March 17, 2000

Nebraska FACE Investigation 99NE028

SUBJECT:

Farm Youth Suffocated in Corn Bin

SUMMARY:

A 15-year-old male was killed while working on the family farm. He had crawled into a 20,000 bushel corn bin, through a door on the top. He had gone in to scoop corn away from the front lower door of the grain bin so a sweep auger could be installed. The bin had corn in it which sloped from the sides to the center take-out. The center take-out area was empty while the corn on the sides of the bin was approximately seven feet high. Coworkers thought the victim had exited the corn bin but hadn't seen or heard from him in about 30 minutes. He was found in the bin, in a sitting position, under approximately four feet of corn. Emergency personnel were called and coworkers performed CPR while waiting for them to arrive. Emergency personnel continued resuscitation efforts upon their arrival, but they were unsuccessful.

The Nebraska Department of Labor Investigator concluded that to prevent future similar occurrences employers should:

* identify grain storage bins as confined spaces and workers should follow confined space entry procedures when entering bins.

* ensure personnel are wearing a safety harness and a lifeline attached to a fixed external anchor to keep them at a level at or above the level of stored grain products and that a coworker is stationed outside a bin whenever a worker enters a bin.

* ensure all equipment which presents a danger to employees is locked-out, blocked-off, or otherwise prevented from operating.

* ensure that visual and/or audible communications be maintained between a worker entering a bin and the observer stationed outside the bin.

* provide and have in place equipment for rescue operations which is specifically suited for the task being conducted.

* develop, implement and enforce a comprehensive safety program that includes, but is not limited to, training in all hazard identification, avoidance, and abatement.

PROGRAM OBJECTIVE:

The goal of the Fatality Assessment and Control Evaluation (FACE) workplace investigation is to prevent work-related deaths or injuries in the future 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 August 9, 1999, at approximately 4:20 p.m., a 15-year-old farm worker was killed when he became engulfed in corn in a grain silo at his family farm. The Nebraska Department of Labor became aware of the fatality on August 10, 1999, via the radio and newspaper. The Nebraska FACE Investigator conducted a site visit on September 7, 1999. Law enforcement reports concerning the incident were also obtained and used in preparing this report.

The incident happened on a family farm which has been in business for approximately 25 years. It has been at its present location for approximately 19 years. Five family members are employed on the farm. The victim, the owner's son, had worked on the farm for several years doing various tasks. The farm does not have a written safety program. The victim did take an agricultural safety class in the eighth grade. This was the first fatality at this farm.

INVESTIGATION:

On the afternoon of the incident, the victim and coworkers were loading corn onto trucks from a grain bin. The incident grain bin is 36 feet in diameter and 24 feet high, and holds 20,000 bushels of grain. It has a ladder going up the outside to a top entry hatch and a ladder on the inside wall from the hatch to the bottom of the bin. (see figure 1) It also has an entry door at the bottom several feet to the right of the external ladder. Worker 1 (the victim) entered the grain bin by climbing the external ladder and opening the top entry hatch. According to coworkers (workers 2 and 3) he had entered the bin to sweep away corn from the front lower door of the grain bin. He was doing this in order to install a sweep auger to remove the remaining corn from the bin.

Worker 2 stated he heard the victim banging on the side of the bin after he entered and thought he was scooping corn away from the edge of the bin or that he was just letting him know he was in there. Worker 2 finished filling his truck, which took approximately 15 to 20 minutes, and before moving his truck told worker 3 that worker 1 was still in the bin. Worker 2 then moved his truck. Worker 3 stated he opened the lower door to the bin and didn't see the victim and assumed he had crawled back out. Worker 3 went in the bin, removed a cone, and then drove his load to town. He stated he was gone for approximately 30 minutes. When he returned, worker 2, who was beginning to load another truck, asked him if he had seen worker 1. Workers 2 and 3 looked in the bin and at this time saw a leg sticking out of the corn. Worker 2 went for help and worker 3 began digging worker 1 out of the corn. Worker 1 was found about six feet from the lower door in a sitting position under approximately four feet of corn. Worker 3 began CPR efforts. Rescue personnel arrived and transported worker 1 to the hospital where he was pronounced dead at 5:34 p.m.

This particular grain bin has a center takeoff and a secondary takeoff close to the edge of the bin. (See figure 2) When worker 1 entered the bin the corn was estimated to be around seven feet high at the outer edge of the bin, slanting down to the bottom of the bin at the center takeoff (see figure 3).

Apparently worker 1 climbed down the interior ladder in the bin to scoop corn from the door in order to install a sweep auger to the center takeoff. Since there were no witnesses, what happened once he was in the bin is speculation. It is possible worker 1 fell from the ladder and started the corn moving, which could have engulfed him. It is also possible he could have made it down the ladder and began shoveling the corn from the door, which could also have caused the corn to move and

engulf him. Another possibility is that he could have been pulled into the corn when the auger was running and corn was being extracted from the secondary takeoff. A remote possibility could be that the corn had bridged, or partially bridged and worker 1 fell through it and was then engulfed in the corn. This is doubtful however, since a law enforcement officer who responded to the incident said he didn't notice any clumps of corn stuck to the side of the bin. There was no indication of bruises or any other injuries to worker 1. An autopsy was performed and indicated the cause of death was suffocation.

CAUSE OF DEATH:

The cause of death, as stated on the death certificate, was compressive hypoxia.

RECOMMENDATIONS/DISCUSSION:

Recommendation #1: **Employers should identify grain storage bins as confined spaces and workers should follow confined space entry procedures when entering bins.**

Discussion: The entry procedures for grain storage structures are listed in 29 CFR 1910.272(g). Recommendations #2 through #6 are some key components of entry procedures into grain storage structures.

Recommendation #2: **Employers should ensure personnel are wearing a safety harness and a lifeline attached to a fixed external anchor to keep them at a level at or above the level of stored grain products and that a coworker is stationed outside a bin whenever a worker enters a bin.**

Discussion: Had worker 1 been wearing a harness and lifeline and a coworker was stationed where he could observe him, he could have been kept above the corn. Also, had he fallen into the corn, the harness and lifeline would have aided in the rescue of worker 1. 29 CFR 1910.272(g)(2) states in part, "Whenever an employee enters a grain storage structure from a level at or above the level of stored grain or grain products, or whenever an employee 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..." The bin had a sufficient quantity of corn to pose a significant engulfment hazard.

Recommendation #3: **Employers should ensure all equipment which presents a danger to employees is locked-out, blocked-off, or otherwise prevented from operating.**

Discussion: In accordance with CFR 1910.272(g)(1)(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." Had the auger been deenergized this may have prevented the corn from engulfing worker 1.

Recommendation #4: **Employers should ensure that visual and/or audible communications be maintained between a worker entering a bin and the observer stationed outside the bin.**

Discussion: Part of the entry into grain storage structures procedures listed in 29 CFR 1910.272(g)(3), requires that the observer stationed outside the bin must maintain communications (visual, voice, or signal line) with the worker entering the bin. If communications are lost, the situation must be evaluated and rescue procedures initiated as appropriate.

Recommendation #5: **Employers should provide and have in place equipment for rescue operations which is specifically suited for the task being conducted.**

Discussion: According to 29 CFR 1910.272(g)(4), "The employer shall provide equipment for rescue operations which is specifically suited for the bin, silo, or tank being entered." No equipment for rescue operations (such as a tripod with winch or a fixed or portable support arm with a winch) was available. A support arm with a winch that slips into a channel for rescue operations would be a viable solution. A channel could be installed on all bins, by the top entry hatch, and the support arm and winch could be moved from bin to bin as needed. Recommend rescue equipment such as this (or a tripod system) be procured for rescue operations.

Recommendation #6: **Employers should develop, implement and enforce a comprehensive safety program that includes, but is not limited to, training in all hazard identification, avoidance, and abatement.**

Discussion: Research has indicated that workers in farming occupations are at increased risk for serious injury and death in the workplace. Training in recognizing and avoiding hazards should be given to all workers, regardless of the number of workers/employees. Written procedures for entry into grain storage structures should be developed and all workers should be trained in these procedures.

NOTE: This incident happened on a small privately owned farm that does not fall under OSHA jurisdiction. However, the OSHA standards, which are referenced in the above recommendations, are accepted guidelines for safe entry into grain structures. Even though a business may not be subject to OSHA jurisdiction it is recommended that OSHA guidelines be followed to enhance safety in the workplace.

REFERENCES:

Office of the Federal Register, National Archives and Records Administration, Code of Federal Regulations, Labor, 29 CFR 1910.272, July 1998.

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