June 12, 2006

Nebraska FACE Investigation NE 2002-17

SUBJECT:

Farm Supply Store Manager Killed When Engulfed by Corn in Grain Bin

SUMMARY:

A 51-year-old farm supply store manager was killed when engulfed by moving corn inside a grain bin at the company's grain mill. The victim and a co-worker (truck driver) were attempting to empty corn from an overhead load-out bin into a truck. As they started to empty the bin, it appeared the discharge chute at the bottom of the bin was plugged by crusted corn. After several attempts to free the plug from below, the victim climbed into the bin with a steel rod to break up the obstruction. The driver stayed outside to close the control gate once the grain started to flow. When the victim broke the obstruction the grain started flowing. The driver attempted to close the control gate, but could not. When the grain broke free, it caused the victim to be drawn down towards the chute. The driver heard a loud sound from inside the bin and the grain stopped flowing again. He climbed to the top of the bin and looked inside for the victim, but could not see him. Help was summoned. The victim was extracted approximately two hours later and declared dead on the scene.

The Nebraska Workforce Development, Department of Labor's Investigator concluded that to help prevent future similar occurrences, employers should:

- Develop, implement, and enforce an emergency action plan.
- Train employees in the recognition and prevention of hazards associated with grain facilities, especially those hazards associated with their own work tasks.
- Train employees on the correct bin entry procedures to include the establishment of a confined space program.
- Provide and train on its use, the proper personal protective equipment (PPE) required for bin entry procedures.
- Establish a Safety Committee and an Effective Written Injury Prevention Program.

PROGRAM OBJECTIVE:

The goal of the Fatality Assessment and Control Evaluation (FACE) workplace investigation is to prevent future work-related deaths or injuries, by a study of the working environment, the worker, the task the worker was performing, the tools the worker was using, and the role of management in controlling how these factors interact.

This report is generated and distributed **solely** for the purpose of providing current, relevant education to employers, their employees and the community on methods to prevent occupational fatalities and injuries.

INTRODUCTION:

On March 20, 2002, at approximately 3:25 p.m., a 51-year-old feed store manager died after he was drawn into flowing corn inside a Chief® overhead load-out grain bin that he and a co-worker (truck driver) were attempting to unload into a truck. The Nebraska Department of Labor was notified of the fatality the following day by the Occupational Safety and Health Administration (OSHA). The Nebraska FACE Investigator met with the investigating OSHA Compliance Officer (CSHO) approximately two weeks later. No site visit was conducted.

The victim's employer had been involved in the grain business for approximately five years when he bought the grain mill, which also included a farm supply store that sold farm-related products in the same town (SIC Code 5153).

The company has been in business for approximately five years. At the time of the mishap the company employed seven employees between both locations, including the victim. The company did not have a written safety and health program as required by State statute. The employer had no previous history of fatalities at either location.

INVESTIGATION:

Victim: The victim was a 51-year-old male. He had been employed by the farm supply store's previous owner since 1992, and remained with the company after the sale in 1998. He normally worked as the feed store's manager, although he did help out at the feed mill when needed. He was considered the second-in-charge of both facilities when the owner was absent and was aware of the daily operations for each facility.

Training: The company did not have a Written Safety & Health Program as required by State statute. The employer stated that he had not provided any written or classroom safety training to any of the employees including the victim, relying on on-the-job instruction instead.

ANALYSIS/SYNOPSIS:

The day prior to the mishap, which was very cold, windy and snowy the employer and victim knew a farmer would need corn the following day. 550 bushels were transferred from a large storage bin into the overhead load-out bin at the grain mill site. On the day of the incident the victim was working at the farm supply store. The employer was in town but away from the incident site.

At approximately 3:15 p.m. a co-worker drove a truck to the mill. The victim went to the mill and weighed the empty truck, then went to the east overhead bin to help the driver load the corn. The victim climbed on the catwalk and opened the control gate for the overhead bin, but only a few kernels of corn came out. The driver stated that the victim opened and shut the bottom of the bin at least ten times, attempting to shake the plugged corn loose. The corn had apparently

formed a “plug” in the discharge chute area, possibly from wet corn drying and forming a crust or “bridge”. The victim received a call on his cell phone, so the truck driver climbed up to the catwalk and also tried opening and shutting the door several times without any success.

In the past, whenever there would be a plug in a bin, the employer would be notified. He would climb up the bin bracing approximately 30 feet to the bin’s bottom and use a rod to unplug the grain from the outside.

The victim told the driver that it was too windy to climb and work from the top of the bin and the driver agreed with him. The victim said he would get a piece of pipe and climb to the top, enter the bin and attempt to dislodge the plug from the inside. The driver said “okay, but be dammed careful”. The victim knew where there was a 10 foot section of pipe they sometimes used to unplug the grain, so he climbed down and went to retrieve it. After returning with the pipe, he told the driver to leave the discharge chute wide open, when the victim “hit” the plug and the grain was flowing freely, to shut it. The wind was blowing very hard, making verbal communication difficult with the wind blowing between the metal bins.

The victim climbed up the bin and entered from the top, climbing down the inside ladder to the corn without a harness and lanyard attached to an appropriate anchor point. The victim began prodding at the corn, attempting to find the “plug” and free the corn. The driver stated that the grain began to exit the bin at approximately ¼ to ½ its capacity for a short period, then started flowing to its full capacity. The driver attempted to close the control gate by turning the wheel handle once or twice. At this same time he heard a loud “bang” from inside the bin, like metal hitting on metal. The driver was unable to stop the grain flow. It is believed that if the plug was in the chute, the metal rod may have been inside the chute, hindering the control gate from closing all the way. The driver opened the control gate all the way again and just a few kernels came out, then stopped flowing altogether. He again tried to shut it, but it would not move.

It is believed that when the grain began to flow, the victim was drawn downward into the bottom of the bin towards the discharge chute. The victim’s leg became wedged under his body, plugging the chute opening, causing the grain to stop flowing. Seeing the grain flow slowing down, the driver again attempted to close the control gate but was unable to do so. The bin initially held 550 bushels of corn and approximately 250 bushels was dumped into the truck, leaving approximately 300 bushels inside the bin.

The driver climbed down from the catwalk and went to the top, banging on the bin in an attempt to communicate with the victim. Unable to see any sign of the victim inside the bin he left to go get help.

The driver notified another co-worker (worker #3) of the situation and he ran to the bin. Worker #3 climbed to the top of the bin, looking inside for the victim but couldn’t locate him. He asked the driver if he was sure the victim was still inside the bin because he couldn’t see him. From his vantage point he looked over the mill site for the victim. The driver said he had to still be inside. When worker #3 looked inside again he saw approximately three feet of the metal rod sticking out of the grain. He climbed down the bin’s internal ladder into the bin, noticing a tether rope attached to the ladder, with the other end in the corn pile. He pulled on the rope, but nothing was attached. Worker #3 tied the rope to himself, grabbed the metal pipe and began to probe the grain. He probed twice and shouted to the driver that he had hit something solid which may be the victim. He probed a third time to see how deep the corn was to the victim, which was about three feet. Worker #3 attempted to dig to the victim, but there was nowhere to move the grain to prevent it from flowing back. He climbed out of the bin and told the driver to go call 911.

The local rescue unit was notified, but initially went to the wrong facility, although the driver reported telling the 911 operator three times which facility to go to. He also notified the company owner. The owner immediately drove to the incident site. He climbed up the bin bracing to the bottom of the bin and was able to see the victim's body in the discharge chute.

The fire department arrived approximately 15 – 20 minutes after the initial 911 call. The owner told them of the victim's location. They placed a ladder against the bin, looked at the victim then came back down. They discussed what they should do, and decided to use an air chisel to cut open the bin which would allow the grain to empty out. They did have a metal cutting chop saw, but were afraid of starting a fire due to the sparks and heat it would generate cutting the metal.

After approximately 30 minutes of air chiseling, they were able to open a 3 inch slice in the bin which allowed the corn to start dumping. Approximately 1 ½ hours after the initial incident, someone brought a personnel hoist to the bin, which they used to retrieve the victim's body approximately two hours after the incident.

CAUSE OF DEATH:

According to the death certificate, the cause of death was: *Suffocation*.

RECOMMENDATIONS/DISCUSSION:

- **Recommendation #1: The employer should develop, and implement, and enforce an emergency action plan.**

  Discussion: The victim's employer did not have an emergency action plan in accordance with established OSHA general industry standards. The standard requires the employer to develop and implement an emergency action plan. The emergency action plan covers those designated actions employers and employees are to take to ensure employee safety from fire and other emergencies, i.e. grain engulfment, etc. 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.

  This 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.

  It is also recommended that employers seek the assistance of the local fire department for the purpose of pre-planning for emergencies. Pre-planning 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.
  29 CFR 1910.38 & 29 CFR 1910.272(d)

- **Recommendation #2: The employer should train employees in the recognition and prevention of hazards associated with grain facilities, especially those hazards associated with their own work tasks.**

  Discussion: No formal training had been accomplished for any employee, no matter what their normal work tasks were. 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.

  No-cost safety training is available through the Nebraska Workforce Development's OSHA Consultation Program. They can be contacted by calling (402) 471-4717.
  29 CFR 1910.272(e)(1)-(2)

- **Recommendation #3: The employer should train employees on the correct bin entry procedures to include the establishment of a confined space program.**

  Discussion: In order to assure that employers maintain control over employee entry into bins, silos, and tanks, OSHA requires 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.
29 CFR 1910.272(g)(1)

- **Recommendation #4: The employer shall provide and train on its use, the proper personal protective equipment (PPE) required for bin entry procedures.**

  Discussion: 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 connected to an appropriate anchor point or a boatswain's chair with a lifeline when entering from the top. In addition, a winch system with mechanical advantage (either powered or manual) would allow better control of the employee. Such a system would allow the observer to remove the employee easily without having to enter the space.

  A hand-held hoist line, like or similar to the one being used in the incident bin, should not be used because it gives a false sense of security and is not safe. There is nothing to prevent the worker from being pulled into the flowing grain if he loses his grip.

  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. 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.
  29 CFR 1910.272(g)(2)-(4)

- **Recommendation #5: Establish a Safety Committee and an Effective Written Injury Prevention Program.**

  Discussion: Although not required by Federal law, the State of Nebraska does require each company that carries Worker's Compensation insurance on their employees to have a Safety Committee and an Effective Written Injury Prevention Program.

  Nebraska's Workplace Safety Consultation Program was brought about by Legislative Bill 757 (LB 757) in 1993. It mandated that employers:

  1. Form a Safety Committee that consists of equal membership representing management and employees. The purpose of the committee is to bring employees and employers together in a non-adversarial, cooperative effort to promote safety at each worksite. They shall meet every three months at a minimum and maintain records of each meeting.

2. The Safety Committee shall develop an Effective Written Injury Prevention Plan that addresses all work sites and all classes of workers. Programs required include, but are not limited to, *Emergency Action Plan*, *Fire Prevention Plan*, *Confined Space Program*, *Lock-Out/Tagout*, etc. Each program shall approach each category of workplace danger with the intention of totally preventing workplace injuries where feasible.

Assistance to develop these programs is available free of charge through the Nebraska Workforce Development's Department of Labor On-Site Consultation Program in Lincoln.
Nebraska State Statute 48-443 to 48-447, and Rules & Regulations, Title 230, Chapter 6.8

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