

FARM MACHINERY SAFETY

Safe Operation
of Agricultural Equipment

Units 8-11

SAFETY IS NO ACCIDENT-

Review of Unit 1

- Accidents cause more deaths to persons between the ages of 15 and 24 than all other causes combined.
- Nearly one-third of all farm injuries are caused by falls.
- The National Safety Council reports that 10 working days are lost for each farm accident.


Important Safety Reminders

- No one is immune from accidents
- Serious accidents occur in all communities
- No machine is completely safe
- Tractors are powerful machines
- Many farm accidents involve misuse of agricultural machinery and tractors
- Our society demands safer working conditions

The image shows the cover of a spiral-bound notebook. The cover is a light beige or cream color with a fine, woven fabric texture. On the left side, there is a silver metal spiral binding. The text is centered on the cover in a black, serif font.

WHY FARM MACHINERY ACCIDENTS OCCUR

UNIT 8

A silver metal spiral binding is visible on the left side of the page, looping through a series of holes in the paper.

This unit emphasizes factors that cause accidents on farms that include both tractors and machinery.

Causes of Farm Machinery Accidents

Attitude

Common attitudes or beliefs that are related to unsafe working conditions are:

- It can't happen to me.
- The law of averages will decide the outcome.
- When my number is up, it's my turn.
- I'll just take one more chance.

Causes of Farm Machinery Accidents

Children Near Operating Machines

- Until children are large enough, mature enough, and can be trained to operate machinery, they should not be allowed on or near equipment while it is in operation.

Clothing

- Only properly fitted work clothing should be worn while operating farm equipment; no loose fitting clothes.

Causes of Farm Machinery Accidents

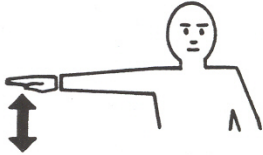





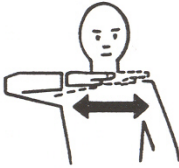
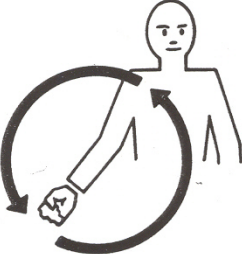

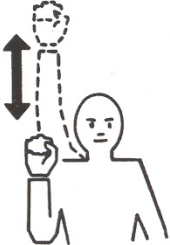
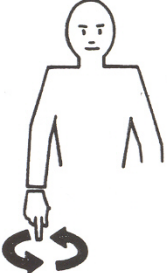
Communication

- Use of hand signals is becoming increasingly important as more farmers buy noise-reducing cabs with tractors and self-propelled implements.

Hurry

- By not rushing through jobs, a worker has more time to think and plan ahead, which reduces accidents because there is more time to identify hazardous situations.

Hand Signals

<p>HAND SIGNALS</p> <p>Use when noise or distance does not allow normal voice communication.</p>	 <p>SLOW IT DOWN - DECREASE SPEED</p>	 <p>THIS FAR TO GO</p>	 <p>MOVE OUT - TAKE OFF</p>
 <p>RAISE EQUIPMENT</p>	 <p>MOVE TOWARD ME - FOLLOW ME</p>	 <p>STOP</p>	 <p>STOP THE ENGINE</p>
 <p>START THE ENGINE</p>	 <p>COME TO ME</p>	 <p>SPEED IT UP - INCREASE SPEED</p>	 <p>LOWER EQUIPMENT</p>

When used properly and understood, hand signals make farm work easier and safer.

Causes of Farm Machinery Accidents

Housekeeping

- Accumulations of debris should be removed so that the farmstead buildings, and fields become safer places to work.

Fatigue

- Because reaction time increases with increased fatigue, the risk of personal injury also increases.
- Machinery operators need an adequate amount of rest and should alternate jobs during the day.

Causes of Farm Machinery Accidents

Improper Maintenance of Machinery

- With even the most careful inspection of machinery, machine failure can occur. It is less likely to occur if the operator checks the conditions of the machine seasonally and again before each day's work.

Improper Use of Machinery

- When human judgment (or error) forces a machine beyond its designed capability limits, a machine operator is in a hazardous position, because the machine does not function efficiently.

Causes of Farm Machinery Accidents

Improper Use of Tools in Machinery Repair

- Worn out tools in poor condition can lead to accidents.
- Injury can result from electrical shock caused from using improperly insulated electric hand tools.
- Farm welders should know the limit of their capabilities and seek competent help for many special welds.

Causes of Farm Machinery Accidents

Lack or Misuse of Safety Devices

- If fire extinguishers, guards, shields, or other safety devices are removed and not replaced, or if a machine is operated carelessly, the operator has set the stage for an accident.

Lack of Training

- No one should be allowed to operate a machine without first being instructed in operational procedures and possible hazards.

Causes of Farm Machinery Accidents

Weather

- When operating farm machinery, consider hazards associated with varying conditions due to mud, ice, snow, or frozen ground.

Well-Being

- The overall effect of health problems is reduced physical capability. A machine will probably be safer if its operator is in good health. However, good health will not guarantee an accident-free day's work.

Bad Luck or Carelessness?

- Many accidents have been attributed to just bad luck. In an analysis of bad luck situations, it is usually not very difficult to locate some type of human error.
- An operator can effectively eliminate bad luck by identifying hazards before the hazards affect the operation of a machine or the operator's safety.

Cost of Farm Accidents

- Accidents cost an average of 10 days of working time according to the National Safety Council.
- Accidents are extremely expensive. Accident costs can include: Hospital bills, doctor bills, extra hired labor, machinery repair, tractor and machinery rental, pain and suffering, and loss of the use of limbs for the rest of one's life.

Simple Safety Precautions Prevent Accidents

Simple precautions that can prevent accidents with farm machines.

1. When using any self-propelled machine, before attempting any adjustments, maintenance, repair, or unclogging operations, **stop the engine and remain in the operator's seat until all machine elements have ceased movement.**

Simple Safety Precautions

Prevent Accidents

2. Keep all safety guards or shields in good repair and in place.
3. Do not allow riders on implements, unless required for operation or training.
4. Never allow children to ride on or walk close to moving implements, trailers, or wagons.
5. Never permit any person to walk closer than six feet beside operating harvesting machinery.

The image shows the cover of a spiral-bound notebook. The cover is a light beige or cream color with a fine, woven fabric texture. On the left side, there is a silver metal spiral binding. The text is centered on the cover in a bold, black, serif font.

FARM MACHINERY ACCIDENT SITUATIONS

Unit 9



The purpose of this unit is to:

- Show that accidents can happen
- Alert trainees to some situations in which human error leads to an accident.

The following slides represent situations, types of machinery and types of equipment that can contribute to farm accidents.

Fencing Hazards

- Tools
- Log chains
- Barbed wire
- Barbed wire
stretcher
- Posts
- Cracked posts
- Postholes
- Clothes


Wagon Hazards

- Improper tractor guidance and control
- Helpers riding on tongues
- Hitching and unhitching
- Excessive or unbalanced loads
- Children playing in and around wagons (gravity boxes)
- Hydraulic lifts
- Un-level parking
- Loading and unloading
- Cross conveyers
- PTO shafts

Tractor Loader Hazards

- Load raised too high
- Load raised too high when on un-level ground
- Using loader while tractor is at excessive speed
- Loader dropping at road speed
- Loader used as a ladder
- Tractor with ladder used to drive cattle
- Loader raised

Tractor Loader Hazards



FACT

FRONT-END LOADERS can change the stability of a tractor-loader combination when not operated properly.

SAFETY TIPS:

- Keep the bucket low while carrying loads or when operating on inclines.

Tractor Loader Hazards

- Loader lifting excessive weight
- Loader used to load straw from top of a pile
- Loading rocks
- Large bales moved on loaders
- Tractor with power loader in a trench silo
- Riders in loader buckets
- Dismounting tractor with loader raised

Elevator and Auger Hazards

- Elevator raised on hillside
- Elevator used for ladder
- Operator's foot is caught in grain dump of elevator
- Helpers slide down elevator
- Elevator moved by livestock
- Tension springs
- Helper guiding elevator spout
- Loose clothing
- Auger not supported on grain bin
- PTO shaft
- Improper operation of engine
- Elevator raised too high

Elevator and Auger Hazards

- Excess grain load
- Playing with grain in grain cart
- Walking on top of grain load
- Power lines
- Lift cranks
- Hydraulic lines



Grinder-Mixer Hazards

- Changing screens before hammers stop
- Cleaning out supplement dump
- Suffocating from dust of closed bin
- Overloading a grinder
- Shoveling grain into hammer mill
- Improper movement or horseplay around elevator hopper
- PTO shaft
- Overhead bin spouts
- Guiding bin spouts
- Clothing

Baler Hazards

- PTO shaft
- Clothing
- Feeding pickup of baler
- Adjusting twine tension
- Hitching/unhitching hayrack
- Riders on wagons and trailers
- Operating baler at excessive speed
- Uneven loads on bale trailers and wagons
- Children playing in windrows
- Cleaning baler parts while the baler is running

Large Round Baler Hazards

- Removing plugged hay from rollers
- Working around rear gate or bale chamber area with out engaging mechanical gate safety lock
- Ejecting bale on hillside
- Moving bales on hillside
- Stopping rolling bales
- Picking up bale with out a grapple hook
- Hydraulic levers
- Improper belt tension

Combine Hazards

- Clothing
- Falls from steps or platform
- Straw spreader
- Worker stuck in grain tank or unloading auger
- Cleaning combine parts while combine is in operation
- Children playing around combine
- Driving in traffic
- Combine ladders
- Adjusting belts and pulley's
- Vision obstruction by dust

Corn Picker Hazards

- Clogged picker
- Gathering unit
- Riders in or on wagon
- Hitching or unhitching wagon
- Fuel leaks
- Children playing around equipment
- Cleaning parts
- Drive chains

Forage Harvester Hazards

- Worker caught in feed mechanism when cleaning clogged header
- Header falls on worker making adjustments
- Driving beside forage harvester
- Adjusting blower spout
- Sharpening knives

Hay Conditioner Hazards

- Worker's hand caught when cleaning clogged rolls
- Worker struck by object thrown from rolls

Cutter Bar Mower Hazards

- Fingers caught in sickle as cutter bar is raised to transport position
- Extra riders
- PTO shaft
- Traveling on uneven ground
- Hitch bolts break as safety release does not function

Rotary Mower Hazards

- Spectators
- Sharpening blades
- No shields around equipment and/or tractor

Windrower Hazards

- Worker crushed under header
- Windrower tips forward when stopping suddenly on steep hillside
- Inexperienced operator drives off road as vehicle approaches

Planter Hazards

- Marker falls on worker
- Worker falls when filling hopper
- Proper safety equipment not in use
- Diesel fuel used for cleaning fertilizer hopper ignites

Sprayer Hazards

- Hillside operation of SP high-clearance sprayer
- Platform and steps cluttered
- Misuse of proper personal protective equipment
- Sprayer boom is caught on post
- Operator fills sprayer using toxic insecticide
- High clearance sprayer wheel runs off edge of truck when loading
- PTO drive
- Children around sprayer

Cultivator Hazards

- Operator caught between tractor and machine being mounted
- Hydraulic cylinder disconnects with gangs raised
- Parallel links not correctly secured
- Gangs drop on operator working under machine
- Spring trip shank crushes hand of worker when manually adjusting trip
- Shank falls from front mounted machine

Disk Harrow Hazards

- Extra riders
- Hydraulic coupler removed with wheel disk in transport position
- Wheel disk rolls after hitch pin is removed
- Extension gang improperly supported
- Operator moves hydraulic lever to raise transport wheels
- Children around disk harrow use

Spike Tooth Harrow Hazards

- Hitch too short
- Drawbar hitch raised too high to help trash flow

Plow Hazards

- Machine left in raised position
- Automatic reset button strikes operator attempting to clear obstruction manually
- Operating on slopes
- Tractor not equipped with correct weights
- Tractor wheels not set at correct width

Summary

- A worker's attitude is a major factor with regard to machinery safety.
- Accidents can happen and often do occur because of human error.
- Safety hazards may be identified in all areas of machinery use.
- Hazards are not always recognizable.

Summary

- Workers must be constantly alert to possible hazardous situations in machinery operation.
- Workers are responsible for the safety of fellow workers.
- Accidents could often be reduced if workers would stop and think about risks involved in machinery operations.

A spiral-bound notebook with a light green, textured cover. The spiral binding is on the left side. The text is centered on the cover.

FARMSTEAD SAFETY

Unit 10

A silver metal spiral binding is visible along the left edge of the page, with the wire looping through a series of holes in the paper.

This unit covers common safety issues associated with the farmstead.

Children and Farm Animals

- If a play area for children must be near animals provide adequate control for children and livestock. Design a barrier to keep children away from livestock.
- When children are near animals adult supervision must be provided.
- Domesticated and handled animals should be housed separately from other livestock.

Adults and Animals

- Some domestic animals have an advantage over humans when brute strength is considered.
- Humans are at a disadvantage, except mentally, when handling livestock.
- Good working facilities are mandatory for human control when handling livestock.

Escape Devices

Humans must have an escape device to remain safe in situations when the animal has more brute power.

The two methods for escape are:

1. Going over or under a fence
2. A convenient opening to step through

Walkways

- When cattle are worked or sorted special walkways are often provided for the people working the cattle.
- Walkways should provide clear space for a person to carry equipment and room for the treating activity being performed.
- Walkways can be at ground level or elevated over the top of the animals.

Gates

- Gates are important for a safe complete animal control system.
- They must be constructed to provide easy and effective control.
- Gates should be mounted on strong, well set corner posts, with heavy hinges, made easy to swing, and never be made entirely of wire.
- Gates should provide a visual barrier to the animal, causing them to stop.

Gates

- Gates should be hung so that it closes to its most important control position, but is still left free to swing.
- Use latches which will not release when pressed against by an animal in a pen.
- Locate latches high enough or use a type that children cannot operate.
- It must be remembered that animals can learn to operate latches and open gates to release themselves from pens.

Fences

- It is important that farm and feedlot fences be high enough to protect people from livestock.
 - Dairy calves: 4 feet high
 - Dairy cows: 4.5 feet high
 - Dairy bulls: 5.5 to 6 feet high

Fences

- Beef cattle chutes/confinement areas: 6 feet high
- Beef cattle (pasture): 4.5 feet high
- Horse show ring: 6 feet high
- Horse field fence: 4.5 feet high
- Finishing hogs: 30 to 48 inches high
- Boars: 4.5 feet high

Electrical Wiring and Lighting

- It is important to protect electrical wiring from animals.
- Wiring should be placed in the walls of buildings and/or located underground.
- If electrical wires must be placed overhead, place them high enough to clear trucks and machines which must pass underneath.

Electrical Wiring and Lighting

- With overhead wires, maintain a minimum ground clearance of 18 feet.
- Where there is no vehicular traffic -- 10-foot minimum height is permitted.
- Always identify switches correctly.
- Good lighting, secure footing, and sound building and maintenance practices help make the farmstead safe.

Protection from Suffocation and Drowning

Changes in livestock and grain handling have resulted in two new types of farm accidents that are usually fatal.

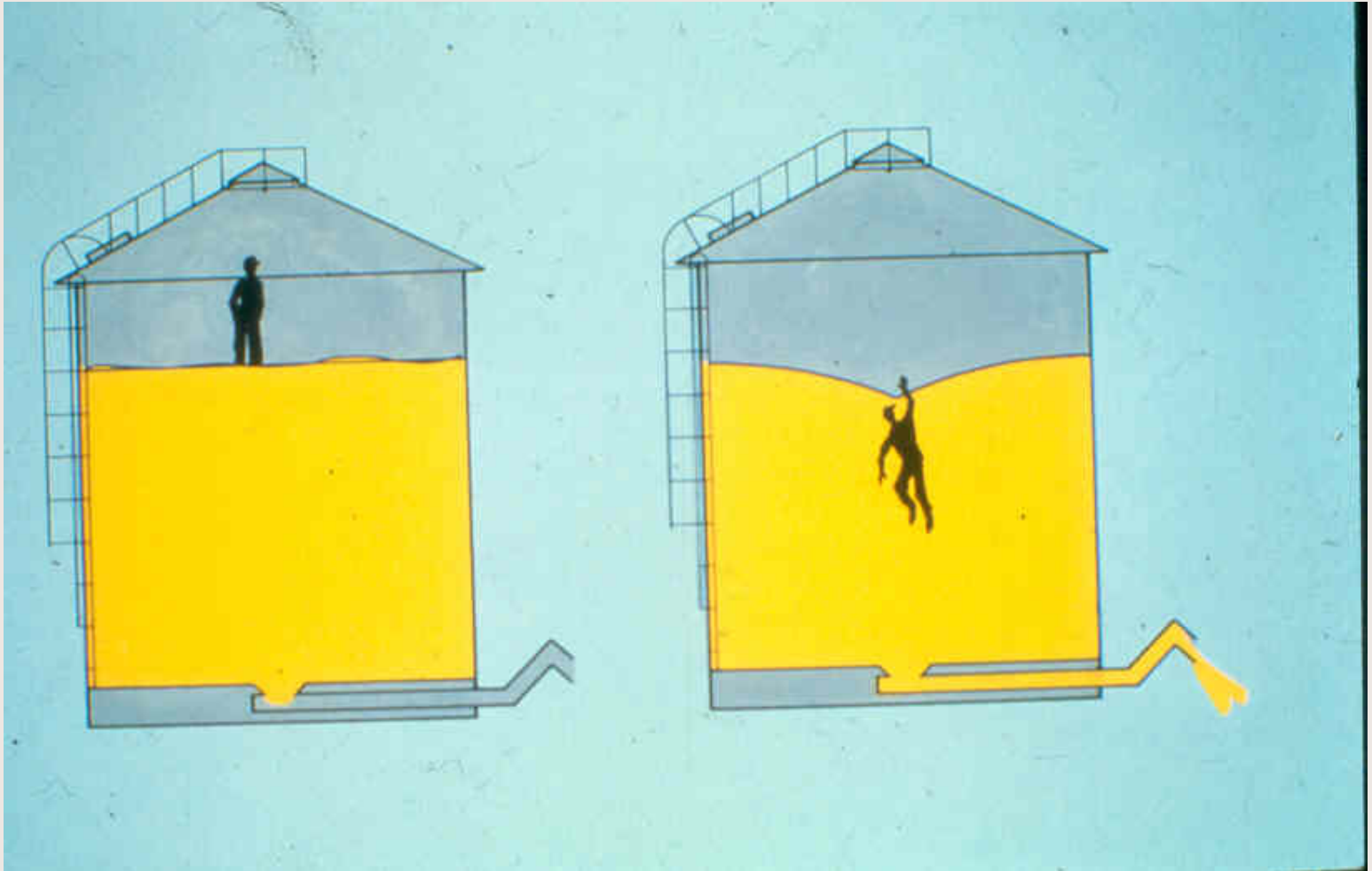
- 1) Drowning: All liquid manure pits must be completely covered and lagoons must be fenced out to help children and adults be aware of possible hazard.

Protection from Suffocation

Drowning

2) Suffocation: Children and adults need to be cautious of grain bins with bottom unloaders. Victims are sucked into the grain at the center of the bin and suffocate because they are helpless to climb out of the bin.

Grain Suffocation



Chemical Center

- Fertilizers and pesticides create hazards for both humans and animals.
- Storage of these materials requires specialized construction and detail.
- A chemical center building should be conveniently located, but as far as from the farm home because of odors and safety of children.

Chemical Center

- Chemicals must be securely locked.
- Distinct areas must be identified for herbicides, insecticides, and fertilizers.
- Always provide necessary protective equipment for anyone working with chemicals.
- Proper water, ventilation, and lighting systems must be used in the chemical center.

Fire Prevention

- Good housekeeping around the farmstead will eliminate fire hazards to the home and other buildings.
- Keep the inside and outside of buildings litter free.
- Proper storage tanks for fuels should be placed at least 75 feet from buildings.
- Select the proper type of fire extinguisher for each building or work area.

Fire Classification

- Class A
 - Paper, wood, cloth, excelsior, rubbish, etc. where quenching and cooling effect of water is needed.
- Class B
 - Burning liquids, where smothering effect is required.
- Class C
 - Fires in live electrical equipment where a non-conducting extinguishing agent is required.

Heated Livestock Buildings

- Modern livestock production systems require the maintenance of temperatures in the range of 70 to 90 degrees Fahrenheit in areas where young are born and raised for as long as six to eight weeks.
- When using space heaters, adequate safety controls and ventilation must be provided.

Airborne Dangers in Livestock Buildings and Lots

- If you are asked to work with livestock be aware of the problems that are associated with airborne hazards, such as:
 - Pesticides
 - Dusts
 - Toxic gases

Dangerous Gases

- Toxic gases in manure pits or silos present potential hazards to both humans and animals. The four major gases found in manure pits include:
 1. Hydrogen Sulfide
 2. Carbon Dioxide
 3. Ammonia
 4. Methane

Dangerous Gases

- Nitrogen Dioxide is a toxic gas that is produced when silage ferments. It is very poisonous, and can cause injury to and kill both humans and animals.
- High concentrations of exposure can result in immediate death. In case of any contact, see a doctor immediately.

Dusts

- Confinement livestock producers encounter a series of problems with dust. Avoid dust-related health problems by wearing a safety mask or other respiratory protector devices.
- All dusts can cause serious health problems depending on the amount, type, and time of exposure.


Pesticides

- Pesticides are a great help on livestock farms in controlling parasites, fungi and rodents.
- Improper use of pesticides can cause serious health problems to the user.
- Always follow the precautions on the label of the container and provide proper chemical cartridge respirators, chemical goggles, gloves and long sleeved clothing when working with pesticides.

The image shows the cover of a spiral-bound notebook. The cover is a light beige or cream color with a fine, woven texture. On the left side, there is a silver metal spiral binding. The text is centered on the cover in a large, black, serif font. The title is split into three lines, and the unit number is centered below it.

SAFETY STANDARDS FOR AGRICULTURAL TRACTORS AND IMPLEMENTS

Unit 11

A silver metal spiral binding is visible along the left edge of the page, with the wire looping through a series of holes.

This unit shows the importance of design standards used by farm tractor and implement companies to provide farmers with safe agricultural equipment.

Safety for Agricultural Equipment

Industry standards are a guide to provide a reasonable degree of personal safety for operators and others during normal operation and servicing of agricultural equipment.

Industry Associations

The following associations have developed engineering design standards that farm tractor and implement companies follow to provide farmers with safe agricultural equipment.

- The Farm and Industrial Equipment Institute (FIEI)
- The Society of Automotive Engineers (SAE)
- The American Society of Agricultural Engineers (ASAE)

Definitions

- Agricultural equipment: Agricultural tractors, self-propelled machines, implements, and combinations thereof, designed primarily for use in agricultural operations
- Propelling machines: tractors or self-propelled units
- Towed, semi-mounted, & mounted equipment: implements or equipment used with propelling machines

Operator's Manual

- Manufacturers must provide operator's manuals for all equipment.
- Operator's manuals provide general safety instructions for normal operation and servicing of equipment.

Always Follow Operator Manual & Posted Instructions



Operator Controls Standards

- Location and movement of operator controls shall be in accordance with ASAE recommendations, and all control elements should be identified.
- Foot pedals shall be slip-resistant and of adequate size, spacing, and shape.
- Hand controls should provide good grip and hand clearance.

Operating and Servicing Standards

- All tractors and implements shall be equipped with slip-resistant steps and handholds.
- Shielding shall be provided on the back of steps and ladders near moving parts.
- To minimize the possibility of falling off of equipment handholds, handrails, guardrails, or barrier-type safeguards should be in place.
- Glass or plastic used in cabs should be made to minimize risk of injury when fractured.

Power Take-Off and Implement Drive Line Standards

- PTO and PTO drive lines should conform to provisions of the SAE-ASAE standards.
- A portion of the shield shall be moveable without detachment from the tractor.
- A master shield must be placed over the PTO stub shaft.
- Rear and auxiliary PTO shafts shall be covered at all times.
- Both towed and mounted PTO-driven implements shall have adequate shielding.

Tractor Roll-Over Protection Standards

- Tractor roll-over protection (ROPS) shall be installed in accordance with ASAE Standard ASAE S383 for Wheeled Tractors.
- A safety seat belt must be provided with ROPS to meet federal safety standards.
- All new farm tractors have factor installed ROPS as standard practice.

Standards for Shields and Guards

- A guard or shield shall be provided to minimize the possibility of inadvertent contact during normal operation or servicing of tractors and implements.
- Pinch points of exposed gears, belts, and chain drives and idlers shall be covered by a shield.
- Any rotating or moving parts that operate when the engine is running should be covered by a shield unless covered by other portions of the machine.

Standards for Shields and Guards

- Projections, such as exposed bolts, keys, sprockets, sheaves, or pulleys shall be shielded unless covered by other portions of the equipment.
- Inspection doors and shields, which present risk of personal injury from moving parts when not in place, shall not be readily detached from a machine.

Standards for Lifted Units

- Safety stops, latches, or locks shall be provided to prevent inadvertent dropping of lifted units.
- The operator's manual should contain instructions to securely support or block components which are raised before servicing or adjusting.

Travel on Highways

- Whenever a propelling vehicle is on a highway the flashing warning lights must be in use.
- Equipment with a cab shall have at least one rear-view mirror to permit the driver to see the area behind the vehicle.
- Hitch pins and other hitching devices shall be provided with a safety catch to prevent accidental unhitching.
- Components that are raised to decrease width for transport shall be properly secured during transport.
- Safety chains must be provided on equipment which is regularly towed behind automotive vehicles on roadways.

Parking Requirements

- All agricultural tractors, self propelled implements, and combinations thereof shall have braking systems for service, parking, and emergency use that meets ASAE standards.
- All towed implements with tongue weights over 55 pounds must have a means of attaching to a tractor without manual lifting (tongue jack).

Fire Protection Standards

- Shields shall be provided for engine manifolds, mufflers, and exhaust pipe when necessary.
- Sediment bowls used on gasoline engines shall be heat resistant.
- Fuel tanks for gasoline engines shall have the air volume vented.

Safety Symbols

- Agricultural equipment shall have safety signs to alert an operator and others of the risk of personal injury in normal operations and servicing.
- The words CAUTION, WARNING, and DANGER, in that order will indicate degrees of hazards.
- Use IMPORTANT, ATTENTION, or NOTICE for instructional signs.

Safety Symbols

Danger Signs



Danger signs must be used only where an immediate hazard exists. Danger signs must have red as the predominant color for the upper panel, black outline on the borders and a white lower panel for additional sign wording.

Safety Symbols

Caution Signs



Caution signs shall be used only to warn against potential hazards or to caution against unsafe practices. Caution signs shall have yellow as the predominant color, black upper panel and borders, yellow lettering or "caution" on the black panel, and the lower yellow panel for additional sign wording. Black lettering shall be used for additional wording.

Safety Symbols



Safety Instruction Signs

Safety instruction signs, when used, must be white with green upper panel and white letters to convey the principal message. Any additional wording on the sign shall be black letters on the white background.