

Safe design and operation of tractors

Code of Practice 2005

This Queensland code of practice was preserved as a code of practice under section 284 of the *Work Health and Safety Act 2011*.

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1. Introduction

This Safe design and operation of tractors Code of Practice 2005 is an approved code of practice under section 274 of the *Work Health and Safety Act 2011* (the WHS Act).

An approved code of practice is a practical guide to achieving the standards of health, safety and welfare required under the WHS Act and the Work Health and Safety Regulation 2011 (the WHS Regulation).

From 1 July 2018 duty holders are required to comply either with an approved code of practice under the WHS Act or follow another method, such as a technical or an industry standard, if it provides an equivalent or higher standard of work health and safety to the standard required in the code.

A code of practice applies to anyone who has a duty of care in the circumstances described in the code. In most cases, following an approved code of practice would achieve compliance with the health and safety duties in the WHS Act, in relation to the subject matter of the code. Like regulations, codes of practice deal with particular issues and do not cover all hazards or risks which may arise. The health and safety duties require duty holders to consider all risks associated with work, not only those for which regulations and codes of practice exist.

Codes of practice are admissible in court proceedings under the WHS Act and WHS Regulation. Courts may regard a code of practice as evidence of what is known about a hazard, risk or control and may rely on the code in determining what is reasonably practicable in the circumstances to which the code relates.

An inspector may refer to an approved code of practice when issuing an improvement or prohibition notice. This may include issuing an improvement notice for failure to comply with a code of practice where equivalent or higher standards of work health and safety have not been demonstrated.

How is the code organised

In providing guidance, the word 'should' is used in this code to indicate a recommended course of action, while 'may' is used to indicate an optional course of action.

This code also includes various references to provisions of the WHS Act and WHS Regulation which set out the legal requirements. These references are not exhaustive. The words 'must', 'requires' or 'mandatory' indicate that a legal requirement exists and must be complied with.

Who has duties?

A **person conducting a business or undertaking** (PCBU) has the primary duty under the WHS Act to ensure, as far as reasonably practicable, that workers and other persons are not exposed to health and safety risks arising from the business or undertaking.

Officers, such as company directors, have a duty to exercise due diligence to ensure that the business or undertaking complies with the WHS Act and WHS Regulation. This includes taking reasonable steps to ensure that the business or undertaking has and uses appropriate resources and processes to provide and maintain a safe work environment.

Workers have a duty to take reasonable care for their own health and safety and that they do not adversely affect the health and safety of other persons. Workers must comply with any reasonable instruction and cooperate with any reasonable policy or procedure relating to health and safety at the workplace.

Consulting workers

Consultation involves sharing of information, giving workers a reasonable opportunity to express views and taking those views into account before making decisions on health and safety matters.

The WHS Act requires that you consult, so far as is reasonably practicable, with workers who carry out work for you who are (or are likely to be) directly affected by a work health and safety matter.

If the workers are represented by a health and safety representative, the consultation must involve that representative.

You must consult your workers when proposing any changes to the work that may affect their health and safety.

Consulting, cooperating and coordinating activities with other duty holders

The WHS Act requires that you consult, cooperate and coordinate activities with all other persons who have a work health or safety duty in relation to the same matter, so far as is reasonably practicable.

Sometimes you may share responsibility for a health and safety matter with other business operators who are involved in the same activities or who share the same workplace. In these situations, you should exchange information to find out who is doing what and work together in a cooperative and coordinated way so that all risks are eliminated or minimised as far as reasonably practicable.

Further guidance on consultation is available in the [Work health and safety consultation, co-ordination and co-operation Code of Practice](#).

2. Controlling risks from tractors

2.1 Tractor risk management

Note: The WHS Regulation imposes duties in relation to tractors (as powered mobile plant). These include:

1. Requiring the person with management or control of powered mobile plant at a workplace to manage risks to health and safety associated with:
 - (a) the plant overturning
 - (b) things falling on the operator of the plant
 - (c) the operator being ejected from the plant
 - (d) the plant colliding with any person or thing
 - (e) mechanical failure of pressurised elements of plant that may release fluids that pose a risk to health and safety.
2. Requiring the person with management or control of powered mobile plant at a workplace to ensure:
 - (a) a suitable combination of operator protective devices for the plant is provided, maintained and used
 - (b) no person other than the operator rides on the plant unless the person is provided with a level of protection that is equivalent to that provided to the operator
 - (c) that the plant does not collide with pedestrians or other powered mobile plant
 - (d) if there is a possibility of the plant colliding with pedestrians or other powered mobile plant, the person must ensure that the plant has a warning device that will warn persons who may be at risk from the movement of the plant.

Tractors are an integral item of plant for agricultural, green keeping, gardening, landscaping and other activities. Being versatile in nature, tractors can have numerous functions not only on the farm but throughout industry.

Tractors are usually quite safe when operated properly, however they become dangerous if incorrectly used. Tractors are heavy and powerful machines that can lead to a serious injury or

death through only a minor mistake. Tractors have been involved in more incidents which have resulted in death or injury than any other piece of rural machinery.

The number and type of potential tractor incidents are numerous. Incidents can be associated with:

- (a) rollovers
- (b) power take-offs
- (c) falls from tractors
- (d) hitching equipment
- (e) tractor operation
- (f) towing.

There are many parties with duties towards the control of tractor risks. Many tractor hazards can be eliminated or controlled at the design stage. Under the WHS Act designers have specific duties to ensure that tractors are designed to be safe when used properly.

Manufacturers of tractors should always manufacture to the designer's specifications. All tractors should be designed and manufactured to comply with the relevant Australian Standards (see Appendix 1) or equivalent design criteria.

PCBUs must consider each type of tractor hazard and associated risk. Control measures must be chosen, implemented and regularly reviewed to ensure the health and safety of all tractor operators. Adequate training must also be provided to all tractor operators. Information on managing risk is provided in the [How to manage work health and safety risks Code of Practice](#).

While few tractors are designed or manufactured in Australia, an importer or supplier of a new tractor should be able to recognise the basic safety features of a tractor. Safety features should be considered by all persons associated with tractors including designers, manufacturers, purchasers and operators of tractors.

The following sections of this code outline the safety features a tractor should have and the safe operation practices necessary to eliminate or reduce tractor injuries and deaths.

2.2 Provision of information

Information about the way a tractor is to be used, to ensure health and safety, must be provided by:

- (a) the designer of the tractor, when giving the design to another entity that is to give effect to the design
- (b) manufacturers of tractors, when supplying a tractor to another person
- (c) suppliers of new tractors
- (d) suppliers of used tractors, if the information is available
- (e) hirers of tractors, at the point of hire.

Information should be provided by the designer and/or manufacturer and distributed by the supplier on the recommended application for which the tractor has been designed. This should include any precautions necessary to ensure the safe operation of the tractor. Such information may be made available to PCBUs and operators in the operators' manuals, information guides and training programs and should cover:

- (a) tractor specifications: power, output, and load carrying capacity and ability to pull loads
- (b) tractor operational data: power take-off procedures, implement specifications, manufacturers' instructions for use
- (c) tractor servicing and maintenance: correct maintenance scheduling and maintenance of logbooks.

3. Safety features

Safety features which need to be addressed at the design, manufacture and operation stage include:

- (a) roll-over protective structures (ROPS)

- (b) falling object protective structures (FOPS)
- (c) guards
- (d) protection from noise and ultraviolet radiation exposure
- (e) other measures for operator health and safety (e.g. seat belts).

3.1 Roll-over protective structures (ROPS)

The WHS Regulation contains regulatory provisions regarding ROPS that must be complied with. These requirements are outlined under section 3.2.1 of this code.

3.1.1 A roll-over protective structure

A roll-over protective structure is a structure designed and constructed to prevent or minimise the risk of death or injury to the operator of a tractor as a result of the tractor rolling over in any direction.

Approved ROPS may be available for early model tractors, even as far back as 1945. If these are unavailable from the manufacturer, a ROPS testing centre (see Appendix 2) may supply an approved frame, or test a home designed frame.

An approved fold-down ROPS with a locking device may be more practical to use where a tractor is operating inside or close to buildings, or near trees.

Image 1: Tractor with a fold-down ROPS fitted, note the locking pins (see arrow)



Circumstances where tractors have overturned include:

- (a) level ground
- (b) uneven ground
- (c) slight and steep slopes
- (d) edges of depressions
- (e) contour banks or water courses
- (f) towing/pulling of light, heavy, stable and unstable loads.

ROPS fitted to tractors should comply with the standards outlined in:

- (a) **AS 1636** Tractors – Roll-over protective structures, criteria and tests, or
- (b) **AS 2294** Earth-moving machinery – Protective structures, or
- (c) Any of the following international standards:
 - **ISO 3463** Tractors for agriculture and forestry—Roll-over protective structures (ROPS)—Dynamic test method and acceptance conditions
 - **ISO 3471-1** Earth-moving machinery—Roll-over protective structures—Laboratory tests and performance requirements

- **ISO 5700** Tractors for agriculture and forestry—Roll-over protective structures (ROPS)—Static test method and acceptance conditions
 - **OECD Code 3** Standard code for the official testing of protective structures on agricultural and forestry tractors (dynamic test)
 - **OECD Code 4** Standard code for the official testing of protective structures on agricultural and forestry tractors (static test)
 - **OECD Code 6** Standard code for the official testing of front mounted roll-over protective structures on narrow-track wheeled agricultural and forestry tractors
 - **OECD Code 7** Standard code for the official testing of rear mounted roll-over protective structures on narrow-track wheeled agricultural and forestry tractors
 - **OECD Code 8** Standard code for the official testing of protective structures on agricultural and forestry tracklaying tractors
 - **SAE J 1040** Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines
 - **SAE J 1194** Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors
 - **SAE J 2194** Roll-Over Protective Structures (ROPS) for Wheeled Agricultural Tractors
- (d) Other appropriate international standards.

An approved ROPS in service has an indefinite lifespan. Any sign of physical deterioration (e.g. dents, rust or cracks) may indicate problems. Cracks and fatigue often affect the mountings or brackets and these should be regularly inspected for any signs of deterioration. A damaged ROPS, whose structural integrity may have been adversely affected, indicated for example by deformation or cracking of the structure, should be replaced.

3.1.2 Designers and manufacturers of tractors

Designers and manufacturers of tractors should ensure that tractors capable of rollover are either designed for a ROPS to be fitted or are fitted with a ROPS.

The design and construction of a ROPS is a skilled operation. The safety of a ROPS is dependent upon the frame yielding and absorbing energy to reduce the load transmitted to the mounting bolts and tractor body.

This type of design reduces the likelihood of continuous rollover while at the same time protecting the operator. A rigid frame, while being strong enough to withstand the rollover, may break the mounting bolts on the tractor or may suddenly fracture rather than yield. The performance of a ROPS under stress can only be determined by conducting a test to the relevant Australian Standard or equivalent overseas standard.

A rollover protective structure is usually tested by a ROPS testing centre. To be approved, a structure should be tested according to the procedures outlined in those standards listed for fitment of ROPS in section 3.1.1 of this code.

Image 2: This ROPS is being tested by destructive methods at an approved testing centre



A manufacturer should ensure that every ROPS approved under AS 1636 or AS 2294 is legibly and permanently marked with the following information:

- (a) the name and address of the manufacturer of the ROPS
- (b) ROPS identification number
- (c) make, model or serial number of the tractor(s) the structure is designed to fit
- (d) the relevant Australian Standard or other acceptable standard with which the structure complies.

3.2 Wheeled agricultural tractors

Under the WHS Regulation wheeled agricultural tractors have specific requirements, regardless of the industry in which they are used. These requirements must be followed and it is recommended that PCBUs consult these regulations. The information below is a summary of these requirements.

A number of specific terms are defined and used in the WHS Regulation. These terms are listed in Appendix 3.

3.2.1 ROPS requirements

The WHS Regulation states:

1. The person with management or control of a tractor at a workplace must ensure that the tractor is not used unless it is securely fitted with a rollover protective structure.
2. If a tractor is used in a place that is too low for the tractor to work while it is fitted with a roll-over protective structure, the structure may be lowered or removed for the period during which the tractor is used in such a situation (but only if other measures to minimise the risk of roll-over are in place).
3. This regulation does not apply if the tractor is:
 - (a) installed in a fixed position, and in a manner which would no longer permit it to be used as powered mobile plant; or
 - (b) a tractor with a mass of less than 560 kilograms or a mass of 15,000 kilograms or more; or
 - (c) being used for a historical purpose or activity.

3.3 Falling object protective structure (FOPS)

If a tractor is capable of being used for tree felling or in other situations which create a risk to the operator of falling objects, then the tractor should be designed for a falling object protective structure (FOPS) to be fitted. FOPS is a system of structural members and mesh sheeting attached to a tractor to provide the operator with protection from falling objects (e.g. branches, rocks and bales).

An approved FOPS should have been tested according to the procedures outlined in *AS 2294: Earth-moving machinery, Protective structures*.

A manufacturer should mark every FOPS legibly and permanently with the following information:

- (a) the name and address of the manufacturer of the FOPS
- (b) FOPS identification number
- (c) make, model or serial number of the tractor(s) the structure is designed to fit
- (d) the relevant Australian Standard or other acceptable standard with which the structure complies
- (e) any other information deemed appropriate by the manufacturer (e.g. installation, repair or replacement information).

3.4 Guards

A designer should ensure that the need for guarding is minimised in the design of the tractor. A manufacturer should manufacture guards to the designer's specifications. A supplier should ensure that a tractor is sold fitted with the guards that were designed for it so that the designer's and manufacturer's requirements are met at the point of sale. The guarding design requirements of

AS/NZS 2153: Tractors and machinery for agriculture and forestry – Technical means for ensuring safety or other equivalent standard should be applied by a designer and manufacturer of the tractor.

Guards should protect the operator or any other person from parts of the tractor which are potentially hazardous either when the tractor is in normal operation or undergoing routine maintenance. An owner of a tractor who modifies or alters guards has the same duties as a designer and manufacturer.

3.5 Noise and ultraviolet radiation

A tractor should be designed to minimise noise from engines, exhausts and vibrating tractor parts. Sound should be deflected upwards and away from the operator. PCBUs must ensure that they, their workers and other persons at the workplace, are not exposed to noise that exceeds the exposure standard for noise. The WHS Regulation prescribes requirements for the control of excessive noise.

The use of canopies with ROPS and/or FOPS should be considered to minimise the operator's exposure to direct sunlight and ultraviolet radiation exposure.

Image 3: A well-designed ROPS will incorporate protection from ultraviolet radiation



4. Tractor operation

In rural industry, tractors are involved in injuring or killing more people than any other piece of farm equipment. Injuries involving tractors usually occur from rollover, various falling objects and people being pulled into unguarded power take-offs. Run-overs are primarily linked to these practices:

- (a) starting a tractor from the ground
- (b) carrying passengers (usually children) on tractors
- (c) attempting to get on or off a moving tractor.

To reduce some of the potential risks from tractor operation and maintenance, safety precautions are recommended.

If any of the information in this section is in conflict with the manufacturer's guidelines for a particular tractor in a particular use, the manufacturer's instructions should be followed.

4.1 Before you buy a tractor

When you are considering the purchase of a tractor, you should consider any risks the tractor may introduce at your workplace. After considering these risks you should ensure that the health and safety design features of the chosen tractor control these risks.

As a guide, buyers should seek a tractor incorporating the following health and safety features:

- (a) ROPS and/or FOPS factory fitted
- (b) factory designed and fitted safeguards
- (c) adequate ventilation if a cabin has been fitted

- (d) non-slip surfaces for access and exit
- (e) easy access to and exit from the tractor
- (f) the positioning of the exhaust outlet to direct gases away from the operator
- (g) adequate for task and terrain for which purchased
- (h) adequate noise control. Where noise cannot be reduced sufficiently at the source, hearing protection equipment should be supplied to the operator
- (i) the location of switches and levers within easy reach of the operator to avoid repetitive injury risks and to reduce the risk of the wrong lever or control being used
- (j) a well-sprung, adjustable seat and seat belt
- (k) control of ultraviolet radiation exposure (e.g. by provision of shade).

Image 4: A safe means for access and exit has been fitted to this tractor



4.2 Before you start a tractor

Read and follow the manufacturer's operating instructions. They contain a wealth of information and are specifically written about your tractor.

Familiarise yourself with the layout of the land before you start working and watch for ditches, embankments and depressions, especially when the ground is unstable or slippery conditions prevail.

Tractor owners should maintain tractors in a safe operating condition by making regular inspections and following the manufacturer's recommended servicing and maintenance procedures. Logbooks should be maintained and records made of scheduled maintenance and repairs performed.

4.3 Hitching implements

When hitching an implement you should:

- (a) Only attach implements to the drawbar, three-point linkage or other specified hitch points specifically designed for that purpose. Never hitch to points forward of, or higher than the drawbar as this could be extremely dangerous.
- (b) Ensure that the weight applied to the three-point linkage by lifting jibs or other attached equipment does not exceed the manufacturer's specifications or adversely affect stability or steering. In addition, seek expert technical advice before fixing counter weights or wheel weights (front or rear) to increase tractor stability.
- (c) Seek advice from the operating manual or supplier about the recommended weight of a trailer or implement that the tractor can safely tow before towing it.

4.4 Starting a tractor

When starting a tractor, the following precautions should be taken:

- (a) Only start and use the tractor according to the manufacturer's instructions.
- (b) Operate the self-starter only from the driving position and do not start the machine while standing on the ground.
- (c) Before starting a tractor engine, check that the handbrake is on and the vehicle is not in gear.
- (d) Engage the appropriate gear for the work being undertaken.

4.5 Operator health and safety

Switches and levers should be designed to be within easy reach of the majority of potential operators and placed to reduce the risk of the wrong switch or lever being used.

Switches should be easy to identify. The operator's seat should be fully adjustable and well sprung to reduce vibration. The backrest should support the lower part of the spine to minimise postural stress to the spine.

Exhaust pipes and cab ventilation systems should be designed and constructed to ensure the operator does not inhale exhaust fumes.

Operator access to and exit from a tractor should be designed to allow a person to get on and off the tractor without undue stretching. All access surfaces should be non-slip and designed to prevent the build-up of dirt and mud.

Where a cabin is fitted, adequate ventilation facilities should be provided for the operator. Windscreens and glass fitted should be safety glass complying with *AS/NZS 2080 – Safety glass for land vehicles*. Alternatively, where any glazing material other than glass is fitted, it should be a clear material of a kind that does not shatter.

A seat belt should be fitted to all seating positions on new tractors in accordance with *ISO 6683 – Earthmoving machinery – Seat belts and seat belt anchorages*. Seat belts should comply with *AS/NZS 2596 – Seat belt assemblies for motor vehicles* or with *SAE J 386*.

Where the tractor is fitted with a seatbelt and a ROPS is present, the seatbelt should be worn by the operator if the tractor is moving. This will provide additional protection in the event of a tractor rolling over by keeping the driver within the protective zone offered by the ROPS.

Tractor design should include features which improve operational safety, such as:

- (a) Warning signs attached to the tractor. Warning signs should include information about the normal operating speed of the power take-off. Where a conversion assembly is available for changing tractor or implement speeds, an instruction placard specifying power take-off speed and corresponding draw bar adjustments should also be provided. The warning signs should conform to *AS 1319 – Safety signs for the occupational environment*, be written in English and permanently attached to a conspicuous part of the tractor.
- (b) Providing the tractor with self-starting equipment. Starting the engine should be by operation of a rotary or pullout switch, which is preferably key-operated to lessen the risk of accidental starting.
- (c) Interlocking the tractor engine starting mechanism with the transmission or clutch to prevent the engine starting up when left in gear.
- (d) Providing efficient service brakes able to stop a fully laden tractor fitted with the heaviest recommended implement. The service brake efficiency should be not less than 40 per cent as measured on a 'Tapley' brake meter. The parking brake or the service brake should hold the tractor with the heaviest recommended implement on a slope of 15 degrees.

Points which should be considered in the operation of a tractor include:

- (a) Drive tractors at speeds slow enough to keep control over unexpected hazards; be cautious in wet conditions.
- (b) Reduce speed before turning or applying turning brakes. Where a differential lock and turning brakes are fitted, ensure that the differential lock is disengaged and the turning brakes are locked together before travelling from one work site to another.
- (c) Descend slopes cautiously with the tractor in low gear. For example, on downward slopes it is possible, in extreme circumstances, for one wheel to reverse, causing the tractor to roll over. Extra care needs to be taken if towing trailers or implements down slopes, as often the trailers will not have brakes. Ascending steep slopes can cause a tractor to back flip in extreme circumstances or the front wheels to lift thus reducing or losing control of steering.
- (d) To increase stability when working on hillsides, set tractor wheels to the widest possible setting.
- (e) When a tractor is bogged in mud or in a ditch, drive out in reverse gear. Logs and planks should only be used behind the rear wheels to increase traction, as using logs and planks in front of the rear wheels increases the chance of back flipping.
- (f) Only climb on or off a tractor that is stopped. Do not dismount from a tractor while the engine is running unless the transmission is in the neutral, or park position and the parking brake is effectively engaged.
- (g) When an attachment becomes blocked, the tractor should be stopped, the drive to the attachment disconnected and the moving parts of the implement stopped before the obstruction is cleared.
- (h) Seek expert technical advice before fixing counter weights or wheel weights (front or rear) to increase tractor stability.
- (i) When using the tractor as a source for stationary power take-off or belt work, apply and lock the parking brake and chock the wheels. Bond the tractor frame to earth according to manufacturer's instructions. This will remove the risk posed by static electricity when using belts.
- (j) If using a tractor in an enclosed area like a shed, make sure the area is well ventilated to avoid build-up of exhaust gases.
- (k) Exercise extreme caution when operating a tractor or any attached equipment when children or animals are in the area.
- (l) Use appropriate warning lights when operating on a declared road reserve on which the tractor may create a hazard.

If the tractor is to be operated on public roads it should be fitted with the following, so as to comply with the requirements of the traffic regulations:

- (a) horn
- (b) brake
- (c) head, tail, and turn signal lights
- (d) reflectors
- (e) rear view mirrors.

Where a tractor is operating in a confined area and other persons can not be excluded, it should be fitted with reversing beepers.

A seatbelt should be an essential design and manufacture feature for all new tractors. Seatbelts should be fitted to all seating positions on new tractors in accordance with *AS 2664 – Earthmoving machinery – Seat belts and seat belt anchorages*. Seatbelts should comply with *AS/NZS 2596 – Seat belt assemblies for motor vehicles* or with *SAE J 386 Operator restraint system for off- road work machines*.

4.6 Stopping tractor operation

When ending tractor operations, the following precautions should be taken:

- (a) park on even ground
- (b) shift the gear selector to neutral or park position
- (c) disconnect power sources and secure implements

- (d) lower blades, buckets or any other attachments to the ground and/or securely block these attachments
- (e) lock the parking brake
- (f) stop the engine and remove the keys.

4.7 Passengers on tractors

Generally, passengers **should not** be allowed to ride on tractors. Passengers can not be effectively protected by ROPS and safe, adequate passenger seating is generally not incorporated into the design of tractors. In only two situations might it be reasonable for passengers to be on a tractor.

The first is for reason of instruction and training, and the second is in situations of extreme emergency (e.g. transport to or from the scene of a serious accident). Where a tractor is routinely used for the purpose of instruction or training, a safe system of work should be maintained. This may involve instruction by:

- (a) two way radio, or
- (b) the provision of a seat or platform with handrail which prevents the instructor slipping, falling or being thrown from the tractor. Most passenger injuries occur because the passenger is thrown from the tractor.

Image 5: An extra seat has been fitted to assist in the safe provision of training



5. Maintenance and modification

5.1 Maintenance

Duty holders should maintain tractors in a safe operating condition by making regular inspections and following the manufacturer's recommended servicing and maintenance procedures. Logbooks should be maintained which record scheduled maintenance and repairs performed and any modifications which might affect the safe operation of the tractor.

When a worker or other person is undertaking servicing or maintenance, the following precautions should be taken. A PCBU should also ensure the precautions are incorporated in an operator's training program:

- (a) Before inspecting or working underneath a tractor, ensure that the operator has exited, the tractor cannot move and any movable attachments are lowered to the ground and/or safely blocked.
- (b) Stop all power sources to pulleys before removing or replacing belts.
- (c) If the wheel track is adjustable set the wheels as wide apart as practicable.
- (d) Stop all hazardous machinery and secure it before any work is undertaken.

- (e) Allow the engine to cool before removing the radiator cap, and be careful of escaping steam.
- (f) When jump-starting the tractor, connect the jumper leads as specified by the manufacturer, to avoid damage to the electrical system and the possibility of a battery explosion.
- (g) When removing and refitting tractor tyres, first remove the valve core to allow air to escape and make the tyres flexible. Maintain a good grip on the tyre lever and stand to the side of the tyre when removing the tube from the rim.
- (h) While inflating a tyre, continually check to ensure the locking ring is properly seated and locked. The tyre should be inflated to its correct pressure, according to the tyre manufacturer's load/inflation specifications. Always stand to the side when inflating a tyre. An inflation cage should be used when inflating large tyres.
- (i) The ballasting of tractor tyres should be done in accordance with manufacturer's recommendations.
- (j) Keep open flames, open lights, lighted cigarettes etc. away from the refuelling operation. During refuelling, maintain some form of contact between the metal outlet of the refuelling hose and the fuel tank opening to reduce the risk of an explosion or fire due to a discharge of static electricity. Always refuel in a well-ventilated area.

5.2 Modifications

Duty holders who modify tractors are considered manufacturers under the WHS Act. Any modifications undertaken need to comply with the specified design criteria for tractor construction or the end product should meet or exceed the design criteria.

Any modification to a ROPS or FOPS such as the welding of brackets to support a roof or the drilling of holes may affect its structural integrity and dramatically reduce its protective ability.

6. Training

6.1 Operator training

A duty holder should ensure the safe operation of the tractor through instruction, training and constant supervision while the operator is gaining experience in tractor operation.

Note: An owner or PCBU may be the operator and therefore should be trained and supervised.

The training received should ensure the operator is familiar with:

- (a) information contained in the manufacturer's operating instruction handbook
- (b) tractor controls and instruments, brakes, clutch and gears
- (c) tractor safety features (e.g. guards, seat belts)
- (d) comfort controls (e.g. adjusting the seat to be in reach of all controls)
- (e) operating instructions including starting, moving off and how to stop the tractor
- (f) regular service procedures required
- (g) proper attachment of implements.

As a guide, it may be useful to fix these instructions to the relevant parts of the tractor. Even when there is reason to believe that an operator is competent, based for example on stated work experience, it is wise to verify this by questioning or demonstration before allowing them to operate the tractor.

A duty holder should ensure that operators hold the appropriate licences and certificates if required. Duty holders should consult sections 3 and 4 of this code when preparing and conducting training for an operator.

Tractor operators should also be informed of possible hazards, and know how to reduce the risk of accidents. High-risk situations require that utmost caution should be taken where:

- (a) there is a risk of the tractor overturning and ROPS and seatbelts have not been fitted
- (b) it is necessary to carry passengers and protective frames and where seat belts are not provided

- (c) the tractor is to be operated in an area where it is not practicable to totally separate the tractor operation from other workers or non-workers (e.g. children).

A tractor operator who requires more information about how to operate the tractor in a competent and safe manner should seek instruction from their PCBU.

Appendix 1: Technical standards

The following standards are relevant to the design and operation of tractors. Equivalent overseas standards have been included.

- **AS 1019** Internal combustion engines – Spark emission control devices
- **AS 1121.1** Agricultural tractor power take-offs - Rear-mounted power take-off types 1, 2 and 3 - General specifications, safety requirements, dimensions for master shield and clearance zone
- **AS 1121.2** Agricultural tractor power take-offs - Rear-mounted power take-off types 1, 2 and 3 - Narrow-track tractors, dimensions for master shield and clearance zone
- **AS 1121.3** Agricultural tractor power take-offs - Rear-mounted power take-off types 1, 2 and 3 - Main PTO dimensions and spline dimensions, location of PTO
- **AS 1121.4** Agricultural tractor power take-offs - Guards for power take-off (PTO) drive-shafts - Strength and wear tests and acceptance criteria
- **AS 1319** Safety signs for the occupational environment
- **AS 1636.1** Tractors – Rollover protective structures – Criteria and tests Conventional tractors
- **AS 1636.2** Tractors – Rollover protective structures – Criteria and tests Rear-mounted for narrow track tractors
- **AS 1636.3** Tractors – Rollover protective structures – Criteria and tests Mid-mounted for narrow track tractors
- **AS 1657** Fixed Platforms, walkways, stairways and ladders – Design, construction and installation
- **AS 2012.1** Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Determination of compliance with limits for exterior noise
- **AS 2012.2** Acoustics - Measurement of airborne noise emitted by earth-moving machinery and agricultural tractors - Stationary test condition - Operator's position
- **AS/NZS 2080** Safety glazing for land vehicles
- **AS/NZS 2153.1** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - General
- **AS/NZS 2153.3** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Tractors
- **AS/NZS 2153.4** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Forestry winches
- **AS/NZS 2153.5** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Power-driven soil-working equipment
- **AS/NZS 2153.6** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Equipment for crop protection
- **AS/NZS 2153.7** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Combine harvesters, forage and cotton harvesters
- **AS/NZS 2153.9** Tractors and machinery for agriculture and forestry - Technical means for ensuring safety - Equipment for sowing, planting and distributing fertilizers
- **AS/NZS 2596** Seat belt assemblies for motor vehicles
- **ISO 3463** (Tractors for agriculture and forestry—Roll-over protective structures (ROPS)—Dynamic test method and acceptance conditions)
- **ISO 3471-1** (Earth-moving machinery—Roll-over protective structures—Laboratory tests and performance requirements)
- **ISO 3767/1** Tractors, Machinery for Agriculture and Forestry, Powered Lawn and Garden Equipment—Symbols for Operator Controls and Other Displays, Part 1: Common Symbols
- **ISO 3767/2** Tractors, Machinery for Agriculture and Forestry, Powered Lawn and Garden Equipment—Symbols for Operator Controls and Other Displays, Part 2: Symbols for Agricultural Tractors and Machinery

- **ISO 5700** (Tractors for agriculture and forestry—Roll-over protective structures (ROPS)—Static test method and acceptance conditions)
- **ISO 6683** Earthmoving Machinery — Seat Belts and Seat Belt Anchorages
- **OECD Code 3** (Standard code for the official testing of protective structures on agricultural and forestry tractors (dynamic test))
- **OECD Code 4** (Standard code for the official testing of protective structures on agricultural and forestry tractors (static test))
- **OECD Code 6** (Standard code for the official testing of front mounted roll-over protective structures on narrow-track wheeled agricultural and forestry tractors)
- **OECD Code 7** (Standard code for the official testing of rear mounted roll-over protective structures on narrow-track wheeled agricultural and forestry tractors)
- **OECD Code 8** (Standard code for the official testing of protective structures on agricultural and forestry tracklaying tractors)
- **SAE J 1040** (Performance Criteria for Rollover Protective Structures (ROPS) for Construction, Earthmoving, Forestry, and Mining Machines)
- **SAE J 1194** (Rollover Protective Structures (ROPS) for Wheeled Agricultural Tractors)
- **SAE J 2194** (Roll-Over Protective Structures (ROPS) for Wheeled Agricultural Tractors)

Appendix 2: ROPS testing centres

Sherwood Machinery Pty. Ltd.

Phone: 02 4883 6093

Fax: 02 4883 6576

Address: Ferndale Rd (PO Box 6)

Bundanoon NSW 2578

Information from www.sherwoodmachinery.com.au

Casey Cab and Frame

Phone/fax: 03 5995 1595

Address: 53 Cameron St

Cranbourne VIC 3977

Email: info@caseycab.com.au

Catalogue available on www.caseycab.com.au

QMW Industries Pty. Ltd.

Tel: 07 3275 2544

Fax: 07 3275 2524

Email: sales@qmw.com.au

Address: 53 Success St

Acacia Ridge QLD 4110

Information from www.qmw.com.au

Appendix 3: Meaning of some terms used in the Work Health and Safety Regulation 2011

Historical purpose or activity, in relation to the use of a tractor, includes an activity ancillary to a historical activity.

Examples

1. *Historical activity*: a historical display, parade, demonstration or re-enactment.
2. *Activity ancillary to a historical activity*: restoring, maintaining, modifying or housing a tractor used, or to be used, for a historical activity.

Roll-over protective structure means a structure designed to protect a tractor operator from injury if the tractor rolls over in any direction.

Tractor means a motor vehicle, whether wheeled or track mounted, designed to provide power and movement to any attached machine or implement by a transmission shaft, belt or linkage system but does not include earthmoving machinery.

Appendix 4: Dictionary

For the purpose of this code the following definitions apply.

Appropriate information means information which states the use for which the tractor has been designed and tested, and the conditions (if any) that must be observed if the tractor is to be used safely and without risk to health.

Historical purpose or activity - see Appendix 3.

Normal operation means operation of the machine within its recognisable limits, in accordance with the manufacturer's instructions by persons familiar with its operations and controls. This definition includes the acts of inspecting the machine and entering and leaving the operator's work area.

PCBU (person conducting a business or undertaking) means

1. For the WHS Act, a person conducts a business or undertaking:
 - (a) whether the person conducts the business or undertaking alone or with others; and
 - (b) whether or not the business or undertaking is conducted for profit or gain.
2. A business or undertaking conducted by a person includes a business or undertaking conducted by a partnership or an unincorporated association.
3. If a business or undertaking is conducted by a partnership (other than an incorporated partnership), a reference in this Act to a person conducting the business or undertaking is to be read as a reference to each partner in the partnership.
4. A person does not conduct a business or undertaking to the extent that the person is engaged solely as a worker in, or as an officer of, that business or undertaking.
5. An elected member of a local government does not in that capacity conduct a business or undertaking.
6. A regulation may specify the circumstances in which a person may be taken not to be a person who conducts a business or undertaking for the purposes of this Act or any provision of this Act.
7. A volunteer association does not conduct a business or undertaking for the purposes of this Act.
8. In this section, **volunteer association** means a group of volunteers working together for one or more community purposes where none of the volunteers, whether alone or jointly with any other volunteers, employs any person to carry out work for the volunteer association.

Roll-over protective structure - see Appendix 3.

Routine maintenance includes adjustment of functional settings, routine lubrication, machine cleaning, performance of minor repairs in the field and renewing consumable items.

Supply

1. A **supply** of a thing includes a supply and a resupply of the thing by way of sale, exchange, lease, hire or hire-purchase, whether as principal or agent.
2. A supply of a thing occurs on the passing of possession of the thing to the person or an agent of the person to be supplied.
3. A supply of a thing does not include:
 - (a) the return of possession of a thing to the owner of the thing at the end of a lease or other agreement; or
 - (b) a prescribed supply.
4. A financier is taken not to supply plant, a substance or a structure for the purposes of this Act if:
 - (a) the financier has, in the course of the financier's business as a financier, acquired ownership of, or another right in, the plant, substance or structure on behalf of a customer of the financier; and

- (b) the action by the financier, that would be a supply but for this subsection, is taken by the financier for, or on behalf of, that customer.
5. If subsection (4) applies, the person (other than the financier) who had possession of the plant, substance or structure immediately before the financier's customer obtained possession of the plant, substance or structure is taken for the purposes of this Act to have supplied the plant, substance or structure to the financier's customer.

Tractor - see Appendix 3.

Worker

1. A person is a worker if the person carries out work in any capacity for a person conducting a business or undertaking, including work as:
 - (a) an employee; or
 - (b) a contractor or subcontractor; or
 - (c) an employee of a contractor or subcontractor; or
 - (d) an employee of a labour hire company who has been assigned to work in the person's business or undertaking; or
 - (e) an outworker; or
 - (f) an apprentice or trainee; or
 - (g) a student gaining work experience; or
 - (h) a volunteer; or
 - (i) a person of a prescribed class.
2. For this Act, a police officer is:
 - (a) a worker; and
 - (b) at work throughout the time when the officer is on duty or lawfully performing the functions of a police officer, but not otherwise.
3. The person conducting the business or undertaking is also a worker if the person is an individual who carries out work in that business or undertaking.

Workplace

1. A workplace is a place where work is carried out for a business or undertaking and includes any place where a worker goes, or is likely to be, while at work.
2. In this section, place includes:
 - (a) a vehicle, vessel, aircraft or other mobile structure; and
 - (b) any waters and any installation on land, on the bed of any waters or floating on any waters.