



MICHIGAN STATE UNIVERSITY: Prevention of work-related deaths through research & investigation

WORK-RELATED DEATHS AND INJURIES FROM TRACTORS

Tractors are commonly used in farming but are also frequently used in other industries such as construction, landscaping, and logging. Since 2001, there have been 199 tractor-related deaths in Michigan; 85 % of the deaths occurred in agriculture. There were eight tractor-related deaths in Michigan in 2021.

CASE NARRATIVES

- A farm hand died when a tree branch from the downed tree being moved by his tractor's loader bucket struck him. The incident occurred near a tree line while he was mowing the perimeter of the property. A tree had broken near the base of the trunk and had fallen from the tree line into the field in the mowing path. The tree had several branches that formed a "Y". The incident occurred while the decedent, seated in the tractor seat, attempted to use the loader as a bulldozer to move/push the tree to the side and out of the field. On the decedent's last attempt, the tree "rolled" up and over the bucket and a branch struck and pinned him in the tractor seat.
- A farmer died when her clothing became entangled in the unguarded rotating power take off (PTO) shaft of a tractor she was using to power a corn elevator. The decedent's clothing had become caught in the gear of the rotating power shaft where it connected to the corn elevator, leading to further entanglement of the decedent and extensive trauma. No part of the PTO driveline was guarded or shielded.
- A volunteer died while mowing grass for a youth organization's camp using a tricycle-type Allis Chalmers Model L59AC farm tractor, retrofitted with an after-market, home-installed underbelly power rotary mower attachment. The tractor overturned to the side on a 30-degree hill and pinned him beneath it. The tractor was not equipped with a rollover protection structure (ROPS) and seat belt.
- A farmer died when he fell off his Ford 5600 series tractor and the tractor ran over him. The decedent was driving the tractor on a two-lane roadway when he entered an extremely deep, steeply sloped ditch on the side of the road. When the tractor entered the ditch, the decedent fell off the tractor and was run over. The tractor was not equipped with rollover protection.
- A farmer died while attempting to climb onto an Allis Chalmers tractor. The police report indicated "the tractor went into gear" and started moving backwards. The decedent was unable to get onto the tractor and was dragged and pinned between a tree and the 3-point hitch on the tractor.
- A farmer died when his tractor was struck by vehicle. The decedent was traveling westbound on a public road when he was struck from behind and ejected from his tractor.
- A farmer died from exposure to carbon monoxide while working on his tractor in a closed garage.
- A student died when the Ford 801 Powermaster tractor she was using to pull out a stuck tractor overturned to the rear, pinning her. A family member attached a chain to the rear of the Ford tractor to the front of the stuck tractor. The family member witnessed the front of the Ford tractor raise off the ground and overturn to the rear.



Tractor seat struck by tree that rolled up and over the bucket

RECOMMENDATIONS TO PREVENT TRACTOR-RELATED DEATHS

- Using tractors other than for their intended use may create unsafe work conditions. Tractor owners should make every effort to obtain an operator's manual for each tractor as well as other safety materials to use as training aids for safe tractor operation and service/maintenance.
- Tractor owners/operators should ensure that the tractor size and capacity is appropriate for the intended task.
- Side overturns have occurred near the edge of drainage ditches or other land depressions or obstacles. Operators should leave a visual clue to identify edges of ditches/depressions/obstacles.
- Read, understand, and follow the safety guidelines in the tractor's Owner/Operator's Manual.
- Retrofit pre-1976 manufactured tractors with a rollover protection structure (ROPS) and seat belt. (*See University of Kentucky reference*).
- Always wear the seat belt during tractor operation in a ROPS-equipped tractor.
- Never start tractors while standing on the ground.
- Tractors are not constructed to safely free stuck equipment. If despite the hazard an operator chooses to use a tractor to free a piece of stuck equipment, the operator should hitch the front of the towing tractor (not the back) to the front of the stuck equipment. The operator should then slowly and deliberately drive the towing tractor in reverse using a slow and steady pull.



Tractor overturned into drainage ditch

DID YOU KNOW

- A typical PTO shaft can:
 - Wrap up 424 feet of shoelace in one minute at 540 rpm, or 785 feet of shoelace at 1000 rpm?
 - Wrap your arm or leg around the PTO shaft nine times in one second at 540 PTO rpm, or 16 times in one second at 1000 PTO rpm.
 - Produce second degree burns on your skin, even if you are lucky enough to have the PTO strip only the cotton clothing from your body. Nylon and other synthetics will cut into skin and muscle tissue rather than rub across it.
- The average replacement PTO shield costs less than \$100 and takes less than two hours to install.
- Hydraulic oil is under extremely high pressure, up to 3000 pounds per square inch. A leak in the hose could force oil under your skin and act like a poison.

RESOURCES

- The NIOSH Division of Safety Research and Protective Technology Branch: Cost-effective rollover protective structures as an alternative to installing commercially available rollover protective structures for four tractor models; Ford 8N, Ford 3000, Ford 4000, and Massey Ferguson 135 <http://www.cdc.gov/niosh/topics/aginjury/rops/>
- National Ag Safety Database: Tractor Safety for the Landscaping and Horticultural Services Industry <http://nasdonline.org/1919/d001874/tractor-safety.html>
- OSHA: Youth in Agriculture – Tractor Safety. <https://www.osha.gov/SLTC/youth/agriculture/tractors.html>
- Kubota Tractor Corporation: The 10 Commandments of Tractor Safety. <https://www.kubotausa.com/service-support/safety/tractor-safety>
- MIOSHA Safety Standard Part 51. Agricultural Tractors: http://www.michigan.gov/documents/CIS_WS_SH_part51-53_83015_7.pdf
- Your Guide to Available Retrofit Rollover Protection Structures (ROPS) for Agricultural Tractors Nationwide - University of Kentucky: <http://rops.ca.uky.edu/>
- National Ag Safety Database: A Guide To Safe Farm Tractor Operation: <http://nasdonline.org/1650/d001534/a-guide-to-safe-farm-tractor-operation.html>
- USDA Agricultural Research Service: Tractor Safety <https://www.ars.usda.gov/northeast-area/docs/safety-health-and-environmental-training/tractor-safety/>