729, Aug. 9, 1994; 59 FR 51748, Oct. 12, 1994]

§ 1910.272 Grain handling facilities.

(a) *Scope.* This section contains requirements for the control of grain dust fires and explosions, and certain other safety hazards associated with grain handling facilities. It applies in addition to all other relevant provisions of part 1910 (or part 1917 at marine terminals).

(b) *Application.* (1) Paragraphs (a) through (n) of this section apply to grain elevators, feed mills, flour mills, rice mills, dust pelletizing plants, dry corn mills, soybean flaking operations, and the dry grinding operations of soybeans.

(2) Paragraphs (o), (p), and (q) of this section apply only to grain elevators.

(c) *Definitions.*

Choked leg means a condition of material buildup in the bucket elevator that results in the stoppage of material flow and bucket movement. A bucket elevator is not considered choked that has the up-leg partially or fully loaded

§ 1910.272

29 CFR Ch. XVII (7-1-10 Edition)

and has the boot and discharge cleared allowing bucket movement.

Flat storage structure means a grain storage building or structure that will not empty completely by gravity, has an unrestricted ground level opening for entry, and must be entered to reclaim the residual grain using powered equipment or manual means.

Fugitive grain dust means combustible dust particles, emitted from the stock handling system, of such size as will pass through a U.S. Standard 40 mesh sieve (425 microns or less).

Grain elevator means a facility engaged in the receipt, handling, storage, and shipment of bulk raw agricultural commodities such as corn, wheat, oats, barley, sunflower seeds, and soybeans.

Hot work means work involving electric or gas welding, cutting, brazing, or similar flame producing operations.

Inside bucket elevator means a bucket elevator that has the boot and more than 20 percent of the total leg height (above grade or ground level) inside the grain elevator structure. Bucket elevators with leg casings that are inside (and pass through the roofs) of rail or truck dump sheds with the remainder of the leg outside of the grain elevator structure, are not considered inside bucket elevators.

Jogging means repeated starting and stopping of drive motors in an attempt to clear choked legs.

Lagging means a covering on drive pulleys used to increase the coefficient of friction between the pulley and the belt.

Permit means the written certification by the employer authorizing employees to perform identified work operations subject to specified precautions.

(d) *Emergency action plan.* The employer shall develop and implement an emergency action plan meeting the requirements contained in 29 CFR 1910.38.

(e) *Training.* (1) The employer shall provide training to employees at least annually and when changes in job assignment will expose them to new hazards. Current employees, and new employees prior to starting work, shall be trained in at least the following:

(i) General safety precautions associated with the facility, including recognition and preventive measures for

the hazards related to dust accumulations and common ignition sources such as smoking; and,

(ii) Specific procedures and safety practices applicable to their job tasks including but not limited to, cleaning procedures for grinding equipment, clearing procedures for choked legs, housekeeping procedures, hot work procedures, preventive maintenance procedures and lock-out/tag-out procedures.

(2) Employees assigned special tasks, such as bin entry and handling of flammable or toxic substances, shall be provided training to perform these tasks safely.

NOTE TO PARAGRAPH (e)(2): Training for an employee who enters grain storage structures includes training about engulfment and mechanical hazards and how to avoid them.

(f) *Hot work permit.* (1) The employer shall issue a permit for all hot work, with the following exceptions:

(i) Where the employer or the employer's representative (who would otherwise authorize the permit) is present while the hot work is being performed;

(ii) In welding shops authorized by the employer;

(iii) In hot work areas authorized by the employer which are located outside of the grain handling structure.

(2) The permit shall certify that the requirements contained in §1910.252(a) have been implemented prior to beginning the hot work operations. The permit shall be kept on file until completion of the hot work operations.

(g) *Entry into grain storage structures.* This paragraph applies to employee entry into bins, silos, tanks, and other grain storage structures. *Exception:* Entry through unrestricted ground level openings into flat storage structures in which there are no toxicity, flammability, oxygen-deficiency, or other atmospheric hazards is covered by paragraph (h) of this section. For the purposes of this paragraph (g), the term "grain" includes raw and processed grain and grain products in facilities within the scope of paragraph (b)(1) of this section.

(1) The following actions shall be taken before employees enter bins, silos, or tanks:

(i) The employer shall issue a permit for entering bins, silos, or tanks unless the employer or the employer's representative (who would otherwise authorize the permit) is present during the entire operation. The permit shall certify that the precautions contained in this paragraph (§1910.272(g)) have been implemented prior to employees entering bins, silos or tanks. The permit shall be kept on file until completion of the entry operations.

(ii) All mechanical, electrical, hydraulic, and pneumatic equipment which presents a danger to employees inside grain storage structures shall be deenergized and shall be disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by other equally effective means or methods.

(iii) The atmosphere within a bin, silo, or tank shall be tested for the presence of combustible gases, vapors, and toxic agents when the employer has reason to believe they may be present. Additionally, the atmosphere within a bin, silo, or tank shall be tested for oxygen content unless there is continuous natural air movement or continuous forced-air ventilation before and during the period employees are inside. If the oxygen level is less than 19.5%, or if combustible gas or vapor is detected in excess of 10% of the lower flammable limit, or if toxic agents are present in excess of the ceiling values listed in subpart Z of 29 CFR part 1910, or if toxic agents are present in concentrations that will cause health effects which prevent employees from effecting self-rescue or communication to obtain assistance, the following provisions apply.

(A) Ventilation shall be provided until the unsafe condition or conditions are eliminated, and the ventilation shall 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.

(B) If toxicity or oxygen deficiency cannot be eliminated by ventilation, employees entering the bin, silo, or tank shall wear an appropriate respirator. Respirator use shall be in accordance with the requirements of §1910.134.

(iv) "Walking down grain" and similar practices where an employee walks on grain to make it flow within or out from a grain storage structure, or where an employee is on moving grain, are prohibited.

(2) Whenever an employee enters a grain storage structure from a level at or above the level of the stored grain or grain products, or whenever an employee walks or stands on or in stored grain of a depth which poses an engulfment hazard, the employer shall equip the employee with a body harness with lifeline, or a boatswain's chair that meets the requirements of subpart D of this part. The lifeline shall be so positioned, and of sufficient length, to prevent the employee from sinking further than waist-deep in the grain. *Exception:* Where the employer can demonstrate that the protection required by this paragraph is not feasible or creates a greater hazard, the employer shall provide an alternative means of protection which is demonstrated to prevent the employee from sinking further than waist-deep in the grain.

NOTE TO PARAGRAPH (g)(2): When the employee is standing or walking on a surface which the employer demonstrates is free from engulfment hazards, the lifeline or alternative means may be disconnected or removed.

(3) An observer, equipped to provide assistance, shall be stationed outside the bin, silo, or tank being entered by an employee. Communications (visual, voice, or signal line) shall be maintained between the observer and employee entering the bin, silo, or tank.

(4) The employer shall provide equipment for rescue operations which is specifically suited for the bin, silo, or tank being entered.

(5) The employee acting as observer shall be trained in rescue procedures, including notification methods for obtaining additional assistance.

(6) Employees shall not enter bins, silos, or tanks underneath a bridging condition, or where a buildup of grain products on the sides could fall and bury them.

(h) *Entry into flat storage structures.* For the purposes of this paragraph (h),

§ 1910.272

29 CFR Ch. XVII (7-1-10 Edition)

the term “grain” means raw and processed grain and grain products in facilities within the scope of paragraph (b)(1) of this section.

(1) Each employee who walks or stands on or in stored grain, where the depth of the grain poses an engulfment hazard, shall be equipped with a lifeline or alternative means which the employer demonstrates will prevent the employee from sinking further than waist-deep into the grain.

NOTE TO PARAGRAPH (h)(1): When the employee is standing or walking on a surface which the employer demonstrates is free from engulfment hazards, the lifeline or alternative means may be disconnected or removed.

(2)(i) Whenever an employee walks or stands on or in stored grain or grain products of a depth which poses an engulfment hazard, all equipment which presents a danger to that employee (such as an auger or other grain transport equipment) shall be deenergized, and shall be disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by other equally effective means or methods.

(ii) “Walking down grain” and similar practices where an employee walks on grain to make it flow within or out from a grain storage structure, or where an employee is on moving grain, are prohibited.

(3) No employee shall be permitted to be either underneath a bridging condition, or in any other location where an accumulation of grain on the sides or elsewhere could fall and engulf that employee.

(i) *Contractors.* (1) The employer shall inform contractors performing work at the grain handling facility of known potential fire and explosion hazards related to the contractor’s work and work area. The employer shall also inform contractors of the applicable safety rules of the facility.

(2) The employer shall explain the applicable provisions of the emergency action plan to contractors.

(j) *Housekeeping.* (1) The employer shall develop and implement a written housekeeping program that establishes the frequency and method(s) determined best to reduce accumulations of fugitive grain dust on ledges, floors, equipment, and other exposed surfaces.

(2) In addition, the housekeeping program for *grain elevators* shall address fugitive grain dust accumulations at priority housekeeping areas.

(i) Priority housekeeping areas shall include *at least* the following:

(A) Floor areas within 35 feet (10.7 m) of inside bucket elevators;

(B) Floors of enclosed areas containing grinding equipment;

(C) Floors of enclosed areas containing grain dryers located inside the facility.

(ii) The employer shall immediately remove any fugitive grain dust accumulations whenever they exceed ¼ inch (.32 cm) at priority housekeeping areas, pursuant to the housekeeping program, or shall demonstrate and assure, through the development and implementation of the housekeeping program, that equivalent protection is provided.

(3) The use of compressed air to blow dust from ledges, walls, and other areas shall only be permitted when all machinery that presents an ignition source in the area is shut-down, and all other known potential ignition sources in the area are removed or controlled.

(4) Grain and product spills shall not be considered fugitive grain dust accumulations. However, the housekeeping program shall address the procedures for removing such spills from the work area.

(k) *Grate openings.* Receiving-pit feed openings, such as truck or railcar receiving-pits, shall be covered by grates. The width of openings in the grates shall be a maximum of 2½ inches (6.35 cm).

(1) *Filter collectors.* (1) All fabric dust filter collectors which are a part of a pneumatic dust collection system shall be equipped with a monitoring device that will indicate a pressure drop across the surface of the filter.

(2) Filter collectors installed after March 30, 1988 shall be:

(i) Located outside the facility; or

(ii) Located in an area inside the facility protected by an explosion suppression system; or

(iii) Located in an area inside the facility that is separated from other areas of the facility by construction having at least a one hour fire-resistance rating, and which is adjacent to

an exterior wall and vented to the outside. The vent and ductwork shall be designed to resist rupture due to deflagration.

(m) *Preventive maintenance.* (1) The employer shall implement preventive maintenance procedures consisting of:

(i) Regularly scheduled inspections of at least the mechanical and safety control equipment associated with dryers, grain stream processing equipment, dust collection equipment including filter collectors, and bucket elevators;

(ii) Lubrication and other appropriate maintenance in accordance with manufacturers' recommendations, or as determined necessary by prior operating records.

(2) The employer shall promptly correct dust collection systems which are malfunctioning or which are operating below designed efficiency. Additionally, the employer shall promptly correct, or remove from service, overheated bearings and slipping or misaligned belts associated with inside bucket elevators.

(3) A certification record shall be maintained of each inspection, performed in accordance with this paragraph (m), containing the date of the inspection, the name of the person who performed the inspection and the serial number, or other identifier, of the equipment specified in paragraph (m)(1)(i) of this section that was inspected.

(4) The employer shall implement procedures for the use of tags and locks which will prevent the inadvertent application of energy or motion to equipment being repaired, serviced, or adjusted, which could result in employee injury. Such locks and tags shall be removed in accordance with established procedures only by the employee installing them or, if unavailable, by his or her supervisor.

(n) *Grain stream processing equipment.* The employer shall equip grain stream processing equipment (such as hammer mills, grinders, and pulverizers) with an effective means of removing ferrous material from the incoming grain stream.

(o) *Emergency escape.* (1) The employer shall provide at least two means of emergency escape from galleries (bin decks).

(2) The employer shall provide at least one means of emergency escape in tunnels of existing grain elevators. Tunnels in grain elevators constructed after the effective date of this standard shall be provided with at least two means of emergency escape.

(p) *Continuous-flow bulk raw grain dryers.* (1) All direct-heat grain dryers shall be equipped with automatic controls that:

(i) Will shut-off the fuel supply in case of power or flame failure or interruption of air movement through the exhaust fan; and,

(ii) Will stop the grain from being fed into the dryer if excessive temperature occurs in the exhaust of the drying section.

(2) Direct-heat grain dryers installed after March 30, 1988 shall be:

(i) Located outside the grain elevator; or

(ii) Located in an area inside the grain elevator protected by a fire or explosion suppression system; or

(iii) Located in an area inside the grain elevator which is separated from other areas of the facility by construction having at least a one hour fire-resistance rating.

(q) *Inside bucket elevators.* (1) Bucket elevators shall not be jogged to free a choked leg.

(2) All belts and lagging purchased after March 30, 1988 shall be conductive. Such belts shall have a surface electrical resistance not to exceed 300 megohms.

(3) All bucket elevators shall be equipped with a means of access to the head pulley section to allow inspection of the head pulley, lagging, belt, and discharge throat of the elevator head. The boot section shall also be provided with a means of access for clean-out of the boot and for inspection of the boot, pulley, and belt.

(4) All the employer shall:

(i) Mount bearings externally to the leg casing; or,

(ii) Provide vibration monitoring, temperature monitoring, or other means to monitor the condition of those bearings mounted inside or partially-inside the leg casing.

(5) All the employer shall equip bucket elevators with a motion detection device which will shut-down the bucket

§ 1910.272

elevator when the belt speed is reduced by no more than 20% of the normal operating speed.

(6) All the employer shall:

(i) Equip bucket elevators with a belt alignment monitoring device which will initiate an alarm to employees when the belt is not tracking properly; or,

(ii) Provide a means to keep the belt tracking properly, such as a system that provides constant alignment adjustment of belts.

(7) Paragraphs (q)(5) and (q)(6) of this section do not apply to grain elevators having a permanent storage capacity of less than one million bushels, provided that daily visual inspection is made of bucket movement and tracking of the belt.

(8) Paragraphs (q)(4), (q)(5), and (q)(6) of this section do not apply to the following:

(i) Bucket elevators which are equipped with an operational fire and explosion suppression system capable of protecting at least the head and boot section of the bucket elevator; or,

(ii) Bucket elevators which are equipped with pneumatic or other dust control systems or methods that keep the dust concentration inside the bucket elevator at least 25% below the lower explosive limit at all times during operations.

NOTE: The following appendices to § 1910.272 serve as nonmandatory guidelines to assist employers and employees in complying with the requirements of this section, as well as to provide other helpful information.

No additional burdens are imposed through these appendices.

APPENDIX A TO § 1910.272 GRAIN HANDLING FACILITIES

Examples presented in this appendix may not be the only means of achieving the performance goals in the standard.

1. Scope and Application

The provisions of this standard apply in addition to any other applicable requirements of this part 1910 (or part 1917 at marine terminals). The standard contains requirements for new and existing grain handling facilities. The standard does not apply to seed plants which handle and prepare seeds for planting of future crops, nor to on-farm storage or feed lots.

29 CFR Ch. XVII (7–1–10 Edition)

2. Emergency Action Plan

The standard requires the employer to develop and implement an emergency action plan. The emergency action plan (§ 1910.38) covers those designated actions employers and employees are to take to ensure employee safety from fire and other emergencies. The plan specifies certain minimum elements which are to be addressed. These elements include the establishment of an employee alarm system, the development of evacuation procedures, and training employees in those actions they are to take during an emergency.

The standard does not specify a particular method for notifying employees of an emergency. Public announcement systems, air horns, steam whistles, a standard fire alarm system, or other types of employee alarm may be used. However, employers should be aware that employees in a grain facility may have difficulty hearing an emergency alarm, or distinguishing an emergency alarm from other audible signals at the facility, or both. Therefore, it is important that the type of employee alarm used be distinguishable and distinct.

The use of floor plans or workplace maps which clearly show the emergency escape routes should be included in the emergency action plan; color coding will aid employees in determining their route assignments. The employer should designate a safe area, outside the facility, where employees can congregate after evacuation, and implement procedures to account for all employees after emergency evacuation has been completed.

It is also recommended that employers seek the assistance of the local fire department for the purpose of preplanning for emergencies. Preplanning is encouraged to facilitate coordination and cooperation between facility personnel and those who may be called upon for assistance during an emergency. It is important for emergency service units to be aware of the usual work locations of employees at the facility.

3. Training

It is important that employees be trained in the recognition and prevention of hazards associated with grain facilities, especially those hazards associated with their own work tasks. Employees should understand the factors which are necessary to produce a fire or explosion, i.e., fuel (such as grain dust), oxygen, ignition source, and (in the case of explosions) confinement. Employees should be made aware that any efforts they make to keep these factors from occurring simultaneously will be an important step in reducing the potential for fires and explosions.

The standard provides flexibility for the employer to design a training program which fulfills the needs of a facility. The type,

amount, and frequency of training will need to reflect the tasks that employees are expected to perform. Although training is to be provided to employees at least annually, it is recommended that safety meetings or discussions and drills be conducted at more frequent intervals.

The training program should include those topics applicable to the particular facility, as well as topics such as: Hot work procedures; lock-out/tag-out procedures; bin entry procedures; bin cleaning procedures; grain dust explosions; fire prevention; procedures for handling "hot grain"; housekeeping procedures, including methods and frequency of dust removal; pesticide and fumigant usage; proper use and maintenance of personal protective equipment; and, preventive maintenance. The types of work clothing should also be considered in the program at least to caution against using polyester clothing that easily melts and increases the severity of burns, as compared to wool or fire retardant cotton.

In implementing the training program, it is recommended that the employer utilize films, slide-tape presentations, pamphlets, and other information which can be obtained from such sources as the Grain Elevator and Processing Society, the Cooperative Extension Service of the U.S. Department of Agriculture, Kansas State University's Extension Grain Science and Industry, and other state agriculture schools, industry associations, union organizations, and insurance groups.

4. Hot Work Permit

The implementation of a permit system for hot work is intended to assure that employers maintain control over operations involving hot work and to assure that employees are aware of and utilize appropriate safeguards when conducting these activities.

Precautions for hot work operations are specified in 29 CFR 1910.252(a), and include such safeguards as relocating the hot work operation to a safe location if possible, relocating or covering combustible material in the vicinity, providing fire extinguishers, and provisions for establishing a fire watch. Permits are not required for hot work operations conducted in the presence of the employer or the employer's authorized representative who would otherwise issue the permit, or in an employer authorized welding shop or when work is conducted outside and away from the facility.

It should be noted that the permit is not a record, but is an authorization of the employer certifying that certain safety precautions have been implemented prior to the beginning of work operations.

5. Entry Into Bins, Silos, And Tanks

In order to assure that employers maintain control over employee entry into bins, silos,

and tanks, OSHA is requiring that the employer issue a permit for entry into bins, silos, and tanks unless the employer (or the employer's representative who would otherwise authorize the permit) is present at the entry and during the entire operation.

Employees should have a thorough understanding of the hazards associated with entry into bins, silos, and tanks. Employees are not to be permitted to enter these spaces from the bottom when grain or other agricultural products are hung up or sticking to the sides which might fall and injure or kill an employee. Employees should be made aware that the atmosphere in bins, silos, and tanks can be oxygen deficient or toxic. Employees should be trained in the proper methods of testing the atmosphere, as well as in the appropriate procedures to be taken if the atmosphere is found to be oxygen deficient or toxic. When a fumigant has been recently applied in these areas and entry must be made, aeration fans should be running continuously to assure a safe atmosphere for those inside. Periodic monitoring of toxic levels should be done by direct reading instruments to measure the levels, and, if there is an increase in these readings, appropriate actions should be promptly taken.

Employees have been buried and suffocated in grain or other agricultural products because they sank into the material. Therefore, it is suggested that employees not be permitted to walk or stand on the grain or other grain product where the depth is greater than waist high. In this regard, employees must use a full body harness or boatswain's chair with a lifeline when entering from the top. A winch system with mechanical advantage (either powered or manual) would allow better control of the employee than just using a hand held hoist line, and such a system would allow the observer to remove the employee easily without having to enter the space.

It is important that employees be trained in the proper selection and use of any personal protective equipment which is to be worn. Equally important is the training of employees in the planned emergency rescue procedures. Employers should carefully read §1910.134(e)(3) and assure that their procedures follow these requirements. The employee acting as observer is to be equipped to provide assistance and is to know procedures for obtaining additional assistance. The observer should not enter a space until adequate assistance is available. It is recommended that an employee trained in CPR be readily available to provide assistance to those employees entering bins, silos, or tanks.

6. Contractors

These provisions of the standard are intended to ensure that outside contractors are cognizant of the hazards associated with

grain handling facilities, particularly in relation to the work they are to perform for the employer. Also, in the event of an emergency, contractors should be able to take appropriate action as a part of the overall facility emergency action plan. Contractors should also be aware of the employer's permit systems. Contractors should develop specified procedures for performing hot work and for entry into bins, silos, and tanks and these activities should be coordinated with the employer. Contractors are responsible for informing their own employees.

This coordination will help to ensure that employers know what work is being performed at the facility by contractors; where it is being performed; and, that it is being performed in a manner that will not endanger employees.

7. Housekeeping.

The housekeeping program is to be designed to keep dust accumulations and emissions under control inside grain facilities. The housekeeping program, which is to be written, is to specify the frequency and method(s) used to best reduce dust accumulations.

Ship, barge, and rail loadout and receiving areas which are located outside the facility need not be addressed in the housekeeping program. Additionally, truck dumps which are open on two or more sides need not be addressed by the housekeeping program. Other truck dumps should be addressed in the housekeeping program to provide for regular cleaning during periods of receiving grain or agricultural products. The housekeeping program should provide coverage for all workspaces in the facility and include walls, beams, etc., especially in relation to the extent that dust could accumulate.

Dust Accumulations

Almost all facilities will require some level of manual housekeeping. Manual housekeeping methods, such as vacuuming or sweeping with soft bristle brooms, should be used which will minimize the possibility of layered dust being suspended in the air when it is being removed.

The housekeeping program should include a contingency plan to respond to situations where dust accumulates rapidly due to a failure of a dust enclosure hood, an unexpected breakdown of the dust control system, a dust-tight connection inadvertently knocked open, etc.

The housekeeping program should also specify the manner of handling spills. Grain spills are not considered to be dust accumulations.

A fully enclosed horizontal belt conveying system where the return belt is inside the enclosure should have inspection access such as sliding panels or doors to permit checking

of equipment, checking for dust accumulations and facilitate cleaning if needed.

Dust Emissions

Employers should analyze the entire stock handling system to determine the location of dust emissions and effective methods to control or to eliminate them. The employer should make sure that holes in spouting, casings of bucket elevators, pneumatic conveying pipes, screw augers, or drag conveyor casings, are patched or otherwise properly repaired to prevent leakage. Minimizing free falls of grain or grain products by using choke feeding techniques, and utilization of dust-tight enclosures at transfer points, can be effective in reducing dust emissions.

Each housekeeping program should specify the schedules and control measures which will be used to control dust emitted from the stock handling system. The housekeeping program should address the schedules to be used for cleaning dust accumulations from motors, critical bearings and other potential ignition sources in the working areas. Also, the areas around bucket elevator legs, milling machinery and similar equipment should be given priority in the cleaning schedule. The method of disposal of the dust which is swept or vacuumed should also be planned.

Dust may accumulate in somewhat inaccessible areas, such as those areas where ladders or scaffolds might be necessary to reach them. The employer may want to consider the use of compressed air and long lances to blow down these areas frequently. The employer may also want to consider the periodic use of water and hoses to wash down these areas. If these methods are used, they are to be specified in the housekeeping program along with the appropriate safety precautions, including the use of personal protective equipment such as eyewear and dust respirators.

Several methods have been effective in controlling dust emissions. A frequently used method of controlling dust emissions is a pneumatic dust collection system. However, the installation of a poorly designed pneumatic dust collection system has fostered a false sense of security and has often led to an inappropriate reduction in manual housekeeping. Therefore, it is imperative that the system be designed properly and installed by a competent contractor. Those employers who have a pneumatic dust control system that is not working according to expectations should request the engineering design firm, or the manufacturer of the filter and related equipment, to conduct an evaluation of the system to determine the corrections necessary for proper operation of the system. If the design firm or manufacturer of the equipment is not known, employers should contact their trade association for recommendations of competent designers of

pneumatic dust control systems who could provide assistance.

When installing a new or upgraded pneumatic control system, the employer should insist on an acceptance test period of 30 to 45 days of operation to ensure that the system is operating as intended and designed. The employer should also obtain maintenance, testing, and inspection information from the manufacturer to ensure that the system will continue to operate as designed.

Aspiration of the leg, as part of a pneumatic dust collection system, is another effective method of controlling dust emissions. Aspiration of the leg consists of a flow of air across the entire boot, which entrains the liberated dust and carries it up the up-leg to take-off points. With proper aspiration, dust concentrations in the leg can be lowered below the lower explosive limit. Where a prototype leg installation has been instrumented and shown to be effective in keeping the dust level 25% below the lower explosive limit during normal operations for the various products handled, then other legs of similar size, capacity and products being handled which have the same design criteria for the air aspiration would be acceptable to OSHA, provided the prototype test report is available on site.

Another method of controlling dust emissions is enclosing the conveying system, pressurizing the general work area, and providing a lower pressure inside the enclosed conveying system. Although this method is effective in controlling dust emissions from the conveying system, adequate access to the inside of the enclosure is necessary to facilitate frequent removal of dust accumulations. This is also necessary for those systems called "self-cleaning."

The use of edible oil sprayed on or into a moving stream of grain is another method which has been used to control dust emissions. Tests performed using this method have shown that the oil treatment can reduce dust emissions. Repeated handling of the grain may necessitate additional oil treatment to prevent liberation of dust. However, before using this method, operators of grain handling facilities should be aware that the Food and Drug Administration must approve the specific oil treatment used on products for food or feed.

As a part of the housekeeping program, grain elevators are required to address accumulations of dust at priority areas using the action level. The standard specifies a maximum accumulation of $\frac{1}{8}$ inch dust, measurable by a ruler or other measuring device, anywhere within a priority area as the upper limit at which time employers must initiate action to remove the accumulations using designated means or methods. Any accumulation in excess of this amount and where no action has been initiated to implement cleaning would constitute a violation of the

standard, unless the employer can demonstrate equivalent protection. Employers should make every effort to minimize dust accumulations on exposed surfaces since dust is the fuel for a fire or explosion, and it is recognized that a $\frac{1}{8}$ inch dust accumulation is more than enough to fuel such occurrences.

8. Filter Collectors

Proper sizing of filter collectors for the pneumatic dust control system they serve is very important for the overall effectiveness of the system. The air to cloth ratio of the system should be in accordance with the manufacturer's recommendations. If higher ratios are used, they can result in more maintenance on the filter, shorter bag or sock life, increased differential pressure resulting in higher energy costs, and an increase in operational problems.

A photohelic gauge, magnehelic gauge, or manometer, may be used to indicate the pressure rise across the inlet and outlet of the filter. When the pressure exceeds the design value for the filter, the air volume will start to drop, and maintenance will be required. Any of these three monitoring devices is acceptable as meeting paragraph (1)(1) of the standard.

The employer should establish a level or target reading on the instrument which is consistent with the manufacturer's recommendations that will indicate when the filter should be serviced. This target reading on the instrument and the accompanying procedures should be in the preventive maintenance program. These efforts would minimize the blinding of the filter and the subsequent failure of the pneumatic dust control system.

There are other instruments that the employer may want to consider using to monitor the operation of the filter. One instrument is a zero motion switch for detecting a failure of motion by the rotary discharge valve on the hopper. If the rotary discharge valve stops turning, the dust released by the bag or sock will accumulate in the filter hopper until the filter becomes clogged. Another instrument is a level indicator which is installed in the hopper of the filter to detect the buildup of dust that would otherwise cause the filter hopper to be plugged. The installation of these instruments should be in accordance with manufacturer's recommendations.

All of these monitoring devices and instruments are to be capable of being read at an accessible location and checked as frequently as specified in the preventive maintenance program.

Filter collectors on portable vacuum cleaners, and those used where fans are not part of the system, are not covered by requirements of paragraph (1) of the standard.

9. Preventive Maintenance

The control of dust and the control of ignition sources are the most effective means for reducing explosion hazards. Preventive maintenance is related to ignition sources in the same manner as housekeeping is related to dust control and should be treated as a major function in a facility. Equipment such as critical bearings, belts, buckets, pulleys, and milling machinery are potential ignition sources, and periodic inspection and lubrication of such equipment through a scheduled preventive maintenance program is an effective method for keeping equipment functioning properly and safely. The use of vibration detection methods, heat sensitive tape or other heat detection methods that can be seen by the inspector or maintenance person will allow for a quick, accurate, and consistent evaluation of bearings and will help in the implementation of the program.

The standard does not require a specific frequency for preventive maintenance. The employer is permitted flexibility in determining the appropriate interval for maintenance provided that the effectiveness of the maintenance program can be demonstrated. Scheduling of preventive maintenance should be based on manufacturer's recommendations for effective operation, as well as from the employer's previous experience with the equipment. However, the employer's schedule for preventive maintenance should be frequent enough to allow for both prompt identification and correction of any problems concerning the failure or malfunction of the mechanical and safety control equipment associated with bucket elevators, dryers, filter collectors and magnets. The pressure-drop monitoring device for a filter collector, and the condition of the lagging on the head pulley, are examples of items that require regularly scheduled inspections. A system of identifying the date, the equipment inspected and the maintenance performed, if any, will assist employers in continually refining their preventive maintenance schedules and identifying equipment problem areas. Open work orders where repair work or replacement is to be done at a designated future date as scheduled, would be an indication of an effective preventive maintenance program.

It is imperative that the prearranged schedule of maintenance be adhered to regardless of other facility constraints. The employer should give priority to the maintenance or repair work associated with safety control equipment, such as that on dryers, magnets, alarm and shut-down systems on bucket elevators, bearings on bucket elevators, and the filter collectors in the dust control system. Benefits of a strict preventive maintenance program can be a reduction of unplanned downtime, improved equipment performance, planned use of re-

sources, more efficient operations, and, most importantly, safer operations.

The standard also requires the employer to develop and implement procedures consisting of locking out and tagging equipment to prevent the inadvertent application of energy or motion to equipment being repaired, serviced, or adjusted, which could result in employee injury. All employees who have responsibility for repairing or servicing equipment, as well as those who operate the equipment, are to be familiar with the employer's lock and tag procedures. A lock is to be used as the positive means to prevent operation of the disconnected equipment. Tags are to be used to inform employees why equipment is locked out. Tags are to meet requirements in §1910.145(f). Locks and tags may only be removed by employees that placed them, or by their supervisor, to ensure the safety of the operation.

10. Grain Stream Processing Equipment

The standard requires an effective means of removing ferrous material from grain streams so that such material does not enter equipment such as hammer mills, grinders and pulverizers. Large foreign objects, such as stones, should have been removed at the receiving pit. Introduction of foreign objects and ferrous material into such equipment can produce sparks which can create an explosion hazard. Acceptable means for removal of ferrous materials include the use of permanent or electromagnets. Means used to separate foreign objects and ferrous material should be cleaned regularly and kept in good repair as part of the preventive maintenance program in order to maximize their effectiveness.

11. Emergency Escape

The standard specifies that at least two means of escape must be provided from galleries (bin decks). Means of emergency escape may include any available means of egress (consisting of three components, exit access, exit, and exit discharge as defined in §1910.35), the use of controlled descent devices with landing velocities not to exceed 15 ft/sec., or emergency escape ladders from galleries. Importantly, the means of emergency escape are to be addressed in the facility emergency action plan. Employees are to know the location of the nearest means of emergency escape and the action they must take during an emergency.

12. Dryers

Liquefied petroleum gas fired dryers should have the vaporizers installed at least ten feet from the dryer. The gas piping system should be protected from mechanical damage. The employer should establish procedures for locating and repairing leaks

when there is a strong odor of gas or other signs of a leak.

13. Inside Bucket Elevators

Hazards associated with inside bucket elevator legs are the source of many grain elevator fires and explosions. Therefore, to mitigate these hazards, the standard requires the implementation of special safety precautions and procedures, as well as the installation of safety control devices. The standard provides for a phase-in period for many of the requirements to provide the employer time for planning the implementation of the requirements. Additionally, for elevators with a permanent storage capacity of less than one million bushels, daily visual inspection of belt alignment and bucket movement can be substituted for alignment monitoring devices and motion detection devices.

The standard requires that belts (purchased after the effective date of the standard) have surface electrical resistance not to exceed 300 megohms. Test methods available regarding electrical resistance of belts are: The American Society for Testing and Materials D257-76, "Standard Test Methods for D-C Resistance or Conductance of Insulating Materials"; and, the International Standards Organization's #284, "Conveyor Belts-Electrical Conductivity-Specification and Method of Test." When an employer has a written certification from the manufacturer that a

belt has been tested using one of the above test methods, and meets the 300 megohm criteria, the belt is acceptable as meeting this standard. When using conductive belts, the employer should make certain that the head pulley and shaft are grounded through the drive motor ground or by some other equally effective means. When V-type belts are used to transmit power to the head pulley assembly from the motor drive shaft, it will be necessary to provide electrical continuity from the head pulley assembly to ground, e.g., motor grounds.

Employers should also consider purchasing new belts that are flame retardant or fire resistant. A flame resistance test for belts is contained in 30 CFR 18.65.

APPENDIX B TO §1910.272 GRAIN HANDLING FACILITIES

National Consensus Standards

The following table contains a cross-reference listing of current national consensus standards which provide information that may be of assistance to grain handling operations. Employers who comply with provisions in these national consensus standards that provide equal or greater protection than those in §1910.272 will be considered in compliance with the corresponding requirements in §1910.272.

Subject	National consensus standards
Grain elevators and facilities handling bulk raw agricultural commodities	ANSI/NFPA 61B
Feed mills	ANSI/NFPA 61C
Facilities handling agricultural commodities for human consumption	ANSI/NFPA 61D
Pneumatic conveying systems for agricultural commodities	ANSI/NFPA 66
Guide for explosion venting	ANSI/NFPA 68
Explosion prevention systems	ANSI/NFPA 69
Dust removal and exhaust systems	ANSI/NFPA 91

APPENDIX C TO §1910.272 GRAIN HANDLING FACILITIES

References for Further Information

The following references provide information which can be helpful in understanding the requirements contained in various provisions of the standard, as well as provide other helpful information.

1. *Accident Prevention Manual for Industrial Operations*; National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.
2. *Practical Guide to Elevator Design*; National Grain and Feed Association, P.O. Box 28328, Washington, DC 20005.
3. *Dust Control for Grain Elevators*; National Grain and Feed Association, P.O. Box 28328, Washington, DC 20005.
4. *Prevention of Grain Elevator and Mill Explosions*; National Academy of Sciences, Washington, DC. (Available from National

Technical Information Service, Springfield, Virginia 22151.)

5. *Standard for the Prevention of Fires and Explosions in Grain Elevators and Facilities Handling Bulk Raw Agricultural Commodities*, NFPA 61B; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

6. *Standard for the Prevention of Fire and Dust Explosions in Feed Mills*, NFPA 61C; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

7. *Standard for the Prevention of Fire and Dust Explosions in the Milling of Agricultural Commodities for Human Consumption*, NFPA 61D; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

§ 1910.301

8. *Standard for Pneumatic Conveying Systems for Handling Feed, Flour, Grain and Other Agricultural Dusts*, NFPA 66; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

9. *Guide for Explosion Venting*, NFPA 68; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

10. *Standard on Explosion Prevention Systems*, NFPA 69; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

11. *Safety-Operations Plans*; U.S. Department of Agriculture, Washington, DC 20250.

12. *Inplant Fire Prevention Control Programs*; Mill Mutual Fire Prevention Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

13. *Guidelines for Terminal Elevators*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

14. *Standards for Preventing the Horizontal and Vertical Spread of Fires in Grain Handling Properties*; Mill Mutual Fire Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

15. *Belt Conveyors for Bulk Materials*, Part I and part II, Data Sheet 570, Revision A; National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.

16. *Suggestions for Precautions and Safety Practices in Welding and Cutting*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

17. *Food Bins and Tanks*, Data Sheet 524; National Safety Council, 425 North Michigan Avenue, Chicago, Illinois 60611.

18. *Pneumatic Dust Control in Grain Elevators*; National Academy of Sciences, Washington, DC. (Available from National Technical Information Service, Springfield, Virginia 22151.)

19. *Dust Control Analysis and Layout Procedures for Grain Storage and Processing Plants*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

20. *Standard for the Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal*, NFPA 91; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

21. *Standards for the Installation of Direct Heat Grain Driers in Grain and Milling Properties*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

22. *Guidelines for Lubrication and Bearing Maintenance*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

23. *Organized Maintenance in Grain and Milling Properties*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

29 CFR Ch. XVII (7-1-10 Edition)

24. *Safe and Efficient Elevator Legs for Grain and Milling Properties*; Mill Mutual Fire Prevention Bureau, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

25. *Explosion Venting and Suppression of Bucket Elevators*; National Grain and Feed Association, P.O. Box 28328, Washington, DC 20005.

26. *Lightning Protection Code*, NFPA 78; National Fire Protection Association, Batterymarch Park, Quincy, Massachusetts 02269.

27. *Occupational Safety in Grain Elevators*, DHHS (NIOSH) Publication No. 83-126; National Institute for Occupational Safety and Health, Morgantown, West Virginia 26505.

28. *Retrofitting and Constructing Grain Elevators*; National Grain and Feed Association, P.O. Box 28328, Washington, DC 20005.

29. *Grain Industry Safety and Health Center—Training Series* (Preventing grain dust explosions, operations maintenance safety, transportation safety, occupational safety and health); Grain Elevator and Processing Society, P.O. Box 15026, Commerce Station, Minneapolis, Minnesota 55415-0026.

30. *Suggestions for Organized Maintenance*; The Mill Mutuals Loss Control Department, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

31. *Safety—The First Step to Success*; The Mill Mutual Loss Control Department, 1 Pierce Place, Suite 1260 West, Itasca, Illinois 60143-1269.

32. *Emergency Plan Notebook*; Schoeff, Robert W. and James L. Balding, Kansas State University, Cooperative Extension Service, Extension Grain Science and Industry, Shellenberger Hall, Manhattan, Kansas 66506.

[52 FR 49625, Dec. 31, 1987, as amended at 53 FR 17696, May 18, 1988; 54 FR 24334, June 7, 1989; 55 FR 25094, June 20, 1990; 61 FR 9242, Mar. 7, 1996; 61 FR 9584, Mar. 8, 1996; 67 FR 67965, Nov. 7, 2002]

Subpart S—Electrical

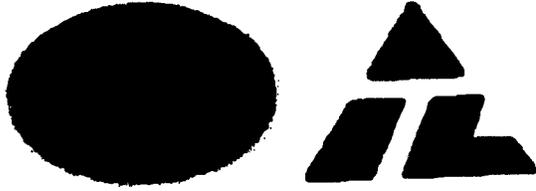
AUTHORITY: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order No. 8-76 (41 FR 25059), 1-90 (55 FR 9033), 5-2002 (67 FR 65008), 5-2007 (72 FR 31160), as applicable; 29 CFR part 1911.

SOURCE: 46 FR 4056, Jan. 16, 1981, unless otherwise noted.

GENERAL

§ 1910.301 Introduction.

This subpart addresses electrical safety requirements that are necessary



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Date:	05/16/2005
Pages:	2 Pages, including this cover sheet

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Attached is the Memo you are looking for.

If you have any further questions, you can contact us at the number listed above.

-Dave Keyes

From...

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U.S. Department of Labor

Occupational Safety and Health Administration
Washington, D.C. 20210

Reply to the Attention of:

DATE: September 30, 1996

MEMORANDUM FOR: Sandra J. Taylor
Acting Regional Administrator

ATTENTION: Cynthia Weaver

FROM: Thomas H. Seymour *DAS*
Acting Director, Directorate of
Safety Standards Programs

SUBJECT: Interpretation of §1910.272(g)(1)(ii)

Your Memorandum of September 16, 1996, requested an interpretation of the OSHA standard for Grain Handling Facilities by the Directorate of Safety Standards Programs. Specifically, you requested an interpretation of §1910.272(g)(1)(ii) with respect to whether employees may enter a bin when machines are running.

This provision was not intended to be a prohibition of employees entering a grain storage structure while machinery is running. Instead, the requirement refers to equipment which "presents a danger" to employees. Therefore, employees may enter a grain storage structure while machinery is running if the employer can demonstrate that appropriate protection has been provided to prevent employees from being exposed to the hazards/danger of the moving machinery.

Procedures for providing appropriate protection may be in the form of lock-out procedures, use of a boatswains' chair, or other method of preventing employees from contacting the moving machinery. It is important to note that the employer must develop and implement specific procedures for whichever method is used, and employees must be trained in those procedures.

This interpretation is consistent with previous conversations with Ms. Cynthia Weaver of your staff, and with Mr. Tom O'Conner of the National Grain and Feed Association.

I hope this information will be helpful to you. If you need further assistance, please contact me at (202)219-8061 or Glen Gardner of my staff at (202)219-7216.

September 29, 2008

Mr. Rick Smithpeter
Director of Risk Services
Cooperative Mutual Insurance Company
3905 S. 148th Street
Suite 100
Omaha, Nebraska 68144

Dear Mr. Smithpeter:

Thank you for your January 23, 2008 letter to the Occupational Safety and Health Administration (OSHA) regarding the grain handling facilities standard at 29 CFR 1910.272. This letter constitutes OSHA's interpretation only of the requirements discussed and may not be applicable to any questions not delineated within your original correspondence. We apologize for the delay in our response. Your paraphrased scenario, questions, and our responses are provided below.

Question 1: The note to 29 CFR 1910.272(g)(2) states: "when the employee is standing or walking on a surface which the employer demonstrates is free from engulfment hazards, the lifeline or alternative means may be disconnected or removed." Does this imply that if the employer can demonstrate that there are no engulfment hazards, then the employer can allow the employee to remove his/her harness and lifeline?

Response 1: Yes. You must note, however, that standing or walking on the grain has been demonstrated to be a source of hazards to workers. To meet the exception provided in the associated note, employers must not allow employees to walk or work on the surface of the grain until the employer has verified that engulfment hazards do not exist as a result of a bridging condition, air pocket or void space below the surface of the grain or that the depth of grain is not sufficient to present an engulfment hazard in the specific bin, silo or tank. Probe tests sufficient to detect any air pockets or void spaces may be one way to assess the stability of the grain surface. However, if a worker must stay on the grain to conduct such tests, the worker must be protected from engulfment during the tests.

Scenario: The second issue raised in your letter addressed OSHA's standard at 29 CFR 1910.272(g)(1)(ii), which provides:

All mechanical, electrical, hydraulic, and pneumatic equipment which presents a danger to employees inside grain storage structures shall be deenergized and shall be disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by other equally effective means or methods.

Also, OSHA's standard at 29 CFR 1910.23(a)(5) provides:

Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength. While the cover is not in place, the pit or trap shall be constantly attended by someone or shall be protected on exposed sides by removable standard railings. Sweep augers are installed at the floor level of grain storage structures to help move grain from the periphery of the structure to the central discharge point. You indicated in your letter that sweep augers attach to a center pivot point that is usually located in an open pit or sump that provides access to the recovery conveyor that removes grain and foreign matter from the bin. The open sump can range from 18 inches to 4 feet deep or from 18 inches to 4 feet in length or diameter, although most sumps are square. You also indicate that, by design, sweep augers do not have a grating covering them.

In your letter, you enclosed "Procedures For Employees Working in Grain Storage Areas While Equipment is Operating (Sweep Augers)." The procedures state that employees must stay six feet behind any partially-guarded or unguarded energized equipment in grain storage areas. If employees must work closer than six feet, the employee must implement positive procedures to assure the equipment is de-energized and there will be no chance of unexpected start-up (i.e., lock-out/tag-out). The procedures also state that an observer shall maintain direct visual contact of all employees working in grain storage areas at all times while equipment is operating. The observer shall be located at the doorway of bins being emptied and shall have control of the on/off switch.

Question 2: Can employees operate the sweep auger if the sump is not being protected by a grating or other similar protection? Does Section 1910.23(a)(5) mean that, as long as the employer assures that the pit or sump is "constantly attended by someone" while the employee is in the grain bin running the sweep auger, the sweep auger need not have a cover or removable standard railings (which would make it impossible to run)?

Response 2: As noted above, OSHA's standard at 29 CFR 1910.272(g)(1)(ii) provides that, before employees enter grain storage structures, equipment which presents a danger to employees must be deenergized, and "disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by equally effective means or measures." The standard is not intended to be a prohibition against employees entering

grain storage structures while machinery is running. Instead, employees may enter such facilities while machinery is running if the employer can demonstrate that appropriate protection has been provided to prevent employees from being exposed to the hazards/dangers of the moving machinery.

An obvious example of an effective method in protecting employees from the hazards associated with machinery inside grain storage structures would be machine guarding. Another example of an effective method might include a rope positioning system, based on the length of rope tied to an employee and installed inside the storage bin, which would prevent the employee from being exposed to the hazards presented by the moving machinery of a sweep auger. On the other hand, because they may not protect employees from the hazards associated with mechanized sweep augers, use of a boatswain chair would not be considered an "equally effective means or method" under Section 1910.272(g)(1)(ii). Additionally, please keep in mind that regardless of whether an employer does or does not implement "other equally effective means or methods," Section 1910.272(e)(2) requires employers to provide employees entering grain storage structures with training on mechanical hazards and how to avoid them.

The procedures for sweep augers enclosed in your letter would not be considered by OSHA as "other equally effective means or methods" as set forth in 1910.272(g)(1)(ii). First, because of the possibility for uneven or moving grain inside grain storage structures, there is a potential for employees to slip and fall on partially-guarded or unguarded moving machinery parts (such as a sweep auger). Second, because of possible poor visibility (e.g., from poor lighting) inside grain storage facilities, employees may have difficulty estimating distances from, or not seeing at all, moving machinery parts. As such, OSHA does not consider maintaining a distance of six feet from partially-guarded or unguarded energized equipment in grain storage structures as an "otherwise equally effective means or method" provided by the standard. Lastly, the reliance on an observer with control of an on/off switch for energized equipment creates a potential for human error and is not a positive method of protecting employees from exposure to hazards in grain storage structures. As indicated in the example above, an equally effective method might include a rope positioning system, which would physically prevent the employee from entering the area where they could be exposed to the hazards associated by moving machinery of a sweep auger.

Finally, you also enclosed in your letter a September 30, 1996, memorandum from Mr. Thomas H. Seymour, Acting Director, Directorate of Safety Standards Programs, to Sandra J. Taylor, Acting Regional Administrator, OSHA Region V, which addressed 29 CFR 1910.272(g)(1)(ii) with respect to whether employees may enter a bin when machines are running. We were not able to determine the origins of the memorandum enclosed in your letter. Memorandums of this type are normally issued by OSHA's Directorate of Enforcement Programs (previously Directorate of Compliance Programs in 1996), and are considered to be in "draft" form until signed and issued by the referenced individual. Please note that the contents of this unsigned memorandum do not reflect official OSHA policy.

Thank you for your interest in occupational safety and health. OSHA requirements are set by statute, standards, and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you can consult OSHA's website at <http://www.osha.gov>. If you need further assistance, please contact the Office of General Industry Enforcement at (202) 693-1850.

Sincerely,

Richard E. Fairfax, Director
Directorate of Enforcement Programs

[December 24, 2009]

Mr. Rick Smithpeter
Cooperative Mutual Insurance Company
3905 S. 148th Street
Suite 100
Omaha, Nebraska 68114

Dear Mr. Smithpeter:

Thank you for your October 15, 2008, letter to the Occupational Safety and Health Administration (OSHA), in which you describe the operation of a sweep auger inside a grain storage bin. Your October 15th letter was in response to [OSHA's reply dated September 29, 2008](#) (enclosed). Please note that this letter constitutes OSHA's interpretation, only of the requirements discussed, and may not be applicable to any questions not delineated within your original correspondence. Your paraphrased questions and our responses are provided below.

Background: You state in your letter that a sweep auger is a portable unguarded screw auger attached to a pivot that circles the perimeter of the storage bin and conveys grain into a center sump(s) located in the bin floor. In order for the sweep auger to work properly, the operator must regularly make adjustments to the device inside the bin. You also state that, by design, a sweep auger cannot be guarded and that there is no room between the bin wall and the end of the sweep auger that would allow a worker to be positioned so that he or she is not in the path of the auger. You contend that the use of a rope positioning system, which would prevent a worker from being exposed to the hazards presented by the moving machinery of the sweep auger, would be extremely dangerous.

OSHA's standard at 29 CFR 1910.272 includes specific requirements addressing safety hazards associated with grain handling facilities. Section 1910.272(g) addresses entry into grain storage structures, including bins, tanks and silos. The exception in Section 1910.272(g) states: "entry through unrestricted ground level openings into flat storage structures in which there are no toxicity, flammability, oxygen-deficiency, or other atmospheric hazards is covered by paragraph (h) of this section."

Section 1910.272(h) includes requirements for entry into flat storage structures. Section 1910.272(c) defines a "flat storage structure" as "a grain storage building or structure that will not empty completely by gravity, has an unrestricted ground level opening for entry, and must be entered to reclaim the residual grain using powered equipment or manual means." Flat storage structures with no atmospheric hazards that are entered at ground level through regular or large-sized doorways or openings are covered by paragraph (h).

Entry into grain storage bins, tanks, silos, and grain storage structures including flat storage structures at or above the grain level or with atmospheric hazards are covered by paragraph (g). Based on the above OSHA requirements and the information that you provided in your letter, it appears that your storage structure is covered by Section 1910.272(g).

Question 1: Can an unguarded sweep auger be in operation (energized) in a grain storage bin while a worker is inside the bin?

Response 1: No. OSHA's standard at 29 CFR 1910.272(g)(1)(ii) states:

All mechanical, electrical, hydraulic, and pneumatic equipment which presents a danger to workers shall be deenergized and shall be **disconnected, locked-out and tagged, blocked-off**, or otherwise **prevented from operating** by other equally effective means or measures. [emphasis added].

Also, with respect to entry into flat storage structures, covered by paragraph (h), Section 1910.272(h)(2)(i) provides:

Whenever an employee walks or stands on or in stored grain or grain products of a depth which poses an engulfment hazard, all equipment which presents a danger to the employee (such as an auger or other grain transport equipment) shall be deenergized, and shall be disconnected, locked-out and tagged, blocked-off, or otherwise prevented from operating by other equally effective means or methods.

We note that workers face a number of hazards whenever they enter a grain storage bin. For example, workers may face an engulfment hazard inside a storage bin when grain is being drawn off to the bottom by an auger. Flowing or moving grain produced from an auger might also result in a tripping or slipping hazard that could cause the worker to accidentally fall into the machinery. In addition, a danger may exist to workers from energized equipment when grain is not flowing or moving. For example, a worker who is required to regularly adjust an unguarded moving auger, in order for it to work correctly, may slip, trip, or fall and be placed in the path of the moving auger.

OSHA's standards clearly provide that if a danger to a worker exists, all equipment inside grain storage facilities must be disconnected, locked-out and tagged, blocked-off or **prevented from operating** by other means or methods. The standards do provide some flexibility to employers for ensuring that equipment is not operating and does not present a danger to workers inside the storage structure. However, based on the additional

information provided in your October 15th letter, OSHA is not aware of any effective means or method that would protect a worker from the danger presented by an unguarded sweep auger operating inside a grain storage structure. Accordingly, unless the employer can eliminate all hazards presented by an energized unguarded sweep auger, operating such a device with workers inside a grain storage structure would be in violation of Section 1910.272(g)(1)(ii) or Section 1910.272(h)(2)(i).

Question 2: If workers follow the requirements in 29 CFR 1910.23(a)(5), can they work in the bin while the sump(s) is not guarded?

Response 2: Yes. OSHA's standard at 29 CFR 1910.23(a)(5) states:

Every pit and trapdoor floor opening, infrequently used, shall be guarded by a floor opening cover of standard strength and construction. While the cover is not in place, the pit or trap shall be constantly attended by someone or shall be protected on all exposed sides by removable standard railings.

The standard sets forth the general rule that every pit and trap door floor opening, infrequently used, must be guarded. However, the standard also includes an exception to the general rule so that workers can work near an uncovered floor opening if, in relevant part, the opening is constantly attended by someone. As a result, a worker may work inside the bin when the sump hole is not guarded as long as a second worker is constantly attending the opening. You must note, however, that when workers are conducting work inside storage bins within the parameters of Section 1910.23(a)(5), employers must still comply with all other applicable OSHA standards, including 29 CFR 1910.272(g)(1)(ii) (e.g., **Lockout/Tagout**).

Question 3: Given the answers to the two questions above, and not including the use of lockout/tagout of energized equipment, guarding of the sweep auger, and providing gates or guarding on the sump(s), can OSHA provide me with a method or procedure for removing grain from flat bottom grain bins?

Response 3: Please keep in mind that OSHA does not approve, endorse, or recommend any particular procedure for removing grain from flat bottom grain bins. The final determination of compliance with OSHA's standards must take into account all factors pertaining to the use of sweep augers and other such equipment. This must include an evaluation, through direct observation, of worker work practices and all conditions of use in the workplace. Therefore, under the Occupational Safety and Health Act of 1970, only the employer is responsible for compliance with the Act and for the safe use of any product, including the use of sweep augers by their workers.

Thank you for your interest in occupational safety and health. We hope you find this information helpful. OSHA requirements are set by statute, standards, and regulations. Our interpretation letters explain these requirements and how they apply to particular circumstances, but they cannot create additional employer obligations. This letter constitutes OSHA's interpretation of the requirements discussed. Note that our enforcement guidance may be affected by changes to OSHA rules. Also, from time to time we update our guidance in response to new information. To keep apprised of such developments, you may consult OSHA's website at <http://www.osha.gov>. If you have any further questions, please feel free to contact the Office of General Industry Enforcement at (202) 693-1850.

Sincerely,

Richard E. Fairfax, Director
Directorate of Enforcement Programs



UPDATE

Grain and Feed Association of Illinois • 3521 Hollis Dr. • Springfield IL 62711 • 217/787-2417

To: Members of the Safety-Health-Environmental Services Program
From: John Lee

Vol. 22 No. 5

August 23, 2010

Most of you have heard about the tragic accident in Mt. Carroll, IL on July 28, 2010. A 14 and a 19-year old were engulfed in a grain bin. Most of you also know that grain engulfment/entrapment/suffocation accidents have been on the rise for several years. According to OSHA, in Region V there have been 42 fatality inspections from 2004-2009. In Illinois, counting the two victims referred to above, we have had eight fatalities at commercial grain elevators since 2007! Please make sure employees are following safe bin entry practices.

Due to the accidents mentioned above and several others, OSHA has decided to conduct a local emphasis program (LEP) for all of Region V. Region V covers Wisconsin, Michigan, Ohio and Illinois. Each area office in these states will conduct at least 10 inspections of grain handling facilities by September 1, 2011. The areas OSHA mentions in the LEP are:

- Falls
- Electrocution
- Grain Engulfment
- Auger Entanglement
- Struck by
- Combustible Dust

OSHA states in the LEP:

“All inspections under this LEP must address all aspects of any potential grain handling work and include a review of all related written documentation (i.e., lock-out/tag-out program, forklift operation, grain entry program and procedures, housekeeping programs, fall protection program, personnel protective equipment, confined space entry, machine guarding, and safety related work practices).” So in addition to the above list OSHA will focus on:

- Lockout/tagout programs
- PPE hazard assessments
- Confined space entry (other than grain bins)
- Forklifts
- OSHA Recordkeeping

The inspections will be very comprehensive.

OSHA also states the following in the LEP:

“The OSHA inspector may discover that outside contractors are also performing work activities at the grain handling facilities. There may be instances where the Compliance Officer would incorporate the outside contractor into the scope of the inspection in accordance with the FOM.”

The inspections could start at anytime. What can you do to prepare? I will try to give examples in this Update of areas that may need to be repaired in your facility or added to your safety program. The list will not be everything OSHA will look at, but it will be a good start.

Training

- Have all employees been trained for the task(s) they perform?
- Is the training documented?
- Do you provide new employee (harvest help) orientation?
- Are employees familiar with 1910.272?
- If you have forklifts, have all employees been trained to operate them?
- Have employees performing electrical work been trained?
- Have employees performing bin entry bin been trained in the hazards?

OSHA Recordkeeping

- Complete the OSHA 300 logs (they will ask for five years worth)
- The forms are:300, 300A, and 301 (300A is the summary that is posted from February 1-April 1)
- Remember workers compensation and OSHA recordkeeping are two separate things. Also remember not all work comp injuries are OSHA recordable.

Fall Hazards

- Any area of the facility over 4' high must have some type of fall protection (railcar loading, catwalks, manlift shafts). See examples below.
- Check all portable ladders for damage and remove damaged ones from service.
- All handrails must be 42" tall with a 21" midrail and a toe board.



The ladder cage above needs to extend 42" above the bin entry door.



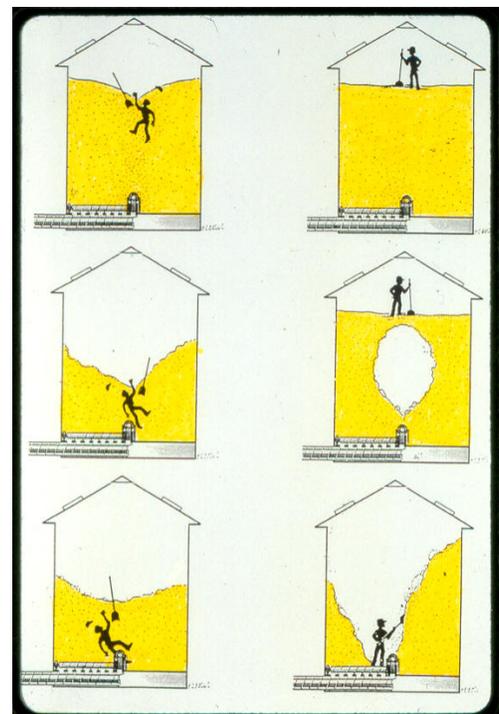
All ladders must extend 42" above exit point.



Handrail (right) needs a toe board and the railings need to be made out of 1.5" material instead of rebar.



Broken ladders should be discarded and not repaired.



Grain Engulfment

- Do employees fill out bin entry permits? (see sample on page 4)
- If not, is there a supervisor present during the entire bin entry?
- Are lifelines and harnesses used for entry?
- If not, how is employee protected?
- Are conveyors locked out and tagged?
- Is atmosphere checked or is ventilation used?
- Have the entrant and observer been trained?
- Sweep augers – have hazards been eliminated?

Bin, Silo and Tank Entry Permit and Checklist

Bin Identification: _____ Date: _____ Time: _____

Work Required: _____

This permit signifies that all safety precautions have been complied with for the job described and will be kept on file until work is completed.

**Personnel shall not enter a bin from below bridged or hung-up material!
Before entering the bin, silo or tank, complete the following checklist:**

	Yes	N/A
1. Lock-out and tag of conveying equipment	_____	_____
2. Atmosphere of the bins, silo or tank:		
a. Oxygen content:		
(1) Oxygen level is 19.5 percent or more (determined through testing); or	_____	_____
(2) Ventilation (natural or forced air) provided before and during entry; or	_____	_____
(3) Self-contained breathing apparatus provided	_____	_____
b. Combustible gases, vapors and toxic agents - if believed to be present:		
(1) Atmosphere tested for suspected gases; or	_____	_____
(2) If testing indicates:		
(a) Ventilation (natural or forced air) provided before and during entry, and atmosphere monitored during entry	_____	_____
(b) Appropriate personal protection provided	_____	_____
3. Body harness and lifeline, or boatswain's chair and lifeline provided	_____	_____
4. Person performing entry:		
a. Instructed on bin entry hazards	_____	_____
b. Trained on safety equipment operation	_____	_____
c. Trained on use of respiratory protection (if provided)	_____	_____
5. Observer:		
a. Communications provided (voice, signal line, sight, walkie talkie, other)	_____	_____
b. Trained in rescue procedures	_____	_____
c. Knows how to obtain additional emergency help	_____	_____
6. Rescue equipment available	_____	_____

***Not to be signed unless all lines of the checklist have been marked.
All equipment used for this job has been checked for performance and/or defects.***

Signature _____
(Person entering bin)

Signature _____
(Observer)

Signature _____
(Manager or authorized rep.)

Completed _____
(Date & Time)

Auger Entanglement/Machine Guarding:

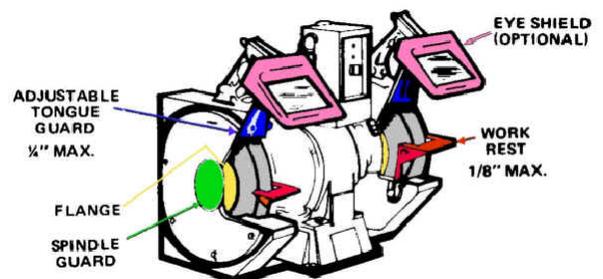
- Does all equipment have guards in place?
- Do V-belt guards have four sides?
- See photos below for common problem areas
- Guards should prevent workers' hand from going:
 Around
 Under "AUTO"
 Through
 Over



No back on guard.



No guard; wheel worn.



Combustible Dust:

- Do you have a housekeeping program?
- Do you have a housekeeping checklist?
- Are dust levels kept below 1/8" in priority areas?
- Do you have an emergency action plan?
- Do you have a maintenance program?
- Is all maintenance recorded?
- Do you follow hot work procedures? (See page 7 for sample hot work permit)



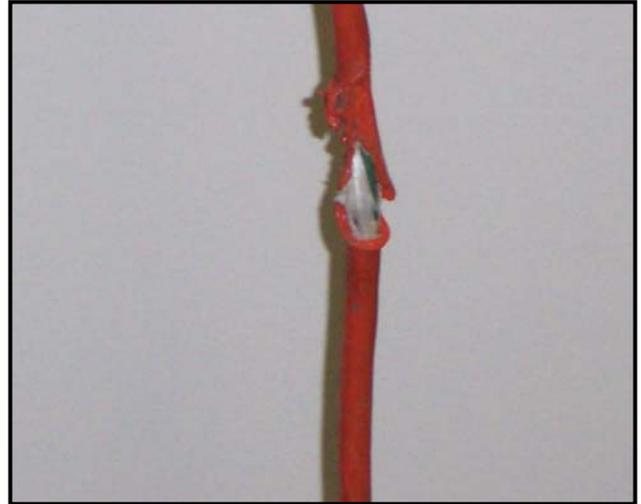
Struck By:

- Have employees been trained about harvest safety (moving equipment)?
- Do all employees know traffic patterns?
- Do employees wear visible clothing?
- Do employees carry radios for communication (i.e. loading railcars)?



Electrical:

- Do employees perform electrical work or troubleshooting?
- Have employees been trained in electrical safety related work practices?
- Do employees work on live equipment?
- Are all extension cords in good condition?
- Are outlets wired correctly?



Missing knockout



Repaired knockout

Lockout/Tagout:

- Have employees been trained in LO/TO?
- Does all equipment have a specific LO/TO procedure?
- Does company have equipment capable of locking out all equipment?



LOCKOUT / TAGOUT PROCEDURE

Equipment or Process: Dry Leg

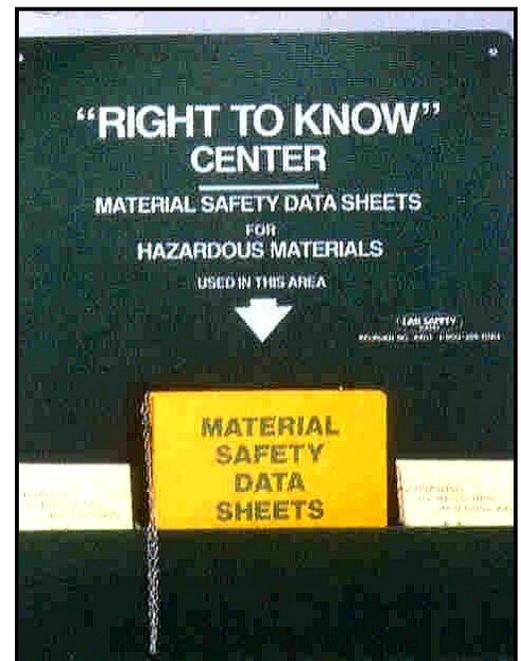
Type of lockout needed: Pad Lock, and Tag

All energy must be locked out before maintenance is to begin. To lockout the Dry Leg take the following steps:

- STEP 1** - PREPARE FOR SHUTDOWN, NOTIFY ALL AFFECTED EMPLOYEES RADIO OR DIRECT COMMUNICATION
- STEP 2** - IN NORTH ELECTRICAL SHED DISCONNECT ELECTRICAL MAIN LABELED "DRY LEG". PLACE PADLOCK AND TAG ON THE MAIN SWITCH ARM
- STEP 3** - VERIFY THAT ENERGY IS ISOLATED BY ATTEMPTING TO START THE MACHINE.
- STEP 4** - BEGIN MAINTENANCE.
- STEP 5** - WHEN ACTIVITY IS COMPLETED, CLEAR ALL TOOLS, EQUIPMENT, AND PERSONNEL FROM AREA.
- STEP 6** - NOTIFY AFFECTED EMPLOYEES OF REACTIVATION.
- STEP 7** - REMOVE LOCKOUT DEVICES.
- STEP 8** - REACTIVATE MACHINE AND VERIFY NORMAL OPERATION.

Hazard Communication:

- Does company have a written Hazard Communication program?
- Do you have MSDS for all hazardous chemicals?
- Are all containers labeled?
- Are employees trained about health hazards?



Personal Protective Equipment:

- Has company completed a hazard assessment?
- Do employees know what PPE to wear and when they should wear the PPE?
- Does company ensure use?

JOB DESCRIPTION	PERSONAL PROTECTIVE EQUIPMENT HAZARD ASSESSMENT													
	HARD HATS	STL TOE SHOES	GLOVES	GOGGLES	EAR PLUGS	FACE SHIELDS	DUST MASKS	SAFETY GLASSES	WELDING GOGGLES OXY/ ACCET.	WELDING GLOVES	WELDING HELMET	WELDING SLEEVES	BODY HARNESS	
GEN. OUTSIDE DUTIES		O	O				O							
CLEANING DRYERS			O				O	O						
CUTTING WEEDS			O		O			X						
CLEANING RAIL CARS			O				O							
CLEANING BINS		O	O		O		O							
CLEANING BASEMENTS			O				O							
CLEANING TUNNELS			O				O							
CUTTING WITH TORCH									X	X				
BENCH/ANGLE GRINDER			O		O	O		X						
BIN ENTRY (TOP ENTRY)							O	O		O				X
DUMPING TRUCKS			O				O							
LOADING RAIL CARS		O	O				O							
MAINTENANCE WORK		O	O											
SPRAYING/MIXING CHEM.				X										
WELDING										X	X	O		

This form certifies that a hazard assessment for the department listed above was conducted on the date indicated.
Where necessary, PPE (personal protective equipment) will be issued to employees.

X = REQUIRED
O = RECOMMENDED

DATE _____

SIGNED _____

I hope this newsletter and other materials help to ensure OSHA compliance at your facilities. Remember to document everything you do in regard to safety training. Even a five-minute safety talk should be documented. Please contact the Grain and Feed Association office at 217.787.2417 for more information.



FATALITY ASSESSMENT AND CONTROL EVALUATION

Farm Worker Dies during Grain Bin Auger Entanglement Case Report: 04NY121

SUMMARY

On November 9th, 2004 a 53-year-old farm worker was killed when he became entangled in a grain bin auger. At the time of the incident, the victim was cleaning the remaining wheat out of a grain bin when he became entangled in the sweep auger that was moving around the floor of the bin. Hooks on the sweep auger caught the material on the worker's pants and his legs were subsequently entangled in the auger. A co-worker working nearby heard the drive belts begin to squeal and after turning off the drive mechanism, discovered the entangled victim. The co-worker immediately asked the farm owner to call 911 while he and another worker went to the aid of the victim. The co-workers cut the material of the victim's pants loose and worked to disentangle the victim's legs from the auger. Emergency responders arrived within minutes and transported the victim via ambulance to the nearby hospital where the victim was stabilized prior to being transported via helicopter to the nearest major trauma center. The victim died from his injuries six hours later at the trauma center.

New York State Fatality Assessment and Control Evaluation (NY FACE) investigators concluded that to help prevent similar incidents from occurring in the future, employers/farm owners should:

- ***Ensure that workers do not enter grain bins while the unloading mechanism is operating;***
- ***Establish lockout/tagout procedures and ensure workers follow them any time a worker enters a grain bin or other confined space;***
- ***Provide employees with proper training in lockout/tagout procedures and procedures for safe entry into confined spaces, such as grain bins and;***
- ***Consider utilizing grain bin and auger designs that can help ensure safety for workers such as self-unloading or bottom-unloading bins.***

INTRODUCTION

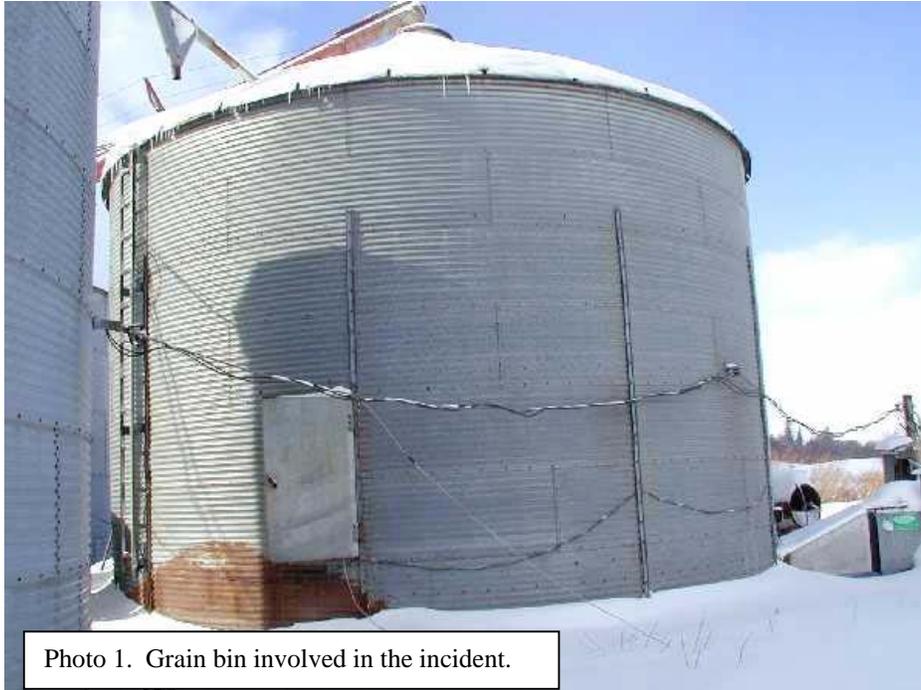
The New York FACE (NY FACE) program learned of the agricultural-related fatality through a news article on November 12th and subsequent referral call from a regional OSHA Compliance Officer. The incident involved a 53-year-old Caucasian male farm worker who was working inside a grain bin sweeping and shoveling some remaining wheat when he became entangled in a sweep auger that was moving around the floor of the bin.

A NY FACE investigator met with the investigation team at the area OSHA office on January 21st, 2005 to learn background details related to the incident. Additionally, the FACE investigator visited the farm location where the incident occurred on January 27th, inspected the grain bin, and spoke with the farm owner regarding the incident. The death certificate and Medical Examiner's reports related to the incident were also reviewed.

The incident occurred at a large dairy farm with 3,500 working acres, 510 dairy cows, and 15 full-time farm workers. The victim had worked on this farm for the past five years. He had considerable prior experience working on farms, having owned his own farm for many years and working on other farms prior to his employment at this particular farm.

INVESTIGATION

On November 9th, 2004, three employees and the farm owner were loading corn from a grain bin into a transport truck in order to transfer the corn into a different bin. The victim was removing the remaining bushels of wheat from the floor of this bin in preparation for the transfer of corn from the first bin. The grain bin where the victim was working was a 1972 Butler grain bin (Photo 1), 30 feet in diameter with a vertical auger in the center of the bin. The auger moved grain up from the center of the bin into a chute which dispensed the grain into a waiting vehicle. The bin also had an approximately 14-foot-long sweep auger. The auger rotated around the circumference of the inside of the grain bin, moving grain from the radius of the bin toward the center at which point the center auger moved the grain vertically upward and out of the bin.



As is common with this type of bin, when the grain level inside the bin becomes low and the grain is at floor level, the sweep augers remove as much of the material as possible and carry it toward the center of the bin. At this point, it was standard practice for a worker to enter the grain bin, with all of the machinery turned off, and to sweep or shovel the remaining grain toward the center to

remove it from the bin. When a considerable amount was piled against the auger, the worker would go outside the bin and re-energize the electricity to the auger motor which would transport the material up and out of the bin (Photos 2 & 3). This method would require repeated shoveling, sweeping, and re-energizing until all of the remaining grain had been removed from the bin.



Photo 2. Grain bin door and electrical panel.

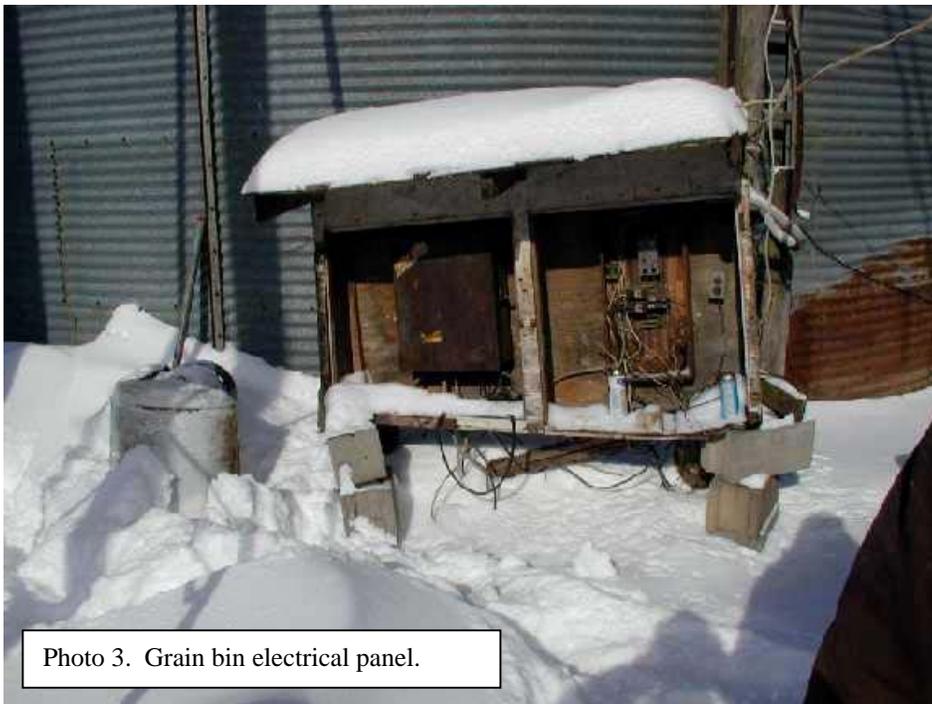


Photo 3. Grain bin electrical panel.

On the day of the incident, the victim was removing all remaining wheat from the bin while the co-workers were working to remove corn from a nearby grain bin to be loaded into a transport truck

operated by the farm owner. As a co-worker came out of the bin containing corn, he heard the drive belt begin to squeal on the drive mechanism in the nearby bin. The drive mechanism has a large electric motor with a pulley that utilizes rubber drive belts to drive the pulley on the end of the auger. Upon hearing the squealing, the co-worker immediately ran over to the power station outside of the grain bin and shut off the power to the motor. He then called to the victim who had been working inside the bin, with no response. He looked inside the grain bin and saw the victim lying on the floor entangled in the middle portion of the 14-foot sweep auger.

The co-worker immediately told the farm owner who called 911. Two co-workers went to the aid of the victim, discovered that the auger had entangled the victim's pants, and proceeded to cut the victim's pants off of the auger shaft. Since one of the victim's legs was under the auger and the other leg was over the auger, the workers backed off the auger so they could remove the victim.

The victim was unconscious with labored breathing when the ambulance crew arrived on the scene. The ambulance transported the victim to a nearby hospital where he was stabilized, and then transported him via emergency helicopter to the nearest major trauma center. The victim was under examination at the major trauma center when he died from his injuries approximately six hours after being found.

At the scene, responding officers noted that there were remnants of the victim's clothing near the center of the auger, where small drive hooks were built into the auger. This friction-driven auger was only two years old and utilized small hook legs on the outside center portion, which "walked" the auger around the circumference of the bin while it was energized. As the auger shaft rotated, these hooks extended past the 4-inch flighting of the auger to make contact in the grain and turn the auger around. Additionally, when the auger reached the floor of the grain bin these legs protruded further than the spiral flighting of the auger. The center portion is where the victim's pant leg became entangled.

Investigators also noted that the final resting place of the victim and the auger was on the opposite side of the grain bin from where small items, including a small notepad, a wristband, glasses and a pen, were located on the grain bin floor. The items had come out during the initial entanglement, suggesting that the victim became entangled in the auger and was dragged halfway around the circumference of the grain bin before the drive mechanism began to squeal.

It is not known why the augers were energized at the time the victim was sweeping inside the grain bin, as normally these augers are turned off while workers are inside the bin. It is believed that as the victim was sweeping the grain bin floor, the sweep auger rotated around the inside of the bin and came up behind him, entangling the material on the back of his pants around the auger flighting.

It is important to note that the sweep auger travels around the grain bin at a faster rate when there is no grain present. This auger is designed to travel at a slow rate when grain is present so that it is moving grain at a uniform rate toward the center discharge auger. The drive hooks that are present only provide traction in loose grain while it is stored in the grain bin. When the grain is removed from the bin these drive hooks contact the concrete floor directly, allowing the sweep auger to move at a faster rate inside the grain bin. This faster rotation rate may have been unfamiliar to the victim

and as he was cleaning inside the bin, he may not have been aware that the sweep auger was approaching behind him at an increased rate of speed.

CAUSE OF DEATH

The cause of death was listed by the medical examiner as multiple injuries.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: *Employers should ensure workers do not enter grain bins while the unloading mechanism is operating.*

Discussion: In this scenario, both the vertical discharge and the sweep augers were energized. The floor could have been swept as efficiently without any unloading augers operating at the time.

Recommendation #2: *Employers should establish lockout/tagout procedures and ensure employees follow them any time a worker enters a grain bin or other confined space.*

Discussion: Establishing and following proper lockout/tagout procedures helps to ensure that augers are not energized when workers are inside grain bins performing maintenance or cleaning. During this incident, it appears that the victim energized the sweep auger himself and then reentered the grain bin. In similar incidents, it is also important to protect workers from having equipment inadvertently energized by other workers, who may not be aware of the location of coworkers.

Recommendation #3: *Employers should provide employees with proper training in lockout/tagout procedures and procedures for safe entry into confined spaces, such as grain bins.*

Discussion: On this particular farm, certain safety training had been done, although there was no lockout/tagout or grain bin safety programs and no locks had been given to workers. Subsequent to this incident, changes are being made to the electrical system and safety training has already begun with the employees at this farm to help prevent future injury.

Recommendation #4: *Farm owners should consider utilizing grain bin and auger designs that can help ensure safety for workers such as self-unloading or bottom-unloading bins*

Discussion: Certain grain bin unloading designs provide additional safety to farm workers. Designs such as self-unloading bins that contain cone bottoms or bottom-unloading grain bins as well as bins that have protected unloading augers provide additional barriers to entanglement. In bottom-unloading grain bins, the unloading auger is built into the floor of the grain bin and grain flows down through that area. Occasionally this design also would need a sweep auger which would only transport the grain to the center of the bin which would then exit down through the center of the floor. Commonly in this style of bin, it is only necessary to sweep the grain to the center of the bin without the use of a sweep auger.

Keywords: *farm, grain bin, auger, entanglement, lockout/tagout, confined space*

The Fatality Assessment and Control (FACE) program is one of many workplace health and safety programs administered by the New York State Department of Health (NYS DOH). It is a research program designed to identify and study fatal occupational injuries. Under a cooperative agreement with the National Institute for Occupational Safety and Health (NIOSH), the NYS DOH FACE program collects information on occupational fatalities in New York State (excluding New York City) and targets specific types of fatalities for evaluation. NYS FACE investigators evaluate information from multiple sources. Findings are summarized in narrative reports that include recommendations for preventing similar events in the future. These recommendations are distributed to employers, workers, and other organizations interested in promoting workplace safety. The FACE program does not determine fault or legal liability associated with a fatal incident. Names of employers, victims and/or witnesses are not included in written investigative reports or other databases to protect the confidentiality of those who voluntarily participate in the program.

Additional information regarding the New York State FACE program can be obtained from:

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Bureau of Occupational Health
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1-866-807-2130

www.health.state.ny.us/nysdoh/face/face.htm