

SIDE UNDERRUN PROTECTION

TECHNICAL ADVISORY PROCEDURE



Developed by the ATA Industry Technical Council

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Operators must comply with the Australian Design Rules (ADRs), the Australian Vehicle Standards Regulations, roadworthiness guidelines and any specific information and instructions provided by manufacturers in relation to the vehicle systems and components.

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Suggestions or comments about this Technical Advisory Procedure are welcome. Please write to the Industry Technical Council, Australian Trucking Association, Minter Ellison Building, 25 National Circuit, Forrest ACT 2603.

About the ATA Industry Technical Council:

The Industry Technical Council (ITC) is a standing committee of the Australian Trucking Association (ATA). The ITC's mission is to improve trucking equipment, its maintenance and maintenance management. The ITC was established in 1995.

As a group, the ITC provides the ATA with robust professional advice on technical matters to help underpin the ATA's evidence-based policymaking. It is concerned with lifting technical and maintenance standards, improving the operational safety of the heavy vehicle sector, and the development of guidelines and standards for technical matters.

ITC performs a unique service in the Australian trucking industry by bringing operators, suppliers, engineers and other specialists together in a long-term discussion forum. Its members provide expert and independent advice in the field to inform the work of the ITC. The outcomes from ITC benefit all ITC stakeholders and the heavy vehicle industry at large.

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Side Underrun Protection - Guidelines

Developed by the ATA Industry Technical Council

Edition 2.3 – April 2020

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1. INTRODUCTION

This Advisory Procedure is published by the Australian Trucking Association Ltd (ATA) to assist the road transport industry improve the technical understanding of Side Underrun Protection Systems and the application of Side Underrun protection to heavy duty trucks and heavy trailers. The Advisory Procedure has been drafted to apply to a generalized range of typical Australian transport industry trucks and trailers and provides guidance for “deemed” compliance in accordance with the requirements as set-out in UN-ECE regulation R73. It is not, nor is it intended to be, complete or without exceptions.

2. DEFINITIONS

Definitions and abbreviations as referenced may be viewed at the ATA-ITC Technical Dictionary:

<https://www.truck.net.au/system/files/industry-resources/ATA%20ITC%20Technical%20Dictionary.pdf>

3. COMPLIANT SIDE UNDERRUN PROTECTION - TRUCKS

By installing Side Underrun Protection to trucks (rigid or prime mover) in accordance with this Technical Advisory Procedure, the installation would be “deemed to comply” with requirements in UN-ECE R73. The 10 October 2017 version of UN-ECE R73 is the referenced document.

The UN-ECE R73 inboard dimension is a maximum of 150 inboard from the outermost plane (maximum width of the vehicle).

The area of intended protection is primarily the side area of a vehicle where intrusion by a pedestrian and/or a cyclist could result in their personal injury.

WARNING: Any gap between truck and trailer will probably not be able to be fully protected by Side Underrun Protection and could remain a potential risk.

The longitudinal section to be protected is typically:

- a) that area rearward of the fuel tank(s), battery box and in front of the drive axle group; and,
- b) that area rearward of the forward axle group, where applicable:

Vertically, the section of protection is:

- c) Not less than 550^{mm} above ground level; and,
- d) Goes to the top of the tyre or 950mm above the ground, whichever is lesser.

For trucks with low chassis heights the coaming and rope rail assembly in its normal position is acceptable as complying as the top rail of the SUP. However, additional SUP protection at a lower level will usually be needed. If rails are used for the SUP, the lower rail should be not more than 300 mm below the bottom of the rope rail and not more than 550 mm above the ground.

In plan the SUP must not be more than 150^{mm} in-board of the outer edge of the vehicle, except that immediately forward of the tyres any supplementary installed

SUP must not be more than 30^{mm} inboard of the outer edge of the tyres. Wheel enclosing mudguards over rear tyres are SUP immediately ahead/rear of tyres. Refer “Clarification of requirements for SUP” below for deemed to comply mudguards.

SUP and Twin Steer Trucks:

The Australian Design Rules limit the centre distance between tandem axles at 2.0^{metres}. This limit might be exceeded subject to special approval (such as PBS etc.)

This technical advisory procedure recommends that SUP be fitted between the twin steer axles where the gap between tyres is not fully protected-by the cab or the axle centres are greater than 2.1^{metres}.

4. COMPLIANT SIDE UNDERRUN PROTECTION – TRAILERS:

By installing Side Underrun Protection to semi-trailers in accordance with this Technical Advisory Procedure, the installation would be “deemed to comply” with requirements in UN-ECE R73.

The UN-ECE R73 inboard dimension is a maximum of 150mm.

The area of intended protection is primarily the side area of a vehicle below 950mm off the ground where intrusion by a pedestrian and/or a cyclist could result in their personal injury.

The longitudinal section to be protected is typically:

- a) that area rear ward of the landing legs and in front of the axle group; and,
- b) that area rearward of the axle group:

Vertically, the section of protection is:

- c) Not less than 550mm above ground level; and,
- d) Goes to the top of the tyre or 950mm above the ground, whichever is lesser.

Note: Specialist trailer types such as double drop decks will require further interpretation by your trailer manufacturer/supplier.

Note: Vehicle modification by the later change of tyre size(s) may require modification of any SUP to ensure continued compliance. This is not currently an explicit VSB6 item.

In plan, the SUP must not be more than 150^{mm} in-board of the outer edge of the vehicle, except that immediately forward of the tyres any supplementary installed

SUP must not be more than 30^{mm} inboard of the outer edge of the tyres. Wheel enclosing mudguards over rear tyres are SUP immediately ahead/rear of tyres.

Notes Trucks and Trailers:

1. *For all vehicles, the outer width of the “body” shall be a vertical longitudinal plane passing through the outermost vehicle feature – maximum legal width.*
2. *Equipment such as fuel, oil or DEF tanks provided within the dimensional scope of “Side Underrun Protection” is accepted as forming part of the SUP.*
3. *Equipment such as toolboxes, air tanks or battery boxes provided within the dimensional scope of “Side Underrun Protection” is accepted as forming part of the SUP.*

Protruding step should have a vertical depth of at least 42^{mm}.

5. TECHNICAL SPECIFICATIONS FOR LATERAL PROTECTION DEVICES:

The following specifications are drawn directly from UN-ECE Regulation 73 Section 12 (Requirements) as follow:

- 5.1. The lateral protective device shall not increase the overall width of the vehicle and the main part of its outer surface shall not be more than 150^{mm} inboard from the outermost plane (maximum width) of the vehicle. Its forward end may be turned inwards on some vehicles in accordance with paragraphs 5.4.3 and 5.4.4. Its rearward end shall not be more than 30 mm inboard from the outermost edge of the rear tyres (excluding any bulging of the tyres close to the ground) over at least the rearmost 250^{mm}.
- 5.2. The outer surface of the device shall be smooth, and so far as possible continuous from front to rear; adjacent parts may however overlap provided that the overlapping edge faces rearwards or downwards, or a gap of not more than 25^{mm} measured longitudinally may be left, provided that the rearward part does not protrude outboard of the forward part; domed heads of bolts or rivets may protrude beyond the surface to a distance not exceeding 10^{mm} and other parts may protrude to the same extent provided that they are smooth and similarly rounded; all external edges and corners shall be rounded with a radius not less than 2.5^{mm}.

Note: Checker plate used for the covers of battery or tool boxes shall be deemed to be “smooth” in this context only.

- 5.3. LPD ^[SUP] may consist of a continuous flat surface, or of one or more horizontal rails, or a combination of surface and rails; when rails are used, they shall be not more than 300 mm apart vertically and not less than:
50 mm high in the case of N₂ and O₃;
100 mm high and essentially flat in the case of N₃ and O₄;
Combinations of surfaces and rails shall form a practically continuous side guard; subject, however, to the provisions of 5.2.
- 5.4. The forward edge of the side guard shall be constructed as follows:
- 5.4.1. Its position shall be:
- 5.4.1.1. on a motor vehicle: not more than 300^{mm} to the rear of the vertical plane perpendicular to the longitudinal plane of the vehicle and tangential to the outer surface of the tyre on the wheel immediately forward of the guard;
- 5.4.1.2. on a drawbar trailer: not more than 500^{mm} to the rear of the plane defined in paragraph 5.4.1.1;
- 5.4.1.3. on a semi-trailer: not more than 250^{mm} to the rear of the transverse median plane of the support legs, if support legs are fitted, but in any case, the distance from the front edge to the transverse plane passing through the centre of the kingpin in its rearmost position may not exceed 2.7^m.
- 5.4.2. Where the forward edge lies in an otherwise open space, the edge shall consist of a continuous vertical member extending the whole height of the guard; the outer and forward faces of this member shall measure at least 50^{mm} rearwards and be turned 100^{mm} inwards in the case of N₂ and O₃ and at least 100^{mm} rearwards and be turned 100^{mm} inwards in the case of N₃ and O₄.
- 5.4.3. On a motor vehicle where the 300^{mm} dimension referred to in paragraph 5.4.1.1. falls within the cab, the guard shall be so constructed that the gap between its forward edge and the cab panels does not exceed 100^{mm} and, if necessary, shall be turned in through an angle not exceeding 45°. In this case, the provisions of paragraph 5.4.2 are not applicable.
- 5.4.4. On a motor vehicle where the 300^{mm} dimension referred to in paragraph 5.4.1.1 falls behind the cab and the side guard is extended forward to within 100^{mm} of the cab, as an option to the manufacturer, then the provisions of paragraph 5.4.3 must be met.
- 5.5. The rearward edge of the side guard shall not be more than 300^{mm} forward of the vertical plane perpendicular to the longitudinal plane of the vehicle and tangential to the outer surface of the tyre on the wheel immediately to the rear; a continuous vertical member is not required on the rear edge.
- 5.6. The lower edge of the side guard shall at no point be more than 550^{mm} above the ground.

See 10: Interpretation/Advisory 1:

5.7. The upper edge of the guard shall not be more than 350^{mm} below that part of the structure of the vehicle, cut or contacted by a vertical plane tangential to the outer surface of the tyres, excluding any bulging close to the ground, except in the following cases:

See 10: Interpretation/Advisory 2:

5.7.1. Where the plane in paragraph 5.7 does not cut the structure of the vehicle, then the upper edge shall be level with the surface of the load-carrying platform, or 950^{mm} from the ground, whichever is the less;

See 10: Interpretation/Advisory 3:

5.7.2. Where the plane in paragraph 5.7 cuts the structure of the vehicle at a level more than 1.3^m above the ground, then the upper edge of the side guard shall not be less than 950^{mm} above the ground;

5.7.3. On a vehicle specially designed and constructed, and not merely adapted, for the carriage of a container or demountable body, the upper edge of the guard may be determined in accordance with paragraphs 5.7.1. and 5.7.2 above, the container or body being considered as part of the vehicle.

See 10: Interpretation/Advisory 4:

5.8. Side guards shall be essentially rigid, securely mounted (they shall not be liable to loosening due to vibration in normal use of the vehicle) and, except as regards the parts listed in paragraph 5.9, made of metal or any other suitable material. The side guard shall be considered suitable if it is capable of withstanding a horizontal static force of **1 kN (102 kg force)** applied perpendicularly to any part of its external surface by the centre of a ram the face of which is circular and flat, with a diameter of 220^{mm} ± 10^{mm}, and if the deflection of the guard under load is then not more than:

30^{mm} over the rearmost 250^{mm} of the guard, and

150^{mm} over the remainder of the guard.

Compliance with this requirement can be verified by calculation.

5.9. Components permanently fixed to the vehicle, e.g. spare wheels, battery box, air tanks, fuel tanks, lamps, reflectors and tool boxes may be incorporated in the side guard, provided that they meet the dimensional requirements of this Regulation. The requirements of paragraph 5.2 shall generally apply as regards gaps between protective devices and permanently fixed components. Therefore, the fixed components should not create a protrusion in the SUP.

5.10. The guard rail may not be used for the attachment of brake, air or hydraulic pipes.

6. CLARIFICATION OF REQUIREMENTS FOR SUP ON TRUCKS:

The following notes are provided for clarification of the requirements of Clause 7.9 in regard to truck supplementary installed SUP installation, in conjunction with fuel tanks, hydraulic tank, DEF tank, battery box, etc., as are typical in the Australian heavy-duty truck fleet.

Based on the intent of UN-ECE R73 to minimize the risk of pedestrians and or a cyclist falling under the side of a vehicle and being caught under the wheels, structural components that provide similar intrusion prevention can be deemed to comply:

- Any tank package or battery/toolbox located primarily under the cab/sleeper, provided that the vertical face of attached access steps are at least 42mm tall and that the outer leading edge is radiused.
- Tank packages for fuel, DEF, water or oil rear of the cab/sleeper that have an outer face within 150^{mm} (refer Concessional Note 1:) of the outer edge of the truck body (Usually 2.5^m width for NC vehicles).
Access steps attached to that tank shall be deemed to comply provided that the vertical face of the step is at least 42^{mm} tall and that the outer leading edge is radiused.
Fitment of step arrangements that are moderately raked inboards for ease of access are acceptable, provided that there is no more than 50^{mm} horizontal difference between the outer edges of the lower and upper steps.
- Battery or toolboxes air tanks rear of the cab/sleeper that have an outer face within 150^{mm} of the outer edge of the truck body (Usually 2.5^m width for NC vehicles). However, projecting brackets or steps that do not comply with Clause 5.2 will require fitment of covering horizontal rails or continuous panels.
Access steps shall be deemed to comply provided that the vertical face of the step is at least 42^{mm} tall and that the outer leading edge is radiused.
- Fitment of a mudguard that covers the outer shoulder of the tyres down to below the centre of the axle(s). Refer Figure 4 below
- SUP shall not be fitted if there is increased OH&S risks for the vehicle operator and there is no other practical alternative

Any longitudinal gap that exceeds 300^{mm} will require fitment of a covering SUP, including across tanks or boxes that are more than 150^{mm} from the outer edge of the truck body.

Technical Note:

Where the fitment of technically essential safety related equipment would be degraded by the installation of enclosed SUP, then safe access to that equipment shall override the SUP requirement (eg: frame access steps) and its presence shall be deemed as SUP compliant. Not withstand this exemption, reasonable steps shall be taken to minimize any potential reduction in guarding the rear wheels.

7. MATERIAL SELECTION:

Materials used in SUPs must be able to withstand the relatively low design load of 1kN (102 kgf) applied over a 220^{mm} diameter contact area.

The options considered in this TAP are:

- Steel Purlins
- Aluminium Channel
- Monopan 30 Composite Panel

Basic calculations for stress and bending have been completed for readily available steel and aluminium structural sections, including C-section steel purlin and Aluminium Channel.

Selected sections - C10015 & C15012 steel purlin and UA2464^(100x50) & UA5058^(125x50) aluminium channel sections are nominally 2.6 to 3.9 kg/metre, with support requirements ranging from 1900^{mm} thru 3000^{mm}.

Actual testing has been completed for Monopan 30 Composite Panel to determine bending resistance and crush resistance.

The Monopan 30 Composite panel (30^{mm} thickness) is provided in sheet form. A minimum section width of 225^{mm} is required in the material for SUP construction. At a section width of 225^{mm}, the material needs to be supported at not less than 950^{mm} centres; as the section width is increased so do the minimum support centres. At 450^{mm} width the supports may be increased to 1900^{mm}.

Section	Maximum Span - Supported	Maximum Overhang
Steel - C10015	2400	600
Steel - C15012	3000	700
Aluminium - UA2464	1900	400
Aluminium - UA5058	2150	450
Monopan 30 – 225 ^{mm}	950	300
Monopan 30 – 450 ^{mm}	1900	450

Your trailer manufacturer/supplier or SUP installer will be able to calculate alternatives for material options and installation.

Installation:

Drawings are attached below to assist in interpretations for installation.

References:

At the time of printing, the UN-ECE Vehicle Regulations can be located at:
<http://live.unece.org/trans/main/wp29/wp29regs61-80.html>

Type Tyre Dimensions – check with your tyre supplier:

	265/70R19.5	275/80R22.5	11R22.5	295/80R22.5	445/50R22.5	385/65R22.5
Typical free Radius	440	515	532	531	504	546
Typical Laden Radius	400	482	492	492	464	496
Tyre Height (typical)	840	997	1024	1023	968	1042

Vehicle Category	ADR Category Code	UNECE Category Code
Medium Goods Vehicle Over 4.5 tonnes up to 12 tonnes GVM	NB NB2	N2
Heavy Goods Vehicle	NC	N3
Medium Trailer	TC	O3
Heavy Trailer	TD	O4

8. EXCEPTIONS OR ALTERATIONS:

Vehicles of the following types need comply only as indicated in each case.

The paragraphs referred to below are from UN-ECE R73, which at the time of publication can be accessed at:

<http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/R073r1e.pdf>.

- a) An extendable trailer shall comply with all the requirements of paragraph 12 (Section 5 of this TAP). When closed to its minimum length; when the trailer is extended, however, the SUP need only comply with sections 5.8., 5.9., and 5.10., and with either paragraph 5.4. or 5.5., but not necessarily both; extension of the trailer shall not produce gaps along the length of the SUP;
- b) A tank vehicle, that is a vehicle designed solely for the carriage of a fluid substance in a closed tank permanently fitted to the vehicle and provided with hose or pipe connections for loading or unloading, shall be fitted with SUP that comply so far as is practicable with all the requirements of paragraph 12.; strict compliance may be waived only where operational requirements make this necessary;

- c) On a vehicle fitted with extendable legs to provide additional stability during loading, unloading or other operations for which the vehicle is designed, SUP may be arranged with additional gaps where these are necessary to permit extension of the legs;
- d) On a vehicle equipped with lashing and securing points in accordance with ISO 9367-1:1989 or ISO 9367-2:1994 for water borne transportation on Ro/Ro vessels, gaps shall be permitted within SUP to accept the attachment of restraint devices.
- e) On a vehicle fitted with a crane for loading, unloading or other operations for which the vehicle is designed, making it impracticable to comply with all the requirements of paragraph 12, the SUP may be arranged with additional gaps where these are necessary to permit the movement or stowage of the crane.

If the sides of the vehicle are so designed and/or equipped that by their shape and characteristics the component parts together meet the requirements of paragraph 12, they may be regarded as replacing the SUP. (This provision includes toolboxes – but must meet the lateral positioning requirements).

9. CONFORMANCE AND MAINTENANCE:

Conformance: This Technical Advisory Procedure provides for the application of Side Underrun Protection to a generalized range of typical Australian transport industry trucks and trailers and guidance for “deemed to comply” in accordance with the requirements as set-out in UN-ECE regulation R73. The fitment of Side Underrun Protection is voluntary, conformance to the intent of this Technical Advisory Procedure is the responsibility of both the vehicle owner and the vehicle operator.

Maintenance: For vehicles to be able demonstrate continued conformance to this Technical Advisory Procedure, the vehicle SUP installation needs to be maintained in accordance with these guidelines and/or the SUP Installer’s design.

10. INTERPRETATIONS AND ADVISORIES

These interpretations and Advisories have been included as guidance in response to queries raised by users of this Technical Advisory Procedure.

They are intended to assist users referencing this document to achieve consistent outcomes.

April 2020:

1. Section 5 Clause 5.6: The 550^{mm} is the maximum gap to the ground from the lower side of the lower “conforming” SUP rail.
2. Section 5 Clause 5.7: 350^{mm} is the maximum gap from coaming or structure to rail to the top side of the upper “conforming” SUP rail.
3. Section 5 Clause 5.7.1: For special application trailers (eg: drop and double drop deck) where the frame or combing rail is below 950^{mm}, the intent is to provide within the structure limitations Side Underrun Protection to an extent as far as is practical.
4. Skeletal (container) Trailers: SUP design should consider the fitment of a continuous side rail in accordance with the recommendations of this Technical Advisory Procedure.

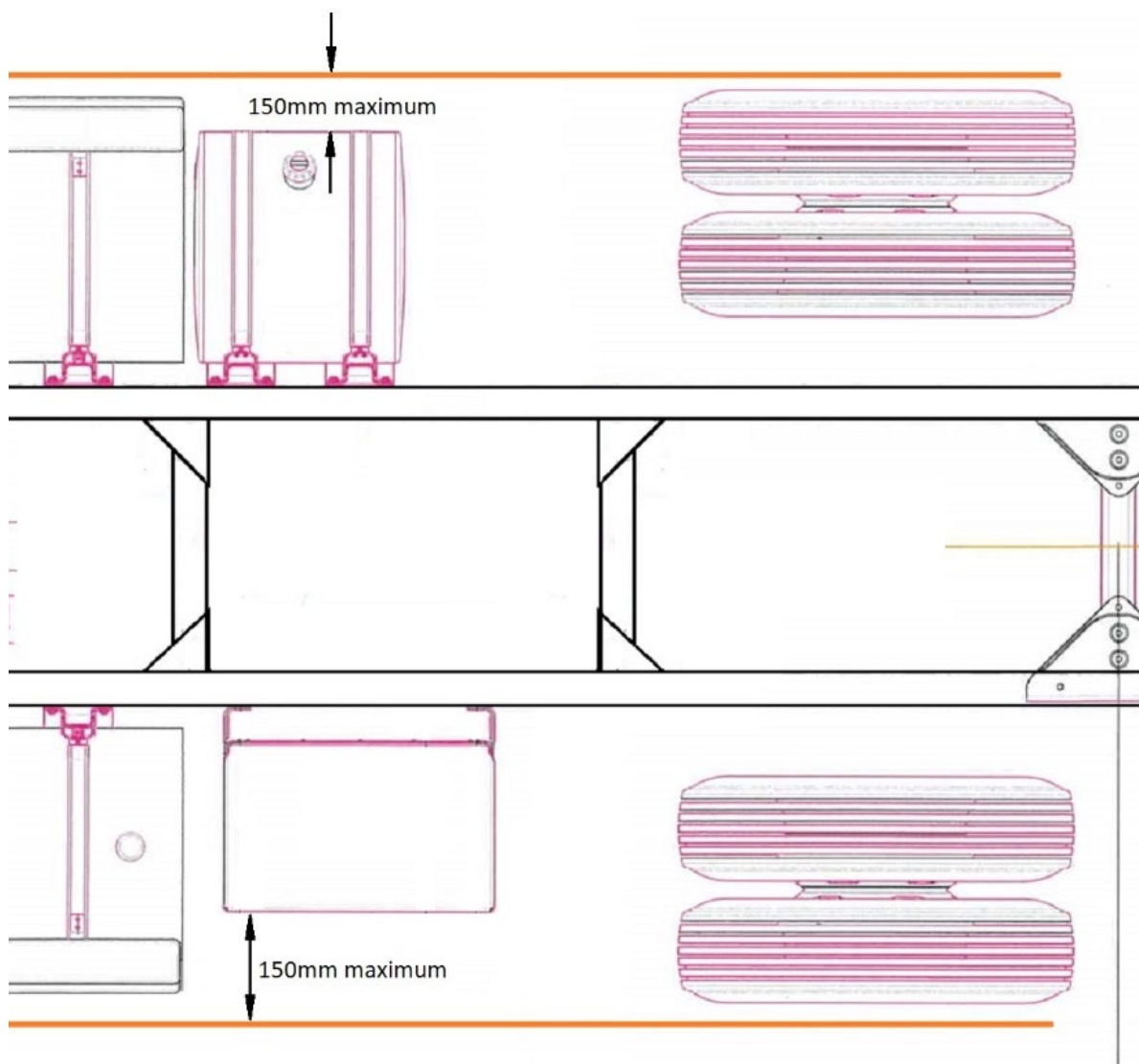


Figure 1

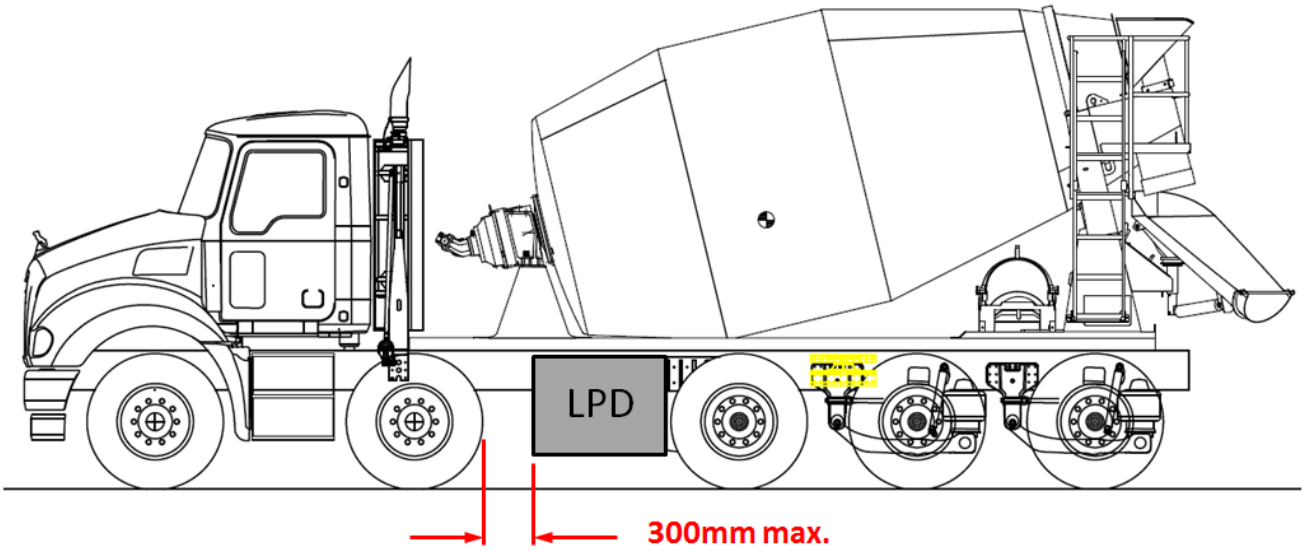


Figure 2

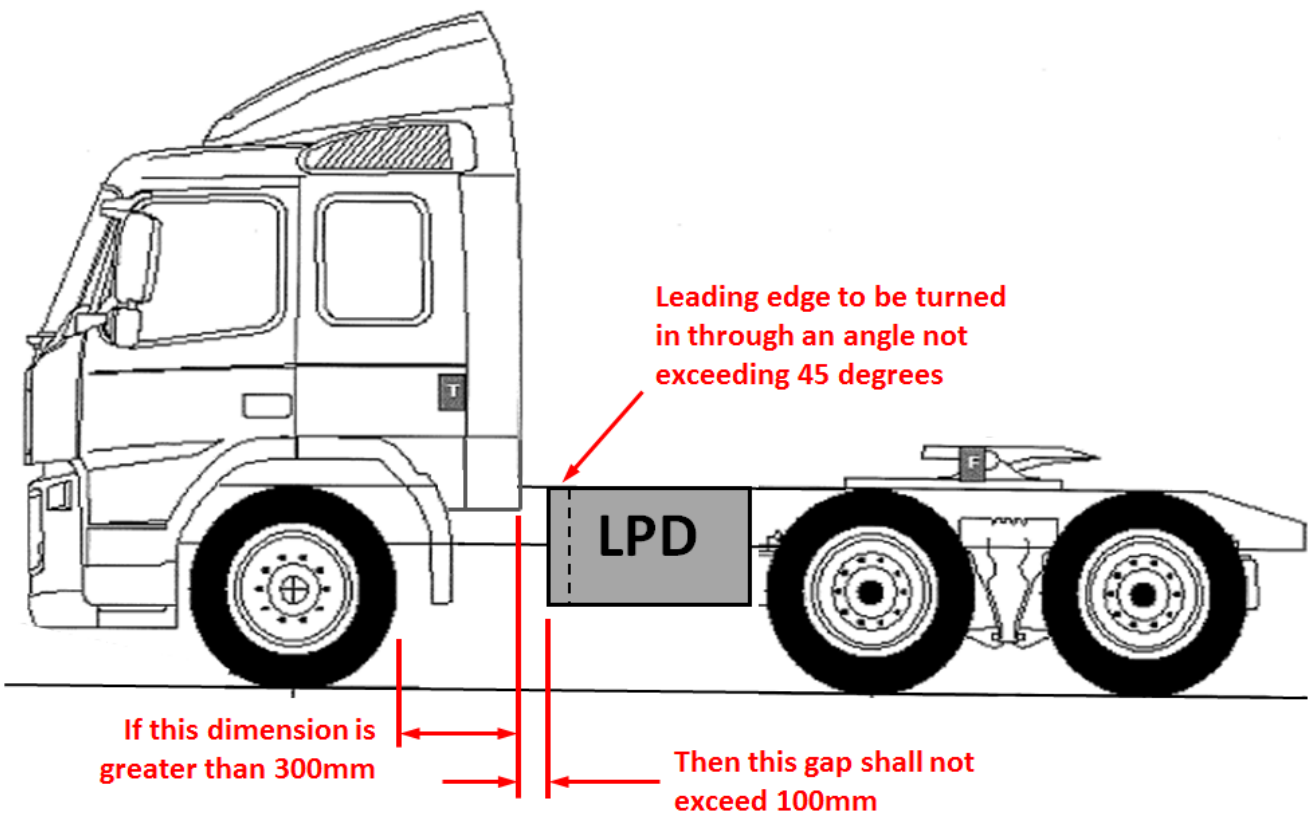


Figure 3

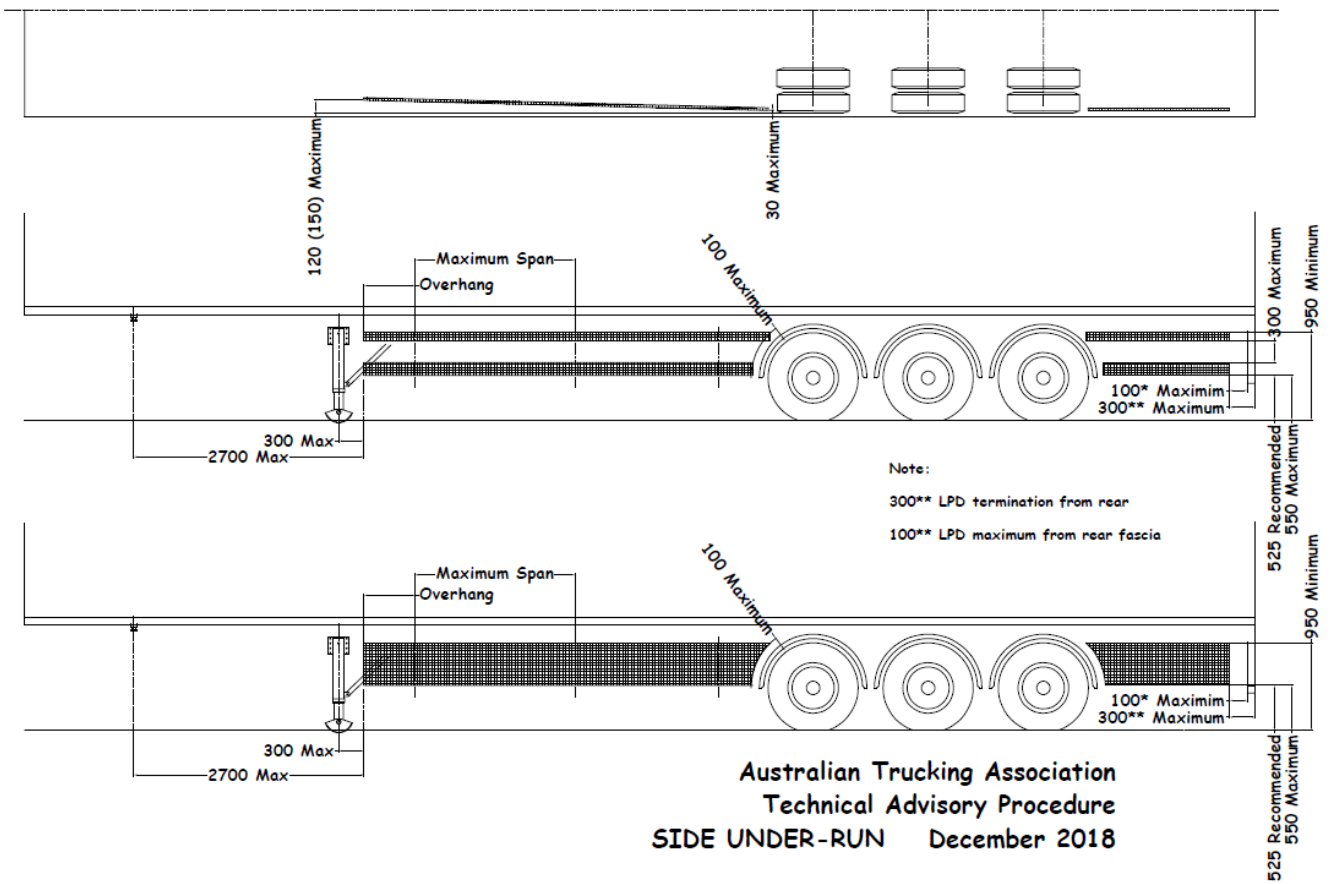


Figure 4

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