

Chain of Responsibility Legislation: Tyres are A Critical Link

By Adam Gosling, Principal Consultant, TyreSafe Australia

Chain of Responsibility (CoR) legislation states that all parties in a supply chain—from the consignor to the consignee—must ensure their legal responsibilities have been met.

As such, owners and directors of steel manufacturing, distributing and fabricating companies must keep in mind that their responsibilities extend to every link of their company's supply chain, including all aspects of transportation and logistics. Failure to appreciate all these aspects, and respond accordingly, could result in legal liability including large fines and even prison.

Accreditation systems such as that of the National Heavy Vehicle Regulator (NHVR) and TruckSafe (via the Australian Trucking Association) are available to heavy vehicle transportation businesses. There are also many compliance systems that cover driver accreditation, driver fatigue, journey planning, load restraint, fault registers and maintenance. All these accreditation and compliance systems satisfy many of the CoR requirements.

But what about tyre safety? How is tyre maintenance evidenced for the purposes of CoR legislation?

Inflation and Overload

All vehicles on our roads share a single common factor. Whether they're heavy, light, electric, diesel, or even autonomous, all vehicles on our roads ride on pneumatic tyres—tyres that require ongoing safety checks and regular maintenance.

For instance, a vehicle can be overloaded, while still under mass. In fact, if tyres are not 'correct', an entire vehicle can be deemed unroadworthy.

How is this so?

At its most basic level, a tyre's prime function is to contain air. After all, a flat tyre cannot support a load. Where there is 11R22.5 16 per tyre, at 120psi this tyre in a dual configuration will support 2,725kg, which is 10,900kg for an axle (four tyres). At 100psi, the same tyre supports only 2,470kg, which is a 9,800kg axle load. That's a 10% reduction in load capacity. Similarly, where is 295/80R22.5 per tyre, at 120psi each tyre will support 3,150kg. This drops to 2,770kg at 100psi, representing a 12% reduction in load capacity.



A 295/80R22.5 steer tyre, reduced by 10psi from 120psi to 60psi. When is it flat?

So, if the tyres are not appropriately inflated for the load on the vehicle then the vehicle will be overloaded, even if the vehicle is within the Gross Vehicle Mass (GVM) requirements.

Why Tyre Safety is Critical

Tyres support a vehicle in more ways than just a load carrying capacity. Traction, steering and braking efforts are all applied via the tyres. If a tyre is underinflated, the tyre will not perform as intended. So then, the question becomes, will the vehicle perform as intended?

When CoR legislation and responsibilities are considered, most often it is only the personnel involved in the supply chain who are subject to review. But, let's apply CoR thinking to the vehicle itself for a minute. The steering wheel is connected to the steering shaft and steering box, which is connected to the linkages that rotate the wheels around the axles axis. The wheels have tyres. The engine produces power that is transferred through the clutch into the transmission that increases the torque applied which is then transmitted to the differentials and axles to drive the wheels. The wheels have tyres fitted to them. The trailer axles wheel end is fitted with brakes, which are applied by the driver as required, the brake shoes or pads engage with the drum or disc and convert the kinetic energy into heat energy reducing the speed of the wheel. The wheel is fitted with a tyre. The tyre connects the brake to the pavement.

Clearly, tyres are absolutely critical to overall vehicle safety. Anti-lock Braking Systems (ABS), Electronic Stability Control (ESC), and all sorts of other electronic devices and systems depend upon the tyres to transfer forces without diminishment.

Stopping to consider how tyre maintenance plays a critical role in vehicle performance should ring alarm bells for most companies. There is little—if any—evidence that tyres are being maintained beyond a cursory glance during periodic servicing.

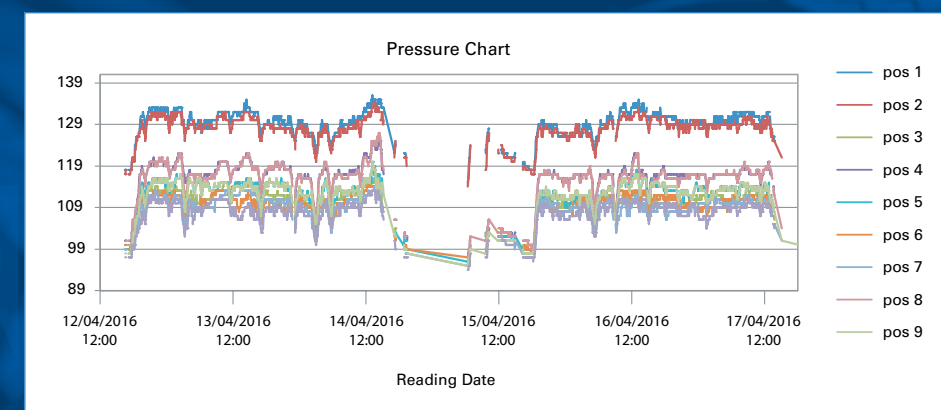
A tyre is like a consignee; it is the last point of contact. It has the responsibility to transfer the steering, drive and braking forces from the vehicle to the pavement. It is ultimately responsible for vehicle performance.

The Performance-Based Standards (PBS) scheme (issued by the NHVR) states, "All the forces needed to both support and guide a vehicle ultimately arise in the area of contact between the tyre and the roadway. These forces are generated at the road surface in response to the deformation of the tyre structure."

Tyres provide not only safety but contribute substantially to economics. Tyres are one of the largest operating expenses for a heavy vehicle. They are one of the most uncontrollable expenses as well. If a tyre fails catastrophically then the damage can be considerable, from broken guards and lights, and lost time awaiting a tyre service, right through to the total loss of the vehicle and even fatalities. Consider a truck driver's worst nightmare: a steer tyre failing whilst travelling at highway speed.

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Tyre pressures every 10 minutes during a Perth to Melbourne return trip.



Benefits of Tyre Maintenance

The upside of maintaining tyres is manifold. Not only do the tyres themselves last longer, but so too do the wheel ends and bearings, the transmission and driveline. In addition, fuel burn is reduced by a couple of percentage points at least. Even driver fatigue is reduced.

Consider a tandem drive, in which all eight tyres drive. If the tyres all have different pressures (which is a very common occurrence), then they will all be driving at a different rate. Imagine this tandem drive set-up wearing a running shoe, teamed with a work boot, a golf shoe, a football boot, a slipper, a high heel and a dress shoes. All these different shoes cannot possibly work at the same rate.

If a vehicle's tyres fail to work as a team, then the driver must constantly redirect the vehicle as each tyre imparts its own effort in driving forward or around a corner. After hours of constantly providing subtle inputs to the steering, a driver will inevitably be tired, and perhaps even fatigued before their driving hours are complete.

How to Maintain Vehicle Tyres

Many people believe that having their tyres set during a vehicle service is adequate. The problem is that this fails to take into account what have the tyres experienced since. Even if the tyres were all set to the same cold pressure before the vehicle departed, once in operation, the tyres will not be at the same working pressures. Inside tyres are deprived of the cooling that outside tyres experience. Steer tyres experience higher loads on downhill sections and at higher speeds, while drive tyres experience more load on uphill sections. Inside tyres experience the waste heat from the engine and exhaust emission systems. High horsepower trucks are even more problematic. If long range fuel tanks are added, and the ventilation is reduced to zero, the tyres continue working but become hotter, increasing in pressure and size, which results in the outside of the tyres scuffing every revolution.

There are weigh-in motion devices on trucks, engine control modules that regulate the amount of power a driver can apply, GPS and speed tracking devices, and even cameras to monitor if a driver has tired, droopy eyes. After all, would you ask a driver to stop his truck, open the engine cover, remove the radiator cap and dip a thermometer into the coolant to check the engine temperature? The driver would break into laughter. The problem is that many people and organisations still use a manual process to monitor their tyres—putting a manual gauge onto a tyre is akin to the engine temperature monitoring process outlined above, which was last used in the 1930s.

Maintaining tyres in real time should be a no-brainer. Just as modern trucks have electronic gauges to monitor engine and transmission pressures and temperatures alerting to out of specification levels, trucks and trailers can be fitted with real-time tyre pressure monitors that can read without leaving the drivers' seat. These systems can even be connected to data loggers or telematics to provide historical evidence and data that can drive real, positive economic outcomes.

For instance, BPW Axles reports that a 5psi difference between a pair of dual tyres equates to a 10% reduction in bearing life, and a 10psi difference equates to a 20% reduction. Transfer this wear back up the driveline exacerbating wear along the way until the engine is working harder, wearing parts out, and burning more fuel—the potential for economic improvements is clear.

Oil to an engine, blood to a human, air to a tyre. Without enough, the engine, human and tyre simply won't function.

Just as a fatigue log book can evidence a driver's work, an ECU can be downloaded to reveal the speed and driver attributes so too tyres can be monitored and evidenced. The CoR does not stop with humans, it extends all the way throughout a vehicle, from its engine right through to its tyres.



Catastrophic steer tyre failure.

As an owner or director of a company, the ultimate responsibility rests with you. You must ensure that you understand and know how you evidence your Chain of Responsibility obligations, and how you maintain your tyre safety record to keep your reputation intact. After all, proper tyre safety and maintenance processes will help you maximise your bottom line.

If your tyres aren't turning, they're not earning®. Aim to keep them turning for longer.

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Adam Gosling leads the TyreSafe Australia team (tyresafe.com.au) providing guidance and direction for mining and transport fleets around the globe. TyreSafe Australia team members work with various road safety bodies and alliances throughout Australia including the Road Safety Commission of Western Australia (<https://www.rsc.wa.gov.au/>), Heavy Vehicle Industry Association of Australia (hvia.asn.au) and Road Freight New South Wales (<http://www.roadfreightnsw.com.au/>).