



The University of Sydney



# Safe Tractor Operation

A practical guide



AUSTRALIAN CENTRE FOR AGRICULTURAL HEALTH AND SAFETY

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# 1. Introduction

## **This publication – Its purpose**

This publication aims to provide practical guidelines for employers and workers to improve and ensure the safety of those who use tractors on farms, and those who are in the vicinity of areas where tractors are being used.

The document briefly provides guidelines on the hazards and risks associated with working with tractors and practical guidelines on how to implement effective occupational health and safety (OHS) risk control that will not only reduce risk, but will assist farmers to meet OHS regulatory requirements, and improve productivity.

The publication has been prepared under the direction of the Farmsafe Australia National Farm Machinery Safety Reference Group, comprising representatives from industry, occupational health and safety, injury research centres, producers and manufacturers.

## **Health and safety problems associated with tractors**

People working with tractors on the farm are exposed to risk of injury and illness associated with a range of hazards. Tractors have been proven to be the most deadly piece of equipment on Australian farms. In the period 1989-1992 there were 87 traumatic deaths associated with tractors (Franklin et al., 2000).

Hazards associated with using tractors on Australian farms include :

- Tractor rollover
- Tractor run over
- Tractor power take offs (PTOs)
- Hydraulics
- Ergonomics
- Noise
- Operator skills

The types of injury range from death, serious injury requiring hospitalization and down time, to “nuisance” injury that stops work for a short time, or makes work slower and reduces productivity.

## **Legal obligations of the people in agriculture production enterprises**

OHS legislation is similar in all states in that it outlines the responsibilities of key parties involved in reducing risk of injury and illness associated with work.

Responsibilities of *employers* include:

- Consultation with workers to implement OHS program
- Provision of a safe working environment
- Organisation of safe systems of work
- Maintenance of work areas, machinery and equipment in a safe condition
- Ensuring safe use, handling, storage and transport of plant and hazardous substances

- Assessment of health and safety risks to employees and others in the workplace, and institution of effective risk control measures
- Provision of adequate information, induction, instruction, training and supervision to employees
- Provision of adequate facilities for the welfare of workers

*Employees* also have responsibilities. Workers must take reasonable care of the health and safety of themselves and others, and cooperate with management in (its) efforts to comply with occupational health and safety requirements.

*Employers and self-employed persons* must ensure the health and safety of people visiting or working at their places of work, who are not their employees, by not exposing them to risk - this includes contractors.

*Manufacturers, designers and suppliers* of plant and substances for use by people at work must make sure that they are safe and without risks to health when properly used. They must also supply adequate information to ensure safe use.

Each of these OHS obligations must be met in all agricultural industries and on each individual enterprise.

## 2. Finding and fixing safety problems associated with using tractors on farms

The key processes (or steps) that must be set in place to manage OHS risk are:

**Step 1: Consult with workers** - there must be a way for workers to actively participate in the OHS program of the enterprise. Information should be shared with workers, they should be given the opportunity to express their views and their views should be taken into consideration prior to decisions being made.

How farm owners and managers consult with workers will be different on different farms and may include:

- Regular meetings where safety issues are discussed
- Systems whereby safety representative are nominated to have specific responsibility for liaison between workers and those managing the farming operation

Whatever system is in use, it is essential that there is a clear commitment to safety of the owner and manager, and that this is obvious by the attitude, behaviour and activity of everyone on the farm, on a day-to-day basis.

**Step 2: Identify hazards** - safety hazards must be identified in a systematic way. This means that farm owners, manager and workers must identify those jobs and situations on the farm that may cause injury or illness not only to people doing the work, but also to bystanders.

Identifying hazards should be an ongoing activity and be carried out:

- At least annually
- When systems are changed – new equipment, changed facilities, changed practice

All workers should be actively encouraged to report anything that could be considered hazardous to health and safety – any unsafe condition, or unsafe task needs to be identified and action taken to make it safe.

**Step 3: Assess risk** - risks associated with safety hazards must be assessed

Risk associated with each hazard must be assessed in terms of the severity of the potential harm that could occur, and the likelihood that such harm could occur – generally the risk is greater if workers are frequently exposed to the hazard.

**Step 4: Control risk using the hierarchy of control approach** - risks must be controlled to prevent injury. A plan of action must be developed which outlines how the risk of injury or illness from the hazard will be minimised. To decide how the risk will be controlled, consider each of the options (1-5) below for each hazard. A combination of these options should also be considered.

The *hierarchy, or order of effectiveness*, is as follows:

**1. Elimination of the hazard**

Where possible, the hazard must be eliminated, or removed from the workplace. This is obviously the most effective way to reduce risk. While it is often not possible to eliminate a hazard, OHS regulations require employers to consider this option. If it is not possible, then the next most effective solution should be sought and put in place (see 2 below).

**2. Substitution for a hazard of lesser risk**

Where it is not possible to eliminate a hazard altogether, consider whether the hazard can be substituted for something that will do the same job, but is less hazardous.

**3. Isolation of hazard from worker and other engineering controls**

If the hazard can not be substituted, consider whether it is possible and practicable to improve the design of work and/or isolate the worker from the hazard. This is the method of most of the safety improvements that should be put in place in the workplace to reduce risk of injury as well as to be compliant with OHS regulations.

**4. Administrative controls**

Administrative controls include safe operating procedures or rules, organising work in such a way that reduces risk, giving safety induction and training to workers, supervising unskilled workers and providing information to workers about the safety risks associated with work on the farm and how these risks can be minimised.

**5. Personal protective equipment**

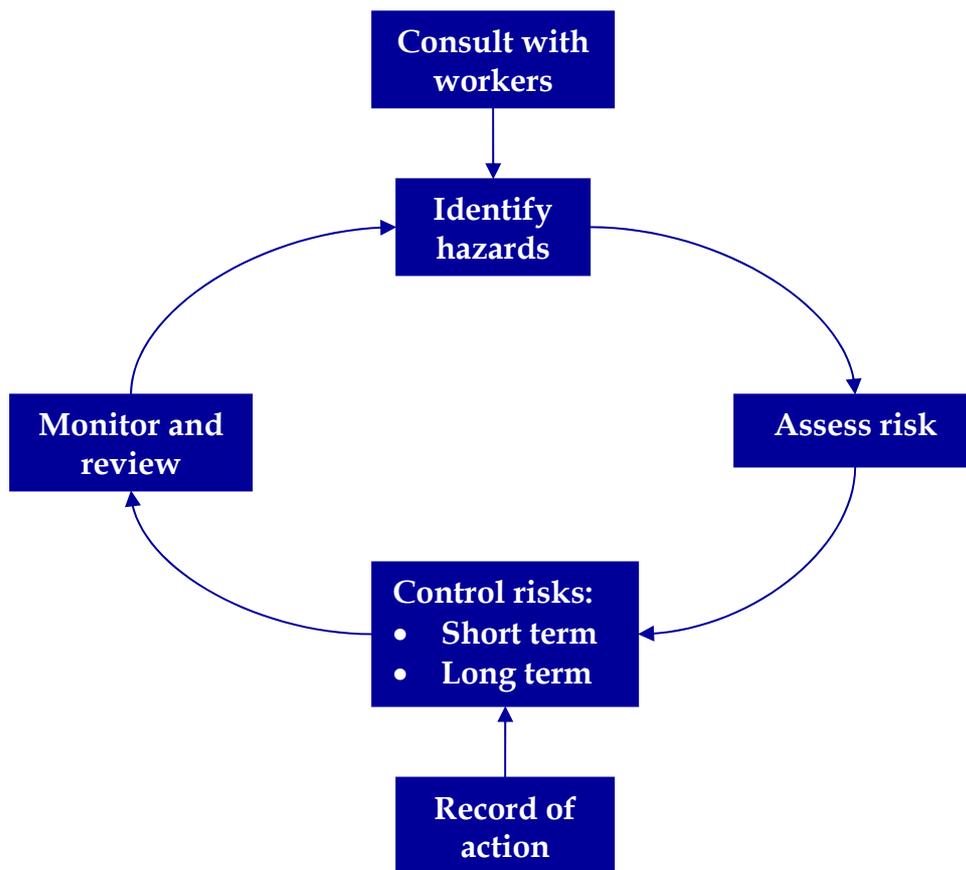
Personal protective equipment must be provided and used where workers cannot be protected from a hazard by a control measure by higher up the order (1-4). This includes providing eye and hearing protection to protect from injury to workers and bystanders in the workplace.

The guidelines provided in this document suggest the use of higher order controls in the first instance (1-3 above), with the lower order, less effective controls that depend on individual behaviour lower in the list (4-5 above). In practice, best practice in OHS risk management requires a mix of controls for the high risk hazards.

**Step 5: Keep a written note of your OHS activity – Record Keeping**

Records of all activity in your OHS program must be kept.

These are not steps to be taken on a once-off basis. The process would be better illustrated in this way:



These processes should become a key part of the management of the whole business. Successful businesses invest significantly in OHS in terms of time, money and commitment at all levels. These businesses understand that overall performance of the business benefits from good OHS practice.

Such businesses do not accept that the major responsibility for workplace health and safety rests with the workers themselves, rather the opposite – that safety is a key management responsibility, and involving workers is a critical management skill.

### 3. Hazards, risk and risk control

This section gives practical examples of how the principles outlined in the section above (2. Finding and fixing safety problems associated with using tractors on farms) can be put into practice on the farm.

#### 3.1 Tractor rollover

Rollovers and backflips are a common cause of tractor deaths. All drivers and passengers, including children, of tractors are at risk of being injured or killed in the event of a rollover or backflip. Older people, 45-59 years and 60-75 years, have the highest death rates.

Hazard and risk	Risk controls
<p>People who operate smaller tractors without a cabin are at risk of injury or death from tractor rollover</p> <p>Driving on narrow or raised tracks or roads poses a risk of the tractor rolling over embankments and injury to the operator.</p>	<p><i>Engineering controls</i></p> <p>Ensure all un-cabined tractors are fitted with Roll Over Protective Structures (ROPS).</p> <p>Widen the wheel width of the tractor to the maximum to increase stability of the tractor</p> <p><i>Administrative controls</i></p> <p>Plan and check routes before transporting tractors to make sure that there is no risk of tractors rolling over embankments</p> <p>Check the Safe Working Load (SWL) of each tractor. Under no circumstances should the SWL be exceeded.</p> <p>When working on steep slopes:</p> <ul style="list-style-type: none"><li>• Always travel slowly</li><li>• If there is not enough room for a gradual turn, use a slow three point turn</li><li>• Reverse up the hill and when coming down, drive slowly forwards in low gear</li><li>• Add front end weights to a tractor pulling a heavy load up a hill</li></ul> <p>When working on mild slopes:</p> <ul style="list-style-type: none"><li>• If the slope is being traversed at a higher speed, a downhill turn should be made</li></ul> <p>When driving:</p> <ul style="list-style-type: none"><li>• Always travel with a front end loader as close as possible to the ground</li><li>• Always reverse out of a bog or use another tractor to pull it out.</li><li>• Only use the drawbar when towing.</li></ul>



Always wear a seatbelt when driving a tractor with a ROPS.



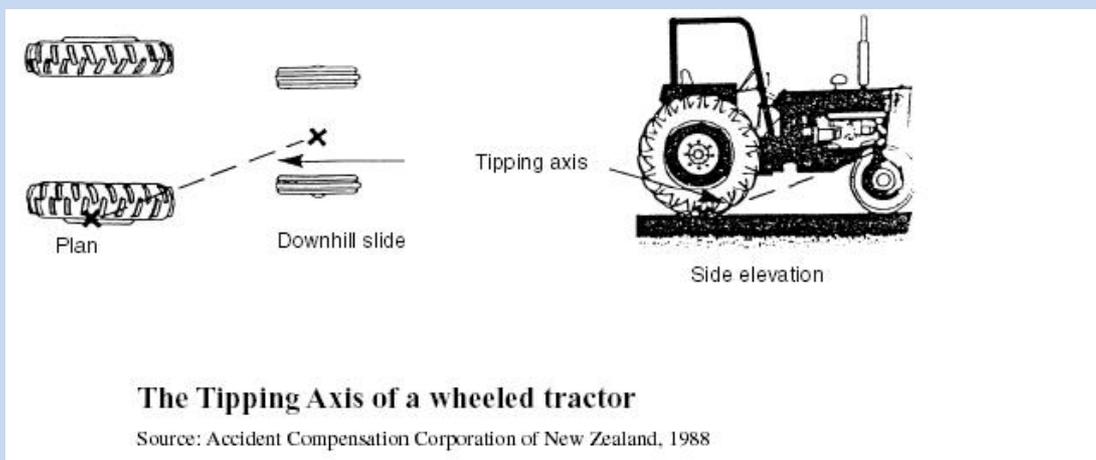
## Why do tractors rollover?

*Sideways rollover* and *backflips* account for most of all rollovers. Gravity and centrifugal force are the two major forces involved in a sideways rollover. *Back flips* are produced through rear axle torque and drawbar leverage.

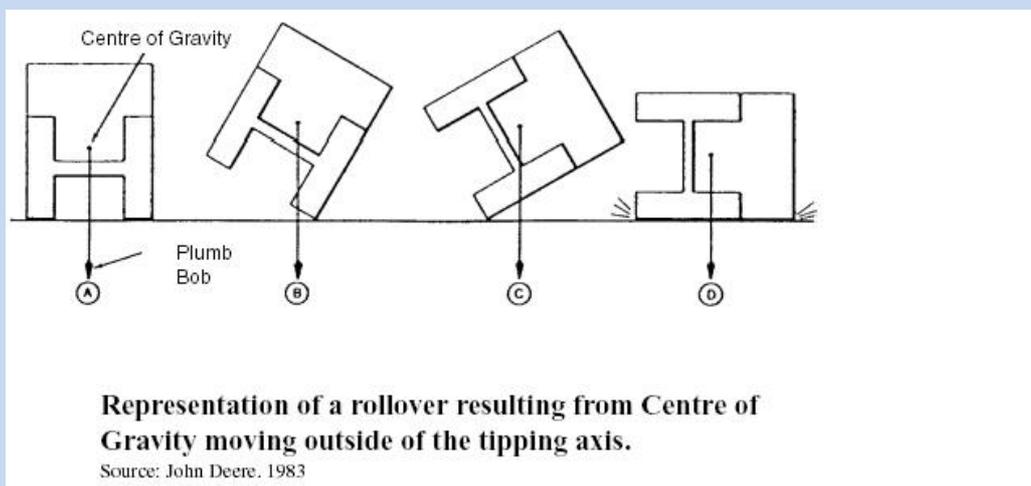
### 1. Sideways rollover

*Sideways rollovers* occur most commonly when traversing a steep slope or cornering too sharply at speed. To understand sideways rollover we need to understand the relationship between the *tipping axis* of the tractor and its *centre of gravity* together with the amount of *centrifugal force* developed during cornering.

The *tipping axis* is the line that a tractor will pivot about during tipping if driven over a steep enough slope.



Once the *centre of gravity*, usually located in the vicinity of the gearbox in the midline of the tractor, lies outside the tipping axis, a rollover is inevitable.



*Centrifugal force* is introduced when a tractor is cornering. This force tends to pivot the tractor on its outside wheels during cornering. This predisposes the tractor to roll over. The centrifugal force varies according to the weight of the tractor, the speed and the turning angle. When a tractor is turning on a slope its centre of gravity may be approaching its tipping axis and it may only require a small amount of centrifugal force to cause a rollover.

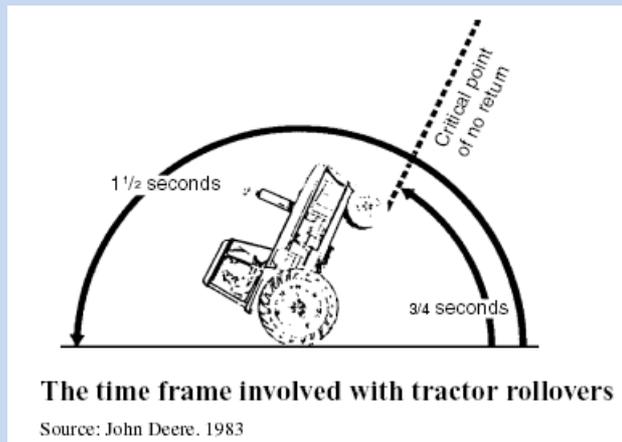
### 2. Backflips

For a backflip to occur there needs to be two forces in action *rear-axle torque* and *drawbar leverage*.

*Rear-axle torque* is the transfer of energy between the engine and rear wheels of a tractor. It may be described as the rear axle rotating with respect to the chassis.

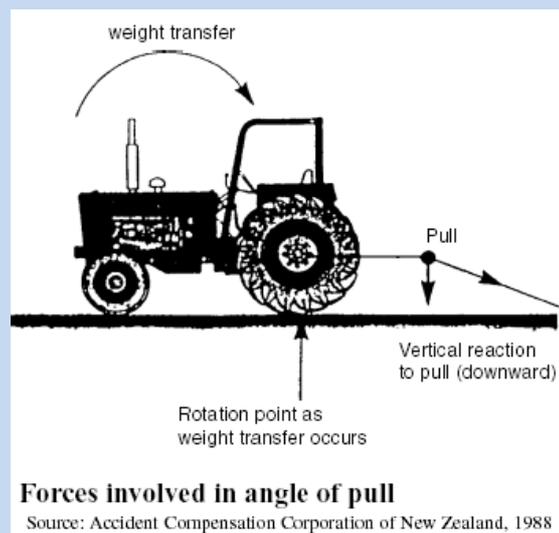
If axle rotation is prevented as in the case where the tyres are stuck (eg if bogged, frozen to the ground or if the load is very heavy), the rotational force moves the tractor backwards around the rear axle, lifting the front wheels off the ground and a backflip can result.

Practices which involve rear-axle torque reactive force acting to cause a backflip include driving off in low gear but with high engine speed, driving the tractor forward when the wheels are unable to move forward, rapid engagement of the clutch of the tractor, and rapid acceleration, particularly when driving uphill or pulling a heavy load.



Four wheel drive tractors are less likely to backflips as they have more weight over the front axle than a 2WD and the torque is applied to both front and rear axles.

*Drawbar leverage* describes the force which tends to pull the tractor rearwards when it is towing or pulling an object. The magnitude and its effect on tractor stability will vary according to a number of factors including the weight, draft, hitching point used, resistance to movement and angle of pull.



## 3.2 Tractor run over

The risk of tractor run over is always present wherever tractors are working. Injuries associated with tractor run over are generally severe. This is due to the weight of the tractor and the nature of associated implements by which the victim is also frequently run over. Examples of associated equipment include slashers, rotary hoes, trailers, chisel and disk ploughs. Deaths from tractor run over are becoming more common and often results from crush injury to the head and upper body. Deaths from tractor run over are a special risk for older farmers.

Hazard and risk	Risk controls
<p>People may be run over by the rear wheel of a tractor or by an implement when they slip, trip or fall on the ground in front of a tractor.</p>	<p><i>Substitution control</i> If a particular job requires frequent mounting/dismounting consider using another piece of equipment such as a ute, motor bike or small utility vehicle.</p>
<p>Standing next to a tractor in front of the rear wheel or a trailing implement may result in being run over.</p>	<p><i>Engineering controls</i> Seriously consider fitting a safe tractor access which allows the operator to mount the tractor from outside the wheel rather than from in front of it (See Section 2 – Safe Tractor Access)</p>
<p>A person standing in front of a tractor may be crushed against a post, gate or building by the front of the tractor.</p>	
<p>Small children may be run over by tractors because they are difficult to see when the tractor is reversed or driven away.</p>	<p>A seat belt on a tractor helps to keep the operator within the safety zone, especially when driving over rough ground or if an object is struck.</p>
<p>Passengers are at risk of tractor run over if there is not a designated passenger seat. Children are particularly at risk as they lack the strength to hold on especially when travelling over rough ground.</p>	<p>Safety start switches should be fitted to tractors wherever possible to help prevent the operator from starting the tractor from the ground or while in gear from the operator’s seat.</p>
<p>Mounting and dismounting a moving tractor may result in being run over by the rear wheels or implement.</p>	<p>A “quick hitch” will save time and decrease the risk of run over by allowing an implement to be hitched without dismounting. However, there is still a risk of run over when unhitching the implement as it is then necessary to dismount the tractor. Jockey wheels are also used to hold an implement in place. However, the jockey wheel should be checked to ensure adequate strength.</p>
<p>Starting the tractor from the ground may result in tractor run over if the tractor is in gear.</p>	
<p>Fatigue may increase the risk of run over as operator reflex times may be slowed and concentration lost.</p>	
	<p>Fitting a reversing alarm may alert and remind bystanders that a tractor is reversing and operators may have reduced visibility.</p>

## Hazard and risk

## Risk controls



### *Administrative controls*

Before starting and moving a tractor, check to make sure that all bystanders are clear and well away from the tractor.

**Never** allow **passengers** on the tractor

Mount or dismount a tractor only when it is stationary and with the park brake on.

Always start the tractor when sitting in the seat, not from the ground.

The tractor should be started using the normal key.

Always lower 3-point linkage and auxiliary equipment when parking the tractor.

Take frequent short breaks when driving the tractor for long periods of time to help reduce fatigue.

When having tea or lunch breaks, stop and get off the tractor for a break, don't eat and drive on the run.



### 3.3 Tractor power take offs (PTOs)

The tractor's power take-off (PTO) provides the power source for many implements and equipment used in production farming. Examples include the post-hole digger, slasher, fertiliser spreader and many others.

The power take-off is a rotating stub shaft at the rear of the tractor. The power take-off and its attachments are a series of high speed shafts that move in a circle 88 mm from the centre of a shaft revolving at 540 RPM at a speed of 5 linear metres per second.

This rotating shaft assembly poses a severe hazard. The rotational force of the shaft is the source of the hazard. It is present wherever implements are power-driven by the tractor power take-off shaft. There is a risk of entanglement of body parts with the shaft. It usually occurs when hair, clothes or jewellery become caught in the rotating shaft.

Hazard and risk	Risk controls
<p>Working near an inadequately guarded PTO shaft runs the risk of entanglement.</p> <p>Bystanders, helpers and children are at risk of injury or death due to their curiosity and limited understanding of hazards.</p> <p>Stepping over an operating PTO increases the risk of entanglement.</p> <p>Wearing looses clothing, clothing with drawstrings, jewellery or having long hair increases the risk of entanglement.</p> <p>Fatigue may increase the risk of entanglement in a PTO as operator reflex times may be slowed and concentration lost.</p>	<p><i>Engineering controls</i></p> <p>Fit and ensure that all PTO assembly and shaft guards are in good order and functional before tractors are operated.</p> <p>Replace missing master guards on tractors. A guide for fitment of a replacement master guard is available from the Australian Centre for Agricultural Health and Safety.</p> <p><i>Administrative controls</i></p> <p>Only people who are absolutely necessary to do the job should be present while the power take-off is in operation.</p> <p>Guards should only be removed for repair or maintenance. If removed, guards should be refitted before further operation. When undertaking these activities, the power take-off should always be disengaged and the tractor shut off beforehand.</p> <p>Reduce power take-off shaft damage by observing the following:</p> <ol style="list-style-type: none"> <li>Avoid tight turns that pinch rotating shafts between the tractor and machine.</li> <li>Keep excessive telescoping to a minimum.</li> <li>Engage the power take-off gradually and avoid over-tightening of slip clutches on power take-off driven machines.</li> </ol> <p>Disengage the power take-off before dismounting.</p>



## Hazard and risk

## Risk controls

It is especially important when working with power take-off equipment that clothing be of a snug fit, buttons done up and sturdy boots are worn. Jackets should be buttoned or zipped up. Rolled up shirt sleeves should be avoided. Pants or overalls with straight legs which don't drag on the ground are preferable to reduce the risk of entanglement.

Frequent short breaks when operating the tractor for long periods of time will help reduce fatigue.



### 3.4 Hydraulics

Working with hydraulics involves the risk of injury from oil under pressure. Many hand injuries are associated with oil under pressure and these injuries are difficult to treat effectively due to the oil penetrating may tissue layers under the skin.

Hazard and risk	Risk controls
<p>Hydraulic fluid under pressure poses risk of penetrating injury.</p> <p>If hydraulics fail, there is a risk of serious crush injury is the rig falls.</p> 	<p><i>Administrative controls</i></p> <p>Check and replace leaking hydraulic hoses and fittings.</p> <p>Before working under raised hydraulic implements, ensure that hydraulic and ram locks have been fitted and that machinery is chocked and supported.</p>

### 3.5 Body stressing (Ergonomics)

Ergonomics is the relationship of the body to the work that is being done. It involves changing the environment to better fit the worker.

Hazard and risk	Risk controls
<p>Operating tractors for long hours can be associated with back, shoulder and other pain and injury – especially with poorly designed seats and controls.</p>	<p><i>Engineering controls</i></p> <p>Replace tractor seats if in need of repair</p> <p><i>Administrative controls</i></p> <p>Check that all seats are in good condition and fit the purpose eg can swivel if needed.</p> <p>Adjust mirrors to give good vision and reduce the need to look backwards.</p> <p>Make sure that controls are adjusted where possible to fit the person doing the work.</p> <p>Take regular breaks to exercise the neck and back to prevent neck, shoulder and back pain.</p>

### 3.6 Noise

Hazard and risk	Risk controls
<p>Hearing injury occurs where the operator is exposed to damaging levels of noise. These may be due to engine noise, and/or radio and stereo at loud volume.</p> 	<p><i>Administrative control</i> Turn the radio or stereo volume down, excessively loud music also damages hearing.</p> <p><i>Personal protective equipment</i> When operating un-cabined tractors always wear ear muffs or ear plugs.</p>

### 3.7 Operator skills

As mentioned previously it is a requirement under the OHS legislation for employers to provide adequate information, induction, instruction, training and supervision to employees.

Hazard and risk	Risk controls
<p>Workers who are unskilled in the work process and unaware of the safety risks are at a higher risk of injury and illness in the workplace and place others at a higher risk.</p>	<p><i>Administrative controls</i> In addition to general OHS induction, all workers who operate tractors must undertake tractor safety induction, at the time they learn their tractor skills, which includes:</p> <ul style="list-style-type: none"> <li>• Information regarding the risks associated with various processes undertaken, and general tractor operation</li> <li>• Specific rules that have been developed to minimise the risk of injury and illness</li> <li>• How to report hazards that they identify when working with tractors</li> </ul> <p>Ensure that all workers are competent to perform the work required of them</p> <p>Provide specific information, instruction training and supervision to all workers</p> <p>Keep a record of assessment and training of workers</p>

## People at special risk

The employer, and/ or the person in control of the farm workplace has a responsibility to provide a safe workplace for all people in the workplace including workers, contractors and visitors.

Most farms in Australia are family farms and are accessible by family members, including children. The safety of all, including children and family visitors must be ensured.

At risk group	Risk controls
<b>Children</b> Children are at special risk of injury around working machinery.	Young children should NOT be taken for rides on tractors.  Children must be physically separated from the workplace with a fence around the house yard.
<b>Visitors</b> Visitors to the farm who are not aware of traffic hazards may pose risk to others as drivers or be at risk as pedestrians.	Farmers have responsibility to protect the safety of other visitors to the farm workplace. Visitors should not be permitted in the workplace unless they are trained and supervised to ensure their safety.  Visitors to the farm should be directed to the farm house or office, with clearly marked signs. Visitors should only be allowed into the worksite when accompanied by a competent person.
<b>Contractors</b> Employers have responsibility to provide a safe workplace for contractors who enter the farm workplace.	Contractors, including tractor operators, should be inducted into the safety systems and rules of the farm enterprise, and be made aware of their obligations.
<b>Older farmers</b> Older workers, although they may be more skilled in the work operation, are likely to be less agile and thence at greater risk of suffering injury.  They often have older tractors with poor access and are at greater risk of tractor run over.  Furthermore, older people, if they do fall, are more likely to suffer a fracture than younger people.	Older people may not recognise that they are less agile than young people. Appropriate steps, including modifying machinery access, steps and improving handrails, allowing extra time to do job, can reduce the risk of injury.

## Emergency preparedness

All properties must be “emergency ready”. Being well prepared with emergency plans and equipment will ensure that the damage to people and property is minimized when accidents happen.

### Risk controls

#### General

Communication systems should be in place to ensure that tractor operators are in contact with others on the farm, and that emergency personnel can be notified immediately.

Emergency plans and procedures should be prepared and communicated to all workers.

Emergency plans should include plans for dealing with injury, poisoning, fire, explosion, pesticide and spills of hazardous substances.

All workers should be aware of emergency plans at induction, and be regularly updated.

Location of telephones and emergency numbers for Ambulance, Fire Brigade, Police and Emergency Services should be included in emergency plans and safety induction.

The property address should be signposted in workshops, farm offices, and beside all farm phones and two-way radios in accordance with Emergency Service requirements. Record property rural address’ and GPS co-ordinates of mail box and airstrips.

#### First aid

A suitable first aid kit should be accessible to all workers on the property. Work health authorities detail the requirements for the type of workplace. An employee operating a tractor requires a first aid kit in the tractor. The kit should be suitable for management of common farm injuries and snake bite.

At least one person, preferably two people, should be trained in First Aid and hold a current First Aid Certificate.

The telephone numbers of the Poisons Information Centre should be available.

#### Fire

Fire is a hazard which is often present when using tractors on the farm. Grain harvest, cotton picking, and slashing are just some of the activities which have a high risk of fire.

Fire extinguishers should be available where fire is a hazard.

All workers should be aware of, and trained in, emergency fire procedures.

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John Deere. 1983 *Fundamentals of Machine Operation*. Deere & Company Service Training. Illinois.

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## Further information and useful contacts

### State / Territory Health and Safety Authorities

#### *New South Wales*

WorkCover NSW

Ph: 13 10 50

[www.workcover.nsw.gov.au](http://www.workcover.nsw.gov.au)

#### *Australian Capital Territory*

ACT WorkCover

Ph: (02) 6205 0200

[www.ors.act.gov.au/workcover/index.html](http://www.ors.act.gov.au/workcover/index.html)

#### *Victoria*

Victorian WorkCover Authority

Ph: 1800 136 089

[www.workcover.vic.gov.au](http://www.workcover.vic.gov.au)

#### *Tasmania*

WorkCover Tasmania

Ph: 1300 366 322

[www.workcover.tas.gov.au](http://www.workcover.tas.gov.au)

#### *South Australia*

WorkCover Corporation

Ph: 13 18 55

[www.workcover.com](http://www.workcover.com)

#### *Western Australia*

WorkSafe – Consumer and Employment Protection

Ph: (08) 9327 8800

[www.commerce.wa.gov.au/WorkSafe/](http://www.commerce.wa.gov.au/WorkSafe/)

#### *Northern Territory*

Northern Territory WorkSafe

Ph: 1800 019 115

[www.worksafe.nt.gov.au](http://www.worksafe.nt.gov.au)

#### *Queensland*

Department of Industrial Relations – Workplace Health and Safety

Ph: 1300 369 915

[www.deir.qld.gov.au/workplace](http://www.deir.qld.gov.au/workplace)

### National Contacts:

Safe Work Australia

Ph: (02) 6121 5317

[www.safeworkaustralia.gov.au](http://www.safeworkaustralia.gov.au)

Farmsafe Australia

Ph: 02 6752 8218

[www.farmsafe.org.au](http://www.farmsafe.org.au)

Standards Australia

Ph: 1300 65 46 46

[www.standards.org.au](http://www.standards.org.au)

Australian Centre for Agricultural Health and Safety

Ph: 02 6752 8210

[www.aghealth.org.au](http://www.aghealth.org.au)

## Safe Tractor Access

Tractor access, from the ground to the seat, which starts outside the tractor wheelbase will reduce the potential for accidents occurring during mounting and dismounting, or by falling in front of the rear wheels.

Tractors are usually mounted on the left hand side, so no access path is needed on the right. A bar to discourage right hand side access is recommended. In cases where the operator needs to mount/dismount on both sides of the tractor, access paths are required on both sides.

Tractor access has improved dramatically over recent years, however steps are usually poor on older style tractors. These notes have been written to guide tractor owners who want to improve safety by improving access. Because of the great variety of tractor makes and models, it is not possible to provide designs, or absolute rules, but the following points should be helpful.

- The bottom step should be no more than 400mm from the ground, with its outer edge close to the line of the outside of the left hand rear tyre, at the narrowest normal track setting. When thinking about the placement of the bottom step, it is important that it be far enough forward of the tractor rear tyre to allow space for a guard between the access platform and the tractor mudguard, to prevent contact between the tyre and the operator (in particular an operator's foot)
- Safe comfortable steps have a rise of no more than 200mm, and tread depth no less than 240mm. The tread material for steps, footplates etc should be a non-slip grating so the ground can be easily seen through the step. Brightly coloured, non-slip nosing on step edges will make the steps more visible and safer. Examples of materials used for the platform are 'Ceramabond' stair tread nosing and serrated platform grating.
- The front of the access path should be defined by a handrail made of material that is easy to hold (eg 30-40mm diameter). The upright portion of this rail should be within the tread of the bottom step and also provide a convenient hand grip. A small handrail is also required on the rear mudguard side of the access path. The space between the handrail and the platform must be filled in using a mesh with minimum dimensions of 75mm x 75mm. A 50mm lip is required along the front and rear edge of the steps to provide a barrier to feet slipping in very muddy conditions.
- The access path should provide comfortable and safe access to the operator's position. Where possible steps should be the same size/slope, and should follow a straight line or smooth curve. Safe access is more like a staircase rather than a ladder.
- The whole structure can usually be attached to the implement mounting pads found on each side of the clutch housing. Further bracing can often be supported off the bolts connecting the gear box housing to the clutch or rear axle. It is important to avoid unnecessary reduction of underframe clearance in positioning supports for the access path. Where the tractor will be used in extremely boggy conditions, it might be desirable to hinge the bottom step from a point well inside the next step up, so it is free to move upwards, clear of the ground.
- Continued access to service points (ie batteries, tools boxes, dip sticks, oil filters) is an essential consideration in looking at the mounting and positioning of platforms, rails and supports. Handrails, supports etc must not be welded onto structural

components of the Roll Over Protective Structure (ROPS). Padding might be required on components like cabin roof edges where the operators head might hit these when getting in and out of the tractor.

- In a few tractors the footplate and operator platform is mounted on flexible mounts or vibration isolators. Positioning of these isolators to make sure they can support the weight of an operator mounting the bottom step can be difficult. It is important that the simple rubber isolators are not put in tension.

Corner of original step to be removed



Mounting points selected – 2 bolts on gear box and 4 below fuel tank



Plate attached to midmount position below fuel tank



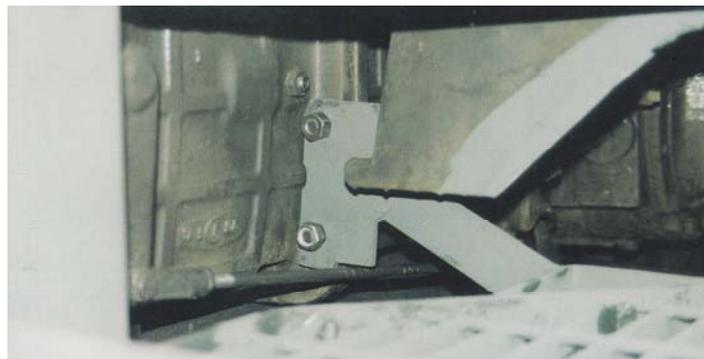
Footplate extension attached



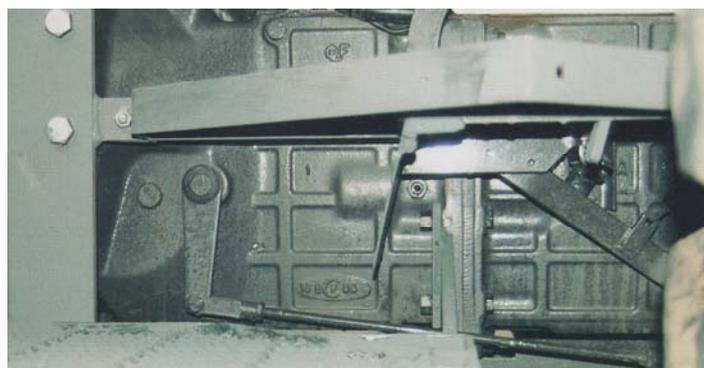
Middle step fitted



Attachment of middle step to gearbox bolts



Attachment of middle step to gearbox and lower step attached to middle step



Upper and lower section of extension fitted to mudguard



Handrail attached



Completed safe tractor access



Owner / Manager: \_\_\_\_\_ Property Name & Address: \_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Completed by: \_\_\_\_\_ Date Completed: \_\_\_\_\_

Tractors & Machinery	Yes No	Risk Level	Action Planned	Cost \$	Target Date	Action Date	Person Responsible	Notes
<b>Tractors and Machinery - Guarding</b>								
Are all tractors fitted with approved rollover protection structures (ROPS) or cabin?								
Do all tractors fitted with a front-end loader or forklift, have approved rollover protective structure with falling object protection (FOPS)?								
Is the PTO master shield in place on all tractors?								
Are all Power Take-Off (PTO) and drive shafts and PIC shaft guarded?								
Are all appropriate guards including manufacturer's guards in place, in good condition and well maintained on all tractors?								
Are steps and handrails and in good condition?								
Do tractor access steps prevent the operator being run-over by the rear wheel? (Access to many older tractors allows the operator to be run over when standing or falling in front of the rear wheel).								
Do all exhaust systems function properly and in good condition?								

<b>Tractors &amp; Machinery</b>	<b>Yes No</b>	<b>Risk Level</b>	<b>Action Planned</b>	<b>Cost \$</b>	<b>Target Date</b>	<b>Action Date</b>	<b>Person Responsible</b>	<b>Notes</b>
Are lights, reflectors, screens and mirrors, clean and functional?								
Are all brakes, including handbrakes properly adjusted and in good working condition?								
<b>Tractors - Safe Operation</b>								
Are all operator and maintenance manuals available for all tractors and machinery?								
Are tractor tyres in good condition?								
Are tractor tyre correctly inflated and ballasted to manufacturers' specifications?								
Are tractors correctly ballasted when towing implements or using 3 point linkage equipment?								
Are all hydraulic hoses in good condition and free of oil leaks from hoses or couplings?								
Are all seats on tractors ergonomically designed and in good condition?								
Is all electrical wiring in good condition?								
Are batteries secure and battery housings and terminals clean?								

Tractors & Machinery	Yes No	Risk Level	Action Planned	Cost \$	Target Date	Action Date	Person Responsible	Notes
Do ignition key and starter switches work?								
Is a fire extinguisher kept on all tractors?								
Is a first aid kit kept near the operating environment or in the tractor?								
Do headlights and tail lights work?								
Are all rear vision mirrors, headlights, tail lights and windscreens clean?								
Do windscreen wipers and washers work?								
Are windscreen wiper blades in good condition?								
Are door seals in good condition to exclude noise, dust and fumes?								
Are earmuffs or earplugs available for tractor and machinery operators if they have to raise their voices to be heard over loud noise?								
<b>Additional Hazards</b>								

Tractors & Machinery	Yes No	Risk Level	Action Planned	Cost \$	Target Date	Action Date	Person Responsible	Notes
<b>Plant and Machinery</b>								
Are all moving exposed belts, pulleys and shafts properly guarded?								
Are all manufacturers' guards in good repair?								
Are all guards in place before machinery is in use?								
Are all steps and handrails in good condition?								
Are all Operator Manuals and Service Manuals available for all plant and machinery?								
Are exhaust systems in good condition and functional?								
Are all hydraulic hoses and fittings free of oil leaks?								
Is there a lock-out system to ensure machinery is not engaged or started during maintenance?								
Are stands, chocks used to support machinery and implements during maintenance and repair?								
Are hydraulics locked and/ or pressure released from hydraulic lines before maintenance or repair?								

Tractors & Machinery	Yes No	Risk Level	Action Planned	Cost \$	Target Date	Action Date	Person Responsible	Notes
<b>Policies and Practice</b>								
Have all tractor and machinery operators been inducted for their safe use on this farm?								
Have all people who operate tractors and machinery been trained in their proper use?								
Is it a known and observed rule that where possible machine power is turned off before adjusting, unblocking or servicing a tractor or machine, including PTO driven machinery?								
Is there a known policy that only persons nominated and approved by management are permitted to operate farm tractors and other machinery?								
It is an observed policy that all operators are trained and aware of safety details including those listed in the operator's manual?								
Are all guards kept in place when machinery is operating?								
Is it policy that tractors are not started from the ground shorting the solenoid to earth?								

<b>Tractors &amp; Machinery</b>	<b>Yes No</b>	<b>Risk Level</b>	<b>Action Planned</b>	<b>Cost \$</b>	<b>Target Date</b>	<b>Action Date</b>	<b>Person Responsible</b>	<b>Notes</b>
Are passengers kept off tractors, machinery and implements?								
Is there a known and observed policy that children are kept away and do not ride on tractors and machinery?								
Are routine services (mechanical and electrical) completed and maintenance records kept on all tractors and machinery?								
Are all machines and powered equipment properly labelled with safety signs?								
Are the keys of all tractors harvesters and vehicles removed and stored away from children and other unauthorised persons when not in use?								
Are pre-operational checks undertaken on all machinery and equipment, including tractors and harvesters prior to use?								
When working under raised machinery, is equipment secured, properly chocked and supported?								
Have all workers received training/ instruction in the safe use of hydraulic jacks?								
Are there appropriate time limits for individuals operating machinery at any one particular time?								

Tractors & Machinery	Yes No	Risk Level	Action Planned	Cost \$	Target Date	Action Date	Person Responsible	Notes
Are all fuel, oil drums stored away from any electrical power tools eg grinders or other source of spark or flame?								
Are all state regulations compiled within the operation of gantries and cranes used in tractor maintenance?								
Are all blocks, chains and slings checked prior to their use for signs of wear?								
Are tractor attachments used within manufacturers' recommendations?								
Are tractor operators instructed in the correct procedures for attaching and operating three-point linkage equipment?								
Is machinery towed within manufacturers maximum load limits?								
<b>Additional Policies and Practice</b>								

## Safe Tractor Operation Resource Evaluation

We are very interested in your feedback regarding this resource so that we can continually improve it. Please complete the questions below and return to:

Fax: 02 6752 6639  
Post: Australian Centre for Agricultural Health and Safety  
PO Box 256  
Moree NSW 2400

*Have you used this Guide to help you with making operation of tractors on your farm safer?*

Yes  No

*If you answered yes above, how useful was the information in the Guide?*

Very useful at all useful  Useful  Not very useful  Not

*What was it about the guide that you liked?*

.....  
.....

*What was it about the guide that you disliked?*

.....  
.....

*What changes have you made, or do you plan to make, as a result of using this guide?*

.....  
.....

**Please complete your details below if you would like to register with Farmsafe Australia to receive further information regarding health and safety issues on the farm.**

Name: .....

Address: .....

Telephone: ..... Fax: .....

Email: .....

What type of enterprise do you have:

<input type="checkbox"/> Beef cattle	<input type="checkbox"/> Grains	<input type="checkbox"/> Rice	<input type="checkbox"/> Vegetables
<input type="checkbox"/> Cotton	<input type="checkbox"/> Grapes	<input type="checkbox"/> Sheep and wool	Other:
<input type="checkbox"/> Dairy cattle	<input type="checkbox"/> Pigs	<input type="checkbox"/> Sugar cane	
<input type="checkbox"/> Fruit	<input type="checkbox"/> Poultry		.....



AUSTRALIAN CENTRE FOR AGRICULTURAL HEALTH AND SAFETY