


The logo is a red shield with a white border, centered on a grey diamond plate background. The shield contains the text 'TMC' in large white letters, 'TECHNICAL & MAINTENANCE CONFERENCE' in smaller white letters with a horizontal line below it, and 'PACCAR & DEALER' in white letters with a small truck icon above the word 'DEALER'.

TMC

TECHNICAL & MAINTENANCE
CONFERENCE

 **PACCAR & DEALER**

2017



DRAWBAR COUPLINGS DESIGN AND MAINTENANCE

- Adam Taylor – towing eyes and pintle hooks
- Ian Thompson – automatic pin-type couplings
- Kel Baxter – the operator's view
- Bob Woodward – the operator's view
- Panel discussion – Q&A



Adam Taylor

Technical Services Officer

SAF-HOLLAND



Drawbars and towing eyes

DB1385



DRAWBAR - Rigid Mount Bolt-On

Part Number	Maximum Vertical Load	Maximum Gross Trailer Weight	Length mm	Weight kg	D Rating kN	CRN
DB1385	6,804 kg	27,216 kg	173.4	8.6	165	24296

When used with hinged tongue trailers, where the maximum vertical load cannot exceed 227kg (500 lbs.) the maximum gross trailer weight is 40,824 kg (90,000 lbs.).

Not designed to be welded to a trailer tongue.

For off-road applications, reduce the stated capacities by 25% and use with a swivel-mount device.

DB61030S



DRAWBAR - Sub Assembly (Swivel)

Part Number	Maximum Vertical Load	Maximum Gross Trailer Weight	Length mm	Weight kg	D Rating kN	CRN
DB61030S	4,082 kg	20,412 kg	434.9	16.3	150	42325

When used with hinged tongue trailers, where the maximum vertical load cannot exceed 227kg (500 lbs.) the maximum gross trailer weight is 38,556 kg (85,000 lbs.).

DB61030



DRAWBAR - Sub Assembly (Fixed)

Part Number	Maximum Vertical Load	Maximum Gross Trailer Weight	Length mm	Weight kg	D Rating kN	CRN
DB61030	4,082 kg	20,412 kg	434.9	16.3	150	42325

When used with hinged tongue trailers, where the maximum vertical load cannot exceed 227kg (500 lbs.) the maximum gross trailer weight is 38,556 kg (85,000 lbs.).

Weld-on and swivel drawbar

- D-Value: 150 kN
- Rigid drawbar trailer:
 - Max vertical load: 4,086 kg
 - Max GTW: 20,412 kg
- Hinged drawbar trailer:
 - Max vertical load: 227 kg
 - Max GTW: 38,500 kg



D-values and CRN numbers

- The various ratings that apply to a drawbar all come from ADR 62/02
- The manufacturer is required to obtain a specific approval for tow couplings, which is called a Component Registration Number (CRN).
- If the supplier cannot quote a coupling CRN, avoid it!

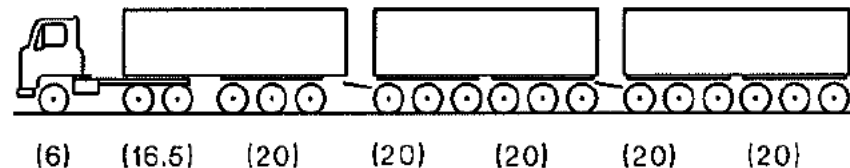


Rating of couplings under ADR 62

- D-value is simply a value that denotes dynamic capacity
- It does not refer to the weight that a piece of equipment can withstand
- Australian Standard AS4968.1-2003 outlines the process for calculating the minimum D-value



Triple road train (Tri axle converter dolly)



(Tri axle converter dolly tare mass = 3.5 t)

$$D = \frac{4.9 \times 46.5 (76.5 + 0.08 \times 46.5)}{(122.5 - 16.5)} \approx 172 \text{ kN}$$



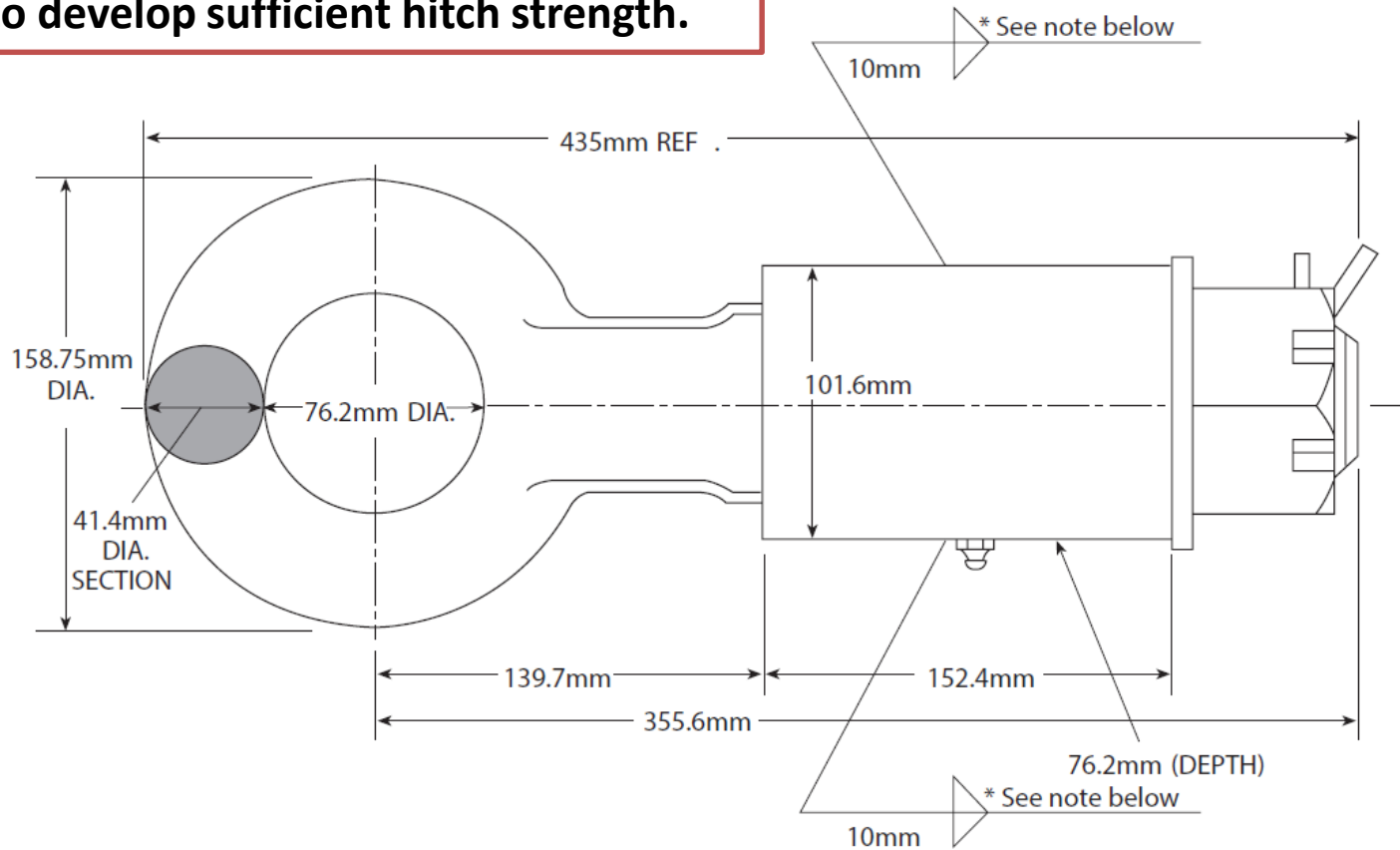
Rating of couplings under ADR 62

- ADR 62/02 also defines ‘S-value’ and ‘V-value’
- Confusingly, these do refer to the actual physical capacity of a coupling:
 - S-value = maximum vertical load for hinged drawbars
 - V-value = maximum vertical load for rigid drawbars
- These are determined by physical testing to the requirements of the ADR



Installation (weld-on)

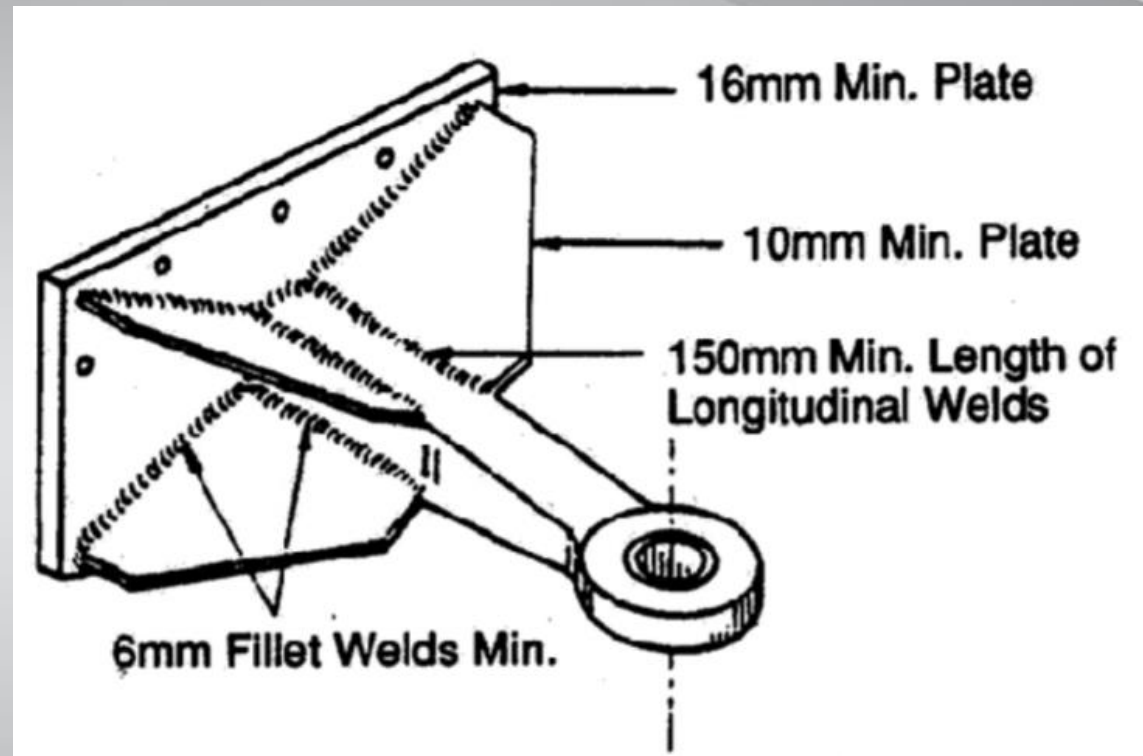
Continuous 10 mm welds, with a total minimum length of 610 mm are required to develop sufficient hitch strength.



ALL DIMENSIONS SHOWN ARE NOMINAL

*Note: Total min 610mm of 10mm fillet weld are required to develop hitch strength.

Example installation (VSB6)



In-service maintenance

- Regularly inspect the towing eye for wear and damage
- If wear exceeds 1/8" (3.1 mm), replace the drawbar
- Check the mounting nut for proper torque.
- Lubricate the mounting block grease fitting every 50,000 kms or 3 months, whichever comes first.



It is important to always refer to the manufacturer's specifications for wear limits – the above is specific to this part only!

Pintle hooks



BH50MMRN41

PINTLE HOOK - Rigid Mount, 50mm diameter ball *(Replaces PH16B)*

Part Number	Maximum Vertical Load	*Maximum Gross Trailer Weight	Length mm	Weight kg	D Rating kN	CRN
BH50MMRN41	1,724 kg	8,618 kg	165.1	4.5	20	25767

*Maximum Gross Trailer Weight for the 50 mm Ball is 4,536 kg (10,000 lbs).

Drawbar Eye Dimensions: 60.4 mm to 76.2 mm I.D. with 31.7 mm to 41.4 mm diameter section.

For off-road applications, reduce the stated capacities by 25% and use with a swivel-mount drawbar.



PH300
PH3001

PINTLE HOOK - Rigid Mount (With Air Cushioned Snubber)

Part Number	Maximum Vertical Load	Maximum Gross Trailer Weight	Length mm	Weight kg	D Rating kN	CRN
PH300	8,165 kg	32,659 kg	*184.1	19	165	24295
PH3001	8,165 kg	32,659 kg	184.1	13	165	24295

*Length Dimension is external to mounting structure. The added measurement is 146.3 mm.

Drawbar Eye Dimensions: 60.4 mm to 76.2 mm I.D. with 31.7 mm to 41.4 mm diameter section.

The complete assembly includes a pintle body, plunger, air chamber, and mounting brackets.

For pintle hooks without an air chamber, bracket, or plunger, order PH3001.

The PH300 can be operated with or without the air chamber.

For off-road applications, reduce the stated capacities by 25% and use with a swivel-mount drawbar.



PHT60AOL8

PINTLE HOOK - Rigid Mount

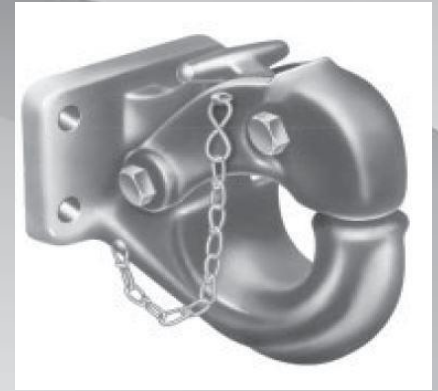
Part Number	Maximum Vertical Load	Maximum Gross Trailer Weight	Length mm	Weight kg	D Rating kN	CRN
PHT60AOL8	2,722 kg	13,608 kg	159.7	5	35	26465

Drawbar Eye Dimensions: 50.8 mm to 76.2 mm I.D. with 31.7 mm to 41.4 mm diameter section.

For off-road applications, reduce the stated capacities by 25% and use with a swivel-mount drawbar.

In-service maintenance

- Clean and check for proper operation
- Inspect for worn, damaged or missing parts
- Inspect, in particular, the coupling contact areas. Replace when wear exceeds 3.2 mm from the original surface profile
- Lubricate latch and lock pivots with a light oil lubricant
- Check fasteners for proper torque





Ian Thompson

**Engineering Manager,
Trailer equipment**

BPW Transpec



Automatic pin type couplings

- Used for:
 - Rigid and Dog trailers
 - A Doubles
 - Road Trains
 - Pocket Doubles
 - Small plant equipment trailers



Automatic pin type couplings

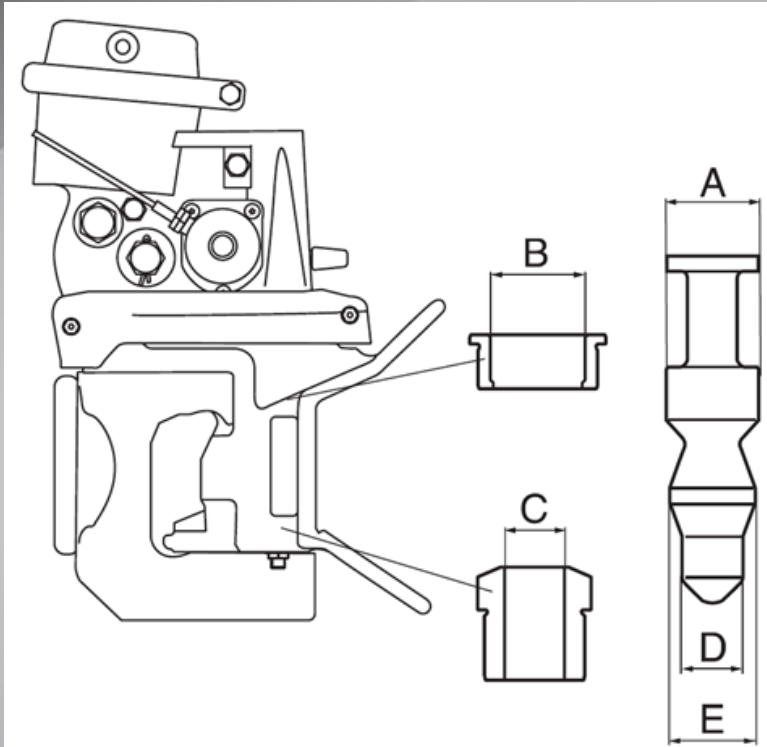
- ADR 62 and AS 2213 sets out coupling requirements including D-value calculations
- Check with your coupling supplier or engineering consultant for specific requirements
- Generally couplings that are used for typical metropolitan dog trailers are often the same as those used for Road Train Application



Examples of worn parts



Ringfeder - wear limits



Wear limits

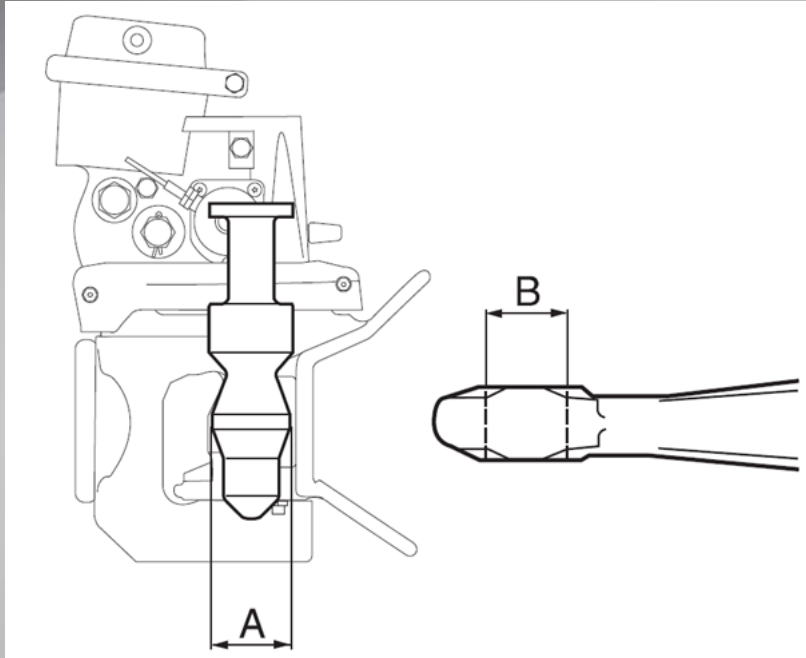
A	outer diameter	min	51.0 mm
B	inner diameter	max	54.0 mm
C	inner diameter	max	36.5 mm
D	outer diameter	min	33.5 mm
E	outer diameter	min	46.5 mm

Vertical play

in the coupling pin max 5.0 mm



Pin coupling - wear limits

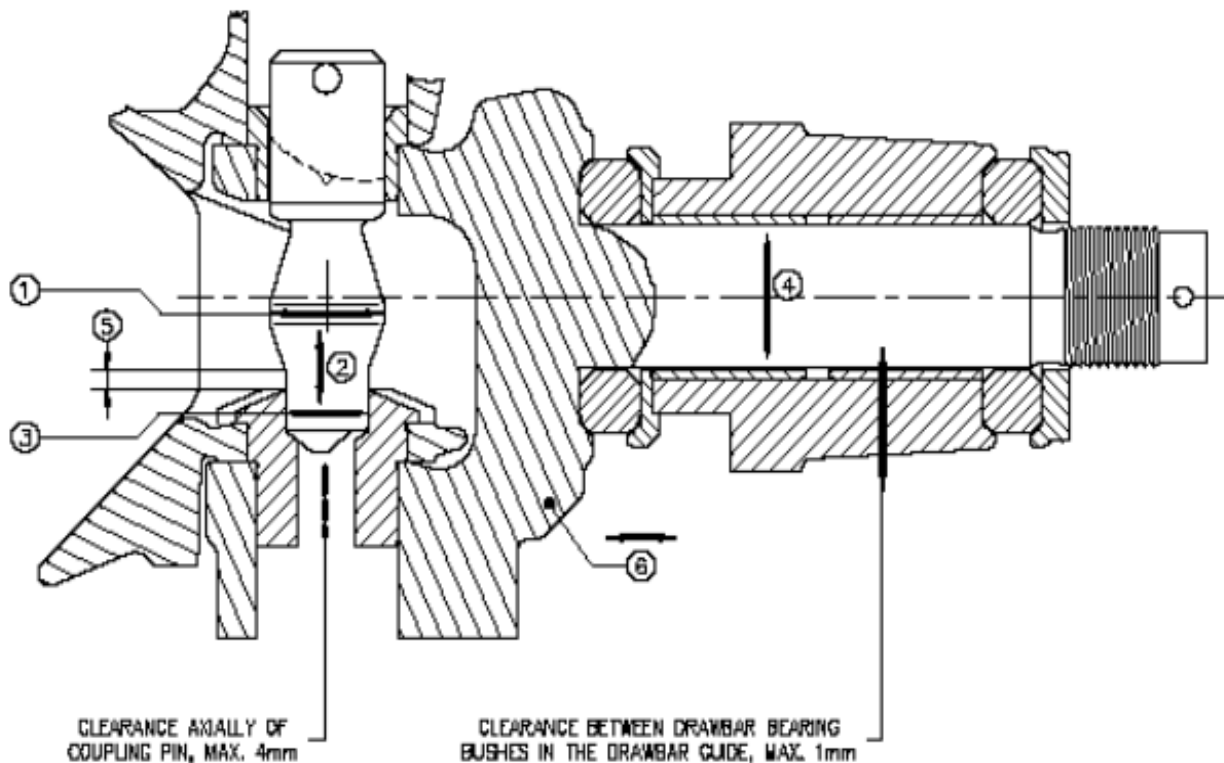


Wear limits

A Coupling pin	min 46.5 mm
B Drawbar eye	max 51.5 mm

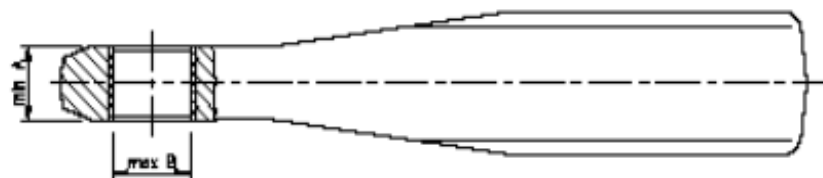
Vertical play in the coupling pin	max 5.0 mm
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CLEARANCE AXIALLY OF COUPLING PIN, MAX. 4mm

CLEARANCE BETWEEN DRAWBAR BEARING BUSHES IN THE DRAWBAR GUIDE, MAX. 1mm



1. WEAR LIMIT OF COUPLING BOLT $\phi 46.5\text{mm}$ MINIMUM.
2. WITH PIN LOCKED IN ENGAGED POSITION, MAXIMUM PLAY 5mm.
3. MAXIMUM DIAMETER OF GUIDE BUSH $\phi 36.5\text{mm}$. MAXIMUM CLEARANCE 2.5mm
4. MAXIMUM CLEARANCE 1mm.
5. MAXIMUM WEAR ON WEAR PLATE 4mm.
6. WHEN ATTEMPTING TO MOVE COUPLING FORE AND AFT BY HAND NO PLAY ALLOWED.

	A (mm)	B
$\phi 40$	28.0	41.5
$\phi 50$	42.5	51.5

CHECK FOR WEAR
 The thickness of the drawbar eye must not be less than A mm. Exchange drawbar eye if maximum wear is exceeded. The inside diameter of the bush may be B mm maximum. Replace bush if this wear is exceeded.
 Drawbar eyes which have been bent or which show cracks or any deformation should be replaced immediately.

REFER ALSO DOC AU5202_1488534

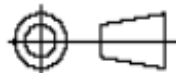


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TITLE
**RINGFEDER COUPLING
 WEAR LIMITS FOR
 50mm PIN TYPE COUPLINGS**

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	DATE	23-03-2011	SCALE	N.T.S

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A3

Tow coupling - lubrication points




Lubrication

Lubricate the coupling regularly with thin oil. For the maximum effect, the coupling must be open when it is being lubricated.

- Lubrication points (see drawing on the left)



NHVIM – Section 3



Section 3 Couplings

Objective
To ensure that all tow couplings and associated components are in a serviceable condition and that they provide the necessary load carrying capacity.

Australian Design Rules that are relevant to this section
ADR 62 Mechanical connections between vehicles
ADR 63 Trailers designed for use in road trains

3.1 Check fifth wheels and turntables
In this section, the term 'fifth wheel' refers to the upper surface of the coupling that directly articulates with the solid plate of a towbar. A 'turntable' is the rotating part of the coupling mount that allows the fifth wheel to rotate, for example a ball race.

Reasons for rejection

- Where ADR 62 applies, the fifth wheel does not display the manufacturer's name/trademark, nominal size (e.g. 50mm) and the 'D-value' rating.
- The top and bottom mounting flanges have insufficient or ineffective fasteners.
- Fasteners either side of the mounting frame, plate or pivot brackets are missing or ineffective.
- Fifth wheel or turntable mounting plate or sub-frame assembly, securing bolts are not ISO Class 8.8 (SAE Grade 5) or stronger.
- Fifth wheel or turntable mounting is not done in accordance with manufacturer's specifications, Australian Standards or VSB Section 12.
- There is movement between the fixed mounting components.
- There is more than 5mm horizontal movement between:
 - the pivot bracket pin and bracket, or
 - a slider bracket and slide base.

Note: This section should be read in conjunction with ADR 62, relevant Australian Standards and manufacturer's specifications for minimum requirements.
Installation of an alternative coupling is a modification. Please refer to Appendix B – Vehicle Modifications.

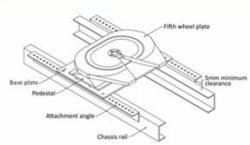
n) The top and bottom plates, flanges and welds are loose, cracked, missing or broken.

o) Ball bearing type turntables are worn beyond the manufacturer's specifications, or to the extent that the upper and lower flanges or bearing halves touch each other or the ball bearings seize.

Note: 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 manufacturer recommends this method.

Trailer skid plates and kingpins are covered in Sections 14.5 and 14.6 of this manual.

Figure 3.1 Fixed base fifth wheel assembly

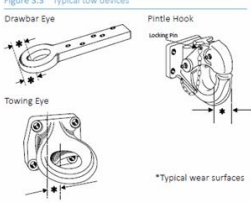


3.2 Check pin couplings and pintle hooks

Reasons for rejection

- Where ADR 62 applies, a 50mm pin type coupling does not display the manufacturer's name/trademark, rated vertical load and the 'D-value' rating.
- The tow ball or hook assembly (127mm or hook type) is not legibly and indelibly marked with the manufacturer's name or trademark and the rated 'D-value'.
- Deformed or cracked fasteners including welds.
- Any mounting bolts, fasteners or weld beads have advanced corrosion.
- The area that the pin coupling or pintle hook is mounted on is loose or cracked or any locking mechanism is not fitted or is inoperative.
- The pin coupling or pintle hook welds have cracks.
- Pin couplings or pintle hooks are worn beyond the manufacturer's limits. If the manufacturer's limits are not known, any dimension on a wear surface of the horn of a pintle hook or pin coupling is worn more than 5% of the original diameter (see Figure 3.3).

Figure 3.3 Typical tow devices



2 of 6 Couplings National Heavy Vehicle Inspection Manual

3.3 Check towbar

Reasons for rejection

- The towbar is not securely mounted or is bent or cracked.
- Any mounting bolts, fasteners or weld beads have advanced corrosion or cracks.
- Where ADR 62 applies, the towbar pin coupling does not display the manufacturer's name/trademark, the rating and the make and model of the vehicle for which it is designed.
- Where any part of the towbar is removable (the bolts, ducts, nuts etc.), fastening these parts do not have a locking device such as a split pin, spring washer or nylon lock nut.
- Towbar assembly (except for vehicles designed for use in road trains) is not fitted with two safety chain attachments mounted one on either side of, and adjacent to, the tow coupling.
- Safety chain attachments are not affixed to part of the tow assembly that is permanently attached to the vehicle.

Note: Always check the underside of drawbar and drawbar eye for excessive wear and cracks.

3.4 Check towing attachments

Reasons for rejection

- Any towing attachment (such as a towball or pinle hook), any mounting bolts, fasteners or weld beads are loose, cracked, broken or otherwise compromised.
- Safety chains or cables (if required) are able to be disconnected or affixed in such a way that the safety chains or cables are liable to accidentally disconnect.
- Safety chains or cable retaining brackets are cracked, deformed or missing.
- Safety chain or cable capacity does not meet required standards.
- The tow coupling capacity does not equal or exceed the aggregate trailer mass (ATM) of any trailer being towed (if applicable).

Note: For further information on safety chains, refer to additional information – safety chains.

Table 3.1 Allowable dimensions in millimetres for worn components

Component	Standard dimension	Allowable wear limit*	Design limit
Coupling pin	48.7 OD	47.2 min	47.5
Drawbar eye	50.0 ID	51.9 max	51.6

Figure 3.4 Measurement of coupling pin and drawbar eye both wear

2 of 6 Couplings National Heavy Vehicle Inspection Manual





Section 3

Couplings

Objective:

To ensure that all tow couplings and associated components are in a serviceable condition and that they provide the necessary load carrying capacity.

Australian Design Rules that are relevant to this section:

ADR 62 Mechanical connections between vehicles

ADR 63 Trailers designed for use in road trains

Note: This section should be read in conjunction with ADR 62, relevant Australian Standards and manufacturers' specifications for minimum requirements.

Installation of an aftermarket coupling is a modification. Please refer to Appendix B – Vehicle Modifications.

3.1 Check fifth wheels and turntables

In this section, the term 'fifth wheel' refers to the upper surface of the coupling that directly articulates with the skid plate of a semitrailer. A 'turntable' is the rotating part of the coupling mount that allows the fifth wheel to rotate, for example a ballrace.

Reasons for rejection

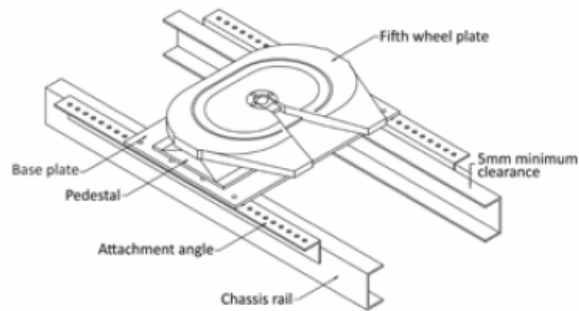
- a) Where ADR 62 applies, the fifth wheel does not display the manufacturer's name/trademark, nominal size (e.g. 50mm) and the 'D-value' rating
- b) The top and bottom mounting flanges have insufficient or ineffective fasteners
- c) Fasteners either side of the mounting frame, plate or pivot brackets are insufficient or ineffective
- e) Fifth wheel or turntable mounting plate or sub-frame assembly securing bolts are not ISO Class 8.8 (SAE Grade 5) or stronger
- f) Fifth wheel or turntable mounting is not done in accordance with manufacturers' specifications, Australian Standards or VSB6 Section P2
- g) There is movement between the fixed mounting components
- h) There is more than 5mm horizontal movement between:
 - the pivot bracket pin and bracket, or
 - a slider bracket and slide base.

- n) The top and bottom plates, flanges and welds are loose, cracked, missing or broken
- o) Ball bearing type turntables are worn beyond the manufacturer's specifications, or to the extent that the upper and lower flanges or bearing halves touch each other or the ball bearings seize.

Note: 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 manufacturer recommends this method.

Trailer skid plates and kingpins are covered in Sections 14.5 and 14.6 of this manual.

Figure 3.1 Fixed base fifth wheel assembly

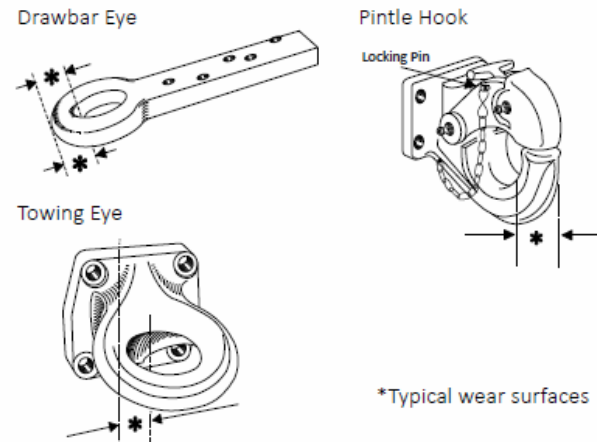


3.2 Check pin couplings and pintle hooks

Reasons for rejection

- a) Where ADR 62 applies, a 50mm pin type coupling does not display the manufacturer's name/trademark, rated vertical load and the 'D-value rating'
- b) The tow ball or hook assembly (127mm or hook type) is not legibly and indelibly marked with the manufacturer's name or trademark and the rated 'D-value'
- c) Deformed or cracked fasteners including welds
- d) Any mounting bolts, fasteners or weld beads have advanced corrosion
- e) The area that the pin coupling or pintle hook is mounted on is loose or cracked or any locking mechanism is not fitted or is inoperative
- f) The pin coupling or pintle hook welds have cracks
- g) Pin couplings or pintle hooks are worn beyond the manufacturer's limits. If the manufacturer's limits are not known, any dimension on a wear surface of the horn of a pintle hook or pin coupling is worn more than 5% of the original diameter (see Figure 3.3)

Figure 3.3 Typical tow devices



- h) Any wear on the diameters of each of the coupling pin and the drawbar eye bush greater than 1.5mm.

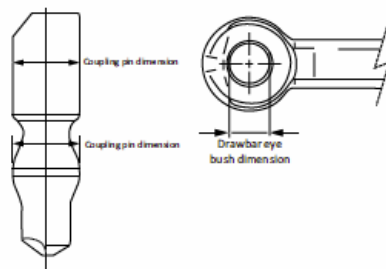
Note: Wear should be checked by direct measurement, or by the use of a gauge. Allowable dimensions for worn components are as per manufacturers' specifications. If manufacturers' specifications are not available, allowable dimensions are given in Table 3.1.

Table 3.1 Allowable dimensions in millimetres for worn components

Component	Standard dimension	Allowable wear limit*	Gauge Sizes
Coupling pin	48.7 OD	47.2 min	47.1
Drawbar eye bush	50.0 ID	51.5 max	51.6

* When the wear of components is checked by direct measurement, it should be noted that an elliptical wear pattern is generated on the bore of the drawbar eye bush, and on the outside of the pin.

Figure 3.4 Measurement of coupling pin and drawbar eye bush wear



- i) Any transverse or circumferential welds on the drawbar eye block
- j) For bolt-in drawbar eyes, the castellated nut is loose or insecure or the split pin is missing or not intact.

3.3 Check towbar

Reasons for rejection

- The towbar is not securely mounted or is bent or cracked
- Any mounting bolts, fasteners or weld beads have advanced corrosion or cracks
- Where ADR 62 applies, the towbar and towing ring does not display: the manufacturer's name/trademark, the rating and the make and model of the vehicle/s for which it is designed
- Where any part of the towbar is removable (the bolts, studs, nuts etc.), fastening those parts do not have a locking device such as a U-clip, split pin, spring washer or nylon lock nut
- Towbar assembly (except for vehicles designed for use in road trains) is not fitted with two safety chain attachments mounted one on either side of, and adjacent to, the tow coupling
- Safety chain attachments are not affixed to part of the tow assembly that is permanently attached to the vehicle.

Note: Always check the underside of drawbar and drawbar eye for excessive wear and cracks.

3.4 Check towing attachments

Reasons for rejection

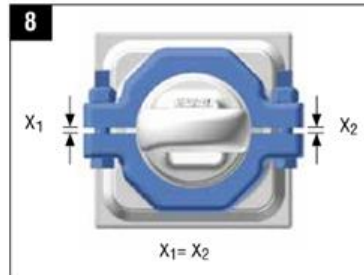
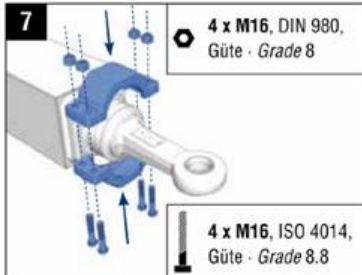
- Any towing attachment (such as a tow-ball or pintle hook), any mounting bolts, fasteners or weld beads are loose, cracked, broken or extensively corroded
- Safety chain/s or cables (if required) are able to be connected or affixed in such a way that the safety chain/s or cables are liable to accidentally disconnect
- Safety chain or cable retaining brackets are cracked, deformed or insecure
- Safety chain or cable retaining brackets do not meet required standards
- The tow coupling capacity does not equal or exceed the aggregate trailer mass (ATM) of any trailer being towed (if applicable).

Note: For further information on safety chains, refer to Additional Information – Safety Chains.

Ringfeder Type 480 drawbar eye



Zugöse mit Typenschild nach oben montieren.
Fit drawbar eye with nameplate facing upward.



Tighten the 4 bolts in 2 stages: 75Nm then 180Nm



Safety chains



NHVIM – safety chains

Additional Information – Safety Chains

Safety chains for:

- trailers in excess of 3.5 tonnes ATM
- trailers in excess of 2.5 tonnes GTM

with fixed or rigid drawbars and automatic pin type couplings.

All fixed or rigid drawbar pig trailers (other than a converter dolly) and any other trailers without breakaway brakes, require safety chains to be fitted.

It is strongly recommended that all other trailers be fitted with safety chains, especially vehicles used in severe conditions, e.g. quarry vehicles which are jackknifed regularly for unloading.

Safety chains complement the safety features of the trailer's breakaway braking system, allowing the driver to maintain control of the truck and trailer combination following a coupling failure or disconnection.

Safety chains **MUST** be supplied and fitted to comply with the following requirements:

Type of chain

Safety chains fitted to a trailer with an ATM over 3.5 tonnes, must be manufactured from alloy steel with a minimum breaking stress of 800MPa to conform with the mechanical properties of Grade T chain as specified in Australian Standard AS 2321 *Short-link chain for lifting purposes*.

Required number and size of chains

Two separate chains must be used.

The minimum breaking strength or size of each chain used on the trailer must meet or exceed the values listed for the maximum gross trailer mass or aggregate trailer mass as indicated in Table 3.2.

Table 3.2 Safety chain size selection

Vehicles manufactured before 1 July 1998

Gross trailer mass (tonnes)	Chain size (millimetres)	Minimum chain breaking load (tonnes)
2.5–4.27	7.1	6.4
4.27–7.5	9.5	11.6
7.5–13.5	12.7	20.4
13.5–21.5	15.9	32.0
21.5–30.0	19.0	46.4
>30.0	22.0	63.2

Vehicles manufactured from 1 July 1998 to 31 December 2008

Aggregate trailer mass (tonnes)	Chain size (millimetres)	Minimum chain breaking load (tonnes)
Over 3.5 and up to 4.3	7.1	6.4
Over 4.3 and up to 7.5	9.5	11.6
Over 7.5 and up to 13.5	12.7	20.4
Over 13.5 and up to 21.5	15.9	32.0
Over 21.5 and up to 30.0	19.0	46.4
Over 30.0	22.0	63.2

Vehicles manufactured from 1 January 2009

Aggregate trailer mass (tonnes)	Chain size (millimetres)	Minimum chain breaking load (tonnes)
Over 3.5 and up to 5.0	6	5.1
Over 5.0 and up	8	8.2

- Manual gives the checks and sizing requirements for chains.
- Some vehicles require them as part of the regulations others don't.
- If they are fitted they must comply!!

ATA – safety alert



Safety alert

Trailer safety chains – are they correctly attached and fitted?

December 2016

Priority: Urgent Necessary For Information

SA # 2016-3

Circulate: Driver Operator Workshop Parts Fleet Manager

The incident or issue:

Recent truck and trailer separation incidents caused by coupling failure have increased the retrofit of safety chains and some areas of the trucking industry now require the use of safety chains. ATA Industry Technical Council (ITC) members have expressed concerns about reports of poor retrofit of these chains.

Safety chain attachment kits must be fitted by competent tradespeople along with technical oversight in order to ensure the chains are compliant and effective. Heavy vehicle safety chains are regulated by ADR62, the requirements of which are summarised in the checklist below.

Incident cause:

A tanker trailer collision on 7 August 2014, near Wodonga Victoria, resulted in three deaths when the trailer separated from the truck. The high profile fleet was typically well maintained. The coroner's report has not yet been published.

Solution:

YES / NO - Check list for retro fitted safety chains to trailer drawbars:-

- 1) Are the safety chains a Grade T high tensile short link chain that meet **AS 2321:2014 Short-link chain for lifting purposes?**
- 2) Are the safety chain attachments located as near as practicable to each coupling point, and are the chains of sufficient length to allow full articulation, but not drag?
- 3) Are the chains crossed? This reduces trailer swing and movement after the coupling fails, and 'catches' a decoupled drawbar preventing it contacting the ground.
- 4) Does the safety chain attachment rating and safety chain rating exceed the Aggregated Trailer Mass (ATM) rating of the trailer being towed?
- 5) Are the rubber airlines (**not plastic or suzi coil airlines**) and electrical service lines of an appropriate length so that they won't drag or come under tension when the trailer is attached using only the safety chains?
- 6) Have the safety chain attachments been fitted to a substantial element of the trailer drawbar by a qualified welder?
Strengthening the drawbar may be necessary if there is not a sufficiently strong nearby location. The ADR requires that all towbars are fitted with safety chain attachments irrespective of whether chains are being used. This should be rectified if towbar safety chain attachment points are not fitted.
- 7) Has the installation of retrofit safety chain attachments been approved and plated/signed off by an AVE (Authorised Vehicle Examiner)?

If the answer is **NO** to any of the above questions, the fitment should be rectified and advice sought from an appropriately qualified and experienced AVE.

Follow-up actions:

- Review installation against the above check list. If any issue is found, investigate and seek appropriate assistance.
- Ensure coupling procedures are appropriate and that drivers and other personnel are trained in how to couple / decouple, check, and maintain their heavy vehicle couplings.
- Coupling systems including airlines and electric lines must be inspected and maintained as per their manufacturers' guidelines.



Example of safety chains fitted between the trailer drawbar and truck towbar. Source: Bartlett Equipment

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- The ATA put out a Safety Alert in December 2016.
- It outlines key points regarding Safety Chains when fitted.

Safety chains ???

5.3. Regulation of use and maintenance

5.3.1. Use of safety chains

Recent trailer separation incidents that had serious implications have involved rigid body trucks towing trailers with drawbars, such as pig and dog trailers, and where safety chains were not being used.

Under current regulations, safety chain attachment points must be fitted to every towbar that is fitted to a heavy vehicle, excluding vehicles designed for use in Road Trains⁸. Additionally, safety chains must also be affixed to the drawbar of all rigid drawbar trailers (excluding converter dollies) and any other trailer that is not fitted with an emergency brake system⁹. Despite these mandatory fitting requirements on individual vehicles, there are no in-service regulations that mandate that safety chains, when fitted, are used.

The intent of requiring safety chains to be fitted and used, is to provide a secondary method of attachment between a trailer and the towing vehicle that prevents separation of the trailer in the event the primary coupling fails. Historically, concerns have been raised over whether a combination would become unsafe to operate should the primary coupling fail and safety chains kept the trailer in tow.

Recently, research has been undertaken to investigate the performance of a combination in the event of a primary coupling failure¹⁰. This research, which used a rigid body truck with an automatic pin coupling connected to a dog trailer with a hinged drawbar, demonstrated that a combination can be safely controlled and stopped in the event of a coupling failure when safety chains are used.

Because of the combination used in this research, the findings may not be able to be extended to other combinations that use different component vehicles and coupling types. If correctly configured, the coupling in the tested combination would not be subject to significant vertical loads as the dog trailer would support its own weight and the hinged drawbar should impose minimal vertical load on the connection.

The majority of SIWG members considered that it was not likely that a regulatory case for mandating the use of safety chains could be established, instead they were of the opinion that their use should remain voluntary. The majority of members also sighted harmonisation

⁸ Clause 13.4, Australian Design Rule 62/02 *Mechanical Connections Between Vehicles*

⁹ Clause 14.3, Australian Design Rule 62/02 *Mechanical Connections Between Vehicles*

¹⁰ Ritzinger A, Di Cristoforo R, Nolan D, Baker W, Heinze K (2016), *The Effects of Safety Chains on the Dynamics of Truck and Full Trailer Combinations in the Event of a Coupling Failure*, Transportation Research Record 2457, Freight Systems, Volume 1, Transportation Research Board, The National Academies of Sciences, Engineering, and Medicine, Washington DC, USA.

- Not mandated on all vehicles.
- No in service mandate that they be used?
- Attachment points must be fitted to all towbars except...
- Not required for Road Trains.
- An A-Double is a Road Train.
- Not required in Europe.

Safety chains ???

issues, as the UNECE Regulations do not mandate the fitment of safety chains. The NHVR, as chair of the SIWG, and the balance of members agreed with the majority that regulatory intervention should only occur when a case for action is justified by both a RIA and CBA. They did not however support the assumption that a regulatory case would not exist.

To resolve this issue, the NHVR, as chair of the SIWG, recommends that:

- the NHVR should undertake additional research on different types of combinations and couplings. This may include a combination where the trailer does not totally support its own mass, such as a pig trailer, and a coupling that is subject to notable vertical loads, such as a ball type coupling.
- following completion of this research, the mandatory use of safety chains for all couplings between heavy vehicles, excluding where a fifth wheel is used, should be investigated by the NHVR, including a CBA and RIA.

5.1.2. Structure of the coupling safety system

Currently the brake systems on a trailer, including the emergency brake system, are required to comply with the standards set out in ADR38/...

ADR38/... mandates that, in addition to service brakes, a trailer brake system must also include an emergency brake system which automatically applies the brakes in the event of the trailer accidentally becoming disconnected from the drawing vehicle (a trailer 'break-away'), and keep the brakes applied for at least 15 minutes. The ADR however does not provide any guidance about what constitutes a 'break-away'.

In a combination where a secondary coupling, such as a safety chain or cable, is not used break-away can be easily identified as the point when the primary coupling between the vehicles disconnects. However, for a combination with both primary and secondary couplings, there are two differing opinions on when a trailer has broken-away and when the emergency brakes must apply:

1. In a trailer separation incident, a trailer should be considered as having broken-away and the emergency brakes should apply only when both the primary and secondary couplings (safety chains) have failed.
2. In a trailer separation incident, a trailer should be considered as having broken away and the emergency brakes should apply when the primary coupling fails, despite safety chains still being attached.

- From the SIWG recommendation was for further investigation by NHVR including CBA and RIA.

- Consider all risks!



Kel Baxter

Bob Woodward

Kelvin Baxter Transport

Ron Finemore Transport





Design

The design must consider in-service issues and must be suitable for maintenance:

- Drawbar styles – hinged and rigid
 - Hinged drawbar with ball-race (a ball-race stabilises the interaction between the dolly and the trailer chassis)
 - Hinge drawbar – blocked fifth wheel
 - Rigid drawbar
 - Drawbar – horizontal, longitudinal, and vertical forces (ADR 62)



Longitudinal Tension and Compression

- For trailers up to 23.5 tonnes 'ATM' other than '*Converter Dollies*', (N) $1.5 \times 9.81 \times \text{'ATM'}$ (kg)
- For trailers over 23.5 tonnes 'ATM' and all '*Converter Dollies*', the lesser of 350 kN or $2.25 \times \text{'Coupling' 'D-value'}$ (kN) for the '*Coupling' 'D-value'* at which the '*Drawbar*' is rated



Transverse Thrust

For trailers over 4.5 tonnes 'ATM' without dolly locking devices, 120 kN. Alternatively, the following may be used:

- 'Single Axle' trailer or a 'Dog Trailer' with a 'Single Axle' front "Axle Group", $(N) 11 \times M / (D_L)$
- 'Tandem Axle Group' trailer or a 'Dog Trailer' with a 'Tandem Axle Group' front "Axle Group", $(N) 18 \times M / (D_L - 1)$
- 'Triaxle Group' trailer or a 'Dog Trailer' with a 'Triaxle Group' front "Axle Group", $(N) 24 \times M / (D_L - 1.6)$

where: M is the 'GGALR' (kg) for the front 'Axle Group' of 'Dog Trailers' or the 'GTM' (kg) for other trailers.

D_L is the 'Drawbar Length' (m)

- For trailers over 4.5 tonnes 'ATM' with dolly locking devices, $(N) 0.5 \times 9.81 \times \text{'ATM'}$ (kg)



Vertical Tension and Compression

For trailers over 4.5 tonnes 'ATM', 120 kN. Alternatively, the following may be used:

- Rigid '*Drawbar*' trailers, (kN) $2.25 \times 'V\text{-value}'$ (kN), where the '*V-value*' is as calculated in AS 2213.1:2001 using the equations in clause 7 of the standard with '*a*' = 2.4
- Hinged '*Drawbar*' trailers, +/- 10 kN

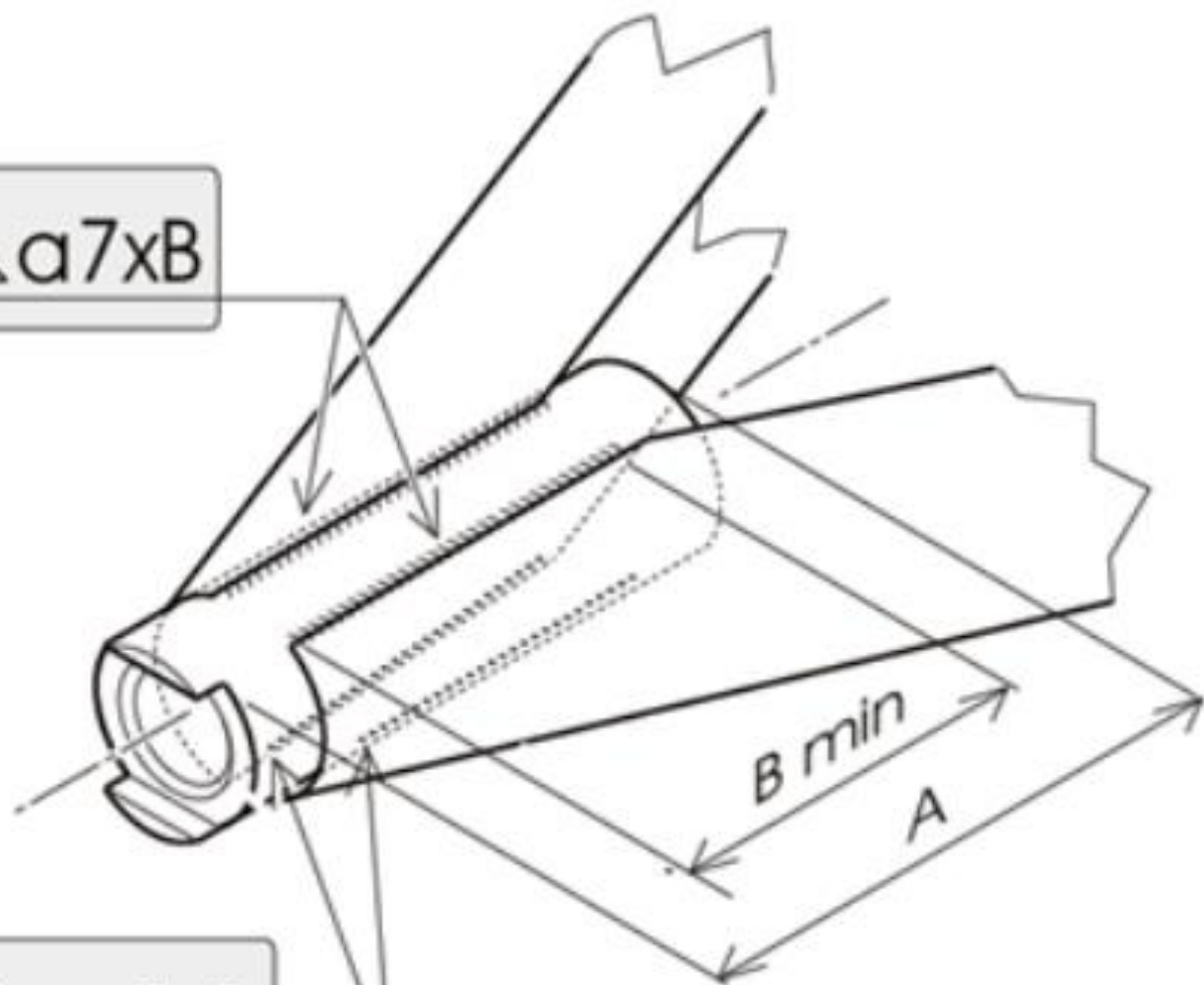


- Consider efficient use of materials in drawbar design
- Typically automatic pin type couplings
 - Alternatives
- Must meet tow coupling (kingpin) manufacturer's installation specifications

The DESIGN MUST consider access for maintenance, inspection



$\triangle a7xB$

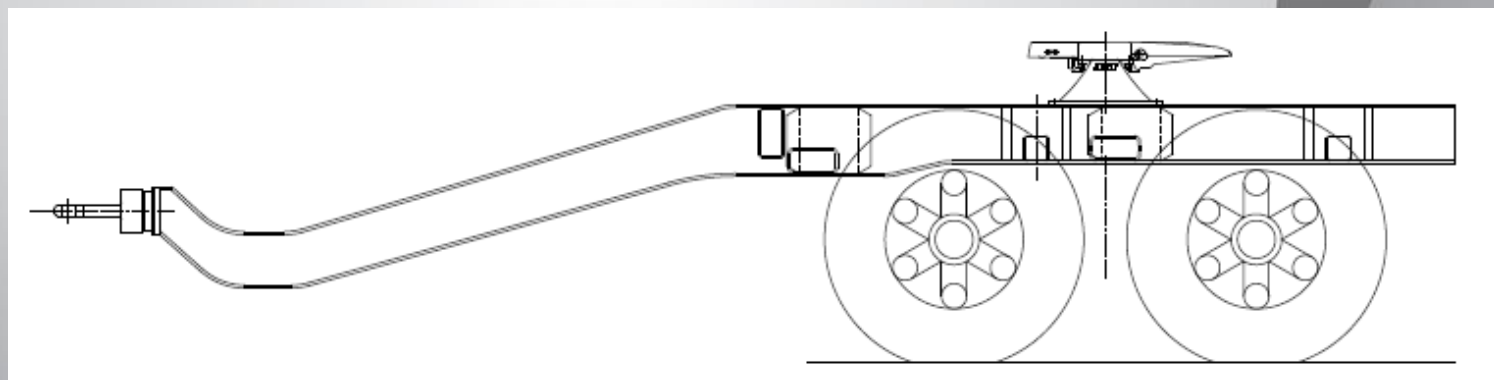


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- Tow coupling types - Static vertical load; and, dynamic vertical load (e.g. ADR 62)
- Backing plates for mounting safety chains
- Impact of Dolly Locks – seldom seen in road train equipment; but frequent in truck and dog applications
- Drawbar configuration for special applications tippers, car carriers



- Rigid drawbars in dog trailers can be an issue when left parked and the suspension goes flat
- In road train tandems demonstrated \uparrow 20% better tyre life



Tow eye sleeve

relatively cheap and easy to replace: better than rebuilding the pin coupling. Silica dust just grinds these away!

- Towing eyes DO GET BENT in operations
- Bent towing eyes – need to be replaced (as a priority)
- Welded type can be a big job
- Bolt-in should be simple – but can be a huge task
- Flanged are simple to change but bolts need to be prepped and torqued (exactly to manufacturers specifications)
- Collar type (my favourite) higher up front cost – but simple!





PANEL DISCUSSION

- Adam Taylor – towing eyes and pintle hooks
- Ian Thompson – automatic pin-type couplings
- Kel Baxter – the operator's view
- Bob Woodward – the operator's view