

Large Round Bale Safety

Knowledge of potential hazards and faithfully following standard safety practices are the keys to safe and efficient production of large round bales. Safe hay production requires constant attention to situations that may cause injuries. Farm accidents contribute to higher costs from increased, unnecessary down time, machinery repair, personal pain, and often medical bills. Being alert and safety consciousness can result in more efficient and profitable baling and handling.

Making large round bales requires working with a baler and bale handling equipment. Begin safety awareness by reviewing the operator's manual for each piece of equipment used. Become reacquainted with the machines at the beginning of each season. Insist that each operator be trained and familiar with all safety precautions in the manual. This includes youth, whose training should be monitored and regularly reinforced.

Handling Bales on Hillsides

Operating large round balers on a slope is a greater concern than almost any other machinery operation. Bales on a slope have the potential to roll down the hill, break through fences and cross roads, leading to bodily harm and potential property damage. Always orient the bale correctly before ejecting the bale from the bale chamber. Sometimes this just means backing the baler at the right angle to eject the bale perpendicular to the slope so it will come to rest securely on the hillside. Steep slopes may require that the bale be taken to a flat location before ejection.

Table 1. Baler Safety

- ◆ Large round balers and bale handling equipment carry warning signs or labels (Figure 1). Read and follow all safety warnings.
- ◆ Never leave the tractor seat until the PTO (power take-off) has been disengaged and all moving parts have stopped. Never attempt to pull hay or twine from an operating baler.
- ◆ When making large round bales, match the size of the tractor to the size of the baler. A tractor that is too small for a baler may get insufficient traction on grassy slopes, its brakes may lock, causing the wheels to slide and the tractor to go out of control.
- ◆ Entanglements are the cause of many fatal baler accidents. They occur when a person becomes entangled in a baler while it is operating. Keep the original shields in place on all power shafts and other moving parts such as chains, sprockets, etc.
- ◆ Gathering tines and bale chamber belts cannot be shielded and must be avoided while the unit is in operation.
- ◆ The baler gate can close on a bystander (Figure 2). The operator must make sure people are a safe distance away before engaging the equipment.
- ◆ Friction created by contact of dry hay or forage material with faulty bearings and baler belts can cause heat to build up. This friction and overheating may cause bales to ignite. People can be burned trying to put out a baler fire. Always carry a 10-pound (ABC) dry chemical fire extinguisher on the tractor. Many balers come with water fire extinguishers.

Forages Series

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Figure 1. Typical safety sign for front-end loaders.

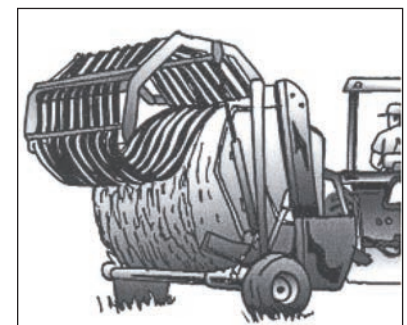


Figure 2. Be sure no one is near the rear gate when it is being raised or lowered.

Handling Large Round Bales

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 pounds and must be handled mechanically. Because of their weight, large round bales can cause significant injury if they roll into or fall on a person.

Sometimes farmers use hauling equipment designed for small square bales to handle these larger packages (usually with minor modifications). When done improperly, this can lead to injury or death from overturning or crushing.

Front-End Loaders

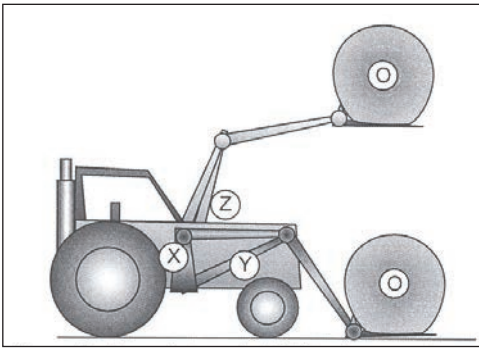


Figure 3. The point marked “X” is the normal center of gravity with a front-end loader. As a large bale is added, the center of gravity moves to a point marked “Z.” When the load is raised, the shift in center of gravity increases the chance of overturning. The point marked “O” is the center of gravity for the round bale.

Many farmers use front-end loaders to move and stack large round bales. Use caution when hauling large round bales or any heavy load on a front-end loader to avoid side overturns or being crushed from a bale rolling down upon the tractor. It is extremely important that the size of the tractor and loader be matched properly to the size and weight of the bales being handled.

Side overturns can occur when the tractor’s center of gravity changes due to the additional weight of the bale. (See Figure 3.)

The normal center of gravity with a front-end loader is at the point marked “X.” When a large round bale is carried on the front-end loader close to the ground, the center of gravity moves forward, represented by point “Y.” The point marked “O,” or half the diameter or length of the bale, is the bale’s center of gravity.

Table 1. Baler Safety

- ◆ Use caution when backing the baler. A round baler is bulky and reduces operator vision to the rear.
- ◆ Large round bales can roll after discharge when on hilly terrain.
- ◆ Block the gate securely before working under it. Use the safety lock system for the baler gate or the safety stops for the gate lift cylinders.
- ◆ Shift the tractor transmission into park and lock the brakes, or block the baler wheels if the baler is not hitched to a tractor, before working on or under the baler.
- ◆ During operation, remain seated on the tractor seat to reduce the chance of falling into the path of the baler.
- ◆ Never allow passengers to ride on the tractor or baler.
- ◆ Use extreme caution when operating a baler on uneven or hilly terrain. Round balers are top heavy (high center of gravity) and may tip sideways if one wheel drops in a hole, ditch or other irregularity, especially if carrying a nearly-complete bale.
- ◆ Raise the pickup to clear rocks, bumps, and obstacles when operating on uneven terrain.
- ◆ Avoid sharp turns. With the tractor wheels set wide to straddle windrows, rear tires could strike the baler tongue on sharp turns.
- ◆ Never hurry the process of baling. Haste leads to poor decisions.
- ◆ Keep safety signs clean, readable and free from obstructing material. Replace damaged or missing safety emblems with new ones. Instruct all operators on the meaning of the hazard signs.

Some operators will carry the load high for improved visibility while driving. However, when the loader is raised, the center of gravity moves to the point marked “Z,” which is both forward and higher than the original center of gravity, “X.” In the raised position, the tractor is less stable and the potential for side overturn increases.

Now visualize a tractor on a slope with two wheels on the downhill side and two wheels on uphill side. As the bale is lifted, the center of gravity gets higher and the potential for the tractor to roll down the hill increases. The chance of side overturns increases when carrying a load on the front-end loader, especially on slightly rough ground. Moving the center of gravity forward causes a transfer of weight from the rear wheels to the front, making it much easier to bounce a rear tire off the ground when driving over bumps or holes. The additional weight on the front tires may also exceed the axle and tire load-carrying capacity.

A loss of traction occurs when weight is transferred from the rear tires to the front tires during bale handling. This can be a problem when moving bales up a slope or on wet soil. Loss of traction by the rear tires can result

Table 2. Front-end Loader Safety Tips

- ◆ Never walk or work under a raised loader.
- ◆ Raise and lower loader arms slowly and steadily.
- ◆ Allow for the extra length of the loader when making turns.
- ◆ Be careful when handling loose or shifting loads.
- ◆ Never move or swing a load when people are in the work area.
- ◆ Stay away from the outer edge when working along high banks and slopes.
- ◆ Watch for overhead wires and obstacles as the loader is raised.
- ◆ Carry loads low to the ground and watch for obstacles on the ground.
- ◆ Always use the recommended amount of counterweight to ensure stability. Add recommended wheel ballast or rear weight.
- ◆ Operate the loader only from the operator’s seat.
- ◆ Move the wheels to the widest recommended settings to increase stability.
- ◆ Do no lift or carry people on the loader bucket or attachments.
- ◆ Lower the loader bucket to the ground when parking or servicing.
- ◆ Park loaders on a firm, level surface with all safety devices engaged.
- ◆ Visually check for hydraulic leaks and broken, missing or malfunctioning parts, then make necessary repairs.
- ◆ Use a piece of cardboard or paper to check for pinhole hydraulic leaks. Pressurized, leaking hydraulic oil can have sufficient force to penetrate the skin, causing serious injury that is difficult to treat.
- ◆ Relieve all hydraulic pressure before disconnecting hydraulic lines.
- ◆ Be certain every loader operator is aware of safe operating practices and potential hazards.
- ◆ Extending the tines of a loader may look like a good way to solve the loading problem, but when this is done, the tractor’s center of gravity is moved forward, and additional stress is placed on the loader, the hydraulic system, and the tractor’s front end.
- ◆ All tractors used to move bales should have rollover protective structures (ROPS). ROPS can either be an enclosed cab or a roll bar.
- ◆ Operators should use the seat belt at all times when operating a ROPS-equipped the tractor.

in a braking loss on all surfaces. Weight should be added to the rear of the tractor to counter-balance the load on a mounted front-end loader. (See Table 2 for additional safety tips.) This additional weight will bring the center of gravity back to the original center.

Another dangerous situation occurs when the loader is raised too high. The bale can roll down the loader arms crushing the operator. Use proper bale handling devices when moving large round bales with a front-end loader. Keep the load as low as possible and move slowly. Loader attachments such as spears and grapple-forks minimize the risk of the bales rolling down the loader lift-arms and injuring the operator.

When using a front-end loader to load round bales on a trailer, park the trailer perpendicular to the slope and load from the uphill or downhill side. Never try to place a second-layer of bales on a trailer that is parked parallel to the slope because the tractor must travel across the slope, increasing the potential for overturn.

Bale Handling Devices

A number of large bale handling devices are available commercially. Two examples are three-point hitch spears that are pushed through the bale and fingers that grasp the edges of the bale. When using bale handling equipment, know where the center of gravity is, especially if the load extends far to the rear of the tractor. This can overload the tractor hydraulic system; the relief valve will open but the lifting actuators will not come up.

It is safer to handle bales with rear attachments rather than with the front-end loader. Rear tires are better suited to carry the extra weight, and there is less chance of a side overturn because the bale is not lifted as high.

Avoid lifting bales with a rear-mounted 3-point lift to a height where the front tractor wheels are barely in contact with the ground. At least 30 percent of the front weight of the tractor should remain on the front wheels. Inadequate weight on the front tires can cause stability and steering problems

With rear-mounted bale handlers there is some increased possibility for rear overturns. However, the bale or carrying attachment may help prevent the tractor from a complete overturn. Some operators use both a rear-mounted handler and front-end loaders (Figure 4). This can reduce the stability problems, but be sure the bale loads do not exceed the tire-carrying capacity of either the front or rear tires.

If possible, try to operate bale handling devices on relatively level ground. When picking up a bale with a front-end loader on an incline, drive up the slope to spear the bale. Care must be exercised when driving across the slope to pick up a bale. To ensure bales are in a safe location for pick up, it may be necessary for the person baling to transport bales in the baler to a safer location before ejection.

Transport

Special low clearance trailers that load bales directly from the ground and carry 4 to 16 bales are the preferred method for moving bales because

they reduce or eliminate problems of potential overturn and overloading a tractor's hydraulic system. They also transport multiple bales at a time.

Since these trailers are capable of carrying so many bales, there can be a problem stopping the load. At 1,500 pounds per bale, load size may exceed 16 tons. Add the weight of the trailer and the total transport weight can exceed 18 tons. The towing tractor must be the proper size and weight to safely stop the bale and trailer weight.

Use a lower gear when going downhill, since the tractor brakes alone may not be able to stop the load. Use low gear going up hill too. Do not attempt to change gears during descent, begin descent in a low gear.

Install brakes on transport trailers carrying heavy loads to make stopping easier and safer. Never operate a hay trailer on the highway that is not equipped with brakes. Trailers can be equipped with electric, hydraulic, or surge brakes. Most models can be equipped with a breakaway device that will lock the brakes if the trailer breaks loose from the towing vehicle.

Keep people out of the area between the trailer and tractor during hitching. Use pre-determined hand signals to communicate with those assisting. Hitch the trailer only to the drawbar; never to any other point on the tractor (Figure 5). Set the tractor drawbar to the lowest, most centered and stationary position. This will keep the tractor's front wheels moving straight and provide extra steering control. Use a safety locking hitch-pin and secure the trailer with chains.

Properly inflate trailer tires before transporting round bales on the highway. A slow-moving vehicle (SMV) emblem (Figure 6) should be clean and visible. Replace worn or faded emblems. Remember, farm vehicles are subject to all traffic laws. If a trailer moves large round bales, the bales should be secured with a strap that has tensile strength greater than 1.5 times the load it is holding. If the transport has large round bales stacked side by side, it probably qualifies as a wide load and may be illegal on interstate highways. On local or state roads, wide loads must follow all traffic laws. Check with state and local police for additional requirements.

Do not allow bales to rest against trailer tires. At transport speeds, the friction of the hay against the rotating tire can generate enough heat to ignite the hay. Remember that trailers pulled by a pickup have faster transport speeds than tractors and heat sufficient to cause a fire can occur in a short distance ($\frac{1}{2}$ mile). Trailer fires are difficult to control and can lead to loss of hay, trailer, and transport vehicle.

While driving on the highway with any vehicle, assure that the driver can see and be seen. Use flashing lights and have an SMV emblem properly mounted. Allow time to pull into and across traffic. Avoid sudden, erratic, or unexpected maneuvers. Keep to the right, pull over at a safe place to let traffic pass. Never wave vehicles to pass; let drivers pass at their own discretion. Signal all turns well in advance and make sure no one is passing when turning left. Pull completely off the road if something goes wrong. Do not transport wide loads after daylight hours, in poor visibility, or bad weather.

Awareness

Fatigue can be an operator's most serious physical obstacle. Long workdays and the pressure associated with baling and forage harvesting can be tiring. Fatigue slows reaction time, impairs judgment and memory, and may even cause hallucinations. Safety breaks, which include stretching, breathing deeply, and periodically walking around, can help prevent the effects of fatigue or boredom. When drowsiness sets in, stop and have a cup of coffee, water, or soda. If fatigue persists, discontinue operations that need full attention and get rest.

Large round baling is a good method for harvesting, storing, and moving hay crops but keep safety in mind. Safety, in the final analysis, is largely a matter of common sense and patience. Most manufacturers have designed and built equipment with operator safety in mind. The ultimate responsibility for its safe and proper operation lies with the operator.

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