

PLANT (AMENDMENT NO. 1)

WHAT IS THE ROLE OF THIS AMENDING CODE?

This code of practice amends the principal Code of Practice for Plant, which came into operation on 1 July 1995. The amending provisions of this code are incorporated into the principal code, that is, all provisions after and including "Part 6 Roll-over Protective Structures".

WHAT IS A CODE OF PRACTICE?

The term "code of practice" has a particular meaning under the Victorian **Occupational Health and Safety 1985** (the Act). Other codes of practice, such as the advisory codes developed by the National Occupational Health And Safety Commission or Standards Australia, voluntary codes in an industry, or codes adopted by other states or countries do not come within the meaning of the term used in the Act. The Act provides for codes of practice "for the purpose of providing practical guidance to employers, self-employed people, employees, occupiers, designers, manufacturers, importers, suppliers or any other persons who may be placed under an obligation by or under this Act..." [S.55(1)].

A code of practice approved by the Minister comes into effect when "notice of approval is published in the Government Gazette or on such later day as may be specified in the notice,..." [S.55(6)]. A code of practice does not have the same legal force as Regulations. Contravention of, or failure to comply with, Regulations made under the Act is an Offence [S.47(1)]. Failure to observe a Provision of an approved code of practice is not in itself a breach of the Act [S.55(8)].

A health and safety representative is able to cite an approved code of practice in a provisional Improvement Notice as a means by which an alleged non-compliance with the Act or Regulations may be remedied [S.35(2)(a)]. Similarly an Inspector may cite an approved code of practice as a means of remedying alleged non-compliance when issuing an Improvement Notice or Prohibition Notice [S.45(2)(a)].

The Act provides for codes to be used as evidence of contravention or failure to comply with a provision of the Act or regulations under the Act. The relevant section is section 56 and it is reprinted below.

Where in any proceedings under this Act it is alleged that a person contravened or failed to comply with a provision of this Act or the regulations to which an approved code of practice was in effect at the time of the alleged contravention or failure

(a) the approved code of practice shall be admissible in evidence in those proceedings; and

(b) if the court is satisfied in relation to any matter which it is necessary for the prosecution to prove in order to establish the alleged contravention or failure that -

(i) any provision of the approved code of practice is relevant to that matter; and

(ii) the person failed at any material time to observe that provision of the approved code of practice -

that matter shall be taken as proved unless the court is satisfied that in respect of that matter the person complied with that provision of this Act or the regulations otherwise than by way of observance of that provision of the approved code of practice.

The practical effect of this section is that provisions in the code constitute compliance with the provision of the Act or regulation to which the code is giving practical guidance. The provisions in a code, however, are not mandatory. That is, a person may choose to comply with the relevant provision of the Act or regulation in some other way, provided that the alternative method used also fulfils the requirements of the Act or regulations.

WHAT IS THE EFFECT OF INCORPORATING STANDARDS IN A CODE OF PRACTICE?

Incorporation of a published technical standard in a code of practice has the effect of making that standard form part of the code. The standards listed in the Code of Practice for Plant (No. 19) provide guidance to designers and manufacturers of plant, and to employers and other users of plant on how to comply with their duties under the Occupational Health and Safety (Plant) Regulations 1995.

It is important to note that the standards themselves have not been written specifically as guidance on how to comply with the duties under the Regulations. As such, following the provisions of an incorporated standard may not constitute full compliance with the relevant duties. This is because the standard itself may not deal with all the matters relevant to hazard identification, risk assessment and risk control for the plant in question. Appropriate judgement needs to be exercised in such circumstances.

To the extent that provisions of an incorporated standard are relevant to a duty under the Regulations, following those provisions (as is the case with any code provision) is deemed by the Victorian WorkCover Authority to be compliance with the relevant duty under the Regulations.

A designer or manufacturer of plant or an employer or self-employed person may have followed the provisions of a relevant standard that is incorporated in this code prior to the Regulations coming into operation. In that case, they need to re-appraise the action they have already taken to comply with previous legislation covering hazards and risks associated with relevant plant, to assess whether or not they are in full compliance with the duties under these Regulations. However, as with other code provisions, provisions of an incorporated standard are not mandatory - alternative measures may be used in order to comply with the duties under the Regulations.

It should be noted that many of the published technical standards listed in the Code of Practice for Plant contain provisions expressed in a mandatory manner, that is, they state that a person "shall" do some action. As well, some of the standards make reference to "approval" or "accredited" by a government authority. The approval or accreditation requirements are not applicable for the purposes of incorporation of

those standards in this code of practice. The mandatory provisions in the published technical standards are not mandatory for the purpose of the code. They should not be treated any differently to other provisions in those standards.

1. TITLE

The title of this code of practice is the **Code of Practice for Plant (Amendment No.1)**.

2. PURPOSE

The purpose of this code of practice is to amend the Code of Practice for Plant* in respect to guidance on roll-over protective structures and other operator protective devices for tractors.

3. AUTHORISATION

This code of practice is approved under section 55 of the **Occupational Health and Safety Act 1985**.

4. MISCELLANEOUS AMENDMENTS

In the Code of Practice for Plant (No. 19) -

(i) Where reference is made to "Health and Safety Organisation, Victoria" **substitute** "the Victorian WorkCover Authority" .

(ii) In the section "What Is A Code Of Practice" where reference is made to "Minister for Industry Service" **substitute** "Minister".

5. INSERTION OF PART 6 ROLL-OVER PROTECTIVE STRUCTURES

After section 23 of the Code of Practice for Plant (No. 19) insert -

* The Code of Practice for Plant (No. 19) came into operation 1 July 1995

"PART 6

ROLL-OVER PROTECTIVE STRUCTURES

24. ROLL-OVER PROTECTIVE STRUCTURES FOR TRACTORS

24.1 *The requirement for ROPS*

The Regulations provide (regulation 903):

- (1) A supplier must ensure that a tractor manufactured in, or imported into, Victoria on or after 1 July 1981 is not supplied to any person for use in a workplace unless it is fitted with roll-over protection.
- (2) An employer or self-employed person must ensure that a tractor is not used at the employer's or self-employed person's workplace unless it is fitted with roll-over protection.
- (3) Sub-regulation (2) does not apply to a tractor manufactured in, or imported into, Victoria before 1 July 1981 if it is not practicable to fit roll-over protection to the tractor.
- (4) This regulation does not apply to a tractor -
 - (a) supplied to a workplace for use or used at a workplace in circumstances where there is no likelihood of the tractor overturning; or
 - (b) used in or being driven to or from an operation -
 - (i) in an orchard; or
 - (ii) inside or in close proximity to a building or structure - if it would not be practicable for the operation to be carried out by means of the tractor if it were fitted with roll-over protection; or
 - (iii) weighing less than 560 kilograms, the weight being taken in the lightest form in which the tractor is normally available for retail sale when new and without water, fuel or lubricating oil.
- (5) Sub-regulation (1) does not apply to a tractor which the supplier intends to be used for parts or scrap material.
- (6) In this regulation -

"Supplier" does not include an auctioneer whose main function in relation to a tractor is to facilitate the supply of the tractor by way of conducting an auction; and

"Tractor" has the meaning attributed to it in regulation 105 except that in this regulation the term applies to a tractor which conveys its power directly to the ground by wheels.

In the clear majority of circumstances on farms, tractors will require the fitting of a roll-over protective structure under this regulation. If there is any uncertainty in a given situation as to whether roll-over protection is required, then the best course of action would be to fit roll-over protection to that tractor.

Regulation 903 does permit a tractor to be supplied or used without roll-over protection in certain circumstances. However, there are a number of conditions which must be met for this to occur if the duty-holders are not to breach the regulation. Further guidance is provided in the sections on supplier's and employer's duties.

25. SUPPLIER'S DUTIES

25.1 *Supplier's duties in relation to tractors*

Regulation 903(1) requires that tractors manufactured in or imported into Victoria after 1 July 1981 (post 1981 tractors) must not be supplied to any person for use in a workplace unless they are fitted with roll-over protection.

However, regulation 903(4) permits a supplier to supply a tractor for use in a workplace without roll-over protection, irrespective of its date of manufacture or importation into Victoria, in specific circumstances. These are:

- (i) if there is no likelihood of the tractor overturning;
- (ii) if the tractor is to be used in an orchard operation or in close proximity to a building, and if it is not practicable for the operation to be performed;
or
- (iii) if the tractor weighs less than 560 kilograms.

Regulation 903(1) refers to supplier duties. This regulation overrides the duty in regulation 603 in relation to roll-over protection.

No likelihood of overturning

There will be few occasions where a supplier would be able to judge that there is no likelihood of a tractor overturning. The most obvious examples are a tractor being supplied to perform exclusively as a stationary power source and some very large tractors which are used exclusively on level terrain. However, it is clear from accident statistics that given certain conditions any tractor may overturn, even on level terrain.

Circumstances where there is a likelihood of overturning include a tractor used:

- in sloping terrain;
- on rough, slick or muddy surfaces;
- near concealed objects, holes, ditches or embankments; or
- to tow or pull objects.

For the vast majority of circumstances where tractors are used the regulation would require roll-over protection to be fitted prior to supply. Suppliers must ensure that a tractor is not supplied without roll-over protection unless he or she is satisfied that it will only be used in situations where there is no likelihood of overturning or in orchard operations or in proximity to buildings.

Section 27.3 provides more detailed guidance on eliminating the likelihood of overturning.

There are no duties placed on suppliers in relation to the fitting of roll-over protection on tractors manufactured in or imported into Victoria before 1 July 1981. This is because the duty to not use a pre 1981 tractor unless it is fitted with roll-over protection is subject to the test of practicability. It would not be reasonable for the supplier to determine whether it is practicable to fit roll-over protection. The onus is more appropriately on the employer or self-employed person.

25.2 Farmers selling second-hand tractors

Farmers selling their tractors will have the same duties as those persons who are in the business of supplying tractors. Therefore, in relation to post 1981 tractors, a farmer will, in the vast majority of circumstances, need to fit roll-over protection prior to sale. The fitting of roll-over protection prior to sale is not required if it can be determined that the purchaser is intending to use the tractor in circumstances where there is no likelihood of it overturning or in orchard operations or in close proximity to buildings.

As discussed at section 27.3, the law applies an objective test to determine whether there is a likelihood of a tractor overturning. This means that the law has referred to the standards applicable to a reasonable person in that situation. The farmer's own subjective view or personal knowledge is not relevant to this test.

As noted above, there are no duties placed on suppliers in relation to the fitting of roll-over protection on pre 1981 tractors.

26. EMPLOYERS DUTIES

26.1 The relationship between regulation 711(2) and regulation 903

Regulation 711 describes a number of duties for employers (and for self-employed persons by virtue of Part 8 of the Regulations) in relation to powered mobile plant. A tractor comes within the definition of powered mobile plant. However, the obligations in regulation 711 dealing with the obligations to provide "operator protective devices" if there is a likelihood of overturning powered mobile plant is taken over by regulation 903.

Regulation 903 aims to describe all of a person's obligations in regard to fitting of roll-over protection. This is why regulation 711 (2A) specifically excludes the application of regulation 711 (2) in regard to fitting of roll-over protection. All the other obligations contained in regulation 711 concerning controlling the likelihood of overturning [regulation 711 (1)], controlling risks to health and safety resulting from objects striking an operator or risks from being ejected from a tractor [regulations 711(2)(b) and 711 (2)(c)], are obligations which do apply to tractors.

26.2 Tractors manufactured in or imported into Victoria after 1 July 1981

Regulation 903(2) requires an employer or self employed person to ensure that a tractor is not used at the employer's or self-employed person's workplace unless it is fitted with roll-over protection. This duty is not qualified by the test of practicability for tractors manufactured in or imported into Victoria on or after 1 July 1981.

When does regulation 903(2) not apply?

This regulation does not apply to a tractor used in circumstances where there is no likelihood of it overturning. There is a very limited number of circumstances in which there is no likelihood of a tractor overturning. Employers and self-employed persons must ensure that a tractor is not used without roll-over protection unless a risk assessment determines that there is no likelihood of the tractor overturning.

There will be few occasions when there is no likelihood of a tractor overturning. The most obvious examples are a tractor being used to perform exclusively as a stationary power source or some very large tractors used exclusively on level terrain. However, it is clear from accident statistics that given certain conditions any tractor may overturn, even on level terrain. For the vast majority of circumstances where tractors are used the regulation would require roll-over protection to be fitted prior to use at a workplace.

Section 27.3 provides more detailed guidance on eliminating the likelihood of overturning.

This regulation also does not apply to tractors weighing less than 560 kilograms. Nor does it apply to tractors used in or being driven to or from an operation in an orchard or inside - or in close proximity to - a building or structure, if it would not be practicable for the operation to be carried out by means of the tractor if it were fitted with roll-over protection.

It must be noted that in relation to tractor operations in an orchard or inside or in close proximity to a building or structure, it has to be established that it is not practicable to carry out the operation if a ROPS was fitted. This means that, in the first instance, consideration must be given to ways in which the operation could be carried out if a ROPS was fitted. This may be achieved by altering the workplace to ensure that the ROPS does not collide with overhead objects. For example, is it practicable to lop off low branches or modify buildings to provide overhead clearance?

If the tractor has not been fitted with a ROPS because it is used in orchard operations or in close proximity to a building, employers and self-employed persons should be aware that a ROPS will be required to be fitted if that tractor is used for any other operation, unless a risk assessment has been done to identify that there is no likelihood of it overturning.

26.3 Tractors manufactured in or imported into Victoria before 1 July 1981

The duty under regulation 903(2) is qualified by the test of practicability for tractors manufactured in, or imported into, Victoria before 1 July 1981.

"Practicable" is defined in the **Occupational Health and Safety Act 1985** as meaning:

"practicable having regard to -

(a) the severity of the hazard - or risk in question;

(b) the state of knowledge about that hazard or risk and any ways of removing or mitigating that hazard or risk;

(c) the availability and suitability of ways to remove or mitigate that hazard or risk; and

(d) the cost of removing or mitigating that hazard or risk."

In determining what measures are appropriate to ensure risk is controlled, each of the elements of "practicable" is required to be considered.

Severity of the hazard or risk

In the event of a roll-over, the severity of the hazard is most likely to be extremely high, involving the potential for death or serious injury. In determining severity of the risk, employers and self-employed persons should assess the likelihood of the tractor overturning, having regard to the nature of the work being performed, the type of terrain likely to be encountered and any other factor (see section 27.3).

State of knowledge

Tractors are the single largest cause of death on farms. The hazard and risk associated with tractor operation are widely recognised and documented. Fitting a ROPS and seat belts to the tractor is the best means by which to mitigate the risk associated with tractor roll-overs.

Availability and suitability of ways of mitigating the hazard or risk

Employers and self-employed persons should determine if it is physically possible to fit a ROPS to their tractor. Commercially-made ROPS are available for most makes and models of tractor. A number of different types of ROPS are available to suit particular farming applications. These include an enclosed ROPS-strength cabin, 4 post, 2 post, pop-up and T-bar structures.

The cost of mitigating the hazard or risk

The cost of fitting a ROPS is low, relative to the severity of the hazard of a tractor roll-over.

When does regulation 903(2) not apply?

As for post 1981 tractors, this regulation does not apply to a tractor used in circumstances where there is no likelihood of it overturning (see section 26.2). Nor does it apply to tractors weighing less than 560 kilograms, or tractors used in or being driven to or from an operation in an orchard or inside or in close proximity to a building or structure, if it would not be practicable for the operation to be carried out by means of the tractor if it were fitted with roll-over protection. However, if the tractor has not been fitted with a ROPS because it is used in orchard operations or in close proximity to a building, it must be fitted with a ROPS for other operations, if it is practicable to do so.

When it's not practicable to fit a ROPS

If an employer or self-employed person has determined that it is impracticable to fit a ROPS, for instance, if no ROPS is available for the tractor, then use of that tractor will not be in breach of the regulation. However, where the tractor is to be used in circumstances where there is a likelihood of the tractor overturning, it is suggested that in the first instance, employers and self-employed persons should consider borrowing or hiring a tractor with roll-over protection fitted to carry out the operation.

26.4 Vintage tractors

The requirements of regulation 903 in relation to tractors manufactured in or imported into Victoria before 1 July 1981 also apply to vintage tractors. That is, a ROPS must be fitted if it is practicable to do so, unless the tractor is used in circumstances where there is no likelihood of it overturning. If the tractor is only used for demonstration purposes, and a risk assessment indicates that the likelihood of it overturning is low, then it would not be practicable to fit a ROPS. "Demonstration purposes" include rallies, street processions, pulls and ploughing competitions conducted under supervised conditions.

However, if a vintage tractor was to be operated in a workplace, then regulation 903 would apply, and a ROPS would have to be fitted if it was practicable to do so.

26.5 Tractors used as stationary plant

If a tractor is used as fixed plant as a source of power, for example, to power water or irrigation pumps and other agricultural machinery, and is not required to be driven by a tractor operator, it need not be fitted with roll-over protection. Used this way, there is obviously no likelihood of overturning and therefore the tractor comes within the ambit of the exception in 903(4)(a) of the Regulations. This only applies while the tractor is immobilised. If the tractor is required to be driven, then regulation 903 would apply.

26.6 Design, manufacture, installation and testing of ROPS

The ROPS and seat belt, when worn, are the two most significant safety devices to protect operators from death during tractor roll-overs. It is important to remember that a ROPS does not prevent tractor roll-overs. Rather, it prevents the operator from being crushed.

Due to the dynamic forces which operate upon a ROPS during a tractor roll-over, it is important that a ROPS be properly designed, manufactured and installed. Correct materials and mounting hardware, as well as engineering design, are necessary to ensure safe performance in all operating conditions.

The safety of the ROPS depends on the frame yielding and thereby absorbing energy to reduce the magnitude of dynamic forces transmitted to the mounting bolts or welds. A rigid frame may shear the mounting bolts on the tractor and may fracture rather than yield. It is recommended that ROPS be designed in accordance with relevant published technical standards. AS 1636 *Tractors - Roll-over protective structures - criteria and tests Parts 1, 2 and 3* provides guidance on methods and standards for the testing of protective structures where tractors may overturn.

It should be noted that ROPS are available for most makes and models of tractors. ROPS manufacturers have designed a wide variety of ROPS to suit many different operational requirements, for example, 2-post, 4-post and pop-up designs. However, employers and self-employed persons may choose to comply with the Regulations by building their own ROPS. In this situation, employers and self-employed persons should have the design and installation of the ROPS certified by an engineer or suitably competent person as adequate to withstand the rigours of a roll-over.

AS 1636 stipulates that destructive testing methods, involving front, rear, side and top impact testing, be carried out. Where a ROPS is designed using computer simulations, AS 1636.1 stipulates that the design be destructively tested. However, employers and self-employed persons purchasing a ROPS designed using computer simulations are not required to carry out further destructive testing on the installed ROPS as long as it was installed in accordance with the designer's /manufacturer's specifications.

It should be noted that other technical standards could be relied on to provide a sufficiently high safety standard for roll-over protection. The fundamental performance requirement is that the ROPS will be adequate for the task of protecting the operator in the event of the tractor overturning.

ROPS should be correctly installed, taking into consideration welds, mounting and brackets which should have adequate energy absorbing characteristics. Any modification to a ROPS is inappropriate unless it is undertaken by a person with relevant engineering and/or mechanical skills. Modifications may impair the ROPS ability to perform properly in the event of a roll-over.

It is important to note that not all tractor cabs are necessarily roll-over protective structures. Some tractor cabs are designed only for weather or chemical protection, and not to protect the operator in case of a roll-over. Tractor owners who have a cab or are intending to purchase a cab should determine from the supplier whether or not the cab is a ROPS cab.

What is so special about the construction of ROPS?

ROPS are designed to work in conjunction with the tractor's mounting brackets and main frame, thereby providing a structure that is strong enough to withstand the loads generated during a roll-over. Therefore they should be designed, engineered and tested in accordance with Australian Standard 1636 or equivalent.

If farmers or other tractor owners intend to build their own ROPS, they should be manufactured and installed to a designer's specification which has been tested using physically destructive methods (as per AS 1636 or equivalent), or have the ROPS certified by an engineer or suitably competent person as adequate to withstand a roll-over.

What does physical destructive testing achieve?

Once a ROPS has been designed and engineered, a prototype is manufactured and mounted to the intended tractor type or tractor's main frame and should be tested in accordance with AS 1636 or an equivalent international standard. This simulates the event of a tractor roll-over and provides confirmation of the design's adequacy.

Why should I wear a seat belt?

In the event of a roll-over, the use of a seat belt keeps the operator within the critical zone of protection created by the ROPS. Without the use of a seat belt, the operator might be thrown from and crushed by the tractor or even by the ROPS. ROPS are more effective when used with a seat belt.

Can I modify my ROPS after it is installed?

Any modification to a ROPS is inappropriate unless it is undertaken by a person with relevant engineering and/or mechanical skills. ROPS are designed, engineered and tested to perform a specific task - to save human life. Modifications may impair the ROPS ability to perform properly in the event of a roll-over.

My tractor fitted with a ROPS rolled over. The ROPS looks in good shape. Do I need to replace it now?

Yes. A ROPS is designed and engineered to provide protection for a single roll-over. During a roll-over a ROPS is subjected to the loads generated by the event. Even though a ROPS may look undamaged after a roll-over, there is no way to know if the structure is damaged in such a way that will cause it to fail in a subsequent roll-over.

Should my ROPS be inspected or serviced?

Yes. ROPS should be inspected periodically to check for excessive rust, cracks or other signs of wear, and rubber isolation mounts, where used, should be inspected periodically for possible deterioration. Any of these defects may cause a failure of the ROPS in the event of a roll-over. Consult the manufacturer if any sign of deterioration is identified.

27. ELIMINATING THE LIKELIHOOD OF TRACTOR OVERTURNING

27.1 Designer's and manufacturer's duty to control risk

Designers and manufacturers of tractors should be aware that regulations 304 and 402 respectively require that plant is designed and manufactured so that any risk associated with its use is eliminated, or, if this is not practicable, reduced so far as is practicable. Tractors should be designed and manufactured so that the probability of their overturning is reduced. For example, four wheel drive tractors are less likely to overturn because of their superior traction. Other examples may include ensuring that tyres are capable of being used as additional ballast and incorporating the capacity to lower the tractor's centre of gravity.

27.2 The employer's duties

The Regulations provide (Regulation 711)

- (1) *An employer must ensure that the likelihood of powered mobile plant overturning or of a falling object coming into contact with the operator of the plant or the operator being ejected from the plant is eliminated, or if it is not practicable to eliminate the likelihood, reduced so far as is practicable.*
- (2) *Where a risk assessment identifies a likelihood of –*
 - a. *A powered mobile plant overturning, or*
 - b. *objects falling on the operator, or*
 - c. *an operator being ejected from the plant –*

an employer must ensure that, so far as practicable, an appropriate combination of operator protective devices are provided, maintained and used to reduce, as far as is practicable the risk to the operator.
- (3) *Sub-regulation (2) does not apply in relation to the fitting of roll-over protection on a tractor which conveys its power to the ground directly by wheels.*

Regulation 801 requires that self-employed persons comply with regulation 711 as if they were employers, in relation to the health and safety of other people. Self-employed persons should comply with this regulation if it is likely that anyone other than the self-employed person will use the tractor. Such persons would include, for instance, children of the self-employed person on a family-owned farm, or a contractor engaged to operate the tractor.

The intention of regulation 711 (2A) is to focus any decisions about regulatory obligations on regulation 903 when a decision has been made about fitting roll-over protection to a tractor. Regulation 711 requires a risk assessment to be made about the risk of overturning, objects hitting the operator and of the risk of the operator being ejected from powered mobile plant. The first duty is to eliminate the chance of these things occurring. If that is not practicable, operator protective devices have to be considered. Regulation 711 (2A) only has the effect of making it clear that the regulatory duties about fitting of roll-over protection to a tractor is not covered under this regulation.

27.3 What is "likelihood of overturning"?

Regulation 711 (1) requires that employers, and self employed persons in relation to the health and safety of other people, ensure that the likelihood of a tractor overturning is eliminated, or, if it is not practicable to eliminate the likelihood, reduced so far as is practicable. It is important to note that the regulation places emphasis on this requirement and makes it an over-riding duty. That is, irrespective of anything done to the tractor to protect the operator in the event of a roll-over, the fundamental obligation is to avoid circumstances where a roll-over will occur.

Determining whether there is a "likelihood" of the tractor overturning should be undertaken having regard to the state of knowledge of the hazard. This is an objective test of the general state of knowledge that a reasonable person in that situation is expected to have. It is not something that varies according to the employer's or self employed person's own subjective view or personal knowledge.

In determining the likelihood of the tractor overturning, the employer or self-employed person should have regard to the nature of the work being performed, the type of terrain likely to be encountered and any other relevant factor, such as the tractor model's propensity to overturn.

It is important to appreciate that the first objective is to ensure that the likelihood of overturning is eliminated. If that is not practicable, consideration should be given to the regulatory requirements associated with roll-over protection.

In the first instance, employers and self-employed persons should consider substituting the tractor operation with another process or altering the normal operational procedure so that the likelihood of roll-over is eliminated. For example, is it possible carry out the operation using a rough terrain carrier or four wheel drive motor vehicle and trailer?

There are very few circumstances in which there is no likelihood of a tractor overturning. Most tractors are fundamentally top-heavy and potentially unstable. An example of there being no likelihood of overturning would be a tractor being used as a power source (see section 26.5). Circumstances in which overturning may occur include the following:

- Ascending or descending steeply sloping terrain.

Steep slopes greatly reduce a tractor's stability. To increase stability, set the wheels at the widest setting suitable even if that setting would be to the detriment of the operation being carried out. Drive slowly and avoid quick uphill turns. If side-mounted equipment is being used, keep it on the uphill side. Keep the tractor in low gear before starting downhill.

- Operating the tractor near ditches and embankments.

Avoid holes that are likely to cause a sideways upset. Reduce speed to minimise the possibility of a sideways upset. To ensure safety around ditches and embankments, stay away from them.



- Turning or crossing on slopes and rough, slick or muddy surfaces.

Centrifugal force is one of the major causes of tractor overturns. This force tries to keep the tractor going in a straight line. Slow down before making any turn. Turning with a raised loader increases the likelihood of overturning. In this situation, reduce speed and keep the loader as low as possible. Watch for ditches, holes and rocks which might cause an overturn. If feasible, delay the operation until a muddy surface dries out.

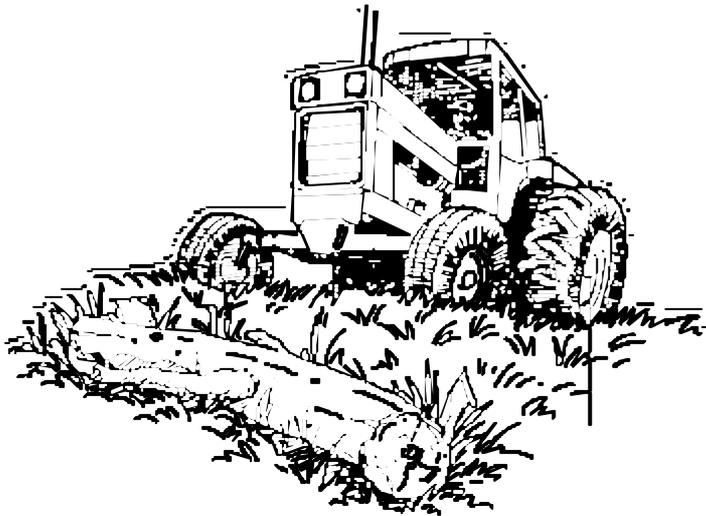
- Jerky turning, starting and stopping.

Engaging the clutch suddenly or quickly shifting a hydraulic transmission to high speed can flip the tractor over backwards, especially when towing a load or starting up a slope.

Slow down before stopping or attempting to make a turn, as fishtailing or severe braking at high speed can cause the tractor to jackknife and roll-over. Turn as wide as possible.

- Running into concealed objects on flat or sloping ground.

Hidden hazards such as rabbit holes, stumps, ditches and rocks are often present. Drive at speeds slow enough to retain control in unexpected circumstances.



- Inappropriate hitching arrangements when towing or pulling an object.

Hitching above the normal drawbar height when towing or pulling a tree stump can result in the tractor flipping backwards. Always hitch to the drawbar, using the mounting points provided by the manufacturer. Never hitch a load or implement which is too heavy for the tractor to handle (refer to the manufacturer's advice).



- Extracting a tractor bogged in muddy ground.

Attempting to drive out a tractor bogged in muddy ground may result in it tipping sideways or flipping backwards. Use another tractor to tow the bogged tractor out. The towing tractor should pull from a hitch point on the drawbar.

Additional safe tractor operation practices may include:

- ensuring all tyres are inflated to recommended pressures ;
- equipping the tractor with dual wheels on the rear for improved stability;
- using wheel weights or calcium solution in the tyres for better traction and stability;
- where possible, clearing the land of loose rocks or debris ;
- ensuring operators are well-versed in emergency procedures, for example, driving techniques that can be used if the angle of the tractor suddenly places it at risk of overturning, such as turning down the slope. Safe tractor operation courses are available through TAFE and Agriculture Colleges.

28. ELIMINATING OTHER TRACTOR – RELATED HAZARDS

28.1 Eliminating the exposure to falling objects

Tractors may be used in a range of working environments, some of which may expose the operator to falling objects, for example, tree branches and hay bales. To meet the requirements of regulation 711 (1), employers and self-employed persons should consider adoption of one of the following measures:

- substitute the operation with another process where falling objects are not a risk to the operator;
- only allow use of the tractor in environments where the operator is not exposed to falling objects ;
- provide an adequate physical barrier such as a tractor cabin to protect the operator against falling objects ;

Falling object protective structures

Where a risk assessment identifies a likelihood of objects falling on the operator, regulation 711(2) requires an employer or self-employed person (in relation to the health and safety of others) to provide, so far as is practicable, an appropriate combination of operator protective devices. Fitting the tractor with a falling object protective structure which meets the requirement of SAE J 167 *Overhead Protection for Agricultural Tractors - Test Procedures and Performance Requirements* or an equivalent standard is one way to achieve compliance with his regulation.

28.2 Eliminating the likelihood of operator ejection

Tractors may be used in terrain where ditches, embankments, depressions or slippery banks may contribute to the operator being ejected from the tractor. To meet the requirements of regulation 711 (1), employers and self-employed persons should consider adoption of one of the following measures:

- substitute the operation with another process where the likelihood of ejection is eliminated;
- modify the design of the operator cabin seating so that the operator will not be ejected;

Use of seat belts

If the risk assessment identifies a likelihood of the operator being ejected from the tractor, regulation 711 (2) requires an employer or self-employed person (in relation to the health and safety of others) to provide, so far as is practicable, an appropriate combination of operator protective devices. Irrespective of the age of the tractor, if there is a likelihood of the operator being ejected, the tractor should be fitted with a seat belt which meets the requirements of AS 2596 *Seat belts for Use in Motor Vehicles*, SAE J386 *Operator restraint systems for off-road machines* or an equivalent standard, if it is practicable do so. It is self-evident that if there is a likelihood of the tractor overturning, there will be a likelihood of the operator being ejected.

When an overturn occurs, the ROPS provides a "zone of protection" for the operator. To work as designed, the operator must stay within this zone. In the event of a roll-over, an operator who is not wearing a seat belt is likely to be ejected from the tractor. If the operator is thrown off the tractor, or is thrown partially off the tractor, he or she may not be protected by the ROPS, and in fact could be crushed by the ROPS itself. Not wearing a seat belt may defeat the primary purpose of the ROPS. In addition to keeping the operator in the "zone of protection", use of a seat belt will prevent the operator from being thrown against the frame, window or door in the event of the tractor overturning.

It is recommended that operators do not use seat belts on a tractor unless a ROPS is fitted as well. Without a ROPS, in the event of a roll-over, the operator will have no chance of survival. The seat belt will keep the operator in the seat as he or she is crushed by the tractor.

It takes less than a second for a tractor to roll over. This is less time than it would take for most operators to react to the impending roll-over and attempt corrective action or to jump clear. Even if the operator does get clear of the initial roll, the jump would normally be downhill of the tractor and he or she would have to avoid any subsequent roll of the tractor. This is unlikely.

A US study concluded that if a tractor rolls and it does not have a ROPS, there is a 75% chance of death resulting. However, where a ROPS is fitted **and** a seat belt is used, an operator has a better than 95% chance of avoiding serious injury*.

Deaths have resulted even when tractors have been fitted with ROPS when the operator has been thrown out of the "zone of protection". The use of a seat belt in combination with a ROPS greatly reduces the likelihood of injury. A study reported by the Wisconsin Rural Health Research Centre** noted that since 1969 there has not been a fatality in the USA resulting from an overturn in which the operator stayed within the ROPS enclosure.

* Iowa State University and the University of Iowa Centre for Agricultural Safety and Health

**A Guide to Tractor Roll Bars and Other Rollover Protective Structures' -published by the Wisconsin Rural Health Research Centre (January 1993)

29. SAFETY OF PASSENGERS

Regulation 711 (5) requires that employers and self-employed persons ensure, so far as is practicable, that no person other than the operator rides on a tractor unless that person is afforded a level of protection from exposure to a risk which is equivalent to that provided to the operator. If there is a likelihood of a tractor overturning, objects falling on the passengers or passengers being ejected from the tractor, the regulation requires that passengers be protected from such risk.

Employers and self-employed persons should ensure that passengers do not ride on a tractor unless it has purpose-designed passenger seating, is fitted with a ROPS and/or FOPS, and passenger seat belts as appropriate. Readers should be aware that purpose-designed passenger seating is generally not incorporated into the design of tractors. The usual lack of specific provision for a passenger in the design of tractors means these people can be at greater risk to their safety than the driver.

Children are particularly at risk while riding on tractors. Children should not be allowed to travel on tractors unless appropriate protective measures are in place.

Most passenger injuries occur because the passenger is thrown from the tractor. Therefore, under no circumstances should passengers ride on the tractor's drawbar, mud guards or tractor access platforms (or other cabin mounting apparatus).

6. INSERTION OF TABLE 121N APPENDIX 2

After Table 11 (Amusement Structures) in Appendix 2 of the Code of Practice for Plant (No. 19) **insert-**

"12. *Operator restraints*

Plant Description	Code Number	Standard Title	Design	Manufacture	Use
Seat Belts	AS 2596	Seat Belts for use in Motor Vehicles	✓	✓	✓
	SAE J386	Operator Restraint for off-road machines	✓	✓	✓

7. INSERTION OF APPENDIX 7

After Appendix 6 in the Code of Practice for Plant (No. 19)

Insert -

"APPENDIX 7

CASE STUDIES OF ROLL -OVER INCIDENTS

Some roll-over incidents which resulted in fatality are described below. These cases are from Victorian incidents investigated by the Victorian WorkCover Authority (or its predecessors) and from overseas jurisdictions.

Roll-over on a flat road

In 1994 the driver of a tractor was killed when the tractor he was driving overturned on a flat unsealed country road. A male passenger on the tractor at the time of the incident received injuries including a fractured rib and bruising on the back and legs.

Even though the road was in good condition and the weather fine, the tractor veered out of control and rolled over on to its roof crushing the driver. The tractor, which had been borrowed by the passenger from a relative, was a two-seater manufactured prior to 1975. While the tractor was fitted with weather cabin, this cabin did not provide any form of roll-over protection for the occupants. This tractor, being a pre-1981 model, was not required under the Regulations in force at the time, to have a ROPS.

Roll-over during farm operation on sloping ground

A self-employed farmer operating his own tractor was killed after it rolled over on sloping ground. The deceased had been driving a pre 1981 tractor up a 16 degree slope on his own property. It would appear that the he was about to select a lower gear or reverse, and in doing so, the tractor began to roll backwards. Application of the brakes caused the tractor to skid sideways and roll over, trapping the operator underneath. The tractor was not fitted with a ROPS. A ROPS was not required to be fitted under the Regulations in force at the time.

Improperly hitched tractor flips while pulling a downed tree

A farmer was killed when his 1950-model tractor flipped backwards while pulling a downed tree. The tow chain used to pull the tree had been hitched above the drawbar of the tractor, which was not fitted with required roll-over protection.

Roll-over while driving through an irrigation channel

A 36 year-old self-employed farmer received fatal injuries when he became trapped beneath his tractor when the tractor reared backwards. At the time of the accident, the farmer was attempting to drive the tractor through an empty earthen irrigation channel, with a large spray tank filled with water attached to the drawbar of the tractor. It would appear that as the tractor reached the top of the bank of the channel, the trailer on which the spray tank was mounted dug into the earth and caused the tractor to rear backwards. The movement of the water in the spray tank may also have contributed to the trailer digging into the ground. The farmer was trapped between the drawbar of the trailer and the steering wheel of the tractor when the tractor rolled over. The tractor was not fitted with any form of roll over protection.

Roll-over while towing a vehicle

In December 1991 a 33 year-old male farm worker died as a result of multiple head and torso injuries sustained during a rear roll-over of the tractor he was using to pull a pick-up truck filled with wood. The tow chain had been hitched high on the back of the tractor. The tractor which was a 1958 model, did not have a ROPS.

Operator killed after being ejected from a tractor fitted with ROPS

A farmer was killed when his tractor rolled over a steep bank on his property. Prior to the incident the farmer had been spraying weeds with a spray unit attached at the rear of his tractor. During the operation the front of the tractor was driven over the lip of a creek bank. As the farmer attempted to reverse, the tractor lost traction and its rear shifted around and toppled over the embankment.

The tractor was fitted with a ROPS. However, a seat belt was not provided and the farmer was either thrown or tried to jump clear but was crushed by the tractor when it rolled to the bottom of the bank."

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