



AE-1157

NOV 17 1998
SOUTH DAKOTA
DODGE

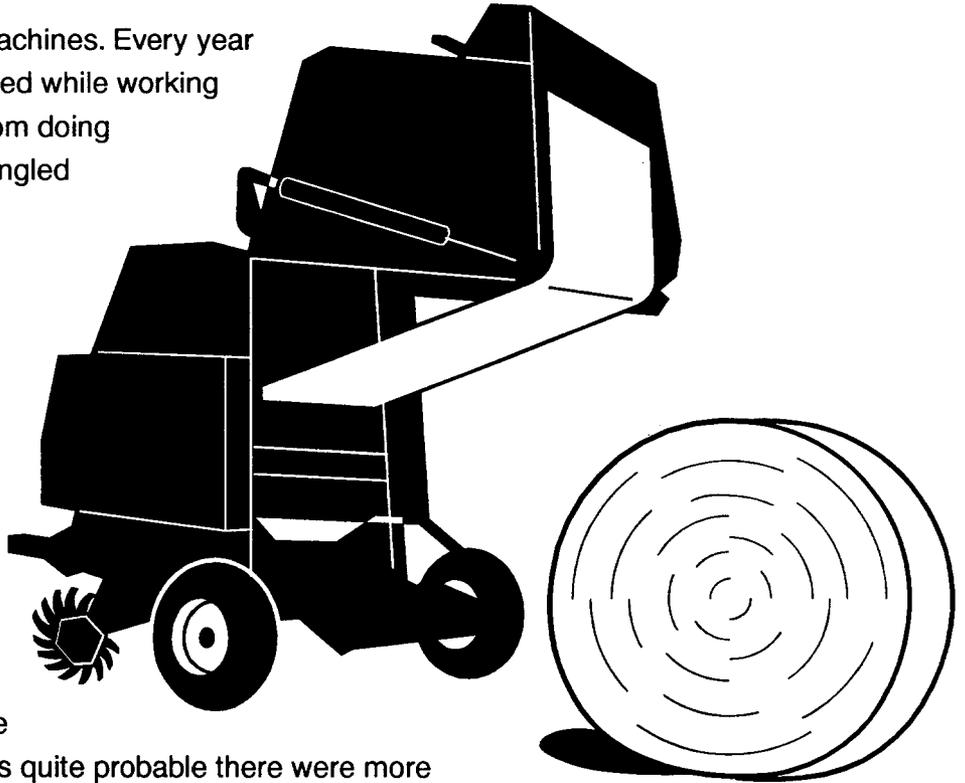
Safe Use of Big Round Balers

George Maher
Agricultural Safety Specialist

Big Round Balers are Hazardous

Big round balers can be dangerous machines. Every year several farm workers are injured or killed while working with these machines. Injuries result from doing maintenance unsafely, becoming entangled while making machine adjustments, unplugging crop material from the baler, and becoming entangled while observing the machine at work.

According to surveillance statistics from the North Dakota Agricultural Occupational Health and Safety Nurse Program, 56 reported injuries resulting from working with and around big round balers were reported in the state from 1991 through 1996. That is an average of more than nine injuries per year. It is quite probable there were more injuries since not all injuries are reported accurately. There were three fatalities due to working with big round balers in North Dakota between 1993 and 1997.



5
544.3
N9
198
70. 1157



NDSU EXTENSION SERVICE

North Dakota State University, Fargo, ND 58105

OCTOBER 1998

Be Alert to Safety Messages

New balers are posted with safety information in all areas of danger. Recognize and follow safety instructions that are posted on the machine. Safety decals may have weathered away on older balers, but they can be replaced with decals obtained from the respective dealer or manufacturer. Keep your older machinery updated with safety decals which can inform you of its hazards.

The safety-alert symbol will alert you of dangerous locations (see Figure 1). Signal words such as DANGER, WARNING, and CAUTION are used to indicate levels of danger. DANGER and WARNING are used to indicate specific hazards, while CAUTION is used to indicate general precautions and safety messages. Pay attention to the safety messages following these signal words; they are there to inform you of the hazard and precautions you should take. The decals and instructions are there for your benefit. The manufacturer posted the safety decals and instructions because hazardous areas and moving parts were recognized.

Typical places to find the DANGER signal word and safety message are at the feeding intake on both sides of the drawbar and at the PTO (power take off) shaft (see Figure 2). The WARNING signal word and safety message will usually be found at the unloading gate and the locking mechanism for the gate (see Figure 3). The CAUTION signal word and safety message can be found on all removable and replaceable shields, urging that they be replaced when removed from the baler (see Figure 4).

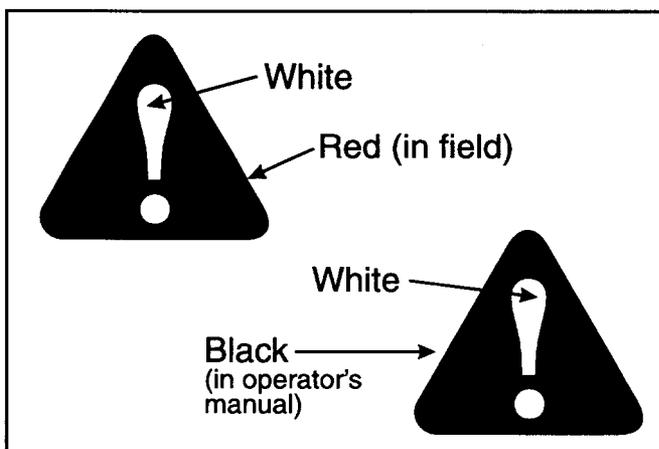


Figure 1. The Safety Alert Symbol is intended to get your attention!



Figure 2. Danger. Indicates one of the most serious potential hazards. Usually red with black or white text on white or black background.

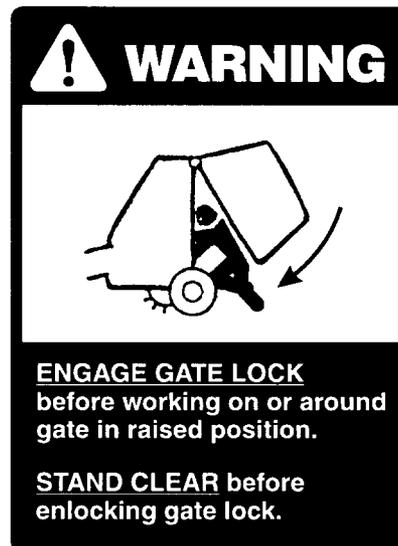


Figure 3. Warning. Indicates a hazard less serious than those indicated by Danger. Usually orange or yellow with black or white text on white or black background.



Figure 4. Caution. Intended to remind workers of safety instruction and identify a hazard less serious than those indicated by Warning. Usually yellow with black or white text on white or black background.

Prepare Yourself for the Job

Recognize and allow for the effect of weather on the fatigue/productivity level of machine operators. Baling hay is often done when temperatures are high. The humidity may be high or conditions may be very dusty. Sunny days are usually favored for baling hay. These conditions affect the degree of comfort and level of stress. As shown in Figure 5, workers suffer more as temperatures rise. Be prepared for more discomfort and stress as working conditions worsen.

High humidity combined with the ambient temperature can place more stress on working people, this is shown in Figure 6. For example, when the environmental temperature is 85 degrees (F) and the relative humidity is 60 percent, then the heat index is equivalent to 90 degrees (F); workers feel they are working in 90 degree (F) heat. The combined effect is like working in a higher environmental temperature. Of course, if the relative humidity was 30 percent with an environmental temperature of 85 degrees (F), then the heat index temperature would be 84 degrees (F). Humans have limits of how much stress they can take before it affects their thinking speed, reaction time, and good judgement capability. Not all people have the same limits and this must be considered. Know your limits and work accordingly. Manage your time carefully and take breaks as needed.

Heat Stress and Apparent Temperature		
Category	Temperature (°F)	Heat Syndrome
Caution	80 to 90	Fatigue possible with extended exposure and physical activity.
Extreme Caution	90 to 106	Heat cramps and heat exhaustion possible with extended exposure and physical activity.
Danger	106 to 130	Heat cramps and heat exhaustion likely. Heat stroke possible with extended exposure and activity.
Extreme Danger	Over 130	Heat stroke very likely.

Adapted from source: U.S. Weather Service.

Figure 5. Categorization of heat stress using the apparent temperature.

Tractors and big round balers are noisy and often produce noise levels in excess of 100 Decibels. Workers using tractors without noise insulated cabs are subjected to this noise level for extended times, their hearing may be threatened (see Figure 7). In these situations, hearing protection should be worn to prevent hearing loss.

Dress appropriately for the work being done. Safety should be considered before comfort. Loose clothing such as hooded sweatshirts (with drawstrings), open jackets, ragged jeans, and shoes with loose, floppy shoestrings should be avoided. Loose gloves can be quite dangerous. Wear close fitting clothing and safety equipment appropriate for the job.

Relative Humidity (%)	Temperature (°F)										
	70	75	80	85	90	95	100	105	110	115	120
0	64	69	73	78	83	87	91	95	99	103	107
10	65	70	75	80	85	90	95	100	105	111	116
20	66	72	77	82	87	93	99	105	112	120	130
30	67	73	78	84	90	96	104	113	123	135	148
40	68	74	79	86	93	101	110	123	137	151	
50	69	75	81	88	96	107	120	135	150		
60	70	76	82	90	100	114	132	149			
70	70	77	85	93	106	124	144				
80	71	78	86	97	113	136					
90	71	79	88	102	122						
100	72	80	91	108							

Figure 6. The Heat Index (National Weather Service).

Permissible noise exposure — hours per day that you can safely be exposed to these sound levels.	
Duration per Day (hours)	Sound Levels (decibels)
8	90
6	92
4	95
3	97
2	100
1½	102
1	105
½	110
¼ or less	115

As specified by the Occupational Safety and Health Act for industrial situations.

Figure 7. Permissible sound exposure.

Read the Manual and Follow Instructions

The operator's manual provides safety information for your benefit. Always read the manual before making adjustments on the machine. If there are questions regarding operation of the baler, consult the manual rather than guessing at the correct operation.

Prepare the Tractor and Baler for Work

Start with a properly set up and adjusted baler. Use the manual and take the time to make recommended adjustments for the existing conditions. An improperly adjusted machine will not operate correctly and will not produce quality bales. Faulty adjustments of the baler will cause problems leading to frequent stops resulting in frustration, disregarding of safety precautions, and possibly lead to an accident and injury, or worse.

Typical adjustments to the tractor include adjusting the drawbar in regard to distance it extends past the PTO stub shaft, the height of the drawbar from the ground, and the alignment of the drawbar with the centerline of the tractor PTO shaft. All of these adjustments are critical to safe operation of the drive line and are specified in the operator's manual for the specific model of baler (see Figure 8).

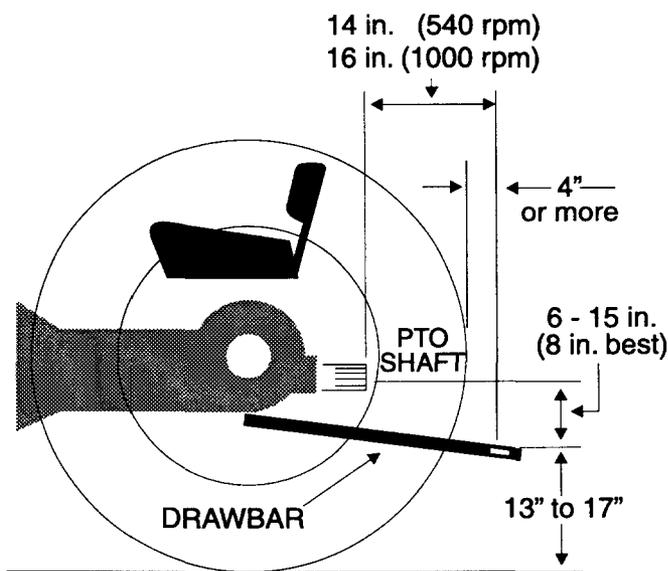


Figure 8. PTO and drawbar adjustments should be made as recommended in both baler and tractor operators manuals.

The tractor wheel spacing is important to provide tractor stability and prevent driving on the windrow. Front and rear wheels should be spaced according to the operator's manual for the specific model of baler and the tractor operator's manual. Not all balers have the same specifications for wheel spacing.

Proper ballasting of the tractor is important to stabilize the machinery when operating on uneven terrain and other adverse conditions. The tractor operators manual should be consulted for this adjustment.

Keep Your Distance

Stay clear of the baler while it is running, and keep all others away from the machine. Observers should watch the machine from a safe distance, at least 10 feet away. It is easy to become mesmerized or lured into a state of reduced awareness when observing working machinery very intently, to the extent that normal precautions are bypassed and dangerous procedures are followed.

Allow no riders at any time on the tractor or the baler. Riders may fall into the path of the baler in much less time than the tractor operator can stop the machine. Numerous injuries are suffered every year by riders on farm equipment. Riders can also block the operator's view, resulting in unsafe operation of the machine.

Keep Your Hands out of the Machine

It can be very tempting to work on machinery while it is running, taking 'just one chance.' Many machinery entanglements have happened when attempting to make adjustments to the machine while it is in operation. This is risky because machinery parts are often moving faster than a worker's reaction time.

Never attempt to feed crop material into the intake area of the baler, or unplug crop material from the intake area of the baler, or feed twine into the baler when the baler is running. These are the most common ways of becoming entangled and pulled into a big round baler.

Always stop the engine and remove the tractor ignition key before dismounting to service the baler. The intake area of the baler is the most dangerous place on the machine. It is aggressive, and workers always underestimate its speed and power (see Figure 9). There is a human tendency to misjudge reaction time when working around aggressive machinery.

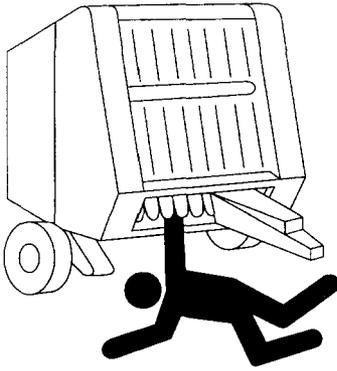


Figure 9.
The intake area of the baler is where many injuries occur.

Do not attempt to feed or unplug feed rolls with the engine running. The rolls will pull your hand in before you can let go of the hay. It is a natural human reaction to pull harder when something is being pulled from your grasp. Many people believe they will readily let go in this situation, but natural reactions frequently override good intentions.

Unload the Bale Safely

Before raising the rear gate to unload a bale, be sure no one is nearby (see Figure 10). Do not let anyone stand close to the rear of the baler when a bale is being ejected. Some balers have an ejector mechanism which swings outward to the rear of the baler, pushing the dropped bale away from the baler. This action may surprise observers at the rear of the baler who don't expect the bale to be pushed away from the machine.

Discharge bales on level ground whenever possible. On sloping ground bales should be deposited crosswise so they will not roll. Observers should be well away from

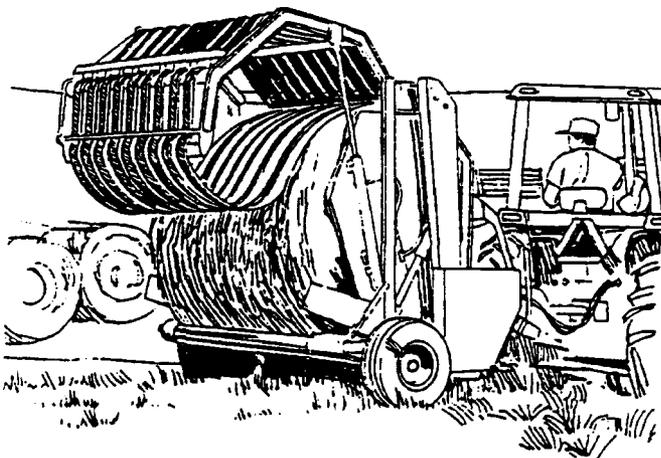


Figure 10. Be sure the area is clear before ejecting a completed bale.

the rear of the machine in these situations. The map or pattern for baling is usually determined when the field is cut for baling. Plan your mowing so bales will not be discharged on sloping ground where they will roll.

Do not attempt to stop a rolling big round bale; let it go. Light weight, big round bales may weigh about 500 lbs. and heavy bales may weigh as much as 2,000 lbs. Even the lighter bale is dangerous when in motion. It cannot be stopped safely by man or machine.

Working On or In the Baler Safely

Always park the baler on a flat, level surface so the machine is stable and will not move. Safely block up the machine if work is to be done on the baler while unhooked from a tractor. It must not be able to tip forward or to the rear.

The machine must be completely stopped before working on it. Look and listen for machinery movement before starting your work. Be sure the rear gate is closed, or locked in the raised position. Close the gate whenever the baler is left unattended.

Be sure the PTO is disengaged, the tractor engine shut off, and the key in your pocket before working on the machine. The tractor should be in park or the parking brake applied. Electric controls for the baler should be shut off.

Adjust, service and lubricate chain drives only when the machine is not running. Do not over-tighten the slip clutch. It must be able to slip to do its job properly. If the slip clutch is tightened beyond specifications, the baler may be over stressed and dangerous to use. Replace broken shear bolts with the correct part. A shear bolt that breaks repeatedly indicates there is something wrong with the machine, check it out. Using a stronger bolt may result in damaged machinery or possibly injured workers.

Always inspect the operation of the forming belts from a safe distance, such as the tractor cab. Never reach in to check forming belt tension or tracking while the machine is running. Always disengage the PTO, shut off the tractor engine, and be sure the baler has stopped running before doing anything with the forming belts.

When maintenance work is finished be sure to remove all tools and replaced parts from the baler. Replace all shields and guards before testing and operating.

Use Lighting for Safety

Use safe and appropriate lighting on your equipment if you will be working after dark or moving your machinery on public roads. Field or work lights should fully illuminate the pickup area of the baler and other lights should illuminate the forming belt area. Another area that needs illuminating is the rear gate where bales are discharged.

When moving the baler on public roads, use proper reflectors (red to the rear and amber to the front) and taillights to show the width of your machinery. Lights must be fully visible from at least 1,000 feet (see Figure 11). Always display an SMV (slow-moving vehicle) sign on the rear of your machinery. Be sure it is clean and completely reflective. It must be fully visible from the rear. Turn off all field and work lights when moving machinery on the public roads.

Safety on the Road

Always use a safety clip on the hitch pin to prevent it from coming out. Attach a safety chain when pulling the baler on a public road to maintain control if the hitch pin should fail (see Figure 12).

The safety chain should have just enough slack to allow turning. Support the chain; it should not be allowed to drag on the ground. Allowing the chain to drag wears the links and weakens them.

Do not pull more than twice the weight of the tractor. If the pulled load weighs more than the tractor be sure to reduce the speed to half the maximum speed of the tractor, or slower.

Maintain a safe speed when pulling machinery on the road. Having an SMV sign on the baler restricts the maximum speed to 25 miles per hour. Most implement tires also are limited to a maximum speed of 25 miles per hour. The baler should not be pulled faster than the maximum speed of its tires.

Use the Power Take Off and Hydraulics Safely

Observe all safety precautions applying to PTO (power take off) and hydraulically operated machinery. Never operate PTO powered machinery without complete shielding of the PTO shaft, universal joints, and PTO couplers. Always check the PTO shielding to be sure it spins freely on the PTO shaft before operating (see Figure 13). Always replace a worn or damaged PTO shield before using the baler. Never inspect hydraulic hoses or lines for leaks by passing a hand over or along the hose or line. Never attempt to connect or disconnect hydraulic hoses while under pressure; relieve the pressure first. Do not operate the baler when hydraulic lines show excess wear or damage, replace them first.

NOTE: If implement obstructs view of SMV emblem on tractor, emblem must be mounted on implement.

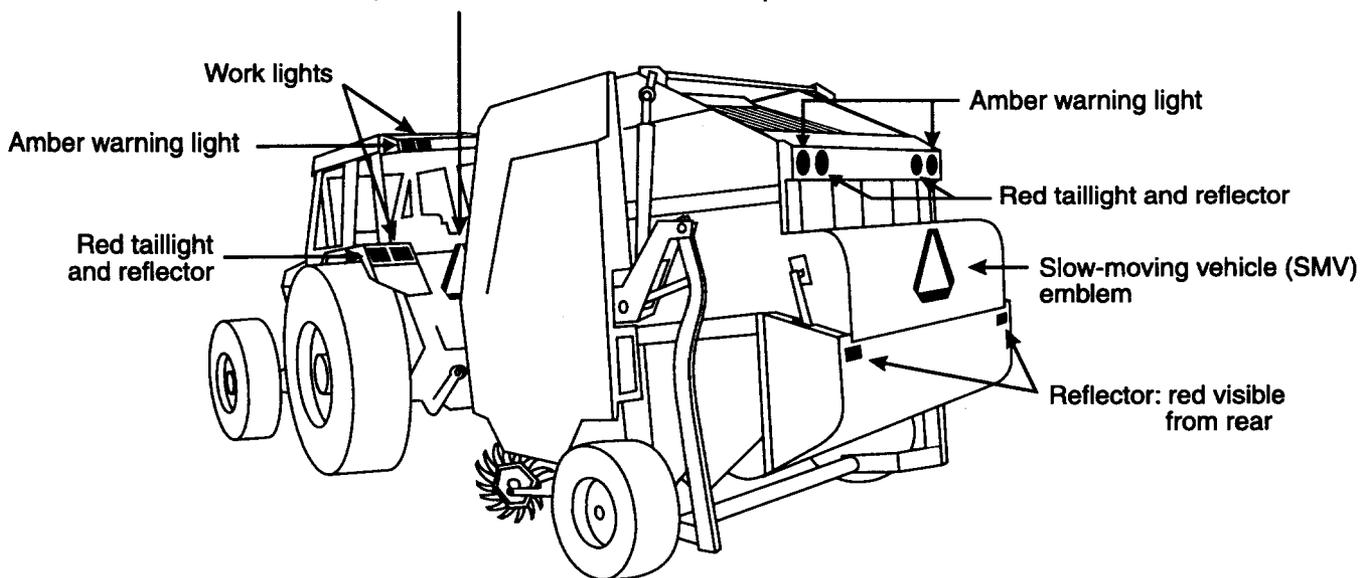


Figure 11. Safe use of lighting and warning lights on farm machinery can save lives.

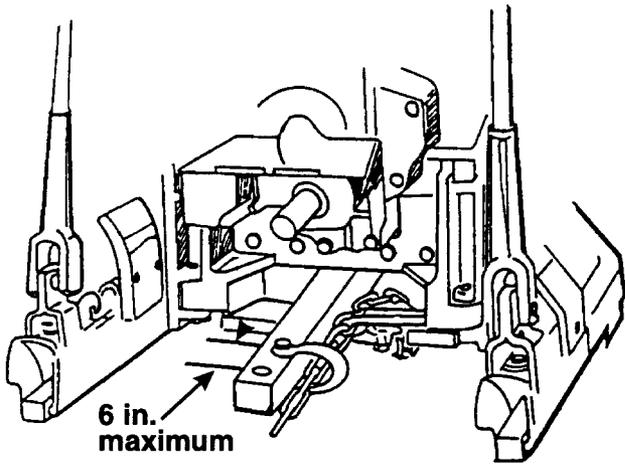


Figure 12. The safety chain should be strong and securely attached.

Moving Large Round Bales

The two most common ways of moving large round bales are using the front-end loader and the three-point hitch bale mover.

Front-end loaders used for moving large round bales should have bale forks or grapple forks. The forks grasp the bale and prevent it from rolling down the arms of the loader and onto the tractor operator. A tractor equipped

with a ROPS (roll over protective structure) cab is more protective of the operator than one with a roll-bar type ROPS or no ROPS structure (see Figure 14). Tractor operators have been fatally crushed by large round bales that rolled down onto them. Lift and carry only one bale at a time, never two.

Tractors with front-end loaders are very unstable with a large round bale elevated high. The tractor's center of gravity goes up as the bale is elevated. Always operate the tractor at a slow speed when moving large round bales in the raised position.

A spear or fork-type bale mover mounted on the front end loader will keep the bale in a more stable position. Since the bale is impaled on the fork or spear it is not as likely to roll down the front end loader and onto the tractor operator's position. However, concerns with tractor stability due to the elevated bale still apply with this type of loader.

Using a spear-type, three-point hitch bale mover raises the center of gravity much less, making it a safer system for moving the bales. A big disadvantage is the limit on how high the bales can be lifted, such as for loading trucks more than one bale high. Use of this type of bale moving system may require adding ballast to the front of the tractor, smaller tractors may need more weight in front for safer steering.

Disengage PTO, shut off engine, and . . .

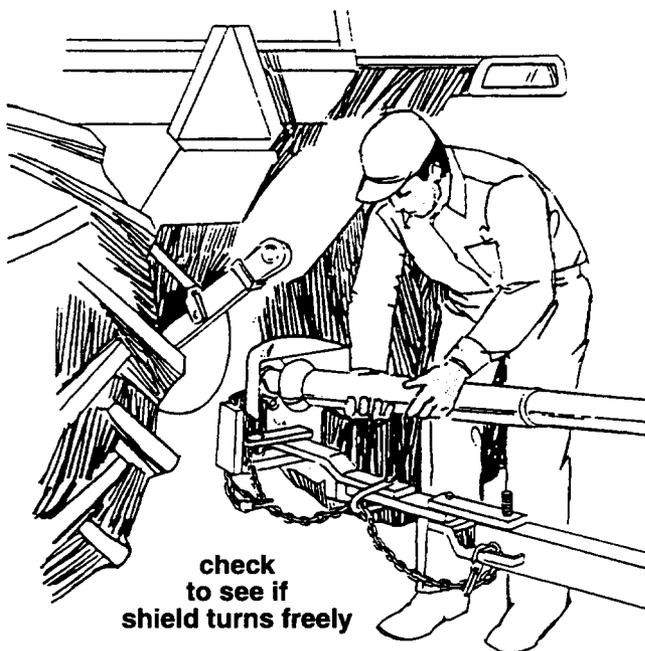


Figure 13. Always check the PTO shield for free movement before operating the baler.

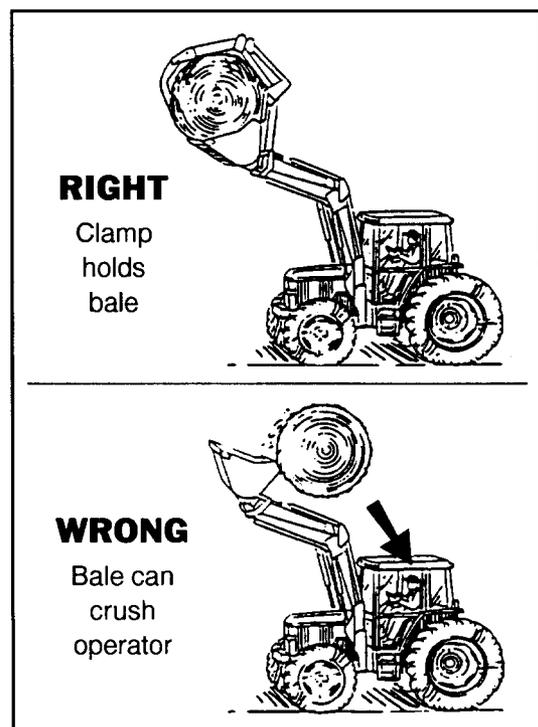


Figure 14. Grapple forks keep big round bales safely in the loader bucket.

Additional Information

Grisso, Robert D., David L. Morgan and Rollin Schnieder, Large Round Bale Safety, NebGuide G76-303-A, University of Nebraska-Lincoln, 1995.

Hanna, Mark and Laura Miller, Reduce Risks Around Big Round Bales, SafeFarm Newsletter, Pm-1518G, Iowa State University, July 1993.

Farm & Ranch Safety Management, Deere & Company, 1994.

Operators Manual, 435 and 535 Round Balers, John Deere Ottumwa Works, OME87614-H2, Issue 15, 1995.

Operators Manual, 8455 Round Baler, Case IH, Rac 9-23355, 1998.

Langley MD, Ricky L., Robert L. McLymore, Sr., William J. Meggs, MD, Gary T. Roberson, Safety and Health in Agriculture, Forestry, and Fisheries, Government Institutes, 1997.

*This material is based upon work supported by
the Cooperative State Research, Education and Extension Service,
U.S. Department of Agriculture, under Agreement No. 98-EDFA-1-0258.*



AE-1157

NDSU Extension Service, North Dakota State University of Agriculture and Applied Science, and U.S. Department of Agriculture cooperating. Sharon D. Anderson, Director, Fargo, North Dakota. Distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914. We offer our programs and facilities to all persons regardless of race, color, national origin, religion, sex, disability, age, Vietnam era veterans status, or sexual orientation; and are an equal opportunity employer.

2M-10-98

This publication will be made available in alternative formats for people with disabilities upon request, 701/231-7881.