FACE 98IA048

To: Director, National Institute for Occupational Safety and Health

From: Iowa FACE Program

Subject: Farmer falls to his death from a combine during maintenance

Summary

A 74-year-old Iowa farmer fell to his death while getting his combine ready for an auction sale. He had retired one year ago, rented out his land, but was still living on the farm. He was now selling the remaining farm machinery and equipment. He was doing maintenance work on a 1969 model combine which was sitting in his farm yard on a concrete patch adjacent to a corn crib. He needed to add antifreeze to the radiator which is located on the right side of the engine on top of the combine. To perform this task he needed to climb on top of the combine using the stationary service ladder on the right side of the machine, then stand on the top steps of the ladder or the maintenance platform behind the engine area. There are no guardrails at this location on this machine. The events were not witnessed, but it appears the man fell from the ladder or platform and received fatal head injuries while falling to the concrete patch in the narrow space between the combine and the crib wall. There was antifreeze dripping from the top of the machine so it appears that he fell or slipped while climbing up, pouring, or climbing down after pouring antifreeze into the radiator. There were no obvious protrusions on the combine or the crib wall which could have caused the head injuries. There were some fist-sized stones on the old worn concrete surface, and they could have contributed to the head injury. This was a hot morning and the temperature may be a contributing factor also. The victim had diabetes, although it was well under control and had not previously caused dizzy spells. He was last seen approximately 10:00 a.m. by his wife and was found lying unresponsive between the combine and the wall at approximately 1:45 p.m.

Recommendations based on our investigation are as follows:

1. *Machinery manufacturers should provide safe service ladders with handholds for safe access to elevated service areas.*

2. *Machinery manufacturers should provide adequate fall protection at elevated service platforms.*

3. *Workers should take extra precaution while working on older machinery which lacks safety features.*

Introduction

The fatality occurred on August 18 on a North-Western Iowa farm. The 74-year-old farmer had retired a year ago, rented out his land, and was living on the farm with his wife. He was now getting ready to sell the remaining farm equipment in an auction sale. The combine was located in the farmyard on a concrete patch on the south side of a corn crib building. The combine was parked close to the crib wall; the distance between being about two feet. He was in the process of maintaining the machine to ensure it was in working order for the sale. This maintenance included filling the radiator with antifreeze. There had been a minor leak in the cooling system before, and the machine had not been used in a long while. The farmer was last seen by his wife about 10:00 a.m. She went to town and returned about 12:55 P.M., then soon became aware that her husband had not been in the house for lunch. She called a neighbor who arrived to help her look around the farm. Around 1:50 they found the farmer lying between the combine and the corn crib wall, unresponsive. She called the ambulance at 1:55 P.M., but her husband had obviously died sometime earlier from head injuries.

Investigation

The Iowa FACE Program learned about the fatality from a newspaper. Additional information was received from the County Sheriff's reports and the autopsy report. One FACE investigator and a research assistant visited the farm site and interviewed the victim's wife. The combine had been sold after the injury and was now at another farm site five miles away. The investigators visited this location as well, made observations and photographed the machine.

The combine was a three-row, self-propelled combine, 1969 model, designed for corn harvesting. It had evidence of wear and tear typical for a combine of this age, however, it appeared to be in fair working order. The engine, radiator, and batteries on this machine were on top, behind the grain tank, which is typical for most combines. A service ladder was located on the right side of the combine and lead to the back of the engine area. To access the radiator cap, the operator must climb on top of the combine and stand either on the last steps which curve towards the center of

the machine or on top of the combine chassis which forms a service platform. The ladder helps getting up on top, however, was not up to the best current standards, such as ASAE S318.13, Section 8. The height of the first step was approximately 710 mm. (28 in.), the usable width of the steps was 280 mm. (11 in.), and the height of the top of the ladder and the service platform was approximately 2,130 mm. (86 in.). The steps were made of smooth metal which was not slip-resistant. There were no guardrails on top of the combine around the service area. To pour antifreeze into the radiator, the worker must stand near the edge of the combine without adequate fall protection. It appears difficult to find solid footing to have adequate support to maintain good balance while pouring antifreeze, considering that both hands may be needed to hold the antifreeze container.

It is not known whether the farmer fell down during climbing up with the antifreeze container, pouring antifreeze into the radiator, or climbing back down to the ground. From his injuries it seems likely he fell from the work platform or top of the ladder. The antifreeze container was found on the ground behind his feet. He was lying between the combine and the corn crib near the service ladder with head towards the front of the combine. Some antifreeze was still dripping from the machine. It is possible that some of the antifreeze had spilled on the steps making them slippery. Some spillage during pouring could be expected since no funnel appeared to have been used. The farmer was wearing his usual six-inch brown leather work boots, which did not appear to contribute to the slipping hazard.

The narrow space between the combine and the corn crib wall may have made climbing somewhat difficult. On the other hand, the wall was close enough that in some circumstances it could have been within reach and provided a solid place of support in case the worker was about to loose balance on top of the machine. Holding the antifreeze container in one hand makes it difficult to maintain a safe three-point connection at all times when climbing. The narrow space between the machine and the corn crib wall may have contributed to falling from the steps, as sudden bumping against the wall could push a man off balance.

The farmer was a diabetic and was taking regular medication, although his condition had not caused dizzy spells previously. Considering the day was quite hot, the machine being on the south side of the building, and the considerable effort climbing on top of the machine, perhaps repeatedly, it is possible that a fainting episode did occur, however, there is no evidence to support or rule this out. Another consideration discussed during the interview was the man's eye sight, but although he needed glasses for reading, it is not likely that his eye sight contributed to missing a step.

Cause of Death: *Massive skull fracture with subdural and subarachnoid hemorrhage.*

Recommendations/Discussion

Recommendation 1. *Machinery manufacturers should provide safe service ladders with handholds for access to elevated service areas.*

Discussion: The service ladder in this machine had a fairly high first step, approximately 710 mm (28 in.). According to ASAE standard S318.13, 8.5.1. “The height of the first step should not exceed 686 mm (27 in.), preferably 550 mm (21.6 in.)”. The handholds at the top of the machine were not adequate to maintain good balance while moving from the ladder to the service platform, especially when carrying tools or fluid containers. Handholds should extend above the top of the ladder. The steps were made of smooth iron. A more slip resistant surface would be preferred.

Recommendation 2. *Machinery manufacturers should provide adequate fall protection at elevated service platforms.*

Discussion: The service platform area on top of the combine did not provide adequate fall protection. According to ASAE S318.13, 8.*4 “Handholds, handrails, guard rails, or barrier type safeguards shall be provided, if necessary, to minimize falling during normal operation or servicing, unless similar protection is provided by other parts of the equipment”.* Furthermore, S318.13, 8.4.1 states: *“Guardrails when provided shall have a top rail 1000 to 1100 mm (39.4 to 43.3 in.) above the working walkway or platform with a rail approximately midway between the platform and the top rail”.* The engine compartment provided adequate fall protection to the front, however there was a considerable risk of falling to the sides of the combine during daily maintenance such as checking the oil and coolant levels. The height of the service platform was approximately 2,180 mm (7’2”), and the possibility of falling from this elevation makes fall protection necessary. While the evidence is not clear whether the service ladder or the service platform characteristics contributed to the fall, following these principles is necessary to avoid falls from large machinery overall.

Recommendation 3. *Workers should take extra precaution while working on older machinery which lacks safety features.*

Discussion: Fall protection and other safety features have improved in farm machinery over the years. However, many older machines with inadequate safety features are still widely in use. It may not be economically or technically feasible to install new safety features such as ladders or guardrails on older machinery. Therefore, farmers should learn to take extra precautions while working with older machinery. While newer combines may have better ladders and better fall protection on service platforms, the size of the machines has increased and the fall hazard still is inherent with any maintenance or service work, as well as just climbing in an out of the cab. Safety education programs should include components regarding the falling hazard related to combines.

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Fatality Assessment and Control Evaluation

FACE

FACE is an occupational fatality investigation and surveillance program of the *National Institute for Occupational Safety and Health* (NIOSH). In the state of Iowa, *The University of Iowa*, in conjunction with the *Iowa Department of Public Health* carries out the FACE program. The NIOSH head office in Morgantown, West Virginia, carries out an intramural FACE program and funds state based programs in Alaska, California, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Oklahoma, Texas, Wisconsin, Washington, and Wyoming.

The purpose of FACE is to identify all occupational fatalities in the participating states, conduct in-depth investigations on specific types of fatalities, and make recommendations regarding prevention. NIOSH collects this information nationally and publishes reports and Alerts, which are disseminated widely to the involved industries. NIOSH FACE publications are available from the NIOSH Distribution Center (1-800-35NIOSH).

Iowa FACE publishes case reports, one page Warnings, and articles in trade journals. Most of this information is posted on our web site listed below. Copies of the reports and Warnings are available by contacting our offices in Iowa City, IA.

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