

## TECHNICAL REPORT – ACCIDENT DAMAGE

<b>VEHICLE MAKE:</b>	Volvo	<b>REPORT DATE:</b>	24 <sup>th</sup> July 2015
<b>VEHICLE REG:</b>	XXXXXXXXXX	<b>TRAILER:</b>	XXXXXXXXXX
<b>INSURED:</b>	XXXXXXXXXX	<b>LOCATION:</b>	Hermans Centurion
<b>INSURER:</b>	XXXXXXXXXX	<b>CONTACT:</b>	XXXXXXXXXX
<b>CLAIM / POL No:</b>	XXXXXXXXXX	<b>DATE OF APP:</b>	23 <sup>rd</sup> July 2015



The vehicles as seen at Hermans in Centurion

Dear XXXXXX,

As instructed I travelled to Hermans to inspect the above mentioned vehicles to ascertain their condition regarding their roadworthiness prior to the incident.

This report is based on my knowledge of the vehicle as well as information supplied, offering my opinion to the insurers on any technical or other issues uncovered as well as on the circumstances of the accident as stated on the claims documentation.

Where reference is made to roadworthiness of the vehicle, I am comparing the item under discussion with the relevant section(s) of the legislated requirements of SANS 10047 2009 – The Testing of Motor Vehicles for Roadworthiness and other relevant sections of the National Road Transport Act 93 of 1996.

**IDENTIFICATION TRUCK TRACTOR:**

The vehicle was identified by its' registration plate, VIN and engine numbers; this data matches the information provided by the Insurers for this vehicle.



Registration plate



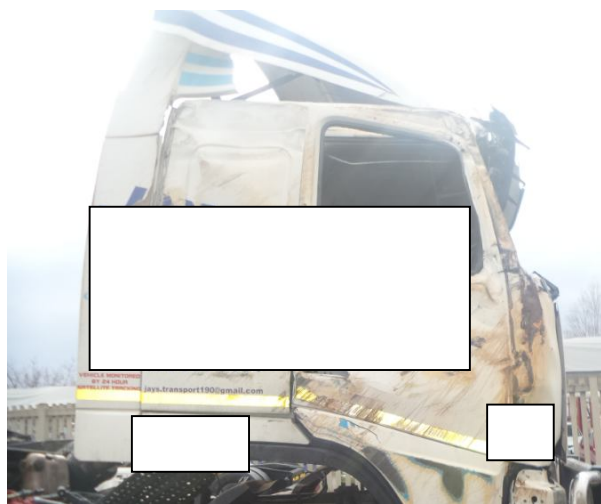
VIN and Engine numbers

Insured Vehicle:	
Truck tractor	
<u>White colored Volvo FH 12 truck tractor</u>	
• Registration number	[Redacted] 81
• Chassis number	
• Engine number	

Information provided by the Insurers

**DAMAGE:**

The truck tractor has suffered substantial damage to the right side of the cab from its contact with the ground.



If this were the only damage to the vehicle, it would be a close call as to whether or not it is economically repairable.

However, as can be seen to the right, as the engine had carried on running whilst the vehicle was lying on its side, the engine had been removed for a detailed strip and quote and although I have not seen the quotation, I was informed by Herman's that there is a substantial amount of bearing and crankshaft damage, which without a doubt renders the vehicle a total loss.



**TYRES:**

One tyre, that being the outer tyre on axle 3 left on the truck tractor, was worn down and would have needed imminent replacement, but was still in a roadworthy condition. None of the remaining tyres on the vehicle presented any problems with regards to roadworthiness; all had adequate tread life remaining and were free from any cuts or abrasions.



Axle 1 left – roadworthy condition



Axle 1 right – roadworthy condition



Axle 2 left – roadworthy condition



Axle 2 right – roadworthy condition



Axle 3 left – outer tyre worn / imminent replacement needed



Axle 3 right – roadworthy condition

### **BRAKES:**

The Volvo has a dual circuit brake system controlled by a Knorr Bremse EBS system. This state of the art electronic / pneumatic brake system combined with the Volvo VEB (Volvo Engine Brake) endurance brake system makes this truck one of the safest on the road.

Volvo “Z cam” type drum brakes are used on all six wheels with parking and emergency braking being supplied by four spring-brakes on the four wheels of axle 1 and 2.



Axle 1 left – adequate linings



Axle 1 right – adequate linings

The brake linings and drums of axle 1 appeared to be in good condition, linings thickness is more than adequate, the only concern being that the bright orange appearance indicating operation at temperatures above the brake assembly’s norm.

All four brake drums on the two rear drive axles displayed the bright orange tell tale colour to a higher degree that those on axle 1. This change in colour from the normal dull brown comes from the rapid oxidization of outer skin of the cast iron drums as it reacts with the oxygen present in the atmosphere when high operational temperatures are reached.

In addition, the paint on the backing plates of all four brake assemblies of the two drive axles had blistered due to the excessive heat and two of them had actually caught fire.



Axle 2 left – adequate linings



Axle 2 right – adequate linings though overheated

The change of colour of the brake lining itself as highlighted in the photo above right is typical of all the linings on the truck tractor and is a further indication of the brakes reaching higher than normal operating temperatures.



Axle 3 left – overheated brake – paint caught alight



Axle 3 right – overheated brake – paint caught alight



The two brake assemblies seen above are those reported by the driver to have been alight and then smouldered without igniting the tyres.

The tyre of axle 3 left seen here was on the verge of ignition, had this tyre have caught alight, there would have been very little to stop the combination from burning out.

It is important to mention at this point that when negotiating hilly terrain as was the case with this incident, poor driving style that is over use of the service brakes, can often lead to the symptoms we see present on the brakes of this vehicle.

However, when the drivers' behaviour is to blame, all the brakes on all three of vehicles in the combination would be affected in the same manner as they would all have been exposed to the same events and environments and are required by law to provide an equal level of brake effort in relation to the load carried on each axle.

As will be shown later when dealing with the brakes on the trailers, this was not the case, only the brakes of the truck displayed the symptoms of overheating.

**TRAILERS:**



Trailers as seen at Hermans in Centurion

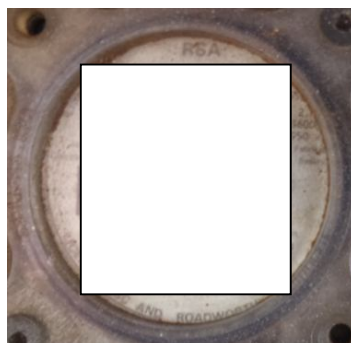
**TRAILER IDENTIFICATION:**

The trailers were identified by their registration plates and data on their license discs; this information correlates with the data provided by the Insurers.

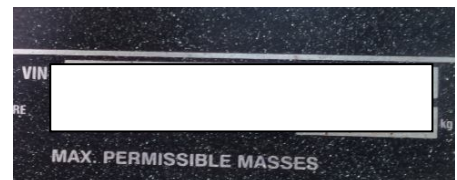
**LEADER:**



Registration plate



License disc



VIN number

**FOLLOWER:**



Registration plate



License Disc

Front trailer	
<u>Bahrain Tautliner interlink twin-axle semi-trailer</u>	
<ul style="list-style-type: none"><li>• Registration number</li><li>• Chassis number</li><li>• <b>Estimated damage</b></li></ul>	<input type="text"/>
Rear trailer	
<u>Bahrain Tautliner interlink twin-axle semi-trailer</u>	
<ul style="list-style-type: none"><li>• Registration number</li><li>• Chassis number</li><li>• <b>Estimated damage</b></li></ul>	<input type="text"/>

Information provided by the Insurers

**DAMAGE:**

The load bodies of both trailers have suffered substantial damage, there is also some wheel and tyre damage, but both trailers are in my opinion repairable.



**TYRES:**

Tyres on the trailers had adequate tread depth remaining and there are no signs of any serious cuts or deformations of the side walls.

**LEADER:**



Axle 1 left – adequate tread



Axle 1 right – adequate tread



Axle 2 left – adequate tread



Axle 2 right – adequate tread

**FOLLOWER:**



Axle 1 left – adequate tread



Axle 1 right – adequate tread





Axle 2 left – adequate tread



Axle 2 right – adequate tread

## **BRAKES:**

Both trailers are fitted with standard twin line pneumatic brake systems that operate S Cam type drum brakes. Service brake effort is supplied on each wheel by the front end of a dual action springbrake actuator while the rear supplies spring force for parking and emergency braking effort.

The pneumatic brake system on each trailer is assisted by an electronic anti lock brake system, however, neither ABS system was in working order prior to the accident.

When manufactured, in order to comply with the provisions of SANS 20013, Uniform Provisions for Braking, which is a compulsory vehicle standard, adjustment of the brakes was carried out automatically by Haldex “type” automatic slack adjusters on all wheels.

However, someone has chosen to replace the automatic slack adjusters with manual types, which by the time I inspected the combination, had been “backed off”, most likely by the towing company.

The driver included the following in his statement:

The truck combination came to a halt in a ditch on the [redacted] Road. The truck tractor’s wheels caught alight and then smoldered. The trailer’s wheels were however cold and I went to inspect it. I then noticed that the trailers’ wheels were turning freely and that the brake linings were far away from the drums.

Although he states that he noticed the “wheels were running freely”, the park brake of the truck was most likely in the drive position as there is evidence that many of the brake linings were making contact with the drums, albeit not in the manner required of them.

Although my inspection took place some three weeks after the accident, none of the brake paths within the drums showed signs of corrosion that would be expected had the linings had not been making contact with the drums for a period of time prior to the accident.

To assess the state of adjustment of the brakes of the trailers, I examined the “S” camshaft faces.

When the brake is applied, the camshaft forces the brake shoe towards the drum by pushing the brake rollers apart. The resulting contact leaves heavy marks on the camshaft face.

When the brake is in good condition and is adjusted properly, the springbrake push rod should meet resistance that stops it approximately half way through its stroke of 64mm, leaving the slack adjuster at a 90° angle to the push rod. This angle is specified as the maximum point of travel in SANS 10047 – The Testing of Motor Vehicles for Roadworthiness, where the vehicle examiner is instructed to reject a vehicle as unroadworthy:

u) brake levers that are not set to the correct angles, as shown in figure 4.

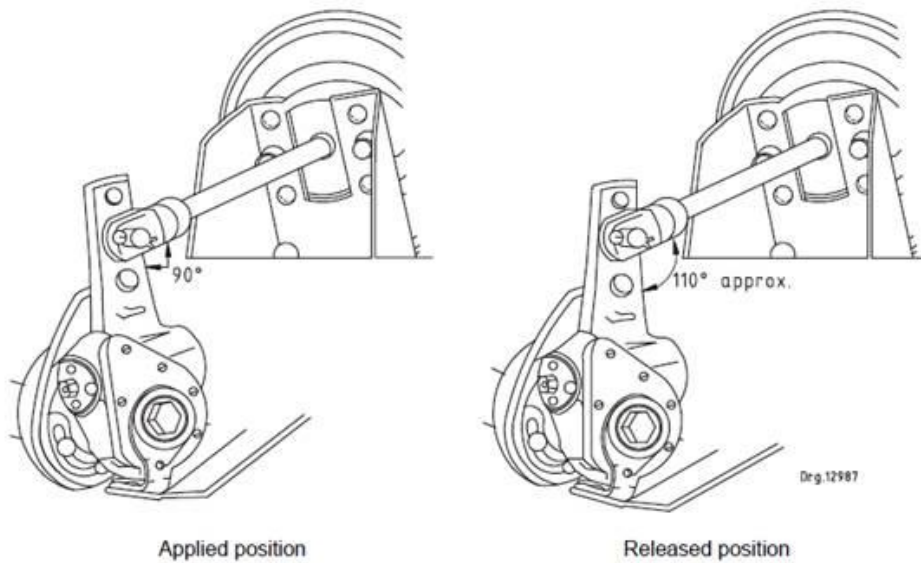
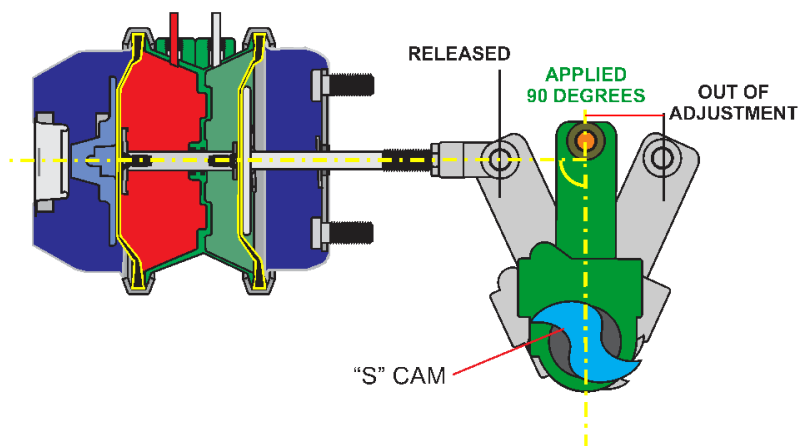


Figure 4 — Angle of brake levers

Placing a restriction on the amount of travel of the slack adjuster provides a simple method of checking for correct brake adjustment. This ensures that the brake is being applied well within the travelling capability of the actuator and with the 90° point being at the top of the arc being travelled by the clevis pin, the point of maximum mechanical advantage is reached.

The sketch below better explains this specification:

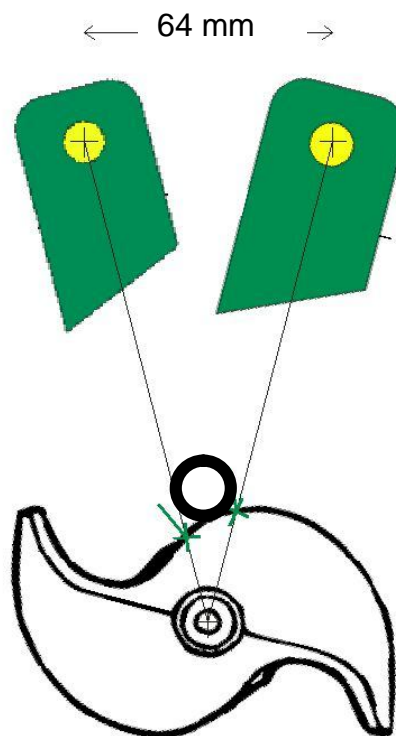


The sketch to the right shows the area of contact as the camshaft turns.

Having inspected thousands of brake assemblies, I can tell at a glance if the brake has been travelling too far by the length of the mark left on the camshaft face by the rollers.

A well adjusted brake leaves a mark approximately 12mm long on the camshaft, depending on the situation, when marks reach 17 – 20mm, I would conduct more accurate tests to determine what state the brakes were in, however in this case, I did not deem this necessary.

Starting with the leader trailer, I found that there were adequate brake linings on all four brake assemblies.



Axle 1 left – adequate linings



Axle 1 left – excessive roller marks on “S” cam faces

Although as previously mentioned, all of the slack adjusters on the trailers had been tampered with, the tell tale roller marks on three of the four wheels on the leader trailer show that the necessary brake adjustment was not carried out.

While this would undoubtedly affect the braking performance of this vehicle and the combination as a whole, this is not the most serious issue with the brakes as will be elaborated upon later in this report.



Axle 1 right – adequate linings



Axle 1 right – excessive roller marks



Axle 2 left – adequate linings



Axle 2 left – acceptable roller marks



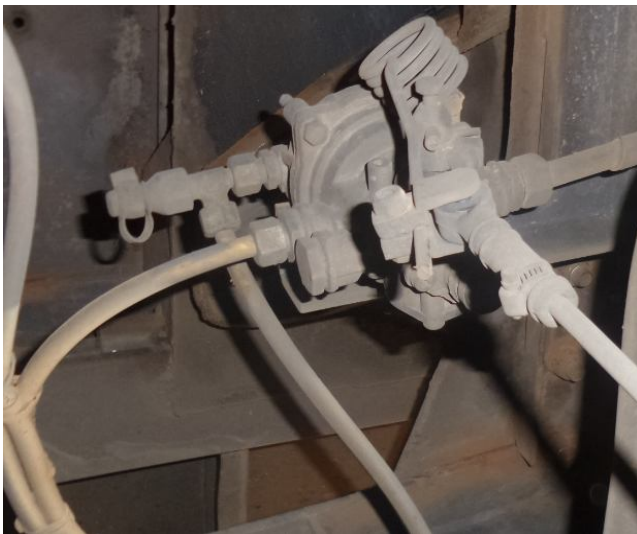
Axle 2 right – adequate linings



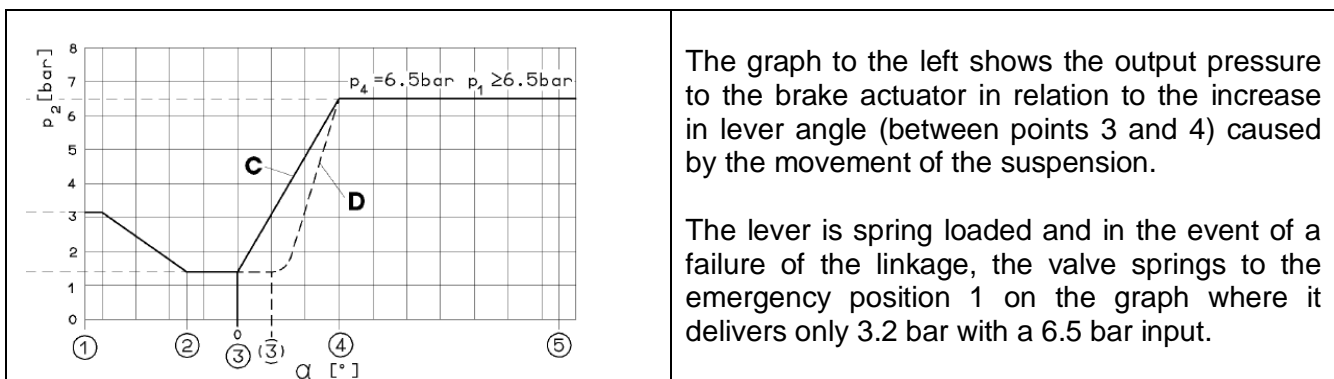
Axle 2 right – excessive roller marks

The lack of brake performance due to poor adjustment was amplified by the fact that the load sensing valve linkage has been broken for some time.

I find more trailer load sensing valve linkages broken than intact when inspecting vehicles following accidents, it is usually difficult to say whether the linkage broke during the accident or was a victim of poor maintenance, however in this case, the condition of the broken rubber joint is a clear indication that the linkage has been in this state long before the accident.



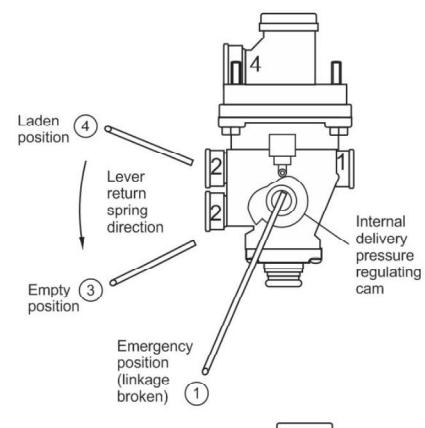
The load sensing valve is a critical piece of equipment as it adjusts the air pressure to the brake actuators in relation to the load being carried, using the linkage to adjust the valve as it reacts to the deflection of the suspension.



This means that when loaded as this combination was at the time of the accident, the best we could have expected from the leader trailers' brakes had they been correctly adjusted, was a performance level that was less than half of what was required of them.

The drawing to the right shows the basic layout of the valve with the air supply port (1), the control port (4) and the delivery ports (2).

The air delivered to the brakes is dependent on the position of internal cam which is controlled by the valve's lever which is shown here; the emergency position (1), the empty position (3) and the laden position (4).



The lever is spring loaded to the emergency position (1) in the event of a linkage failure. The pressure delivered whilst the valve has failed to the emergency position is designed to provide for emergency braking, specified in SANS 10013 as 30% of the full braking application.

There is no doubt that the braking performance that the leader trailer was capable of producing was far short of that required and that this rendered the vehicle unroadworthy.

**FOLLOWER:**

The foundation brakes of the follower trailer were found in a very similar state as the leader, there were adequate brake linings, automatic slack adjusters replaced by with manual units that lacked proper adjustment.



Axle 1 left – adequate linings



Axle 1 left – excessive roller marks on “S” cam faces

The actuator push rod on the brake assembly of axle 1 right had bent, this is not an uncommon sight when the brake is out of adjustment and the angle of the slack adjuster travels beyond 90°



Axle 1 right – adequate linings



Axle 1 right – pushrod bent



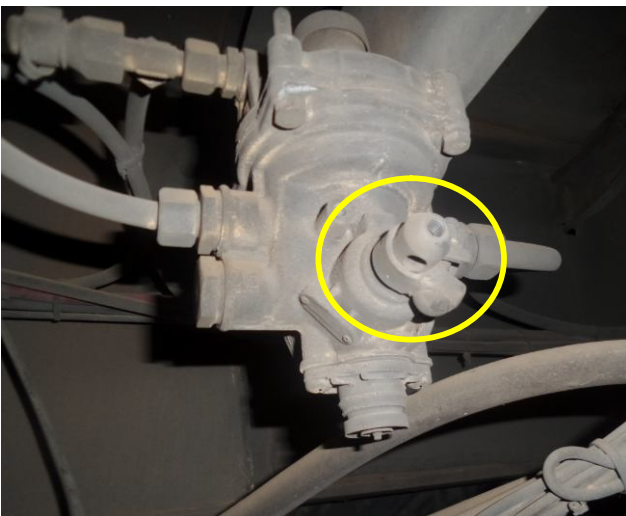
Axle 2 left – adequate linings



Axle 2 right – adequate linings

I would have been kinder with my comments regarding the broken linkage of the load sensing valve if there weren't so many issues found where the performance of safety critical equipment has been blatantly disregarded.

On the follower trailer, the benefit of the doubt regarding the condition of the load sensing valve operation is not a consideration as the linkage has been removed entirely. I can't imagine how someone has knowingly robbed this vehicle of at least 50% of its braking ability when laden and then allowed a driver to take it out on to a public road.



Load sensing valve linkage removed

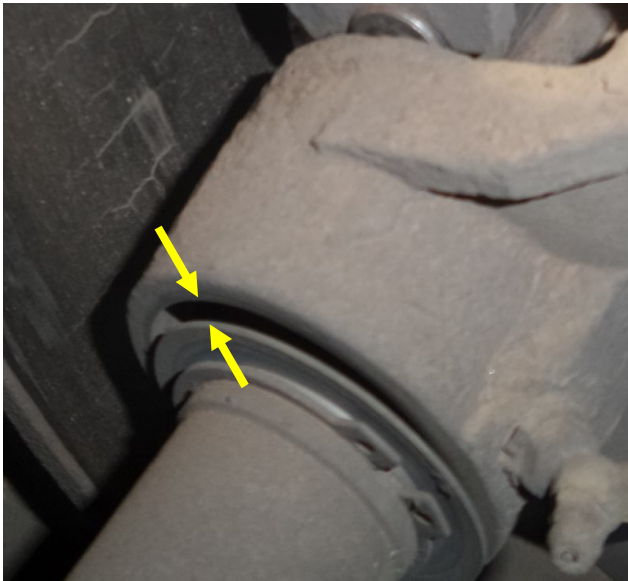


No rubber on spring box

The spring loaded lever that mounts onto the valve camshaft, the rubber joints and the rod have been removed.

These parts could not have fallen off and simply been missed during a routine service. As with the leader, this meant that when laden, the follower trailer was being provided with air pressure far below that being supplied to the brakes of the truck.

Although the Insured claims that the combination was regularly serviced and in good condition, further issues indicate the contrary. I found all of the inner “S” camshaft bushes to be worn and without the expected presence of grease either around the bushes or on the greasing points.



Badly worn “S” cam bush



Lubrication point

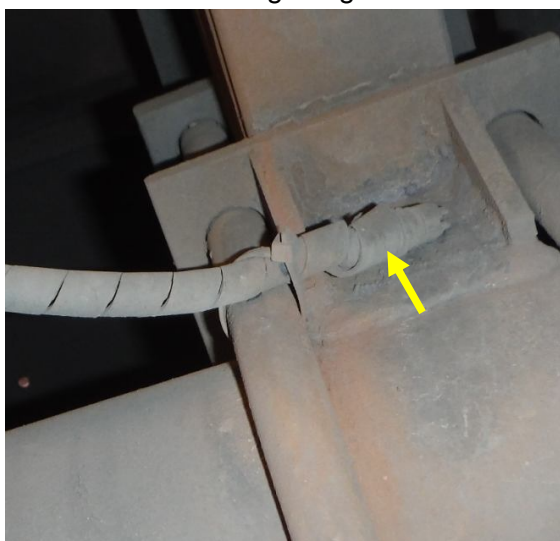
The worn “S” cam bushes further hinder the brake’s ability to perform as required.

#### **CAMSHAFT**

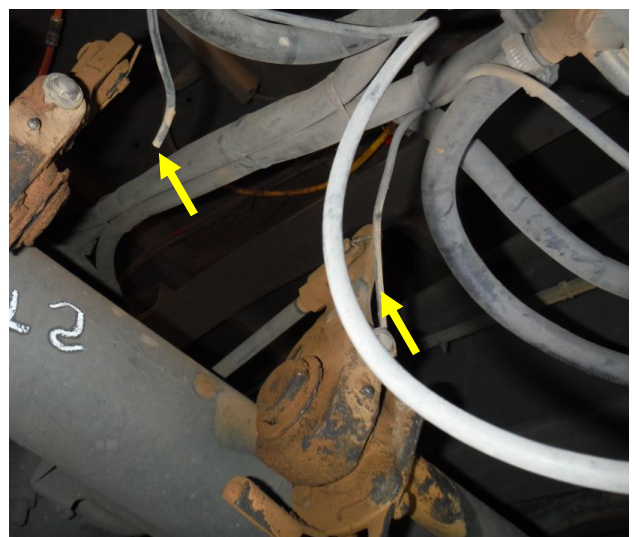
1. Inspect camshaft spline for cracks and excessive deformation. Replace as necessary.
2. Inspect the camshaft bearing journals for wear or corrosion. If the shaft shows wear or roughness that is visible or roughness that can be detected by feel, it must be replaced.
3. Inspect cam head for cracks, and its roller surfaces for flat spots, brinelling, or ridges. Note unusual wear patterns which may indicate an out-of-square condition. Replace if any of these conditions exist.

The clip to the left from the manufacturers repair manual describes excessive wear in the “S” cam bushes as being if you can feel the movement, here you don’t need to feel the play, the gap is visible with the naked eye.

As mentioned previously, the ABS systems of both trailers were inoperative, with components being disconnected or missing altogether.

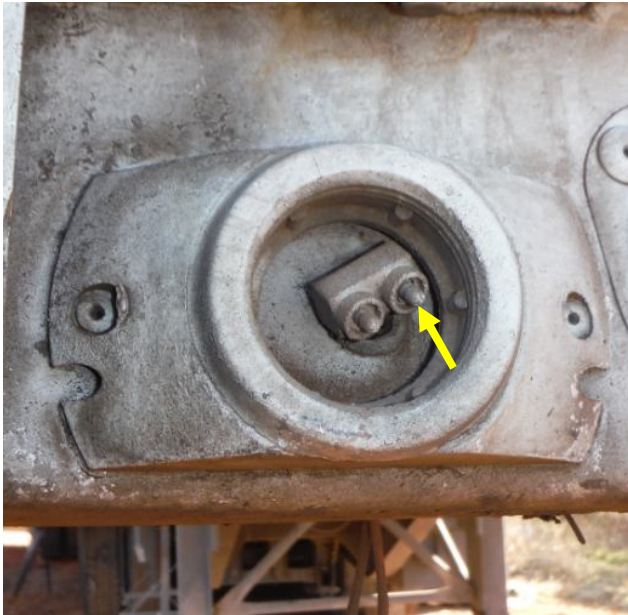


Sensor cable tied up – no sensor fitted



ABS cables cut and left loose





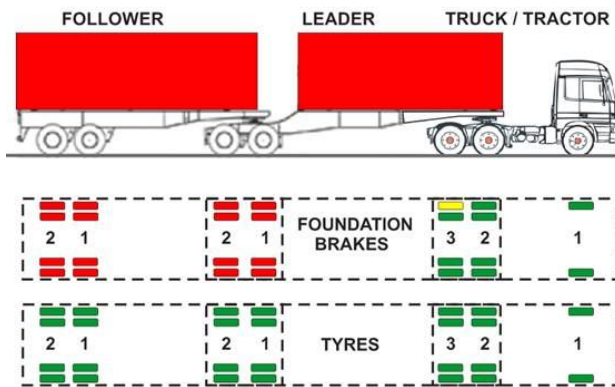
ABS info lamp broken and painted over



ABS info lamp not connected

**CONCLUSION:**

I am certain that the brakes on both trailers had issues that would render them individually unroadworthy and obviously the combination as a whole the same.



The easy to understand graphic to the left indicates my opinion as to the condition of the brakes and tyres prior to the accident.

The colours depicted for each wheel represent the following:

- Brake operating correctly
- Tyre in acceptable condition
- Brake operating below par
- Tyre requiring imminent replacement
- Brake inoperative or dangerous
- Tyre has serious defect

The technical issues with the brakes of the two trailers as detailed in this report fall into two categories. Firstly there is the conscious decisions that were made to remove the mandatory automatic slack adjusters, disconnect the leader trailer's load sensing valve and ignore the various problems with both anti-lock brake systems to the point where they serve no purpose.

Secondly, there is the lack of necessary maintenance that is needed to keep the foundation brakes in good working order which includes much more frequent adjustment of the brakes now that manual units are fitted and more routine maintenance that has been needed, particularly lubrication and replacement of the "S" camshaft bushes.

Together, these problems resulted in a lack of brake performance from the trailers, which, once presented with the right circumstances, led to the overworking of the trucks foundation brakes, to the point where the drive axle brakes caught fire.

The physical evidence on the three vehicles supports the driver's version of events, being that he experienced a loss of braking effort from the combination once the trucks' brakes began to experience fade due to increasing temperatures.

I am certain that the combination was not roadworthy and that the issues mentioned played a major role in the cause and severity of this accident and that for this reason, the Insurers would be fully justified in repudiating the claim should they wish to do so.

I hope this report has completely covered all aspects of the matter that you require. Should you need anything further, please do not hesitate to contact me.

Kind regards,

A handwritten signature in black ink, appearing to read 'Peter Banbury', with a stylized flourish at the end.

Peter Banbury  
076 012 6162