
N.Z. Perspective on the Emerging Critical Issues and Research Needs in Vehicle Size and Weights

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There is no doubt in my mind that 1986 will be the year to be remembered in N.Z. as the year of the vehicle size and weight changes. All those industry groups and government departments that have worked relentlessly in formulating a package to alter the existing heavy duty vehicle dimensions and weights. N.Z. with its population of just over three million people with 75% living in the North Island and 50% living in the Northern Auckland area of the North Island. The Auckland city and surrounding suburban area alone has a population of 1 million. This represents a major imbalance in road transport haulage.

The topography of both islands is generally very hilly and with high rainfall averaging 30 to 40 inches in most areas. Hence the high number of streams and rivers accounting for the high number of bridges throughout the country which we regard as our number one roading problem. Both islands are covered by a network of state highways. The total roading network is 93000 kilometers of which 11500K come under the state highway network, 14000K are urban roads and 67000 are rural roads of the 93000K, 5000K are sealed with the remainder being in various states of gravel construction. Our "number one enemy" bridges, total in number 3000 and these account for 134 kilometres of bridge decking. It is this 134 kilometers that is the greatest stumbling block when considering a revision of weights and dimensions. It is obvious our forefathers built bridges for the day and not for the future. The roading network is government owned and under the control of the National Roads Board. The N.R.B. is serviced by the Ministry of Works & Development, and is chaired by the Minister.

The Ministry of Works and Development, take the responsibility for design, build and maintenance of all state highways. Some of this work may be let by tender to private contractors. Policing of highway vehicles and checking weights, dimensions and vehicle fitness comes under the control of the Ministry of Transport. The heavy transport fleet is not large. A total of 71000 in the 2 ton and over

category. Approximately 16000 in the 200H.P. plus range. Truck sales total approximately 700 per annum in the 200HP range. Total heavy trailer sales total 500 per annum. Total trailer fleet 16000.

FUNDING

Since 1977 the government of the day instituted a policy of user pay and with very little consultation with industry, introduced a road-user charges system (RUC) which completely floored the heavy transport industry. Up to that stage the taxing of heavy vehicles was on a diesel tax. The arguments against the diesel tax was that only approximately 35% of the diesel was being used by the heavy motor vehicle road transport industry and the remainder being used by farming, contracting, heavy industry and fishing sector. Therefore, the rebates necessary to those sectors was difficult to administer. The RUC system meant the fitting of hubodometers as the charges are related to all trucks and trailers. It is divided into two categories.

1. Power vehicles
2. Unpowered vehicles

These categories were divided into axle configuration sectors and a charge was calculated on the amount of road wear each axle configuration created and a scale of fees was charged on a 1000 kilometer basis. There has been several revisions to the system since its introduction, but like all systems it only works providing everyone pays their fair share. The policing has become a major problem, and particularly trying to decide between those that have genuinely, accidentally run out of licence, and those that have willfully and blatantly tried to beat the system. Law courts at present treat all offenders as hardened criminals with fines around the \$8000 mark not uncommon. The hubodometer can easily be tampered with, pulled apart, wound back, same serial number stamped

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on several units and changed as the mileage reaches the amount stated on the licence.

My advice to any country that is contemplating this method of road user tax collection, then take a good hard look at it first. It is not the complete answer.

The N.Z. road transport industry accepts the principle of user pay. It is not happy with

1. The way it is administered
2. The way it is policed
3. Having to repay for the mileage
4. That N.Z. roads being 100% funded by the road users then the road user should be able to determine and demand what standard of roads and bridges are most acceptable to them.

The road transport industry should be able to demand highways that will take the world wide weight limits, as all our road transport equipment is imported from other countries where there are much higher independent axle weight limits.

The taxes collected in the 1984 year from the road-user charges was \$96.6 million NZ dollars. This amount when added to the total motor vehicle taxation for that year totaled \$962 million. The \$962 million was made up of sales tax on motor vehicles, sales tax on compressed natural gas, the liquid petroleum gas, motor spirits duty and other fees under the Transport Act 1962, drivers licence fees and distance tax. The \$96.6 million from the road user charges plus the CNG and LPG revenue of \$7 million was allocated directly to the National Road Board's funds. This was supplemented by another \$93 million from the consolidated fund and the total amount with other interests from investments and miscellaneous receipts allowed the National Roads Board a total expenditure of \$338 million for the year 1984. The remainder of the \$962 million collected from motor vehicle taxation goes into a "big pot" that the government call the "consolidated account". It is always a mystery where these funds end up but it is obvious with the over rated social welfare system that we have in N.Z. that a high proportion of this money goes to keeping that afloat and not necessarily to the transport infrastructure that the funds should be allocated to.

DEREGULATION

Since 1976 a move was taken to deregulate road transport. Prior to that, the inefficient N.Z. railway system was propped up to the tune of \$80 odd million a year and a majority of the road transport operators were limited to a 40 mile radius from their registered domiciled area. This was later extended to 150 kilometers. Livestock, furniture and one or two other commodities were exempt of these regulations. But since 1983 there has been a planned phasing out of this by deregulation of the transport industry and making some endeavour to make the railways stand on their own feet. This in turn has made the total transport scene a far more competitive industry. However, when we check figures from the International Road Federation we note that the comparison of average annual taxation of five common categories of vehicles, i.e. private car in the 1000CC-1500CC 4500CC range, a public carrier in 16 ton laden weight, a public carrier in 32 ton laden weight, we note that N.Z. tops the poll in the heavy truck over 32 tonne laden weight, operating at 75% capacity travelling at 8000 kilometres per annum and is consuming 50 litres of diesel per 1000 k's is taxed at 60 times greater than the 4500cc car and in comparison to Australia which is only taxed 3 times that of the car, it is easy to see that we would have to be the most over-taxed heavy transport industry in the world. By comparison with Australia, the N.Z. truck is taxed three times more than Australia. This means a N.Z. operator's cartage rate is about N.Z. \$2.65/tonne a kilometer based on being loaded both ways.

EXISTING SIZE AND WEIGHT REGULATIONS

Since the introduction of the road user charges, the axle configurations have changed considerably because the road user charges are aimed at penalising those axles in the 8 ton range. Because of this, there was a major switch to the use of tandem axle groups and using more axles than were actually needed.

EXISTING AXLE LOADS

Single tired (front steering axle)	5.4 tonne
Twin tired axle	8.2 tonne
Tandem bogie twin tired	14.5 tonne
Tandem bogie 1.8 m spread	15.5 tonne
Maximum overall gross	39 tonne

Measurements are overall length of 19 metres, overall width 2.5 metres and overall height of 4.25 metres because of the high proportion of narrow twisting roads throughout N.Z. A system of forward lengths was introduced in the early 60's. This may be referred to as the sum of the squares formula which restricted the swept path of the combination of units and that swept path formula was as follows:

- 7.4 mtr with 4.7 mtrs
- 6.8 mtr with 5.5 mtrs
- 6.2 mtr with 6.2 mtrs

In other words, if the tractor unit forward length i.e. from the centre of the rear axis to the front of the unit was 4.7 mtrs, then the forward length of the semi trailer i.e. Kingpin to centre of rear axis would be 7.4 mtrs. When the forward length rule was introduced it was by far the better method than had been used prior to that. But since the introduction of the 40' containers and the general need to have a 40' trailer the 7.4 mtr maximum forward length measurement i.e. Kingpin to centre of rear axis became unworkable. This led to the invention and introduction of things like the 3 axle self steer bogie plus the use of castoring axles. A 40' trailer could be manufactured with a steering castoring system which allowed the rear bogie to be positioned further towards the rear of the semi so allowing for a more evenly distributed axle loading. This got around the 7.4 mtr length regulation as the effective rear axis was still within that measurement and these units had worked reasonably successfully over the past 20 odd years. However, they are considerably heavier in tare weight and much more expensive to manufacture and maintain than a close coupled tri bogie. Truck and trailer units have been in common use and these range from 4 axle twin steered trucks with four axle trailers, to 6 wheelers with 2 or 3 axle full trailers. These have proved their worth over the years and have been particularly good in live-stock haulage when there has been difficult access roads and the trailer can be left on the main highway and the livestock ferried by the truck to the trailer and then re-loaded off the truck. N.Z. has always been a big user of the 'A' train concept i.e. the tractor unit, semi trailer with a full trailer behind. It has been particularly useful in the tipping type trailer area for carting of road gravel, fertilizer, wood chip and other bulk loads such as milk tankers, but over the last few years questions have been asked about the lateral stability of these units and due to the lack of local research we can only be guided by research done in America and Australia. We feel more research is necessary to

verify that stability, or lack of, with the dimensions they are being built to at the moment.

PROPOSED CHANGES

Some three years ago the N.Z. Road Transport Association led the way by presenting a report to the government of the day "a case for an increase in gross vehicle weights and dimensions". This report was based on the known socio economic advantages this would be to N.Z. and the report hit at these main factors.

1. Increase from 39 tonne to 44 tonne gross weight.
2. Forward length limits to be changed to commit better configurations of heavy vehicles.
3. The maximum overall length changed to 21 metres.

'B' trains were introduced into New Zealand in the late 70s and these complied with the present forward length regulations and also proved to be a great deal more stable laterally than the 'A' train. They have been used extensively in the dry freight, tanker, logging and tipping configurations. The N.Z. Road Transport Association could see that the increase to 44 tonne could make better use of 'B' trains and the equipment that was already in use which had been created by the road user charges system. In particular these were the 4 axle trailers and 'B' trains. The increase to 44 tonnes still came within the existing axle load tolerances but created problems with our "number one enemy" bridge deck loadings.

This then would require changes to the first to last axle measurements. The dimensional changes suggested have mainly been the change in the forward length criteria which would take the maximum Kingpin to bogie centre to 8.5 mtrs and overall length of semi trailer unit complete with tractor unit to 17 mtrs. The case for 21 mtr overall has been lost, so 19 mtrs truck and trailer combinations will be retained. However, an increase has been agreed to, in principle, to 20 mtrs for 'B' train combinations. The trailer deck lengths will remain the same but will allow longer tractor units to be used. The existing width and height measurements remain the same but with a watchful eye kept on the world trend towards 2.6 mtr width. Overall length limit of 11 mtrs would be placed on a full trailer that is from the centre of the towing

eye to the rear of the trailer with a rear overhang of 3.2 mtr. Overall length of the single rigid vehicle would also be 11 mtrs and the rear overhang 3.2 mtrs but extended to 3.7 mtrs for vehicles longer than 9.5 mtrs. There is still a lot of other decisions to make on such things as the positioning of the coupling pin on the rigid vehicle in relationship to the centre of the rear axis and the same when the coupling is fitted to the rear of the semi trailer.

The changes will ultimately lead to greater use of 13.2 mtr length tandem and tri-axle semis, 'B' trains and 4 axle trucks with 3 axle full trailers.

With these proposed changes the M.O.T. see it as a great opportunity to tidy up some of the other dimensional and safety related problems that have loomed up over the past few years.

PROPOSED AXLE WEIGHT LIMITS

(a) Maximum weights on individual tires

Single tired	6.0 tonnes
Twin tired	8.2 tonnes

(b) Maximum sum of weights on tandem axles fitted with twin tires

Axle spacing	Weight limit
1.0 m but less than 1.3 m	14.5 tonnes
1.3 m but less than 1.8 m	15.0 tonnes
1.8 m or more	15.5 tonnes

(c) Maximum sum of the weights on tri-axle groups fitted with twin tires

Distance from first to third axle or tri-axle group	Weight limit
2.4 m but less than 2.6 m	17.5 tonnes
2.6 m but less than 3.0 m	18.0 tonnes

(d) Statutory gross weight limits

The statutory maximum sum of the weights on any two or more adjacent axles (including the maximum gross weights) are (in tonnes):

Distance from first to last axle (Metres)	Weight limit (Tonnes)
3.0	19.0
3.3	20.0

3.6	21.0
4.0	22.0
4.7	23.0
5.1	25.0
5.4	26.0
5.8	27.0
6.4	28.0
7.0	29.0
7.6	30.0
8.2	31.0
8.8	32.0
9.4	33.0
10.0	34.0
10.8	35.0
11.6	36.0
12.4	37.0
13.2	38.0
14.0	39.0
14.4	40.0
14.8	41.0
15.2	42.0
15.6	43.0
16.0 or more	44.0

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Some of these points that are up for discussion are:

1. The towing vehicle must be at least 50% of the towed mass.
2. Minimum power rating for tractor units.
3. Approved load sharing suspensions.
4. Rear reflective markings.
5. Compliance with a code or standard for fifth wheels and ballrace turntables.
6. Suitable minimum rating on axles.
7. Critical components rated to suit maximum loading.
8. Use of seat belts in trucks.
9. Compliance with standards for wheels and rims.

10. All heavy transport drivers be 21 years of age and passed a defensive driving course.
11. Trucks to comply with noise emission standards.
12. Fitting of spray suppressing devices.
13. Fitting of under run rear protection.
14. Limitations on maximum speed.

The road transport industry must be commended on the responsible attitude it has taken in the past few years. In a lot of cases without the direction or assistance from the government, the N.Z.R.T.A. together with N.Z. Institute of Road Transport Engineers, the N.Z. Truck Trailer Manufacturers', the Logging Industry Research Association, and the Dept. of Scientific and Industry Research have researched and instigated codes of practice for the safe cartage of logs and sawn timber, and a code of practice for towbars and drawbeams. They have also been involved with the new load securing code and Safe Handling of Dangerous Goods Code of Practice. There is a committee working on brake compatibility. This presents more of a problem in N.Z. than most countries due to the importation of 30 different makes of heavy trucks from countries like U.K., France, Germany, Italy, Sweden, Japan, Australia, India, Canada and the U.S.A. Each country has a different standard so the trailer manufacturer has great difficulty in setting a standard to be compatible with all makes of trucks. Maybe now is the time to look at a world standard for brake performance and compatibility.

TO CONCLUDE

Answers are still needed for the following areas:

1. Brake compatibility
2. The possible reduced wear and tear on pavements by the use of air sprung suspensions and hopefully an increase axle load carrying capacity.
3. Up to date research on stability of 'A' trains, 'B' trains, 'C' trains and truck and full trailer units.
4. Improvements in design and rating of fifth wheels, particularly in the fact that there is no reference in design standards to a vertical

load. This has been of particular concern to N.Z. due to high centre of gravity loads and high speed cornering.

5. Research into antispray.
6. Research into front and rear underrun protection.
7. Methods other countries have for funding road research because believe it or not N.Z. government allocate very little of that \$962 million to research. This could mean that the industry will have to accept certain trade offs to achieve the 44 tonne gross limits without proper research being carried out.
8. I question the validity of the AASHTO fourth power formula if it still applies to the late 1980s, when tire and suspension technology has advanced since the mid 50s when the AASHTO report was conceived.

We also need into how to obtain funds for basic practical research into cost savings for the whole economy - that is our most critical issue - transport is part of every industry.

SESSION 2
PAVEMENT RESPONSE TO HEAVY VEHICLES 1

Chairman:

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