

# Buying a Safer Heavy Trailer



This booklet provides you with important advice on safety that will help you make an informed decision the next time you buy a heavy trailer (over 4.5 tonnes). It explains the main safety features to look for when buying a new or used trailer.

For your convenience, a check list is located on the back of the booklet containing a list of important safety features (including information on Roadworthy Certificates). Please use these the next time you purchase a trailer.

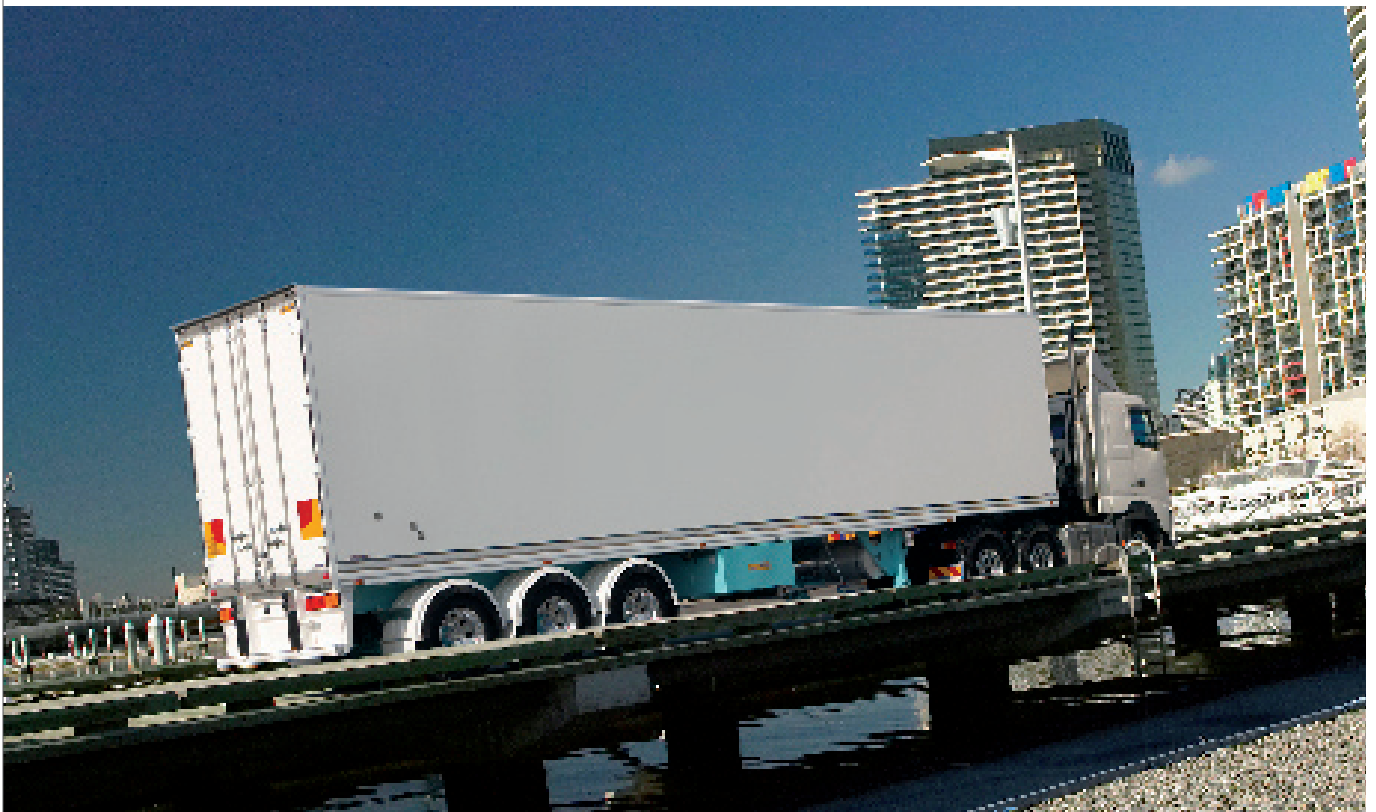
## Maximise the Benefits

It is fundamental to any trailer purchase that it must be properly specified to suit the intended task. Not providing the proper equipment immediately reduces the potential to maximize the commercial and safety benefits.

A safe and efficient trailer will:

- ***Reduce the risk of a crash***
- ***Reduce OH&S issues/injuries***
- ***Reduce restraint/containment needs***
- ***Increase commercial benefits***

It is also important to consider the needs of your customers and the working environments (yards, delivery points) that the trailer will be operated in. Also ensure that the trailer or workplaces where the trailer will be used, have the appropriate equipment for safe loading/unloading.



## Braking and Stability Features

Having an efficient braking system in your truck and trailer is the best protection you can have to reduce the risk of a crash. Australian manufactured trailers often have conventional pneumatic brakes with very few fitted with ABS and EBS. Disc Brakes have started to become more common on trailers in the last couple of years. Compatibility issues with non disc brakes may require the services of a disc brake supplier.

Brake technology has advanced greatly in recent years. Three systems – ABS, EBS, and ESC – have evolved to provide improved safety for truck operators.

### Anti-lock Braking System (ABS)

An Anti-lock Braking System (ABS) eliminates brake lock by controlling the braking pressure applied to individual wheels thus allowing the driver to continue steering, making it easier to avoid a crash. ABS is engaged when braking is so hard that one of the wheels is about to lock. A control unit controls each wheel's brake cylinder via a modulator by cycling the brakes very quickly.

In heavy vehicle combinations in which the trailer is also fitted with ABS, the risk of trailer swingout during heavy braking is reduced. ABS can be integrated with skid control technology and a roll back lock to control the braking and traction functions of the entire truck and trailer unit.



ABS can also reduce the vehicle's stopping distance on some road surfaces.



### Electronic Braking System (EBS)


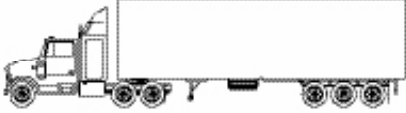



The Electronic Braking System (EBS) was developed to electronically signal the brake system and speed up the application of the brakes. If EBS is fitted to the trailer it can provide safety benefits even if EBS is not fitted to the prime mover (see table). Electronic sensors fitted to the driver's footbrake register when the driver applies the brake. A signal is instantaneously generated and sent to the EBS control unit which determines the braking pressure for each axle and wheel. Air or hydraulic pressure is then used to apply the brakes at that wheel. Most EBS systems include ABS; an electronically controlled braking system is designed to ensure that the braking power is distributed efficiently between the wheels depending on the load on the axle. The following table shows that having a trailer fitted with EBS can provide a range of safety functions depending on the prime mover's braking system. EBS on the trailer requires power from the truck usually via the ABS connector.

Roll Stability Program (RSP) is an extension of the EBS that detects if a trailer is rolling. RSP then applies trailer braking to slow the vehicle to a speed below the rollover threshold. RSP is effective with combination vehicles and works independently of the prime mover apart from a power source.

| <br>Prime mover<br>Brake System<br>Configuration | <br>Trailer EBS Functionality |     |              |     |                              |
|---|---|-----|--------------|-----|------------------------------|
|   | Electronic Brake Actuation  | ABS | Load Sensing | RSP | Trailer Information Recorder |
| EBS   | ✓   | ✓   | ✓            | ✓   | ✓                            |
| ABS   | ✗   | ✓   | ✓            | ✓   | ✓                            |
| Conventional without EBS or ABS   | ✗   | ■   | ■            | ✗   | ✗                            |

■ Depends on brand of equipment used

The following table outlines the consequences of mixing the various brake system technologies now available in an articulated vehicle combination (\*assumes matched power supply voltage).

|   |  |
|---|--|
| <br>TOWING VEHICLE with EBS      TRAILER with conventional AIR BRAKES | <p><b>✗✗✗ NOT RECOMMENDED</b><br/>                     Load proportioning only on towing vehicle can result in over-aggressive trailer braking &amp; accelerated brake wear. No ABS on trailer with over aggressive braking can result in chronic wheel lock &amp; dangerous instability accentuated by push from slow trailer system.</p>       |
| <br>TOWING VEHICLE with EBS      TRAILER with Load Sensing           | <p><b>✓✗✗ LESS THAN OPTIMAL (SAFETY)</b><br/>                     Load proportioning on both for improved brake balance &amp; more even brake wear, but no ABS on trailer means wheel lock &amp; instability still possible, &amp; pneumatically triggered trailer system behind 'fast' EBS towing vehicle accentuates trailer lag/push.</p>     |
| <br>TOWING VEHICLE with EBS      TRAILER with ABS                    | <p><b>✓✓✗ LESS THAN OPTIMAL (WEAR)</b><br/>                     Electronic load proportioning only on towing vehicle can result in over-aggressive trailer braking &amp; accelerated brake wear. ABS on both* ensures stability but pneumatically triggered trailer system behind 'fast' EBS towing vehicle accentuates trailer lag/push.</p>    |
| <br>TOWING VEHICLE with EBS      TRAILER with EBS                    | <p><b>✓✓✓ HIGHLY RECOMMENDED</b><br/>                     Electronic load proportioning on both* for optimum brake balance &amp; even brake wear at all loads. ABS on both* &amp; RSS on trailer* for optimum stability &amp; minimum stopping distance. Electronically triggered trailer system* for synchronous braking (no trailer push).</p> |
| <br>TOWING VEHICLE with ABS      TRAILER with EBS                    | <p><b>✓✓✓ RECOMMENDED</b><br/>                     ABS on both* &amp; RSS on trailer* ensures optimum stability &amp; reduced stopping distance. Load proportioning only on trailer may result in more aggressive towing vehicle braking, but ABS prevents instability, &amp; TEBS load proportioning can be disabled if desired.</p>            |

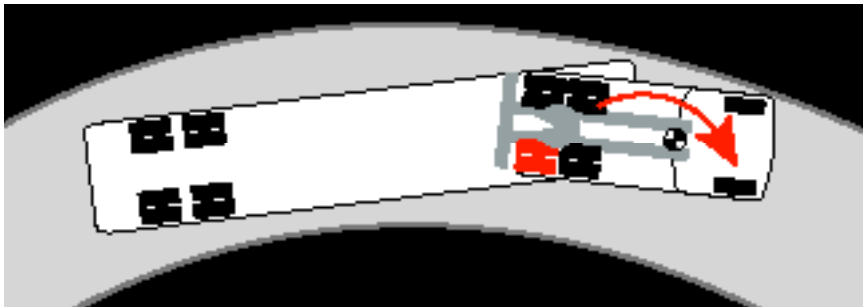
## Electronic Stability Control (ESC)

Electronic Stability Control (ESC) needs to be fitted to the prime mover to work on the trailer. ESC has many different names including Electronic Stability Program. It builds on ABS and EBS to provide advanced braking and stability control. Widely used in Europe, this technology is also available for trucks and trailers in Australia. ESC helps prevent jackknives, rollovers and other loss of control crashes.

ESC helps you remain in control of your vehicle by:

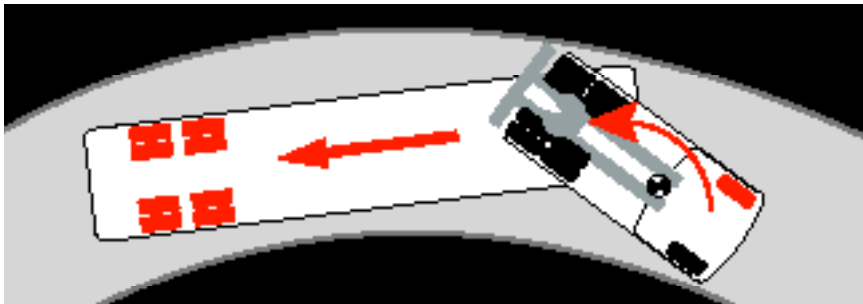
- Correcting impending oversteering or understeering
- Stabilising the vehicle during sudden evasive maneuvers e.g. swerving
- Improving handling on gravel roads e.g. road shoulders
- Improving traction on slippery or icy roads.
- Providing balanced braking depending on the load

ESC actively monitors and brakes the wheels individually. Using a number of sensors that measure steering angle and lateral acceleration, the system detects when the truck is about to skid, is in danger of turning over on a bend, or when the trailer tilts as the result of a sudden evasive maneuver. As soon as the impending skid or tilt is registered, ESC selectively brakes individual wheels and reduces engine torque to bring the vehicle back on the course the driver is steering. In simple terms, ESC is an in-built, active safety system that assists the driver to maintain control of their vehicle by slowing one or more wheels.



### **Understeer**

*ESC slows the inner rear wheel and turns the prime mover into the bend and the front wheels regain their grip.*



### **Oversteer (Jack Knife)**

*ESC brakes the outer front wheel to turn the prime mover back and give the back wheels grip. The trailer brakes to avoid jackknifing. (Trailer must be fitted with ABS/EBS).*



## Disc Brakes versus Drum Brakes

Disc brakes provide better “hot” performance and do not fade under heavy prolonged braking. Disc brakes also reduce braking distance. Disc brakes are now available with many of the more advanced braking systems. Disc brakes on trailers have started to become more common but compatibility with non-disc brake prime movers can be a problem.



### Mixing Different Brake Systems

When purchasing a truck and/or trailer it is critical to be aware of mixing brake systems on vehicles and trailers. Some aspects of the mix problem are:

- mixing disc and drum brakes on prime movers and trailers – it is important to have auto slack adjusters on the drum brake unit, and to have minimal dominance between the truck and trailer
- EBS on the truck with the trailer having a conventional air brake system
- where smaller sized tyres have been fitted on a used trailer
- ABS on trailers not working because ABS trailer connections are not fitted on trucks
- excessive brake power on some vehicles in a combination
- when ‘swapping’ trailers (changeovers etc.) where brake compatibility hasn’t been established.

Check with your manufacturer if unsure about the compatibility of the truck/trailer braking systems.

## Suspensions

Suspension selection and set-up is a factor in the overall behaviour of a vehicle. Characteristics such as vertical stiffness, roll stiffness, roll centre height and roll steer coefficient can each affect a vehicle’s behaviour in different ways. Therefore it is imperative that designers and constructors of multi combination vehicles take reasonable steps to select the most appropriate suspension for the task, and that operators set them up and maintain them regularly. Designing a multi-combination vehicle for best dynamic performance involves juggling many different competing goal sets. Improving performance in one area can sometimes degrade performance in another. Finding the right balance between all goal sets is a matter of experience and technical know-how.

A number of key points need to be considered:

- Always select a suspension that is suited to the task. Price and tare mass are not the most important factors in the suspension selection process.
- Always install a suspension according to the manufacturer’s installation procedure.
- Always operate a suspension according to the manufacturer’s specifications.

Normally there is only one correct ride height for an air suspension. Always operate a suspension at its design ride height.

- Always follow the suspension manufacturer’s recommended procedures when adjusting the ride height of an air suspension.
- Always adjust the ride height of an air suspension before carrying out an alignment.
- With mechanical suspensions on trailers ensure that the equalisers (rockers) are parallel to the ground.
- Always ensure that air-suspended converter dollies with fifth wheels and hinged drawbars are properly blocked to prevent ‘nose-diving’.
- Always operate vehicle combinations with correct skid plate heights and angles.

Contact the suspension supplier and the vehicle manufacturer if a multi-combination vehicle is experiencing dynamic performance problems.

Download “A Guide to the Application and Use of Suspensions on Multi-Combination Vehicles August 2005” from [www.artsa.com.au](http://www.artsa.com.au) for further details.

## Side and Rear Underrun Protection

In crashes involving other road users, side and rear underrun protection helps prevent serious injuries. A side and rear underrun barrier can also help prevent damage to the trailer.

## Load Restraint

Depending on the load, effective load restraint can require the provision of front headboards, load racks, winch tracks, curtain sides, drop sides, side gates, stanchions, pins and posts. The trailer manufacturer must design the restraint components for the intended loads.



Some of the basic things to consider are:

- Well designed fixed or removable headboards greatly reduce the number of tie downs needed
- Side gates and drop-sides should be high enough to “contain” the load
- Vehicles that carry loose steel plate, sheets, pipe etc require stakes, pins, pegs or posts to provide direct restraint
- Metal Cradles, Chocks and A-Frames need capping or load bearing surfaces with timber or rubber to increase friction.
- Unless curtain sided vehicles are certified for load restraint – the load must be restrained as if the curtain did not exist. (Refer to the NTC’s Load Restraint Guide p.235 - 239).

A well designed trailer will allow the driver to work from the ground and avoid lifting heavy gates and other equipment. A number of trailer manufacturers offer innovative curtain and gate systems which dramatically reduce the OH&S risks to drivers/unloaders.

The “Design of Vehicle Body Systems for Load Restraint Compliance” publication produced by ARTSA provides a comprehensive overview of the issue and is available from their website [www.artsa.com.au](http://www.artsa.com.au)

## Steps and Ladders

To reduce the risk of falls, access steps and ladders need to conform to Australian Standards AS1657. A number of manufacturers offer retracting or storable steps that allow quick and safe access to the top of the trailer.



## Lights and Increased Visibility

**Lights fitted to trailers must comply with the Australian Design Rules. However, it may be worthwhile to consider upgrading older trailer lights to the more recent LED or other high standard lights to improve visibility.**

The use of reflective tape or paint can also dramatically improve your trailer's visibility at night.

## Wheel Nuts

**Each year in Australia trucks lose their wheels and deaths and serious injuries occur. The main reason for wheel loss is incorrect clamping pressure on the wheel nut. This can be caused by many reasons including incorrect tightening at fitting, loosening over time, rust, dirt or paint in between the nut and the wheel surface and damage to the stud.**

Preventing wheel loss requires regular checks of the wheel nuts.

A new type of wheel nut works by the interaction of an interlocking cam. As the angle of the cam is greater than the pitch of the tread on the stud, a wedging action takes place and the clamp load is maintained. It is fitted to the wheel the same as a conventional wheel nut.

Wheel Nut Indicators are also available that show if a wheel nut is loose.

## Spare Wheel

**The location and safe storage of the spare wheel is important. The wheel needs to be located where it can be safely removed to avoid back injuries and other common hazards. New devices have been developed by some manufacturers to assist the unloading of the spare tyre and reduce the risk of injuries.**

## Tyres

**Advanced or unusual tyre wear can reduce grip on slippery roads. Visually check a used trailer tyres for uneven wear, looking for high and low areas or unusually smooth areas.**

All tyres have tread wear indicators. These indicators appear in the main grooves when the tread has worn down to 1.6mm, showing the tyre needs to be replaced.

Tyre selection and good tyre maintenance play an important role in the tracking ability of a vehicle. Selecting quality tyres will reduce the swaying of a vehicle, while maintaining correct operating pressures will help to improve tracking.

Maintaining the correct tyre air pressure is very important as it affects fuel consumption, the rate of tyre wear, stability, load ability and general safety.

Having a wheel alignment which precisely measures and then positions the wheels to ensure the least amount of wear to your tyres. A wheel alignment will significantly extend the life of your tyres and improves fuel economy.





## Self Tracking Trailers

Self tracking axle trailers track along a much narrower path in a corner. Benefits of self tracking trailers include increased safety because they take less room to turn and they dramatically reduce tyre wear, fuel consumption and road damage. A recent development has been the Trackaxle assembly which also has a reversing steering device with a remote control to dramatically improve safety while reversing.



## Storage of Equipment

An area to store readily needed equipment is essential to avoid equipment falling from the trailer.

## Working on the Trailer

If the work cannot be done on the ground it may be necessary to install fall protection devices such as guard rails or arrest systems. Anchor points or other devices might need to be incorporated into the design of the trailer.



Some companies also provide paint markings on the trailer to highlight edges and other high risk locations.

## Trailer Plates

To be registered for the first time trailers must have a plate attached with details that include the Vehicle Identification Number.

## Rear Couplings

It is common for trailers to have rear couplings which must comply with ADR 62. Visit [www.vicroads.vic.gov.au](http://www.vicroads.vic.gov.au) to obtain the ADR's.

## Roadworthy Certificate

Some trailers are poorly maintained. If buying a second hand heavy trailer make sure it comes with a current Roadworthiness Certificate.

### What is a Roadworthy Certificate?

When you purchase a heavy trailer a Roadworthy Certificate is required in some states. A Roadworthy Certificate is a check of the trailer to ensure that key components have not worn or deteriorated and that the vehicle is safe for normal road use.

A roadworthy inspection only covers the major safety related items, including:

- wheels and tyres
- suspension and braking systems
- lamps and reflectors
- the structure of the trailer

The roadworthiness test is not a check of the mechanical reliability or general condition of the trailer.

The certificate does not mean:

- the trailer is in top condition without any wear or deterioration
- non-safety related items are working
- items checked during the roadworthy inspection will continue to function after the inspection e.g. a brake light can stop functioning at any time after the inspection

The Roadworthy Certificate will also not reveal if the trailer is fitted with parts not supplied by the original manufacturer.

An inspection by a person or organisation with an understanding of trailer designs and standards is recommended.

## More information

If you want to know more about trailer safety, please visit:

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

- “Safety by Design” publication
- “Transport & Storage Industry - Who is the weakest link...?” publication

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

- for a range of heavy vehicle information including mass and dimensions

**[www.vicroads.vic.gov.au/vehicle safety](http://www.vicroads.vic.gov.au/vehicle%20safety)**

**[www.ntc.gov.au](http://www.ntc.gov.au)**

- and download the Load Restraint Guide.

**[www.dotars.gov.au](http://www.dotars.gov.au)**

**[www.vta.com.au](http://www.vta.com.au) and download the**

- “Buying a Safer Truck” publication

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

**[www.artsa.com.au](http://www.artsa.com.au) and download:**

- “Design of Vehicles Body Systems for Load Restraint”
- “A Guide to the Application and use of suspensions on multi combination vehicles”

**[www.atatrucks.net.au](http://www.atatrucks.net.au)**

## Health & Safety checklist

**The next time you go to buy a trailer, check for these important safety features:**

| <b>Safety Feature</b>               | <b>Yes/No</b> |
|-------------------------------------|---------------|
| Electronic Braking System           | <hr/>         |
| ABS                                 | <hr/>         |
| ESC                                 | <hr/>         |
| Disc brakes                         | <hr/>         |
| Side Gates, Drop Curtains, Curtains | <hr/>         |
| Storage area                        | <hr/>         |
| Side Underrun Device                | <hr/>         |
| Rear Underrun Device                | <hr/>         |
| Spare wheel safely located          | <hr/>         |
| Steps/Ladders to access trailer     | <hr/>         |
| Load securing devices               | <hr/>         |
| Roadworthy supplied                 | <hr/>         |

## Used Trailer Q/A

**When purchasing a used trailer you need to ask yourself:**

### **Question**

What is the service history?

Where are the maintenance records?

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Were the original manufacturers parts used in servicing?

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What type of work was undertaken by the trailer?

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Is there excessive welding at high stress points which can indicate structure failures?

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# Buying a Safer Heavy Trailer

The Victorian Transport Industry Safety Group wishes to acknowledge the following people and organisations for their support.

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