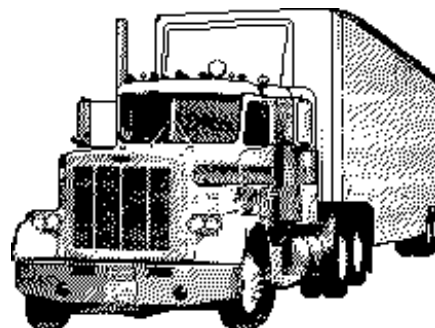
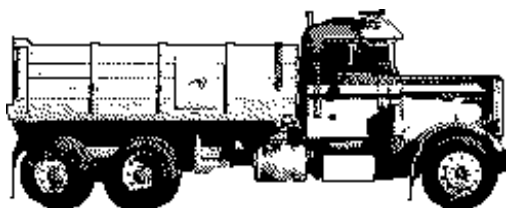


Section P

TOW COUPLING/FIFTH WHEELS



HEAVY VEHICLE MODIFICATIONS

1. SCOPE

This Section relates to the fitting of Tow Couplings/Fifth Wheels to heavy vehicles.

It outlines the minimum design, installation and performance requirements for the selection and mounting of Tow Couplings (including Fifth Wheels), Drawbars and Tow Bars and associated componentry on heavy vehicles.

The scope of this Section is limited to two groups of activities:

- Fitment and refurbishment of the following types of rear mounted Tow Couplings:
 - 50mm Pin-type Coupling
 - 50mm Ball Coupling
 - 127mm Ball Coupling
 - Hook Coupling
- Fitment and refurbishment of the following “Fifth Wheel” equipment:
 - Fifth Wheel Turntables to towing vehicles
 - Kingpin assemblies to trailers

Modifications that are **not** covered by this Section are:

- Modification of other than Heavy Vehicles

2. GENERAL INFORMATION

Australian Design Rule 62/.. became effective in July 1991. This ADR, in addition to defining a number of specific requirements, draws together a number of Australian Standards that have been progressively introduced over the last 25 years. Accordingly, this Section uses ADR 62/.. as its basis and supplements it with information about good industry and workshop practice.

All new installations must comply with the functional and plating requirements of ADR 62/..; and it is strongly recommended that all couplings be upgraded to comply with this ADR also.

3. ADR's AFFECTED

ADR's that may be affected by the fitting of Tow Couplings or Fifth Wheels are:

ADR 42/..	<i>General Safety Requirements;</i>
ADR 44/..	<i>Specific Purpose Vehicle Requirements;</i>
ADR 62/..	<i>Mechanical Connections Between Vehicles;</i>
ADR 63/..	<i>Trailers Designed for Use in Road Trains;</i>
ADR 35/..	<i>Commercial Vehicle Brake Systems;</i>
ADR 38/..	<i>Trailer Brake Systems.</i>

HEAVY VEHICLE MODIFICATIONS**4. AFFECTING MODIFICATIONS**

The following activities constitute a modification under this code:

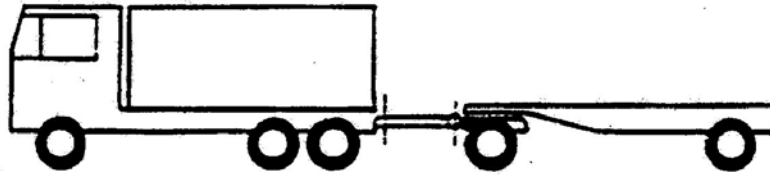
- Initial fitment of a Tow Coupling/Fifth Wheel;
- Change of a Tow Coupling/Fifth Wheel;
- Relocation of a Tow Coupling/Fifth Wheel;
- Change of “D-Value”;
- Change to Chassis Rear Overhang;
- Change of Trailer Type;
- Change of Operational Requirements;
- Fitment of Additional Axle;
- Wheelbase Modification;
- Fitment of Sleeper Compartment;
- Axle(s) Change;
- Axle Mass Limit Regulation Change;
- Refurbishment Requiring Welding or Change of Design.

This Section applies to modifications to all vehicles regardless of whether or not they were initially manufactured to comply with ADR 62/...

HEAVY VEHICLE MODIFICATIONS

5. TOW COUPLING APPLICATIONS

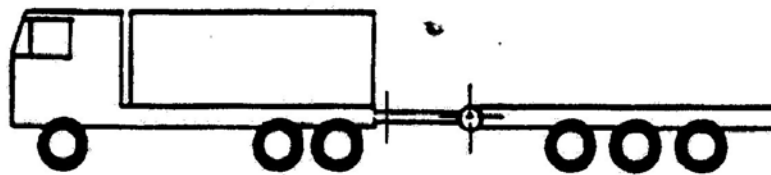
Typical tow coupling applications in present use in Australia are listed below and illustrated in Figure 1.



(a) Dog Trailer (or converter dolly/semi trailer)



(b) Pig Trailer (fixed drawbar)



(c) Pig Trailer (articulated drawbar)



(d) Semi Trailer (tag trailer, car carrier, etc)

Figure 1. Tow Coupling Applications

HEAVY VEHICLE MODIFICATIONS

The fixed drawbar pig trailer application can result in unknown vertically up or down coupling forces due to the unpredictable trailer load position in relation to the suspension.

This is of particular concern under heavy braking conditions. Increase in drawbar length reduces this effect.

The 'tag' trailer type application somewhat reduces the uncertainty of the vertical load on the coupling by situating the load forward of the suspension centre.

Fixed drawbar applications involve a combination of draught load and vertical load and, in this regard, are similar to semi trailer applications with fifth wheel couplers.

6. TOW COUPLING LOADS

It is a requirement of ADR 62/.. that couplings, when installed in the design configuration, be able to withstand the forces given in that clause for the particular type of coupling.

Three components of normal tow coupling loads should be considered, i.e. draught loads, vertical loads and braking loads.

The effects of impact should be considered and included as a load multiplying factor. The degree of impact depends on vehicle speed and condition of the road surface. Loads that occur due to the articulation allowance of the coupling being exceeded should also be considered.

6.1 Tow Coupling Draught Loads

The approximately horizontal draught loads alternate between tension and compression, and depend on:

- Gross mass of towing vehicle
- Gross mass of trailer/s
- Vehicle acceleration or deceleration.

6.2 Tow Coupling Vertical Loads

The tow coupling/drawbar installation should be such that, in the laden condition, the drawbar is substantially horizontal. Hence, vertical loads are only considered to be significant in fixed drawbar applications and will alternate between up and down depending on:

- Gross mass of towing vehicle
- Gross mass of trailer
- Vehicle acceleration or deceleration
- Position of load and tow coupling in relation to suspension.

6.3 Tow Coupling Braking Loads

Under fixed drawbar trailer braking conditions, the brake reaction couple acts at the suspension and the tow couplings. The vertical load on the tow coupling depends on:

HEAVY VEHICLE MODIFICATIONS

- Gross mass of trailer
- Centre of gravity of loaded trailer
- Trailer deceleration
- Distance between trailer suspension and tow coupling

6.4 Tow Coupling Loads - Exceeding Articulation Allowances

Tow couplings need to provide articulation in all planes, viz:

- The horizontal plane
- The vertical plane
- Roll angle.

Exceeding the articulation allowance in operation will result in high stresses in the coupling. For example, reversing a trailer beyond the allowable jackknife angle can result in high loads in tow coupling assemblies. This can result in high bending stresses in, and deformation of, drawbar eyes in both fixed and articulated drawbar trailers.

7. TOW COUPLING RATING**7.1 Tow Coupling “D-Value”**

In order to select a coupling and design the attachment assembly with an appropriate strength rating, the required “D-Value” for the particular application must be calculated.

The “D-Value” is an expression that quantifies the required tow coupling dynamic performance as a function of the separate masses of truck and trailer/s. Trailer couplings and drawbar eyes must be rated by their manufacturer for a particular “D-Value” (in tonnes) and tested in accordance with the requirements of the applicable Australian Standard. Multiplying factors are applied to the “D-Value” to relate it to specific operating applications.

Formulae for calculating “D-Value” are given in Australian Standard AS 2213.

Where components of different “D-Values” are connected in a vehicle combination, the component with the lower “D-Value” will determine the overall rating of the towing connection.

The capacity of all towing components must be at least equal to the “D-Value” rating requirement of the vehicle combination. ADR 62/.. requires that all couplings have the rated “D-Value” and the name or trademark of the manufacturer clearly and permanently marked. 50mm pin type couplings must also have marked the rated vertical load.

For road train application, tow coupling assemblies must have a “D-Value” of not less than 186kN (19.0t).

HEAVY VEHICLE MODIFICATIONS

7.2 Other Expressions for Tow Coupling Rating

- **Vertical Load:** The vertical load imposed on the tow coupling by the trailer is a function of a number of variables, and includes braking loads. The vertical up load can be significant in some trailer applications. Vertical load rating cannot be used alone in the selection of a suitably rated coupling, but the maximum vertical load rating of the coupling must not be exceeded.
- **Gross Trailer Mass Rating:** The GTM rating, used by some tow coupling manufacturers, does not allow for dynamic interaction between towing vehicle and trailer and is not suitable for coupling selection. However, the Gross Trailer Mass Rating of the coupling must not be exceeded.
- **Aggregate Trailer Mass Rating:** The ATM rating, used by some coupling manufacturers, is the total mass of the laden trailer when carrying the maximum load recommended by the manufacturer. This will include any mass imposed onto the drawing vehicle when the combination vehicle is resting on a horizontal supporting plane.

8. TOW COUPLING INSTALLATION

8.1 Tow Coupling Selection

The selected Tow Coupling for a particular application must satisfy the requirements of all chapters of this Section. The following recommendations are made:

- Pin-type Couplings are recommended for low vertical loads, in formed road use - e.g. Hinged (Articulated) Drawbar Trailers.
- Ball Couplings are recommended where high vertical loads are imposed on the coupling assembly - e.g. Rigid Drawbar Pig Trailers.
- Hook Couplings are recommended for use in rough terrain off-road applications for either Rigid or Hinged Drawbar Trailers.

8.2 Tow Coupling Location

- Coupling Overhang. The coupling overhang for all vehicles should be as outlined in ADR 62/.. and ADR 44/..;
- Coupling Height. The coupling height for all vehicles should be as outlined in ADR 62/..;

8.3 Tow Coupling Tow Bar

The tow bar must comply with the requirements outlined in ADR 62/..; without any residual deformation, breaks, cracks or separation of components, and must be designed as such.

In the case of high “D-Value” couplings, substantial reinforcement and bracing will be required for towing members, such as the ‘A’ frame end of frame towing member shown in Figure 2.

HEAVY VEHICLE MODIFICATIONS

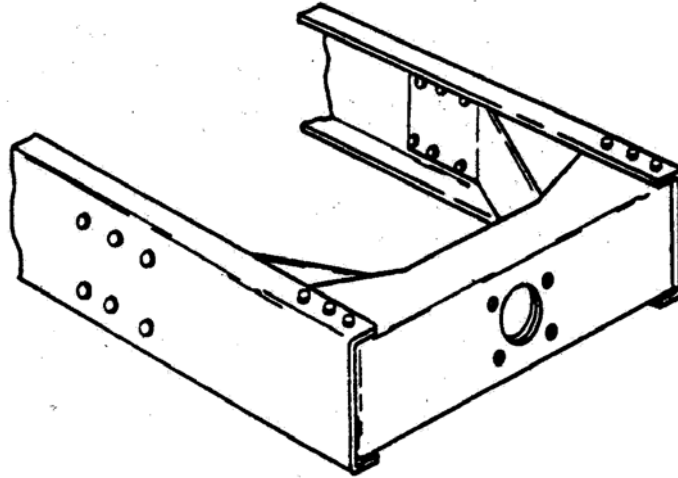


Figure 2.

Vehicle manufacturers often have optional chassis components for use in the installation of end of frame tow couplings. If available, these components should be used with the provision that they are suitable for the rating of the tow coupling to be installed.

It is recommended that tow bars be mounted and bolted centrally to the webs of the drawing vehicle chassis side member.

An alternative (but less preferred) method is the mounting of the tow bar below the drawing vehicle chassis side members and attached to them through fishplates.

The load requirements for tow bars is outlined in ADR 62/.. (or ADR 63/.. for road train trailers). As a guide, suggested bolting requirements are as follows:

- Bolt holes should be match drilled and provide a maximum clearance of 1mm. Good practice is to ream the holes to size.
- Suitable hardened washers should be installed under the nuts. On aluminium alloy chassis, hardened washers must be used under both the nut and bolt head.
- Each bolt must have a self locking nut. A spot of weld or spring washer are not acceptable.
- The bolt length should be such that the thread portion is not within the grip length.
- It is recommended that M20 bolts be used with a chassis having double web thickness and that M16 bolts be used on single web thickness. It is preferable to use bolts with fine threads.
- The bolts must be ISO Grade 8.8 (SAE Grade 5) or stronger.

Coupling manufacturers issue instructions and requirements for installation of their couplings, including tow bar web thickness, hole pattern, bolt size, grade and torque and coupling assembly. All instructions from the manufacturer must be obtained and followed. To ensure the safe operation and long working life of the tow coupling, the manufacturer's operating, maintenance and reconditioning instructions must be followed. Wear and damage inspections should be regularly conducted.

HEAVY VEHICLE MODIFICATIONS

Except where the tow bar is an integral part of the vehicle, the tow bar must be clearly and permanently marked in accordance with the requirement prescribed in ADR 62/...

8.4 Tow Coupling Drawbar Strength

In the case of a single trailer, the drawbar must be able to withstand the forces given in ADR 62/.. without incurring loss of attachment or any distortion or failure which would affect the safe drawing of the towed trailer.

In the case of a road train, the drawbar must be able to withstand the forces prescribed in ADR 63/.. without residual deformation, breaks, cracks or separation of components.

The drawbar must be securely attached to a substantial portion of the trailer.

8.5 Tow Coupling Drawbar Design

The drawbar length should be the minimum practicable, consistent with the operation and preferably symmetrical in side elevation.

For road train operation, the location and height of the drawbar and drawbar pivots must be as outlined in ADR 63/...

For all other trailers, the location and height of the drawbar and drawbar pivots should be as outlined in ADR 62/...

The drawbar should be designed using good engineering practice and should include the following:

- The change in cross section between the towing eye shank and drawbar structural members is to be as gradual as possible to prevent stress concentration.
- Bends in structural members are to be as few as practicable and shall be reinforced.
- The drawbar eye shank is to be fixed in the drawbar to prevent rotation where used with rotating type couplings.
- The assembly should avoid sections capable of accumulating and retaining dirt, moisture or material likely to cause corrosion.

8.6 Tow Coupling Drawbar Welding Considerations

All welding shall comply with the requirements of Australian Standard 1554 Part 1 - *Welding of Steel Structures*. Welding of side arms to the drawbar eye or, in the case of a demountable draw bar eye, must be on the longitudinal parallel sides of the eye.

Before welding the block onto the drawbar, the drawbar eye must be removed. Transverse or circumferential welds on the drawbar eye/block are not permitted under any circumstances.

All welds applied to the drawbar eye shall be carried out in accordance with the manufacturer's recommendations. However, the requirements of the above paragraph override any conflicting manufacturer's recommendations.

HEAVY VEHICLE MODIFICATIONS

Where no manufacturer's specific recommendations for welding of the drawbar eye are available, then the following weld procedure shall be used (refer Figure 3):

- Preheat drawbar eye to 250°C.
- Low hydrogen electrodes, dried according to the manufacturer's recommendations or a hydrogen controlled welding process, shall be used to make all welds, including tack welds and welds on cover plates, etc.
- Weld runs should consist of a number of runs of small welds so that the heat input to the eye and structure is progressive.
- A minimum of four welds, 150mm long and 6mm fillet minimum are required.
- Care must be taken to avoid end craters, undercutting and penetration notches.
- After welding, the towing eye shall be protected by suitable means so as to ensure slow cooling from the welding temperatures.

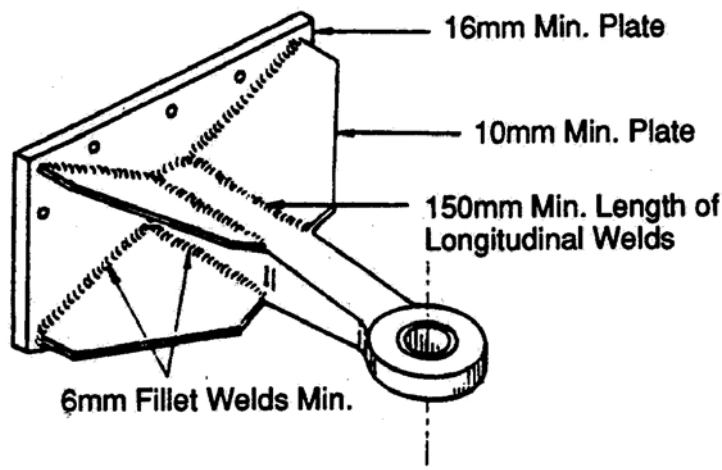


Figure 3.

If welding on the towing eye is stopped for any length of time, the components shall be raised to the preheat temperature before welding is recommenced.

The drawbar eye attachment shall be designed so that all welds are visible for inspection purposes. Inspection of welds on the drawbar eye should, preferably, be carried out by ultrasonic methods in order to detect any heat affected zone cracking.

9. TOW COUPLING SAFETY CHAINS

All vehicles to which safety chains are required to be fitted shall be so equipped as outlined in ADR 62/... Vehicles having the capacity to tow trailers with an aggregate trailer mass of 2.5 tonnes or more, must be fitted with two safety chain attachments, one on either side of, and adjacent to, the tow coupling.

Each attachment and safety chain must be able to withstand the forces prescribed in ADR 62/.. without any residual deformation, breaks, cracks or separation of components.

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“RAMS-HORN” TYPE HOOKS ARE NOT PERMITTED FOR SAFETY CHAIN ATTACHMENTS except in conjunction with 50 mm ball couplings. They are not recommended in these cases but may be used providing it can be demonstrated that the material used and the method of forming and attachment results in an installation that meets the strength requirements specified below.

It is strongly recommended that all trailers be fitted with safety chains, especially vehicles used in severe conditions, for example, logging or quarry vehicles.

NOTE: A pair of safety chains is required.

9.1 Tow Coupling Safety Chain Specification

All safety chains are to be comply with the specifications as described in ADR 62/..; covering the material requirements and the chain size to be used.

The use of chains larger than specified should be avoided to minimise the shock loading on attachment fittings in the event of coupling failure.

9.2 Arrangement of Tow Coupling Safety Chains

Safety chains must be arranged so that:

- The chains are permanently attached to the trailer.
- The chains are crossed to support the drawbar and prevent it from dropping to the ground in the event of coupling failure or disconnection.
- The points of attachment to both the towing vehicle and the trailer must be as near as practicable to the coupling and arranged so as to maintain direction of the trailer in the event of coupling failure or disconnection, without any part of the trailer attachment touching the ground.
- The chains are as short as possible but long enough to permit proper turning of the vehicle.
- The brake hoses are of sufficient length to prevent them breaking in the event of a coupling failure or disconnection.

IMPORTANT: Ensure that the attachment fittings do not foul on the rear of the towing vehicle or trailer drawbar under any possible operating conditions.

9.3 Attachment of Tow Coupling Safety Chains

Safety chains must be attached so that:

- The attachments of the towing vehicle and the trailer are separate from the coupling and its fasteners.
- Chain coupling links (“Berglok” type BL Grade 8 or similar) are used to connect the chains to the trailer and towing vehicle. **Note: Shackles are not permitted.**
- The chain and coupling links are not welded, deformed or electroplated subsequent to its manufacture.

HEAVY VEHICLE MODIFICATIONS**10. TOW COUPLING REPAIRS & MAINTENANCE**

Deformed, badly worn or fractured drawbar components shall not be repaired and must be replaced. Drawbar eye bushes must be fitted in accordance with the manufacturer's instructions and must not be retained by welding.

To ensure uniformity when repairing or rebuilding drawbar eyes and tongues, the following procedures should be adopted. The procedures outlined are the suggested minimum requirements to be followed.

- The mounting plate is to be a minimum of 16mm thick and the gusset plates shall be 10mm minimum thickness.
- If the mounting plate is to be bolted to the trailer drawbar as in most instances, then a minimum of six grade 8 bolts should be used e.g. a pig trailer with a rigid drawbar having a "D-Value" of 17.3 tonnes will require 6 x M20 (3/4" diameter) grade 8 bolts.
- All welding is to comply with the requirements of Australian Standard 1554 Part 1 - *Welding of Steel Structures*.
- Welding of gussets to the drawbar eye may be parallel to shank only with a minimum of four (4) longitudinal welds (minimum 6mm fillet), 150 mm in length and using hydrogen controlled electrodes or a hydrogen controlled welding process (Refer Figure 3). No transverse or circumferential welding on the drawbar eye is permitted.
- The drawbar eye attachment shall be so designed that all welds are visible for inspection purposes.
- Forged drawbar eyes should not be reclaimed.

11. FIFTH WHEEL APPLICATIONS

There are essentially three basic types of fifth wheel. Illustrations of these three basic types are as shown:

- Single oscillating – fixed base on prime mover - Fig 4.
- Single oscillating – turntable mount on prime mover - Figs 5 & 6.
- Double oscillating – restricted application only - Figs 7 & 8.

11.1 Type 1 - Single Oscillating

This type is shown below in Figure 4 and, having the oscillation axis fixed relative to the prime mover, is suitable for platform and van type semi trailers operating on normal road surfaces.

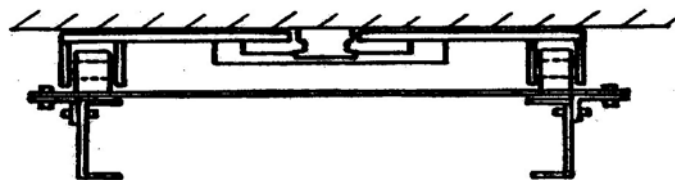


Figure 4.

HEAVY VEHICLE MODIFICATIONS**11.2 Type 2 - Single Oscillating, Turntable Mount.**

There are two sub types:

- Turntable Based Single Oscillating, Utilising a Hollow Centre (Greasy Plate) Turntable. This type maintains the oscillation axis fixed relative to the trailer. It is illustrated in Figure 5.

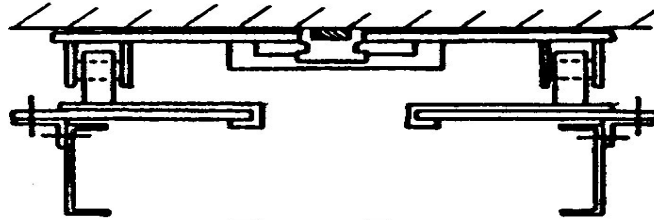


Figure 5.

- Turntable Based Single Oscillating, Utilising a Ball Bearing Turntable. This type also maintains the oscillation axis fixed relative to the trailer.

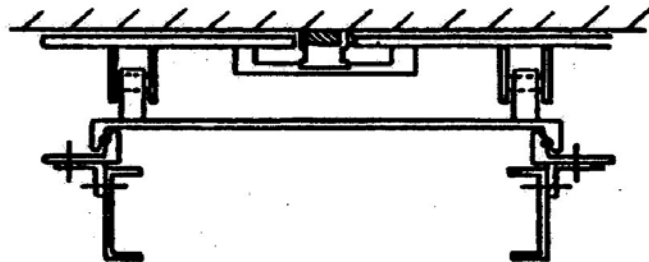


Figure 6.

NOTE: Turntables in Figures 5 & 6 are mounted to a solid base that then mounts to the vehicle.

11.3 Type 3 - Double Oscillating.

Again there are two sub types:

- Double Oscillating, Unrestricted. This type suits only heavy low loader application, where the trailer has very high torsional rigidity and an unsprung suspension. It is illustrated in Figure 7.

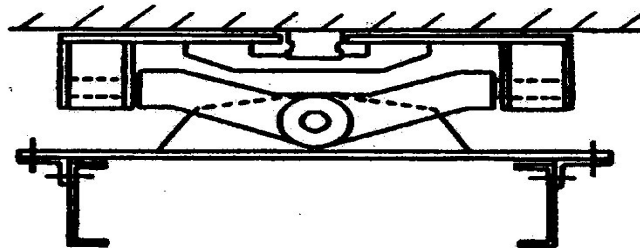


Figure 7.

HEAVY VEHICLE MODIFICATIONS

- Double Oscillating, Restricted. This is suitable only for tanker trailers and low loaders with high torsional rigidity and low centre of gravity. Not recommended for use where air suspensions are used.

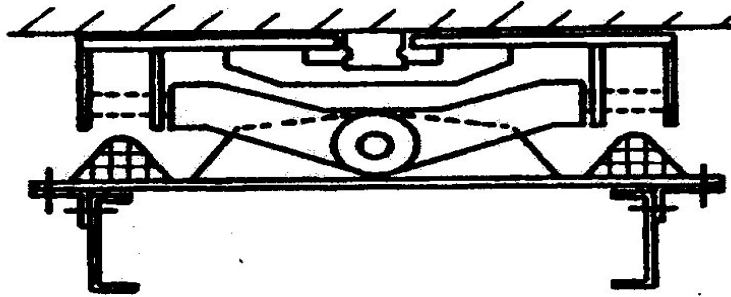


Figure 8.

12. FIFTH WHEEL RATING**12.1 Fifth Wheel “D-Value”**

In order to select a Fifth Wheel and design the attachment assembly with an appropriate strength rating, the required “D-Value” for the particular application must be calculated.

The “D-Value” is an expression that quantifies the required tow coupling dynamic performance as a function of the separate masses of truck and trailer/s. Fifth Wheels must be rated by their manufacturer for a particular “D-Value” (in tonnes) and tested in accordance with the requirements of the applicable Australian Standard. Multiplying factors are applied to the “D-Value” to relate it to specific operating applications.

Formulae for calculating “D-Values” ratings for Fifth Wheels and King Pins are given in Australian Standard AS 1773 and AS 2175.

Where components of different “D-Values” are connected in a vehicle combination, the component with the lower “D-Value” will determine the overall rating of the towing connection.

The capacity of all towing components must be at least equal to the “D-Value” rating requirement of the vehicle combination.

12.2 Minimum Ratings

The minimum “D-Value” for any vehicle combination is specified in ADR 62/..; Fifth Wheels and King Pins having a “D-Value” of not less than 101kN (10.3t) are adequate for all vehicles up to 42.5 tonnes Gross Combination Mass (GCM).

Fifth Wheels and King Pins for use in road train application must have a “D-Value” not less than 162kN (16.5t).

If a fifth wheel or king pin does not have a “D-Value” rating, then it should have a manufacturer’s strength rating of not less than the maximum legal GCM for the vehicle combination.

HEAVY VEHICLE MODIFICATIONS**13. FIFTH WHEEL INSTALLATION****13.1 Fifth Wheel Type Selection**

- Wherever possible, the fifth wheel should be of a fixed base type (refer Type 1, Figure 4). In this type, the oscillation axis is maintained fixed, relative to the towing vehicle, thus giving the maximum all round vehicle stability.
- Turntable base fifth wheels (also known as stabilised fifth wheels, (refer Figure 6) should only be used in special applications, and then only when absolutely necessary.
- Double Oscillating Fifth Wheels offer no trailer roll stiffness at the front of the trailer, thus effectively halving the trailer's roll stiffness. Thus they are suitable for only very specialised applications operating at low speeds.

In addition to the Fifth Wheel type, there are other factors that may be taken into account when considering fifth wheel selection:

- Fifth wheel capacity ("D-Value")
- Coupling interchangeability
- Range of towing/towed vehicle combinations to be operated by the vehicle being fitted.

13.2 Design and Workmanship Standards

All design and workmanship must be in accordance with other relevant sections of this National Code of Practice to ensure the complete vehicle is modified to a satisfactory standard and with the following:

- Australian Standard 1771- *Installation of Fifth Wheel Assemblies*
- Australian Standard 2174 (Parts 1 & 2 and amendments) *Articulated Vehicles – Mechanical coupling between prime movers and semi-trailers - Interchangeability requirements*
- Australian Standard 1773 *Articulated Vehicles - Fifth Wheel Assemblies*
- Australian Standard 2175 *Articulated Vehicles - Kingpins*
- *Australian Design Rules for Motor Vehicle Safety* - 2nd and 3rd Editions.

Specific requirements for the installation of fixed or sliding fifth wheel assemblies are given in the following paragraphs.

13.3 Installation of Fixed Assemblies

The fifth wheel must be mounted on either a base plate or a sub chassis.

There must be at least 5mm clearance between the base plate or sub chassis and chassis flange (refer Figure 9) or as defined in the chassis manufacturer's recommendations.

HEAVY VEHICLE MODIFICATIONS

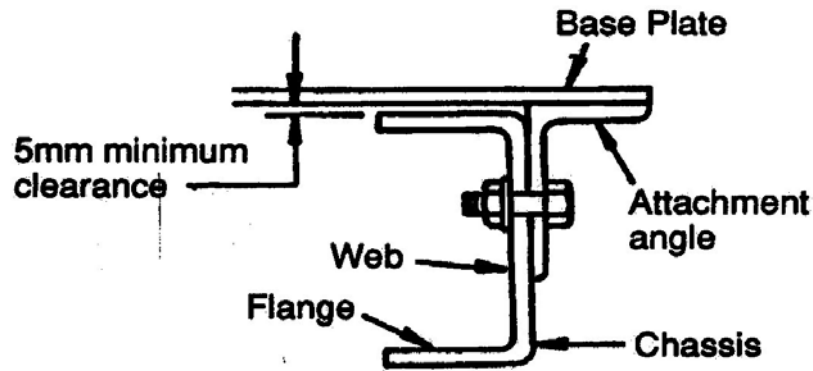


Figure 9.

If the base plate is made of flat plate, it must be at least 12mm thick. If “ripple” plate is used, it must be at least 8mm thick and have other dimensions as illustrated in Figure 10.

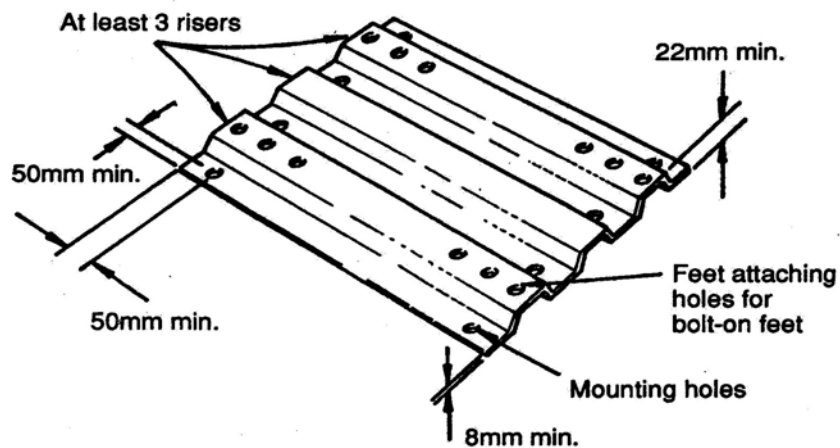


Figure 10.

The fifth wheel assembly must be bolted to the web of the chassis (using attachment angles or fishplates).

There must be at least four M20 (3/4") or six M16 (5/8") bolts per side. It is recommended that M20 bolts be used with chassis having double web thickness and that M16 bolts be used on single web thickness. It is preferable to use bolts with fine threads.

Bolt spacing must be within the range (Figure 11):

- M16 - 100 to 225mm
- M20 - 100 to 300mm.

HEAVY VEHICLE MODIFICATIONS

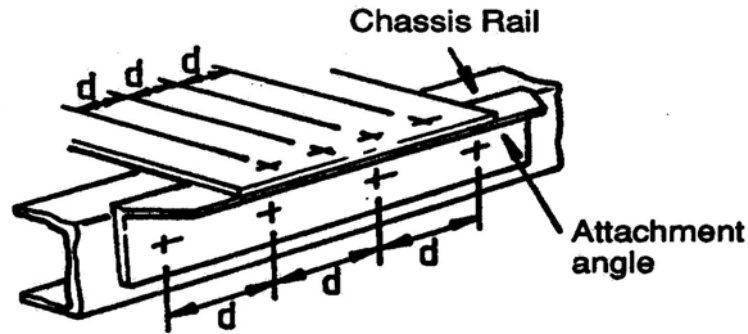


Figure 11.

The bolts must be ISO Grade 8.8 (SAE Grade 5) or stronger. Refer Figure 12 for suitable bolt head markings.

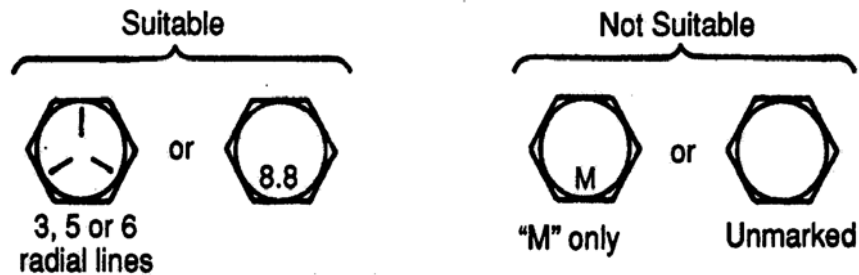


Figure 12.

Each bolt must have a nut locked onto it. The locking method must not be a spot of weld, spring washer or a split pin hole drilled through the side of the nut (unless it is a proprietary castellated nut). An acceptable method is to use self locking nuts. Manufacturer's re-useability limitations on nuts must be observed.

Hardened washers must be used under all nuts (hardened washers usually have three radial tangs on the outer circumference). Tapered shims must be used where appropriate. On aluminium alloy chassis, hardened washers must be used under both the nut and bolt head.

The bolt hole clearance should be no more than 1mm. Good practice is to ream the holes to size. It is good practice to install all vertical bolts with the head uppermost. This will ensure that if the nut is lost, the bolt will not fall out. The bolt length should be such that the thread portion is not within the grip length.

The recommended bolt torque is 170-190Nm (126-140ft.lbs) for M16 size bolts and 330-370Nm (244-273ft.lbs) for M20 size bolts (Refer Figure 13).

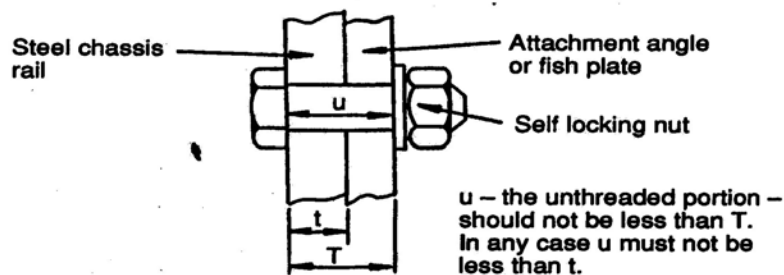


Figure 13.

HEAVY VEHICLE MODIFICATIONS

Chassis mounting bolts must not be within one fifth of the chassis depth of the top and bottom flange (Refer Figure 14).

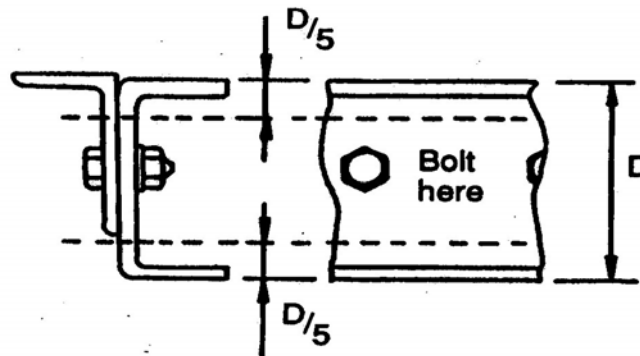


Figure 14.

U-Bolts, or an array of smaller size bolts, are not acceptable for attachment of the fifth wheel.

The base plate must be secured onto the sub chassis or attachment angle using either bolts or by welding. Bolting is preferred. If bolted, it must incorporate at least four M20 (3/4") or six M16 (5/8") bolts per side.

The bolt spacing must be within the range:

M16 - 100 to 225mm

M20 - 100 to 300mm.

The bolts must be ISO Grade 8.8 (SAE Grade 5) or stronger.

If welded, more than 450mm (total) of 10mm fillet weld per side is required (Refer Figure 15).

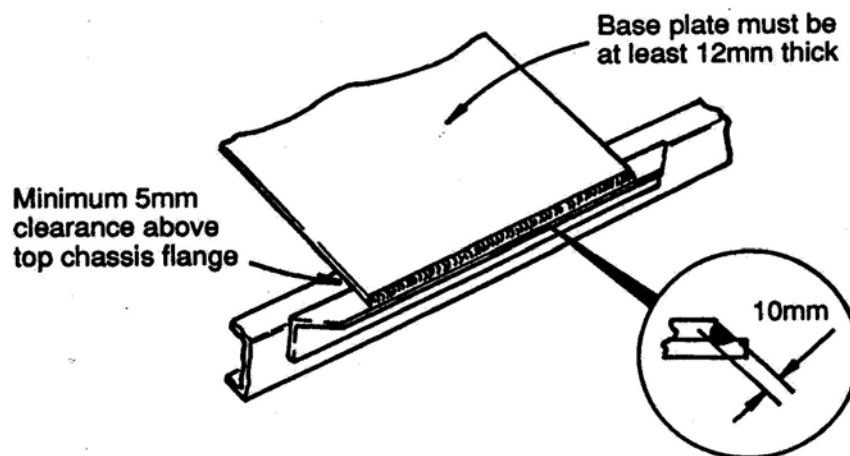


Figure 15.

If intermittent welding is used, the weld runs must be at least 40mm long.

HEAVY VEHICLE MODIFICATIONS

Any person considering welding as an attachment method should consult the turntable manufacturer to determine if any special requirements are necessary. Only competent persons, trained in welding techniques, should be employed to weld components. All welds must be of good quality and not incorporate any undercuts or craters.

The fifth wheel feet shall be secured to the base plate either using bolts or by welding. Bolting is preferred - welding is only permitted if the turntable manufacturer approves of this method.

If bolted, at least four M20 (3/4") or six M16 (5/8") grade 8.8 bolts per 300mm must be used (Refer Figure 16).

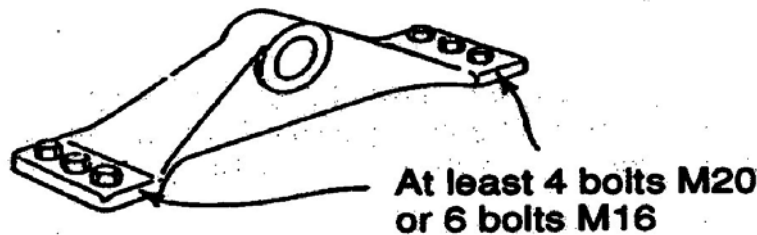


Figure 16.

If welded, then at least 450mm (total) of 10mm fillet weld per fifth wheel foot on at least 3 sides must be used (Refer Figure 17).

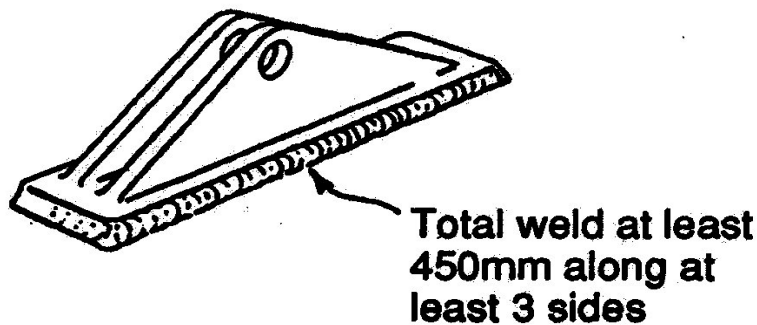


Figure 17.

The weld must be of good quality and not incorporate any undercuts or craters (see earlier comments on welding).

If the attachment angle is cut to accommodate a spring hanger, then there must be at least one bolt in close proximity to each side of the cut out. The bolts must not be closer than 50mm to any spring hanger bolt or rivet (Refer Figure 18).

HEAVY VEHICLE MODIFICATIONS

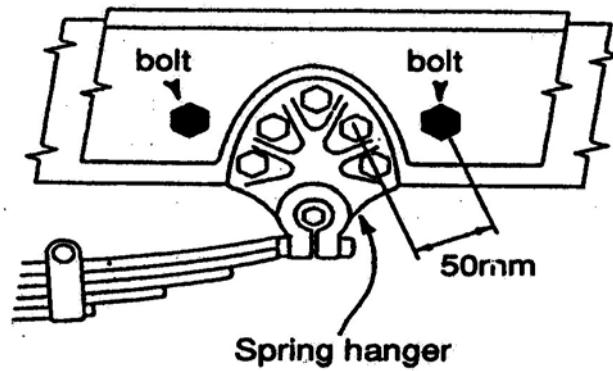


Figure 18.

The length of the attachment angle (or fishplate overall spacing) must be greater than the chassis width, preferably by about 600mm (this avoids abrupt section change and distributes the load more evenly) (Refer Figure 19).

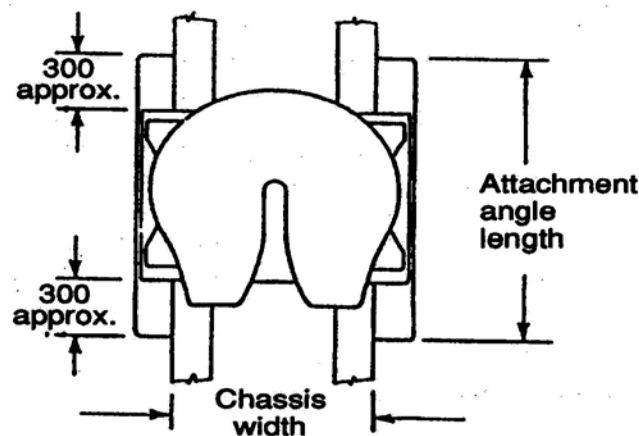


Figure 19.

On attachment angles or fishplates there must be at least one bolt at least 50mm forward of the leading edge of the base plate, and at least one bolt at least 50mm rearward of the base plate (the preferred minimum is 80 mm) (Refer Figure 20).

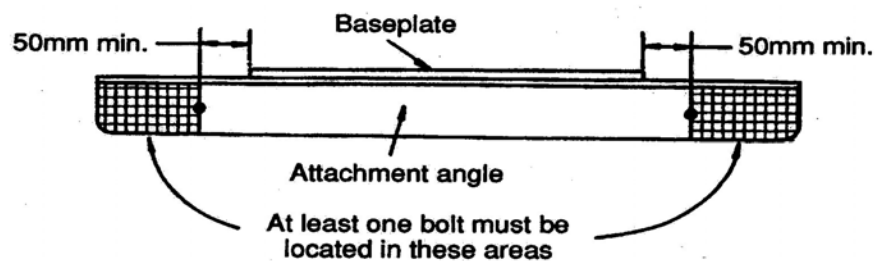


Figure 20.

Attachment angles used must have the minimum dimensions of 100 x 75 x 10mm (4 x 3 x 3/8").

Fishplates or cheek plates must be a minimum of 10mm thick and any bolt hole centre lines must not be closer than 50mm from any edge (Refer Figure 21).

HEAVY VEHICLE MODIFICATIONS

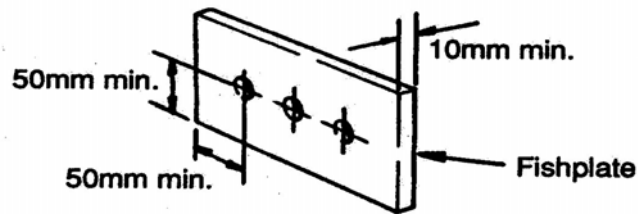


Figure 21.

13.4 Installation of Sliding Assemblies

As well as those requirements listed above, sliding assemblies (Figure 22) must also be fitted as follows:

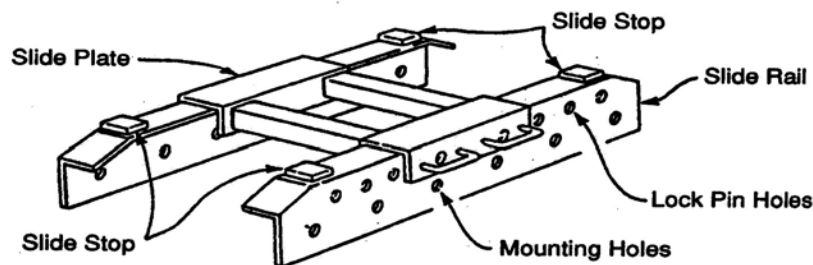


Figure 22.

The attachment angle on a sliding assembly must have a bolt located at or beyond each end of the travel of the slide plate. No bolt shall be located within 50mm of any suspension mounting bracket fastener. Slide stops must be fitted.

The load capacity of the locking device must be of at least equivalent value to that of the rating of the fifth wheel. Slide stops must be secured by bolts or welding.

If bolted, at least one grade 8.8 M16 bolt per stop must be provided (Refer Figure 23).

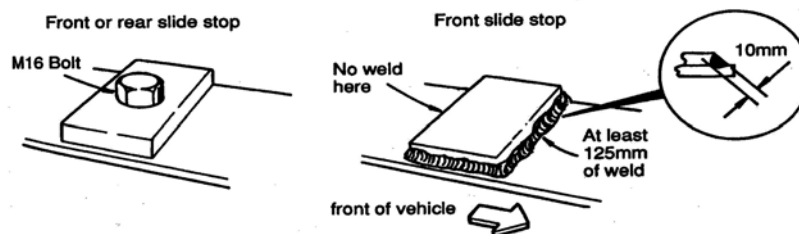


Figure 23.

If welded, there must be at least a total of 125mm of 10mm weld on three sides. The stop face must not have any weld (Refer Figure 23).

The weld must be of good quality and must not contain undercuts or craters.

The locking mechanism must be of a positive locking type.

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The locking mechanism must be resistant to detachment due to vibration or wear.

14. FIFTH WHEELS FOR “B” DOUBLES

The location, mounting and strength requirements used to couple “B” Double units must comply with the information shown in this Section and with the appropriate Australian Standards AS 1771, 2174 and 1773.

“Centre of Gravity Compensating” or equivalent fifth wheels will be considered for vehicles with a high torsional stiffness (e.g. tankers, freezer vans).

Double oscillating type fifth wheels will **not** be considered.

15. FIFTH WHEELS KING PINS**15.1 Introduction**

The following information is provided to assist repairers and operators to correctly select and install semi trailer fifth wheel king pins.

There are two different types of installation commonly available:

- Bolt in King Pins
- Weld in King Pins

15.2 Fifth Wheel Bolt In King Pins

A number of fifth wheel king pin manufacturers offer a bolt in assembly, consisting of a housing and bolt in pin.

It is recommended that vehicle repairers and operators use this type of installation, even though the initial cost may be higher than the weld in pin. This initial cost disadvantage can be made up many times over when a replacement pin must be fitted.

- Advantages:
 - Quick, easy replacement
 - Less time off road
 - Accurate installation.
- Disadvantages:
 - Higher initial cost.

It is important that all pin retaining bolts are tensioned correctly, this will ensure reliable service.

HEAVY VEHICLE MODIFICATIONS

15.3 Fifth Wheel Weld In King Pins

Weld in pins have been in use for a number of years, and provided correct installation practices are adopted, reliable service will result. There are, however, a number of disadvantages with this type of installation when replacement becomes necessary.

- Disadvantages:
 - Access for replacement difficult
 - Longer time off road
 - Experienced tradesperson required
 - Specialised equipment required.

Before attempting to replace a pin of this type, it is essential that the manufacturers pin replacement guidelines be referred to. This will ensure the correct techniques are used. These guidelines should cover:

- Type of welding rods to be used
- Welding current
- Welding sequence
- PRE heat and POST heat treatments (if necessary)
- Installation.

If a Weld In King Pin is employed, note that welding is **NOT** permissible in the shaded area shown in Figure 24 below.

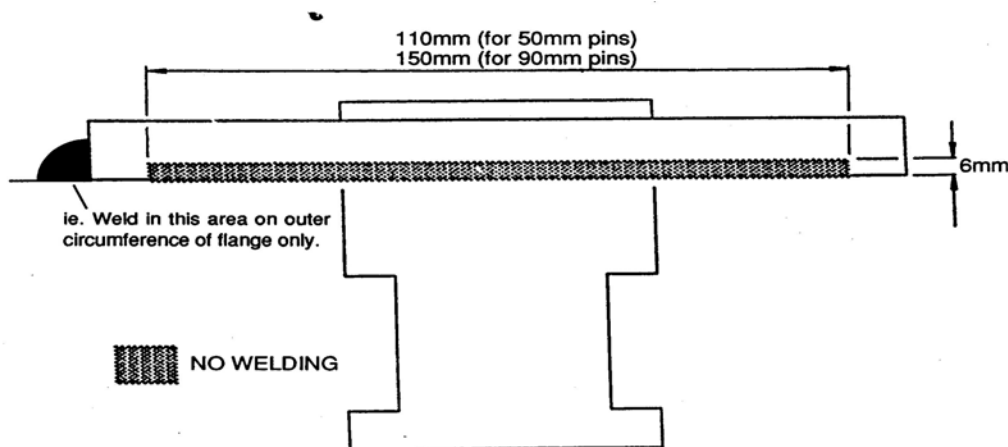


Figure 24.

15.4 Fifth Wheel King Pin Attachment

With the registered Gross Combination Mass of vehicles now reaching 42.5 tonnes, it is important to ensure that all king pin installations, be capable of withstanding a loading of at least 27 tonnes.

HEAVY VEHICLE MODIFICATIONS

15.5 Fifth Wheel King Pin Protrusion

To give satisfactory service, all pins, bolt in or weld in, should be correctly selected to suit the thickness of the trailer skid plate (Refer Figure 25).

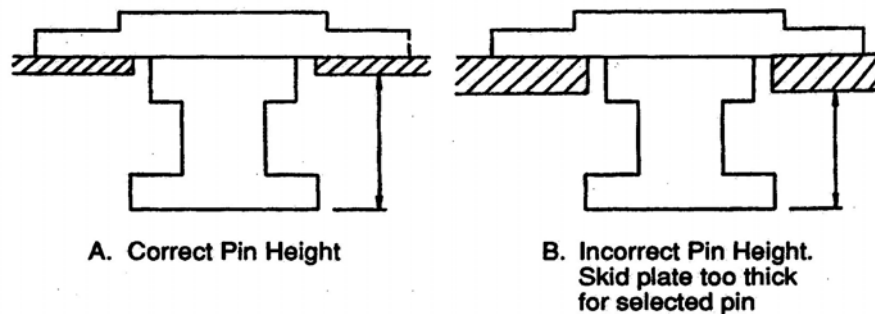


Figure 25.

Incorrect height as shown in B above, will lead to damage and premature failure of the fifth wheel jaws and pin. It can also prevent the correct locking of the fifth wheel and subsequent loss of the trailer from the prime mover.

Installation is critical and must be in accordance with Australian Standard and the manufacturer's recommendations. Figure 26 below shows the critical dimensional requirements for 50mm king pins.

(Standard AS 2175)

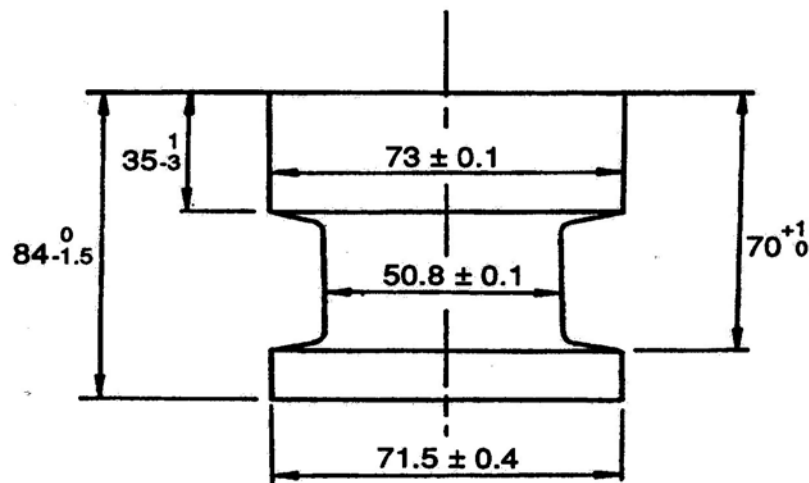


Figure 26.

CAUTION: If the king pin supplier cannot supply fitting instructions from the pin manufacturer, purchase your replacement pins from a professional supplier who can.

15.6 Fifth Wheel Wear Plates

When a teflon or other wear plate is fitted to a skid plate, the king pin must be repositioned so correct projection below this wear plate is maintained.

HEAVY VEHICLE MODIFICATIONS

15.7 Fifth Wheel King Pin Gauge

Use of an approved height/wear gauge is recommended. These gauges provide a quick and accurate check of the pin to ensure it can safely be put back on the road. Figure 27 shows a typical gauge.

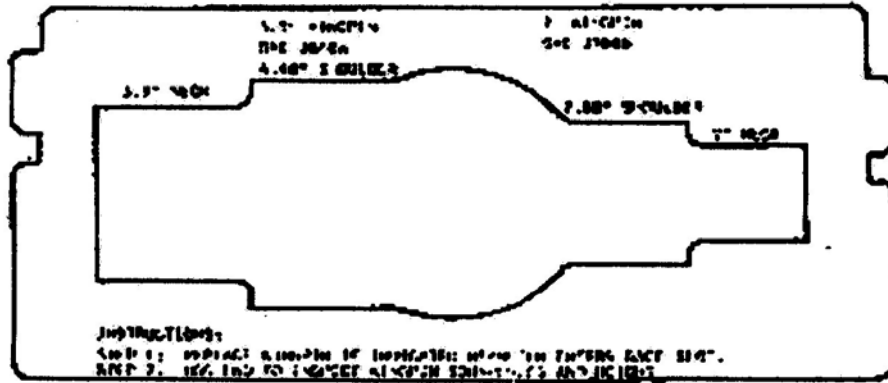


Figure 27.

15.8 Machining of Fifth Wheel King Pins

Machining of any surface of a king pin assembly, including any flanges, is **NOT** permitted, unless it is performed strictly in accordance with manufacturer's specifications.

16. FIFTH WHEEL REPAIRS & MAINTENANCE

When replacing turntables, new attachment angles and fittings must be used unless the existing angles and fittings can be used without the necessity of drilling new holes.

Welding is a specialised and skilled matter. For example, some metals are unable to be welded, others require the use of special grades of welding rods and special techniques should be employed to weld components. If in doubt, use bolts!

Nuts, bolts and washers should not be re-used. Self locking nuts are designed to be used once only and must not be re-used.

Any bolt that has been drilled for a split pin must not be used, if, when installed, the hole is between the bolt head and the top of the nut.

17. RECORDING

It is not feasible in this code to cover every aspect of analysis that might be necessary in a Tow Coupling/Fifth Wheel modification. However, in the Appendices of this document are:

- Appendix 1 - Pro-Forma Modification Report - Fifth Wheel & Turntables Evaluation Data. This form, completed in full, should be retained by the Certifying Officer.
- Appendices P1 and P2 which:

HEAVY VEHICLE MODIFICATIONS

- Summarise the scope of modification work that may be certified under each of these Modification Codes.
- Include lists of Sections of the National Code of Practice covering other areas of the vehicle which may have been affected by the modification and which should be analysed to determine whether they, too, require re-certification.
- Include checklists appropriate to the particular Modification Code that should be completed by the Certifying Officer.

It is suggested that analysis work records, sketches and other vehicle data, together with copies of the Calculation Sheet and completed Checklists, be retained by the Certifying Officer for at least the period specified in Part A of this National Code of Practice.

HEAVY VEHICLE MODIFICATIONS

Appendix 1

Fifth Wheels & Turntables Evaluation Data

Report No.

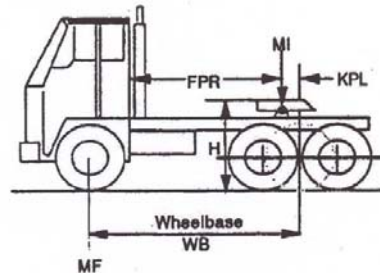
Vehicle Make & Model <input type="text"/>	Fifth Wheel Type <input checked="" type="checkbox"/>	Fixed Base <input type="checkbox"/>	Stabil. Base <input type="checkbox"/>	Sliding Base <input type="checkbox"/>	Fifth Wheel Make & Model <input type="text"/>
Fixed Base Make & Model <input type="text"/>	Stabil. Base Make & Model <input type="text"/>			Sliding Base Make & Model <input type="text"/>	

Compliance with AS 1773-1990 ☐ Yes ☐ No

If NO - Alternative Standard Applicable:

Installation:

Wheelbase WB	<input type="text"/>	mm
Tare Mass Front Axle MF	<input type="text"/>	kg
* King Pin Lead KPL	<input type="text"/>	mm
* Height H	<input type="text"/>	mm
Imposed Max. Load MI	<input type="text"/>	kg
Max. Static Load front axle MF	<input type="text"/>	kg
Manufacturer's Front Axle Rating	<input type="text"/>	kg
* Forward Projection Radius FPR	<input type="text"/>	mm



MF Must not exceed the least of legal limit, tyre capacity or manufacturer's rating.

MF Must not be less than MFT

KPL Minimum = 2% WB

* Refer AS2174 - 1978

Mountings:

Mounting Angle
 Sizes = mm (min. 100 x 75 x 10 or equivalent)
 Length = mm (min. Chassis Width + 600)

Mounting Bolts

Base Plate to Angle: No. of Bolts
 Angle to Chassis: No. of Bolts

Dia. mmGrade Dia. mmGrade

Clearance:

Top of Chassis to Top of Angle = mm (min. = 5mm)

Formula

$$MF = \frac{MFT + (MI \times KPL)}{WB}$$

For Sliding Assemblies:

Describe means of positive locking:

Describe slide stops and give bolt size or weld size & length

Signed _____ Date _____ RES No. _____

HEAVY VEHICLE MODIFICATIONS**Appendix P1****Modification Code P1****TOW COUPLING INSTALLATION****VEHICLES OVER 4.5 TONNE GVM**

Modifications that are covered under this Modification Code are:

1. Selection and mounting of tow coupling.
2. Design and construction of tow coupling mounting.
3. Safety chain attachment.
4. Fitting trailer electrical connectors.

Modifications that are **not** covered under this Modification Code are:

1. Fitting components that are not compatible with original vehicle components.
2. Fitting components not designed for automotive use.
3. Modifications that do not meet the requirements of this code.

NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards or Regulations/Acts.

Outlined below are areas of the vehicle that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance for the modified vehicle.

DETAIL**REQUIREMENTS**

Design and Construction of Tow Bar

National Code of Practice - Section P

ADR 62/..., Good Engineering Practice

Selection of Tow Coupling

National Code of Practice - Section P

ADR 62/...

Safety Chain Attachment

National Code of Practice - Section P

ADR 62/...

Brake Lines and Connections

National Code of Practice - Section G

ADR 35, 35A, 35/..., ADR 38, 38/..., SAE Standards

Trailer Electrical Connections

National Code of Practice - Section P

HEAVY VEHICLE MODIFICATIONS

Checklist P1

TOW COUPLING INSTALLATION
(VEHICLES OVER 4.5 TONNE GVM)(Y=Yes N=No)
delete if not applicable**1.0 Coupling**

- | | | | |
|-----|---|---|---|
| 1.1 | Does the coupling conform to the requirement of ADR 62/.. (has been tested or certified by the manufacturer)? | Y | N |
| 1.2 | Is the coupling's D-value rating sufficient for the required loads? | Y | N |
| 1.3 | Is the coupling installed in accordance to the requirements of this National Code of Practice and ADR 62/..? | Y | N |

2.0 Tow bar

- | | | | |
|-----|--|---|---|
| 2.1 | Has the tow bar been designed and mounted in accordance with the requirements of this National Code of Practice? | Y | N |
|-----|--|---|---|

3.0 Drawbar

- | | | | |
|-----|---|---|---|
| 3.1 | Has the drawbar been designed in accordance with this National Code of Practice? | Y | N |
| 3.2 | Has the drawbar eye been mounted in accordance with this National Code of Practice and does all the welding conform to AS 1554, Part 1? | Y | N |
| 3.3 | Have safety chains been fitted in accordance with this National Code of Practice and ADR 62/..? | Y | N |

4.0 General

- | | | | |
|-----|---|---|---|
| 4.1 | Is the quality of workmanship to a satisfactory standard? | Y | N |
|-----|---|---|---|

NOTE: If the answer to any relevant question is "NO", the modification is not acceptable.

Make:.....

Model:.....Year of Manufacture:.....

Vehicle Chassis No/VIN:.....

Vehicle Modifier:.....

Examined by:.....

Company (if applicable):.....

Certifying Officer No:..... Modification Certificate No:.....

HEAVY VEHICLE MODIFICATIONS

Modification Plate No:.....

Signed:..... Date:

HEAVY VEHICLE MODIFICATIONS

Appendix P2

Modification Code P2

FIFTH WHEEL KING PIN INSTALLATION

Modifications that are covered under this Modification Code are:

1. Fitting of fifth/wheel turntable assemblies, including construction of base and mounting of fifth wheel/turntable.
2. Fitting of king pin assemblies to trailers.
5. Design and construction of tow coupling mounting..

Modifications that are **not** covered under this Modification Code are:

1. Modifications of the fitting of components that do not meet the requirements of this National Code of Practice.
2. Modifications of other than commercial vehicles.

NOTE: The modified vehicle/modifications must continue to comply with all applicable ADR's, Australian Standards or Regulations/Acts.

Outlined below are areas of the vehicle that may have been affected by the modifications and that may require recertification, testing and/or data to show compliance for the modified vehicle.

DETAIL

Chassis Frame Alterations

REQUIREMENTS

Modification Code H4

HEAVY VEHICLE MODIFICATIONS

Checklist P2

FIFTH WHEEL KING PIN INSTALLATION

(Y=Yes N=No)
delete if not applicable**1.0 Coupling Selection**

- | | | | |
|-----|---|---|---|
| 1.1 | Based on the D-Value rating of the fifth wheel manufacturer's strength rating, is the fifth wheel of sufficient capacity for the maximum legal GCM for the vehicle combination? | Y | N |
| 1.2 | Is the type of fifth wheel suitable for the application of the vehicle combination? | Y | N |

2.0 Coupling Installation

- | | | | |
|------|--|---|---|
| 2.1 | Is there at least 5mm clearance between the base plate/sub chassis and chassis flange? | Y | N |
| 2.2 | If the base plate is made of flat plate, is it at least 12mm thick, or if a "ripple" plate is used, is it constructed as per Figure 7 of this Section? | Y | N |
| 2.3 | Do at least four M20 (3/4") or six M16 (5/8") bolts per side secure the attachment angles/fishplates to the web of the chassis rail? | Y | N |
| 2.4 | Do at least four M20 (3/4") or six M16 (5/8") bolts per side, or at least 450mm (total) of 10mm fillet weld per side, secure the base plate to the attachment angles/fishplates? | Y | N |
| 2.5 | Do at least four M20 (3/4") or six M16 (5/8") bolts per fifth wheel foot, or at least 450mm (total) of 10mm fillet weld per fifth wheel foot, secure the feet to the base plate? | Y | N |
| 2.6 | Are the attachment bolts ISO grade 8.8 (SAE Grade 5) or stronger? | Y | N |
| 2.7 | Does each bolt have a nut suitably locked onto it? | Y | N |
| 2.8 | Is a hardened washer situated under each nut? | Y | N |
| 2.9 | In the case of an aluminium alloy chassis, is a hardened washer situated under each nut and bolt head? | Y | N |
| 2.10 | Is bolt hole clearance less than 1mm? | Y | N |
| 2.11 | 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 cutout, and are all bolts at least 50mm from any spring hanger bolt or rivet? | Y | N |
| 2.12 | Is the length of the attachment angle (or fishplate overall spacing) greater than the chassis width? | Y | N |
| 2.13 | On the attachment angle or fishplates, is there at least one bolt at least 50mm forward of the leading edge of the base plate, and at least one bolt at least 50mm rearward of the rear edge of the base plate? | Y | N |

HEAVY VEHICLE MODIFICATIONS

2.14	If attachment angles are used, are they at least 100 x 75 x 10mm (4 x 3 x 3/8") in dimension?	Y	N
2.15	If fishplates are used, is the thickness of the plates at least 10mm, and are all bolt holes at least 50 mm from all edges?	Y	N
3.0	Sliding Assemblies		
3.1	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?	Y	N
3.2	Are slide stops on both slide rails attached at each end of travel?	Y	N
3.3	Is each slide stop secured by at least one grade 8.8 M16 bolt, or a total of 125mm of 10mm weld on three sides of the stop?	Y	N
3.4	Is the stop face of the slide stop free from weld?	Y	N
3.5	Is the locking mechanism of the sliding fifth wheel assembly a positive locking type and resistant to detachment due to vibration and wear?	Y	N
4.0	"B" Doubles		
4.1	If the vehicle is for "B" Double application, is the fifth wheel a single plate, single oscillating type?	Y	N
5.0	King Pins		
5.1	Is the king pin installed as per the king pin manufacturer's instructions?	Y	N
5.2	Is the king pin and its installation capable of withstanding a loading of at least 27 tonnes?	Y	N
5.3	Does the king pin have the correct protrusion below the trailer skid plate or wear plate?	Y	N
5.4	Is the king pin within the dimensional limits given by Australian Standard 2175?	Y	N
5.5	If any machining has been performed on the king pin, has it been performed in accordance with the manufacturer's specifications?	Y	N
6.0	General		
6.1	Are all components and workmanship in accordance with AS 1771, AS 2174 (Parts 1 or 2), AS 1773, AS 2175 and the Australian Design Rules for Motor Vehicle Safety - 2 nd and 3 rd Edition?	Y	N

*If the answer to question 4.1 on "B" Doubles is "NO", a "Centre of Gravity Compensating" fifth wheel may be acceptable for a vehicle with a high torsional stiffness (i.e. tanker, freezer van). Double oscillating fifth wheels are NOT acceptable.

HEAVY VEHICLE MODIFICATIONS

Make:.....

Model:.....Year of Manufacture:.....

Vehicle Chassis No/VIN:

Vehicle Modifier:.....

Examined by:.....

Company (if applicable):

Certifying Officer No:..... Modification Certificate No:.....

Modification Plate No:.....

Signed:..... Date: