TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Program

SUBJECT: Farmer crushed to death while changing U-joint on older farm truck-- Iowa.

SUMMARY: A 51 year old farmer was killed while working under a farm grain truck. The truck was over 20 years old and had a noisy universal joint that needed repair. The man drove the truck next to a corn crib away from the wind on dry ground, which was slightly sloping away from the building. He set the parking brake, put the transmission in neutral, and proceeded to remove the driveshaft and U-joint immediately to the rear of the transmission. He was lying parallel to the truck, on the ground with his head towards the front of the truck. No chocks were put under the wheels, only the parking brake was used.

As the victim removed the last bolt of the U-joint, the drive shaft spun out of his hands and hit the victim in the neck and face area. The truck started rolling down the slope and stopped with the front axle crushing the victim's chest. He was not found until 30-40 minutes later when a relative saw him under the truck and noticed that he was not moving. A tractor front end loader was used to raise the front of the truck to access the victim. CPR was attempted, but he was dead at the scene.

It was determined later that the parking brake on this truck was connected to the transmission, and acted through the drive shaft. This break became ineffective when the driveshaft was disconnected from the transmission and the truck was free to roll backwards down the incline. The victim obviously assumed that the parking brake locked the rear wheels.

RECOMMENDATIONS following our investigation were as follows:

1. Workers should always chock the wheels when working on a vehicle that is left on an incline.
2. Trucks should be repaired in a shop equipped to repair large vehicles.
•3. Vehicle manufacturers should avoid parking brake construction which operates through the driveline, and does not effect the wheels directly.

INTRODUCTION

On November 4, 1995 a 51 year old Iowa farmer was killed while working under his grain truck, which rolled down a slight incline pinning him to the ground. The Iowa FACE Program became aware of the incident a few days later by a newspaper article and began an investigation. Other information was gathered from the victim's brother, newspaper articles, the police report, and coroner's report. A site visit was conducted on November 16 by two investigators from the Iowa FACE program and photographs were taken.

The victim was a partner in a 1400 acre farm operation raising hogs, cattle, stock cows, chickens and turkeys. Although others were at the farm when the accident occurred, the victim was working alone under the truck. The truck had recently been in the shop for maintenance. However, there was a noise in the driveline, which was not repaired at the shop, and the victim had discussed with his brother about fixing the U-joint. They had purchased the parts, a driveshaft bearing and U-joint parts, for the repair. On the day of the incident the victim had a lot of help on the farm finishing harvest. He had some free time and decided to fix the driveline.

INVESTIGATION

The victim was planning to change the worn universal joint on his 1973 Chevy grain truck. This joint was located directly behind the transmission. Since it was a chilly day, he drove the truck next to a corn crib to get out of the wind, put on the truck's parking brake, and put the transmission in neutral. In this location the ground was dry to work under the truck, and sloped away from the building to the truck's rear. He was earlier told by his son, who is a mechanic, to put the transmission in neutral so the driveline linkage would be free to work on. He crawled under the truck, with his head towards the front, and began to remove the U-joint. He did not use wheel chocks or other means to secure the truck, assuming that the parking brake was connected to the rear brakes.

When he loosened the U-joint sufficiently, the assembly apparently spun out of his hands and hit him in the neck and face area. There were wounds visible on one side of his face that indicate this. Once the joint was disconnected there was nothing to stop the truck. It rolled down the slight incline and the front axle pinned the man to the ground in the chest region. The victim was a large man, and he was heavily clothed for the weather. The clearance from the axle to the ground was measured at 10 inches, and this was enough to crush the man's chest and prevent his escape. Lack of any signs of struggle indicate that he may have been knocked unconscious from the initial blow of the spinning shaft and U-joint.

The victim was pinned under the truck for approximately 30-40 minutes. A relative walking by saw him under the truck and was alarmed when she saw no movement. She ran for the victim's brother who used a tractor and loader to lift the front end of the truck off the ground, pulling the man out. After the truck was let down it rolled further down the incline until it came to rest on a level area. CPR was attempted by the brother but was not successful. When emergency personnel arrived it was evident that the man was dead at the scene.

CAUSE OF DEATH

The cause of death from the state medical examiner was *"mechanical asphyxiation secondary to chest compression beneath machinery".* An autopsy was performed which confirmed the cause of death as stated above. Toxicology results were negative.

RECOMMENDATIONS / DISCUSSION

Recommendation #1 *Workers should always chock the wheels when working on a vehicle that is left on an incline.*

Discussion: This should be common procedure at all times, especially when working under any vehicle. Mechanical failure of the parking brake enabled the truck to move. Although the incline was not steep, it was sufficient to roll the truck backwards and trap the worker under the front axle. In this case wood blocks were readily available and would have prevented this accident if used. Appropriate blocks should be carried with the vehicle to make them available anywhere when needed. Using wheel chocks makes good sense when parking any heavy truck, especially on an incline, and should be standard procedure.

Recommendation #2 *Trucks should be repaired in a shop equipped to repair large vehicles.*

Discussion: The victim was unaware that loosening the bolts would disable the parking brake. His lack of experience with this type of brake mechanism, combined with the cold, windy weather, working on an incline, poor lighting, and lying on an uneven surface--all these factors contributed to the accident. Working on heavy equipment requires special tools and skills, and appropriate working conditions. If an owner/operator is not adequately equipped to repair a vehicle, he/she should arrange to have it repaired at a qualified shop.

Recommendation #3 *Vehicle manufacturers should avoid parking brake design which operates through the driveline, and does not affect the wheels directly.*

Discussion: The victim in this case assumed the parking brake would directly activate the rear wheel brakes. This assumption is understandable since most parking brakes do connect directly to the rear brakes. In addition, this brake was still functional even after the transmission was put in neutral. Only after the driveshaft was disconnected did the brake fail. Manufacturers of vehicles should avoid this parking brake design. This type of parking brake may also be ineffective if one wheel is on slippery ground and there is no differential lock engaged. Those who own vehicles with this type of parking brake should be made aware of the hazard and alert workers who may work on these vehicles.

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Fatality Assessment
&

Control Evaluation Program
(FACE)

The University of Iowa, in conjunction with Iowa Department of Public Health and National Institute for Occupational Safety and Health (NIOSH), is investigating the causes of work-related fatalities in the State of Iowa. FACE is a surveillance program that identifies all occupational fatalities, conducts in-depth, on-site investigations on specific types of fatalities, and makes recommendations for employers employees, farmers and others to help prevent similar fatal accidents in the future.

Iowa is a major farming state, and therefore the Iowa FACE Program deals with many occupational deaths on the farm. It is a very hazardous profession that claims hundreds of lives nationally every year. We publish detailed reports that are disseminated to agricultural leaders in Iowa to share our concern for the safety of farmers. To reach and effectively communicate with the agricultural community, which is at high risk of fatal injuries, is a worthy challenge in Iowa.

NIOSH funded state-based FACE Programs include: Alaska, California, Colorado, Georgia, Indiana, Iowa, Kentucky, Maryland, Massachusetts, Minnesota, Missouri, Nebraska, New Jersey, Wisconsin, and Wyoming.

Additional information regarding this report or the Iowa Face Program is available from:

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