

# Bale Safety

**As hay packaging trends to denser, larger and heavier bales, so too does their lethality, warn experts in farm safety.**

Story by  
**ED HAAG**

Throughout the last two decades, as ranchers moved away from producing 60-pound (lb.) two-tie bales in favor of denser, larger and heavier round bales weighing 1,500 lb. to one ton, handling hay has taken a lethal turn. The practice, once associated with tired muscles, slipped discs and hernias, has now given way to deadly tractor rollovers and fatalities linked to falling bales.

Robert Grisso, professor and Extension engineer at Virginia Tech, is one of a growing number of farm safety experts who have noticed this change.

“Whereas small square bales, weighing 35 to 85 pounds, are traditionally handled and stacked manually or with a bale loader, large round bales usually weigh between 500 and 2,500 lb. and must be handled mechanically,” he says. “Because of their weight, these bales can cause significant injury if they roll into or fall on an individual.”

Sometimes just the enormity and weight of today’s bales are enough to cause an accident. Consider the following: In 2004, a 76-year-old farm owner in New York was moving large round hay bales from a field using a hay wagon pulled by a tractor. As he attempted to drive the

tractor, pulling a wagon loaded with eight 800-lb. bales down a lane with a 27° slope, the excessive weight of the load caused the tractor and wagon to jack-knife. The steel tongue connecting the wagon and tractor snapped in half, and the tractor overturned, fatally pinning the victim beneath his vehicle.

At the inquest it was determined that the total weight of the bales and wagon was 8,000 lb., while the total weight of the tractor was slightly more than 4,000 lb. The coroner rightfully concluded that the excessive weight of the bales in relation to the weight of the tractor was directly responsible for the accident and that using either a larger tractor or reducing the load on the wagon would have lessened the chance that the tractor would be pushed out of control.

Grisso notes that this type of accident, which involves the improper handling of large, heavy round bales, is growing in frequency as farmers switch from small square bales to high-density large round

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— Robert Grisso

bales. He adds that it is not uncommon for even an experienced farmer to miscalculate the weight of his round bales as they relate to his machinery and transportation practices.

“Many farmers use hauling equipment designed for small square bales to handle these larger packages — sometimes with minor modifications,” he says. “When done

improperly, this can lead to injury or death due to overturning or crushing.”

## Always start with a plan

Considering the unforgiving nature of the larger round bales, Willard Downs, University of Missouri Extension ag engineer and

director of the Missouri AgrAbility Project, emphasizes the importance of initially understanding the risks associated with large bales and acting accordingly. He says most accidents involving large bales are due to bales being mishandled and are avoidable if the operator spends a short period of time prior to starting his tractor to examine the task at hand from a safety perspective.

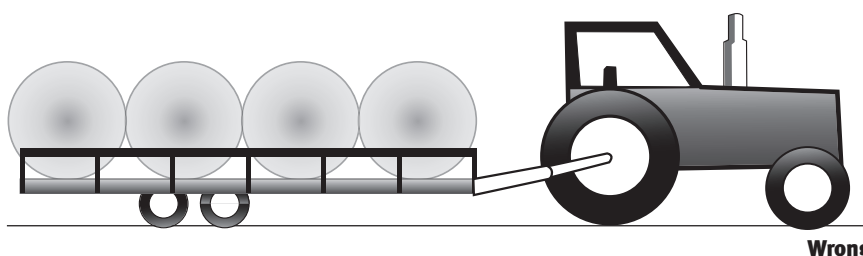
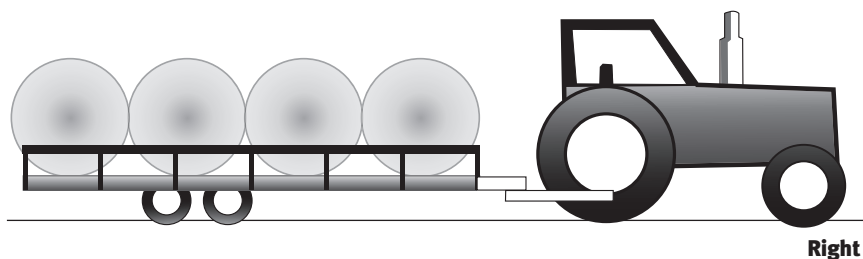
“This means thinking through what you want to accomplish and what you want to avoid, rather than just starting into a project and figuring it out later,” Downs says, noting such a plan should include evaluating the appropriateness of equipment being used, its condition, the terrain on which the task will take place and any other variables that might affect safety.

## Baling on hills increases risk

In a Virginia Tech safety bulletin authored by Grisso, he states that one of the most important pieces of advice that can be given regarding safety in the age of large bales is to

**Fig. 1: Proper and improper hitch attachment**

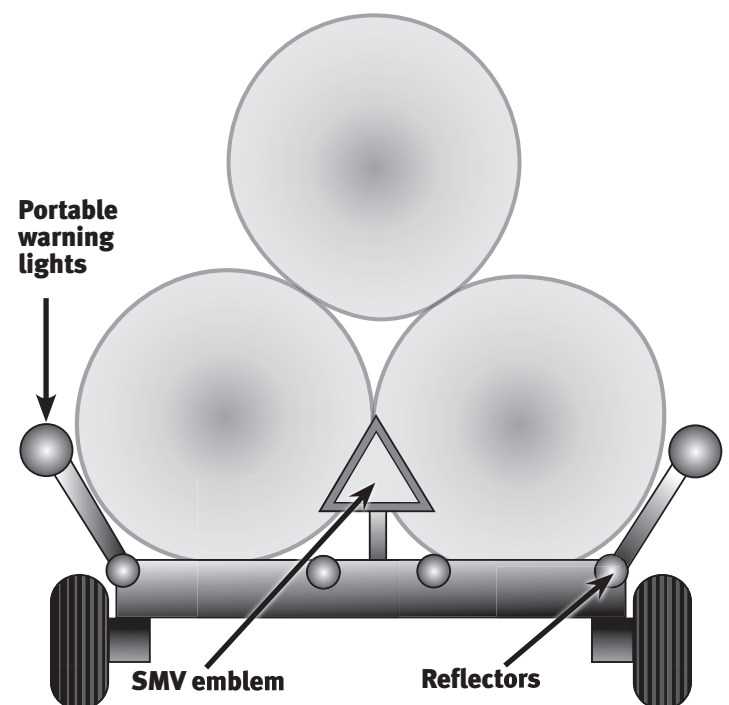
Hitch only to the tractor drawbar. Hitching anywhere else increases the chances of tractor overturn.



Source: Virginia Tech.

**Fig. 2: Warning indicators**

Trailers should be equipped with slow-moving vehicle (SMV) signs, reflectors and warning lights.



Source: Virginia Tech.

be certain that the tractor and loader are matched properly to the size and weight of the bales involved.

This applies to the process of baling as well as to moving and transporting finished bales. He notes that undersized tractors can develop stability problems, especially towing a near-completed bale on uneven or sloping ground.

“A small tractor is more likely to be pushed down a hill by a large baler,” Grisso says. “Also, with insufficient traction on grassy slopes its brakes may lock, causing the wheels to slide and the tractor to go out of control.”

But, Grisso says, the most dangerous part of baling on a hill is what can happen to the bales after they leave the baler. “Bales on a slope have the potential to roll down the hill, break through fences and cross highways, leading to bodily harm and potential property damage,” he warns, adding that the operator must always orient the bale correctly before ejecting it from the bale chamber.

Backing the baler at the right angle to eject the bale perpendicular to the slope is a commonly used practice. In other situations it makes sense to haul the finished bale to level ground before expelling it.

Another consideration when baling on uneven ground, Grisso says, is most round balers have high centers of gravity. This increases their potential for tipping over, especially if one wheel inadvertently drops into an unseen hole or ditch.

### Gravity rules

The role that the shifting center of gravity plays in bale-related accidents cannot be overemphasized, Grisso says. “This shift can put your tractor and operator in an unstable situation.” As the center of gravity of a tractor rises so does the instability of the tractor.

A large heavy object, such as a large round bale, being lifted most assuredly will affect the center of gravity.

He cites, as an example of this, a round bale lifted with a front-end loader of a tractor. When a bale is first lifted into a lower position, the center of gravity shifts forward and downward on to the front wheels of the tractor, but as the bale is raised, the center of gravity shifts upward into a more unstable position (see Fig. 4, page 162). Grisso notes that such a top-heavy position can lead to a backward or side overturn.

The risk to the operator is exacerbated by what Grisso views as one of the two most common accidents relating to large round bales. “This is the one where the round bale being lifted rolls down the arms of the lift and crushes the operator sitting in the seat,” he says. “Without the appropriate driver protection (a cage or extended roll bar), this can easily end in a fatality.”

### A two-part process

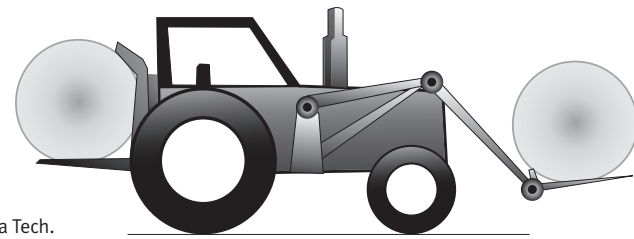
For Downs, the act of moving bales off a field, for immediate use or into longer-term storage, should be viewed as a two-step process. Step 1 is getting the

bales safely off the field,” he says. “That should be done with the bales as low to the ground as possible during the entire process.”

Downs adds this should be done slowly and deliberately, watching for any obstructions that could affect the movement of the tractor.

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**Fig. 3: Rear- and front-end bale-handling devices**



Source: Virginia Tech.

## Bale Safety *(from page 161)*

Step 2, which often involves manipulating bales and sometimes requires the operator to lift bales to heights that exceed those needed to complete Step 1, has additional variables to consider, Downs says.

“Before you start Step 2 you should look for elements in your prospective working environment that could cause disruption to the stability of your lifting platform,” he says, adding that an important consideration is slope. “If you have to work on a slope then you want to orient yourself so the load is in front of you going up the slope. That way you don’t have the slope creating additional instability, causing the tractor to lean.”

He adds that under no circumstances should a tractor try lifting large round bales any height when it is parallel to a slope.

Downs identifies other potential hazards as low or soft spots that can drop one wheel and alter the center of gravity, power lines that can catch a raised bale, and even areas that restrict broad movement and force the operator to use higher-risk turning radiuses when manipulating bales.

### Trailer transport checklist

For Karen Funkenbusch, rural safety and health specialist at the University of Missouri, one of the most important aspects of transporting large round bales on trailers is making sure that the

equipment is maintained properly.

“Because most farmers don’t use their trailers all the time, they should thoroughly check them over each time they are used,” she says. “That means that all the belts are in place, the tires are properly inflated, the safety belts are there and there are no loose parts that can fly off while you are transporting.”

Funkenbusch is quick to point out that the large round bales do create unique problems to a transporter. To limit the potential of these problems occurring, she recommends using low-profile trailers specifically used to haul round bales.

“These trailers are preferred because they reduce the risk of overloading the hydraulic system and the potential for overturning,” Funkenbusch says, noting that the increased capacity of these specialized trailers (capable of hauling four to 10 bales at a time) does require additional vigilance with breaking. “Because of the substantial combined weight of bales, trailer and vehicle doing the hauling, there can be difficulties stopping.”

Before using any trailer-tractor combinations, Funkenbusch recommends assessing the total hauling weight and determining whether additional brakes are needed on the trailer to supplement those available on the tractor.

Another important part of the transportation package is the connection between the tractor and the trailer,

Funkenbusch says. “You must make sure that that tractor drawbar is in the lowest, most centered and stationary position. This keeps the tractor’s front wheels moving straight and also provides for extra steering control.”

Funkenbusch adds that the trailer-towing package should include a system that allows the operator to use the safety lock pin and secure the trailer with a chain. In addition, the bales being hauled

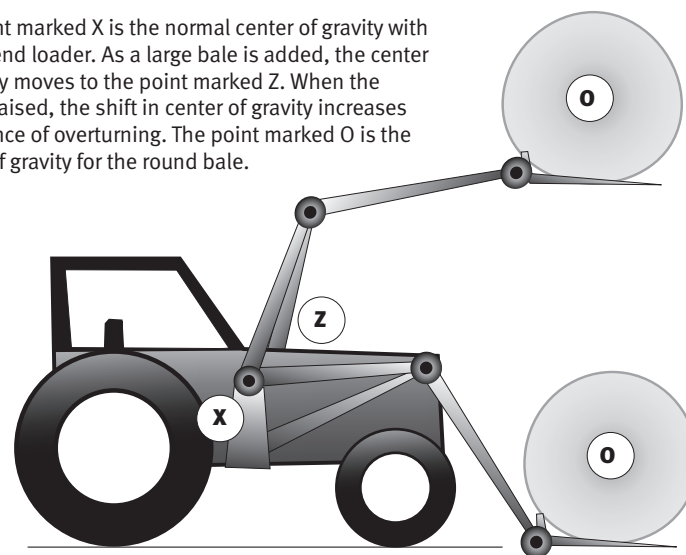
should be secured with straps with a strength greater than 1.5 times the weight of the load.

Finally, when transporting bales on public roads, Funkenbusch stresses that the operator should consult with highway authorities to determine local, state and federal regulations regarding their transport.



**Fig. 4: Center of gravity**

The point marked X is the normal center of gravity with a front-end loader. As a large bale is added, the center of gravity moves to the point marked Z. When the load is raised, the shift in center of gravity increases the chance of overturning. The point marked O is the center of gravity for the round bale.



Source: Virginia Tech.