

MIFACE Investigation Report #14MI200

Subject: Farmer Crushed Under Free Standing Grain Bin Struck by Horses and/or Manure Spreader

Summary

In fall 2014, a male dairy farmer in his 20s died when he was crushed by a falling freestanding (unsecured) grain bin containing approximately six tons of grain after it was struck by bolting horses and/or the trailing manure spreader. The grain bin was positioned on a concrete pad between two barn access points on the east side of the barn. Two horses

were hitched to a manure spreader. The manure spreader was positioned inside of the barn; the horses were positioned in the barn facing east (outward) at the main barn access. The decedent was shoveling manure into the spreader when for reasons unknown, one or both of the horses were spooked, and bolted from the barn. As the horses turned to the south, the spreader struck the frame of the barn door and a bumper post, and then the horses and/or the spreader struck the grain bin. The decedent exited the second access to try to catch the horses. (See Figure 1). He ran into the path of the falling grain bin. A family member heard a loud crash and went outside, noticed the bin had fallen, investigated, and found the decedent under the bin. The family did not have a phone, so the family member ran down the driveway to use a neighbor's phone. She was met by the rural mail carrier who made the emergency call. Emergency response arrived and directed a neighbor using a front end loader to roll the bin from the decedent. He was declared dead at the scene.

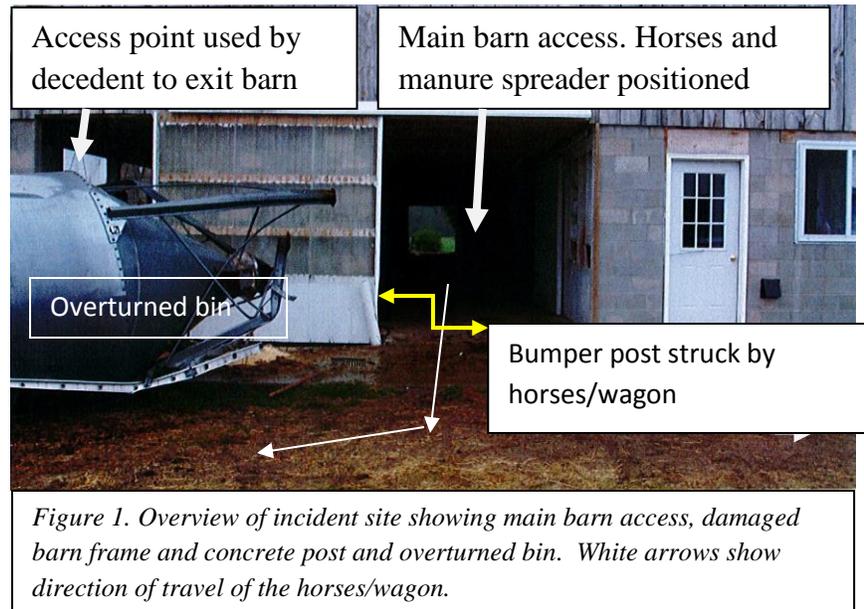


Figure 1. Overview of incident site showing main barn access, damaged barn frame and concrete post and overturned bin. White arrows show direction of travel of the horses/wagon.

MIFACE investigators identified the following factors which may have contributed to this incident:

- Free standing, non-anchored grain bin
- Unknown condition of legs and braces of incident bin
- Condition of grain
- Distribution of grain within bin
- Age and experience of one of the unattended horses
- Wind direction
- Roaming dog

RECOMMENDATIONS

- Ensure grain bins are anchored to the ground/concrete to minimize potential for overturn.
- Inspect bins regularly for rust and deterioration to ensure the legs and braces are strong enough to maintain the weight on the bin.
- Conduct periodic reviews of elevated storage structures to assure they remain within manufacturer leveling specifications.
- Install “bollards” like those used in gas stations or in factories to protect bins located in “traffic” areas from being struck by moving equipment.
- Unhook the horse from the equipment while equipment is unattended and/or stationary for a long period of time.
- Ensure any animal used to draw equipment has been properly introduced/trained for the work.
- Secure roaming animals to avoid the potential startling of horses.
- Develop a farm emergency action plan to enable farm family members and/or farm employees to effectively respond to an emergency situation.
- MSU Extension should offer a workhorse workshop for individuals who utilize draft horse teams.

BACKGROUND

In fall 2014, a male dairy farmer died when he was crushed by a freestanding grain bin holding approximately six tons of grain, which fell after being struck by a horse and/or manure spreader. MIFACE learned about this incident from a newspaper clipping. The MIFACE researcher contacted the county’s MSU Extension agent, who contacted the family of the deceased. One of the decedent’s family members agreed to be interviewed by the MIFACE researcher. The MSU Extension agent accompanied the MIFACE researcher to the family member’s home. The family member accompanied the MIFACE researcher and MSU Extension agent to the decedent’s farm. During the writing of this report, the death certificate, police and medical examiner reports, and the MIOSHA compliance file were



Figure 2. View of barn looking west

reviewed. Pictures used in Figures 1 and 5 are courtesy of the responding police department. Pictures used in Figures 2-4 were taken at the time of the MIFACE site visit.

The decedent had been at this location for three years (Figure 2). He had been raised on a dairy farm. He currently raised 31 dairy cows. The decedent had attended some general farm safety meetings held by his community, but the safety meetings dealt primarily with sawmill safety.

INVESTIGATION

The decedent bought the grain bin involved in the incident second-hand; the age of the bin was unknown. The smooth walled steel hopper bottom grain bin had a capacity of 8 tons. The day prior to the incident, 6 tons of grain was delivered. Each of the grain bin's legs was positioned on a fairly level concrete pad, which was positioned next to the east side of the barn, between two access points for the cows. The grain bin was free standing – none of the legs were anchored to the pad.

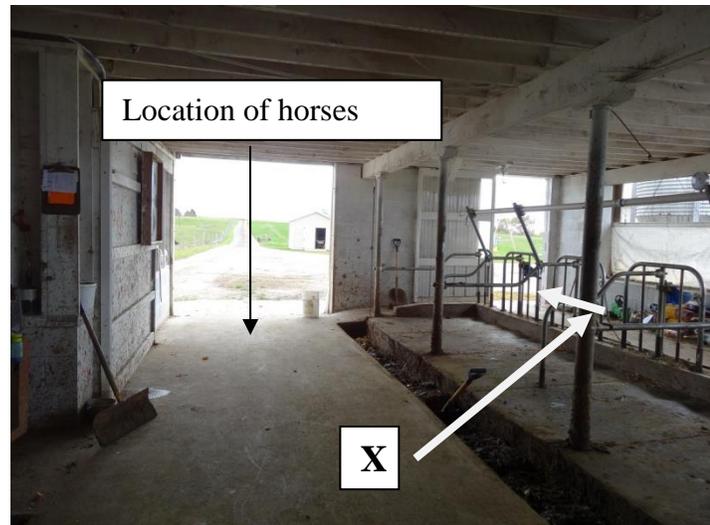


Figure 3. Inside barn, looking east, standing near north manure trough. Decedent location indicated by X. Arrows mark path of decedent leaving barn to catch horses.

The dairy barn access points were on the east and west side of the barn. The east side of the barn had two access points for the cows to enter/exit. The dairy cow stalls ran the length of the barn and were positioned so the cows, when in the stalls, were facing north and south. An access door was provided for each side of the stalls. The two waste gutters also ran the length of the barn and were oriented in an east/west direction.

The decedent used two horses to haul the manure in the manure spreader. One of the two horses was a “young” horse. The young horse was positioned to the left of the experienced horse. The family member indicated it was the first time the young horse had been attached to the manure spreader.

There was an easterly wind on the day of the incident. A German Shepherd had the run of the property.

The two horses and manure spreader were positioned inside of the barn next to the north gutter, near the access door on the east side of the barn. It is unknown if the horses “reins” were attached to the bumper pos. Police pictures taken at the scene show a blue “rope” attached to the bumper post and it is unknown if the rope was secured to one/both of the horses (See Figure 4).

The decedent, working alone, was using a shovel to remove the manure from the north gutter to the spreader (See Figure 3). Based on the extent of manure removal, the family member surmised that the incident occurred during the second load of manure. The family member thought that it took approximately 15-20 minutes to fill the manure wagon.

For reasons unknown, while the decedent was shoveling the second load of manure into the spreader, something startled one or both of the horses. The family member hypothesized that something specifically startled the younger horse. Both horses bolted of the barn. The young horse pulled to the right (south) causing damage to the barn frame and the bumper post next to the barn access (See Figure 4). Both damage sites had manure on them. Both horses and the trailing manure spreader continued to run south around the concrete pad with the unsecured grain bin. It is unclear whether the experienced horse, manure spreader or both the horse and manure spreader struck the northeast leg of the grain bin. At some point, the bin began to collapse in a southeast direction.



Figure 4. Damaged barn frame and bumper post

Boot tracks from the decedent traced his path in the barn as he ran after the bolting horses (See Figure 3). He crossed over the stalls and out of the south access door, which placed him in the path of the collapsing grain bin.

A family member heard the crash and ran out of the home. The family member was in the process of running to a neighbor's home to use their phone when a mail carrier came by. The mail carrier called for emergency response.

A neighbor arrived with a large front end loader, and upon direction from emergency responders, moved the bin to provide emergency responder access to the decedent. The decedent was declared dead at the scene.

The horses were found by another individual in a nearby cornfield approximately 100 yards away from the scene.

CAUSE OF DEATH

The cause of death on the death certificate was multisystem trauma due to or as a consequence of a crushing injury. An autopsy was not performed.

DISCUSSION/RECOMMENDATION

- Ensure grain bins are anchored/tied down to the ground to minimize potential for overturn.

All grain bins should be anchored to the ground to minimize overturn caused by high winds or other outside forces, such as being struck by machinery or, as in this case, a horse and/or manure spreader. It is important to anchor every leg of a hopper bottom bin. To do so, when the bin is placed on a concrete pad, use a leg anchor or similar mechanism for each leg. Leg anchors attach to the bin leg and have anchor bolts drilled into the concrete pad to provide stability. If the bin is not on a concrete pad, clear away any gravel or rock, and use a tie down/anchoring system that is installed in firm soil.



Figure 5. Overturned grain bin

- Inspect bins regularly for rust and deterioration to ensure the legs and braces are strong enough to maintain the weight on the bin.

The decedent bought the bin second hand. There were no full pictures of the bin from the police report to determine the condition of the legs and bracing for the bin and if the bin had all of the necessary cross-bracing for stability. MIFACE recommends that bin owners conduct a structural inspection of the bin on a regular basis. Elevated storage structures are typically designed for “vertical” loads, check manufacturer’s installation guidance for leveling requirements.

- Conduct periodic reviews of elevated storage structures to assure they remain within manufacturer leveling specifications.

Certain feed and grain products are subject to clumping, lodging or adhering to structure walls leading to uneven structure loading. MIFACE recommends establishing a standard operating procedure (SOP) related to minimizing the use of products known to be a risk for uneven structure loading and to establish a procedure for clearing the structure of lodged product.

- Farm operators should identify “lanes of travel” for equipment, livestock, and pedestrians and install barriers to protect equipment, buildings, storage units, utilities, etc. from damage.

The location of the incident grain bin placed it in the “lane” of travel for both the dairy cows to enter/leave the barn and the horses/manure spreader.

MIFACE recommends that farm operations identify “lanes of travel” and install barriers to protect vital assets, such as buildings, storage units, etc. from damage. One low cost method of barrier protection is a bollard, which is a sturdy, short, vertical steel post that creates a protective perimeter to what is being protected (See Figure 6).



Figure 6. Example of bollard use. Picture courtesy of Xavier Development. <http://www.xavierdevelopment.com/bollards/>

Bollards can be anchored to concrete, cored into a hard surface, buried in the ground or secured on a self-locking taper or impact recovery system to protect the surrounding foundations when a bollard is struck.

- Unhook the horse from the equipment while equipment is unattended and/or stationary for a long period of time.

In this incident, the horses were hooked to the manure wagon while it was being filled. It is safer to unhook the horse team from the equipment if the equipment will be unattended or being loaded. It only takes a fraction of a second for something unexpected to spook a horse. If horses are to stand with the equipment, a second person should be utilized to help control the horses if they react unexpectedly to external distractions, such as blowing trash and leaves, other animals, loud noises, etc.

- Ensure any animal used to draw equipment has been properly introduced/trained for the work.

Although even experienced horses can startle, care should be taken to appropriately introduce a young, inexperienced horse to a harness/hauling equipment operation. Steps should include a general introduction to the harness to ensure the horse is comfortable in and accepts all parts of the harness. When the horse is comfortable in the harness, equipment should be introduced. Depending upon the horse and its personality, the equipment could be directly attached or walked alongside the equipment being pulled by another horse; the purpose of this exercise is to have the new horse get used to the sound of the equipment behind it. When the horse is finally attached to the equipment, there should be someone positioned at the side of the horse near its head with a lead to guide and provide direction and someone near the horse’s hind quarters with reins to control the horse as it becomes acclimated to the weight of the attached equipment.

- Secure roaming animals to avoid the potential startling of horses.

It is unknown if the German Shepard, which could roam freely on the property, was a factor in this incident. It is good practice to secure roaming animals so the animal does not provide a distraction to either workers or draft animals.

- Develop a farm emergency action plan to enable farm family members and/or farm employees to effectively respond to an emergency situation.

A farm emergency can occur at any time and may occur without warning. Effectively dealing with an emergency requires preparation. It is vitally important that farm family members and farm workers to know *how* to respond in an emergency and are prepared both physically and mentally to respond to a farm emergency, such as a natural disaster, chemical spill, physical injury or, in this tragic incident, the death of a loved one.

An emergency action plan (EAP) is an "action plan" to organize the farm family member/farm employees' actions during a farm emergency. When a farm develops emergency procedures and provides training to all involved, the response can help to minimize the effects of the emergency. An emergency action plan is developed by using four basic concepts: Plan, Prepare, Respond, and Resume. The best way to protect yourself and others is to prepare for an emergency before it happens by conducting a thorough assessment of the farmstead - think about possible emergency situations and evaluate your farmstead to see if it is sufficiently prepared. A review of the farm operation is necessary so an identification of known limitations to response, such as lack of phone service or limited on-site response tools/equipment can be noted and addressed. These identified limitations will help guide the preparation and development of a farm-specific emergency response plan.

- MSU Extension should offer a workhorse workshop for individuals who utilize draft horse teams.

MIFACE recommends MSU Extension offer a workhorse workshop for farm families who utilize draft horses to provide the families an opportunity to learn and practice appropriate training, hitching, driving and handling the horses. The decedent was in his early twenties, and while he may have been experienced with working and handling draft horses, he may not have had the experience working with horses of different ages as a two horse team and/or learned appropriate safety practices concerning working with horses. MSU Extension would be one of the trusted agricultural community partners to reach out to the agricultural community, including farmers and 4-H participants to encourage community members to attend.

KEY WORDS: Agriculture, Horse, Horse-drawn equipment, Grain bin, Struck by, Dairy

RESOURCES

- General Driving Safety. National Ag Safety Database. <http://nasdonline.org/902/d000742/general-driving-safety.html>
- *4H Driving Manual*. Oregon State University Extension. <https://catalog.extension.oregonstate.edu/sites/catalog/files/project/pdf/4-h1321.pdf>
- *WikiHow to Train A Horse To Drive* <https://www.wikihow.com/Train-a-Horse-to-Drive>
- Bollard information. <https://en.wikipedia.org/wiki/Bollard>

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