Conveying Goods/Freight on your Layout.

by Arthur Hayes

As we look and observe our local railways we will find they carry various types of goods and freight to various destinations. Adding loads to your wagon fleet gives your railway a reason to operate, realism and added interest. Plus, this will add your own personal stamp to your rollingstock and will provide plenty of discussion with your mates. Loads can also be used to add or hide weight to your wagons. Sometimes strength is needed or a means is required to keep a wagon straight, this added reinforcing can be hidden by a load.

Loads conveyed by rail changed over time. If modelling a set era or period you may need to research that era. Books, DVD's and the internet are all good places to research, even the ones you viewed several times before will be review with a new focus. When modelling a selected location you may find a set paten in the loads coming and going. I look back to Rocklea in the 80's, set customers sent and received goods, some came every few days, others one or twice a month. A few years later the location was being used by a Freight Forwarder changing the ball game. Much the same for private siding, loads changed subject to contracts. If operating a card system, loads add realism to the process.

First, let's look at what the go is on with the prototype. We need to look at a number of areas, these include the Network, Safety Management System (SMS), selecting the correct wagon, process to getting the wagons on site, train marshalling requirements and securing methods.

- **Network.** Structures (Building, Bridges, and Tunnels etc.) and adjacent tracks on the network will dictate clearances for that track section. This will vary from one section to the next, newer track section will have greater clearance than older branch lines. A few years back, bridge structures were altered and tunnel floors were lowered to improve clearances and to allow higher loads (Containers).

- **Safety Management System.** Rail Operators must demonstrate to the Rail Regular that they can operate trains safety. To achieve this, the Rail Operator will have a set of rules known at the Safety Management System covering the requirements of the Network Owner/s. Networks Owners will provide loading gauges for their track section. Today there is generally two loading gauges, one for fixed loads (containers on fixed securing points) and a second for loose loads secured to wagons or container flat racks.

  Loading gauges for the standard gauge network is available on ARTC website.

Wool in an open Wagon is a loose load.

A truck body on a container is a loose load and is loaded in accordance with the loose or general loading gauge.

Empty flat rack containers stacked in a nest is a loose load.

For fixed loads, ARTC use a loading out line that the same as the loose loading gauge. Various Rail Operators with various wagon types, with different floor heights.

On the over hand, QR container wagon fleet operating on the QR Network all have as similar floor height. Thus, a maximum container height is shown for given track sections. i.e. Acacia Ridge to Cairns, Townsville to Mt Isa section is available for 3.050 m (10 foot) containers. In the early days of containers when various wagons with different floor heights were used, the container height was shown and what wagon it could be conveyed on over a given track section. i.e. Supplement to Working Time Table 1991. Containers 2.65 m high (8 ft 8½ ins) by 2.44 m or 2.5 m wide can only be accept between Helidon and Toowoomba on B, PC, PFC, PFCF, PFCC, PJS, MPJS, PCS and PCSS wagons with side frames removed and with the written approval of the Regional Civil Engineer Toowoomba

Poor loading of goods/freight can cause derailments, damage to structures, other trains and injury to passengers, members of the public and rail workers.

Rail Operators will have manuals to provide guidance to employee on how goods/freight are loaded and secured.

Correct Wagon.

A few years back, consignors with goods/freight contacted their local Station Master. The consignor would provide details of the items to be loaded and destinations. The Station Master knowing the weight/mass, dimensions and destination would allocate a wagon/s after considering the following. Track classification to destination, wagon capacity, wagon dimensions, floor height for high loads, for heavy loads like a bulldozer will the floor hold a consolidated load. Some loads could be outside the dimensions of the loading gauge and require an "Authority to Travel" on Train Notice as "Out of Gauge" load.

Getting that Wagon.

Each day all locations would check each siding and record all wagons and traps on hand. At 8 am a wagon report was sent to the District Officer using the uniform telegraph code. If there is not a suitable wagon on hand, the Station Master would order a wagon from the District Office. The District Officer would locate a suitable wagon and arrange for the wagon to be forwarded via suitable shunts. Generally, empty wagons were returned to major locations to wait there next job.

Loading. Weight Distribution.

- The load and wagon must not excess the axle load for the track over which it will travel.
- The load not to excess the carrying capacity
- Heavier loads to be placed over the bogies
- Where possible, the weight of the load must be evenly distributed along and across the wagon.

Securing:- All loaded must be secured so that it cannot move during travel and arrives safety at its destination.

Before securing the load it must be checked to make sure it is

- Inside the loading gauge
- Fits inside the wagon
- Load is balanced & stable
- Neat & orderly
- Low centre of gravity.

Forces on the Load

During travel the load will have various forces applied.

- Stopping and starting (A train of 40 wagons has about one wagon length in free slack in the coupling/draft gear).
- Run in and out during travel (Up and down hills)
- Shunting
- Track conditions
- Weather conditions (strong winds etc)
- Traveling around curves and turnouts.

Train going forward Load can move

Train braking Load can move

Shunting the load can move up and down the wagon.

Train hits stop blocks Load moves

Rough track Load can move

Train travelling forward into a head wind High load

Fast cornering with wind on the load also applies forces

- **Train Marshalling** Some loads will need special consideration when placed into a train. Movements of special loads which are “Out of Gauge” will have various restrictions, may need to be marshalled behind the hauling locomotive. In some cases where tokens are exchanged between train crew and station staff, wide loads need to back a few wagons from the hauling locomotive. For timetable operators, additional time is allocated at various locations to allow for checking.

  The Dangerous Good Code also places restrictions on how a train should be marshalled. Some loads cannot be marshalled to be next to dangerous goods. Steel pipes/logs are not to be marshalled next to flammable liquids.

Load Restraints Methods:-
A combination of indirect and direct restraints is best to secure a load to a wagon.

Indirect Restraint
Is when freight is prevented from moving by using tie downs over the load and tightening restraints.

Direct Restraint.

Is when freight is prevented from moving by the wagon sides/end, or when the goods is directly secured to the wagon by chains etc? Containers on containers wagons fixed to the wagon by twistlocks/spigots. Some times is best to use a combination of two securing methods.

Direct and Indirect methods used to secure a load

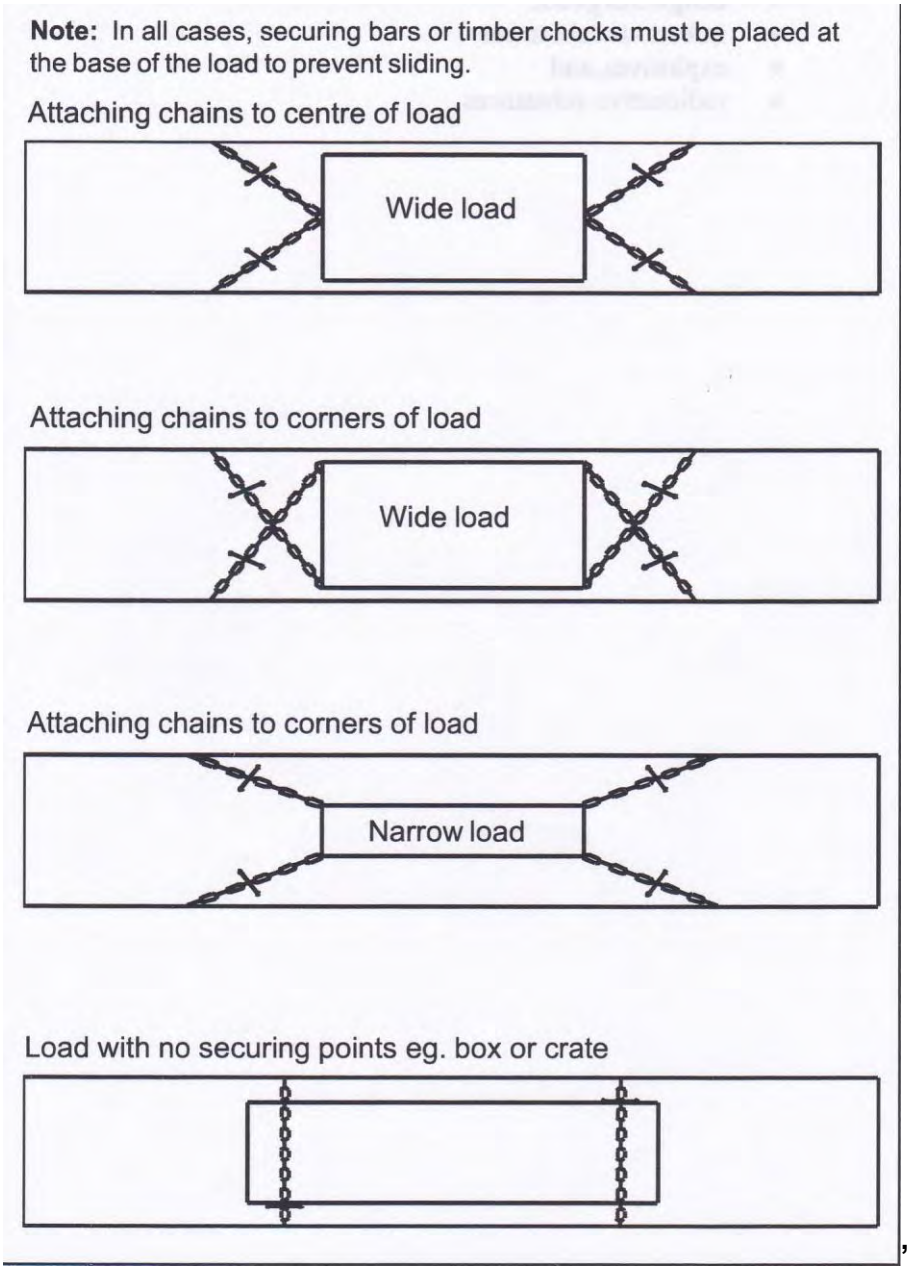
Securing Equipment:-
The same equipment and methods used to secure goods/freight to wagons can also be used to secure goods/freight to flat rack containers.

The following can be used to prevent a load from moving:-

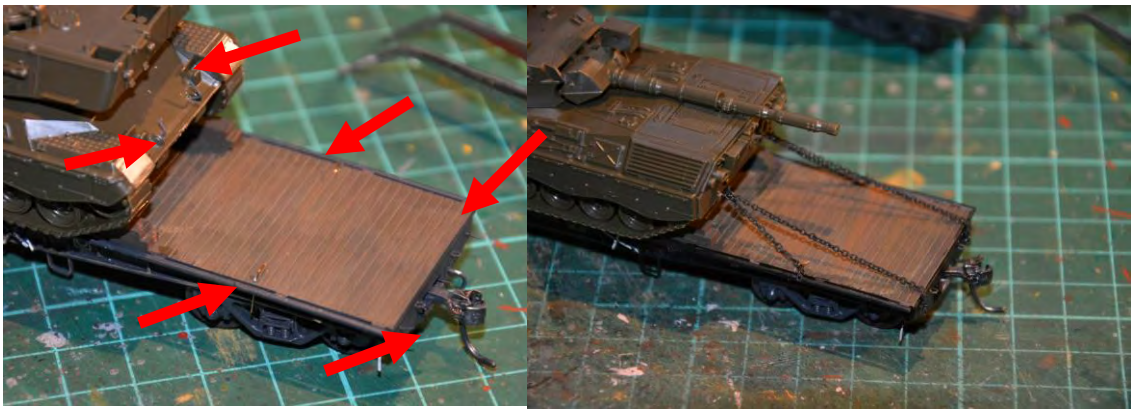
Chains:- Must be angled to prevent movement of the load across or along the wagon. Old sleepers/securing bars can be used to assist the load from moving along the wagon. Must be tight and fixed to securing anchors.

Short lengths of chain between load and securing point on wagon. Angle between 30º & 60º

Long lengths of chain between load and securing point on wagon. Angle between 45º & 60º



Various scale chain is available, mainly in three sizes, medium duty 27 links per inch is good working size for truck, steel loads. Make small hooks from brass wire to secure the chain to, paint hooks black after chain is glued into the correct position.



Webbing Straps:- Protectors may be needed on corners. To be applied straight across the load, be tight without twits. Generally found in two sizes, 2 tonnes (blue), 5 tonnes (yellow). I make web straps from washed used tea bags cut into strips and painted.

Note the old car tyre for packing to fill the gap along the wagon.

Wire:- Used with other securing equipment, chocks/securing bars/old sleepers. Mostly is galvanised (silver). About 1 ton limit. Check out the wife's sewing cabinet for suitable cotton.

Rope:- In the 60's and 70's, rope was widely used on various items, which varied from system to system, but today use only for light loads (less then ½ a tonne) as a secondary means. Used to secure loads within the wagon, not above the sides. Was used by freight forwards where gated loads were covered by tarpaulins. A rope tired down with a truckie knot was placed over the tarp. Once again, check out cotton in the sewing cabinet.

Folded trap and dunnage tied to container floor with rope.

Tarpaulins:- Various loads are covered by tarpaulins for weather protection. Generally, Rail Operators had a standard tarpaulin which fits a four wheeled wagon. Bogie wagon may need 2 or 3 traps to cover the load depending on it length. Traps must be secured so they cannot be lifted by the wind rushing over the wagon during travel. If more than one tarp is used to cover a load, the tarp on the trailing end goes on first with leading end tarp coming back over the trailing tarp. Ropes used to tie down tarps should not be secured to uncoupling levers, brake equipment etc. Tarpaulins can be made from cloth, tissue paper, tea bags etc.

Tarpaulins are not to be provided to cover goods, which from their nature are not considered as requiring such protection. Goods which are not to be covered include:-

Agricultural or farming implements and machinery	Bottles – loose or bagged	Boxes and cases – empty, of wood or iron	Clay, except where otherwise specially authorised
Bitumen	Bones	Bricks	Charcoal in bags
Coke, bulk or bagged	Earthenware articles packed in straw	Empty cases, casks, drums, gas cylinders	Fencing wire and wire netting
Firebricks, except where otherwise specially authorised	Gravel, stone, screening, sand, ashes, ore marble, gypsum	Livestock loading in cattle wagons or sheep vans	Log timber
Lump rock salt not in bags	Machinery for outdoor use	Melons and pumpkins, loose or bagged	Motor cars and other motor vehicles
Motor chassis	Motor spirit, oil etc in drums	Pipes of all descriptions	Sawdust, loose or bagged
Sawn timber and shooks (bundles of timber) except as approved	Tallow	Tractors	

(The above table give some hints for more load types)

Sawn timber generally is not to be covered and on no account must new or comparatively new tarpaulins be used for this purpose. Other classes of tarpaulins may be supplied for the consignment consisting of the following descriptions:-

1. Dressed sawn timber
2. Consignment for “ready-to-erect” houses.
3. Timber shooks for making cases.

Special tarpaulins were provided for covering trucks of dressed sawn timber and these are branded “Timber only” on both sides and in the centre of the sheet. When not in use they must be folded at the receiving station and advice sent to the District Officer

Tarps on this group of wagons were made from cloth, Kleenex tissues, gift wrapping tissue and used tea bags.

Other Reading
Narrow Gauge Downunder Oct 2011 Quick & Easy wagon Tarpaulins
Branchline Modeller No 1. Tea-bag Tarpaulins
Australian Model Railway Magazine # 100 Jan/Feb1980. Tarpaulins
Australian Model Railway Magazine # 156 June1989. Tarpaulins
Australian Model Railway Magazine # 283 August 2010 Tarp your Load.
Modelling the Railways of Queensland Handbook 2012

Rolls of Polythene Pipe:- Rolls up to 1.5 metres diameter, flat on the floor of a wagon with sides or standing up. 1.5 to 2.5 metres diameter, the curved part rests on the wagon floor with the flat part against or parallel to the end of the wagon.
2.5 to 2.75 metres diameter, laid flat between stanchions on platform wagons.
Rolls standing up are generally covered with tarpaulins.

***Cars* (wheeled vehicles under 2 tonnes):-**
There are various methods used to secure cars/motor vehicles to wagons. Each Rail Operator will have their preferred method. Some may have special purpose built wagons which also differ between Rail Operators. If modelling a set system you will need to check that Operators securing manuals. QR had three (3) methods, one for wooden floored wagons, steel floor wagons and wagons with securing bars or brackets.

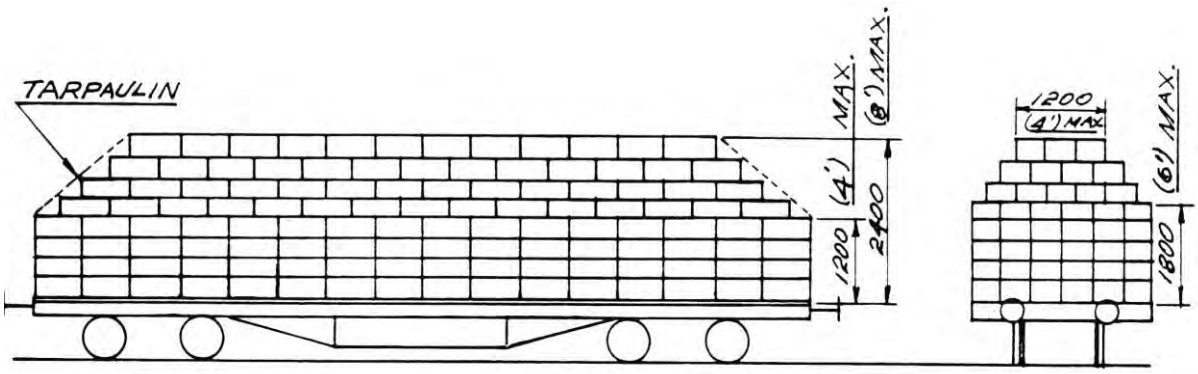
Note:- If modelling an era, be carefully about the vehicle you place on a wagon. Some I have observed modelling the 60's have vehicle from the 80's on the wagons???.

Trucks, Tractors, Machinery etc.:-

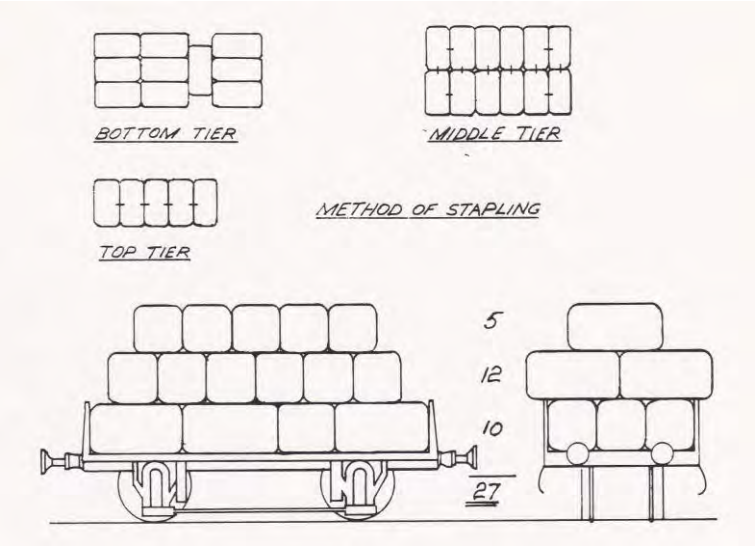
Caravans:- The height of caravans can be issue, on some lines special consideration may be required. Some vans may need the wheels removed or loaded onto well wagons.

Photos by Peter Kennedy

Hay:- .



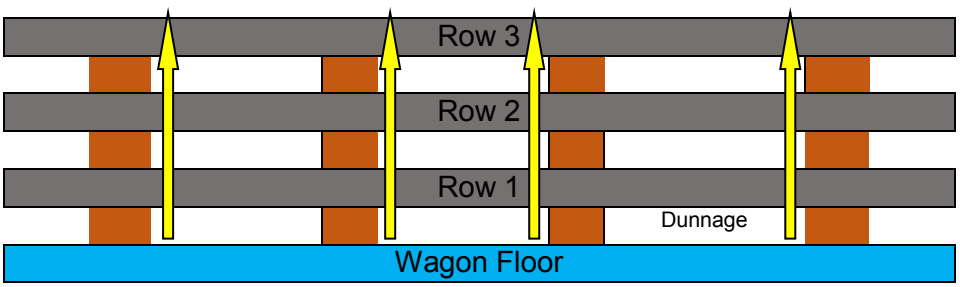
Bales of Wool:- Today wool bales are 1370 mm long, 760 mm wide, 760 mm high and weight in at 175 kgs. Most railway system have loading diagrams to assist with loading. During the 60's wool bales were made from a different material and were a different size, also loading paten was different. Tarpaulins in good condition is used to secure/cover wool loads. A couple of points to consider when loading wool, not all loads were full loads. Each grazier had his own agent (Elders, etc.) which had their own stores which may not be in the location as other agents.



Loading Wool arrangement of a FJS wagon *(1981)*.

Steel Loads:- Steel products are generally loaded by a forklift or crane. To allow for the movements of tynes or slings, dunnage is placed between each tier/row. Today, the standard for dunnages is 4' x 4' (100mm x 100mm) hard wood. With square timber each side is the same, there is no wrong side to place the dunnage on the floor. If using other dunnage and the thin side is placed on the floor upwards, there is a chance the dunnage will roll during transit allowing the securing equipment to come loose causing load movement.

As each row/tier is completed, dunnage for the next row/tier is place directly above the dunnage on the previous row/ tier. When the load is completed, the securing equipment is placed over the load next to where the dunnage is located.



Making Steel Loads:- Various steel products are conveyed on rail, some have be produced by RTR manufactures.

Sheet/Plate Steel:- Sheet styrene of various thickness cut to size and painted gunmetal for new product or roof brown for weather steel.

Weld Mesh:- Weld Mesh loads can be made for fly screen.

Steel Rod:- Evergreen rod stacked into a pyramid or in round bundle.

Reinforcing Rod:- I made reinforcing rod using fishing line. Take a length of timber and partly nail a nail into each end. Wrap the fishing line between the two nails. Using a soft wire (fuse wire) to secure the various runs of fishing line together to form the bundles. Four or five ties are required for each bundle. I made my bundle 20' long, making the timber assist with having the ties in the correct place. Once all ties have been add, cut to size and place on wagon. Place dunnage between each row.

Beams:- Beams of various shapes/size/lengths are conveyed by rail. They can a wagon load of one type or a mixed consignment.

Evergreen, plastruct cover most types. Leftover bits from kits can make a nice load, plus they can give you something to think about on how you are going to stack it on the wagon.

Long steel beams (over length) with loaded runner in the middle.

Wire Coils:- Between steel works and major cities, wire coils are conveyed in special wagons or containers. To regional centres coils are conveyed on containers as below.

Coil Steel:- Some rail operators have special wagons. Other use open wagons, the coil is secured by old sleepers/hard wood/dunnage and chained to securing points on the wagon.

I used cotton reels to make steel coils, cut to length, add styrene sheet to each end, sand to shape. The steel strapping was applied with a fine Artline pen.

Photo by Peter Kennedy

Pipes:- Pipes come in various diameter, lengths and are made from various products, some pipes have a outerjacket which cannot be damaged. Thus various loading methods are used to load and secure these loads. Some projects requires pipes to be moved by the train load. In the last few years, gas pipes have been move by the train load from Brisbane and Gladstone to western gas fields. Wagon were modified and made into sets with each set doing two or three round trips a week. A few years back, container wagon were fitted with bolsters for moving pipes. Some pipes are conveyed in special made cradles, others may have tyres between the pipes, and others can be built up in a pyramid. Pipes can be secured with chains, other with outer coating are secured by web straps.

Photo by Mark Koch

When loading pipes/beams/poles that are longer than the wagon, a runner is required. When loads extend over another wagon, there a few things to take into consideration. The load needs to support it self and clear the runner floor by 200 mm, travelling around curves, through points etc. the extended load can move outside the wagon profile. The maximum length over the end of a wagon is 5 metres and not wider than 925 mm from the centre line of the wagon. When loading long loads at BHP, three wagons were often used, the long loads were loaded on the two end wagons towards the runner in the middle. The runner was also loaded with a suitable load of plate steel or smaller beams. For loads that needed to overhang both ends, runners were attached to each end of the wagon, then the runners were loaded with a suitable load.

Some long loads likes pipes/poles etc., the runner wagons will run empty, sometimes the runner may be a platform wagon of a different class.

Photo by Peter Kennedy

Photo by

Mark Koch

Gas pipes on 19m Container wagons using system 66 securing equipment.

Over length pipes on 50’ wagon with runner attached.

Stanchions, pipes bundled together with web strapping, chain over load

Pipe loads can be made various ways. Most of my pipes are made from balloon sticks, white or yellow in colour. Evergreen have various tube products suitable for pipe loads. If you are looking for some weight, K & S have thin walled tube. Sometimes, I use cotton bubs to clean wheels, these made a good small pipe. I cut the leftover lengths of tube into small pieces to made pipe couplings and stack them up at the end of the wagon.

Other long loads:- Logs and poles may require the wagon stanchions extended to achieve a full load. Good straight tree branches make a good load that looks real. May need to remove the bark for some applications.

Photo by Peter Kennedy

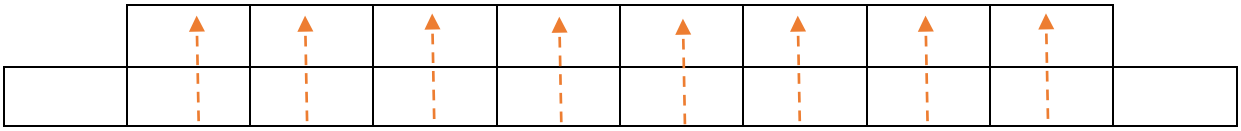
Stanchions and chains can be part of the equipment on a wagon, for special loads some modifications to the stanchions may be necessary.

In later years with containers, web strapping is more the norm.

Timber Loads:- Various timber loads can be made up using stripwood or paddle pop sticks. False floor can built a load to the required level saving work and time. Some load types for consideration include sleepers (across the wagon), crossing timbers for points (longer than sleepers, along the wagon), sawn timber (stripwood bundled and loaded along the wagon. Some timber loads may require hungry boards/gates fitted to the wagon sides to achieve a full load.

Bricks, Bales of Paper, Fruit Bins:-

When bricks are loaded into open wagons, and a second layer is loaded, each row of pallets on the upper layer must be secured to the wagon by web strapping fitted with corner protection. Pallets of bricks on the upper layer must not be loaded on top of pallets at each end of the bottom layer. Any gaps between pallets should be filed with packing, i.e. tyres, pallets etc. to prevent movement.



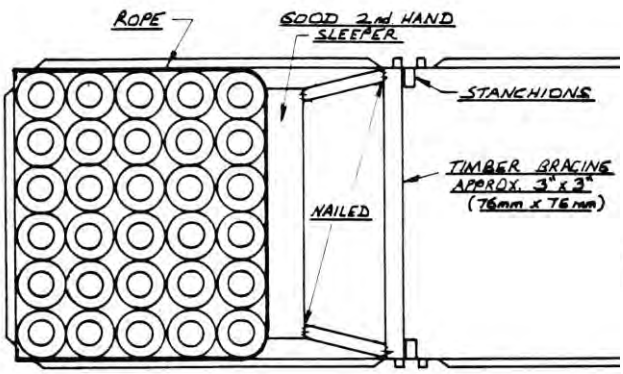
Other Loads:-"

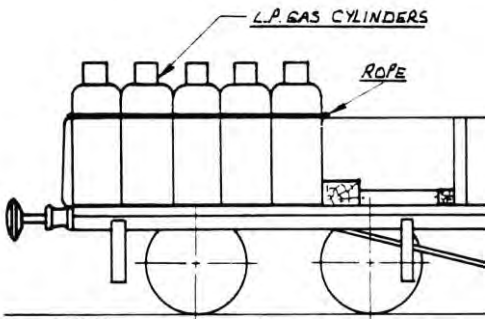
Drums:- Loaded, Fuel/oil in open wagons upright.
Empty, in open wagons upright, can also be on their sides or a mix of both.
Each oil company could identified their drums by it colour and marking on the top.
(Shell – silver. Castrol oil – green. Mobil – brown).

Departmental Goods:- Items used to maintain the rail network and rollingstock were conveyed free of charge. Coal in open wagon for steam locos at out depots, sleepers, bridge timbers, rails, derailed wagons being conveyed to workshops for repairs, wheels/bogies, gang materials and camps, spoil/ballast from/for track work to name a few.

This wagon of spoil may also be overload ??????

Gas Bottles:-



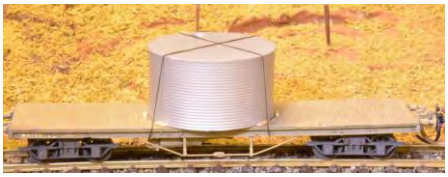


Rough / Cranky Loading:- Odd shaped or long items that don't fit into containers/box wagons is know as rough or cranky loading, these items are loaded in open wagons or gated flat racks.

Boats:-

Photo by Peter Kennedy

Tanks:- Various types of tanks have been conveyed on flat wagons or containers.



News Print:- A few years back, new print rolls were conveyed in covered wagons, in recent times they are conveyed on flat rack containers shrink wrapped.

Special Loads:- Many special loads are outside the loading gauge and need special authority to travel. The authority to travel will list instructions for the safe passage of the train. These loads are known as “Out of Gauge”. Some of these loads are conveyed on special wagons like well/beam wagons.

Some special loads could be:- trucks, caravans, army vehicles, huts, transformers, generators, heavy machinery, to list a few.

Loads like bridge beams, gantry crane would require swivel bolsters on two wagons.

Photo by Peter Kennedy

Photos by Peter Kennedy

Leopard Tanks on NSWR “BEX” Wagons at Clapham

Road Tanker on “PJW” Wagon at Roma Street

Top photos by Peter Kennedy

NSW “NZZA” Beam Wagon at GEC Rocklea with a Transformer for WA.

Summary:-

Many manufactures produce loads, which are available from hobby shops and exhibitions. Plus, as you look around in the shops, many items on display will also make a good load. Purchase a few and do a few yourself that are different, mix them up, not all loads were the same.

Buy & Sell meeting is another good place to look for loads, as they say ones junk is someone else treasure. I often kit bash items into something not available, plus you can use parts left over for loads or other projects.

A cement truck cab and chassis was used for another project and the body was used for a wagon load.

These little projects only take a night or two to complete and are most enjoyable.

I trust you enjoyed the presentation and you found the information helpfully.

Acknowledgements / References

Thanks to Peter and Mark for allowing me to use their photos for this presentation.

Past QR Publications	Weekly Notices Train Notices The Loading & Securing of Special Loads & General Loads 1981 General Appendix to the Book of Rules Goods & Livestock Rates Book.
ARTC	TOC Manual *(available on ARTC website)*