

DATE: May 19, 1995

FROM: Minnesota Fatality Assessment and Control Evaluation (MN FACE)
Program
Minnesota Department of Health

SUBJECT: MN FACE Investigation 95MN00201
Farmer Dies After Tractor He was Driving Rolled Over on Him

SUMMARY

A 52-year-old male farmer (victim) died of injuries sustained when the tractor he was driving rolled over on him. The victim was driving a farm tractor pulling an empty feed wagon. The tractor was not equipped with a rollover protective structure or a general purpose enclosed cab. The farm yard where the incident occurred was covered with a layer of packed snow. In addition, sleet and freezing rain several days before the incident left the entire farm yard very slippery.

On the morning of the incident the victim started the tractor and drove it with the attached feed wagon out of a pole barn and along the south side of the barn. When he reach the west end of the pole barn, he turn to the right and drove down a gradually inclined driveway toward two silos. Apparently, either while the victim turned the tractor north or as he began driving down the yard driveway, the tractor began to slide. The tractor slid off the driveway, overturned 180 degrees to it's left side and pinned the victim underneath it.

An individual vacating a second house on the farm discovered the overturned tractor shortly after the incident occurred. He immediately notified the victim's brother who was working in another farm building. Emergency medical personnel were called and arrived at the scene approximately 15 to 20 minutes later. Before they arrived, the victim's brother used a tractor equipped with a front-end loader to raise one side of the overturned tractor. He removed the victim from underneath it and started cardiopulmonary resuscitation. Shortly after emergency medical personnel arrived, resuscitation efforts were discontinued and the victim was pronounced dead. MN FACE investigators concluded that to reduce the likelihood of similar occurrences, the following guidelines should be followed:

- all tractors should be equipped with a rollover protective structure and a seat belt;
- tractors should be equipped with tire chains when driven in slippery conditions; and
- operators should lock both brake pedals together before driving in slippery conditions.

INTRODUCTION

On January 24, 1995, MN FACE investigators were notified of a farm work-related fatality that occurred on January 5, 1995. The county sheriff's department was contacted and releasable information obtained. Information obtained included a copy of their report and copies of their photos of the incident site. A site investigation was conducted by a MN FACE investigator on March 24, 1995. During the site investigation, information concerning the incident was provided by the victim's brother. The individual who discovered the overturned tractor was not available and could not be interviewed at the time of the site investigation.

INVESTIGATION

The victim was driving a farm tractor pulling an empty feed wagon. The tractor was 28 years old and was not equipped with a rollover protective structure or a general purpose enclosed cab. It had a narrow front wheel configuration and did not have dual wheels on either rear axle. The feed wagon was used to fill feedbunks¹ in a cattle feeding lot. The self-unloading wagon was equipped with a power-take-off driven mechanism that transferred the feed from the wagon to the feedbunks.

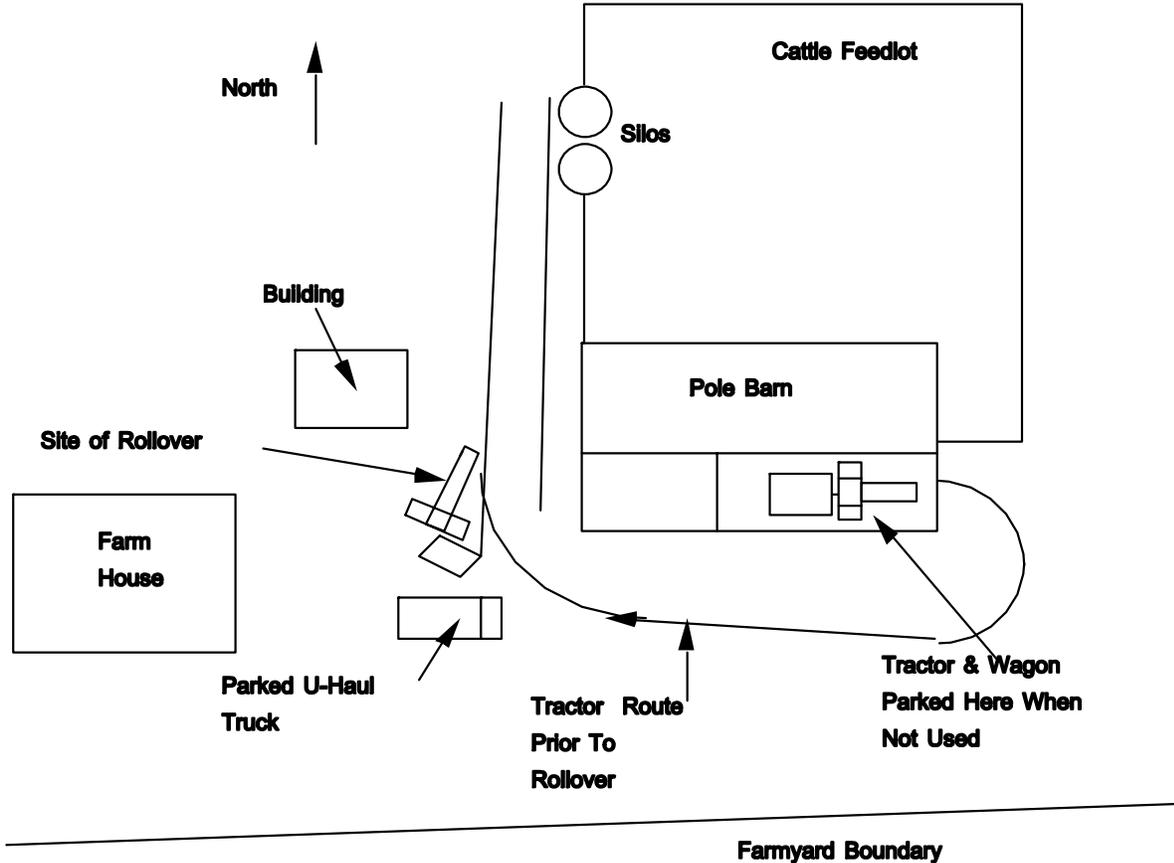
On the morning of the incident, the tractor and the empty feed wagon were parked in a pole barn. The pole barn was used primarily as a shelter for beef cattle. Part of the building was partitioned off and was used for storage of the tractor and the feed wagon. The farm yard was nearly completely covered with a layer (approximately 1 to 2 inches) of packed snow. In addition, sleet and freezing rain several days before the incident had left the entire farm yard very slippery.

The victim started the tractor and drove it with the attached feed wagon out of the east end of the

¹ Feedbunk: A long narrow trough for holding feed for dairy or beef cattle.

pole barn (see Figure 1). The victim's brother did not know what gear the tractor was in nor the speed the tractor was traveling at the time of the incident. The victim made a 180 degree turn to the right and drove along the south side of the pole barn. When he reach the west end of the pole barn, he turn to the right and drove down a gradually inclined yard driveway (estimated slope less than 5%) toward two silos located approximately 150 feet from the pole barn. Apparently, either while the victim turned the tractor north or after he began driving down the yard driveway, the tractor began to slide. The momentum of the tractor and the force of the empty wagon pushing on the tractor drawbar caused the tractor to slide off the west side of the driveway. There was a drop of two feet along the west side of the driveway at the location where the tractor left the driveway. The slope was 45 degrees or 100% based on measurements of a vertical drop of two feet over a horizontal distance of two feet. When the tractor slid off the driveway, it overturned 180 degrees to the left side and pinned the victim underneath it.

An individual vacating a second house on the farm discovered the overturned tractor shortly after the incident occurred. He immediately notified the victim's brother who was working in another farm building. Emergency medical personnel were called and arrived at the scene approximately 15 to 20 minutes later. Before they arrived, the victim's brother used a tractor equipped with a front-end loader to raise one side of the overturned tractor and removed the victim from underneath it. Cardiopulmonary resuscitation was started and continued until emergency medical personnel arrived. Shortly after their arrival, it was discontinued and the victim was pronounced dead.



**Figure 1. Farmyard Incident Site
Not To Scale**

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CAUSE OF DEATH

The cause of death listed on the death certificate was crush injury to chest.

RECOMMENDATIONS/DISCUSSION

Recommendation #1: All tractors should be equipped with a rollover protective structure and a seat belt.

Discussion: Preventing death and serious injury to tractor operators during tractor rollovers requires the use of a rollover protective structure and a seat belt. These structures, either a roll-bar frame or an enclosed roll-protective cab, are designed to withstand the dynamic forces acting on them during a rollover. In addition, seat belt use is necessary to ensure that the operator remains within the "zone of protection" provided by the rollover protective structure. Government regulations require that all tractors built after October 25, 1976, and used by employees of a farm

owner must be equipped with a rollover protective structure and a seat belt. Many older tractors are in use on family farms and do not have, nor are they required by government regulation to have, such structures to protect their operators in case of a rollover. All older tractors should be fitted with a properly designed, manufactured, and installed rollover protective structure and seat belt. If the tractor involved in this incident had been fitted with a rollover protective structure and a seat belt, and the seat belt had been in use, this fatality might have been prevented.

Recommendation #2: Tractors should be equipped with tire chains when driven in slippery conditions.

Discussion: When tractors are operated on packed snow or ice, the rear wheels may suddenly lose traction and cause the tractor to slide. The surface design of rear tractor tires generally consists of large smooth rubber lugs or bars. The lugs extend from the center line of the tire face to either side and are placed at an angle to the direction of travel. These lugs or bars provide significant traction for pulling heavy loads straight ahead but generally do not provide adequate traction on slippery conditions or if a tractor slides to either side. Tire chains provide additional traction on icy conditions and reduce stopping distances during slides and skids. If the tractor involved in this incident had been equipped with rear wheel tire chains, this fatality might have been prevented.

Recommendation #3: Operators should lock both brake pedals together before driving in slippery conditions.

Discussion: The center of gravity of most two-wheel drive tractors, is behind the midpoint of the tractor's length and above the rear axle height. During turns, the forces acting on the tractor can cause it to roll over to the side. If an operator applies braking to only one rear wheel or uneven braking to the rear wheels while driving on slippery conditions, the tractor may suddenly begin to slide to the side. During a slide to either side, the forces acting on the tractor are similar to the forces that exist during high speed turns and they may cause the tractor to overturn. Whenever tractors are used to pull heavy loads or when they are operated on slippery surfaces, the brake pedals should be locked together to reduce the likelihood of causing the tractor to slide to either side and overturn as the result of uneven braking.

REFERENCES

1. Office of the Federal Register: Code of Federal Regulations, Labor, 29 CFR Part 1928.51 (b), U.S. Department of Labor, Occupational Safety and Health Administration, Washington, D.C., April

25, 1975.

2. Agriculture Safety, Fundamentals of Machine Operation, 1987, Deere & Company, Moline, Illinois, Third Edition.

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