

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 underneath, and 'PACCAR & DEALER' at the bottom with a small truck icon above the word 'DEALER'.

TMC

TECHNICAL & MAINTENANCE
CONFERENCE

PACCAR & DEALER

2017



SETUP AND MAINTENANCE OF AUTOMATIC SLACK ADJUSTERS AND LOAD-SENSING VALVES

Chair

Adam Ritzinger – SAF-Holland

Panel members

Andrew Stroud – VicRoads

Ian Thomson – BPW Transpec

Ed Ryan – Bisitecniks

Val Gomez – CMV



Adam Ritzinger

Senior Engineer

SAF-Holland Australia





Topical: how not to set up a braking system



Vice grips 'clamping off' the rear brakes

Adelaide Hills, Oct 2017



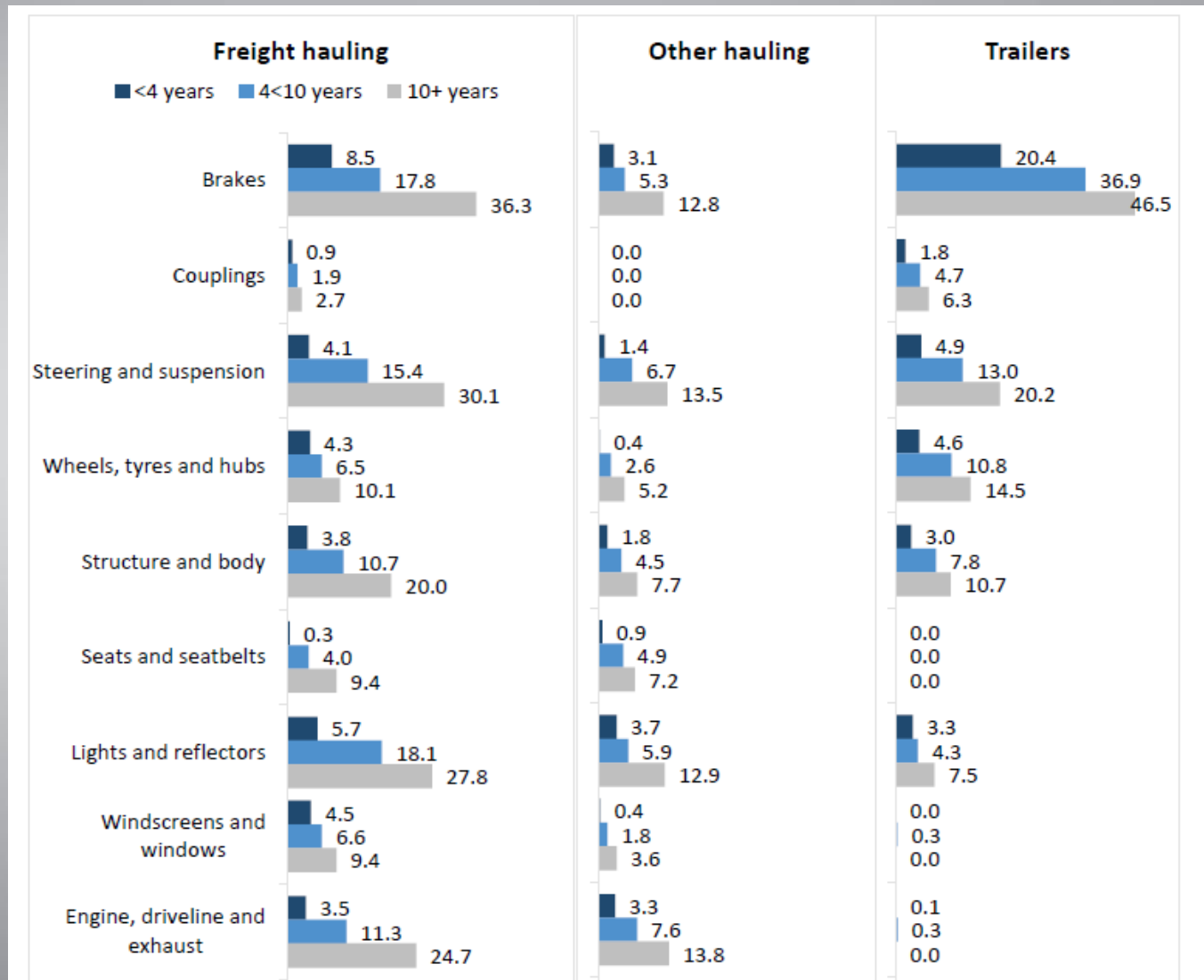
Setting the scene - NRBS

- NRBS – National Roadworthiness Baseline Survey
- Mid to late 2016
- Broadest and most comprehensive assessment of the Australian heavy vehicle fleet ever undertaken

State of Inspection	Quota	Surveyed	Difference	Comment
NSW	1635	1761	+126	
VIC	1730	1917	+187	
QLD	1585	1696	+111	
SA	1050	983	-67	(under-sampling of plant/SPV)
TAS	290	316	+26	
NT	255	241	-14	(under-sampling of plant/SPV)
ACT	170	216	+46	(over-sampling of PFI)
TOTAL	6715	7130	+415	



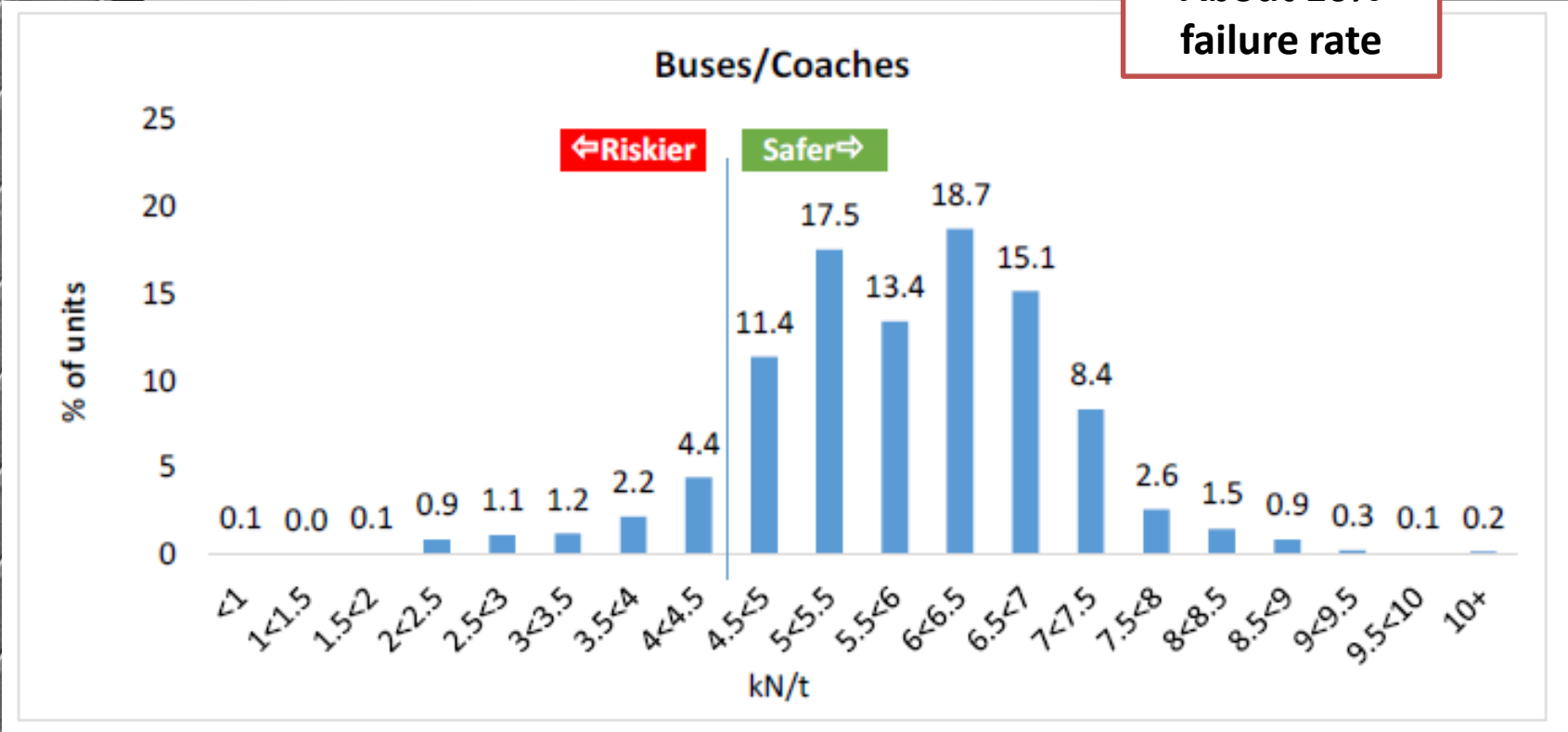
Non-compliance percentage





Brake test results – bus/coach

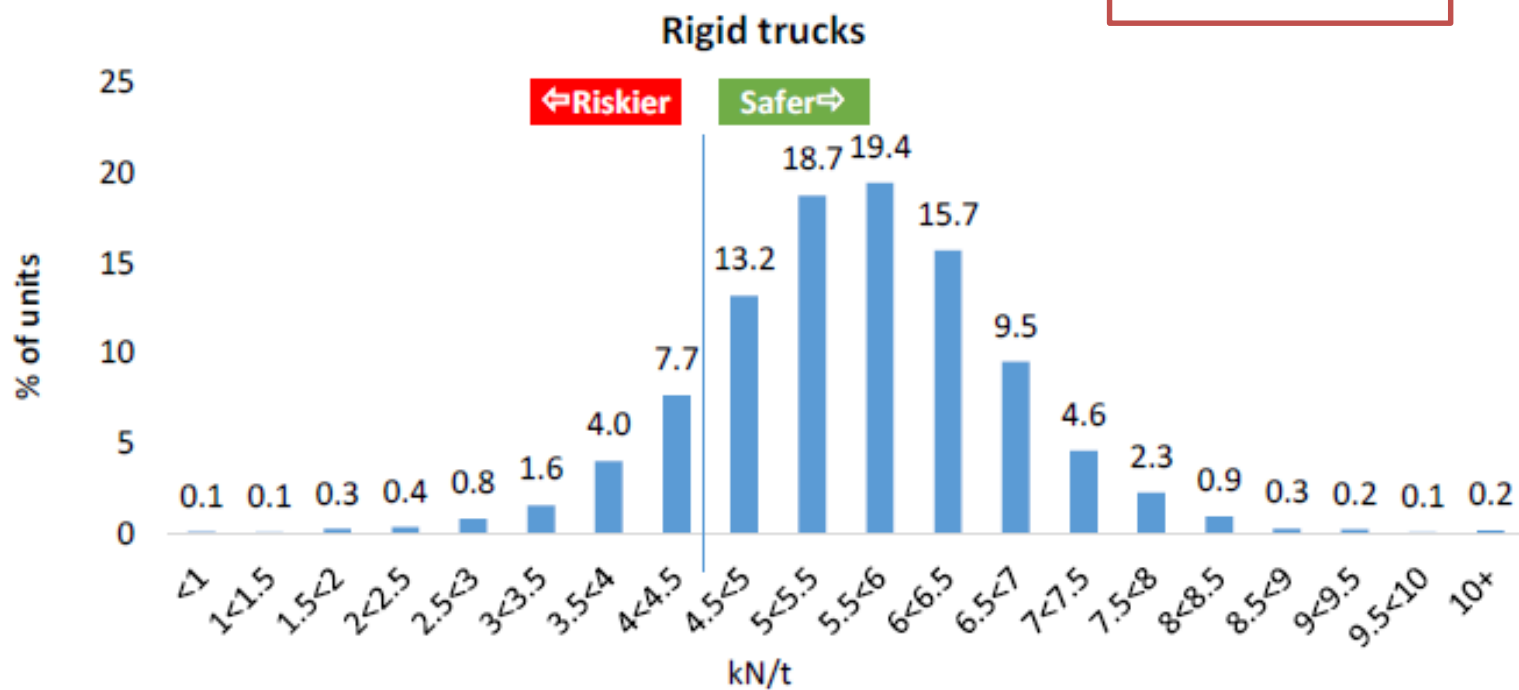
About 10% failure rate





Brake test results - rigids

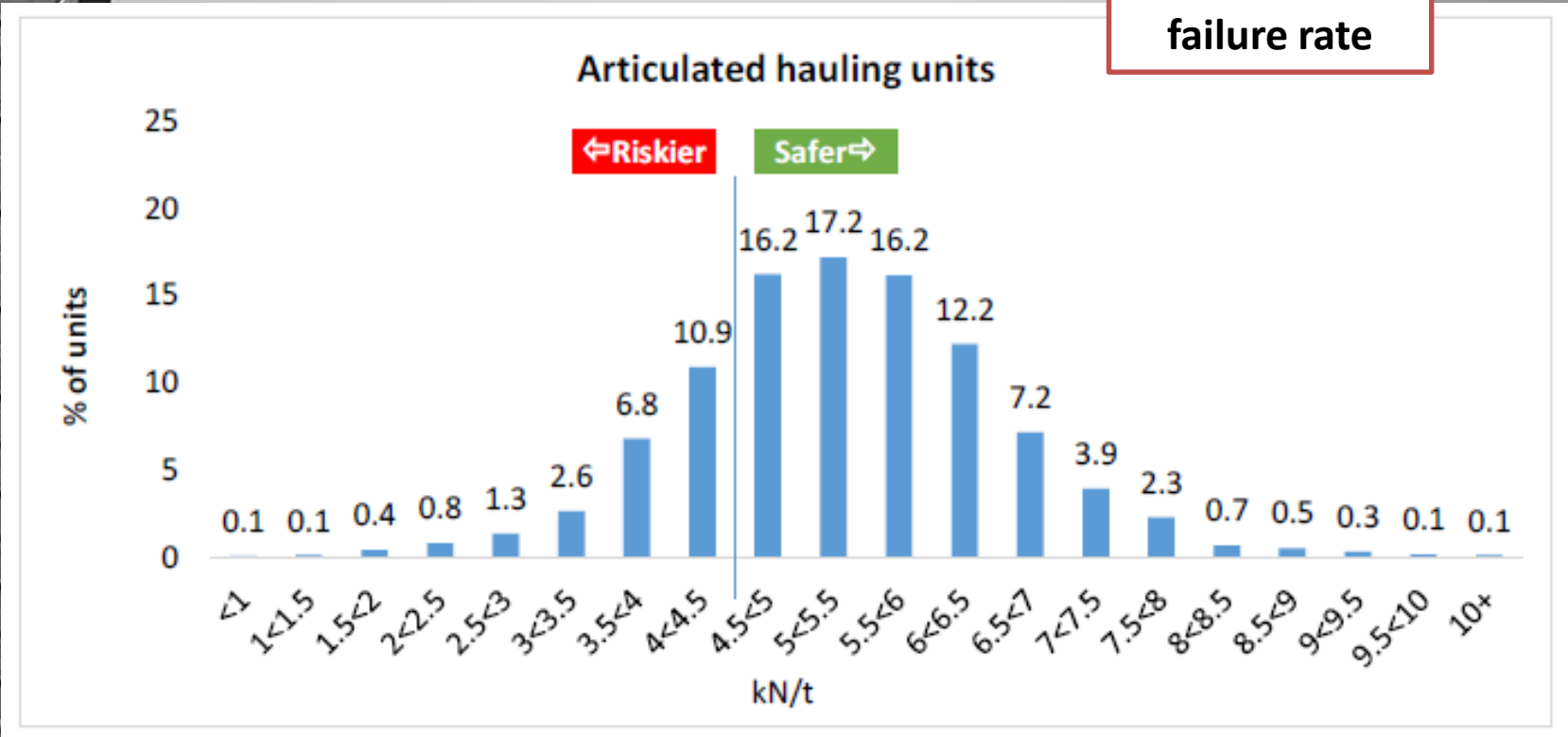
About 15% failure rate





Brake test results – artic. haul

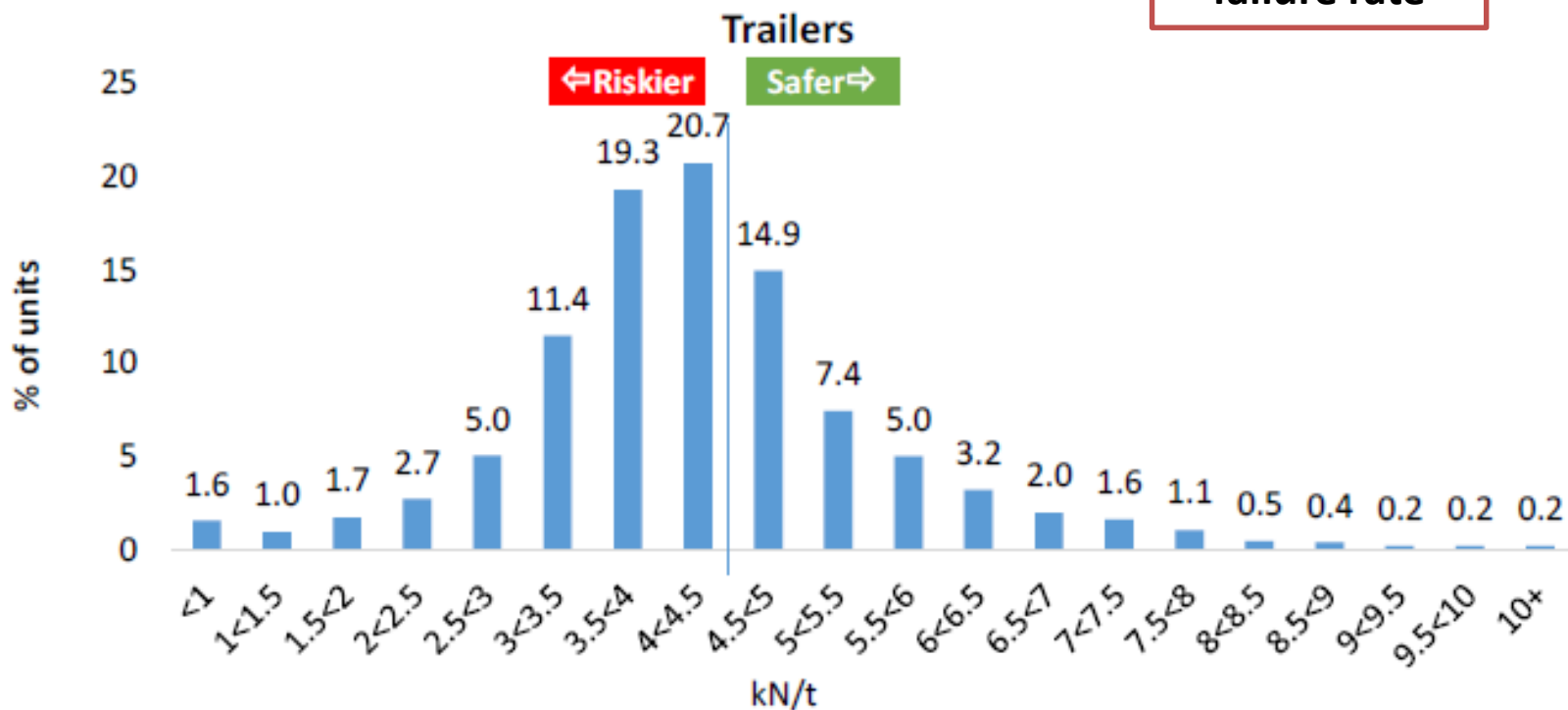
About 23% failure rate





Brake test results – trailers

About 65% failure rate





Andrew Stroud

TSS officer
Automotive Technician

VicRoads



Brake inspection findings

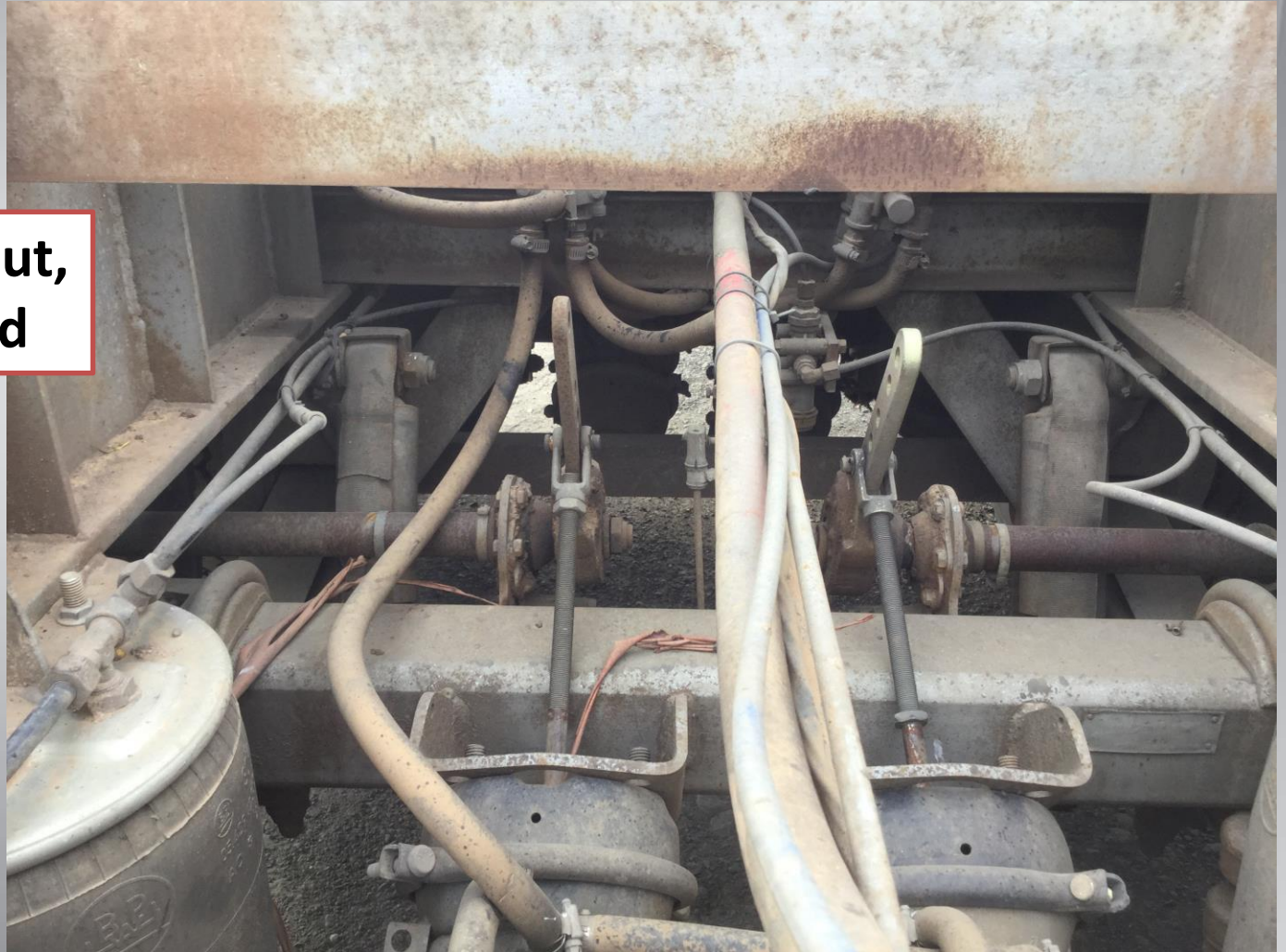
**Right-side
misaligned,
bearing worn,
push rod
locking nut**





Brake inspection findings

**Locking nut,
push rod**





Brake inspection findings



**Push rod just
engaged,
locking nut not
secure**

11/04/2017 07:56



Brake inspection findings



**Worn brakes,
over stroked,
lack of
maintenance**



Brake inspection findings

**Direct result of
poor brake
maintenance**





On a lighter note...

**Missing at least
another 2 load
binders?**





On a lighter note...

Its not that bad!





All-time favorite

**When you see
this on the
road, you
need to have a
closer look.....**





All-time favorite

...to find this in front of the driver!





Ian Thompson

**Engineering Manager,
Trailer equipment**

BPW Transpec





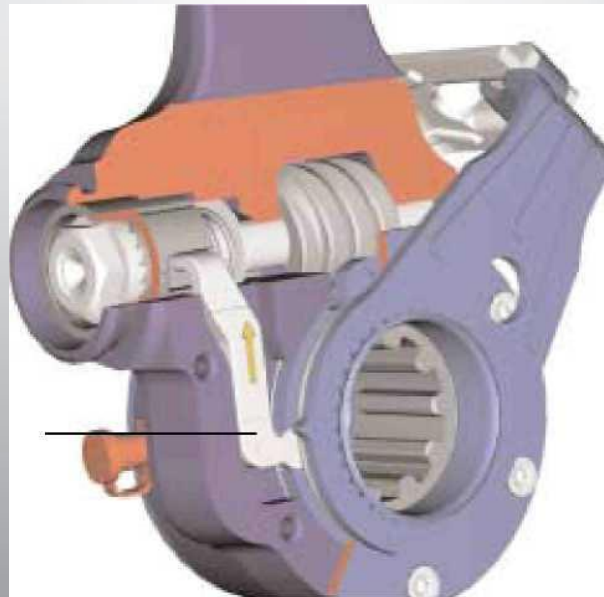
Auto slack adjusters

- Required to be fitted as part of the ADR when ABS and EBS brake control systems are used.
- Typically Australia lags Europe and USA where Autoslacks have been in wide use for the last 20 years.
- Important that they are set up correctly.
- Important that they are given some maintenance attention.
- At BPW we have very few claims regarding operation of auto slacks most that we have are attributed to poor set up and damage to reaction arms.



BPW Auto slack cross section

- When the lever is operated, the automatic slack adjuster brings the brake lining into contact with the brake drum
- The adjustment lever moves up, turning the sleeve, and ratchets to the next point

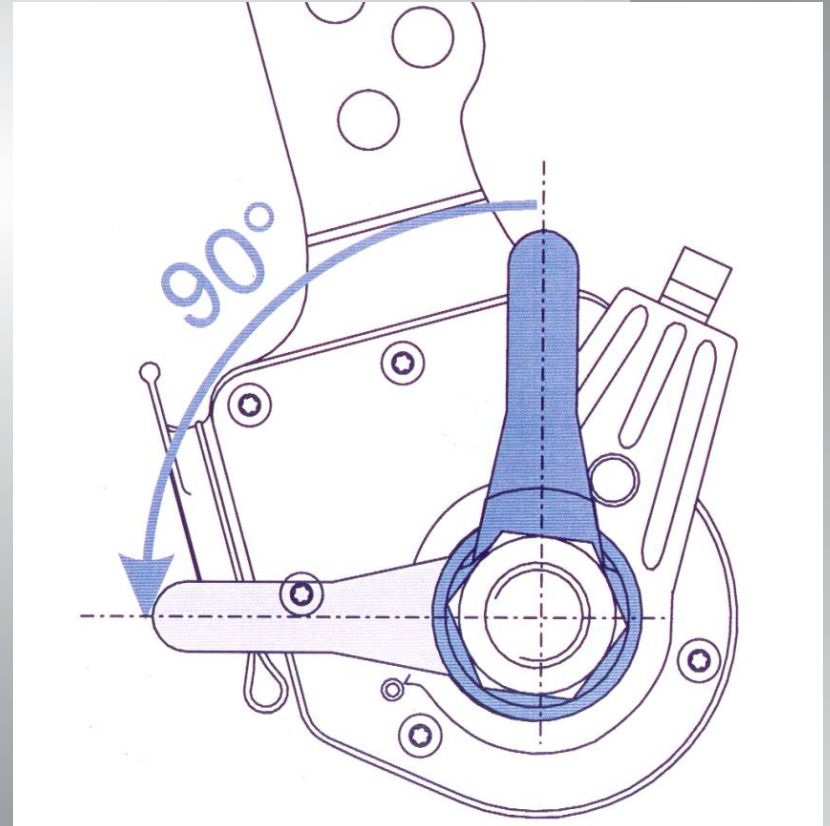


Brake Application



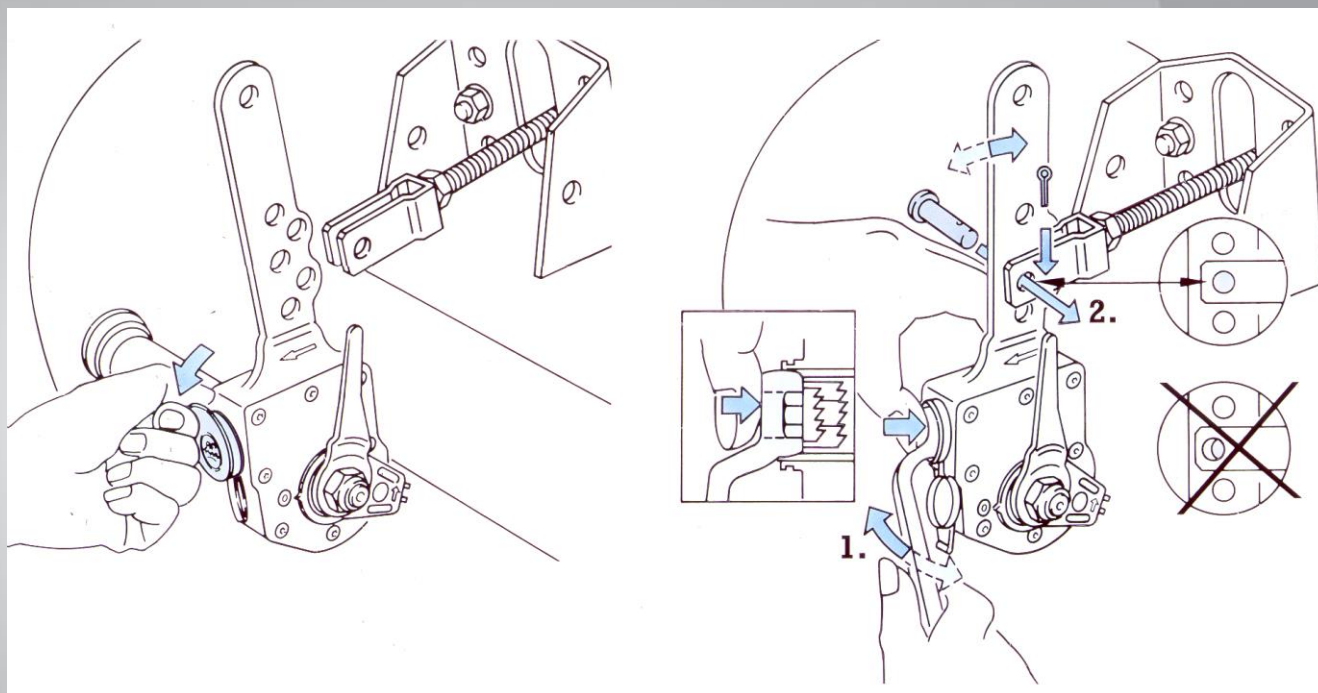
Wear Indicator

- With new shoes and drums
 - the wear indicator is set at vertical





2. Assembly Instruction ECO-Master

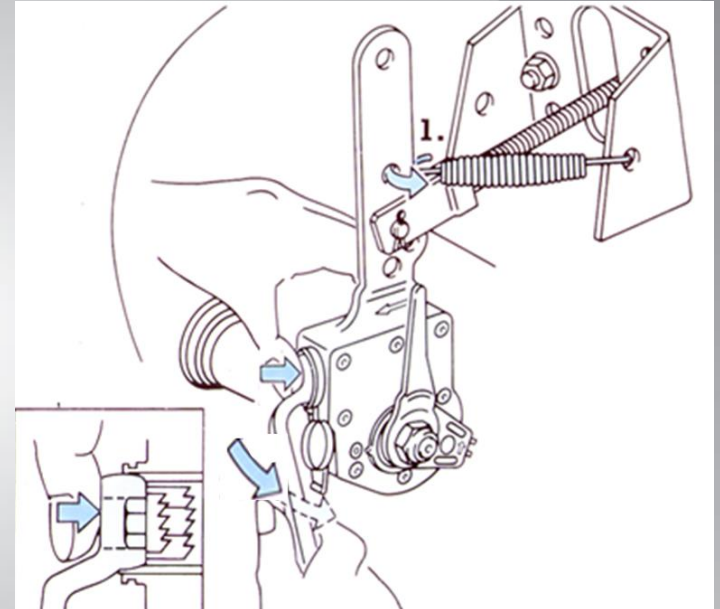
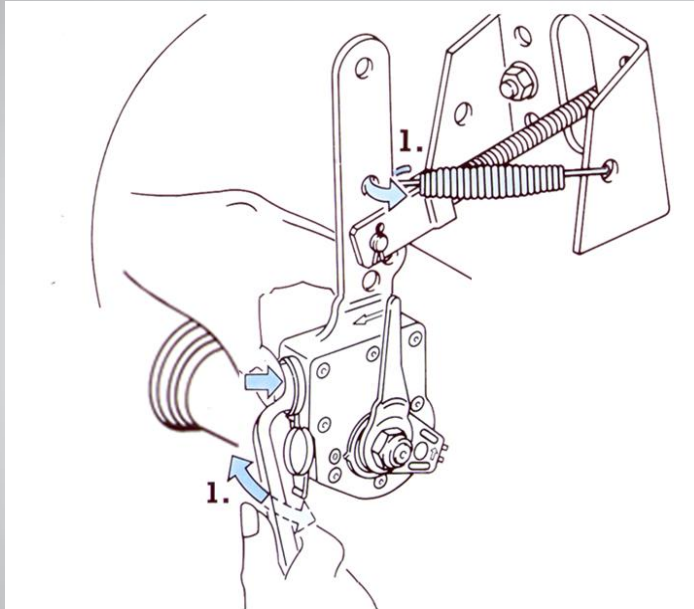
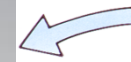
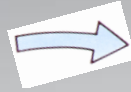


With the pushrod and clevis set to the right length and the booster in the correct holes. Booster should be caged or air supplied to the spring brake side. Wind the slack adjuster in clockwise, as per **1.** to fit the clevis pin.



3. Assembly Instruction

ECO-Master



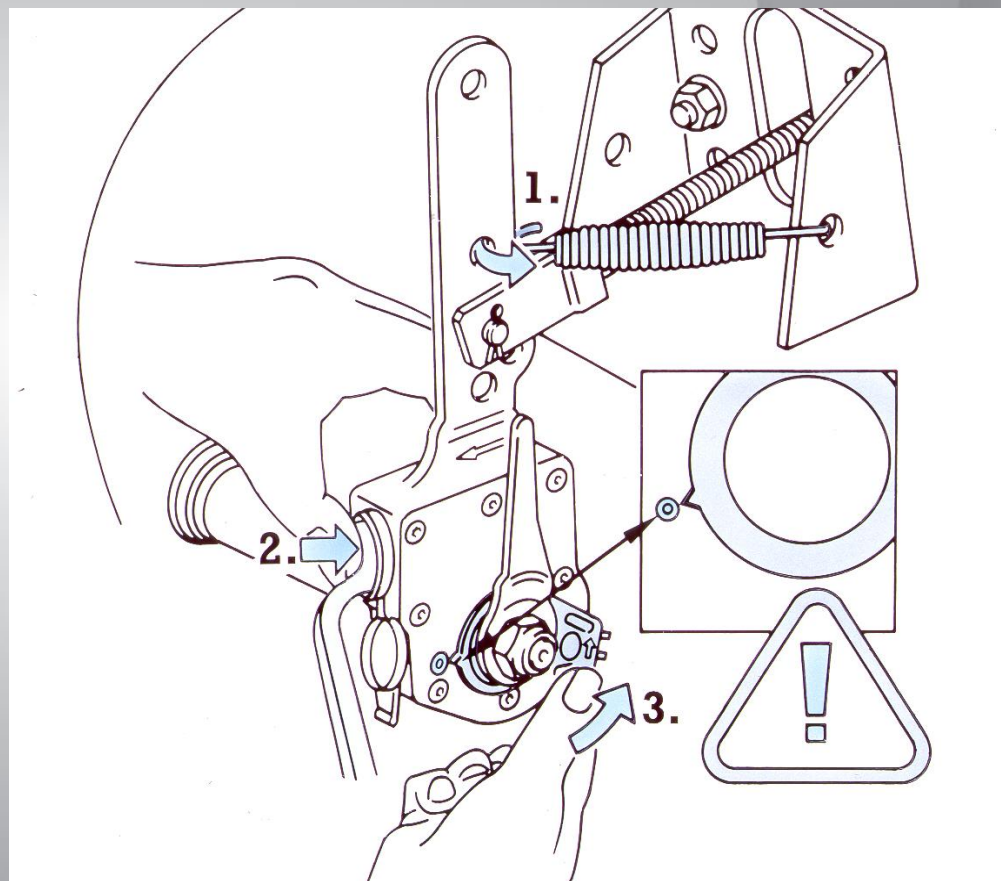
1. With the brake booster still caged/released
2. Depress the lock collar to engage the slack adjuster and rotate the 19mm nut clockwise until the brake shoes are in contact with the drums.
3. Adjust the brakes by depressing and rotating the lock collar nut anti-clockwise to achieve the 10-15% free play. (approx. $\frac{3}{4}$ of a turn).
4. The reaction brackets can now be set.



4. Assembly Instruction ECO-Master

With the brakes still released (i.e.: Booster caged or air to the spring brake side):

Push the nut in **2.** and rotate the reaction bracket **3.** into place so that the arrow and pimple mark line up.

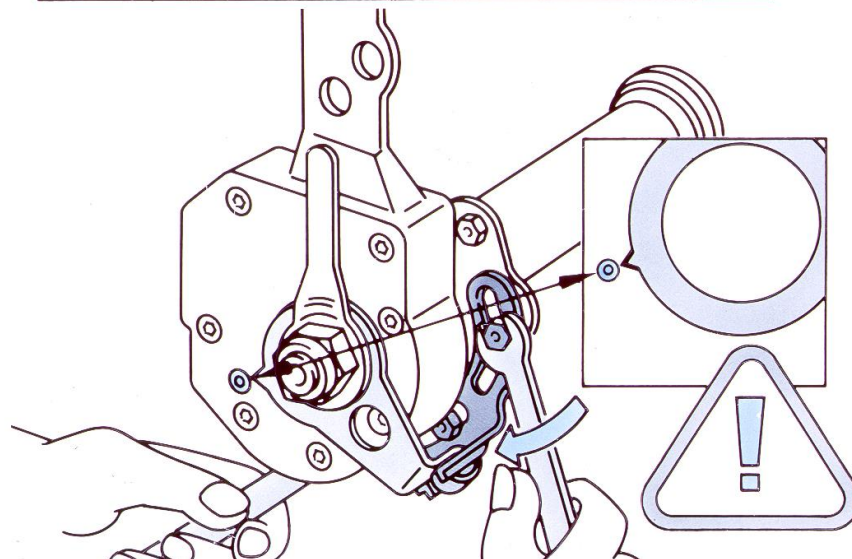
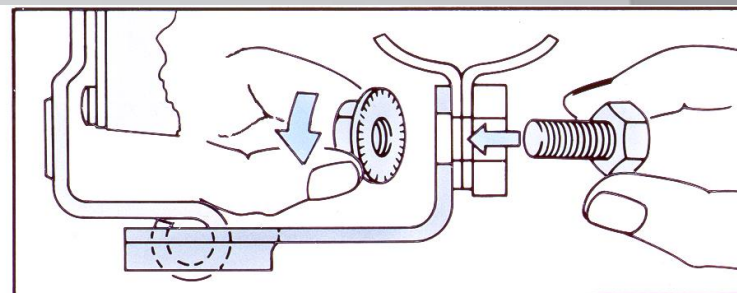




5. Assembly Instruction ECO-Master

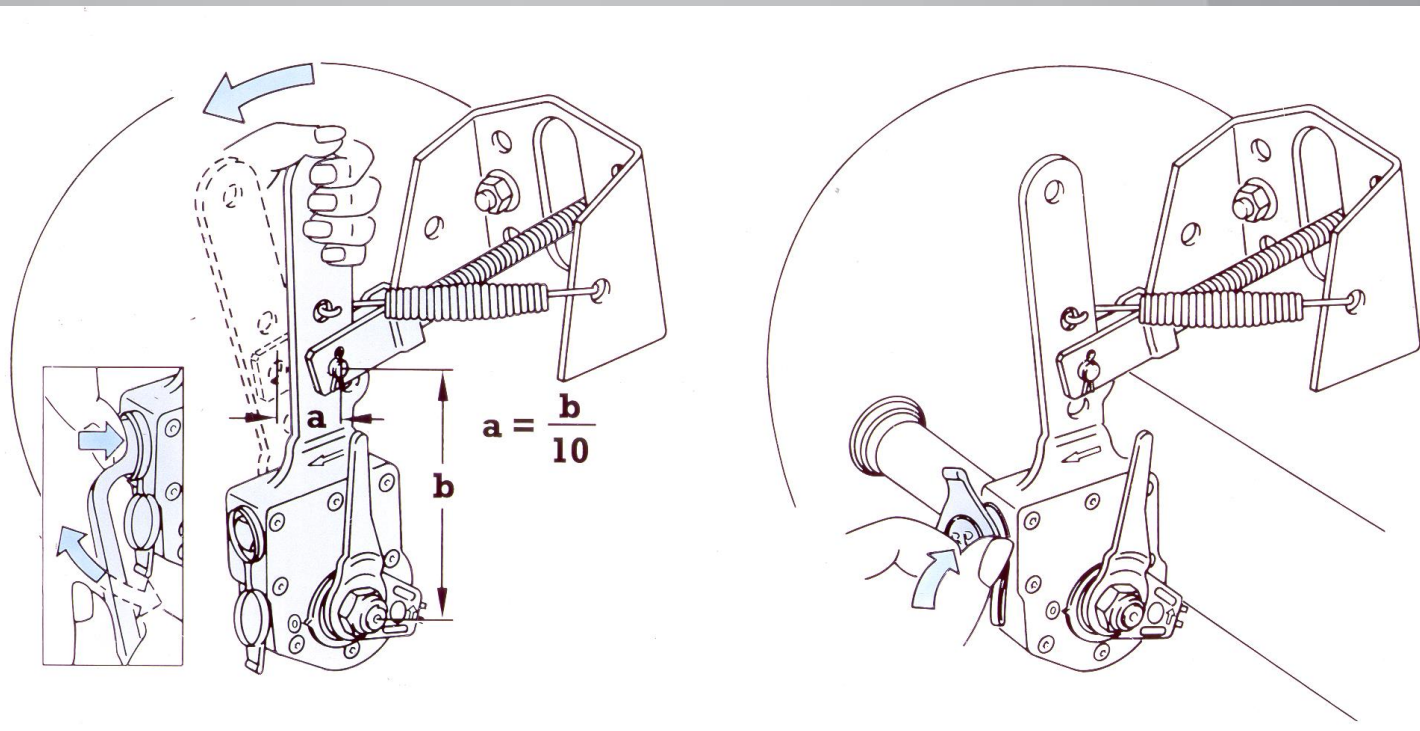
With the brakes still released (i.e.: booster caged or air to the spring brake side):

Tighten the reaction arm bracket onto the Camshaft-axle bracket with the two securing bolts (25 Nm)





6. Assembly Instruction ECO-Master



With the Brakes still released:

Check the free play by hand it should be in the range 10-15% $a=b/10$
(eg:15-22 mm on 150 mm slack hole)

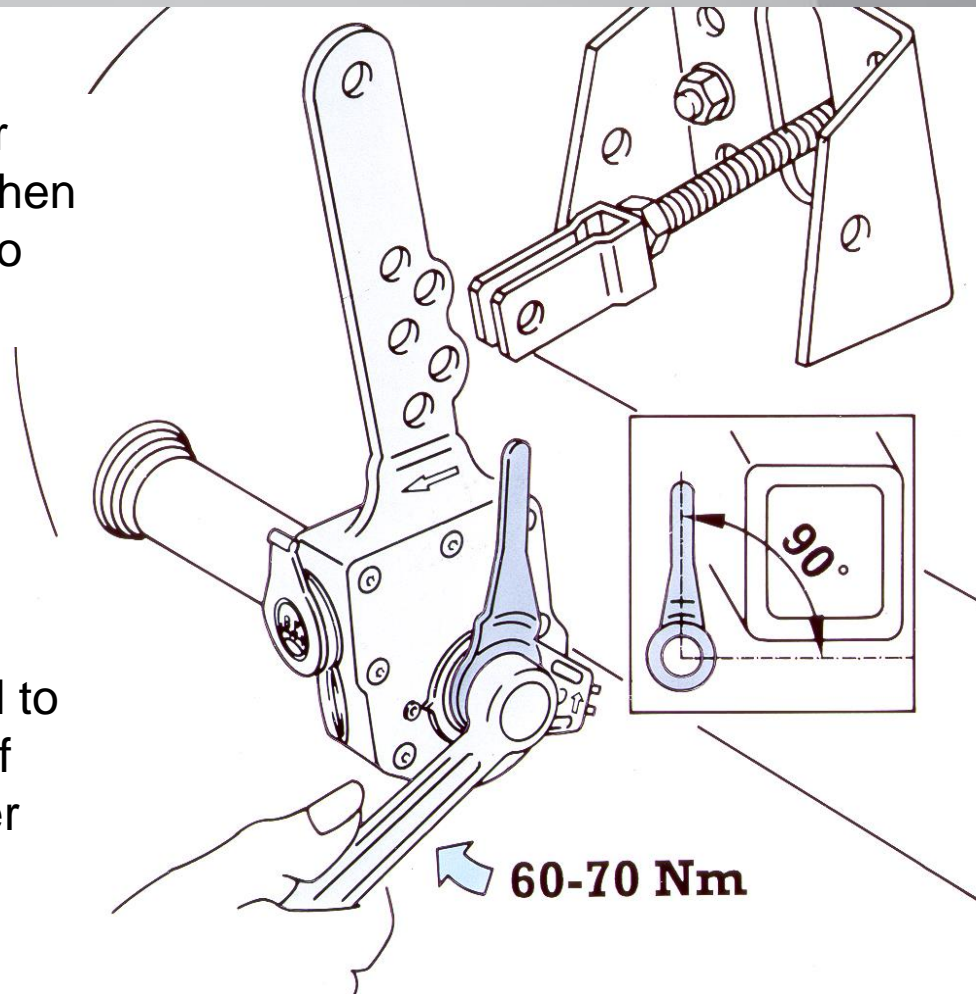
Adjust = depress and turn the 19mm adjustment nut as required



7. Assembly Instruction ECO-Master

Align the plastic wear indicator to 90° and then torque the main nut to 60-70 Nm

Note: We recommend to check the operation of the auto slack adjuster every 12 weeks (quarterly).





Load Sensing Valves

- Current ADR for trailers is ADR 38/04 and for truck is ADR 35/05.
- Trailer Regulation allows use of ABS/EBS or Load sensing and in some cases an older style pneumatic kit can be used.
- ADR currently under review and this will be raised in another session.





What a Load Sensing Valve does

By adding a LSV to a trailer brake kit the brake control signal is reduced when the trailer is empty to limit the chance of trailer brake lock up.

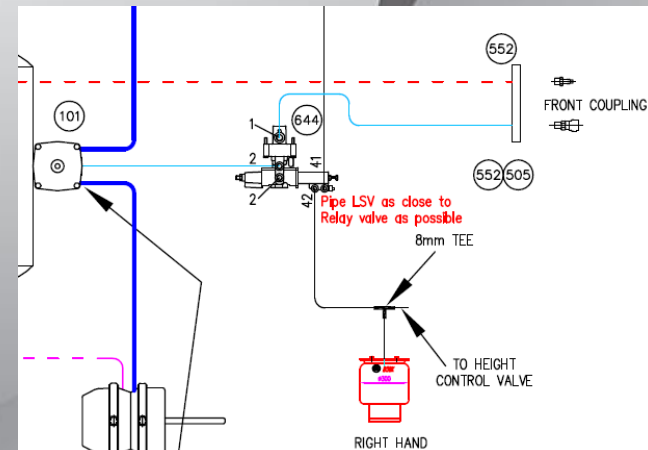
- When the trailer is loaded the brakes revert to a 1:1 input to output ratio through the LSV i.e.: full brakes.
- The LSV makes use of the trailer suspension air bag pressure and some predetermined settings to dumb down the ratio of input to output signal.
- Low/unladen suspension pressure reduces the ratio (less brake output).
- High/laden suspension pressure ratio returns to 1:1 (full brake output).
- No requirement for auto slacks with LSV option.





LSV in a brake circuit

- With an LSV in the circuit the initial feel of the trailer brakes is reduced and typically drivers complain that the trailer isn't braking.
- The reason for this is two fold: The brake circuit response is slightly slower and brake effort of the trailer is less than drivers are used to.
- The aim of the introduction of the LSV is to reduce the likelihood of empty trailer lock up.
- Especially on light trailers such as empty tippers and skels.
- LSV control doesn't give any scope for altering brake compatibility.
- Insertion of a valve in the circuit creates a time delay.





LSV SETTINGS

File Settings Info

WABCO

load sensing valve | air suspension

475 714 500 0

axle or axle group (1=front 2=rear) (2 for semi- or center-axle trailer)

test pressure (pin LSV) 10kPa

output pressure laden p2 10kPa 6.5 max

output pressure unladen p2 10kPa 1.2 min

bag pressure laden 10kPa

bag pressure unladen 10kPa

input i ?

LSV for
air suspension

no. of separator(s) N

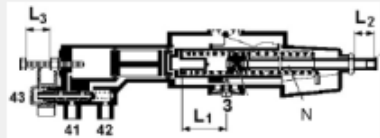
length of spring L1 mm

length of screw L2 mm

"empty" adjusting screw L3 mm

regulating ratio laden i

regulating ratio unladen i



bar / 10kPa
 bar

The calculated values are approximate values and must be corrected, if necessary.



LSV SETTINGS

WABCO

load sensing valve | air suspension | Label for LSV

475 714 500 0

axle or axle group (1=front 2=rear) (2 for semi- or center-axle trailer)

test pressure (pin LSV) 10⁵kPa

output pressure laden p2 10⁵kPa 6.5 max

output pressure unladen p2 10⁵kPa 1.2 min

bag pressure laden 10⁵kPa

bag pressure unladen 10⁵kPa

LSV for
air suspension

Please install the spring 896 512 360 4 with thickness of wire 4.0 mm.

no. of separator(s) N

length of spring L1 mm

length of screw L2 mm

"empty" adjusting screw L3 mm

regulating ratio laden i

regulating ratio unladen i

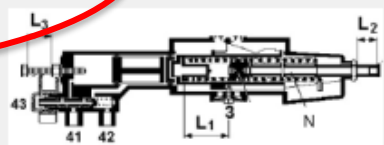
bar / 10⁵kPa
 bar
 10⁵kPa

The calculated values are approximate values and must be corrected, if necessary.

input i ?

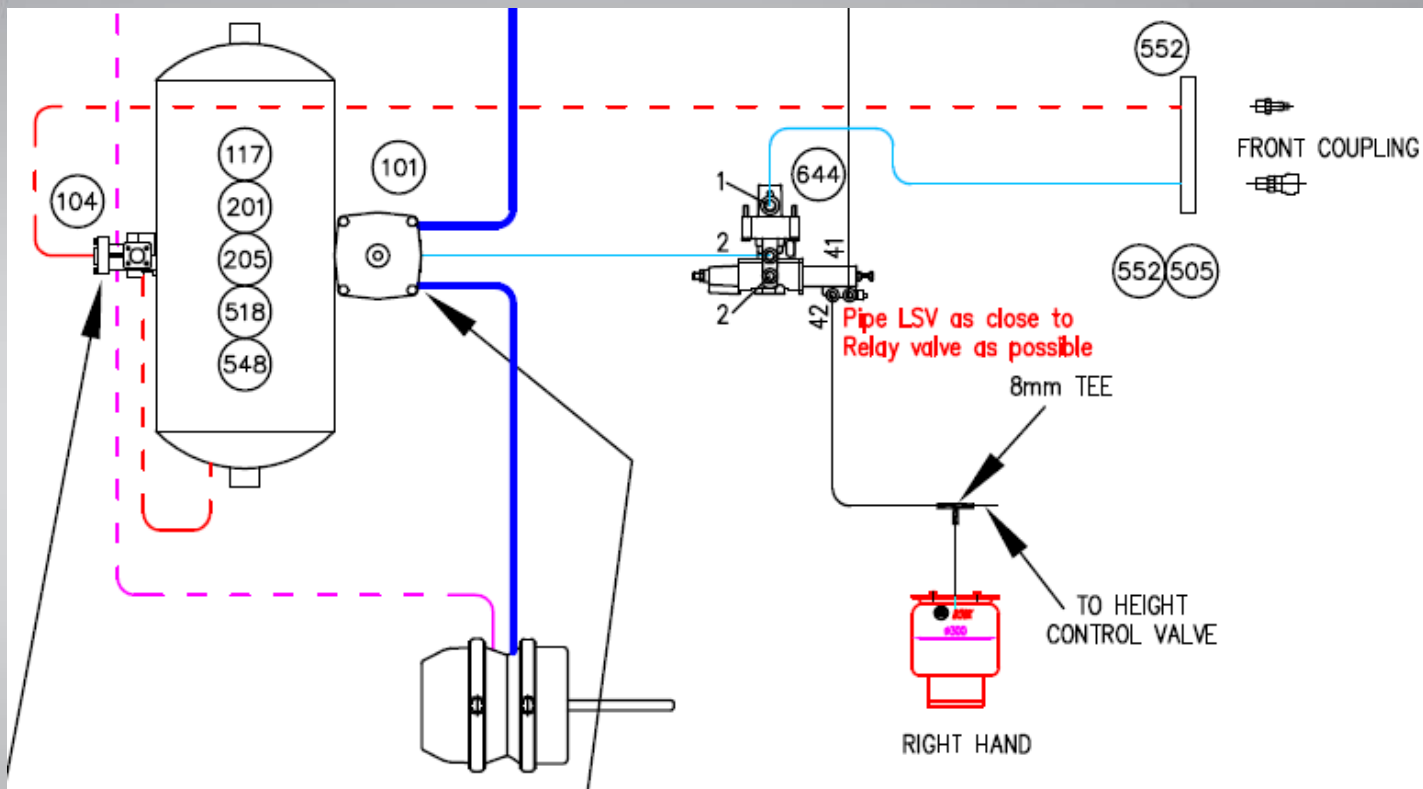
Table of intermediate conditions

Table of unladen conditions





LSV PIPING



Brake control signal (Blue)

LSV adjusts the signal due to air bag pressure = load

Delivers reduced signal to the relay valve and in turn the boosters



LSV on a Lead Trailer

- A lead or road train trailer that is fitted with an LSV is required to have an ABS/EBS connection cable fitted (ADR38/04 clause 6.7.2).
- The reason for this is make sure that if an ABS/EBS trailer is connected behind it that it would be able to be powered up.



ABS/EBS Plug



ABS/EBS Socket





Ed Ryan

Engineer

Bisitecniks



CHECKING THE LSV IN-SERVICE

- ADR 38 (Trailer Brakes) requires trailers with an LSV to have a sticker or plate fitted stating the setting i.e. the input/output pressures at airbag pressures/spring deflections.

Weweler Tri				
Control Data	Vehicle Loading condition	Axle Group Load (kg)	Suspension Press. (kPa)	Nominal outlet Press. (kPa)
Inlet Pressure (kPa) 650	Laden	22500	(4.89bar) 489	650
	Unladen	3500	(0.30bar) 30	260

WABCO		Automatisch lastabhängiger Bremskraftregler (ALB) für Fahrzeug-Typ: Load sensing valve (LSV) for vehicle type: 1 Axle Semi Trailer IPA/vari :31905/1003			
Vorderachse(n)		Front axle(s)	Hinterachse(n)		Rear axle(s)
Eingangsdruck Input pressure	bar			Eingangsdruck Input pressure	6.5 bar
Ventil Nr. Valve No.			475 714 500 0		
Achslast Axle load kg	Balgdruck bag press. bar	Ausgangsdruck Output pressure bar	Achslast Axle load kg	Balgdruck bag press. bar	Ausgangsdruck Output pressure bar
			2000	0.9	3.4
			9000	5.9	6.5

THIS VEHICLE IS FITTED WITH A LOAD SENSING BRAKE SYSTEM

Valve Part No: **WABCO 475 714 500 0**

Input Pressure: **kPa** ADR 38/04 ISO Test Port Output
+ Ref: Axle Load (kg) Press. (kPa) Press. (kPa) +

Unladen			
Laden			





TESTING THE LSV

- The valve's output pressures can be checked by simulating the laden/unladen airbag pressures at the ISO test port and comparing the readings back to the data on the sticker or plate.

Input signal from front coupling →

Simulate Airbag pressures from compressor →





LSV ADJUSTMENT

- The LSV can be adjusted but requires a sign-off by an Authorised Vehicle Examiner (AVE) i.e. VSB 6 'blue plate'.
- Adjustment made according to the application e.g. B-Double and using the tare weights can enhance the combinations braking compatibility.
- Improved braking compatibility between vehicles in combination helps wear characteristics and braking 'feel'.



Val Gomez

Service Manager

CMV



Why Auto Slacks

- SAFETY
- COMPLIANCE
- SAVINGS



SAFETY

- Ensuring a safe vehicle on the road by having all brakes in a combination properly adjusted.
- More important in a multi combination such as Double and Triple Road Trains.
- Reduce the risk of accidents – Jack knives.



COMPLIANCE

- Properly adjusted brakes reduce problems with Road Authorities brake roller testing.
 - Reduce unnecessary defects issued due to poorly adjusted brakes.
 - Most times a half a turn of the adjuster was sufficient to bring brake to compliance.



SAVINGS

- Savings by:
 - Less wear and tear on foundation brakes components.
 - Reducing wheel lock ups on mismatched brakes and tearing up tyres.
- Reducing minor accidents, rear enders, jack knives with well adjusted brakes.
- Reduce insurance premiums



Workshop Training a must

- Training is essential for:
 - The proper installation of Auto Slack Adjusters.
 - Not all Auto Slacks are set up the same.
 - Understanding how the Auto Slack Adjuster works and when it needs to be changed.
 - Do not adjust Auto Slack Adjusters in service.





SETUP AND MAINTENANCE OF AUTOMATIC SLACK ADJUSTERS AND LOAD-SENSING VALVES

PANEL Q & A

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