

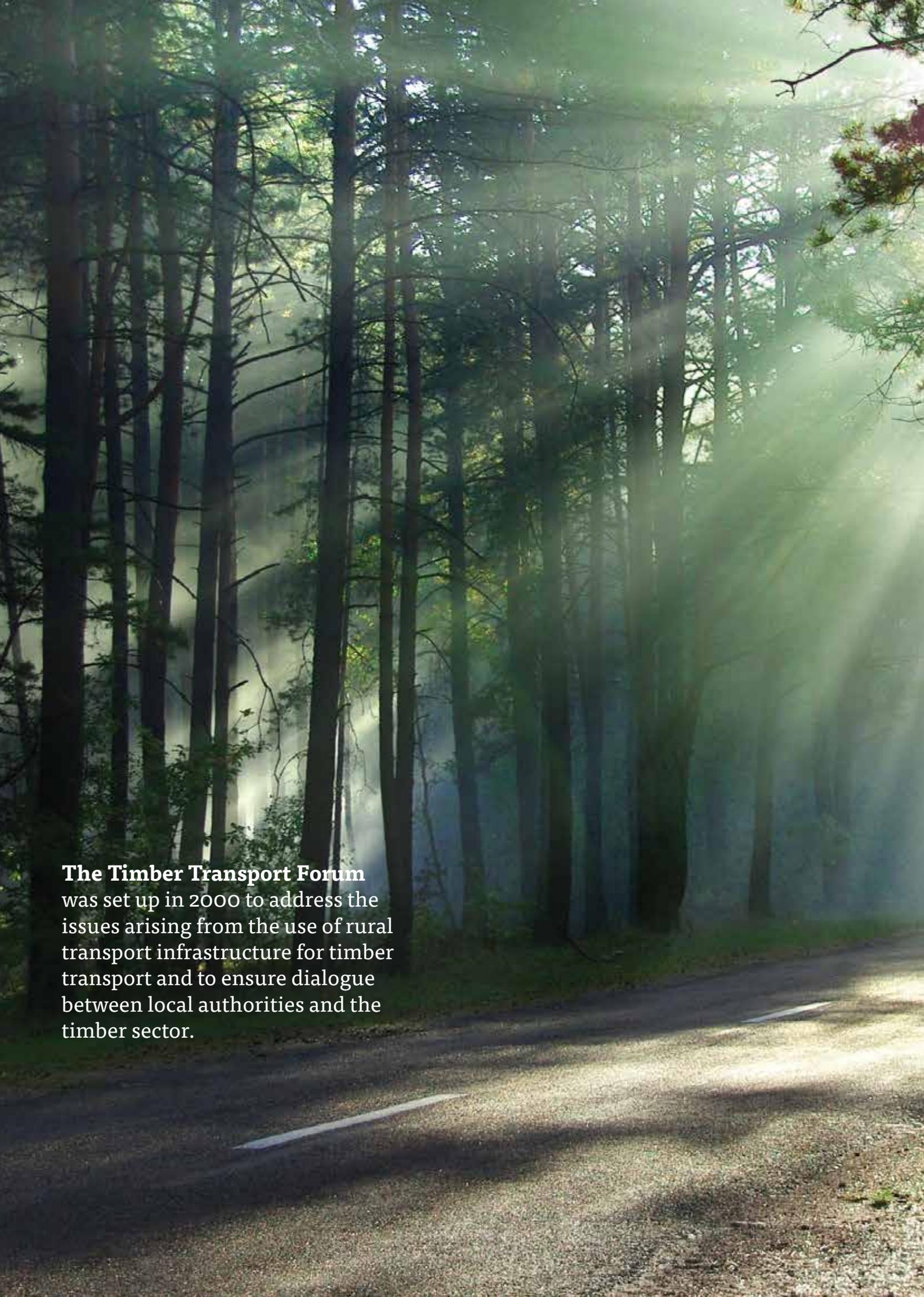
Tread Softly

Lower impact vehicles
for timber haulage



TimberTransportForum

delivering solutions for a growing UK harvest



The Timber Transport Forum was set up in 2000 to address the issues arising from the use of rural transport infrastructure for timber transport and to ensure dialogue between local authorities and the timber sector.



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Timber Haulage

Britain's forests produce 10 million tonnes of softwood logs each year. Most is transported by lorry from the forest to the processors where it is converted into sawn timber, wood panel boards, pulp, paper and biomass fuel.

The network of public and forest roads serving the forests is of variable suitability for heavy haulage. The Timber Transport Forum's Good Practice Guide sets out a partnership approach to minimising the impact of timber haulage on the road network, through road and traffic management.

Timber hauliers have responded with innovative developments in lower impact vehicle technology.

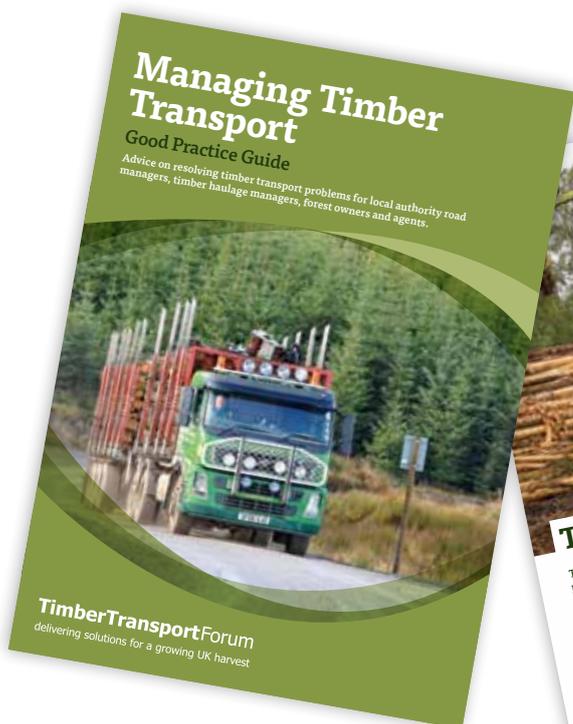
This guide explains the limitations of the forest and public roads and describes the range of haulage vehicles used in timber transport. It focuses on lower impact

technologies that can be incorporated into timber haulage to help reduce road maintenance costs. The aim is to promote understanding and communication of the options available. The information is provided for guidance only, as each haulage operation will have different circumstances and requirements.

The majority of timber haulage can be undertaken with standard haulage vehicles. Lower impact vehicles are significantly more expensive, and will add cost, and reduce returns along the timber supply chain; they should only be considered where they offer clear savings to the transport infrastructure.

Selecting the most appropriate vehicle for a particular haulage operation will require discussion between timber hauliers, those contracting and managing timber haulage operations, and the managers of forest and public roads. Timber transport groups should consider where lower impact vehicles can complement other measures in developing the agreed routes map approach.

Managing Timber Transport Good Practice Guide sets out the Timber Transport Forum's partnership approach to resolving timber transport problems.



Transporting Timber

Timber production is an expanding rural industry that provides jobs, reduces imports and helps to reduce greenhouse gas emissions.

Each year in the UK around 350,000 lorry-loads of sustainably grown logs are transported from our forests for processing in sawmills, pulp and paper mills and in wood energy plants.

While the area of planted forest started to expand in the early 1980s Country it was assumed that the public road network would evolve in line with timber production. However, more logs are still moved by relatively weak minor roads which may not be suitable to large volumes of heavy traffic.

This good practice guide provides an overview of how timber transport can be managed to minimise the impact of timber traffic on the fabric of the roads and on the neighbouring community.



The Economics

Timber production forms a key component of the rural economy and underpins sustainable land management. Our commercially harvested forests deliver a wide range of public benefits including recreational facilities and environmental services.

However, roundwood logs have a relatively low value at the forest gate and transport costs can significantly affect the ability to realise the potential from this sustainable resource. Value is added along the processing chain containing jobs in harvesting, bucking, skidding, processing, distribution, marketing, construction and energy production, and contributing towards the value at every stage.

Many areas of forest planted in the 1970s and 1980s are now becoming ready to harvest so timber production from the forests is increasing substantially. Meanwhile the local authorities responsible for the road network are facing more pressure on their budgets as rising motorist demands for better roads and competing demands for funds to be difficult for councils to prioritise expenditure on minor roads in remote rural areas.

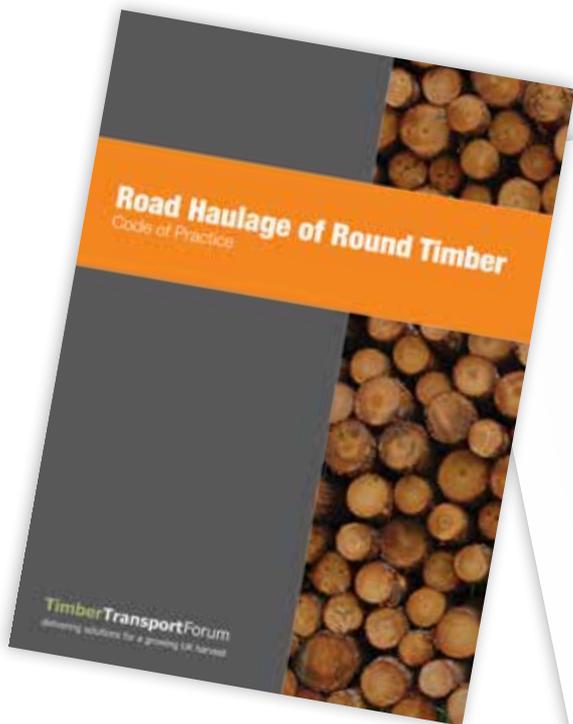
The Timber Transport Forum

The Timber Transport Forum was set up in 2000 to address the issues arising from the use of rural transport infrastructure for timber transport and to ensure dialogue between local authorities and the timber sector.

The Forum has a 'Partnership Charter' and works through a network of Timber Transport Groups made up of forest owners and managers, local authority roads engineers, local councils, timber processors and timber hauliers. The Forum and Groups provide a voluntary framework to manage timber movement on the public roads.



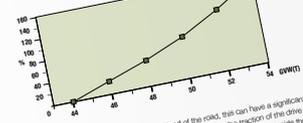
The Road Haulage of Round Timber Code of Practice sets out the legal and technical issues relating to the safe and efficient haulage of logs.



3.2 Overloading (road damage)

Roads are significant financial assets, and damage to them through overloading must be avoided.

The graph below shows the increased damage due to overloading of a 3+3 combination (see Appendix 1) that can legally operate at 44 tonnes GVW.



If the load increases beyond the design load of the road, then can have a significant effect. In particular, the practice of using axles to increase the traction of the drive axles can not only lead to significant overloading of the other axles, perhaps outside the vehicle's design limits, but can also lead to even greater damage to the road than shown above. It is everyone's interest to work together to make sure that there is no need for a driver to even consider using an axle. Tyre pressure control systems fitted to drive axles can help improve traction.

3.3 Roadside facilities

Roadside facilities can help safe extraction, stacking and timber loading, while protecting the road. Facilities could include:

- additional tracks to keep harvesting machines off the road where possible; protecting the road. Facilities could include:
 - ramps to allow safe access to logging sites;
 - stacking or loading places on clear, flat ground;
 - trails parking bays;
 - lay-by bays;
 - all trees and other controls to avoid environmental damage and pollution;
 - adequate turning areas for lorries;
 - a one-way system to minimise reversing (where possible);
 - paving places;
 - parking places for site staff.

Careful consideration of the need for and siting of roadside facilities will help the safe and efficient loading of stacked timber.

3.4 Road defect reporting

Dealing promptly with road defects is important, especially as some holes could be being used much heavier than in the past. It is important to be clear about what constitutes a defect. Unsealed roads are subject to potholing, rutting and corrugations, as well as accumulations of loose material – this is normal. However, as these features worsen they will, at the very least, hinder operations and slow other road users. In these circumstances, agreement will be required on when to intervene.

It is the responsibility of all road users to report defects early – before the defect has become serious enough to make using the road unsafe. If a written record is required, an example form is provided on the inside back cover.

- Everyone involved in a harvesting or haulage operation should be aware of a road defect reporting system, set up as part of the contract. The procedure must make clear:
- where and who to report to;
 - the information required;
 - how repairs are funded;
 - the responsibilities of the landowner, forestry works manager, contractor and sub-contractor.

This does not mean that a road will receive an immediate repair, but it does put into practice a system where the road can be assessed and repairs carried out promptly. In some instances, the landowner may reserve the right to close the road or provide an alternative route.

3.5 Agreed Routes

Local authorities are responsible for providing and maintaining an adequate rural road network. The condition and strength of public roads in rural areas is variable. The forestry industry has issues with various local authorities to agree when public roads to be used for harvesting timber from the forests to the main public roads. The need led to a system of Agreed Routes being set up in many areas. This process allows questions of road and environmental damage, and community and safety issues to be addressed and to enable local authorities to target their resources effectively.

If there is not an Agreed Routes scheme in a particular area, liaison with the local authority and other interested parties to discuss and agree a preferred route for the proposed contract is recommended.

You should make hauliers aware of any Agreed Routes and make sure they use them. Failure to do so could result in further restrictions being imposed by the local authority.



Public Roads

Forests are often accessed by minor rural roads. Many such roads were ‘adopted’ by the local authority and given a tarmac¹ surface after minimal improvement. They have proved adequate for light traffic but with heavy goods vehicles working at maximum load, any road limitations quickly become apparent.

Where a minor road crosses a weaker stretch of soft ground or fill, the road will flex with the weight of the lorry. The road should recover from occasional heavy traffic but repeated loading can damage the surface and the underlying layers. Weak traditional bridges and stone culverts can also suffer.

On single-track roads the lorry may be almost as wide as the carriageway so that the wheels are at the weaker edges of the road. Long trailers can over-run tight

corners causing damage to the road edges and verges and the rear axles in particular may ‘scrub’ the road surface when negotiating tight bends. Passing places are limited and usually too small to allow vehicles to pass without damaging verges and roadside drains. Poor drainage results in a high water table that can further weaken the road structure.

Strengthening and improving public roads is expensive and local authority investment tends to be targeted at higher

volume roads with greater public use. The Timber Transport Forum highlights the need to upgrade the more strategic timber transport roads and carry out minor improvements where appropriate to reduce the impact of timber haulage.

¹ In this report the term tarmac has been used to cover all types of flexibly bound pavements such as tarmacadam, bitumen macadam, asphalt and multiple layers of surface dressing



Forest Roads

Timber lorries regularly pick up logs from within forests, travelling on gravel-surfaced ('unsealed' or 'waterbound') forest roads.

There is a proposed specification² for new forest roads but not all forest roads meet this standard. Some have been upgraded from earlier tracks using local materials and their strength may be variable. Even when built to specification and regularly maintained, forest roads can be steep, rough, narrow, pot-holed and rutted, and traction can be limited in wet weather. Forest roads are particularly fragile after periods of frost and will usually be closed to lorry traffic until they thaw out and settle.

In some parts of Scotland and Wales, in-forest haul roads are being built to bypass fragile public roads. These can be up to several kilometres in length.

Forest roads take their toll on road-going vehicles with greater torsion on the chassis and more vibration. Fuel consumption is substantially higher than on tarmac surfaces and tyre punctures and damage to the suspension are more frequent.

Where there are large volumes of timber to move, over a long period of time, it makes sense to invest in a strong forest road network suited to all road vehicles. Even then, the local topography and the road building materials available may limit what can be achieved at reasonable cost.

² The design and use of the structural pavement of unsealed roads , Timber Transport Forum

Timber Haulage Vehicles

Timber hauliers are expanding the range of vehicles in their fleets to enable efficient haulage from the full range of forest sites, including those served by weak roads and longer stretches of forest road.

Typical Configurations



Flatbed artic

The standard UK heavy goods vehicle is the 44 tonne articulated lorry made up of a three axle tractor unit and a three axle semi-trailer. Fitted with a flat-bed and removable bolsters, this can carry a range of loads as well as roundwood logs. The required six axles normally comprise a steering axle, a single drive axle (fitted with twin wheels), and a non-drive axle on the tractor. The non-drive axle may be a 'mid' axle located ahead of the drive wheels or a 'tag' axle behind. In both cases the non drive axle is normally fitted with single or super single tyres, and it can be raised when the vehicle is travelling empty. Flatbeds used regularly for roundwood often opt for a tag axle which makes the lorry more manoeuvrable. The three trailer axles are normally fitted with super single wheels. Often one of the trailer axles can be lifted when the vehicle is traveling empty to save on fuel and tyre wear.



Advantages:

These trucks are mass produced and readily traded. They are stable (having wide axles and a wide chassis), fuel efficient and lightweight, carrying a payload of around 28 tonnes. With a flatbed trailer they can be used flexibly, delivering logs to a mill and leaving with packs of sawn timber or other goods. Removable bolsters can be stowed away when not needed for timber. Loaded or unloaded trailers can be relatively quickly disconnected or swapped.



Disadvantages:

They have limited off-road capability and need to be loaded and unloaded by a separate machine or a lorry fitted with a crane. The single wheels concentrate the weight of the loaded trailer on a small tyre footprint at the edge of narrow roads.



Dedicated timber artic

A more specialised 'timber' version of the articulated lorry may opt for two drive axles on the truck (all drive axles on 44 t lorries have to be fitted with twin wheels) or, one twin-wheeled drive axle and a single 'tag' axle behind it. Drive wheel tyres will have a more aggressive tread pattern than is normal on general haulage vehicles to improve traction off-tarmac. The tag axle and rear trailer axle can be lifted when running empty, which increases low speed manoeuvrability and reduces fuel consumption and tyre wear. Super single wheels on the trailer axles help to keep the weight down to maximise payload.

The skeletal trailer may be built with a stronger chassis to cope with forest roads and to allow fitting and use of an on-board crane. Easily adjustable sliding aluminium bolsters allow logs of different sizes to be carried.



Advantages:

Timber artics are designed to haul logs from within the forest to the mill. When fitted with a crane they can combine self-loading capacity with a payload of 24-26 tonnes. Specialised lightweight skeletal trailers without cranes can carry a payload of up to 29 tonnes.



Disadvantages:

The strengthened chassis, crane and sliding log bolsters make this vehicle timber specific and more expensive. A second drive axle will add 500kg to the fixed weight and the crane another 2-3 tonnes, reducing the payload accordingly. The semi-trailer (articulated) configuration results in a long trailer length which can cut tight corners, damaging road edges and verges. The super single trailer wheels concentrate the weight of the vehicle on the weaker edges of single track roads and can contribute to rutting of forest roads.



Timber wagon and drag

The lorry and drawbar trailer combination, or 'wagon and drag', tends to be used for shorter hauls which combine significant in-forest haulage and shorter distances on the public road. They achieve the 44 tonne limit through a three axle rigid 26 tonne lorry (usually with two drive axles and a skeletal body) and a three axle drawbar log trailer. This configuration has a longer overall length than an artic but is more manoeuvrable and tends to have a narrower 'swept path' on twisting roads, with the trailer wheels closely following the wheel path of the truck. The front or rear trailer axle can often be lifted when running empty. The configuration also works well on undulating forest roads. A crane can be mounted at the front or rear of the lorry load-space.



Advantages:

The wagon and drag configuration provides more load space which is useful when hauling longer sawlogs. It is more precisely manoeuvrable at low speeds and the lorry can be used without the trailer if necessary.



Disadvantages:

This configuration is more expensive than an articulated lorry and, being heavier, has a slightly lower payload of less than 25 tonnes. The fuel consumption of wagon and drags tends to be greater than for artic as they are less streamlined and have double drive axles. The lorry also tends to be geared at a lower ratio suited to local roads. Drivers familiar with articulated lorries may take some time getting used to the wagon and drag configuration and will need a trailer entitlement on their license.



Specialised low ground pressure configurations

A small number of specialised vehicles have been developed for longer distance haulage on weak in-forest roads. Wagon and drags can be scaled up to a four (or five) axle rigid lorry with various trailer configurations, carrying payloads of up to 50 tonnes on forest roads. More complex trailers have offset alternate axles that follow different wheel paths, spreading the load and minimising rutting.

Large in-forest loads can also be transported using wide-wheeled agricultural tractors and multi-wheel, multi-axle trailers. Multi-wheeled axles work better on roads with a flatter profile and crossfall, rather than those with a conventional camber.

Specialised vehicles are expensive to build. Normally these in-forest vehicles will transfer the logs to public road-going

vehicles for onward haulage. This double handling will require a secondary stacking area. Occasionally local authorities have allowed such vehicles to use short stretches of the public highway.



Lower Impact Technologies

Public road-going timber lorries are being developed to incorporate additional wheels, wider tyres and tyre pressure control systems to help reduce damage to weak roads.

Wheels and tyres

Heavy goods vehicles and trailers traditionally had to be fitted with twin wheels on the drive and trailer axles to take the weight of the load. However, as tyre technology developed, the use of single wheels became the industry standard on non-drive axles (twin wheels are still required on drive axles). The tyre manufacturer Goodyear coined the trade name 'super single' to describe their single wide-based tyre, designed to replace twin wheels, and the term became widely used. Super singles are cheaper and lighter than twin wheels and create less drag and scrub on the road surface when cornering, improving fuel-efficiency and reducing tyre wear. Super single wheels also allow for a wider axle and trailer chassis which increases trailer stability and reduces roll on rough roads, especially when combined with modern air suspension systems. Stability is particularly important on timber lorries as they usually carry a full load with a relatively high centre of gravity.

The significant downside of super singles is that they run at a relatively high tyre pressure and concentrate the weight of the loaded trailer on a smaller footprint, increasing the pressure on the road. Typically a 385 super single tyre has a tread width of 290mm rather than 448mm (two times 224mm) of a twin 275 wheel assemblage.

Recently, various manufacturers have started producing much wider single tyres for trailer axles. These typically have a tread width of 410mm and are commonly referred to as 'maxi' tyres, derived from a Michelin tyre trade name. While not having the effective width of a twin wheel, the maxi tyres are still a significant improvement on super singles, increasing the rubber on the road. Because maxi tyres can also accommodate wide axles and air suspension systems, they minimise roll, producing a more stable trailer.

The wheels in a twin assembly usually run at a softer tyre pressure than is



recommended for super single and maxi tyres, helping to reduce the impact on fragile roads. Tyres used on forest roads can be damaged and unusable before they wear out their tread and an individual tyre on a twin wheel is cheaper to replace than a maxi tyre.



Tyre Pressure Control Systems

Tyre pressure control systems³ (also known as Central Tyre Inflation (CTI) systems) provide an additional way of helping to spread the load. They were originally developed to help military vehicles move over soft ground but are now being used in a variety of heavy haulage operations. A system of air tanks, valves and hoses link the vehicle's air compressor to the tyres. The tyres can be partially deflated and inflated again while the vehicle is in motion, using a console in the cab.



Higher Pressure



Lower Pressure

Tyre pressure control offers a number of benefits. Reducing the pressure in a radial tyre lengthens the footprint of the tyre on the road. On rough road surfaces this helps to improve traction and driver comfort and can reduce tyre wear and damage if used properly. Increasing the area of tread in contact with the road spreads the load, helping to reduce primary rutting on forest roads and fatigue of thin tarmac pavements.

Tyre pressure control systems are now being fitted to some bespoke timber lorries in Britain allowing the driver to optimise the tyre pressure to suit the load and the road conditions. Typically the pressure will be lowered when the vehicle is running empty and further reduced when running on fragile or forest roads. Once the vehicle is loaded the tyre pressure is partially increased and only returned to full pressure when the loaded vehicle reaches the main road.

³ Tyre pressure control systems should not be confused with tyre monitoring systems which simply provide an indication of tyre pressure but cannot adjust the pressure, or tyre pressure maintenance systems which will monitor and inflate tyre pressures, if low, but cannot deflate the tyre.

The actual tyre pressure settings that can be used on different types of roads should be agreed between the tyre pressure control system provider and the tyre manufacturers, taking account of the lorry configuration, load and speed. These can then be pre-set for easy selection on the driver's console. A typical pressure matrix is shown in the table below. Safety overrides will automatically inflate the tyres should the lorry speed increase above the limit for a selected pressure.

Tyre pressure control systems can be fitted to any or all axles of the truck and trailer. Equipping only the drive axles will improve traction but will do little to reduce road impact if the trailer wheels remain at high pressure. Some hauliers have found that one drive axle fitted with a tyre pressure control system improves traction on forest roads, such that the second drive axle can be replaced with a non-driven, liftable tag axle.

The tag axle tends to be linked to the pressure control valve for the drive axle and may limit the extent to which the pressure can be lowered. Fitting a wider super single to the tag axle, (rather than a standard single) would allow for lower pressure settings for both the tag and drive axles.

Tyre pressure control systems fitted to twin wheels will balance the pressure in the tyres,



helping the wheels to sit more evenly on cambered roads, reducing damage to the road and uneven tyre wear.

On some twin assemblages, the space between the tyres may need to be adjusted to prevent the tyres 'kissing' at lower pressures.

It has not become common practice in Britain to equip the steering axle with tyre pressure control, although this is done elsewhere. It is the most expensive

axle to equip. The limited experience so far suggests that it does make a difference both to the road impact of the lorry and particularly to driver comfort – substantially reducing vibration. A partial alternative is to fit slightly wider than standard tyres to the front wheels. These are typically rated for heavier loads and can therefore be run at slightly lower pressures.

Typical Tyre Pressure Matrix

Setting	Description	Steer psi	Drive/tag psi	Trailer psi	Max mph *	Max time
1	Public road empty	130	60	50	None	No limit
2	Forest road empty	130	60	50	50	No limit
3	Forest road loaded	130	65	80	20	No limit
4	Fragile public road loaded	130	75	85	30	No limit
5	Local public road loaded	130	80	110	50	No limit
6	Trunk road loaded	130	85	130	None	No limit
7	Emergency traction	130	35	60	5	5 mins

1. This table provides a typical pressure matrix for a timber artic with, in this case, a single (twin-wheeled) drive axle and tag axle on the tractor, and with maxi tyres on the tri-axle trailer. This is an example only; actual pressures for any configuration must be agreed between the provider of the tyre pressure control system and the tyre manufacturer.

2. * Max mph refers to the maximum speed for the tyre at that pressure; **the speed limit for the road may well be much lower.**



Public Road Impact

In 2001 as super singles became widely adopted, a large-scale EU study⁴ was undertaken to look at the relationship between tyre contact area and the potential for damage. This identified the following main mechanisms for damage to flexibly paved public roads:

- Fatigue, where the road pavement fails as a result of cracking induced by multiple repeat loads.
- Primary rutting, caused by permanent compression of the bituminous layers.
- Secondary rutting, where the failure is largely caused by compression of the granular material or subgrade beneath the bound surface layers.

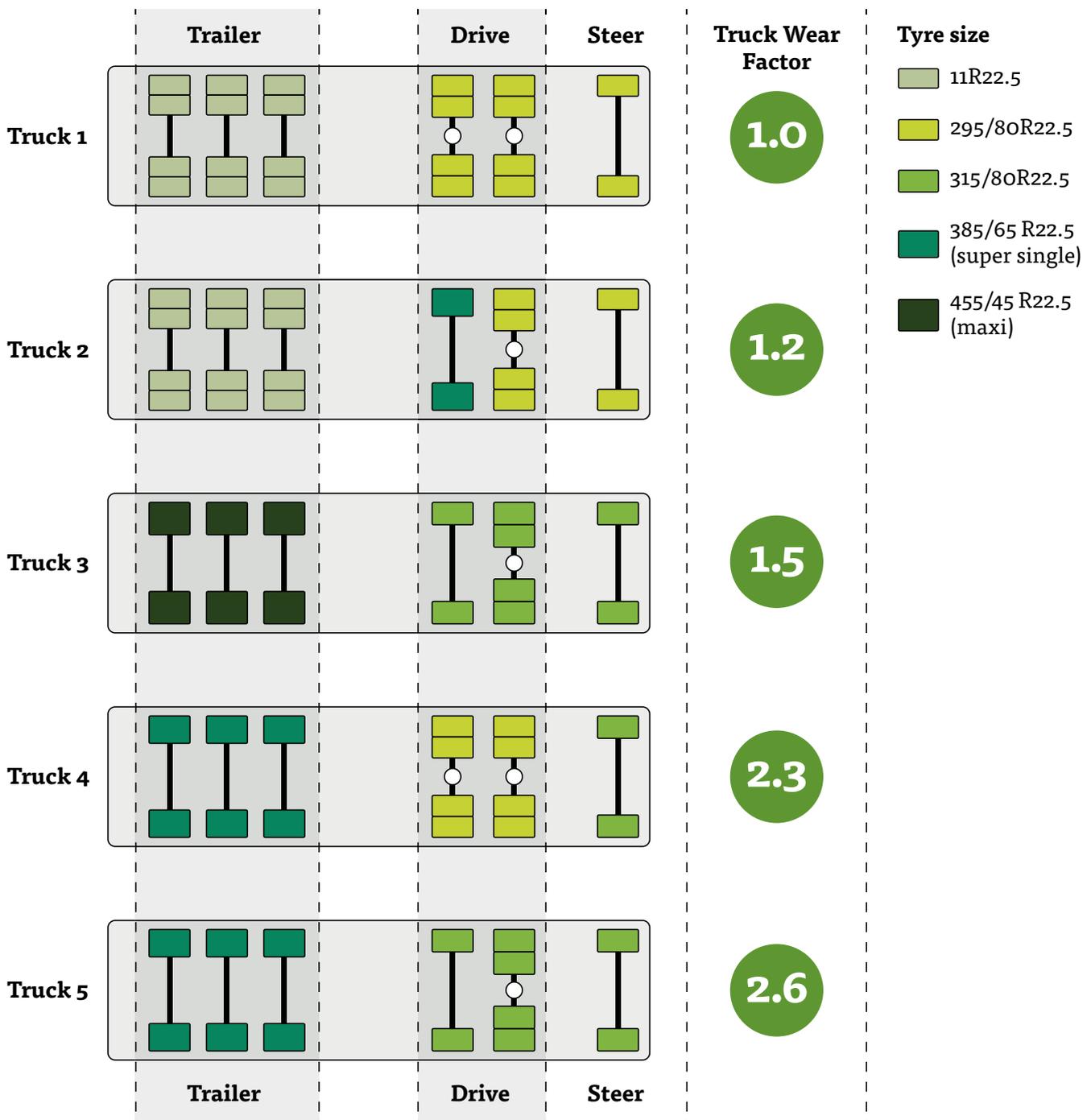
Many of the minor public roads serving forests have extremely thin bound pavements of 100mm or less. With such thin pavements, fatigue cracking and secondary rutting are the main modes of failure.

The impact of loads on roads has traditionally been calculated using the Fourth Power Law where doubling the load on an axle does not just double the damage, it increases it by a factor of 2⁴ (or 16 times). This is particularly valid for weaker minor roads.

The EU study incorporated and refined this law and calculated a 'tyre configuration factor' based on the tread width and the load. For fatigue and secondary rutting, the 'effective tread width' of twin wheels includes the 100mm gap between the wheels. The EU study took account of real world conditions caused by inflation pressure differences, axle bending and dynamic behaviour to calculate an 'axle wear factor'.

A Technical Report commissioned by the Highland Timber Transport Group⁵ has used this methodology to compare the overall impact of some of the lorry configurations used in timber haulage, by combining different axle and wheel assemblages to calculate a 'truck wear factor'.

The table below shows the 'truck wear factor' for a range of axle and wheel configurations. These are examples of typical arrangements but several other configurations are possible. The table suggests that Truck 5, (a fully loaded general haulage vehicle fitted with a single drive axle and tag axle and with super singles on the trailer) is likely to have more than two and a half times the impact of Truck 1 which is fitted with twin wheels all round. Replacing the second drive axle with a tag axle in Truck 2 reduces the amount of rubber on the road and increases the impact slightly. Truck 3 has replaced the twin wheels on the trailer with maxi tyres. Choosing the vehicle for a particular site should take account of other factors. The matrix on p.19 suggests where different vehicle configurations may be most appropriate.



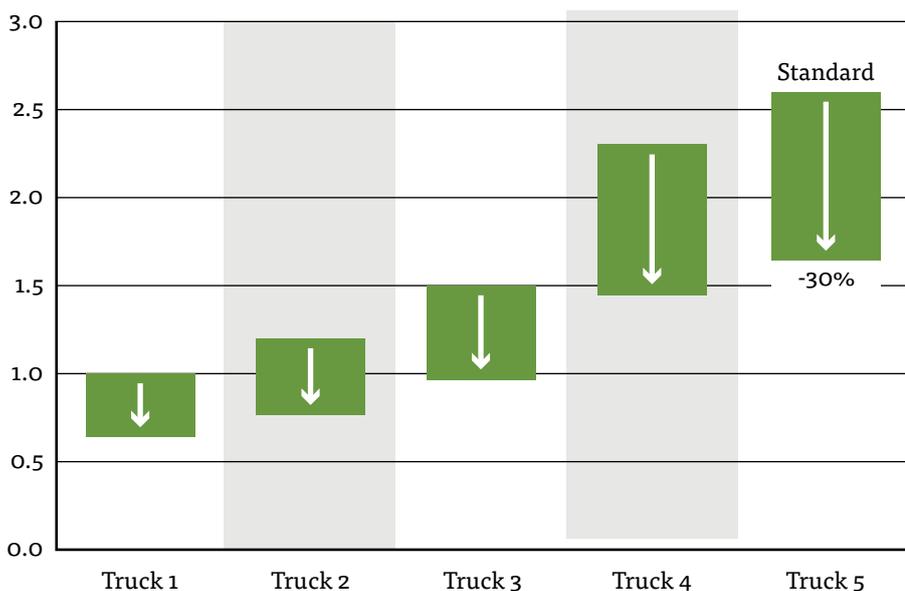


Reduce The Pressure

The 2001 EU study presented research showing that lowering tyre pressure could further reduce the impact on tarmac roads, particularly on secondary rutting which damages the subgrade layers. The Highland Timber Transport Group Technical Report drew on this to show how altering tyre pressure would influence the Truck Wear Factor for the vehicles described earlier.

Truck Wear Factor:

Impact on secondary rutting of reducing tyre pressure by 30%.



The graph suggests that tyre pressure control systems can reduce the impact of lorries fitted with super singles (Trucks 4 and 5) but, even then, they do not better the reduced impact of the lorries fitted with twin tyres (Trucks 1 & 2) or maxi tyres (Truck 3) when the latter are at standard pressures.

Reduction in TWF with pressure



Forest Road Impact

Wheel configuration and tyre pressure also have a bearing on the impact of lorries on unsealed or 'waterbound' forest roads. Spreading the load across a wider area using twin or maxi tyres and reducing tyre pressure will help reduce both primary rutting and compression of the sub-layer.

The construction principles and use of forest roads is described in more detail in an Annex to the Timber Transport Toolkit⁶. The stone used to construct forest roads should be 'well-graded', an interlocking mix of different sizes, with a finer size range in the surface layers. The material is at its strongest at about 15% moisture content when water fills some of the pore space between the particles leaving room for some air.

Lorry wheels compress the material squeezing out the air. After a period of time the material bounces back, decompressing and refilling the air space. If the road is too wet, or if there is insufficient time for the road to recover, the water itself comes under pressure and the material becomes more fluid.

As the wheels pass, the material squeezes out to the side of the tyre leading to primary rutting of the surface. Forest roads require regular re-grading to remove the ruts and reshape the road profile, followed by rolling to pack down and smooth the surface. Where ruts persist they prevent water draining from the road surface, further increasing the moisture in the road. If haulage continues on unmaintained roads, traction can be compromised, tyres spin, the surface layers lose integrity and the road can quickly degrade.

When driving empty trailers, lifting unnecessary axles and lowering the tyre pressure on remaining axles can help maintain the road surface. The flexibility and longer footprint created by reduced

tyre pressures helps negotiate loose, stony surfaces with less damage to tyres, less ravelling of the surface material and reduced washboarding, (where regular close-spaced ripples develop in the road). If stones are dislodged from the road surface, water will collect in the pockets, starting the process of potholing and weakening the road.

⁶ The design and use of the structural pavement of unsealed roads, Timber Transport Forum



Efficient, cost-effective timber haulage

It is in everyone's interest to keep costs to a minimum.

Timber lorries are expensive. A full-spec road-going timber lorry with on-board crane, motorised adjustable lightweight bolsters, twin/maxi wheels and tyre pressure control will cost at least 50% more than a general haulage lorry.

Hauliers gain cost efficiencies and reduce environmental impacts by minimising unloaded lorry miles. The fewer restrictions placed on the type of lorry hauliers can use, the more flexibly and efficiently they can manage their fleet.

Lower ground pressure technologies should only be specified where they have the potential to significantly reduce road maintenance costs.

Timber Transport Groups in Scotland, north England and parts of Wales have identified fragile public roads where lower impact

vehicles would be appropriate for timber haulage, and experience is growing of the contribution lower impact haulage can make. Similarly the forest road network on the public forest estate in Scotland is being categorised to better identify where lower impact vehicles may be required.

Forest road managers need to weigh up the costs and benefits of strengthening forest roads against the additional costs of contracting lower impact haulage or more specialised low ground pressure vehicles.

In some cases lower impact vehicles can make the difference between problem free haulage and a costly damaged road. The following table provides an indication of where lower impact vehicles may be appropriate.

Selecting appropriate vehicles

This table is not intended to be prescriptive. It should be used as an aid to developing agreement between those contracting haulage and the local road managers. Discussions will also need to take account of the availability of lower impact vehicles, market conditions, the volume of timber being hauled and the condition of the existing road.

Road Type	Road Strength		
	Weak	Medium	Strong
Forest Roads	Wagon and drag or artic with: <ul style="list-style-type: none"> Wider single on steer axle Double drive axles with TPC Twin wheels/maxis with TPC on trailer 	Artic with: <ul style="list-style-type: none"> Single drive axle and tag with TPC Maxis with TPC on trailer 	Artic with: <ul style="list-style-type: none"> Single drive axle and tag Super singles on trailer
Standard 2 lane public road (5.5m or more)	Wagon and drag or artic with: <ul style="list-style-type: none"> Double drive axles with TPC Twin wheels/maxis with TPC on trailer 	Artic with: <ul style="list-style-type: none"> Single drive axle and tag with TPC Super singles with TPC on trailer 	Artic with: <ul style="list-style-type: none"> Single drive axle and tag Super singles on trailer
Standard 3.3m single track/narrow two lane public road	Wagon and drag or artic with: <ul style="list-style-type: none"> Double drive axles with TPC Twin wheels/maxis with TPC on trailer 	Wagon and drag with: <ul style="list-style-type: none"> Maxis on trailer or Artic with: <ul style="list-style-type: none"> Single drive axle and tag with TPC Maxis with TPC on trailer 	Artic with: <ul style="list-style-type: none"> Single drive axle and tag Super singles on trailer
Narrow single track public road (<3.3m)	Wagon and drag with: <ul style="list-style-type: none"> Double drive axles with TPC Twin wheels with TPC on trailer 	Wagon and drag with: <ul style="list-style-type: none"> Maxis with TPC on trailer 	Wagon and drag

Notes:

1. TPC = Tyre Pressure Control. Where a trailer has TPC it is assumed the axles on the tractor unit (drive and tag axles), will be fitted with TPC.
2. Where artic units are specified above, they can always be replaced by an equivalent wagon and drag.
3. Super single tyres can be replaced by maxi tyres on the trailer, and either can be replaced by twin wheels.



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Delivering lower impact haulage

Where it is considered appropriate to specify a lower impact vehicle for timber haulage, other complementary measures such as road, traffic, driver and vehicle management may also be necessary to ensure cost savings are achieved.

The overall approach should be developed through early discussion between hauliers, harvesting managers, timber buyers, forest owners and road managers. Where the strength of roads is uncertain or untested, a learning approach is appropriate, recording lorry traffic, monitoring road condition, keeping track of maintenance costs and adjusting the haulage and road management regimes as required.

Look after the roads

- Ensure that drains are maintained and roadside vegetation cut back
- Consider minor improvements such as widening corners and passing places, and strengthening weaker sections of the road
- Identify and highlight hazards or sensitive sections of road
- Prevent access by heavy traffic in severe weather conditions (flood, thaw).
- Inspect and document road condition periodically and record maintenance costs
- Monitor lorry traffic on the road
- Report any road defects to the local Roads Department

Control the traffic

- In haulage contracts, include adherence to agreed routes, and any road and traffic management plans
- Restrict use of roads to vehicles that meet the agreed specification for that road
- Set and enforce appropriate speed limits
- Discourage convoying and agree a minimum lorry return period to allow fragile roads to recover
- On longer and more fragile in-forest hauls, consider using a single driver and low impact vehicle to make regular journeys back and forth along the road, delivering to a transfer point for road-going vehicles.

Engage with the drivers

- Assign experienced, skilled and reliable drivers
- Make drivers aware of the road and traffic management regimes that have been agreed.
- Encourage regular drivers to monitor changes in road condition and report problems before they worsen

Drive with skill and care

- Understand and use the low impact features of the vehicle
- Drive carefully and at appropriate speeds and tyre pressure settings to ensure the road gets the benefit of the technology.
- On forest roads, use the full, safe width of the road, varying the tracked path where possible.

Avoid convoys

Minor public roads and weaker forest roads will flex under the weight of a lorry. Much of the stress created by the load is temporary and the road will recover after a period, leaving little or no permanent strain in the surface layer or subgrades. Ideally lorry traffic on weaker roads should be well-spaced throughout the day. Convoys of timber vehicles should be avoided on all roads.



This is a Road Friendly Vehicle with TYRE PRESSURE CONTROL

DENNISON

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Demonstrating lower impact haulage

Where haulage contracts specify a particular vehicle configuration, the use of tyre pressure control systems or other vehicle management prescriptions, then it is the responsibility of those contracting the haulage to make sure these conditions are being followed. Hauliers should expect to provide records that demonstrate adherence to these conditions.

Where tyre pressure control is specified, the haulier should provide a pressure matrix showing the tyre pressure settings to be used on the relevant categories of road. The particular settings should reflect road conditions and be within the pressure and speed limits agreed between the provider of the tyre pressure control system and the tyre manufacturer, for that particular lorry configuration.

Vehicle telematics systems can share and record detailed live information on an individual lorry's movements such as the route being taken, the driver's hours, the payload, the vehicle speed and even brake use and gear changes. Telematics systems are important aids to managing a timber fleet effectively and are to be favoured where there are particular route constraints or community concerns to be addressed. Some tyre pressure control systems can be integrated into a vehicle's telematics to record use of tyre pressure control along any particular route.

Demonstrating effective traffic management may be more complicated where more than one harvesting operation is taking place on a particular road. Usually communication between all the parties involved can address this. Where appropriate, roadside cameras can be used to record traffic, and in some areas a formal permit system may be agreed with the local authority to simplify local monitoring of agreed protocols.

In-cab cameras are now widely available and these can help to record other traffic using the road and road conditions.

Road managers should use established survey techniques for formal monitoring of road condition.

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