

Tractor Safety Guidelines



IOWA STATE UNIVERSITY

Environmental Health and Safety

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IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY**Protecting the Safety, Health, and Environment of the Iowa State Community**

Iowa State University strives to be a model for safety, health, and environmental excellence in teaching, research, extension, and the management of its facilities. In pursuit of this goal, appropriate policies and procedures have been developed and must be followed to ensure the Iowa State community operates in an environment free from recognized hazards. Faculty, staff, and students are responsible for following established policies and are encouraged to adopt practices that ensure safety, protect health, and minimize the institution's impact on the environment.

As an institution of higher learning, Iowa State University

- fosters an understanding of and a responsibility for the environment,
- encourages individuals to be knowledgeable about safety, health and environmental issues that affect their discipline, and
- shares examples of superior safety, health and environmental performance with peer institutions, the State of Iowa and the local community.

As a responsible steward of facilities and the environment, Iowa State University

- strives to provide and maintain safe working environments that minimize the risk of injury or illness to faculty, staff, students, and the public,
- continuously improves operations, with the goal of meeting or exceeding safety, health and environmental regulations, rules, policies, or consensus standards, and
- employs innovative strategies of waste minimization and pollution prevention to reduce the use of toxic substances, promote reuse, and encourage the purchase of renewable, recyclable and recycled materials.

The intent of this statement is to promote environmental stewardship, protect health, and encourage safe work practices within the Iowa State University community. The cooperative efforts of the campus community will ensure that Iowa State University continues to be a great place to live, work, and learn.



Wendy Wintersteen
President

Directory of Service and Emergency Providers

Services

Environmental Health and Safety

2408 Wanda Daley Drive | (515) 294-5359

Iowa State University Occupational Medicine Department

G11 Technical and Administrative Services Facility (TASF), 2408 Pammel Drive | (515) 294-2056

McFarland Clinic PC, Occupational Medicine

1018 Duff Avenue | (515) 239-4496

Thielen Student Health Center

2647 Union Drive | (515) 294-5801

Emergency

Emergency - Ambulance, Fire, Police

911

Department of Public Safety/ Iowa State University Police

Armory, 2519 Osborn Drive | (515) 294-4428

Mary Greeley Medical Center

1111 Duff Avenue | (515) 239-2011

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A. Introduction



Tractors have contributed immensely to farm productivity. Over the years, manufacturers have added many safety features such as seat belts, roll over protection structures (ROPS), and power take-off (PTO) guards. Although today's tractors are safer than previous models, they are still involved in farm accidents. A well-trained operator, aware of the potential hazards will help minimize this risk.

Why Does Tractor Safety Matter?

According to the U.S. Department of Labor, tractor accidents accounted for 40 percent of farm fatalities in 2017. Tractor overturns were the leading cause of death for these farmers and farm workers, according to the Center for Disease Control and Prevention (2018).

According to the National Agriculture Safety Database, the use of ROPS and a seat belt is estimated to be 99 percent effective in preventing death or serious injury in the event of tractor roll overs.

Environmental Health and Safety (EH&S) and Iowa State University (ISU) want to ensure the safety of employees using tractors or tractor operated equipment. Please carefully read the precautionary guidelines and contact EH&S if you have further questions.

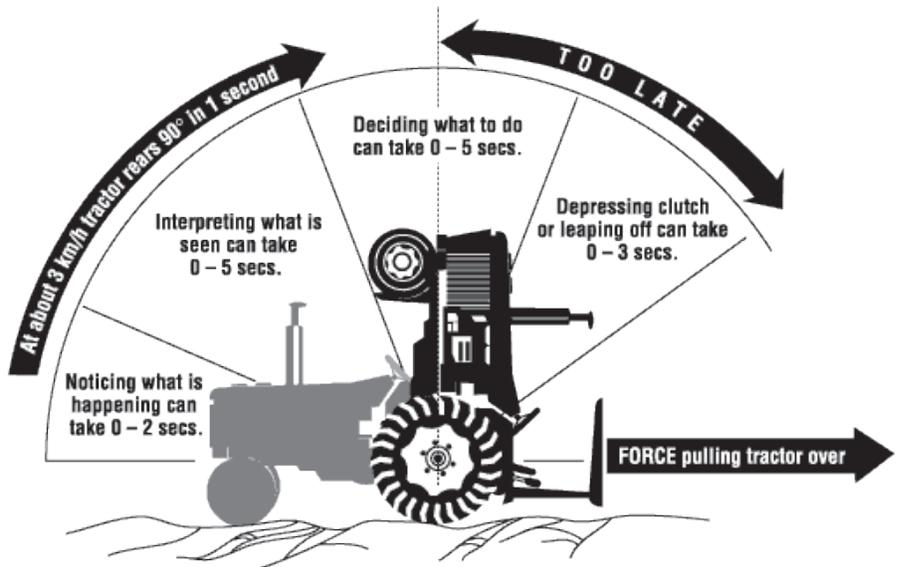
B. Protective Devices

Protective Structures

Roll-over protective structures (ROPS) refer to the operator compartment structure, typically a cab or framework intended to protect operators from injuries caused by overturns or rollovers. Seat belts are an integral part of any ROPS and should always be used.

All tractors should be equipped with ROPS, and most new tractors are installed with ROPS. However, not all tractor cabs are ROPS, so consult your tractor's operator's manual to determine if your cab is a ROPS. If it is not, a ROPS can be installed by a certified farm equipment dealer.

Falling object protective structures (FOPS) should be installed (tractors with front end loaders) if there is a risk of the tractor operator being struck by debris.



C. Before Operating a Tractor



Your tractor has been designed and built with your safety in mind. Its safe operation, however, is entirely in your hands.

Know Your Tractor

Be familiar with your tractor's operator's manual and any attached implements before operation. Seek training on safe operation from a competent instructor.

- Know each control, its location, and how it works.
- Know how to stop the tractor quickly in the event of an emergency.
- Never use a machine unless it is properly maintained.
- Never operate farm machinery under the influence of drugs or alcohol.

Dress properly:

- Avoid clothing that could get caught in moving parts (e.g., loose fitting, scarves, or clothes with strings).
- Tie back long hair or contain in a hat.
- Avoid wearing jewelry.
- Wear closed-toe shoes that are sturdy with non-skid soles.
- Wear eye and hearing protection as appropriate or required.
- Wear work gloves as needed.

Start-up Checklist

- inspect
- area clear
- park or neutral

Start-up Safety Checklist

Before starting;

1. Complete an inspection.
 - Verify that all lights are visible and working.
 - Verify that all safety guards are in place.
 - Check for clear visibility on all sides.
2. Ensure all bystanders are at a safe distance.
3. Verify that tractor is in park or neutral.



Adjust controls before operating.

Operator Platform

The operator's platform consists of steps, seat with seat belt, and multiple controls at hand and foot positions.

- Ensure steps are clear of obstructions (mud, manure, chains, tools, or hitch pins).
- Check and adjust the seat and steering column so that you can comfortably reach all controls.
- Seat belt should be worn at all times when the tractor has a ROPS. **Never wear a seat belt in a tractor without a ROPS.**
- Ensure the cab windows are clean and vision is not obstructed.
- When equipped, ensure there is a fire extinguisher with the pressure gauge in the charged range (green zone).
- A first aid kit is recommended.
- Always use access steps and hand-holds. Never jump from the platform.
- Enter and exit facing the tractor to ensure a good grip.
- Never get on or off a tractor while it is moving.

Driving



Ensure SMV emblem is visible.

- Evaluate your surroundings and ensure that no pedestrians or other vehicles are in the vicinity.
- All farm equipment traveling on any roadway must be equipped with an approved slow moving vehicle (SMV) emblem. Emblems should be clean and in serviceable condition. Broken, worn, or discolored emblems should be replaced. Emblems should be on the rear of the vehicle, in such a location that they are highly visible, and not obscured by the mechanical components of the implement.
- Public road driving should be done in the daytime, if at all possible, and during the lightest traffic hours.
- Obey all traffic laws when traveling on public roadways. This includes proper lighting, turn signals, and right of way, etc.
- Lock brake pedals together to help assure straight-line stops on public roadways.
- Stay off the shoulders, when possible. If you must drive on the shoulder, reduce your speed and watch for side rails, soft spots, slopes, and other hazards.
- Avoid high traffic roads and stop to allow traffic to pass, when possible.
- Drive at speeds appropriate for;
 - the job you are doing

Tractor Safety Guidelines



Evaluate the terrain.



No Seat, No Rider



Accidents are common when hitching or unhitching tractor-mounted machines.

- the terrain over which you are traveling.
- the equipment you are using.
- always remember to slow down when making a turn.
- always allow for appropriate stopping distances.
- Evaluate the terrain you will be traveling over during the work period. To prevent tractor roll-over, avoid driving on steep slopes, through ditches, over rough ground, stumps and large rocks. Do not drive along the edge of streams or pits, and always seek an alternate route in dangerous areas. If a safe route is not available, proceed cautiously at a slow speed. Descend slopes cautiously in low gear.
- Check the planned route for low power lines or overpasses. Ensure bridges can support the weight of the tractor and equipment.
- Follow the “No Seat, No Rider” rule. Never allow additional passengers on a tractor, unless equipped with an “instructor seat.”
- To aid communication, use hand signals during tractor operation, such as those developed by the [American Society of Agricultural and Biological Engineers](#).

Stopping Safely

When parking or leaving a piece of machinery for any length of time;

1. Make sure the transmission is in park or neutral with the parking brake engaged,
2. Fully engage the brakes.
3. Deactivate attachments and lower to the ground,
4. Stop the engine and remove the key.

Always come to a complete stop before leaving your seat, when someone approaches, or when anyone is working on the machine.

Hitching and Attachments

Tractor implements and attachments should be regarded as tools. They can be useful and labor saving when used properly, but can be dangerous if not used correctly.

- Equipment being towed should be hitched directly to the draw bar, with a hitch pin secured in place by a cotter pin or locking pin. Do not tow implements with chains, cables, or ropes.

Tractor Safety Guidelines

Preferred drawbar height is 17-21 inches above the ground level.



Travel with load as close to the ground as conditions permit.

- The draw-bar on a tractor should be kept as low as possible. Know the maximum height recommended by the tractor manufacturer, preferably 17-inches above ground level and not to exceed 21-inches above ground level. **NEVER attach equipment to the tractor frame or axle, unless it is designed or intended for that purpose.**
- Do not exceed the towing capacity of the tractor. Too much towing weight can cause a tractor to become unstable and extremely difficult to control due to the “swaying” action of the load.
- Never allow anyone to stand between the tractor and equipment, unless the tractor is stationary and the driver is aware of their presence.
- Use a spotter (a designated person to guide you) with implement and attachment connections if visibility is reduced, especially when reversing.
- Never walk or work under a raised loader bucket or implement.
- Always carry a load as low as possible to the ground and watch for obstructions.
- Allow for the extra length of the tractor implement and attachment when making turns.

D. Preventive Maintenance



Maintained Tractor

Save an engine from costly repairs; check the fuel, coolant, and oil levels before starting the engine.



Grease fitting

Performing maintenance is a critical task for every tractor operator. Keeping the tractor in good repair is an important part of safety.

- Read and follow safety procedures in the manufacturer's manual, for specific maintenance schedules and requirements.
- Make sure the engine is turned off and key out of ignition when performing maintenance.
- During the repair of any machinery, use appropriate personal protective equipment (PPE) matched to the hazard encountered (goggles, gloves, hearing protection, and safety shoes). Baggy clothing should be avoided, as it can be caught in rotating machine parts.
- Make sure to replace any guards removed during equipment repair.
- When preparing to work on a piece of equipment, chock the wheels to prevent movement. Jacks should be placed on a flat, hard surface, be in good condition and designed and rated for the load to be suspended.
- Brakes, hitches, safety chains, springs, and shackles should be inspected regularly for wear, broken or missing parts, cracked welds and excessive debris (mud, manure, rust).

Fuel, Oil, Coolant, and Lubrication

- Check for water or sediment in the fuel line sediment bowl and drain as needed.
- Add a fuel conditioner to keep both gasoline and diesel fuel stable.
- Check the engine oil, transmission fluid, and hydraulic oil.
- Add engine oil as needed. Low engine oil levels can be an indicator of other problems.
- Change the engine oil per the manufacturer's maintenance schedule.
- Check the radiator fluid level. Gradual loss of fluids over time can be expected, however, if a significant loss is noted, a more serious problem like coolant leaking into the engine oil may exist.
- Never remove a radiator cap from a hot engine. Steam and hot fluids can scald your skin.
- Using a hydrometer, test the engine coolant for level of temperature protection.
- Check the radiator screen for accumulation and clear as necessary.



Check tire condition

- Know the location of lubrication points (i.e. grease fittings or grease zerks). Look for grease fittings on steering components, brake and clutch linkages, and three-point hitch pivot points.
- Grease the fittings regularly. Clean the fitting, attach the grease hose, and pump grease until the seal begins to expand or grease is seen oozing out of the attachment you are lubricating. Do not over lubricate!

Tire and Wheel Condition

Check for:

- Low tire pressure and leakage from the valve stem.
- Loose bolts or lug nuts on wheels.
- The tread and overall condition.

Batteries

- Check for corroded battery terminals.
- Check battery fluid levels. If the battery has access caps, open to ensure that the fluid is covering the battery cells. Warning: the battery contains acid, wear appropriate gloves and eye protection.
- A sealed, maintenance-free battery does not require fluid level checks.

Belts and Hoses

- Check the fan drive belt for wear and tension.
- Check for oil and hydraulic leaks on the ground.
- Use caution when performing maintenance on hydraulic and pneumatic systems. If there is any indication of damage to these lines they require immediate replacement. Ensure that the systems are cool and residual pressure is relieved before loosening any fittings or removing lines. Use appropriate PPE when performing maintenance on hydraulic systems.
- If fittings or connections are leaking, tighten or replace seals.

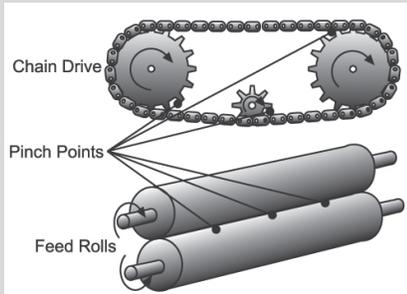
Filters

- Check the fuel filter for accumulated water.
- Check the air filter often. Since tractors are often operated in dusty conditions, this filter may need to be cleaned daily or weekly. Replace the filter if it cannot be cleaned satisfactorily or if it is damaged.
- Replace the oil filter at the time of an oil change.

Other things to check include:

- SMV emblem
- operators platform/steps
- seat belt condition
- fire extinguisher
- lighting/flashers
- visibility from operator's seat

E. Machine Hazards



Farm machinery produces power, which creates a number of hazards for both operators and bystanders. General machinery hazards include thrown objects, pinch, crush, wrap and shear points. Injuries can be serious, including amputations or death! It is important to recognize and be alert for machinery hazards and take precautions to avoid injury.

Pinch Points

Belt drives, chain drives, gear drives, and feed rolls are all pinch points. When guards cannot be provided, operators must avoid contact with hands or clothing in pinch point areas.

Thrown Objects

Any object that can become airborne because of moving parts is a thrown object. Some examples of equipment and implements that can throw objects include mowers, stalk cutters, and combines.



Pull-In Points

Pull-in points occur where objects are pulled into equipment, usually by some type of processing. Examples include feed rolls, grinders, and forage harvesters. Never attempt to hand-feed materials into moving feed rollers.

Wrap Points

Wrap points include rotating power take off (PTO) and other shafts (e.g., joints, couplings, shaft ends and crank shafts). Avoid contact with components on rotating shafts, such as couplers, universal joints, keys, keyways, pins, or other fastening devices. Splined, square, and hexagonal shafts are usually more dangerous than round shafts because the edges tend to grab fingers or clothing more easily than a round shaft. However, round shafts may not be smooth and can also grab quickly.



Crush Points

Crush points are created when two objects move toward each other or one object moves toward a stationary object. Examples include pivot points, such as articulated steering on four-wheel drive tractors, working under raised heavy objects like combine heads, hitches, telescoping shafts, hoods, and doors.



Shear Points

Shear points are created when the edges of two moving parts move across one another or where a single sharp part moves with enough speed or force to cut soft material. Examples include sickle bar mowers, rotary shredders and cutters, cutter heads of forage harvesters, augers in tubes, chain and paddle conveyors, rotary mower blades, and certain points in an implement frame during raising or lowering.

Machinery Guarding

Unguarded power take-offs, machine blockages and maintenance activities can cause serious injuries.

A guard may be any cover, casing, physical or electronic barrier, intended to prevent contact between a hazardous machine part and any part of a person's clothing or anatomy.

Safe Work Practices

- Read and follow machine safety decals.
- Ensure guards are in place before activating machines.
- Never disable, modify or ignore machine guards or devices.
- Never attempt to service or unclog a machine while it is energized or the engine is running.
- Pay attention to what you are doing – don't get distracted or become complacent.
- Immediately report problems to your supervisor or the farm manager.



Read safety decals

F. Emergency Preparedness

Do you know what to do in the event of an emergency? What defines an emergency when you're operating a tractor?

An emergency is defined by the Federal Emergency Management Agency (FEMA) as "any unplanned event that can cause death or significant injuries to employees or the public; or that can disrupt operations, or cause physical or environmental damage." Agricultural emergencies can be natural or man-made.

Natural emergencies include thunderstorms, lightning strikes, tornadoes, flooding, winter storms, excessive heat and fires. Examples of man-made emergencies may include rotating and moving equipment incidents, amputations, chemical releases or spills, turnovers and rollovers, workplace violence, accidental poisoning and fires.

The first step in planning for potential emergencies is to perform an assessment of what might constitute an emergency while operating a tractor. The second, how should you prepare for each? And third, who should be contacted for different events?



Fire

Fires may occur on tractors, equipment, in fields, and in buildings. If a piece of equipment is the source of the fire's ignition, this can result in the equipment becoming engulfed in the fire. Did you check to see that your tractor is equipped with a fire extinguisher and that the gauge is in the green before starting the tractor? Other preventative measures include keeping machinery clean and free of combustible materials and periodically checking equipment during operation for field trash or heated bearings and belts.

Medical

Being prepared for medical emergencies is important. Ensure that a well stocked first aid kit is available, and that you are trained in basic first aid. Being prepared for a medical emergency is vital in rural areas because rescue personnel may have further to travel in the event of an emergency.



Mechanical Failure

No matter how well a tractor or piece of equipment is maintained, breakdowns are inevitable. Contingency planning for mechanical failures such as a flat tire or broken shaft is essential. Planning should include emergency phone numbers to call during business hours, as well as after-hours.



**SPILL
KIT**

Severe Weather

Severe weather can produce lightning, hail, high winds, tornadoes or flash flooding, all of which can be hazardous for someone operating a tractor. Protecting yourself during a severe weather situation can involve a variety of actions, such as delaying the work, knowing the weather forecast for the day, listening to the radio for updated weather reports, having a telephone or radio to use in the event of an emergency, and knowing where to seek shelter.

Spill

Spills are unintentional and can pollute soil and groundwater. While operating a tractor, a spill can occur when fueling, during operation if a fuel or hydraulic line breaks, or when applying chemicals. The plan for responding to spills should include emergency phone numbers to call, instructions for containing and cleaning up spills, and providing safety data sheet (SDS) information to responding personnel.

Emergency Action Plans

When planning for emergencies, be sure to communicate hazards through postings/signage and have procedures in place for personnel to follow. An [Emergency Action Plan template](#) has been developed to help address potential issues.

- Develop a procedure for responding to medical emergencies at your location. Be sure the procedure includes identification of the emergency, evaluation of the scene before entering (to avoid rushing into a potentially dangerous condition or atmosphere), and instructions for contacting emergency services.
- Post the names and phone numbers of agencies or people to contact during an emergency.
- Post a National Fire Protection Association (NFPA) 704 diamond in areas where chemicals, fuel, compressed gas cylinders, etc., are stored.
- Identify evacuation routes and meeting locations for emergencies.
- Know the location of safety equipment such as fire extinguishers, safety shower, etc.

G. Resources

- Canadian Centre for Occupational Health and Safety (CCOHS), Tractor Roll-over Protection, 2012.
- Health and Safety Executive, “Using Tractors Safety: A step-by-step guide.” 2013.
- Health and Safety Ontario; Agricultural Tractor Safety, 2011.
- IowaWatch.org. “Matter of Seconds: Tougher Farm Safety Regulation Hard to Come by in Iowa, 2013.
- Kubota Tractor; Kubota 10 Commandments Tractor Safety, 1998.
- Purdue University, Cooperative Extension Service, “Safety with Farm Tractors.” 1993.
- Center for Disease Control and Prevention (CDC); The National Institute of Occupational Safety and Health (NIOSH); Agricultural Safety, 2018.
- The Pennsylvania State University; Hazardous Occupations Safety Training in Agriculture (HOSTA) Task Sheets, 2004.
- The US Department of Labor; Bureau of Labor Statistics: “National Census of Fatal Occupational Injuries in 2017.” 2018.

H. Non-discrimination Statement

“Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. veteran. Inquiries regarding non-discrimination policies may be directed to Office of Equal Opportunity, 3350 Beardshear Hall, 515 Morrill Road, Ames, Iowa 50011, Tel. 515 294-7612, email eooffice@iastate.edu”