TO BE UPDATED TO REFLECT LATEST LEGISLATIVE CHANGES

GOOD PRACTICE GUIDELINES

Safe use of tractors on farms

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New Zealand Government

WORKSAFE NEW ZEALAND | MAHI HAUMARU AOTEAROA

The purpose of these guidelines is to help reduce the risk of injuries and fatalities by providing practical guidance on how to manage various tractor hazards.

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- Accident Compensation Corporation (ACC)
- Beef and Lamb New Zealand
- DairyNZ
- Dairy Women's Network
- FarmSafe
- Federated Farmers of New Zealand Inc
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The guide was largely adapted from an existing draft FarmSafe New Zealand publication *Guidelines for the Safe Use of Tractors*. Parts were also adapted from the ACC publication: *Tractor Safety: Information that could Save your Life*.

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TRACTORS: KEY POINTS

Operators must be trained/experienced enough to do the job

Always wear a seatbelt if the tractor has a Roll-Over Protective Structure (ROPS)

Do not carry passengers on tractors that do not have instructor seats, ROPS, and safety belts

Ensure PTO shafts and connections are guarded and keep clear when it is engaged

Never jump on or off a moving tractor

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INTRODUCTION

IN THIS SECTION:

This publication provides practical guidance for using tractors safely on farms.

1.1 PURPOSE

This guideline outlines potential hazards of using tractors on farms, and provides recommendations to eliminate, isolate and minimise those hazards. WorkSafe NZ accepts these recommendations as current industry good practice. They will help you comply with the Health and Safety in Employment Act 1992 (the HSE Act).

On average, six to seven farmers are killed every year in New Zealand, when using farm tractors. Many hundreds have been seriously injured. The main types of accidents involving farm tractors are:

> tractors rolling over
> people being run over
> people being tangled in implements and machinery.

Other risks are:

> tractor fires
> working under raised loads
> touching overhead power lines
> noise-induced hearing loss
> slips, trips and falls while getting on and off the tractor.

The cost to the injured person, their families, their businesses and New Zealand are too high. We must improve tractor driving practices.

1.2 SCOPE

This guide applies to farmers, agricultural contractors and anyone else using tractors on farms. Training providers will also find this guide useful.

It focuses on on-farm use of tractors. For on-road guidance, see NZTA's *Agricultural Vehicles Guide*.

Every model of tractor is different and will have slightly different safety requirements. Read and follow the instructions in the operator's manual to ensure you're operating your tractor safely.

1.3 DEVELOPMENT

Industry experts helped WorkSafe NZ develop this guide. WorkSafe NZ also conducted a thorough review of both accident statistics and published academic literature, and looked at how overseas health and safety regulators manage the same issues.

WorkSafe NZ made every effort to ensure the hazard controls in this guide reflect current good practice.

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HAZARDS AND CONTROLS

IN THIS SECTION:

The most common hazards faced by tractor operators are set out on the following pages. Guidance is provided about ways to effectively control those hazards.

2.1 PASSENGERS

Passengers riding on tractors, tractor implements or trailers are at a high risk of injury. Tractors travel over uneven ground and passengers can easily be jolted, lose their grip and fall. If someone falls under the wheels or into trailed machinery, they can be seriously hurt or die.

MANAGING THE HAZARD:

Do not carry passengers on tractors without instructor seats, roll-over protective structures (ROPS) and safety belts.

Most older tractors are not designed to carry passengers. You can carry a passenger if the tractor is fitted with ROPS, cabs, an instructor seat and safety belt.

Do not carry passengers on tractor-mounted implements or trailers that are not designed to carry people.

Some types of trailed machinery, like ridgers, are designed for people to ride on and operate. Passengers can ride on this type of implement if the machinery is safe and well-kept.

You can carry passengers on a transport tray mounted to the tractor's three-point linkage. Tell the passengers to hold on.

2.2 GETTING ON AND OFF THE TRACTOR

The most common tractor injuries happen when people get off the tractor. These happen when people slip and fall to the ground or jump down and land heavily on uneven ground. If the driver gets off facing away from the tractor, their pant cuffs or boot loops can snag, tripping them forward off the tractor.

MANAGING THE HAZARD:

When climbing on and off a tractor, always keep three points of contact (eg two hands and one foot) with the tractor or ground. Get off facing towards the tractor, the same as you do when getting on. Never jump on or off a moving tractor.

Figure 1: Getting on or off with three points of contact

Clean the steps regularly. You are more likely to slip and fall if the tractor steps are dirty or wet.

Drivers should also wear suitable footwear with a good grip and clothes, like overalls, that will not snag on machinery.

Before getting off, always put the tractor in neutral, apply the brakes and disengage the power take-off, even just to open a gate. If you're leaving the tractor to do something else, shut off the engine.

2.3 LOUD NOISE

Tractor engines create lots of noise. Drivers are exposed to this noise if the tractor does not have a sound-proof cab. If people drive tractors for a long time, over a number of years, they can suffer from noise-induced hearing loss (NIHL).

MANAGING THE HAZARD:

If the tractor does not have a sound-proof cab, always wear hearing protection.

2.4 USING THE CONTROLS

Many injuries happen because farmers try to work the tractor controls when standing beside the tractor. The tractor can run over the driver, crushing them under the wheels.

As people age they lose speed and dexterity; this can put them at greater risk from being run over.

MANAGING THE HAZARD:

Always work the tractor's controls from the driver's seat unless the manufacturer has specifically designed controls for use in other positions. Never start the tractor from the ground.

Modern tractors have a colour coding system to identify the levers:

ORANGE	Movement (gears, 2WD, 4WD, accelerator)
YELLOW	Power take-off (PTO)
BLACK	Rear three-point linkage

Most tractor controls are designed to be used from the driver's seat. Only use the controls from there. If the manufacturer has designed controls that you can work from the ground, make sure you're standing where you are not in danger of being run over and crushed.

Start the tractor engine ONLY when sitting in the seat – never start it from the ground.

2.5 TRACTOR STABILITY

Tractors are used in all farming regions in New Zealand in tough terrain. Steep, rough, slippery or loose ground and towing implements increase the risk of losing control.

Manufacturers advise caution in all these circumstances. The tractor could become unstable because of sudden changes in direction and the tractor's centre of gravity.

Drivers can easily lose control of tractors after hitting an object, finding poor ground conditions or when towing implements and trailers. The driver can fall off the tractor and hit the ground, another object or the tractor itself.

MANAGING THE HAZARD:

Where appropriate, take steps to improve the stability of the tractor.

- Widen the wheel-base (by fitting dual wheels for example).
- Add wheel weights that bolt into the wheel's centre.
- Slow down on rough ground and slopes.
- Before going up or down hills, carefully check the ground and set the tractor up to meet the conditions. You might have to get off the tractor and walk the route you plan to take. When planning your route, find an emergency run-out spot in case you lose traction.
- On 4WD tractors, reverse the tyres to help with traction braking on the front axle. (Some manufacturers recommend this practice on steep land.)

2.6 TOWING A TRAILER AND OTHER HEAVY FARM IMPLEMENTS

The trailer's or mounted implement's weight behind the tractor can cause instability and affect the steering:

- The weight on the rear wheels can make the tractor keep going in a straight line when the steering wheel is turned.
- A load that is too heavy to control, or a trailer without a good braking system, can jack-knife.
- Mounted spray tanks cause more instability because of the liquid's movement.

MANAGING THE HAZARD:

Do not tow a trailer or implements too heavy for the tractor. Stay within the manufacturer's guidelines.

The higher the mounted equipment is on the tractor's rear linkage, the less stable the tractor becomes. Keep mounted equipment as low as possible, while making sure you can still use it effectively.

If necessary, fit a counterweight at the front of the vehicle to keep the front wheels on the ground.

Try to avoid sharp turns.

Think about fitting baffles in tanks to reduce liquid movement, and stabiliser bars or chains on the three-point linkage to prevent sideways movement of the tank.

For more information on safe towing, see the towing section later in this guide.

2.7 TURNING ON AND CROSSING SLOPES

Tractors need to turn when they come to row ends or when steering around trees. You are more likely to overturn a tractor when turning on and crossing slopes. Slopes change the tractor's centre of gravity and when the tractor turns, centrifugal forces keep the tractor moving in a straight line. These forces can cause the tractor to roll over. If a tractor begins to slide sideways, it may tip over in a ditch, or run into an obstacle and overturn.

MANAGING THE HAZARD:

Don't turn down a slope – this is very dangerous.

- Don't work across slopes if your tractor has large diameter, tubeless, low-ground-pressure tyres.
- Plan work across slopes so you make turns uphill rather than downhill.
- Slow down before turning or crossing slopes.
- Keep alert at row ends and make as wide a turn as possible.
- Apply a single brake in the direction of the turn (left turn, left brake).
- Sometimes the up-hill wheel brake can be applied to maintain direction stability. This forces the bottom wheels to drive, keeping the nose of the tractor up-hill, and gives better traction.
- Don't do tractor work on steep slopes.

2.8 TRAVELLING DOWNHILL

Selecting the wrong gear can result in losing control of the tractor:

> too high a gear and engine braking may not hold back the tractor

> too low a gear and the tractor may start to slide, like brakes applied on a slippery surface.

MANAGING THE HAZARD:

Always drive straight down steep hills.

> Do not drive diagonally across and down slopes. Find the gentlest possible slope and drive straight down.

> Select a low gear before driving down and apply the throttle to reduce the chance of the engine stalling.

> Engage 'diff lock' before starting a hill descent for maximum braking and to prevent singlewheel lockup. (CAUTION: The tractor will not turn as efficiently when diff lock is on.)

> Drive slowly forward (heavy end up slope) controlling your speed with engine braking. Allow for any towed implements' extra weight. Check surface conditions, slope and route.

> If the tractor starts to slide forward, quickly pulse the throttle until you regain traction. Do not brake, as you have to keep the wheels turning to keep traction.

> If the engine loses power, apply the brake and put the tractor in 'park' mode.

> If you lose control, drop any implements into the ground to act as an anchor.

> Keep the tractor well-maintained and filters clear to reduce the chance of engine failure.

2.9 TRAVELLING UPHILL

When travelling uphill, the weight moves to the rear of the tractor, increasing the risk of the tractor flipping over backwards.

The wheels can lose traction and make the tractor slew to the side, increasing the risk of the tractor rolling over.

The tractor can also start rolling backwards, increasing the risk of a backwards flip if the brakes are applied suddenly.

Some modern tractors have hydraulically powered brakes and steering. If the engine stalls, you can lose power to the brakes and steering.

MANAGING THE HAZARD:

Always drive straight up steep hills.

> Select a low gear before driving up and apply the throttle to minimise the possibility of the engine stalling.

> Climb with the heavy end up the slope (in reverse).

> If it's a straight climb, engage diff lock and four-wheel drive before starting.

> Don't change gear when moving up slopes. This increases the risk of the tractor flipping backwards. If you lose traction, apply the brake and clutch together, select reverse gear and back down the hill.

2.10 ROLLOVER

Tractor rollovers – tipping sideways or backwards – can seriously injure or kill drivers. They are often pinned or trapped underneath the tractor.

Many people think that tractors only turn over in steep or hilly country. While that is a high-risk situation, research shows about half of tractor rollovers happen on flat or slightly sloping ground. These accidents usually involve obstacles like stumps, stones, ruts or ditches.

Most tractors have a high centre of gravity. Increased loads, raised implements and driving across slopes change the centre of gravity, increasing the risk of rollover.

Speed strongly influences the tractor's stability and is a big factor in many rollovers. As the speed of the tractor increases, sudden turns, braking or gear changes are felt more abruptly, increasing the chances of a rollover.

MANAGING THE HAZARD:

All agricultural tractors, except those excluded (as follows), must be fitted with roll-over protective structures (ROPS).

Any agriculture tractors bought new after 1 September 1970 must have a ROPS meeting the relevant design and manufacturing standards, except for the following:

> Tractors bought new on or before 31 August 2001:
  - Crawler tractors and wheeled tractors weighing under 762kg or more than 4000kg.
> Tractors bought new after 31 August 2001:
  - tractors weighing under 700kg.
> Tractors used:
  - in any orchard, hop garden, blueberry garden or greenhouse
  - in any vineyard carried out beneath vines supported overhead
  - work in or near any building or structure used to keep and care of poultry for financial gain.

If it is not practical to fit ROPS to an agricultural tractor because of the type of the work it's used for, you can apply for an exemption. Send your application to:

The Chief Executive
WorkSafe New Zealand
PO Box 165
Wellington 6140

Or email info@worksafe.govt.nz

For more information on safety frames, see the *Approved Code of Practice for Roll-over Protective Structures on Tractors in Agricultural Operations:* www.business.govt.nz/healthandsafetygroup/information-guidance/all-guidance-items/acop-roll-over-protective-structures-on-tractors-in-agricultural-operations/rops-tractor-acop-pdf

All new agricultural tractors bought after 31 August 2001 must have seatbelts.

Fit seatbelts in line with AS 2664 or an equivalent standard with the same or stricter criteria.

Always keep seatbelts and anchor points in good condition.

Display seatbelt warning signs in every protective structure, warning drivers to wear their seatbelt to help reduce the chance of them being hurt if there's a rollover or other similar accident.

When driving a tractor, always wear seatbelts when they are fitted and the tractor has a ROPS.

Seatbelts hold the operator in the protective structure during rollovers, reducing the chance of injury.

2.11 HYDRAULICS

Most mounted implements use the tractor's hydraulic power. Connecting and disconnecting the hoses for these implements is dangerous as it can spray high-pressure oil.

Hydraulic hoses will fail. When the failed hose feeds a ram supporting weight, that weight can drop, quickly and unexpectedly. People standing in the weight's path can be seriously injured or killed.

MANAGING THE HAZARD:

Never work under equipment that's only supported by a hydraulic ram.

> If you have to work under raised equipment, make sure it has a stable support that can't move. Use a jack stand or other sturdy support. Don't rely on hydraulics or mechanical locks.
> Regularly check hoses for wear and tear. Don't put your hands around or close to hydraulic hoses under pressure. The oil can penetrate the skin, causing serious injuries.
> Before working with the hoses, jiggle the levers to release the oil pressure.
> Drivers should wear gloves and eye protection when working on hydraulic equipment.
> Work hydraulic controls from the driver's seat or according to manufacturer's instructions.
> When parking the tractor – even for a short time – lower the front and rear hydraulics to the ground. Make it part of your routine.

2.12 FRONT-END LOADERS

Front-end loaders handle different types of material like feed, manure, soil and gravel. Their versatility lets you easily load, lift, transport and handle materials.

However, heavy loads raised too high raise the tractor's centre of gravity and increase the chances of rollover.

Front-end loaders carry lots of weight and are dangerous if the weight falls on someone.

Front-mounted tines, forks, buckets and other devices are dangerous if the tractor has a head-on crash.

MANAGING THE HAZARD:

Carry the load with the bucket or attachment lowered. Raising it reduces stability.

When operating a front-end loader:

> Keep the speed down when carrying a load.
> Avoid sudden stops when carrying a load – the tractor could overbalance.
> Back down slopes when carrying a load.
> Lower the bucket or attachment to the ground when parking.

Train operators to use front-end loaders safely.

Check the tractor's front-end loader has a rated lifting capacity. Consult the machinery supplier and manufacturer's specifications about lift ratings and locations. When checking the tractor's lift capacity, you may need to attach a counterbalance – carried on the three-point linkage – before using a front-end loader.

Keep the bucket (or other attachment) as low as possible to maximise driver visibility and tractor stability. Turn the leading edge of a front-mounted bucket downward or upward, so it is safer on road. Also consider positioning the implement to reduce the chance of it 'digging in' if you suddenly lose hydraulic power to the front-end loader.

Carry out maintenance according to the manufacturer's directions. It is important to check the front tyres and highly stressed parts of the lifting mechanism for cracks and excessive wear.

2.13 FRONT-END LIFTING FORKS

Forks can be dangerous when driving on-road if the tractor has a head-on crash.

MANAGING THE HAZARD:

If driving on the road, position forks (and anything else sticking out) to reduce the risk to other road users.

Do an assessment based on the tractor's design and the function and shape of the projecting parts. Work out the safest position based on this assessment.

2.14 FALLING OBJECTS

Many tractor operators are killed and injured by objects falling onto the tractor.

MANAGING THE HAZARD:

Use a tractor with a falling object protective structure (FOPS) if you could be hit by falling objects.

2.15 HAY BALES

Lifting hay bales or other heavy objects can increase the risk of rollover. Hay and wrapped silage can also roll back down the loader's arms onto the driver if the load is held too high, or fall from a stack onto the tractor driver.

MANAGING THE HAZARD:

Use the right attachment for the job and follow the manufacturer's recommendations.

- Use a hay spike for hay and a grab for wrapped silage. Do not use flat forks or buckets.
- Carry bales slowly and as low as possible to the ground.
- Check the tractor's lift capacity.
- Use a counterbalance if necessary.
- Do not carry bales stacked higher than the back frame of the forks. If possible, extend the height of the frame if you want to safely pick up more bales.
- Be careful not to turn the implement upwards, letting the bales slip down the lift arms.

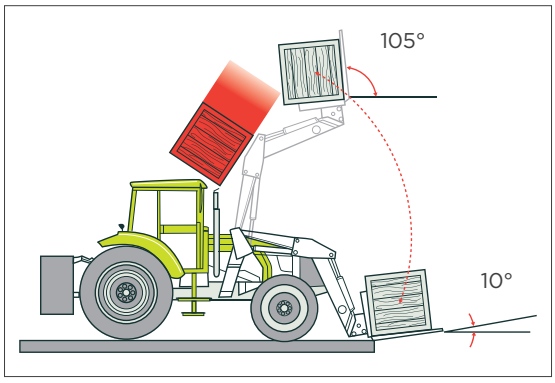

Figure 2: Falling objects

2.16 USING TRACTORS FOR FARM FORESTRY

When using tractors in farm forestry, the operator could be hit by falling objects like tree limbs or felled trees.

MANAGING THE HAZARD:

Use a tractor with FOPS for farm forestry tasks and work within the manufacturer's recommendations.

> Do not use wheeled tractors for directly pulling trees.
> When winching logs, don't back the tractor against a tree for extra anchorage. Use a bigger tractor.
> Keep cables and chains in good condition and store correctly when they're not in use.
> Watch out for dead limbs on trees – any tree movement could bring them down.

2.17 MOUNTED OR TRAILED EQUIPMENT

Tractors are designed to use a wide range of mounted or trailed implements. These help the farmer do a huge variety of farm tasks. There are various forms of mounted and trailed equipment, including Power Take-Off (PTO) operated equipment (like mowers), three-point linkage attachments (like back blades) and trailers.

Some implements make the tractor less stable, increasing the risk of it rolling over. The three-point linkage or hydraulics can also cause problems.

2.18 POWER TAKE-OFF SHAFT

The PTO shaft is found at the rear of a tractor and uses a tractor's engine to drive tools or equipment attached to the tractor – such as post drivers, mowing equipment, boom spraying equipment and feed grain roller mills. They are also found on other machines, such as slashers.

People have been killed and seriously injured after getting caught in PTO shafts and couplings. There does not need to be any part sticking out from the PTO assembly to cause entanglement. Clothing only needs to wrap around the shaft once, then the friction of the fabric touching itself makes it stick, and as the PTO turns, the force wrapping the fabric around the shaft increases.

To assess the risk of injury from a PTO, consider:

> Is the turning equipment guarded well enough?
> Are workers trained properly? Do they know the dangers of using this equipment?
> What is the risk of clothing, hair, jewellery or tools getting caught in the PTO?
> Was the PTO made and tested to an appropriate standard?

MANAGING THE HAZARD:

PTO shafts must be appropriately guarded.

The guarding for a PTO includes:

> A fixed power output coupling (POC) guard (also known as the 'tractor master guard'), which should be permanently attached to the tractor. If it is movable, it must be held securely in place when the tractor is in use.
> An implement power input coupling (PIC) guard, which should be permanently attached to the implement. If it is movable, it must be held securely in place when in use. There should be no nip-points where body parts or clothing can be caught.
> A PTO shaft guard, which extends into the POC and PIC areas for the maximum practical distance. The guard can be either rotating or not. A non-rotating guard needs a way to be restrained. A rotating guard must turn freely and be able to be stopped by hand without risk of injury or entanglement.

Guarding considerations:

> Where protection is needed in the PTO drive line, place torque limiters, free wheels or clutches at the power input connection (tool end) of the PTO drive shaft.

> Do not rest the PTO drive shaft on the guards when it is uncoupled.

> When the machine is not in use, support the drive shaft and the guard on the cradle. If there is no cradle, support the shaft and guards using something else that equally protects against damage.

> All guards specified by the manufacturer must be in place and well maintained.

> If a guard needs to be removed for maintenance or cleaning, isolate and lock-out machinery so it cannot be started without the guard.

> Refer to the manufacturer's fitting, operating and maintenance instructions.

> Check all guards regularly (eg daily when in use) for wear and damage, and replace damaged guards.

Older tractors and tools may not have original POC or PIC guards, or the originals may not be in a safe condition. Employers must still make sure all parts of the PTO are adequately guarded. This may mean buying guards or having them made.

Keep clear of the PTO and attached equipment when it is running.

> Make sure everyone is clear before engaging the PTO. Keep them away when using PTO-driven equipment.

> Never step across or lean over a rotating power shaft. Always walk around the tractor.

> Always disengage the PTO before you get off the tractor.

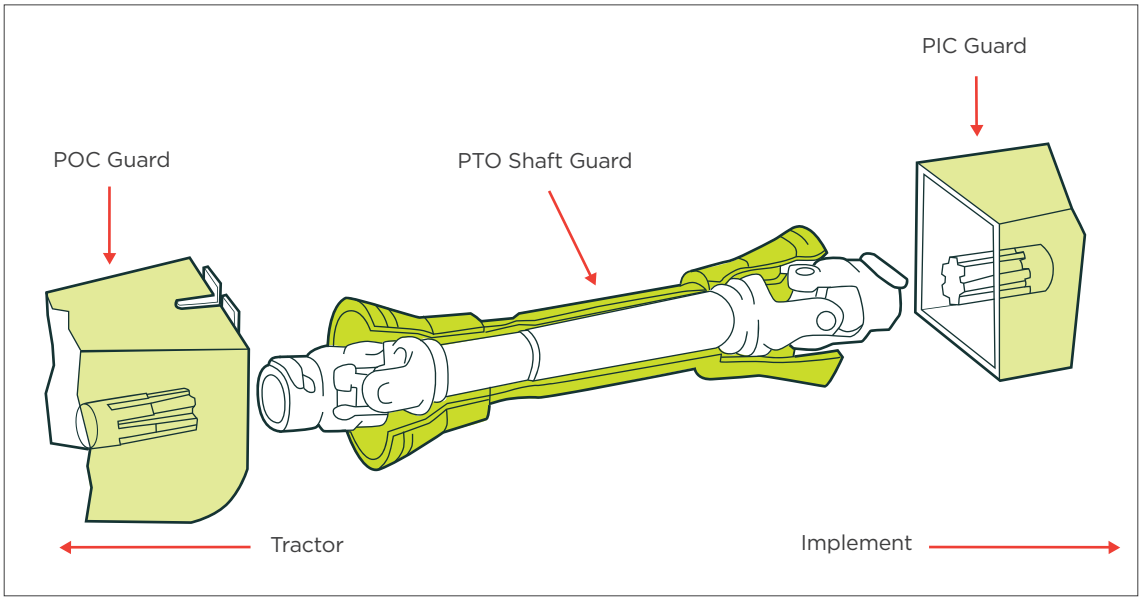

Figure 3: Power take-off guarding (PTO = power take-off; POC = power output coupling; PIC = power input coupling)

2.19 MOWERS

Tractor-mounted mowers have blades that spin at high speed. If these blades hit someone, they can cause serious injury or death. Blades that hit stones or other objects can propel them at speed toward the driver or nearby people – another potentially deadly hazard.

Some rotary (flail) mowers have pivot bolts that can wear and shear off. They are used to secure the cutting blades and when they break, the blades are ejected at speed. These parts can hit people near the mower (including the driver).

MANAGING THE HAZARD:

A skirt should be fitted around the mower's openings and outside edge.

A skirt reduces the chances of stones and other objects hitting people. Keep the skirt well-maintained.

Only fit manufacturer-recommended pivot bolts to the mower. Check the bolts regularly and replace them if worn.

2.20 BALERS

Balers are complex machines with lots of moving parts. They have the potential to cause serious injury or death.

MANAGING THE HAZARD:

Follow manufacturer's recommendations when using balers.

When using conventional balers:

> Use the correct ground speed to avoid overloading.

> Correctly splice and thread the baling twine in the tractor. You should not be able to pull anything out of the knotter while the baler is in use.

> Remove all twine before re-feeding bales into the baler. The baling twine is too strong to break if anyone gets entangled.

> Never feed broken bales into the baler by hand – use a pitchfork instead, or leave the bale on the ground and drive into it.

When using round balers:

> Use the correct ground speed to avoid overloading.

> No one should stand near the rear of the baler when ejecting the bale.

> Never eject large bales on slopes where they could roll.

> Always engage the mechanical gate safety lock before entering the open rear gate area. Do not rely on the hydraulic controls.

> The large springs and hydraulic hoses store a lot of energy. Relieve the pressure or tension before servicing. Follow the manufacturer's maintenance and operating rules.

> Keep the correct tension on drive belts. A loose belt can start a fire.

2.21 THREE-POINT LINKAGE

Tractors are designed to connect to ploughs and other implements with a three-point linkage. The three points create a triangle so the implement's weight is carried by the tractor itself. This system is designed to transfer some of the implement's weight to the tractor at a point below its centre of gravity, which increases its traction.

Trailers, on the other hand, have wheels and support their own weight.

Some tractors have 'quick hitches' to connect trailed equipment to the three-point linkage. This moves the towing point further back, and the tractor might react unpredictably when braking and cornering.

Connecting implements incorrectly or above the tractor's centre of gravity can cause a tractor to roll over backwards.

Pulling objects by connecting chains or cables to a point that is too high, instead of the draw bar, can also cause a tractor to roll over backwards.

If you use the wrong hitching pin it can suddenly fail and whatever you are towing can disconnect.

You also risk being crushed or run over when connecting an implement to the tractor.

MANAGING THE HAZARD:

Always connect implements to the tractor the way the manufacturer designed them. This connects the load well below the tractor's centre of gravity.

Keep the pull angle horizontal and as low as possible.

Always match the equipment to the correct-sized tractor. Check the manufacturer's recommendations. Use a counterweight if necessary.

Don't let anyone stand between the implement and the tractor when reversing to connect. If you have to move the tractor when attaching the implement, helpers should step out of the area between the tractor and implement. If you have to inch the tractor into position while someone puts in the connecting pins, back the tractor up too far, get the helper to approach, then inch the tractor forward until the helper can insert the pins.

The correct sequence for attaching implements to the three-point linkage is: left, right then centre.

2.22 ROTARY CULTIVATORS

Rotary cultivators are heavy pieces of equipment. They can cause serious injury if people get caught in them.

MANAGING THE HAZARD:

Make sure the cultivator is well-maintained and use it in line with the manufacturer's recommendations.

> Don't work the cultivator if the blade bolts are missing.
> Make sure there is no interference when you lift, back or turn the cultivator.
> If the tractor lunges while cultivating a hard surface, immediately step on the clutch and brake pedals. Inspect for damage and remove the hazards before starting again.
> Always raise the cultivator at the end of a work run. Blades that keep turning in the soil could propel the tractor.

2.23 DISC HARROWS

Disc harrows are heavy pieces of equipment with spring-tensioned parts. It is dangerous if the tension suddenly releases.

MANAGING THE HAZARD:

Make sure the harrows are well-maintained and operate them according to the manufacturer's recommendations.

> Make adjustments before getting onto the tractor.
> Place blocks or supports under elevated parts when working on discs.
> Release the hydraulic pressure before working on the hydraulic lines.
> Beware of springs under tension when dismantling or maintaining the disc harrows.

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2.24 TRAILERS

Tractors often pull wheeled trailers using a drawbar with a clevis hitch or a fitted tow ball. Tractors can rear up and roll over backwards if they are used with trailers connected to a high hitch point.

Accidents happen when steering on slopes or slippery surfaces with poor trailer brakes because it pushes the tractor side-ways, causing it to slide out of control. Excessive wear can also be placed on the tractor's brakes.

MANAGING THE HAZARD:

Always connect wheeled trailers to the drawbar. This means the load is pulled under the tractor's centre of gravity. Check that the safety chain or cable is suitable for the job. Always use correctly sized and rated pins.

Use the correct high-strength steel hitching pin designed for the tractor and the task. Use the appropriate diameter pin for the tractor or trailer coupling's diameter, whichever has the smaller hole. The coupling pin's diameter must not be smaller than 75 per cent of the larger coupling hole.

Do not repair or weld coupling pins and towing hooks. Replace pins and hooks that are damaged, deformed, cracked or worn at any point to below 90 per cent of their original diameter, or the manufacturer's wear tolerance, whichever is less.

Securely retain coupling pins by a locking mechanism.

Figure 4: Correct and incorrect hitching pins

Do not repair tow-eyes. Always replace them if they are worn beyond 10 per cent of the original diameter or the manufacturer's wear tolerance, whichever is less.

Fit a safety chain between a tractor and towed trailers or implements, except those carried on a three-point linkage. The safety chain's tensile strength (its breaking load) must be equal to or greater than the total weight towed.

The safety chain's length must be adjustable so it is neither too tight nor too loose. Where practical, attach the chain to the tractor's chassis, not the hitch. The chain's tensile strength must be displayed on the chain using a plate or similar method.

Also:

> Use a large enough tractor and choose the best gear to stop the combination within a safe distance.

> Buy trailers with a suitable braking system to match your tractor. Ask the supplier for brake efficiency information.

> When connecting implements or trailers in train, make sure the collective weight does not go over the manufacturer's recommendations. Correctly hitch all trailers.

2.25 TRACTOR FIRES

Fires can cause serious and fatal injuries. Three things must be present for a fire: air, material that can burn and an ignition or heat source. Around three-quarters of all tractor fires start in the engine compartment. Some common causes are grease or oil build-up, hay or straw, or bird's nests.

If the tractor does catch fire, approach it with extreme caution. Even a small fire can flare up dramatically when doors, hatches or other areas are opened to gain access. Fires are very dangerous when liquid fuels are involved.

MANAGING THE HAZARD:

Keep the tractor clean, remove ignition sources and carry a fire extinguisher.

Regularly remove caked-on grease, oil, crop residue, dry chaff, leaves, bird nests and other material. Clear away wrapped plant material on bearings, belts and other moving parts – and check them for wear. Make sure the exhaust system is in good condition and leak-free. Check exposed electrical wires for damage or wear.

A fully charged 2kg extinguisher is your best source of fire protection. If a fire breaks out, quickly shut off the engine, grab the extinguisher and get out. Try to use the extinguisher's flexible hose to shoot the chemical at the flames' base from a safe distance. Blanket the flames to starve the fire of oxygen and prevent the fire restarting.

If the fire extinguisher runs out, use water (from troughs or creeks) or soil to put out the fire.

Use a mobile phone or two-way radio to call for help.

2.26 OVERHEAD POWER LINES

If any part of a tractor, front-end loader, mounted implement or trailer touches overhead power lines, it can be lethal. If an operator touches the tractor and the ground at the same time, they could be seriously hurt or killed when electricity flows through them.

MANAGING THE HAZARD:

Avoid working near overhead power lines if possible.

> Know the minimum line heights and the maximum height/reach of tractors and machines passing below or near power lines.

> Look up before raising implements.

> Think about the height and reach of machinery when buying or hiring replacements.

> Mark power lines on a farm map and pass this information on to employees, contractors and other visitors that need to know where they are.

Do not get out of the tractor if it or an implement touches power lines. Instead, ring for help, warn people not to come near and wait until the power company has made it safe.

2.27 WORKING ALONE AND IN ISOLATION

Working alone is a common hazard in farm work.

If a farmer has a tractor accident in a remote area, it can be a long time before help arrives. Sometimes the injuries can get worse or the farmer could die.

MANAGING THE HAZARD:

Tell someone where you are working and when you plan to return. Have regular check-in times – help will arrive more quickly if you do not return.

It is important to have a way to raise the alarm if you are injured, like a mobile phone or emergency beacon. Some mobile phones have GPS that can easily communicate your location. You can even download applications (apps) to smart phones so you can track where several phones are at once, in real time.

Work out an emergency plan with workers and family members so they know what to do if something goes wrong.

2.28 PERSONAL FACTORS

Sometimes, fatigue, stress, attitude (eg over-confidence or recklessness), drugs or alcohol can impair tractor drivers. This causes poor judgement, and reduced balance, coordination and reaction times, and increases the risk of a serious injury or fatality.

MANAGING THE HAZARD:

Don't operate a tractor under the influence of drugs or alcohol. Reassess tasks and find other jobs if there are stress and fatigue issues.

As an employer, make sure tractor drivers know the hazards of working a tractor and how their own behaviour and attitudes impact on them.

As a tractor driver, take responsibility and let someone know if you're not up to the job for any reason.

2.29 UNAUTHORISED TRACTOR ACCESS

It can be dangerous if someone drives the tractor without the owner knowing or giving permission.

MANAGING THE HAZARD:

Take the keys out of the tractor and/or put other measures in place to make sure the tractor is only used with the farmer's knowledge and permission.

Do not let friends and colleagues drive tractors unless they are properly trained and given permission.

03/

DRIVING ON THE ROAD

IN THIS SECTION:

If you're driving a tractor on the road, follow the road rules.

3.1 DRIVING ON THE ROAD

All tractors driven on the road must be capable of getting a warrant of fitness, even if they don't have one.

Check that the tractor and any implement or trailer is not too wide and has the correct signage. See NZTA's *Vehicle Dimensions and Mass Rule* for more information: www.nzta.govt.nz/resources/rules/vehicle-dimensions-and-mass-2002-index.html

3.2 WHAT CLASS OF LICENCE DO I NEED?

Tractor or agricultural vehicle drivers that drive on New Zealand roads must have at least a Class 1 Driver Licence (a car licence), so they will have studied the road code to get the licence. It is the basic guide to safe, legal and considerate road user behaviour in New Zealand.

Under the Land Transport (Driver Licensing) Amendment Rules 2013:

a. You need a class 1 licence (full or restricted) or overseas tractor licence to drive a tractor up to 18 tonnes (or in combination up to 25 tonnes) up to 40kph.
b. You need a class 1 (full) with wheels endorsement to drive:
   - a tractor up to 18 tonnes (or combination of up to 25 tonnes) over 40kph
   - other agricultural vehicles under 18 tonnes (eg combine harvesters) up to 40kph.
c. You need a class 2 licence with wheels endorsement to drive other agricultural vehicles under 18 tonnes (eg combine harvesters) over 40kph.
d. You need the appropriate class of licence for all other non-agricultural vehicles or agricultural vehicles heavier than 18 tonnes or 25 tonnes in combination.

If you are driving any agricultural vehicle on a Class 1 licence, you do not need to follow the work time rules or keep logbooks.

For more information about agricultural vehicle road rules, see: www.nzta.govt.nz/vehicle/your/agriculture-forklifts.html

3.3 DEFINITION OF A ROAD

'Road': includes a street and any place to which the public have access, whether as of right or not. This includes all bridges, culverts, ferries and fords forming part of any road, street or place to which the public have access.

For more details of the current road transport and driver licencing rules please see: www.nzta.govt.nz/resources/rules/about/index.html

3.4 MANAGING ON-ROAD HAZARDS

To read all the rules, check out NZTA's *Agricultural Vehicles Guide*.

04/

TRAINING REQUIREMENTS

IN THIS SECTION:

Give thorough training to all tractor-driving employees. As well as training, employers must make sure that people who don't have the knowledge or experience to drive tractors are supervised by an experienced person.

Give all drivers information about the working procedures of every machine they are expected to use, the hazards they will face and closely supervise them until they prove they can work on their own. This includes all implements, front-end loaders, trailers, ballast and counterweights.

Training should include:

> Induction – all workers and contractors should receive information about hazards, control measures, farm rules and policy, safe work procedures and how to safely use a particular tractor, implement, loader or trailer.
> On-farm training – experienced co-workers can do this.
> Direct supervision – provide this for inexperienced operators until they reach an appropriate level of competency.
> Formal training and accreditation – this provides independent, up-to-date knowledge and good practice. Organise this through a recognised training organisation. Operators should obtain appropriate NZQA qualifications for the class of tractor they have to operate.

Keep records of induction and training for all tractor operators.

4.1 YOUNG PEOPLE ON TRACTORS

Children under 15 years are normally not able to drive tractors or implements. However, Section 61 of the Health and Safety in Employment Regulations 1995, states that in special cases, children over 12 years old can drive or ride on tractors or implements if they:

> are fully trained in using the tractor and any implements attached to it
> are in a safe position on the tractor or implement
> are the only child on the tractor.

It is important that:

> they only use the tractor for agricultural work, or
> the tractor is only used to train a child to drive the tractor for agricultural work.

Despite this, farm owners and managers still must keep young people driving tractors safe and make sure they are not put at risk.

4.2 TRAINING FOR HEALTH AND SAFETY REPRESENTATIVES

The Health and Safety in Employment Act 1992 gives employees the right to be involved in workplace health and safety matters. One way this can be achieved is by electing a health and safety representative. This is someone employees can go to when they have any concerns or suggestions regarding health and safety in the workplace. The representative will work with the employer in good faith to find a solution.

This representative is allowed to take two days paid leave each year to go to approved health and safety training.

05/

MAINTENANCE

IN THIS SECTION:

TO BE UPDATED TO REFLECT LATEST LEGISLATIVE CHANGES

Tractors work hard and wear out. Brakes, steering and tyres – all critical to the tractor's safety – are particularly prone to wear. Accidents happen when tractor maintenance is delayed beyond the manufacturer's specifications. This puts operators at greater risk and increases costs through replacing parts and components, or causing business interruptions and breakdowns. Trying to repair a tractor in the field is also hazardous.

5.1 HOW TO MAINTAIN THE TRACTOR

Tractors need regular maintenance. It must be scheduled and planned, and can differ from one tractor to another. Always read the manufacturer's operation and maintenance manual for advice.

Keep all service and maintenance records for the tractor's life so that it can be passed on to the new owner if the tractor is sold. You are likely to get a better price for it too!

5.2 WHAT MAINTENANCE?

Keep your tractor maintenance up-to-date. Even small things, like mud and dirt, build up on the cab floor and get under the pedals. A brake pedal depressing onto five centimetres of caked dirt is a pedal that has five centimetres less travel.

If guards or protective covers have to be removed for maintenance, attach them to the tractor with a lanyard so they don't get lost, and re-attach them correctly.

SAFE PRACTICE DURING TRACTOR MAINTENANCE:

1. **Apply the park brake**

   Chock the wheels and apply the park brake before starting maintenance.

2. **Lower hydraulic equipment**

   Lower hydraulic equipment to the ground before starting maintenance.

3. **Disconnect the battery**

   Remove the key and, if practical, disable the tractor by disconnecting the battery to make sure the tractor cannot accidentally start during maintenance.

WHAT TO CHECK

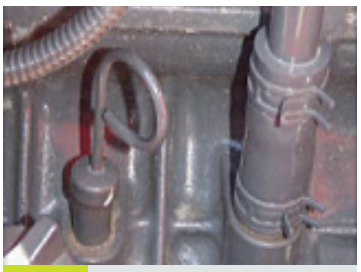
Check battery terminals and levels.

Check brake and clutch fluids.

Check hydraulic fluid levels.

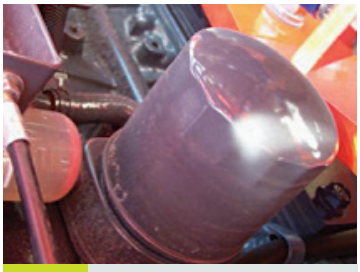
Check fuel levels.

Check grease points.



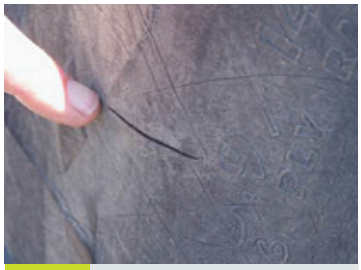
Check engine oil filter and dipstick level.

Check hydraulic filters.



Check the radiator catch tank.

Check for birds' nests.



Check tyres for damage and wear and make sure wheel nuts are tight.

Check for rust weep from the wheel nuts. It may be a sign of loose nuts. Also check for cracks in rims.

Check seatbelt.

5.3 MAINTENANCE CHECKLIST EXAMPLE

Below is a typical tractor maintenance checklist. Get a competent person, who knows the tractor's acceptance/rejection criteria, to do the maintenance.

MAKE:		**REGISTRATION:**		**ODOMETER READING:**	
MODEL:		**YEAR:**		**OWNER OR LOCATION:**	

ITEM	CHECK
Brakes	> Check adjustment, pads, linings and brake fluid levels. > Auxiliary or parking brake stops tractor from moving. > Check all discs, drums, brake linings and linkages for any signs of wear and damage. > Check wheel cylinders and that there are no brake fluid leaks. > Check brake pedals lock together and brakes pull evenly. Lubricate where applicable. > Check there is nothing under the brake pedal to hinder application (eg mud or tools).
Tyres	> Roadworthy and give good control. > Adequate tread depth and are free from excessive wear, cuts or other damage. > See manual for correct pressure settings. > Check tyre pressures with valve at 12 o'clock position. > If any liquid ballast has been added, this will affect pressure readings.

ITEM	CHECK
Roll-over protective structure (ROPS)	> Tractor is fitted with ROPS meeting *AS 1636 Tractors – Roll-Over Protective Structure – Criteria* and tests for roll over (if relevant). > Tractor meets *Approved Code of Practice for RollOver Protective Structures on Tractors in Agricultural Operations*.
Falling-object protective structure (FOPS)	> FOPS is in good condition and is undamaged (no holes drilled etc) and all bolts are securely fastened. > No loose, worn, corroded or missing bolts. > Tractor is fitted with FOPS that meets *AS 2294.1 Earthmoving Machinery – Protective Structures for Falling Objects* and has a confirming specification plate.
Front-end loader	> FOPS is provided, is in good condition and meets the manufacturer's specifications. > No damaged worn or missing pins. Pins are correctly retained with lynch pins or manufacturer's clips or bolts. > Pins are well lubricated. > Lubrication is done in line with the maintenance schedule.

ITEM	CHECK
Wheels	> Check wheel nuts are all present and tight. > Check for rust weep from the wheel nuts. It may be a sign of loose nuts. > Grease wheel bearings. Replace retainers where needed. > Check wheels for free movement. No signs of wheel bearing wear or obstruction. > Check alignment and 'toe in' – refer to manual.
Steering	> Check for smooth movement of steering wheel from full left to full right. > Check linkages, ball joints and sockets, rubber boots covering linkages are all free from mud; there are no blockages and signs of wear or damage. > Check power steering fluid (hydraulic oil) level. > Clean all steering hoses and inspect for scuff marks and leaks.
Guards	> Tractor safety guards are in place and are in good condition. > Power take-off (PTO) guards are fixed in place, functional and undamaged. > Check PTO attachments, no loose, missing or broken pins, bolts or lynch pins.
Clutch	> Note: Do this test with the wheels chocked. > When park brake is applied and clutch pedal depressed there is some easy clutch pedal travel before resistance is felt (check operator's manual for specifications and method of adjustment).

ITEM	CHECK
Seatbelts	> Seatbelt is provided and is in good working order. > Seat is in good condition and each driver can adjust it. > Note: Seatbelts are necessary if the tractor is fitted with a ROPS.
Drive belts	> Check condition and tension meet manufacturer's specifications
Greasing points, nipples	> Find greasing points and lubricate as recommended by the operator's manual. > Clean grease nipples before greasing to stop dirt getting in. Do not over-grease universal joints or sealed bearings as it will damage the seals and allow dirt into the joint.

Fluid levels	> All fluid levels (tractor and any attachment) as recommended in the operator's manual:
	  > radiator water level
	  > transmission fluid
	  > engine oil
	  > battery fluid
	  > brake fluid
	  > fuel tank filled
	  > hydraulic oil level on three-point linkage or front-end loader (FEL) (Refer to operator's manual for ram/cylinder position)
	> Oil reservoir level on loader (if supply is separate from tractor).

Exhaust	> Holes and corrosion. > Excessive noise. > Looseness. > Spark-arrestor fitted. > Note: replace the exhaust if any holes are found in it.

ITEM	CHECK
Battery	> Battery attached securely. > Terminals free of corrosion and tightness. > Electrolyte levels. > Damaged casing.
Lever controls	> Operator lever controls are clearly identified and marked showing what they are and how they work. > Check for damage to knobs or levers and repair before using the machine.
Hydraulic hoses	> Hoses are not leaking or worn. > Switch tractor off – wipe all hose and fitting surfaces with a clean rag. > Wear eye protection, gloves and close fitting clothing. > Restart tractor and cycle all the hydraulics until the oil reaches operating temperature. > Lower attachments to the ground then turn engine off and check that all cleaned areas show no signs of dampness. > DO NOT place hands around hoses or connections when the system is under pressure.
Other	> A first aid kit, working fire extinguisher and other personal protective equipment are on the tractor. > Earmuffs available for any tractor without a cab. > Know safe work load (SWL), axle loads and counterbalance requirements for all attachments. > Windows clean with good all-around visibility.

ITEM	CHECK
Air filter	> Check, clean and replace regularly in line with the manufacturer's specifications.
Lights	> Check and replace lights that aren't working. > Lights (field, head, tail and external warning lights). > Horn works. > Indicators and mirrors working and clean.
Attachment controls	> Test for correct operation of all controls for three-point linkage and FEL attachment. > Check for excessive hydraulic creep by starting the tractor and lifting the bucket or attachment to its full height. Turn off the engine and watch how quickly the raised equipment drops. Follow manufacturer's instructions. > Refer to manufacturer's operator manual or equipment specifications for drop rates. > Ensure no-one enters the area during this inspection.
Other	> Operator's cabin is free of mud and oil. > Platform access, steps and handrails are secure, clean and have three points of contact. > All gauges and lights in the cabin operate correctly when the tractor is running (refer to operator's manual). > Vehicle registration (if applicable) is current and clearly visible.

MAINTENANCE CHECK PERFORMED BY:		**DATE:**	
NEXT CHECK DUE (DATE):			

06/

REFERENCES

IN THIS SECTION:

6.1 GLOSSARY

TERM	DEFINITION
2WD	Two-wheel drive.
4WD	Four-wheel drive
All Practicable Steps	Section 2A Health and Safety in Employment Act 1992: 'The steps taken to achieve the result that it is reasonably practicable to take in the circumstances, having regard to: 1. the nature and severity of harm that may be suffered if the result is not achieved; and 2. the current state of knowledge about the likelihood and severity of harm that will be suffered if the result is not achieved; and 3. the current state of knowledge about harm of that nature; and 4. the current state of knowledge about the means available to achieve the results and about the likely effectiveness of each of those means; and 5. the availability and cost of each of those means. 'To avoid doubt, a person required by the Health and Safety in Employment Act 1992 to take all practicable steps is required to take those steps only in respect of circumstances that the person knows or ought reasonably to know about.'
Counterweight	A weight you can attach to the front or rear of the tractor to offset the weight of other front- or rear-mounted implements. The counterweight distributes the weight of the tractor and implements more evenly over the front and rear wheels, improving traction and stability.
Diff lock	A locking differential. This provides increased traction, compared to a standard or 'open' differential, by restricting each of the two wheels on an axle to the same turning speed regardless of traction or differences in resistance seen at each wheel.
FEL	Front-end loader. An articulated hydraulic lift arm (most often detachable) with a bucket or scoop that fits on to the front of a tractor for digging and loading earth and other substances.
FOPS	Falling object protective structure. A reinforced cab or safety frame designed to protect the driver or passenger from objects that fall onto the cab.
Forks	An implement most often connected to the front-end loader for lifting and impaling loads, such as hay bales.
Implement (mounted or trailed)	An agricultural machine attached to a tractor to do work in agricultural production, eg, ploughing, harrowing, mowing.
Lift ratings	See load rating
Load rating	The maximum load for which something is designed.

TERM	DEFINITION
NIHL	Noise-induced hearing loss. A hearing loss disorder that results from exposure to high-intensity sound, especially over a long time.
PTO	Power take-off. A system made up of an output shaft on a tractor (usually on the rear of the tractor between the three-point linkage) with teeth or ridges. It is designed so a drive shaft can be easily connected to a matching input shaft on the other end. The power take-off allows implements to use energy from the engine of the tractor.
Quick hitch	A system attached to the three-point linkage that is designed to allow implements to be attached in a faster, easier way.
ROPS	Roll-over protective structure. A reinforced cab or safety frame designed to protect the driver and passenger from crush injuries in the event of a rollover by creating separation between the tractor and the ground.
Tines	Prongs or sharp points, such as those on a fork.
Three-point linkage	A system for attaching implements to the tractor. It is made up of three hitch-points that create a triangle shape and allow the weight of the implement to be carried by the tractor itself. Unlike a trailer, which may support its own weight.
Tow eye	The hole in the tractor drawbar through which the hitch-pin is inserted to connect trailers and other implements.
Wheel brake	Brakes that apply to specific wheels. Wheel brakes can be used to help the tractor make sharp turns.

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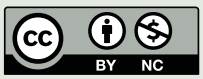

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