

## Section P

# Tow Couplings

### Contents

<b>Section P — Overview</b>	<b>2</b>		
1. Description	2		
2. Related Australian Design Rules	2		
3. Record keeping	2		
4. Design requirements	2		
5. Tow coupling and fifth wheel applications	3		
<b>Modification Code P1 — Towbar and coupling installation other than fifth wheels and kingpins</b>	<b>4</b>		
1. Scope	4		
2. Related standards	4		
3. Certification procedure	4		
4. Compliance requirements	4		
5. Design requirements	4		
6. Installation requirements	6		
P1 Checklist — Towbar and coupling installation other than fifth wheels and kingpins (example)	10		
		<b>Modification Code P2 — Fifth wheel and kingpin installation</b>	<b>11</b>
		1. Scope	11
		2. Related standards	11
		3. Certification procedure	11
		4. Compliance requirements	11
		5. Design requirements	11
		6. Installation requirements	12
		P2 Evaluation sheet — Fifth wheel and turntable evaluation report (example)	18
		P2 Checklist — Fifth wheel and kingpin installation (example)	19

# Section P — Overview

## 1. Description

This section of Vehicle Standards Bulletin 6 (VSB6) relates to the fitting of tow couplings to heavy vehicles. It outlines minimum design, installation and performance requirements to select and mount tow couplings, including fifth wheels, drawbars and towbars and associated componentry on heavy vehicles.

Modifications that may affect the tow coupling include:

- prior fitting of a tow coupling (including fifth wheel)
- fitting of a bullbar
- change of a tow coupling/fifth wheel
- relocation of a tow coupling (including fifth wheel)
- re-rating the D-value of a tow coupling
- change to chassis rear overhang
- fitting of additional axle
- modification of wheelbase
- change of axles
- refurbishment requiring welding or change of design.

### Scope limit

This section is limited to fitting and refurbishment of drawbars, safety chains and tow couplings that comply with ARD 62/.. including:

<b>Fifth wheel coupling types</b>	<ul style="list-style-type: none"> <li>• fifth wheel turntables to towing vehicles</li> <li>• kingpin assemblies to trailers.</li> </ul>
<b>Non-fifth wheel coupling types</b>	<ul style="list-style-type: none"> <li>• 50 mm pin-type coupling</li> <li>• 50 mm ball coupling <sup>1</sup></li> <li>• 127 mm ball coupling</li> <li>• hook coupling</li> <li>• other couplings.</li> </ul>

<sup>1</sup> For the requirements on the installation of a 50 mm ball coupling on vehicles with a GVM over 5 t, see Modification Code P1, '6. Installation requirements'.

### Modification codes

This section consists of the following modification codes:

<b>P1 Install towbar couplings</b>	<ul style="list-style-type: none"> <li>• selecting and mounting towbars and couplings other than fifth wheel and kingpin</li> <li>• designing and constructing towbars and couplings mounting other than fifth wheel and kingpin</li> <li>• attaching safety chains and safety chain attachment points</li> <li>• fitting trailer electrical connectors (other than ABS connection).</li> </ul>
<b>P2 Install fifth wheel and kingpin</b>	<ul style="list-style-type: none"> <li>• fitting of fifth wheel / turntable assemblies, including construction of base and mounting of fifth wheel / turntable</li> <li>• fitting of kingpin assemblies to trailers.</li> </ul>

## 2. Related Australian Design Rules

The Australian Design Rules (ADRs) relevant to this section include:

ADR no.	Title
35/..	Commercial Vehicle Brake Systems
38/..	Trailer Brake Systems
42/..	General Safety Requirements
43/..	Vehicle Configuration and Dimensions
44/..	Specific Purpose Vehicle Requirements

62/..	Mechanical Connections Between Vehicles
63/..	Trailers Designed for Use in Road Trains
84/..	Front Underrun Impact Protection

## 3. Record keeping

The person responsible for certifying the modification should:

- collate complete records, including drawings, calculations, test results and copies of the appropriate issue of Australian Standards and ADRs
- retain the records for a minimum of seven years after commissioning of the modified vehicle
- make the records available upon request for inspection by officers of the relevant federal, state or territory authority or heavy vehicle regulator.

### Reports and checklists

The person responsible for certifying the modification must complete and record the following reports and checklists as applicable:

P1 Checklist	Towbar and coupling installation other than fifth wheels and kingpins
P2 Checklist	Fifth wheel and kingpin installation
P2 Evaluation sheet	Fifth wheel and turntable evaluation report

## 4. Design requirements

### Advanced braking systems

Advanced braking systems are an important safety feature fitted to many new vehicles.

Advanced braking systems are programmed by the vehicle manufacturer and are specific to the vehicle to which they are fitted. Changes made to the vehicle, such as engine, tyre size, steering control, suspension characteristics, vehicle mass and its distribution, may impact the performance of the advanced braking system.

Exercise extra caution when modifying vehicles fitted with advanced braking systems. Electric braking systems may be known as:

- electronic stability control (ESC)
- electronic stability program (ESP)
- vehicle stability control (VSC)
- dynamic stability control (DSC)
- vehicle stability assist (VSA)
- roll stability control (RSC)
- roll control system (RCS)
- electronic braking system (EBS)
- trailer electronic braking system (TEBS).

⚠ Advanced braking systems and their components may be easily damaged by common modification, maintenance and servicing techniques, such as the use of rattle guns within one metre of the sensors. When undertaking any work on a vehicle fitted with an advanced braking system, ensure all modifiers are familiar with these systems and the precautions that must be taken.

⚠ Ensure that before undertaking any modification on a vehicle that is fitted with an advanced braking system the modifier and approved vehicle examiner (AVE) consult with the vehicle manufacturer to determine the impact on the system.

## 5. Tow coupling and fifth wheel applications

Typical tow coupling applications used in Australia are shown in Figure 1.




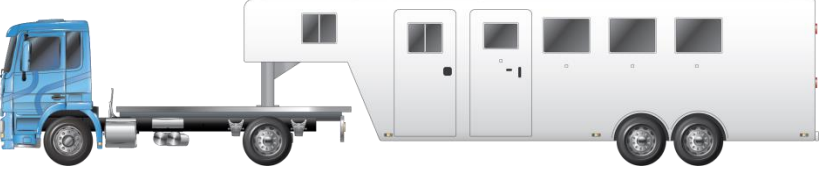
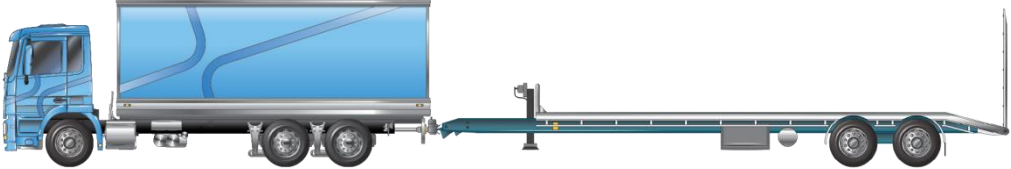

<p><b>Dog trailer</b></p>	 <p>Typical couplings for this application are automatic pin-type couplings.</p>
<p><b>Pig trailer — fixed drawbar</b></p>	 <p>This type of trailer can result in unknown vertical coupling forces due to unpredictable trailer load position in relation to suspension and is of concern under heavy braking conditions. Increase in drawbar length reduces this effect.</p> <p>Typical couplings for this application are ball couplings or hook type couplings.</p>
<p><b>Pig trailer — articulated drawbar</b></p>	 <p>Typical couplings for this application are automatic pin-type couplings.</p>
<p><b>Semitrailer (gooseneck type)</b></p>	 <p>Typical couplings for this application are ball couplings or mini fifth wheels.</p>
<p><b>Semitrailer not attached by fifth wheel</b></p>	 <p>This type of trailer reduces some vertical load uncertainty on the coupling by situating the load forward of the trailer's suspension centre.</p> <p>Typical couplings for this application are ball couplings or hook type couplings.</p> <p>This type of trailer has a rigid drawbar and requires safety chains to be fitted.</p>
<p><b>Semitrailer — attached by fifth wheel</b></p>	 <p>This trailer type applications reduce some vertical load uncertainty on the coupling by situating the load forward of the trailer's suspension centre.</p> <p>Typically the coupling on the vehicle is placed on or ahead of the axle centreline.</p> <p>Typical couplings for this application are fifth wheels.</p>

Figure 1: Typical tow coupling applications

# Modification Code P1 — Towbar and coupling installation other than fifth wheels and kingpins

## 1. Scope

Modifications covered under this code:

Covered
<ul style="list-style-type: none"> <li>selecting and mounting tow coupling</li> <li>designing and constructing tow coupling mounting</li> <li>attaching safety chains and safety chain attachment points</li> <li>fitting trailer electrical connectors (other than ABS connection)</li> <li>selecting and mounting towbars and their brackets</li> <li>selecting and mounting drawbars and eyes</li> <li>installing, modifying, replacing or increasing the rating of a towbar</li> <li>installing, modifying, replacing or increasing the rating of a tow coupling other than a fifth wheel or kingpin</li> <li>installing, modifying, replacing or increasing the rating of a trailer drawbar</li> <li>changing a trailer tow coupling to a different type, specification or rating</li> <li>changing a motor vehicle tow coupling to a different type, specification or rating.</li> </ul>

Not covered
<ul style="list-style-type: none"> <li>fitting components that are not compatible with original vehicle components</li> <li>installation of trailer air brake controls (see VSB6 Modification Code G2)</li> <li>fitting components not designed for automotive use or on-road use</li> <li>fitting of any component that does not comply with the ADRs or relevant heavy vehicle standards regulation</li> <li>modifications that do not meet the requirements of this code</li> <li>installing kingpins and fifth wheels (see Modification Code P2).</li> </ul>

## 2. Related standards

Modified vehicles must comply with all ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The certifier must ensure that the modified vehicle continues to comply with all related ADRs.

This...	Must comply with...
Design and construction of a towbar	VSB6 Section P — Tow couplings ADR 62/..
Selection of tow coupling	Good engineering practice
Safety chain attachment	
Brake lines and connections, including trailer ABS plug	VSB6 Section G — Brakes ADR 35, 35A, 35/.. , ADR 38, 38/.. SAE Standards
Trailer electrical connections (other than ABS connection)	VSB6 Section P — Tow couplings

## 3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the modification is within manufacturer specifications. <ul style="list-style-type: none"> <li>If <b>yes</b>, the modification will need to be done in accordance with manufacturer specifications.</li> <li>If <b>no</b>, the modification will need to be done in accordance with this modification code.</li> </ul>
2.	Modifier	Consult with an accredited P1 AVE for guidance on how to perform the modification.
3.	Modifier	Perform modification in accordance with AVE advice and this code.
4.	Modifier	Organise approval inspection by an accredited P1 AVE.
5.	P1 AVE	Perform inspection, complete P1 checklist and determine if compliance has been achieved: <ul style="list-style-type: none"> <li>If <b>yes</b>, proceed to step 6.</li> <li>If <b>no</b>, do not proceed, advise modifier rework is required to ensure compliance. Return to step 2.</li> </ul>
6.	P1 AVE	Issue modification certificate, affix modification plate, and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that vehicle modification requirements are being met. It is advised that before modifications are carried out they are discussed with the certifying AVE.

## 4. Compliance requirements

This code primarily relies on ADR 62/.. Mechanical Connections between Vehicles, which applies to heavy vehicles manufactured after July 1991 and draws together a number of Australian Standards that have been introduced progressively over 25 years. All new installations other than front mounted couplings must comply with ADR 62/.. requirements and all other couplings should be upgraded to comply with this ADR.

This code applies to modifications of all vehicles regardless of whether they were manufactured to comply with ADR 62/.. .

## 5. Design requirements

For most vehicles, guidelines for the installation of towbars and tow couplings will be available from the vehicle manufacturer. Where manufacturer's guidelines have been produced, ensure that the installation complies with these guidelines rather than VSB6.

Towbars and tow couplings are safety critical components and are required to undergo rigorous testing in accordance with ADR 62/.. . Whenever a towbar or tow coupling is manufactured it must be verified as complying with ADR requirements, including where a towbar or tow coupling is manufactured individually or in low volumes.

The vertical load is a critical specification when choosing a coupling and designing the installation. Typically the static vertical load is the load that can be measured at the coupling point when the vehicle is stationary on flat level ground and disconnected. Whilst the actual vertical coupling load is subject to fluctuation while underway, the static vertical load gives a measurable common point that can be designed.



## Rating of tow couplings

### Rating by D-value

D-value is an expression that quantifies the dynamic performance required of the tow coupling as a function of the separate masses of truck and trailers. Formulae to calculate D-value are given in:

- AS 2213.1-2001 Commercial road vehicles - Mechanical connections between towing vehicles - Selection and marking of pin-type couplings and drawbar eyes
- AS/NZS 4968.1:2003 Heavy-road vehicles - Mechanical coupling between articulated vehicle combinations
- AS/NZS 4968.2:2003 Heavy-road vehicles - Mechanical coupling between articulated vehicle combinations - Testing and installation of fifth wheel and associated equipment.

If components of different D-values are connected in a vehicle combination, the component with the lowest D-value determines the overall rating of the tow coupling.

### Required:

- Ensure the trailer couplings and drawbar (as applicable) are rated by their manufacturer with a D-value (in kilonewtons) and tested in accordance with the Australian Standard.
- Ensure that the tow coupling is clearly and permanently marked with the rated D-value and name or trademark of the manufacturer in accordance with ADR 62/..
- Ensure where the coupling is a 50 mm pin-type coupling or hook type coupling, that it is also marked with the rated vertical load V-value.
- Ensure that tow coupling assemblies for road train application have a D-value of not less than 186 kN.

### Further coupling rating restrictions

<b>Vertical load</b>	This is imposed on the tow coupling by the trailer due to variables such as load distribution, trailer design as well as braking loads, and can be significant in some trailer applications. <ul style="list-style-type: none"> <li>• Do not exceed vertical load rating of the coupling and use both vertical and horizontal loads to assess coupling suitability.</li> <li>• Do not exceed vertical and horizontal ratings. Formulae for calculating V-value are given in AS 2213.1-2001 Commercial road vehicles – Mechanical connections between towing vehicles – Selection and marking of pin-type couplings and drawbar eyes.</li> </ul>
<b>Gross trailer mass rating</b>	Reference to trailer GTM rating is used by some tow coupling manufacturers to rate their products. This method alone is not permissible under ADR 62/.. and as such couplings with a 'only a GTM' rating are not to be installed. <ul style="list-style-type: none"> <li>• Where a coupling has a GTM rating, ensure it is not exceeded.</li> <li>• Do not install couplings with only a GTM rating.</li> </ul>

<b>Aggregate trailer mass rating</b>	ATM is the total mass of the laden trailer when carrying the maximum mass recommended by the manufacturer, and any mass imposed on the drawing vehicle when the combination rests on a horizontal supporting plane. As this rating does not allow for dynamic interaction between the towing vehicle and trailer it is not of itself a suitable basis to inform selection coupling. <ul style="list-style-type: none"> <li>• Do not exceed the ATM rating of the coupling.</li> </ul>
<b>Gross combination mass (GCM)</b>	GCM rating may restrict the coupling that can be used but as it does not allow for dynamic interaction between the towing vehicle and trailer, this method alone is not permissible under ADR 62/.. and as such couplings with a 'only a GCM' rating are not to be installed. <ul style="list-style-type: none"> <li>• Ensure that when the GCM of the vehicle or combination is increased all couplings are appropriately rated.</li> <li>• Where a coupling has a GCM rating, ensure it is not exceeded.</li> <li>• Do not install couplings with only a GCM rating.</li> </ul>
<b>Maximum load rating</b>	Manufacturers use maximum load to rate front mounted pin couplings. As most are not rated for use on road they should be marked as such. <ul style="list-style-type: none"> <li>• Assess the rating against the GCM of the towed vehicle when towing.</li> </ul>

## Tow coupling selection

### Required:

- Ensure tow couplings selected for an application satisfy the requirements of this section.
- Calculate the required D-value for the particular application to select a coupling and design the attachment assembly of appropriate strength rating.
- Ensure the capacity of all towing components is at least equal to the D-value rating requirement of the vehicle combination.
- Ensure the coupling is certified for road use.
- Ensure the coupling meets the requirements of ADR62/..

### Recommended:

The following combination of tow couplings and application are suggestions only and there are many exceptions to the recommendations below. When selecting a tow coupling, it is the responsibility of the modifier to ensure that the tow coupling is suitable for the application.

- Use pin-type couplings in applications where a low vertical load is imposed on the coupling assembly, e.g. hinged (articulated) drawbar trailers.
- Use ball couplings where:
  - high vertical loads are imposed
  - the articulation point needs to be at the rear of the vehicle (e.g., rigid motor vehicles).
- Use fifth wheels for applications that are subject to high vertical loads imposed on the coupling assembly and where the articulation point does not need to be at the rear of the vehicle, e.g., standard semitrailers.
- Use hook couplings for rigid or hinged drawbar trailers in rough terrain off-road applications.

## Tow coupling location

- Coupling overhang for all vehicles must be as specified in ADR 62/.. , ADR 63/.. and/or ADR 44/.. as applicable.
- Coupling height for road train vehicles must be as specified in ADR 62/.. and/or ADR 63/.. as applicable.

## Drawbar strength and design

### Required:

- For combinations with a single trailer, ensure the drawbar can withstand forces specified in ADR 62/.. .
- Ensure that calculations, simulations or test results that demonstrate compliance with ADR 62/.. are made available for retention by the certifying AVE.
- Attach the drawbar securely to a substantial portion of the trailer.
- Ensure drawbar length on a dog trailer or converter dolly does not exceed 5 m.
- For road trains, ensure the:
  - drawbar can withstand forces specified in ADR 63/..
  - length exceeds 3 m but does not exceed 5 m
  - location and height of the drawbar and drawbar pivots comply with ADR 63/.. .
- For rigid drawbar trailers ensure the distance between the coupling pivot point and the centre of the axle group does not exceed 8.5 m.

### Recommended:

- Ensure drawbar length is the minimum practicable length whilst remaining consistent with vehicle operation and symmetrically mounted to the chassis.
- Design the drawbar using good engineering practice.
- Design the change in cross-section between the towing eye shank and drawbar structural members so they are as gradual as possible to prevent stress concentration.
- Ensure bends in structural members are as few as practicable and are reinforced.
- Fix the drawbar eye shank in the drawbar to prevent rotation where used with rotating type couplings.
- Avoid using material sections in the assembly that would allow dirt, moisture or material likely to cause corrosion to accumulate.

## 6. Installation requirements

### Towbar

Coupling manufacturers issue instructions and requirements for installation of their couplings, including towbar web thickness, hole pattern, bolt size, grade, torque and coupling assembly. Obtain and follow all instructions from the manufacturer.

Where manufacturer's guidelines have been produced, ensure that the installation complies with these guidelines rather than VSB6.

- The majority of couplings currently on the market will be accompanied with installation instructions provided by their manufacturer.
- Where provided, these instructions must be followed.
- Where installation instructions are not provided for a coupling, consideration should be given to whether the coupling is appropriate for road use.

### Required:

- Ensure the towbar complies with the requirements specified in ADR 62/.. including strength requirements.
- Ensure where the chassis or cross-member is reinforced to provide adequate strength for the tow member that all

chassis modifications are certified in accordance with VSB6 Section H.

- Except where the towbar is an integral part of the vehicle, ensure the towbar is clearly and permanently marked in accordance with ADR 62/.. .
- Ensure towbars can show compliance with ADR 62/.. either by:
  - calculations approved by the administrator of vehicles (Department of Infrastructure and Regional Development (DIRD)); or
  - testing conducted by a registered Road Vehicle Standards test facility or National Association of Testing Authorities facility.
- Ensure each bolt has a self-locking nut. Do not use a spot of weld or spring washers.
- Ensure bolts are at least ISO Grade 8.8 (SAE Class 5).
- Ensure the bolt pattern that connects the towbar to the chassis of the truck is designed with adequate strength for the intended rating, and meets or exceeds the ADR 62/.. strength requirements.
- Ensure a detailed assessment of the bolt group has been provided which takes into account the different loads that are imposed on each bolt in the group.
- Tension all towbar mounting bolts using recognised procedures and accurate tools to the bolt manufacturer's torque requirements.

### Recommended:

- Use fine thread M20 (3/4" UNF) bolts on a chassis with double web thickness.
- Use fine thread M16 (5/8" UNF) bolts on a chassis with single web thickness.
- Mount and bolt towbars centrally to the webs of the drawing vehicle chassis side member.
- Where vehicle manufacturers offer optional chassis components designed for the installation of end-of-frame tow couplings, install these components provided they are suitable for the rating of the tow coupling and application.
- Consider, as an alternative, mounting the towbar below the drawing vehicle chassis side-members and attaching them with fish plates of adequate size and strength to meet the requirements of ADR 62/.. .
- Apply the following load requirements for towbars (as advised in ADR 62/.. or ADR 63/.. for road train trailers:
  - Match drill bolt holes and provide a maximum clearance of 1 mm, and ream the holes to size as required.
  - Install suitable hardened washers under both the nut and bolt head.
  - Install bolts of appropriate thread length to ensure the thread portion is not within the shear area.

### 50 mm ball couplings

50 mm ball couplings are a common type of coupling used on heavy motor vehicles that tow trailers with an aggregate trailer mass (ATM) up to 3500 kg. Under ADR62/.. , 50 mm ball couplings intended for towing trailers with an ATM of up to 3500kg must comply with the requirements of AS 4177.2, which sets requirements about design, construction, dimensions, strength and testing.

#### **Installation of 50 mm ball coupling on vehicles with GVM of 5000 kg or less**

AS4177 allows a compliant 50 mm ball coupling to be used on a towing vehicle with a GVM of 5000 kg or less to tow a trailer with an ATM of up to 3500 kg. There is no impact on these types of vehicles.



**Recommended:**

Where the vehicle may not have a dedicated driver who is aware of the towing limitations of the vehicle, such as in a fleet situation:

- fit a label in or on the vehicle; or
- provide a towing capacity advice sheet listing the limit of the couplings

**Tow coupling****Required:**

- Replace deformed, badly worn or fractured drawbar components with new components or repair them in accordance with manufacturer recommendations.
- Fit drawbar eye bushes in accordance with manufacturer instructions and ensure they are not retained by welding.
- All welding complies with AS/NZS 1554.1:2011 Structural steel welding - Welding of steel structures.
- The mounting and gusset plate minimum thickness are as specified by the coupling manufacturer.
- Ensure uniformity when replacing drawbar eyes or tongues as follows:
  - A mounting plate to be bolted to the trailer drawbar is a minimum of six bolts of at least ISO Grade 10.9 (SAE Class 8) (for example, a pig trailer with a rigid drawbar with D-value of 17.3 tonnes needs six M20 ISO Grade 10.9 or 3/4" diameter SAE Class 8 bolts).
  - Welding of gussets to the drawbar eye are parallel to shank only with a minimum of four longitudinal welds (minimum 6 mm fillet), 150 mm in length and using hydrogen controlled electrodes or a hydrogen controlled welding process (see Figure 3).
  - No transverse or circumferential welding on the drawbar eye or drawbar attachment block is permitted unless specifically permitted by the coupling manufacturer.
  - The drawbar eye attachment (including attachment block if applicable) is designed and fabricated such that all welds are visible.
  - Forged drawbar eyes are not reclaimed.

**Drawbar installation**

Drawbars are a critical safety item. If a drawbar is modified or replaced it must comply with the requirements of ADR62/.. .

**Drawbar welding considerations****Drawbar eye****Required:**

- Ensure all welding complies with AS/NZS 1554.1:2011 Structural steel welding - Welding of steel structures.
- Weld side arms to the drawbar eye, or for a bolt-in drawbar eye weld side arms on the longitudinal parallel sides of the drawbar eye mounting plate or block.
- If the drawbar eye is removable from the drawbar eye mounting plate or block, before welding the block onto the drawbar remove the drawbar eye.
- Do not allow transverse or circumferential welds on the drawbar eye/block under any circumstances.
- Carry out all welds on the drawbar eye and drawbar mounting plate or block in accordance with the manufacturer's recommendations.

**Drawbar eye (where no manufacturer instructions exist)****Required:**

If there are no manufacturer recommendations for welding the drawbar eye, follow these weld guidelines (see Figure 3):

- Preheat drawbar eye to 250° C.
- Use low hydrogen electrodes, dried according to the manufacturer's recommendations or hydrogen controlled welding process, to make all welds, such as tack welds and welds on cover plates.
- Try to make weld runs out of a number of runs of small welds so that the heat input to the eye and structure is progressive.
- Use a minimum of four 6 mm fillet welds, at least 150 mm long.
- Take care to avoid end craters, undercutting and penetration notches.
- After welding, protect the towing eye by suitable means to ensure slow cooling from the welding temperatures.

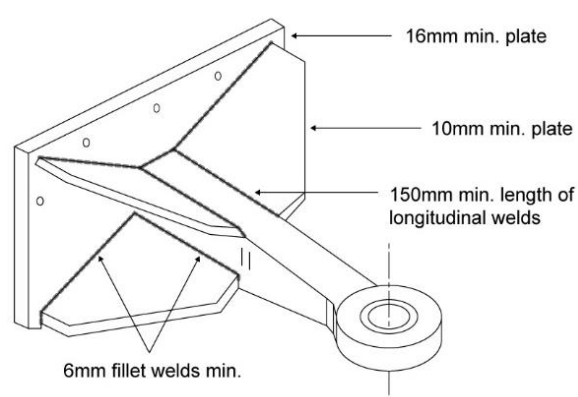


Figure 3: Example of recommended towing eye welding

- If welding on the towing eye has stops for any time, raise the components to the pre-heat temperature before restarting welding.
- Design the drawbar eye attachment so that all welds are visible for inspection purposes.
- Inspect welds on the drawbar eye (preferably using ultrasonic methods) to detect cracking in any heat affected zone.
- For a bolt-in drawbar eye, take care that the rear nut has enough access space for torque wrench.
- For a bolt-in drawbar eye, take care that the socket welding is performed according to the manufacturer's specifications

**Front mounted tow couplings**

Front mounted pin-type couplings are usually installed when a bullbar is fitted. The design guidelines provided in this code do not apply to front mounted pin-type couplings, nor are they addressed in ADR 62/.. .

**Required:**

- If pin-type couplings are installed or included in bullbar design, clearly and permanently mark them with their towing capacity or with the words *Not for Towing or, For Yard Use Only*.
- If pin couplings are rated, take into account the strength of the:
  - pin
  - receiver unit
  - bar it is mounted on and the mounting points to the vehicle chassis.



- Do not let the rating of the unit exceed the lowest strength among the above items.
- If vehicles are subject to ADR 84/.. and have a front tow coupling installed, ensure the front underrun protection continues to comply with ADR 84/.. .

### Safety chains and safety chain attachment points

ADR 62/.. sets the requirements for safety chains and safety chain attachment points on trailers and motor vehicles. Compliance with this standard must be maintained.

Safety chain attachment points must be fitted to all motor vehicles with a towbar (excluding vehicles designed for use in a road train combination).

Safety chains are required on all trailers with a rigid drawbar but may be fitted to other trailer types.

#### Safety chains

##### Required:

- Ensure safety chains comply with the specifications of ADR 62/.. including material requirements and chain size.
- Ensure the fitting (including the retrofitting and replacement) of chains complies with ADR 62/.. requirements and is in accordance with manufacturer instructions.
- Ensure the trailer has two safety chains permanently fixed in a manner that is difficult to remove, for example, using fastening methods that require special or uncommon tools to overcome.
- Ensure the connectors used to attach the safety chain to the towing vehicle (known as chain connectors or coupling links) are appropriately rated.
- Ensure that chain connectors and coupling links are not welded, deformed or electroplated subsequent to their manufacture.
- Ensure the chains fitted are as short as possible and are positioned so that:
  - the chains can be crossed when coupled to the towing vehicle to support the drawbar and prevent it from dropping to the ground in the event of coupling failure or disconnection
  - they permit proper turning of the vehicle
  - the risk of them causing inadvertent coupling release is minimised.
- Ensure safety chains are fitted to all trailers:
  - without emergency brakes
  - with rigid drawbars, other than converter dollies
  - meet the requirements of ADR62/.. , including the need for two safety chains
  - via attachment points that meet the requirements of ADR 62/..
  - as near as practicable to the coupling
  - are arranged to maintain direction of the trailer in the event of coupling failure or disconnection, without any part of the trailer attachment touching the ground
  - so that the safety chain attachment points do not foul on the rear of the towing vehicle or trailer drawbar under any possible operating conditions (i.e. articulation in operation).

##### Recommended:

- Fit all drawbar trailers with a pair of safety chains.
- Fit safety chains to all vehicles used in severe conditions, for example, logging or quarry vehicles.

#### Safety chain attachment points

##### Required:

- Ensure safety chain attachment points have demonstrated compliance with ADR 62/.. (testing), can withstand the forces prescribed in ADR 62/.. .and have been fitted, rated and marked accordingly.
- Ensure safety chain attachment points are positioned to minimise the risk of them causing inadvertent coupling release.
- Ensure two safety chain attachment points are fitted to vehicles that:
  - are not designed for use in a road train combination (optional)
  - have a towbar; and
  - have capacity to tow trailers with an aggregate trailer mass of over 3.5 tonnes.
- Ensure the placement of safety chain attachments are:
  - one on either side of the tow coupling; and
  - adjacent to the tow coupling.
- Ensure that attachments of the towing vehicle and the trailer are separate from the coupling and its fasteners.

## P1 Checklist — Towbar and coupling installation other than fifth wheels and kingpins (example)

### P1 Checklist — Towbar and coupling installation other than fifth wheels and kingpins

► This checklist is for use by approved vehicle examiners (AVEs) when certifying towbar and coupling installation.

#### Vehicle and modifier details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	Vehicle chassis no. (if applicable):	Vehicle modifier (company name):

#### Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1 Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Modification details

Modification criteria	Check Yes or No as applicable:	Yes	No
1 Has the modification been performed in accordance with the manufacturer's guidelines?		<input type="checkbox"/>	<input type="checkbox"/>

#### Installation details

Safety chains and attachment points	Check Yes, No, N/A as applicable:	Yes	No	N/A
1 If retrofitted, have the safety chains been fitted in accordance with VSB6 and Australian Design Rule (ADR) 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 If retrofitted, have the safety chain attachment points been fitted in accordance with VSB6 and ADR 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Coupling	Check Yes, No, N/A as applicable:	Yes	No	N/A
3 Has the coupling been tested to demonstrate and/or certified that it complies with the requirements of ADR 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Is the coupling's D-value rating sufficient for the application?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Is the coupling installed in accordance to the requirements of VSB6 and ADR 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 If the trailer is intended for road train use, does the coupling meet the requirements of ADR 63/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Towbar	Check Yes, No, N/A as applicable:	Yes	No	N/A
7 Has the towbar been designed and mounted in accordance with the requirements of VSB6 and ADR 62/.. , including strength requirements?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Is the coupling's D-value rating sufficient for the application?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Are safety chain attachment points fitted in accordance with VSB6 and ADR 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 If the trailer is intended for road train use, does the towbar meet the requirements of ADR 63/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Drawbar	Check Yes, No, N/A as applicable:	Yes	No	N/A
11 Has the drawbar been designed in accordance with VSB6 and ADR 62/.. , including strength requirements?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 Has the drawbar eye been mounted in accordance with VSB6 and does all the welding conform to AS/NZS 1554.1:2011 <i>Structural steel welding - Welding of steel structures</i> ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 Have safety chains been fitted in accordance with VSB6 and ADR 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 If the trailer is intended for road train use, does the drawbar meet the requirements of ADR 63/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Compliance

Modification	Check Yes or No as applicable:	Yes	No
1 Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code P1?		<input type="checkbox"/>	<input type="checkbox"/>
2 Is the quality of the work to an accepted industry standard?		<input type="checkbox"/>	<input type="checkbox"/>
3 Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?		<input type="checkbox"/>	<input type="checkbox"/>

#### Authorisation

Other than modification criteria, if the answer to any relevant question is NO the modification is not acceptable.

Comments:			
Examined by:	Company (if applicable):	AVE no.:	
Signed:	Modification certificate no.:	Modification plate no.:	Date:

Vehicle chassis no./VIN:	Date:	Signed:
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# Modification Code P2 — Fifth wheel and kingpin installation

## 1. Scope

Modifications covered under this code:

### Covered

- fitting of fifth wheel / turntable assemblies, including construction of base and mounting of fifth wheel / turntable
- fitting of kingpin assemblies to trailers.

### Not covered

- modifications of fitting of components that do not meet the requirements of VSB6
- modifications of other than commercial vehicles
- fitting components not designed for automotive use or on-road use
- fitting of any component that does not comply with the Australian Design Rules (ADRs) or relevant heavy vehicle standards regulation
- relocation of a previously certified fifth wheel within the limits of the mounting angles already fitted.

## 2. Related standards

Modified vehicles must comply with all ADRs, Australian Standards, acts and regulations. Below are some but not all of the areas that may be affected by the modifications in this code and require certification testing or evidence to demonstrate compliance.

The certifier must ensure that the modified vehicle continues to comply with all related Australian Design Rules.

This...	Must comply with...
Chassis alterations	VSB6 Modification Code H4

## 3. Certification procedure

The certification procedure for this modification code is as follows:

1.	Modifier	Determine if the modification is within manufacturer specifications. <ul style="list-style-type: none"> <li>If <b>yes</b>, the modification will need to be done in accordance with manufacturer specifications.</li> <li>If <b>no</b>, the modification will need to be done in accordance with this modification code.</li> </ul>
2.	Modifier	Consult with an accredited P2 AVE for guidance on how to perform the modification.
3.	Modifier	Perform modification in accordance with AVE advice and this code.
4.	Modifier	Organise approval inspection by an accredited P2 AVE.
5.	P2 AVE	Perform inspection, complete P2 checklist and determine if compliance has been achieved. <ul style="list-style-type: none"> <li>If <b>yes</b>, proceed to step 6.</li> <li>If <b>no</b>, do not proceed, advise modifier rework is required to ensure compliance. Return to step 2.</li> </ul>
6.	P2 AVE	Issue modification certificate, affix modification plate, and submit paperwork as required by the relevant AVE registration scheme.

AVEs must be satisfied that the vehicle modification requirements are being met. It is advised that before modifications are carried out they are discussed with the certifying AVE.

## 4. Compliance requirements

All fifth wheel designs and work must be completed in accordance with other relevant sections of VSB6, ADRs and the following Australian Standards:

AS/NZS 4968.2:2003 Heavy road vehicles	Mechanical coupling between articulated vehicle combinations - Testing and installation of fifth wheel and associated equipment
AS 2174.1-2006 Heavy road vehicles	Mechanical coupling between prime movers and semitrailers - Interchangeability requirements – Non-dedicated vehicle combinations
AS 2174.2-2006 Heavy road vehicles	Mechanical coupling between prime movers and semitrailers - Interchangeability requirements – Dedicated vehicle combinations
AS/NZS 4968.3:2011 Heavy road vehicles	Mechanical coupling between articulated vehicle combinations - Kingpins and associated equipment

Requirements to install fixed or sliding fifth wheel assemblies are provided below.

## 5. Design requirements

For most vehicles, guidelines for the installation of fifth wheels and kingpins will be available from the vehicle manufacturer. Where manufacturers guidelines have been produced, ensure that the installation complies with these guidelines rather than VSB6.

### Fifth wheel applications

There are essentially three basic types of fifth wheel.

Single oscillating	fixed base on prime mover (see Figure 4)
Single oscillating	turntable mount on prime mover (see Figure 5 and Figure 6)
Double oscillating	restricted application only (see Figure 7 and Figure 8)

#### Single oscillating

This application type has an oscillation axis fixed relative to the prime mover and is suitable for platform and van type semitrailers operating on normal road surfaces.

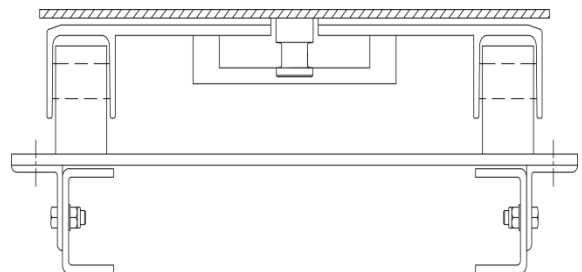


Figure 4: Example of single oscillating fifth wheel

#### Single oscillating, turntable mount

These maintain the oscillation axis fixed relative to the towed trailer rather than to the towing vehicle. The turntables in Figures 5 and 6 are mounted to a solid base that then mounts to the vehicle. Turntable mounted fifth wheels (Figures 5 and 6) are also suitable for platform and van-type semitrailers operating on normal surfaces.

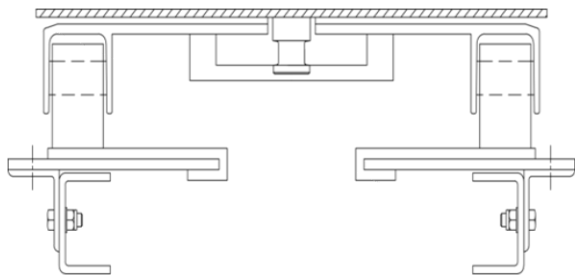


Figure 5: Example of hollow centre (greasy plate) turntable mounted single oscillating fifth wheel

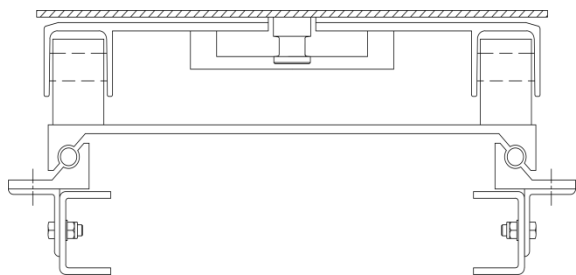


Figure 6: Example of ball bearing turntable mounted single oscillating fifth wheel

### Double oscillating

Double oscillating fifth wheels have two axis of oscillation, one in-line with the length of the towing vehicle and one perpendicular to it.

There are two sub types of double oscillating fifth wheels, both of which are suitable only for applications where the trailer has high torsional rigidity and an un-sprung suspension, i.e., heavy low loaders.

### Restricted double oscillating fifth wheels

Restricted double oscillating fifth wheels are not recommended for use in most combinations and must not be used in B-double or road train combinations unless:

- the semitrailer design requires torsional stresses to be minimised, i.e., road tank trailers; and
- the roll axis of the fifth wheel coupling is above the surface of the coupler plate of the coupling; and
- the degree of rotation allowed around the roll axis of the fifth wheel coupling is restricted to prevent roll instability.

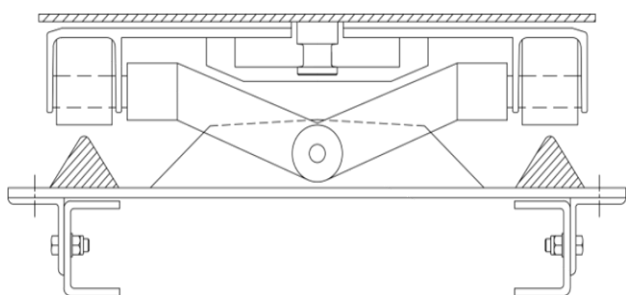


Figure 7: Example of typical restricted double oscillating fifth wheel

### Double oscillating fifth wheels

Double oscillating fifth wheels are further limited in application and only suitable for road tank trailers and low loaders with high torsional rigidity and low centres of gravity. Avoid using these in combination with trailers with air suspension (see Figure 7 and Figure 8).

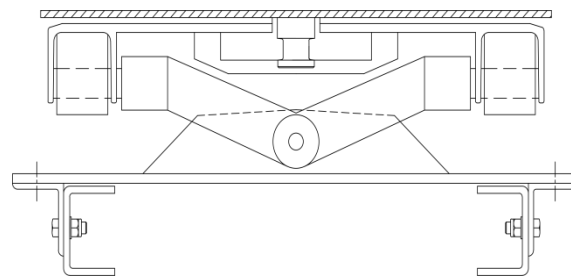


Figure 8: Example of typical double oscillating fifth wheel

### Fifth wheel type selection

The choice of the correct fifth wheel type for the vehicle's application is critical to ensure the safety of the vehicle combination.

#### Required:

- To select a fifth wheel and design the attachment assembly with an appropriate strength rating, calculate the required D-value for the particular application.

➤ Note attachment assembly includes, but is not limited to, components such as:

- fixing hardware
- base plate
- ripple plate; and
- attachment angles.

- Also consider:
  - fifth wheel capacity (D-value and vertical load capacity)
  - fifth wheel height
  - interchangeability of coupling
  - range of towing/towed vehicle combinations to be operated by the vehicle being fitted.

#### Recommended:

- Seek guidance from the fifth wheel manufacturer as to the fifth wheel type that best suits the application.

## 6. Installation requirements

Install the fifth wheel in accordance with component and vehicle manufacturers' instructions. If these are not available, follow the guidelines below if possible, or seek support from a professional engineer registered with a professional registration body who is able to perform the required calculations and prepare a report.

Welding is a specialised process and requires skilled personnel and special welding equipment. Some metals cannot be welded, others require use of special grades of welding rods and special techniques to weld components.

If you are intending to use welding to attach assemblies and plates ensure the welding is performed by a suitably qualified welder. Where this is not possible, the use of bolts is preferred.

### Mounting the assembly

#### Required:

- Mount the fifth wheel on either a base plate or a sub-frame.
- Flat base plate, ensure it is at least 12 mm thick.
- Ripple base plate, ensure it is at least 8 mm thick and has the dimensions shown in Figure 9, or as recommended by the manufacturer provided equivalent mounting strength/security is maintained.



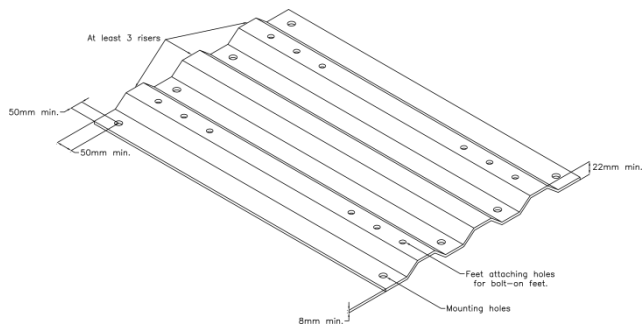


Figure 9: Ripple plate requirements

- Bolt the fifth wheelbase plate or a sub-frame to the web of the chassis (using attachment angles or fish plates).
- Ensure the bolt hole clearance is no more than 1 mm.
- Allow at least 5 mm clearance between the base plate or sub-frame and chassis flange (see Figure 10) or as defined in the chassis manufacturer's recommendations.

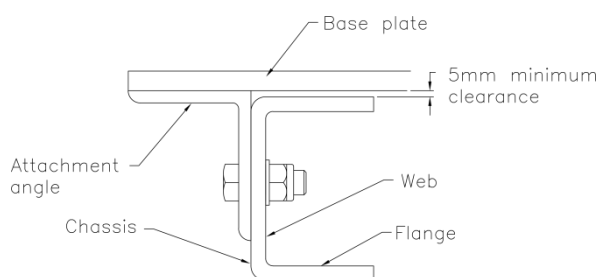


Figure 10: Fifth wheelbase plate and/or sub-frame, clearance to chassis flange

### Fifth wheel angles and fish plates

#### Required:

- Ensure there are at least four M20 (3/4") or six M16 (5/8") of at least ISO Grade 8.8 (SAE Class 5) bolts per side (see Figure 11):
  - use M20 bolts if the chassis has double web thickness
  - use M16 bolts if the chassis has single web thickness
  - use bolts with fine threads if possible.
- Ensure bolt spacing (see Figure 11) between the fifth wheel angles and the chassis is within the range of:
  - $d = 100$  to  $225$  mm for M16 bolts
  - $d = 100$  to  $300$  mm for M20 bolts.

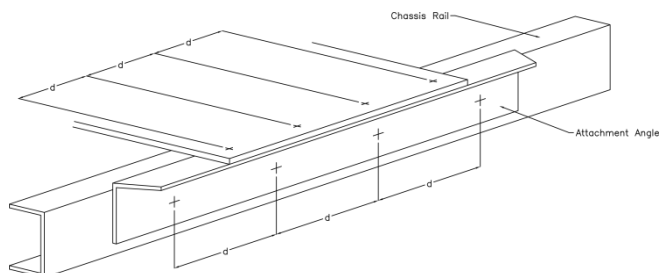


Figure 11: Fifth wheel angle and base plate bolt spacing

- Ensure the bolt hole clearance is no more than 1 mm.
- If the attachment angle is cut to accommodate a spring hanger, ensure there is at least one bolt in close proximity to each side of the cut-out.
- Do not allow bolts to be closer than 50 mm to any spring hanger bolt or rivet (see Figure 12).

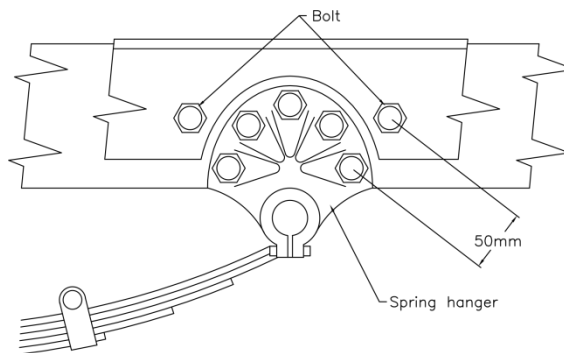


Figure 12: Bolts near suspension brackets

- Mount the ends of the attachment angles or fish plates properly.
- Ensure there is a minimum of:
  - one bolt, at least 50 mm forward of the leading edge of the base plate; and
  - at least one bolt 50 mm rearward of the base plate trailing edge.
- Do not place this bolt less than 80 mm away from the base plate edges (see Figure 13).

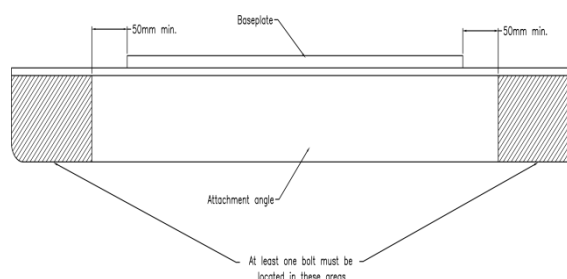


Figure 13: Attachment angle securing bolts

- Use a self-locking nut for each bolt and observe the manufacturer's re-usability limitations on nuts.
- Do not use methods such as spot of weld, spring washer or a split pin hole drilled through the side of the nut.
- Where split pins are used as a method of self-locking, ensure castellated nuts are used.
- Use tapered shims if required.
- Use hardened washers under all nuts (typically identifiable by three radial tangs on the outer circumference of the washer).
- Use hardened washers under both the nut and bolt head on aluminium alloy chassis.
- Ensure the chassis mounting bolts are not within one fifth of the chassis depth of the top and bottom flange or on the chassis rail radii (refer Figure 14).

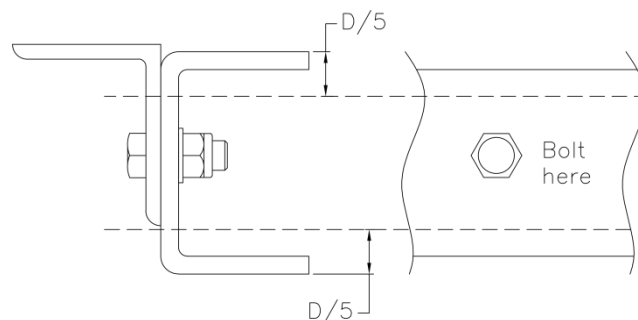


Figure 14: No bolting area

- Do not use U-bolts or an array of smaller size bolts to attach the fifth wheel assembly.
- Use attachment angles that are at least 100 x 75 x 10 mm (4 x 3 x 3/8") in size.

- Ensure the fish plates or cheek plates are at least 10 mm thick and bolt hole centre lines are not closer than 50 mm to any edge.
- Ensure the length of the attachment angle (or fish plate overall spacing) is greater than the chassis width, and is approximately 600 mm longer to avoid abrupt section change and distribute load more evenly (see Figure 15).

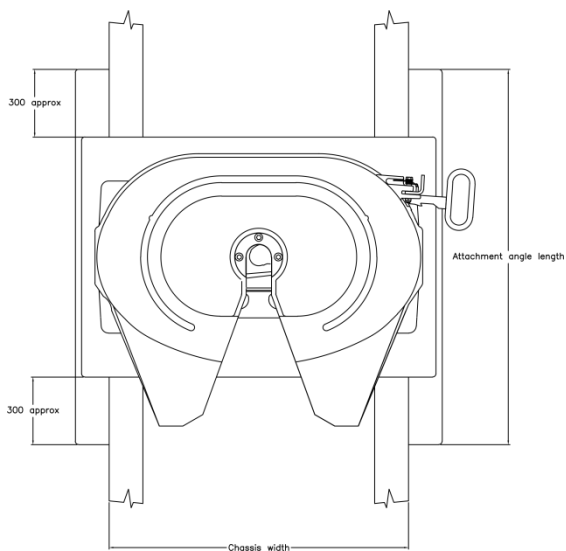


Figure 15: Attachment angle length

**Recommended:**

- Ream the holes to size.
- Install all vertical bolts with the head uppermost as this will ensure that if the nut is lost, the bolt will not fall out.
- Ensure the bolt length is such that the thread portion is not within the grip length.
- Use a bolt torque of:
  - 170–190 Nm (126–140 ft.lbs) for M16 size bolts
  - 330–370 Nm (244–273 ft.lbs) for M20 size bolts.
- Ensure the unthreaded position is not less than the total bolting thickness and not less than the chassis rail thickness (see Figure 16).

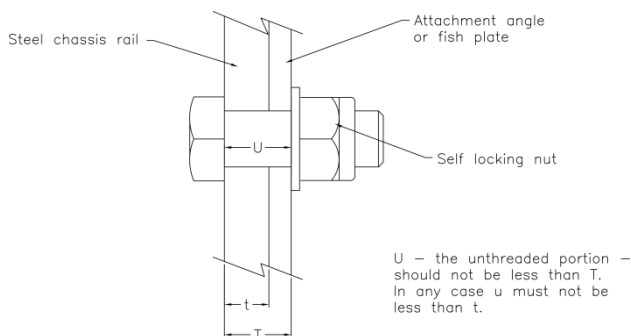


Figure 16: Minimum bolt thread length

**Securing the base plate to the sub-frame**

**Required:**

Secure the base plate to the sub-frame or attachment angle using either welding or, preferably, bolts.

- If bolted, use at least four M20 (3/4") or six M16 (5/8") bolts of at least ISO Grade 8.8 (SAE Class 5) or stronger per side (see Figure 11):
  - use M20 bolts if the chassis has double web thickness
  - use M16 bolts if the chassis has single web thickness
  - use bolts with fine threads if possible.
- Ensure the bolt hole clearance is no more than 1 mm.

- If welded, use 10 mm fillet welds not less than 450 mm (total) on each side with weld runs not less than 40 mm long (see Figure 17).

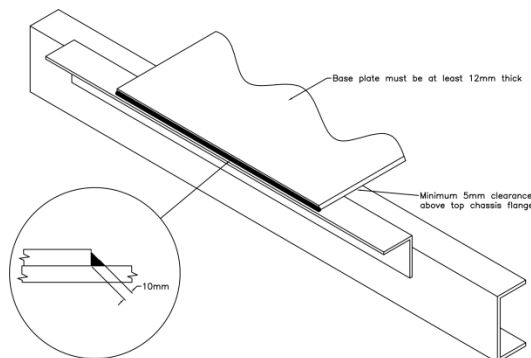


Figure 17: Fifth wheel mounting plate welding

- Ensure all welds are of good quality and do not incorporate any undercuts or craters.

**Fixed fifth wheel mounting**

- Ensure the bolt spacing between the base plate to the fifth wheel angles (see Figures 11 and 18) is within the range:
  - d = 100 to 225 mm for M16 bolts
  - d = 100 to 300 mm for M20 bolts.

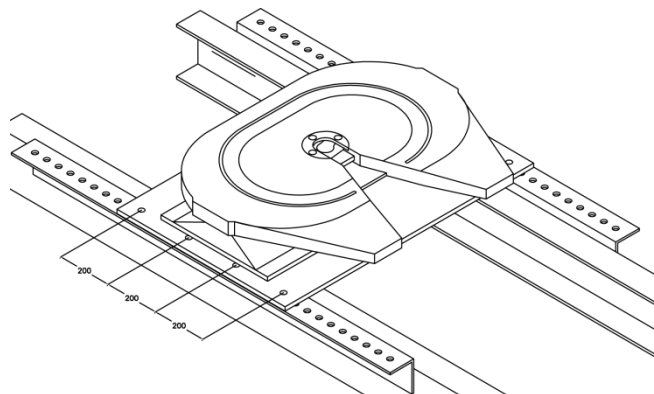


Figure 18: Typical fixed fifth wheel bolt spacing

**Rotating (ballrace) fifth wheels**

- Ensure the bolt spacing between the base plate to the fifth wheel angles (see Figures 18 and 19) is within the range:
  - d = 100 to 225mm for M16 bolts
  - d = 100 to 300mm for M20 bolts.
  - spacing around the ballrace/pivot may be extended as per Figure 19 if the bolting can be shown to give at least equivalent mounting strength/security.

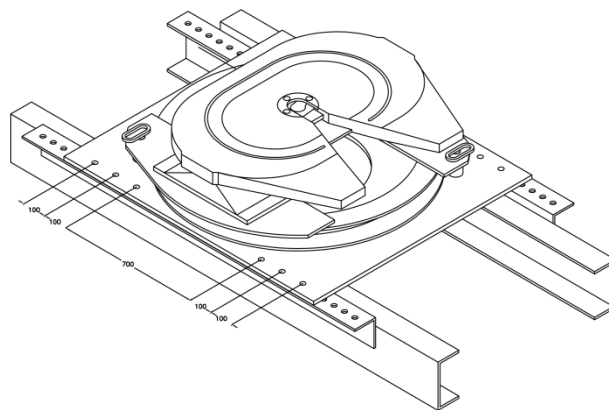


Figure 19: Typical rotating (ballrace) fifth wheel bolt spacing

**Recommended:**

- If using welding as an attachment method, consult the turntable manufacturer to determine if there are special requirements.
- Ensure all welds are carried out by competent persons, trained in welding techniques.

**Securing the fifth wheel pedestals**

Secure the fifth wheel pedestals to the base plate preferably by using bolts and only by welding if the turntable manufacturer approves this method.

**Required:**

- If bolted, use at least four M20 (3/4") or six M16 (5/8") bolts of at least ISO Grade 8.8 (SAE Class 5) per fifth wheel pedestal (see Figure 20).

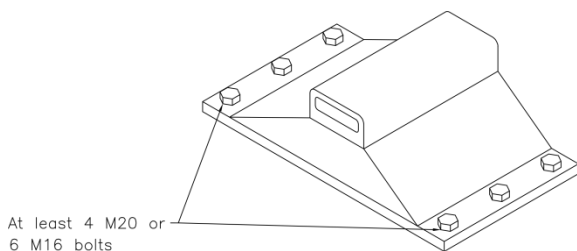


Figure 20: Minimal fifth wheel bolting

- If welded, use at least 450 mm (total) of 10 mm fillet weld per fifth wheel pedestal along at least three sides (see Figure 21).

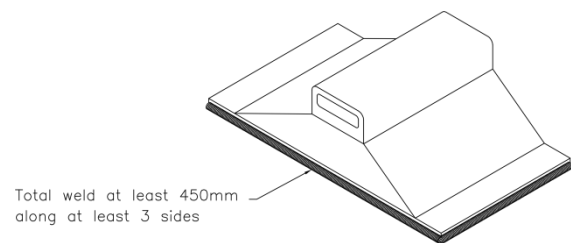


Figure 21: Minimum fifth wheel pedestal welding

- Ensure the weld is of good quality and does not incorporate undercuts or craters (see earlier comments on welding).

**Installing sliding assemblies**

**Attachment by bolts**

**Required:**

- Install sliding fifth wheel assemblies (see Figures 22 and 23) in accordance with the assembly and vehicle manufacturers' instructions, and if unavailable with the instructions below.

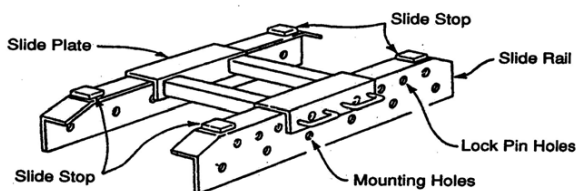


Figure 22: Typical older style sliding fifth wheel assembly

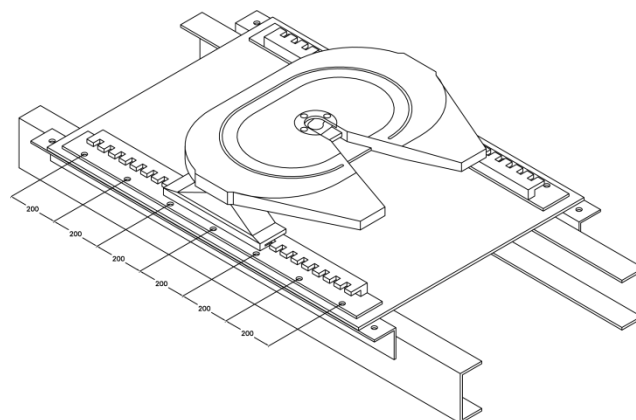


Figure 23: Typical sliding fifth wheel assembly

- On attachment angle of a sliding assembly, locate a bolt at or beyond each end of the travel of the slide plate.
- Do not locate a bolt within 50 mm of any suspension mounting bracket fastener.
- Fit slide stops at each end of travel (note that on modern sliders, stops are typically built into the assembly and no additional stops are required).
- Attach slider stops to slider assembly or slider sub-frame, not directly to the vehicle chassis.
- Secure slide stops by bolts or welding.
- When using bolts, provide at least one ISO grade 8.8 (SAE Class 5) M16 (5/8") bolt per stop (see Figure 24).

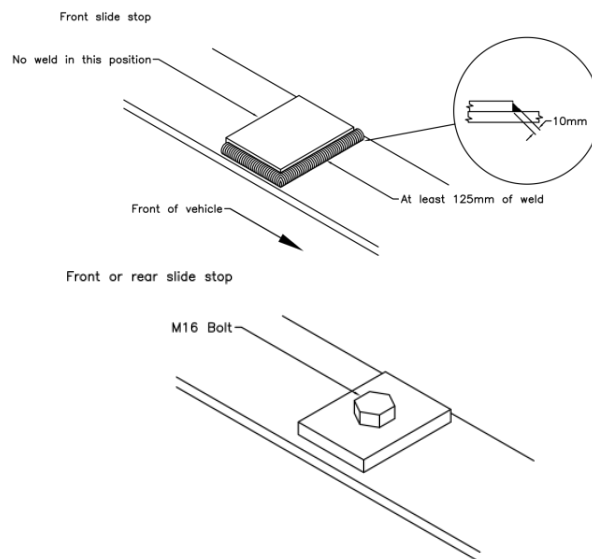


Figure 24: Example of slide stops

- Ensure the load capacity of the locking device is of at least equivalent value to that of the fifth wheel rating.

**Attachment by welding**

**Required:**

- When welding the sliding fifth wheel assembly, ensure at least a total of 125 mm of 10 mm weld over at least three sides.
- Do not place any weld on the stop face, such as a welded front slide stop, (see Figure 24). Note the rear stop is the mirror image of the front stop.
- Ensure the weld is of good quality and does not contain undercuts or craters.
- Ensure the locking mechanism is of a positive locking type and resistant to detachment due to vibration or wear.

## Installing fifth wheels

### Required:

- Ensure the location, mounting and strength of fifth wheels comply with requirements of VSB6 Section P and with the relevant ADRs, AS/NZS4968 *Heavy Road Vehicles – Mechanical Coupling Between Articulated Vehicle Combinations* and AS 2174 *Heavy Road Vehicles – Mechanical Coupling Between Prime Movers and Semitrailers – Interchangeability Requirements*.
- When determining the location of the fifth wheel calculate the laden steer-axle mass to ensure:
  - steer axle/s do not exceed the manufacturer's or regulatory mass limits
  - effective steering capability is maintained.
- For fifth wheels used, or intended for use, in a B-double or road train configuration, ensure the strength of the coupling is appropriate for multi-combination use.
- Do not use double oscillating fifth wheels in B-double or road train combinations unless:
  - the semitrailer design requires torsional stresses to be minimised, i.e. road tank trailers; and
  - the roll axis of the fifth wheel coupling is above the surface of the coupler plate of the coupling; and
  - the degree of rotation allowed around the roll axis of the fifth wheel coupling is restricted to prevent roll instability.

### Recommended:

- Install restricted double oscillating or equivalent fifth wheels on vehicles with a high torsional stiffness (e.g. road tank vehicles, low loaders).
- When replacing or repositioning fifth wheels or turntables, if existing angles are reused, ensure any new holes are at least 3d or 50 mm from another hole, where d is the diameter of the hole.
- Do not reuse nuts, bolts and washers. Most self-locking nuts are designed to be used only once.
- Where rivets were previously used, select a bolt that is at least the size of the original rivet.
- Ensure that all bolts with split pins do not have holes within the area of tension of the bolt (i.e. not have the hole between the head of the bolt and the top of the nut).

### Fifth wheel wear plates

#### Required:

Repositioning the kingpin to ensure correct engagement with the fifth wheel is highly likely to make the kingpin installation non-compliant.

- If fitting a low friction (nylon, greaseless, Teflon) or other wear plate to a fifth wheel, ensure the fifth wheel manufacturer provides assurance regarding the suitability of the product. If this is unavailable, ensure the wear plate manufacturer can provide evidence that the fifth wheel will continue to comply with the strength and dimensional requirements of ADR62/.. and AS 4968.2.

📌 Note that if the only change to the vehicle is the fitment of a low friction plate, and it is in accordance with Vehicle Standards Guide 18 - Low friction plates on fifth wheels, no certification under this modification code is required.

## Installing kingpins for use with fifth wheel assemblies

Kingpins are subject to wear and require replacement when worn beyond acceptable limits.

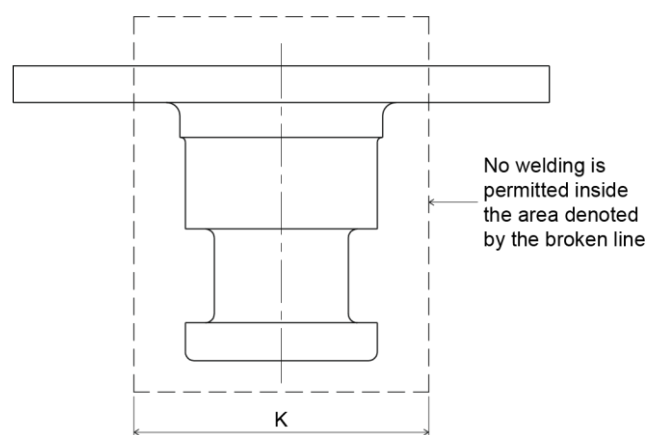
The two common forms of kingpin installation are:

Bolt-in kingpins	These consist of a housing welded into the trailer chassis and a kingpin that bolts into that housing. Replacement involves unbolting the kingpin and inserting a new one into the housing. Initial purchase price is likely to be higher for a bolt-in kingpin than a weld-in, but installing replacements requires significantly less labour.
Weld-in kingpins	These consist of a kingpin incorporating a base that is welded into the trailer chassis. Replacement involves cutting the kingpin out of the trailer chassis and re-welding the new one into it. Initial purchase price is likely to be lower for weld-in than a bolt-in but installing replacements requires far more labour.

Modifiers must correctly select and install semitrailer kingpins as follows:

### Required:

- If a bolt-in kingpin is employed, weld the housing into the trailer chassis and install or replace the kingpin into the housing in accordance with the manufacturer's guidelines.
- Tension all kingpin retaining bolts correctly to the bolt manufacturer's torque requirements.
- If a weld-in kingpin is employed, do not weld in the area shown in Figure 25.



Dimension	Kingpin size	
	50 mm	90 mm
K (mm)	110	150

Figure 25: No welding area of weld-in kingpins

### Kingpin protrusion

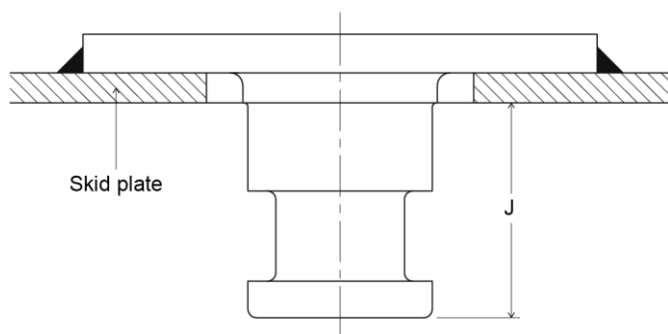
Correct installation of kingpins is critical and must be in accordance with the AS/NZS 4968.2:2003 *Heavy-road vehicles - Mechanical coupling between articulated vehicle combinations - Testing and installation of fifth wheel and associated equipment* and AZ/NZS 4968.3:2011 *Heavy road vehicles - Mechanical coupling between articulated vehicle combinations - Kingpins and associated equipment* in the first instance and then the manufacturer's recommendation.

Installing at an incorrect height (see Figure 25, part B below) can prevent correct locking of the fifth wheel and therefore loss of the trailer from the prime mover. It also leads to damage and premature failure of the fifth wheel jaws and kingpin.



**Required:**

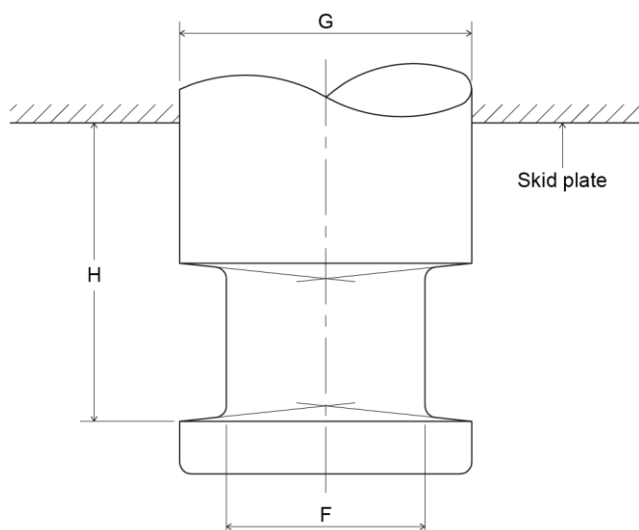
- To ensure full and correct engagement is possible, correctly select all pins, bolt-in or weld-in to suit the thickness of the trailer skid plate (see Figure 26).



Dimension	Kingpin size	
	50 mm	90 mm
J (mm)	82.5 - 84.0	72.0 - 74.0

Figure 26: Kingpin projection distance

- Apply the critical dimensions for 50 mm and 90 mm kingpins as shown in Figure 27.



Kingpin size (mm)	Dimension (mm)		
	F	G	H
50	49	71	73
90	86	112	62

Figure 27: Kingpin dimensions

**Use of kingpin gauge****Recommended:**

- Use an approved height/wear gauge to provide a quick and accurate check of the kingpin and ensure it is safe for use (see Figure 28).

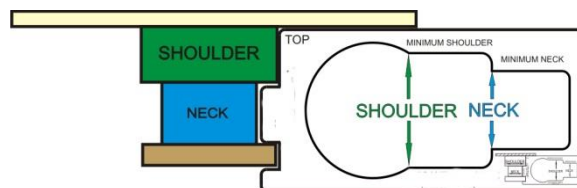


Figure 28: Typical kingpin wear limit gauge

**Skid plate wear plates****Required:**

- When a low friction (i.e. nylon, greaseless) or other wear plate is fitted to a skid plate, reposition the kingpin to maintain correct projection below this wear plate.

**Machining of kingpins****Required:**

- Do not machine any surface of a kingpin assembly, including flanges, unless it is strictly in accordance with the manufacturer's machining specifications.
- In accordance with AS 4968.3 *Heavy road vehicles—Mechanical coupling between articulated vehicle*, do not re-machine or build up kingpins by welding to achieve or restore required dimensions.



## P2 Checklist — Fifth wheel and kingpin installation (example)

### P2 Checklist — Fifth wheel and kingpin installation

► This checklist is for use by approved vehicle examiners (AVEs) when assessing fifth wheel and kingpin installations.

#### Vehicle and modifier details

Vehicle make:	Vehicle model:	Month and year of manufacture:
VIN (if applicable):	Vehicle chassis no. (if applicable):	Vehicle modifier (company name):

#### Advanced braking systems

Braking systems	Check Yes, No, N/A as applicable:	Yes	No	N/A
1 Is the advanced braking system (where fitted) un-affected or re-certified after the vehicle modification?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

#### Modification details

Modification criteria	Check Yes or No as applicable:	Yes	No
1 Has the modification been performed in accordance with the manufacturer's guidelines?		<input type="checkbox"/>	<input type="checkbox"/>

#### Installation details

Coupling selection	Check Yes, No, N/A as applicable:	Yes	No	N/A
1 Has the fifth wheel / kingpin been certified to Australian Design Rule (ADR) 62/.. ?		<input type="checkbox"/>	<input type="checkbox"/>	
2 Is the D-Value of the fifth wheel or kingpin appropriate for the maximum legal GCM/ATM for the vehicle in combination?		<input type="checkbox"/>	<input type="checkbox"/>	
Fifth wheel coupling installation	Check Yes, No, N/A as applicable:	Yes	No	N/A
3 Is the type of fifth wheel suitable for the application of the vehicle combination?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 If the base plate is made of flat plate, is it at least 12 mm thick, or if a ripple plate is used is it constructed as per Figure 8 of Section P?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Do at least four M20 (3/4") or six M16 (5/8") bolts per side secure the attachment angles / fish plates to the web of the chassis rail?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Do at least four M20 (3/4") or six M16 (5/8") bolts per side, or at least 450 mm (total) of 10 mm fillet weld per side, secure the base plate to the attachment angles / fish plates?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Do at least four M20 (3/4") or six M16 (5/8") bolts per fifth wheel foot, or at least 450 mm (total) of 10 mm fillet weld per fifth wheel pedestal, secure the feet to the base plate?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Are the attachment bolts ISO grade 8.8 (SAE Grade 5) or stronger?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9 Is each bolt used with a suitable self-locking nut?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10 Is a hardened washer situated under each nut, as required by this modification code?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11 In the case of an aluminium alloy chassis, is a hardened washer situated under each nut and bolt head?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12 Is the bolt hole clearance less than 1 mm?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13 If the attachment angles are cut to accommodate a spring hanger, is there at least one bolt in close proximity to each side of the cut out, and are the bolts at least 50 mm away from any suspension mounting brackets bolt?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14 On the attachment angle or fish plates, is there at least one bolt at least 50 mm forward of the leading edge of the base plate, and at least one bolt at least 50 mm rearward of the rear edge of the base plate?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15 If attachment angles are used, are they at least 100 x 75 x 10 mm (4 x 3 x 3/8") in dimension?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16 If fish plates are used, is the thickness of the plates at least 10 mm, and are all bolt holes at least 50 mm from all edges?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sliding assemblies	Check Yes, No, N/A as applicable:	Yes	No	N/A
17 If a sliding fifth wheel assembly is used, is at least one bolt located at or beyond each end of travel of the slide plate?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18 Are slide stops on both slide rails attached at each end of travel?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19 Is each slide stop secured by at least one grade 8.8 M16 bolt, a total of 125 mm of 10 mm weld on three sides of each stop, or built into the slider assembly?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20 Is the stop face of the slide stop free from weld?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21 Is the locking mechanism of the sliding fifth wheel assembly a positive locking type (including built in stops)?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Vehicle chassis no./VIN:	Date:	Signed:

## P2 Checklist — Fifth wheel and kingpin installation

► This checklist is for use by approved vehicle examiners (AVEs) when assessing fifth wheel and kingpin installations.

B-doubles and road trains	Check Yes, No, N/A as applicable:	Yes	No	N/A
22 If the vehicle is for B-double or road train application, is the fifth wheel: <ul style="list-style-type: none"> <li>• a single plate, single oscillating type; or</li> <li>• is the vehicle designed to tow a torsionally rigid semi-trailer; and</li> <li>• is the roll axis of the fifth wheel coupling above the surface of the couple plates of the coupling; and</li> <li>• is the degree of rotation allowed around the roll axis of the fifth wheel coupling restricted to prevent roll instability?</li> </ul>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23 For fifth wheels used, or intended for use, in a B-double or road train configuration is the strength of the coupling appropriate for multi-combination use?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24 If the trailer is intended for road train use, does the fifth wheel meet the requirements of ADR 63/..		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Kingpins	Check Yes or No as applicable:	Yes	No
1 Is the kingpin installed in accordance with Australian Standards AS/NZS 4968.2:2003 and AZ/NZS 4968.3:2011 or the kingpin manufacturer's instructions with the Australian Standards given priority in the event of a contradiction?		<input type="checkbox"/>	<input type="checkbox"/>
2 Is the D-Value of the kingpin equal to or greater than that required for the rating of the trailer and its installation in conformance with the manufacturer's recommendations?		<input type="checkbox"/>	<input type="checkbox"/>
3 Does the kingpin have the correct protrusion below the trailer skid plate or wear plate?		<input type="checkbox"/>	<input type="checkbox"/>
4 Is the kingpin within the dimensional limits given by AS/NZS 4968.3:2011?		<input type="checkbox"/>	<input type="checkbox"/>
5 If any machining has been performed on the kingpin, has it been performed in accordance with the manufacturer's specifications?		<input type="checkbox"/>	<input type="checkbox"/>
6 If the trailer is intended for road train use, does the kingpin wheel meet the requirements of ADR 63/.. ?		<input type="checkbox"/>	<input type="checkbox"/>

### Low friction plates (nylon, greaseless, Teflon etc.)

Fifth wheels	Check Yes or No as applicable:	Yes	No
1 If a low friction (nylon, greaseless, Teflon) or other wear plate is fitted to the fifth wheel, has the fifth wheel manufacturer provided assurance regarding the suitability of the product and continued compliance with the strength and dimensional requirements of ADR62/.. and AS 4968.2? If this is unavailable, has the wear plate manufacturer provided evidence that the fifth wheel will continue to comply with the strength and dimensional requirements of ADR62/.. and AS 4968.2 with the low friction plate installed?		<input type="checkbox"/>	<input type="checkbox"/>
Skid plates	Check Yes or No as applicable:	Yes	No
2 If a low friction (nylon, greaseless, Teflon) or other wear plate is fitted to a skid plate, has the kingpin been repositioned to maintain correct projection below the wear plate?		<input type="checkbox"/>	<input type="checkbox"/>

### Compliance

Modification	Check Yes or No as applicable:	Yes	No
1 Does this modification meet all the requirements of the manufacturer's guidelines / Modification Code P2?		<input type="checkbox"/>	<input type="checkbox"/>
2 Is the quality of the work to an accepted industry standard?		<input type="checkbox"/>	<input type="checkbox"/>
3 Does the vehicle continue to comply with ADRs and heavy vehicle standards regulations affected by the modification?		<input type="checkbox"/>	<input type="checkbox"/>

### Authorisation

Other than modification criteria, if the answer to any relevant question is NO the modification is not acceptable.

Comments:			
Examined by:	Company (if applicable):		AVE no.:
Signed:	Modification certificate no.:	Modification plate no.:	Date:

Vehicle chassis no./VIN:	Date:	Signed: