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## G76-303 Large Round Bale Safety (Revised June 1995)

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Grisso, Robert D.; Morgan, David; and Schnieder, Rollin D., "G76-303 Large Round Bale Safety (Revised June 1995)" (1976). *Historical Materials from University of Nebraska-Lincoln Extension*. 1320.

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## Large Round Bale Safety

This NebGuide covers the safety aspects for equipment used in large round bale packages such as: balers, front-end loaders, bale handling and transport devices.

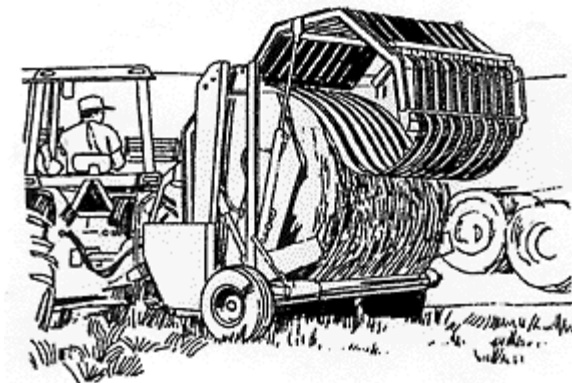
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Large round baling creates unique safety problems for farmers and ranchers. Large round balers have many moving parts that can cause injury or death if a person becomes entangled. Never leave the tractor seat until the PTO (power take-off) has been disengaged, the engine is shut off, and all moving parts have stopped.



**Figure 1. Be sure no one is near the rear gate when it is being raised or lowered.**

Many fatal accidents have occurred when an onlooker has become entangled in a baler during its operation. For your protection and the protection of others, keep the original shields in place on all power shafts and other moving parts such as chains, sprockets, etc.

The gathering tines and bale chamber belts cannot be shielded and must be avoided while the unit is in operation. The gates of the baler can close on a bystander (*Figure 1*). The operator may not even realize

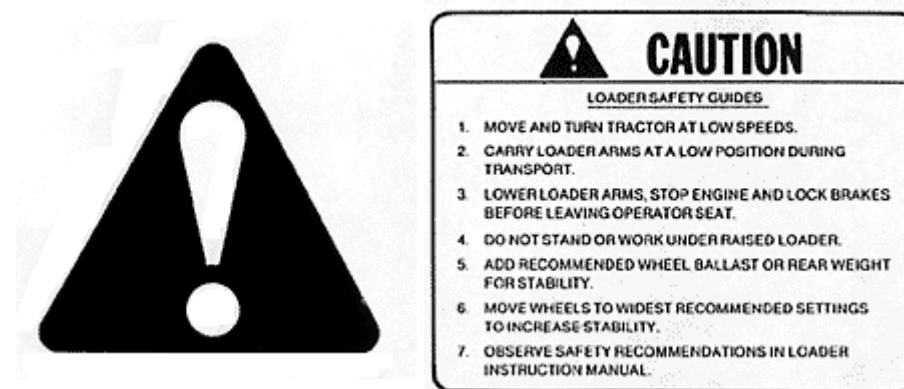
the person is there.

### Table I. Round Baler Safety Tips.

- A round baler is bulky and reduces operator vision to the rear. When the bale chamber contains a bale, rear vision may be completely eliminated. Be watchful when backing the baler.
- Be sure no one is near the rear gate when it is being raised and lowered. Keep everyone clear of the rear of the baler during unloading. Large round bales can roll after discharge when on hilly terrain.
- Before servicing, cleaning, or adjusting a round baler, disengage the tractor PTO and shut off the engine. Never attempt to pull hay or twine from an operating baler.
- Block the gate before working under it. Use the safety lock system for the baler gate or the safety stops for the gate lift cylinders.
- Always keep the PTO properly shielded.
- Always 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 baler during operation or transport.
- Be extremely cautious when operating a baler on uneven or hilly terrain. The baler could tip sideways if it strikes a hole, ditch or other irregularity, especially if carrying a near-completed bale.
- Raise the pickup to clear humps and obstacles when passing over uneven terrain.
- Do not make sharp turns; with the tractor wheels set wide to straddle windrows, rear tires could strike the baler tongue on sharp turns.
- Never be in a hurry about anything to do with the baling operation.
- 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.

As an operator, make sure that everyone is clear before engaging the equipment. Balers and bale handling equipment should carry warning signs or labels (*Figure 2*). Read and heed all safety warnings (see *Table I* for additional safety tips).

**Figure 2. Typical safety sign for front-end loaders.**



### *Bales Operating 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 highways,

leading to bodily harm and potential property damage. Always haul the bale to a safe location in the field before ejecting the bale from the bale chamber. Take care to make certain that the bale will come to rest securely on the hillside, if the slope is not too steep.

### ***Handling Large Round Bales***

Baling hay with large round balers creates unique safety problems not associated with other forage handling methods. Whereas small square bales weighing 60 to 120 pounds are traditionally handled and stacked manually or with a bale loader, large round bales usually weigh between 1,000 and 3,500 pounds and must be handled mechanically.

Many farmers use existing equipment designed for small square bales to handle these larger packages (sometimes with minor modifications). When done improperly, this can lead to injury or death due to overturn or crushing.

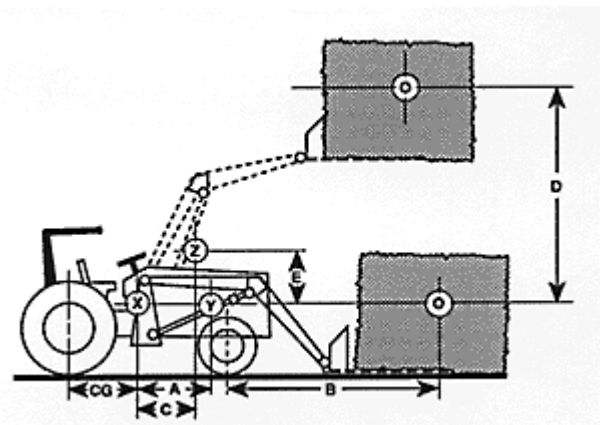
People have had severe bodily injury caused by friction from balers' moving belts. Heat can build up due to friction created by contact of the hay or forage material with the baler and belts. Farmers report that this friction has caused bales to ignite. Always carry a 10 pound dry chemical fire extinguisher on the tractor.

### ***Front-End Loaders***

Many people use front-end loaders to move and stack large round bales. Always use great caution when hauling large round bales or any heavy load on a front-end loader so that you can avoid side overturns and being crushed from a bale rolling down upon the tractor.

**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 "Y." When a large round bale is lifted by the front-end loader, 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.**

Side overturns result from the change in the tractor's center of gravity due to the additional weight of the bale. *Figure 3* shows what happens to the center of gravity.



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.

Some operators will carry the load high for improved vision while driving. However, when the loader is raised as shown, 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.

The chance of side overturns are increased when carrying a load on the front-end loader, especially on slightly rough or rolling 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 passing over bumps or holes. Plus, the additional weight on the front tires may exceed the tire load-carrying capacity.

Another problem when weight is transferred from the rear tires during bale handling results in a loss of traction. This can be a problem when moving bales up a slope or on wet soil. Loss of traction can result in a braking loss on all surfaces. Mounted front-end loaders (see *Table II* for additional safety tips) should be used when the load is properly counter-balanced by adding weight to the rear of the tractor. 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 onto the operator. If you handle a bale with the front-end loader, keep the load as low as possible.

**Table II. Front-End Loader Safety Tips.**

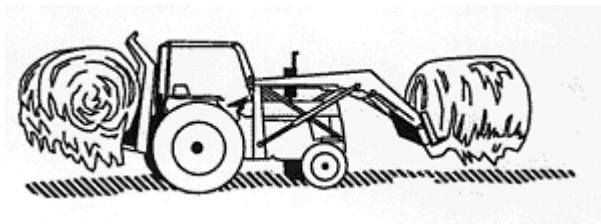
- Never walk or work under a raised loader.
- Raise and lower loader arms slowly and steadily.
- Allow for the extra length of the loader when making turns.
- Be careful when handling loose or shiftable loads.
- Never move or swing a load as long as people are in the work area.
- Stay away from the outer edge when working along high banks and slopes.
- Watch for overhead wires and obstacles when you raise the loader.
- Carry the load low to the ground and watch for obstructions on the ground.
- Always use the recommended amount of counterweight to ensure good stability. Add recommended wheel ballast or rear weight.
- Operate the loader from the operator's seat only.
- Move the wheels to the widest recommended settings to increase stability.
- Do not lift or carry anyone on the loader, bucket or attachments.
- Lower the loader when parking or servicing.
- Make sure all parked loaders on stands are on a firm, level surface and all safety devices are engaged.
- Visually check for hydraulic leaks and broken, missing or malfunctioning parts, then make necessary repairs.
- Under pressure, escaping hydraulic oil can have sufficient force to penetrate the skin, causing serious personal injury. Use a piece of cardboard or paper to check for pinhole leaks.
- Before disconnecting hydraulic lines, relieve all hydraulic pressure.
- Be certain anyone operating the loader 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. Extra stress is placed on the loader and the hydraulic system.

All tractors used to move bales should have roll-over protection structures (ROPS). ROPS can either be a protective enclosed cab or a roll bar with a canopy.

***Bale Handling Devices***

A number of large bale handling devices have appeared on the market. Three-point hitch lances that are pushed through the bale and fingers that grasp the edges of the bale are available. Know where the center of gravity is when using this handling equipment, especially if the load extends far to the rear of the tractor. This can overload the tractor hydraulic system.



**Figure 4. Rear and front-end bale-handling devices.**

Avoid lifting bales to a height where the front tractor wheels are barely in contact with the ground. This causes steering and stability problems. At least 30 percent of the front weight of the tractor should remain on the front wheels.

It is better 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 side overturns.

Be aware, there is a higher possibility for rear overturns; however, the bale or carrying attachment may help keep the tractor from overturning backwards. Some operators use both a rear-mounted handler and front-end loaders (*Figure 4*). This will reduce the stability problems, but make 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 fairly level ground. Also, transport bales in the baler to a safer location if the place where the bale is ready for discharge is dangerous.

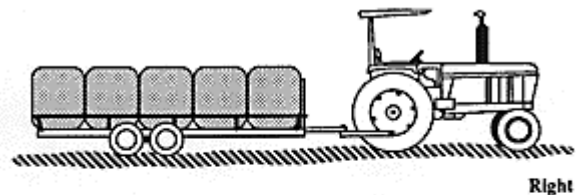
### ***Transport***

Special low clearance trailers that carry four to 10 bales and load bales directly from the ground are available. These units are preferred for moving bales because they reduce or eliminate problems of overloading the hydraulic system and reduce potential overturn. They also handle more than one or two bales at a time.

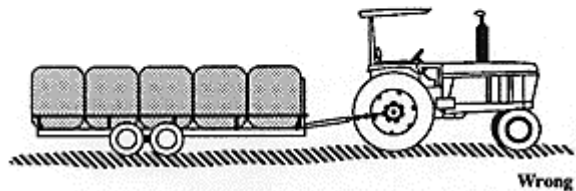
Since these trailers can carry four to 10 bales, there can be a problem with stopping the load. At 1,500 pounds per bale, load size is between 3 to 7 tons. Add the weight of the bale trailer to this and the total transport weight approaches 9 tons. The tractor has to stop all this weight.

Use the engine as a brake when going down hills, since the tractor brakes alone may not be able to stop the load. The reverse may occur when moving a large load uphill. When going uphill, use a low gear.

Install brakes on transport trailers carrying heavy loads. This accessory can make stopping easier and safer. 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.



**Figure 5. Hitch only to the tractor drawbar. Hitching anywhere else increases the chances of tractor overturn.**



Keep people out of the area between the trailer and

tractor during hitching. Hand signals should be used and understood by both the operator and those assisting (see *Table III* for safety tips). Hitch the trailer only to the drawbar; never attach to any other point on the tractor (*Figure 5*). Place the tractor drawbar in the lowest, 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.

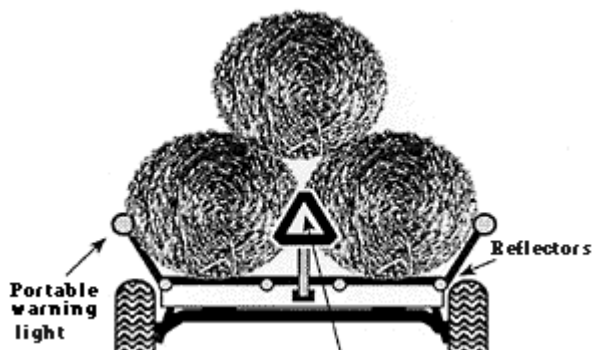
Trailer tires should be properly inflated before transporting round bales on the highway. A slow-moving vehicle (SMV) emblem (*Figure 6*) should be clean and visible. Any worn or faded emblems should be replaced. Remember, farm vehicles are subject to all traffic laws. If a trailer moves large round 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, you probably have a wide load. These loads are illegal on the Nebraska interstate highways, and wide loads have to follow all traffic laws.

### Table III. Tractor Operations Safety Tips.

- Know the tractor, the implements and how they work. Be thoroughly familiar with both the operator's manual and the tractor before starting.
- Know the controls, where they're located and how they work. Practice stopping the tractor and attachments quickly in the event of an emergency.
- Use roll-over protective structure (ROPS) and seat belts. Most tractor fatalities are caused by overturns and most baler injuries and fatalities occur from bales rolling out of the loading forks or bucket onto the operator.
- Be familiar with the terrain and drive safely. Use caution on slopes, slow down for all turns and stay off the highway. While on the highway, use appropriate lighting and follow all rules of the road.
- Never start an engine in a closed shed or garage. Carbon monoxide is colorless and deadly.
- Always keep the PTO properly shielded.
- Keep hitches low and always tow or pull from the drawbar. Otherwise, your tractor might overturn backwards.
- Never jump off a moving tractor or leave it with the engine running. Never try to jump onto a runaway tractor; it is extremely dangerous.
- Never refuel while the engine is running or hot. Do not add coolant to a radiator while the engine is hot; radiator coolant can erupt and scald.
- Keep children off of and away from the tractor, implements and attachments at all times.
- Never be in a hurry about anything to do with a tractor. Take time, take a break and do it right.
- 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.

Do not transport wide loads after daylight hours, in poor visibility or bad weather.

**Figure 6. The trailer equipped with SMV, reflectors and warning lights.**



Do not allow bales to rest against the 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 (1/2 mile). Hay trailer fires are difficult to control and can lead to loss of hay, trailer and tractor (or pickup).

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 and pull over to let traffic pass. Signal all turns and make sure no one is passing when turning left. Pull completely off the road if something goes wrong.

### ***Awareness***

Fatigue often is an operator's most common physical problem. Long workdays and the pressure associated with baling and forage harvesting can be tiring. Fatigue can slow reaction time, impair memory, and even cause hallucinations. Safety breaks, which include stretching, breathing deeply, and periodically walking around, can help prevent the effects of fatigue or boredom. If you feel drowsy, stop and have a cup of coffee or soup. If you still feel drowsy, discontinue operations that need your full attention.

Large round baling is a good method of 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 your safety in mind. The ultimate responsibility for its safe and proper operation lies with the operator.

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### ***File G303 under: SAFETY***

#### ***A-2, Farm***

*Revised June 1995; 3,000 printed.*

*Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture. Elbert C. Dickey, Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.*

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