

The following table shows the proportion of fatalities related to various machines:

Fatal Entanglement Incidents by Machine Type, Canada, 1990-96*	
Machine Type	Fatalities
Power Take Off (PTO)	36%
Baler	12.5%
Grain Auger	10%
Combine/Harvester	7%
Manure Spreader	5.5%
Post Hole Auger	5.5%
Swather	3%
Other	20.5%

* Canadian Agricultural Injury Surveillance Program



HAZARD: Unguarded grain auger.

How can you prevent an entanglement injury?

Len P. lost his left leg in a post-hole auger when he slipped on frost – it was November – and the self screw on the PTO shaft hooked onto his nylon bootlace. He points out, “The digger wasn’t shielded. There had been a shield at one time, but it interfered with the operation of the machine, I guess. I borrowed the thing from my neighbour and there was no shield with it. I thought about putting a shield on it, but aach, I’ll be careful! So anyway, I remember the thought going through my mind, ‘I should get out of here,’ and the next thing I knew I was in it.”

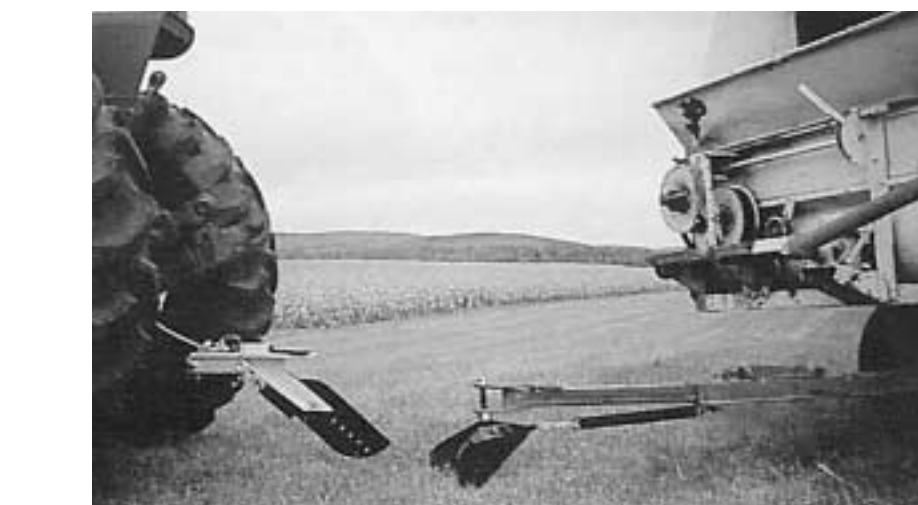
- Guard or shield all moving parts on machinery.** Reinstall guards or shields that have been removed. Contact the manufacturer to order retrofit guards or shields when necessary. Frequently inspect and immediately repair damaged shields, belts, pulleys and bearings.
 - Why should you do this when it means more time and expense to operate and maintain the equipment?
 - Entanglement injuries are among the most traumatic events seen in hospital emergency departments. They include amputations, crushing or fractures of the limbs, major lacerations, head and spinal cord trauma, and frequently result in permanent disability.
 - Reacting quickly won’t protect you from a machinery entanglement. A PTO shaft rotating at 540 rpm travels more than two metres in less than a second.
 - There will be times when you are tired, frustrated, or in a rush. You may trip momentarily and reach out, grabbing whatever is nearest. A machine guard provides you with a safety net when operating, or operator conditions are not ideal.

2. Do a pre-operational safety check on the operator. (That means you!)

- Any of the following human factors increases the likelihood of accidents including machinery entanglements:
- Rushing
 - Fatigue
 - Frustration
 - Hunger or thirst – low blood sugar and dehydration affect the brain first
 - Becoming chilled or overheated – too high or too low a body temperature affects muscle coordination, reaction time and thinking.
 - Using alcohol or medications that impair judgement, balance and coordination, while at work
 - Temporary physical illness or chronic disease which may affect perception, balance and coordination.
 - Complacency – “I’ve done it that way for years.”

When Doug T.’s feet became entangled in a hard core baler on September 5, 1990, he was pulled in up to thigh level. Miraculously, he survived with functioning legs and feet thanks to reconstructive surgery. Doug can identify two human factors – fatigue and frustration – in that incident: “We had combined the night before until about 3:00 a.m. and then I got up at 6:00 a.m. to start doing some baling before the day’s combining began. I had trouble getting the bale started and, finally, I must have got frustrated enough that I kicked some straw into the pick-up. It happens quick and you think it would never, ever happen to you. It’s not the baler’s fault, you know, it’s the person on the baler.”

Joe S. lost his left lower arm and hand on January 15, 1985 while trying to unplug a PTO driven feed mill, clogged by a frozen bale. He had unplugged the mill while it was running dozens of times before. Joe recalls, “That time, the grate between my hand and the hammers slipped. The hammers took the big mitt I had on and rolled it under, catching the index finger of my left hand. It was all over in the twinkling of an eye, or a blink.” Hindsight tells Joe he could have prevented the incident by leaving the frozen bales to thaw. “There were other bales, and I knew the frozen ones plugged the mill. Sometimes you just have to ‘work smarter’ not harder.”



HAZARD: Forage wagon with unshielded variable speed drive

3. Always disengage the PTO, turn off the engine and remove the keys before leaving the tractor seat. If you’re a bystander, walk around, don’t climb over a rotating PTO.

- The seconds it takes to:
- disengage the PTO
 - turn off the engine
 - remove the keys, and
 - walk around a rotating PTO
- are insignificant when compared to the time it will take to perform even the simplest tasks with a missing arm or leg for the rest of your life.

Bob G., now in his 50’s, lost his right arm at age four when he became entangled in a tractor PTO. On behalf of the provincial Farmers with Disabilities group, he visits other farmers who have recently been injured. He says, “With any of the people I talk to when I do a visitation, it’s always, ‘They were going to save a little time.’”

Neil E. lost his right lower arm and hand on October 23, 1996 while cleaning out the auger of a combine that he was helping a neighbour put away for the winter. He recalls how easily it happened. “My neighbour said, ‘I’m going to start the auger up’ but I didn’t hear him.” Neil emphasizes, “When you’re working with another person, you need to take three steps to:

- verify,
- clarify, and
- confirm communication.

How does that work? First you say, ‘I’m going to start up now.’ Next you say, ‘Did you hear me?’ And then you ask, ‘What did I say?’ It doesn’t take many seconds to prevent a tragedy.”

5. Communicate effectively when you work with another person.

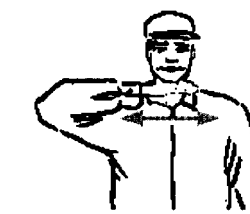
- Machinery noise can make it difficult to communicate verbally. Add to that the fact that older farmers with poor hearing due to years of noise exposure may not hear a shout of warning, and you have an accident in the making.
- Hand signals are another way to communicate when you can’t hear clearly. Standard signals ensure everyone gets the same message from the same signal. The Canadian Federation of Agriculture (CFA) developed a poster with frequently used signals such as “Start engine”, “Stop engine”, “Slow down”, “Move toward me” and “Stop”. Download the poster from the CFA website at www.cfa-fca.ca or request a copy from the Canadian Federation of Agriculture, 1101 - 75 Albert St., Ottawa, ON K1P 5E7



STOP – Raise hand upward, arm fully extended, palm to the front. Hold that position until the signal is understood.



COME TO ME – (may mean “Come help me” in an emergency): Raise arm vertically overhead, palm to the front, and rotate in large horizontal circles.



STOP THE ENGINE – Move your right arm across your neck from left to right in a “throat-cutting” motion.



THIS FAR TO GO – Put hands in front of face, palms facing each other. Move hands together or further apart to indicate how far to go.

6. Consider yourself an elite athlete – and dress for the event.

- PTO entanglements occur in all months of the year but are most common during cold weather when there is an increase in the amount and type of clothing worn. Be especially careful when conditions are windy. A gust can blow an otherwise stationary piece of clothing into the path of moving machinery parts.
- Wear close fitting clothes.
 - Make sure bootlaces are tucked away.
 - Cover long hair.
 - Avoid loose cuffs, belts, ties or protruding buckles that are easily caught on equipment. Coveralls conceal such hazards.
 - Leave jewellery and accessories such as chains or scarves with loose ends at home. Even rings can increase the damage to a finger or result in amputation when a hand is crushed.
 - Close fitting leather or insulated work gloves are less apt to become caught than loose fitting handwear.

Basil B. became entangled in a tractor PTO on November 4, 1996. He recalls, “I had on insulated winter coveralls over blue jeans and long johns, and pull on leather work boots. The legs on the coveralls were wide to fit over the tractor and seeing the wind blow the pant leg of my coveralls toward the PTO, it flipped me to the ground. I have since learned it takes less than one-third of a second to wrap a 36-inch pant leg up a PTO.”

Andrew W., age 8, was helping his dad unload a grain truck during harvest of 1997. Trying to close the end gate, he slipped and fell into the auger. His right arm was amputated at the shoulder.

Andrew's mother speaks of the toll the accident has taken on the family:
"We take full responsibility and have experienced guilt and grief. Although time is healing, we still cry and feel numb when we remember that day."

7. **Keep bystanders and children away from all moving machinery.**
 Tractors and other machinery account for 70% of all farm fatalities and over 80% of fatalities occurring in children aged 14 years and younger.
- ✓ Farm kids will always want to help with farm work, and learning "on the job" is part of growing up on a farm. It is the responsibility of the parent or other supervising adult to decide what jobs a child can handle safely, and to provide the appropriate training and supervision. The North American Guidelines for Children's Agricultural Tasks can help parents make those decisions. To view the illustrated Guidelines on line, visit www.nagcat.com. To order Guidelines, contact Gempler's Inc. by telephone at 1-800-382-8473.
 - ✓ Every farm with young children, or children who visit regularly, needs a designated safe area for unsupervised play, away from machinery. If they are around operating machinery, young children need the full attention of an adult.
 - ✓ Also at risk are adult family members from off the farm and temporary help who may not be fully aware of the danger of drive shafts, belts and pulleys. A reminder to stay a good distance from moving machinery parts will alert them to the hazard.



Remote control engine shut-off and receiver.

8. **Invest in a remote control engine shut-off.**
 ✓ By installing receivers on all potentially hazardous equipment, you can shut down an engine immediately with a credit card sized transmitter in a pocket or attached to your belt. With the addition of a solenoid, the device works on manual shut-offs. A fail safe feature prevents the engine from starting again without turning the key in the ignition.

Tony P. became entangled in a baler on August 6, 1993. He used his left hand and a utility knife to gradually sever the rotating 8 inch belt that had taken most of the flesh from his elbow and arm. Tony tells other farmers,
"When you're alone in that situation, and there's no way to shut the equipment down, it's a real Hell hole."

Too many men, women and children suffer the devastating effects of a farm machinery entanglement.
 On September 24, 1982, Clara C. and her husband were combining. As she reached through the moving pulley of a variable speed drive to reset a slipped belt, her right hand became entangled and was amputated at the wrist.
 Although Clara was admitted to hospital at 1:55 p.m., her surgery did not take place until midnight. Surgical staff were busy with another farmer who had lost a hand in an unrelated combine incident and a farmer who lost a ring finger the same day.



Photo by Naomi Friesen

Clara C. lost a hand while combining.

Safeguard yourself from entanglements ...

1. Guard or shield all moving parts on machinery.
2. Do a pre-operational safety check on yourself.
3. Always disengage the PTO, turn off the engine and remove the keys before leaving the tractor seat. If you're a bystander, walk around – don't climb over – a rotating PTO.
4. Turn off power before attempting to repair, adjust or unplug machinery.
5. Communicate effectively when you work with another person.
6. Consider yourself an elite athlete – and dress for the event.
7. Keep bystanders and children away from all moving machinery.
8. Invest in a remote control engine shut-off.

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PREVENTING FARM MACHINERY ENTANGLEMENTS

A typical entanglement fatality

The victim, a 47-year old male, was grinding grain in a feed mixer mill driven by a power-take-off (PTO) device. Eyewitnesses stated that his clothing became entangled in the rotating PTO shaft as he attempted to step over it. There was no guard on the PTO shaft (the master shield was not in place). He suffered an amputation of the right leg, several broken ribs and a fractured spine. He died while emergency personnel were trying to extricate his body from the PTO mechanism.

How common are farm machinery entanglements?

- Entanglements cause 30% of the farm machinery injuries on Canadian farms.
- Entanglements involve both sexes and all ages of people.
- Entanglements are frequently fatal, causing, on average, ten deaths a year in Canada.
- Entanglements injure another 250 Canadians every year seriously enough to require hospitalization.



What type of machinery is involved?

Entanglements can occur when a machine has any of the following hazards:

Hazard	Description	Examples
Pinch point	Two or more parts move together with one moving in a circle	Pulleys and belts
Crush point	Two components move toward each other	Three-point hitches Hydraulic cylinders
Wrap point	Exposed rotating components; nicks, mud or rust increase wrap potential	PTO shafts Augers
Pull-in point	Mechanisms designed to pull in crops or other material	Pick-ups: combines, balers Feed grinders, conveyors
Shearing, cutting points	Two parts move across each other or a stationary object	Cutter bars, augers feed mixers