The National Institute for Occupational Safety and Health (NIOSH)

Farm Worker Dies After Being Engulfed In Wheat In Semi-Truck Box in Minnesota

Minnesota FACE00MN036

SUMMARY

A 19-year-old male farm worker (victim) who worked as a truck driver died after he was engulfed in wheat in a truck box. The truck was a belly-dump semi-truck. The victim and coworker each drove semi-trucks that were full of recently harvested wheat to a farm site. The victim stopped his truck at a bin site and together the two workers prepared to unload the truck. At the bin site were several grain augers that were used to transfer the wheat from the trucks to storage bins. The intake end of an auger known as a swing auger was mounted on small rollers and was rolled into position under the unloading door of the rear compartment of the truck box. The workers then removed a canvas cover from the top of the truck. Then they started the unloading augers and partially opened the unloading door of the rear compartment.

After the wheat began to flow from the truck they climbed a ladder mounted to the back of the truck and sat on the edge of the truck box. While they sat on the edge of the box and watched the wheat flow from the truck, the victim entered the box and walked in the flowing wheat. When the truck box was about one-third emptied the victim realized he was being pulled into the wheat. The coworker grabbed the victim's hand but was unable to pull him from the box. He climbed down the ladder on the back of the truck, closed the unloading door and stopped the auger. He climbed the ladder to help the victim but found that he was completely submerged in the wheat. The coworker yelled to others at the farm site and a call was made to emergency personnel who arrived at the scene shortly after being notified. They administered oxygen to the victim while they freed him from the grain. He was transported to a local hospital where he was pronounced dead on arrival. MN FACE investigators concluded that, in order to reduce the likelihood of similar occurrences, the following guidelines should be followed:

- workers should never enter grain hauling equipment or a grain storage structure when the equipment or structure is being emptied;
- all grain handling equipment should be stopped and the power source locked out before workers enter grain hauling equipment or grain storage structures;
- the grain box of grain hauling equipment should be identified as a confined space and posted with hazard warning signs; and
- inexperienced workers should be provided comprehensive safety training for all work tasks and associated hazards.

INTRODUCTION

On August 28, 2000 MN FACE investigators were notified of a farm work-related fatality that occurred on August 25, 2000. The county sheriff's department was contacted and a releasable copy of their report of the incident was obtained. On September 20, 2000 a MN FACE investigator met with personnel from the national agency that arranged for the victim to learn about American agricultural practices by working on a host farm in the United States. A site investigation was conducted by a MN FACE investigator on December 19, 2000. During MN FACE investigations, incident information is obtained from a variety of sources such as law enforcement agencies, county coroners and medical examiners, employers, coworkers and family members.

INVESTIGATION

On the day of the incident, the victim and a coworker were unloading a semi-truck load of wheat at a farm site. Both individuals were residents of South Africa and had come to the United States to learn about American agriculture by actively working on a "host" farm. A national nonprofit organization located in Minnesota accepts applications from foreign farm workers who want to work on U.S. farms and assigns them to "host" farms. The national organization identifies and maintains a list of farm owners who have agreed to provide foreign workers with an opportunity to work on their farms and learn about U.S. agricultural practices and procedures. The national organization provides several days of classroom orientation to each foreign worker upon their arrival in the U.S. Orientation includes a discussion of general safety issues associated with farm work but does not provide specific training for machines and equipment that workers may operate during their stay at a host farm. Host farm owners provide workers with on-the-job training necessary to operate specific machines and equipment and discuss safety issues associated with those machines and equipment.

The victim arrived in the United States on February 28, 2000 to work for one year on assigned farms. Initially, he was assigned to a farm in South Dakota where he worked for about three months. He then transferred to a farm in Minnesota where he worked from June, 2000 until the time of the incident. The host farmer from Minnesota operated a large grain and livestock farm. Primary crops grown on the farm were corn, soybeans and hay. The farm's livestock operation consisted of feeding beef cattle for sale to commercial meat packing plants. The host farmer also owned and operated a "for hire" grain harvesting business. During the summer months, the farmer, his son and several other workers harvested wheat in states throughout the central part of the U.S. Several combines, trucks and other equipment were transported to the southern U.S. in early June where they were used to harvest wheat in Texas and Oklahoma. The workers and equipment moved north through Kansas, Nebraska, South Dakota and Minnesota as wheat matured later in the summer in those states.

The victim worked primarily as a semi-truck driver of the wheat harvesting crew since the time he began working for the Minnesota farmer. The semi-truck associated with this incident was a belly-dump semi-truck that was designed for hauling grain. The truck box was 42 feet long, 8 feet wide and had sides that were 5.5 feet high. The truck box was divided in the middle which resulted in two compartments that were each 21 feet long. The bottom of each compartment was slanted from all four sides which caused grain to flow by gravity to a sliding horizontal unloading door located at the bottom of each compartment. The horizontal unloading door was 16 inches above the ground. The vertical height of each compartment from the horizontal unloading door to the top of the box was approximately 9 feet. The capacity of each compartment was about 460 bushels.

The victim and coworker each drove semi-trucks that were full of wheat from a wheat field that had just been harvested to a farm site. The victim stopped his truck at a bin site and together the two workers prepared to unload the truck. At the bin site were several grain augers that were used to transfer the wheat from the trucks to several storage bins. The intake end of an 8 inch diameter auger known as a swing auger was mounted on small rollers and was rolled into position under the unloading door of the rear compartment of the truck. The workers then removed a large canvas cover from the top of the truck to prevent it from being pulled into the truck box as the wheat flowed from the truck. Then they started the unloading augers and partially opened the unloading door of the rear compartment.

After the wheat began to flow from the truck box they climbed a short steel ladder mounted to the back of the truck box and sat on the edge of the truck box. While they sat on the edge of the box and watched the wheat flow from the truck, the victim entered the box and began to walk in the flowing wheat which had flowed into a funnel shape as the truck emptied. When the truck box was about one-third emptied, the victim realized that he was being pulled into the wheat. The coworker grabbed the victim's hand but he was unable to pull the victim from the box. He climbed down the ladder mounted to the back of the truck, closed the unloading door and stopped the unloading auger. He climbed the ladder to help the victim but found that he was completely submerged in the wheat. The coworker yelled to others at the farm site and informed them that the victim was submerged in wheat in the truck box.

A call was made to emergency personnel who arrived at the scene shortly after they were notified. They administered oxygen to the victim while they freed him from the truck. The victim was transported to a local hospital where he was pronounced dead on arrival.

CAUSE OF DEATH

The cause of death listed on the death certificate was suffocation due to aspiration in grain (wheat).

RECOMMENDATIONS/DISCUSSION

Recommendation #1: Workers should never enter grain hauling equipment or a grain storage structure when the equipment or structure is being emptied.

Discussion: Whenever grain is removed from grain hauling equipment or storage structures, the flow of the grain creates a funnel on the surface of the grain. The flow of grain is from all points on the surface of the funnel until the grain reaches the center of the funnel. At the center of the funnel the flow is straight down toward the exit opening at the bottom of the equipment or structure. The appearance of grain flowing slowly toward the center of it's funneled surface may not appear hazardous, however the flow becomes faster and very hazardous at the center of the funnel. A worker standing in flowing grain at the center of the grain's surface funnel may quickly become immersed to their waist at which point escape is impossible and total engulfment imminent. In this incident, after wheat began to flow from the truck box the victim and coworker climbed a ladder on the back of the truck and sat on the edge of the box. The victim stood up and for no apparent reason began walking in the wheat as it flowed from the truck. He suddenly realized that he was being pulled into the flowing grain and was completely submerged before the flow of grain could be stopped. Suffocation in flowing grain can be prevented if workers never enter grain hauling equipment or grain storage structures if grain is flowing from the equipment or structure.

Recommendation #2: All grain handling equipment should be stopped and the power source locked out before workers enter grain hauling equipment or grain storage structures.

Discussion: Under normal grain conditions, it is never necessary for workers to enter grain hauling equipment or grain storage structures while the equipment or structure is being emptied. If conditions change and a worker must enter grain hauling equipment or a storage structure, all grain handling equipment should be stopped and the power source locked out before workers enter. Flowing grain acts similarly to quicksand and creates forces that are so great that once a worker is waist deep in the grain, he or she will be unable to escape even with the aid of a safety rope. Typical auger unloading rates are high enough that a worker may be pulled below the surface of the grain in less than 20 seconds. Because of these hazards, all grain handling equipment should be stopped and the power source locked out before workers enter grain hauling equipment or grain storage structures. Power sources should be locked out to ensure that unloading equipment cannot start accidentally or be started inadvertently by someone else. This may require locking out all electrical circuits that operate electric motors, removing ignition keys from tractors or removing spark plug wires from gasoline engines.

Recommendation #3: The grain box of grain hauling equipment should be identified as a confined space and posted with hazard warning signs.

Discussion: The grain box of grain hauling equipment meets the NIOSH definition of a confined space. A space is considered "confined" if it has any one of the following characteristics: (1) limited openings for entry and exit; (2) unfavorable natural ventilation; or (3) is not designed for continuous worker occupancy. Entrance into confined spaces are addressed in NIOSH Publication No. 80-106 (Working in Confined Spaces). Warning signs to alert farm workers of the hazards associated with a confined space and flowing grain should be posted on the exterior of grain boxes. In addition, if entrance into the grain box of grain hauling equipment is necessary, workers should follow confined space entry procedures such as those described in NIOSH Publication No, 80-106.

Recommendation #4: Inexperienced workers should be provided comprehensive safety training for all work tasks and associated hazards.

Discussion: Many fatal and nonfatal occupational injuries could be prevented if all employees and workers were provided comprehensive safety training. Comprehensive safety training should address all aspects of safety related to specific tasks that workers are required to perform. In addition, workers should be trained to recognize and avoid hazardous work site conditions. The victim of this incident was from a foreign country and due to inexperience may not have been aware of specific hazards associated with large scale U.S. agricultural practices. Although he had been provided several days of orientation upon his arrival and general on-the-job training by the host farmer, he was not aware of the hazards associated with flowing grain. Workers should be trained to recognize, control, avoid and if possible, eliminate hazardous work conditions associated with their work environment and the tasks they are required to performed.

REFERENCES

1. NIOSH (1979). Criteria For a Recommended Standard: Working in Confined Spaces. Morgantown, WV: U.S. Department of Health, Education, and Welfare, Public Health Service, Centers for Disease Control, National Institute for Occupational Safety and Health, DHEW (NIOSH) Publication No. 80-106. Available online: https://www.cdc.gov/niosh/docs/80-106/ (Link updated 4/13/2015)

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