

TO: Director, National Institute for Occupational Safety and Health

FROM: Iowa FACE Program

SUBJECT: Farmer killed from tractor rollover while loading hay on hillside-- Iowa.

SUMMARY: In August 1995 a farmer was killed while loading hay onto a haywagon. The man was working with his two sons loading square bales of hay in a rolling hayfield with mild contours. He was using a tricycle type tractor equipped with a front end loader and powered hayfork. The wagon was unattached to the tractor and left on a slight incline. While loading the second layer of haybales on the wagon, the farmer used the front end loader to push and align the bales. The wagon started to roll slowly backwards. The older son jumped off and grabbed the tongue of the wagon trying to steer the wagon uphill.

His father quickly backed off and drove the tractor to the downhill side of the wagon and tried to place the loader in front of the moving wagon. The wagon hit the raised front end loader from the right side, overturning the tractor sideways, crushing the farmer under the right rear tire, killing him instantly. The tractor had no rollover protective structure (ROPS). The farmer's younger son, age 10, was riding on the tractor. He was pinned beneath the tractor by his right arm which was severely crushed. Emergency crew lifted the tractor off the boy and rushed him to the hospital. His father was dead at the scene.

RECOMMENDATIONS following our investigation were as follows:

1. *All tractors used with front end loaders should be equipped with ROPS.*
2. *Tricycle type narrow front tractors should not be equipped with front end loaders. Tractors that are so equipped should be used only on level grounds with special caution.*
- 3. *Wagons left unhitched on sloping ground should always be chocked or have wheel brakes capable of holding the wagon.*
- 4. *Tractor operators should be made aware of overturn hazard and methods to reduce this hazard, including safe driving on sloping grounds, keeping the bucket low while driving, and using counterweights on the tractor.*
- 5. *Children should not ride as passengers on tractors.*

INTRODUCTION

On August 26, 1995, a 39 year old farmer was killed while loading hay with his two sons. The Iowa FACE Program became aware of the incident a few days later from a newspaper article. Information about the case was gathered working cooperatively with the regional OHNAC nurse. Two investigators from the Iowa FACE Program visited the farm and talked with the victim's family. Both sons were eyewitnesses to the accident. Other information was received from the county sheriff, who had photographs of the accident scene.

The victim was a lifelong farmer specializing in hay production for several years. He had approximately 600 acres in hay and also did custom baling. He used the square baling method to be able to market hay to users not equipped to handle large bales. The victim had been a vocational agriculture instructor for the local school district and was well known in the area. He farmed with the aid of his family and two sons, age 11 and 13.

The man was very experienced in loading hay and using the front end loader tractor. He had built the large 23 foot steel frame wagon himself. He had fields several miles away from his farm site and loading and transporting hay was very common work. The accident occurred at approximately 8:30 P.M. The field was dry, weather was good, visibility was good and besides the sloping ground there were no other environmental factors found to contribute to the accident.

INVESTIGATION

The victim and his two sons had left their farm with a tractor and haywagon to a remote field to load square bales of hay. The tractor was tricycle type, approximately 60 hp, early sixties model, equipped with powered hayfork attached to the front end loader. The hayfield was several miles from the farm, rolling hills terraced in some areas. The victim had unhitched the haywagon from the tractor and started to load haybales using the front end loader. The wagon was left on a slightly sloping ground. No chocks were used on the wagon wheels.

The victim had loaded the first layer of bales and part of the second layer. He used the loader to push and align bales on the wagon. While pushing the bales the wagon began to slowly roll backwards away from the tractor. The older son on the wagon jumped off attempting to turn the wagon tongue steering the wagon more uphill. The father quickly drove the tractor to the downhill side attempting to place the loader in front of the moving wagon (see diagram). He had the loader raised to catch the back of the wagon and haybales. When the wagon contacted the loader, the tractor was already tilted to the left because of the sloping terrain. The force from the moving wagon to the side of the raised loader was sufficient to overturn the tractor. Since the tractor had no ROPS it overturned completely. The farmer was fatally crushed by the right rear wheel of the tractor. The boy riding on the tractor remained conscious through the rollover and was pinned to the ground with his right arm crushed under the tractor seat. The other son ran to a nearby residence for help, and emergency crews arrived shortly. They lifted the tractor and removed the boy and flew him by helicopter to a regional hospital.

CAUSE OF DEATH

The official cause of death from the medical examiner's report was "crush injuries to chest and abdomen" due to a tractor accident. No autopsy was performed.

RECOMMENDATIONS / DISCUSSION

•**Recommendation #1** *All tractors used with front end loaders should be equipped with ROPS*

(Roll Over Protective Structure)

Discussion: Front end loaders move a tractor's center of gravity higher and towards the front wheels making the tractors less stable. Front end loaders increase the risk of overturn, especially in hilly areas, uneven or soft grounds, roadways, near ditches or embankments, and even on fairly level grounds while making sharp curves. Rollovers to the side are common with front end loaders and the need for ROPS is evident. Installation of a ROPS on this tractor would likely have saved the operator's life by preventing a complete rollover.

•**Recommendation #2** *Tricycle type narrow front tractors should not be equipped with front end loaders. Tractors that are so equipped should be used only on level grounds with special caution.*

Discussion: Older tricycle type tractors are common on row crop production farms. Putting front-end loaders on these tractors was common in the past, and many of these tractors are still in daily use as "chore tractors" on many farms. While the loader shifts the center of gravity higher and from the back wheels towards the front wheels, the tractor loses lateral stability. Narrow front wheels provide no support to prevent side overturn. The larger the load and the higher the loader is raised, the more unstable a tricycle tractor becomes. A wide front axle allows the tractor to tilt until the axle catches the stop and in many instances provides adequate support to prevent overturn. Rear counterweights or liquid-filled tires improve stability, but the operator must still be constantly aware of changing slopes, holes, bumps, and ruts which can dangerously tilt the tractor. Tricycle type tractors are significantly more prone to rollovers than wide front tractors, and therefore should not be used with front end loaders.

•**Recommendation #3** *Wagons left unhitched on sloping ground should always be chocked or have wheel brakes capable of holding the wagon.*

Discussion: Chocking the wheels should be standard practice for all types of wagons whenever working on sloping ground. Chocks or blocks of wood should be carried with the wagon readily available when needed. The haywagon began to roll slowly backwards on sloping ground and created a hazardous situation. Choking the wheels would have prevented the accident.

•**Recommendation #4** *Tractor operators should be made aware of the overturn hazard and methods to reduce this hazard, including safe driving on sloping grounds, keeping the bucket low while driving, and using counterweights on the tractor.*

Discussion: The haywagon hit the raised front end loader from the side while the narrow front tractor was tilted to the side on an incline. The operator had no time to evaluate the situation; he acted instinctively to save the wagon and the load from getting damaged. Operators should be aware of overturn hazard and make precautions, such as using counterweights in the back and avoiding the use of front end loaders on tricycle type tractors. The operators should drive with the loader down when possible, avoid sloping, uneven and unstable grounds, drive straight up and down hills with the loader on the uphill side, and make

turns on level ground.

•**Recommendation #5** *Children should not ride as passengers on tractors.*

Discussion: The boy injured in this case was riding on the right axle of the tractor when it overturned. He is very fortunate to be alive. Children riding on tractors are frequently injured. They can easily fall off the tractor and get seriously injured or killed when getting run over by the rear wheel of the tractor, trailer, or other towed implement.

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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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