



IRTENZ 18th International Conference

FUTURE HIGHWAYS
Future Vehicles

**Unlocking Barriers to Greater
Productivity**

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Introduction of HPMVs

- 2010 Amendment to the VDAM Rule to allow HPMVs
- HPMV bridge formula and small increases to some axle weight limits
- No overall length or gross combination weight limit specified
- Limitation was what the infrastructure could accommodate
- NZTA tasked with implementation



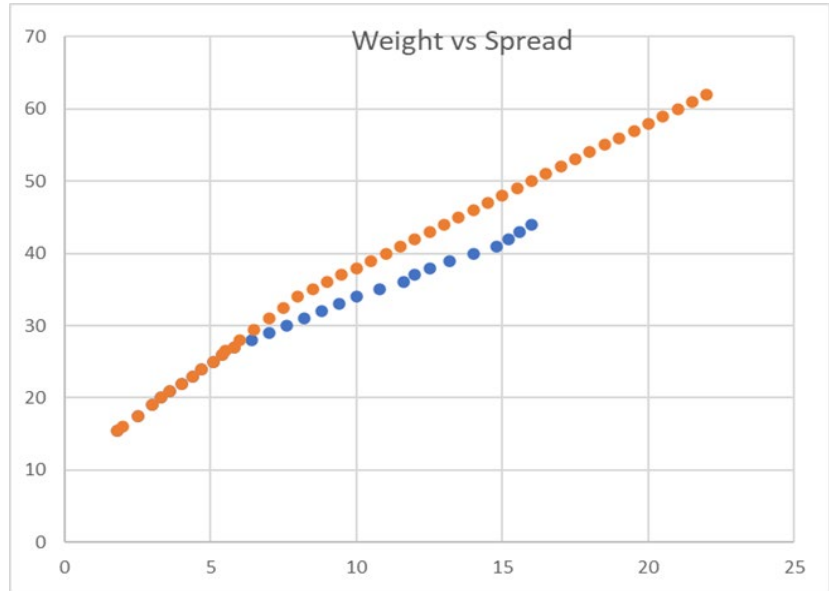
Pro-forma Designs

- To facilitate rapid uptake NZTA introduced pro-forma design approach
- For standard legal weights – general access
- For higher weights, route assessment required
- Good productivity gains for volume-constrained loads
- Challenges in getting route approvals for higher weights particularly from some local RCAs



Two Issues for Local RCAs

Bridge strength and capacity



Additional pavement wear and funding



50MAX Vehicles

- NZTA addressed these issues by introducing 50MAX
- Standard bridge formula extrapolated to 50t
- Required to have nine axles so that pavement wear per tonne of freight no greater than standard vehicles
- Concept has been widely accepted
- Excluded from some routes but relatively few
- Not an optimal solution but acceptable to all parties
- Strong uptake



Potential for Higher Weights

At standard legal weights, sum of axle group limits;

- 4-axle truck and 4-axle trailer: 56t
- 3-axle truck and 4-axle trailer: 51t
- 4-axle truck and 3-axle trailer: 49.2t
- 8-axle B-train: 54t 7-axle B-train: 51t

Extrapolated standard bridge formula

First-to-last axle spread (m)	Weight (kg)
20.5m to less than 21.1m	51,000
21.1m to less than 21.7m	52,000
21.7m to less than 22.3m	53,000

At 23m OAL it would be possible to achieve 51t or 52t depending on overhangs



Local RCA Funding

Land transport system is funded through the National Land Transport Fund (NLTF)

NLTF income comes mainly from Fuel Excise Duty (FED), Road User Charges (RUCs) and vehicle registration fees

Local RCAs receive, on average, 50% funding from NLTF with the rest coming from local ratepayers



Road User Charges

Five components:

- **Driver** component based on vehicle-kms does not apply to trailers
- **Space** component based on Passenger Car Equivalent (PCE-kms)
- **Weight** component based vehicle weight on tonne-kms.
- **Wear** component based on Equivalent Standard Axles ESA-kms
- **Residual** component for all costs not included above including negative values for the Fuel Excise Duty and for the roading costs paid by the local RCAs in vehicle-kms. This component is negative, i.e. the rebates are bigger than the costs.

Note: the rebate is effectively shared equally by all vehicles.



Example of Impact of Increased Weight

23m 4-Axle Truck and 4-Axle Trailer

	Standard Weight	Higher Weight	Change /Trip
Gross weight	46t	52t	+13%
Payload	29t	35t	+21%
RUCs	\$639	\$891	+39%
ESA	1.38	2.26	+64%

21% Payload increase implies 17% fewer trips required

RUC increase per unit payload 16%

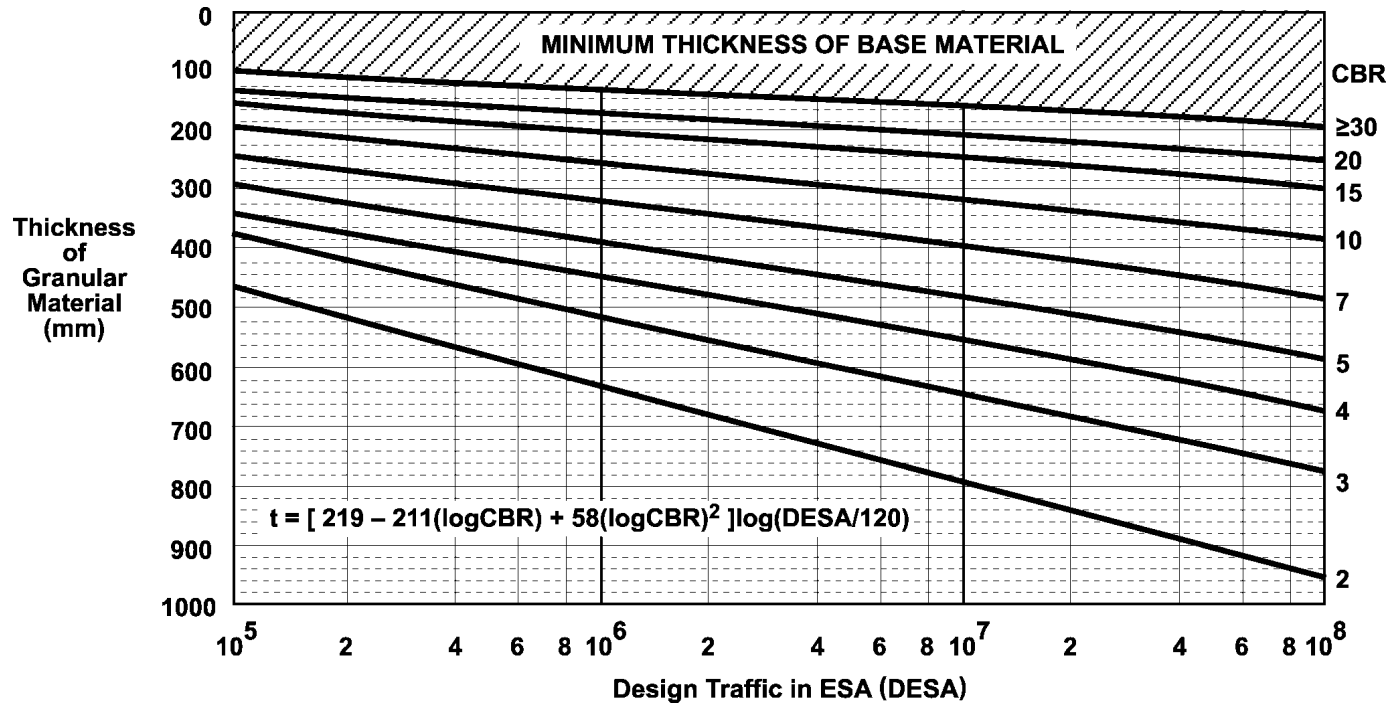
ESA increase per unit payload 36%

Fuel consumption per trip +3% (est)

Fuel consumption per unit payload -14%



Effect on Pavement Requirements



With CBR 10 and design traffic of 10⁶ ESA, the minimum base thickness is 259mm
 With design traffic of 1.36 x 10⁶ ESA, the minimum base thickness 268mm
i.e. Additional thickness required for 36% increase in ESA is relatively small

Effect of New Technologies

- Battery electric trucks are now on the market
- Tare weights are relatively high and thus loaded trucks exceed current axle load limits
- One example: 3-axle EV tractor with up to 8 tonnes on steer axle and 17t on tandem rear axles – increased pavement wear when loaded:
 - Quad axle semi at 41t, 13%
 - 50MAX B-train at 50t, 25%
 - HPMV B-train at 58t, 6.4%
- Note: some loss of payload weight capacity



Possible Solutions and Challenges

- Fully fund local RCAs for structural work from NTLF
- Requires an increase in RUCs but this comes out of Residual, so equally shared by all road users
- If EVs are made liable for standard RUCs they will be disadvantaged
- RUCs and FED do not include an emissions cost
- Apply an emissions cost to all fossil fuels and reduce RUCs proportionately

