WA's Road Transport Industry Safety Forum

TRANSAFEWA
TRANSPORT.SAFETY.COMPLIANCE

Engistics

Roll Over Risks and Load Restraint Lessons

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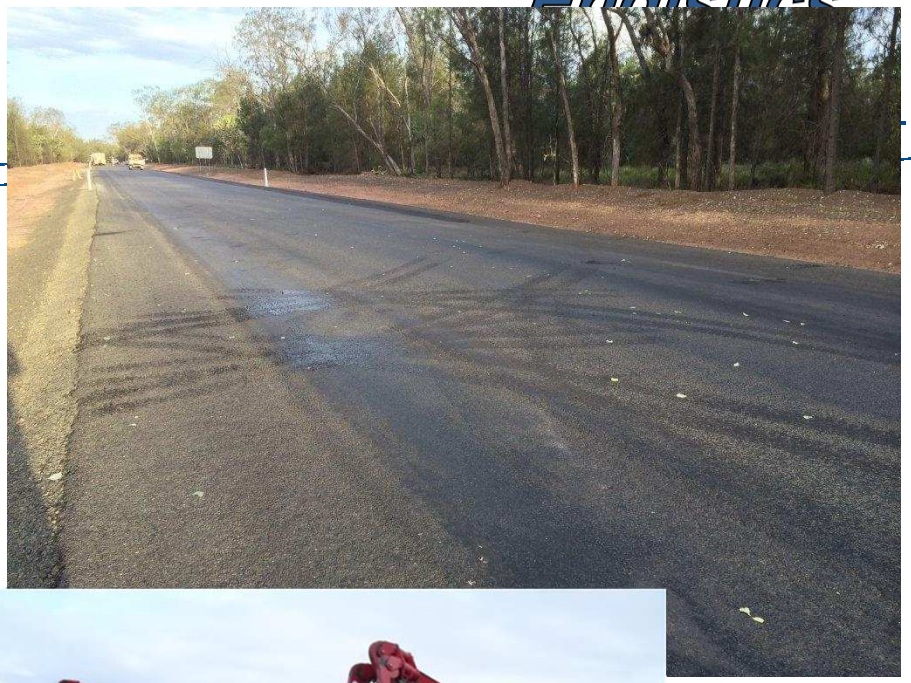
Our Ref:

Insights One – Rollovers

How can you Rollover on a straight road?



57 times with the same driver, same truck, same load, same corner, but only rolled on 58th time. How can that be?

Insights One – Rollovers

- **Roll Over Factors**
- **WHY - The Key Factors**
  - Speed & Cornering
  - Roundabouts & Flick flack effect
  - High Centre of Gravity
  - Load Shift
  - Road Geometry
  - Tyres and Suspensions
  - Kerb Impacts
- **Electronic Roll Stability**

- **Speed**
- **Instantaneous Radius of Turning**

Particularly note in this video how the chassis twists as the rear axle group lifts off while the prime mover is still in full contact with the road.

Look *Carefully* at the picture..... NO brakelights!

Analysis of load restraint test

Analysis of load restraint test

Analysis of load restraint test

Speed + Turning = Centrifugal force

$$\text{The Overturning Force} = \frac{\text{Speed}^2}{\text{Radius of Cornering}}$$

		Speed^2	Increases overturning by
If the Recommended speed was	60 km/h	3600	
			17.4%
Is it serious if the truck does	65 km/hr	4225	
			36.1%
Or if the truck does say	70 km/hr	4900	

Now say the driver misjudges the line of the corner a little, and has to "tighten up"

		Radius 90%		Radius 80%	
If the Recommended speed was	60 km/h	4000		4500	
			30.4%		**46.7%**
Is it serious if the truck does	65 km/hr	4695		5281	
			51.2%		**70.1%**
Or if the truck does say	70 km/hr	5444		6125	

Electronic Rollover Prevention

ERP works by:

- Initial micro pulses to sense the rollover point
- Monitoring the lateral forces and adding a (modest) safety margin
- Braking when the forces reach the safety margin

BUT it takes time to slow sufficiently if it's a swerve failure.

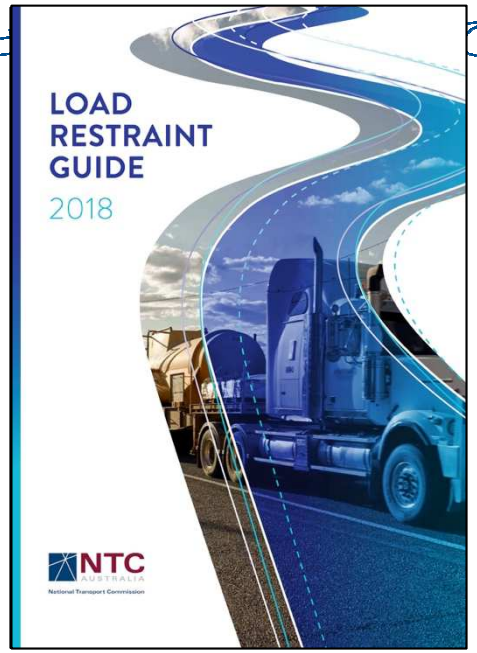
Extra time to brake with very heavy combinations

ERP about 80-90% successful

Load Restraint

Load Restraint Compliance

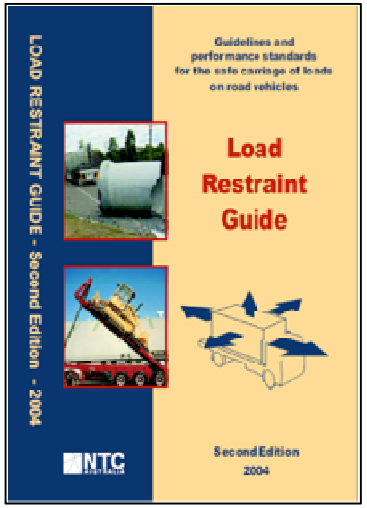
- In Feb 2018, the NTC published a new Edition of the Load Restraint Guide
- HV National Law changed on 1 October 2018 to specifically quote the Performance Standards
- WA and NT (not in HVNL) still reference the 2nd edition performance standards (for now?)



HVNL

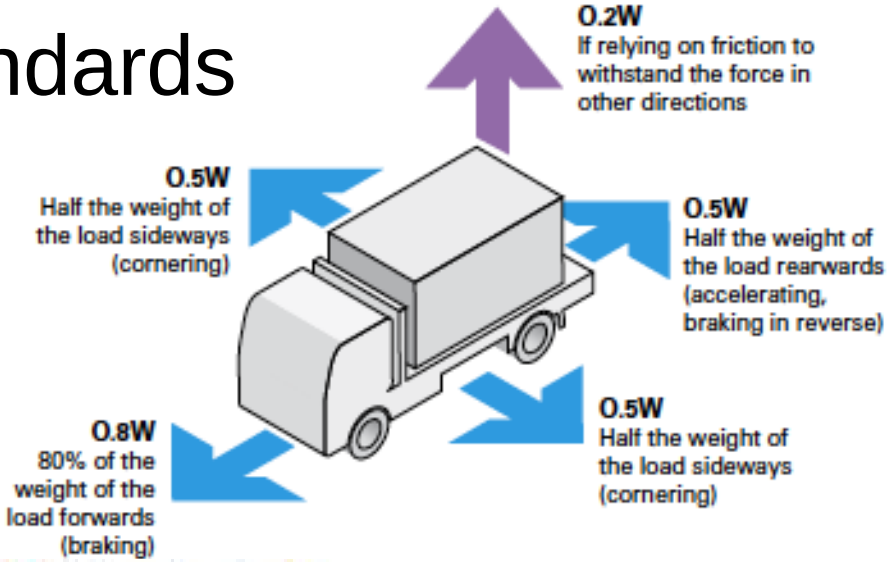
Performance standards

- Good news – No effective change
- Better legal clarity eg Blocked & Contained = max gap 200mm forwards, 50mm sideways, defines "adversely affect stability"
- Nothing stops WA using better guidance in the new Guide to get better safety



WA & NT

3. Legal - Performance Standards



(3) For subsection (1), the circumstances are that the loaded vehicle is subjected to—

(a) any of the following, separately—

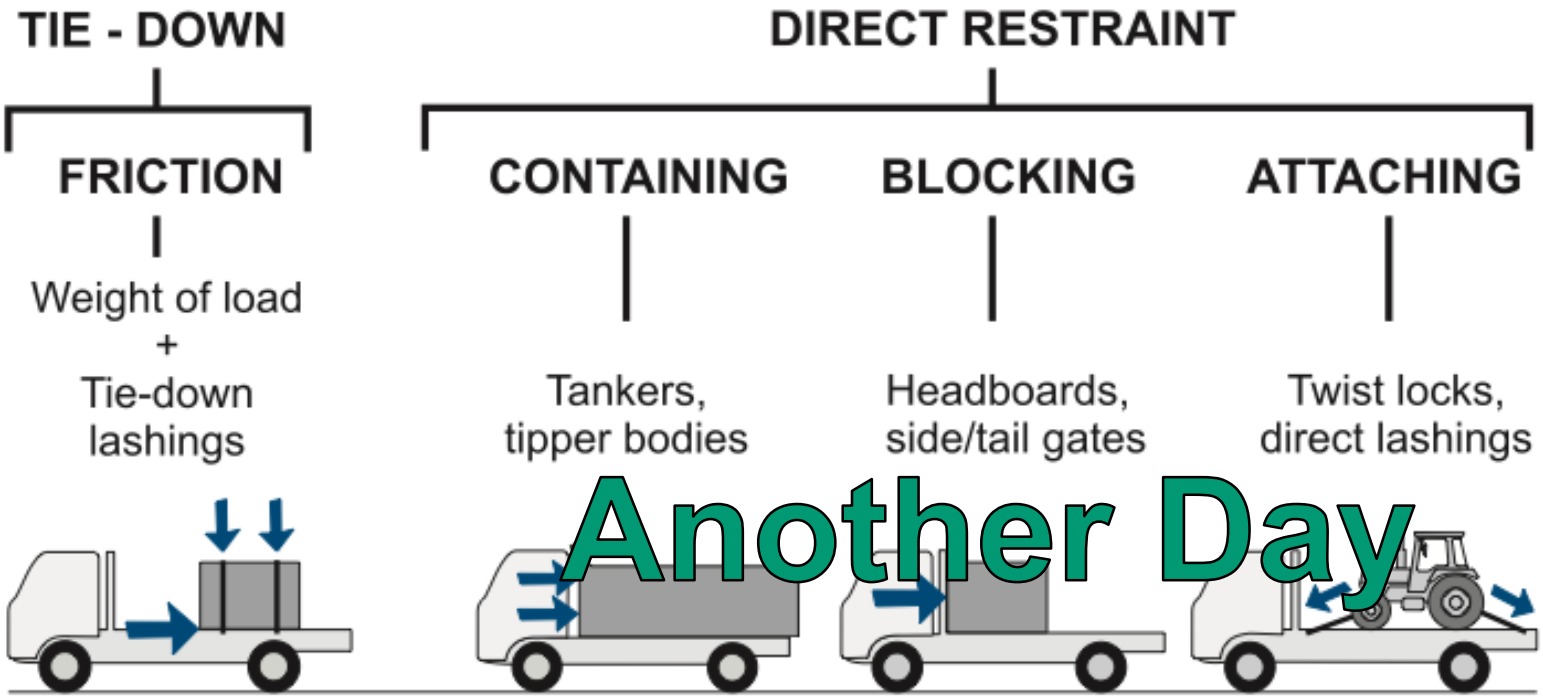
(i) 0.8g deceleration in a forward direction;

(ii) 0.5g deceleration in a rearward direction;

(iii) 0.5g acceleration in a lateral direction; and

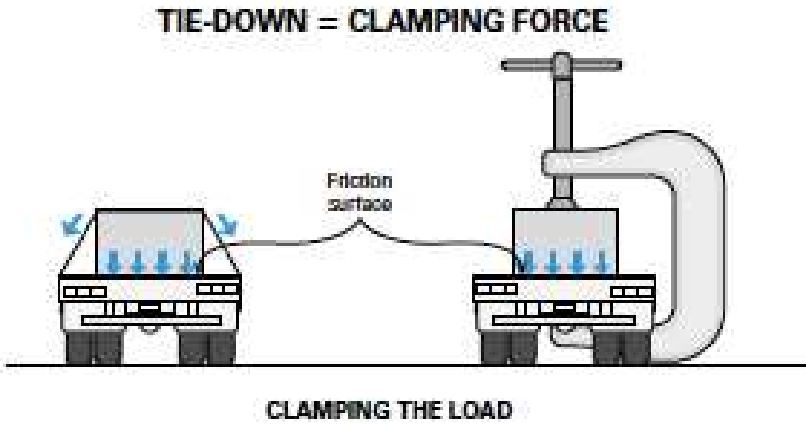
(b) if friction or limited vertical displacement is relied on to comply with paragraph (a)—0.2g acceleration in a vertical direction relative to the load.

4. Types of Load Restraint



- Many loads in Australia use tie-downs.
- Friction is critical for the tie-down method

4. Friction is Critical for Tie Down



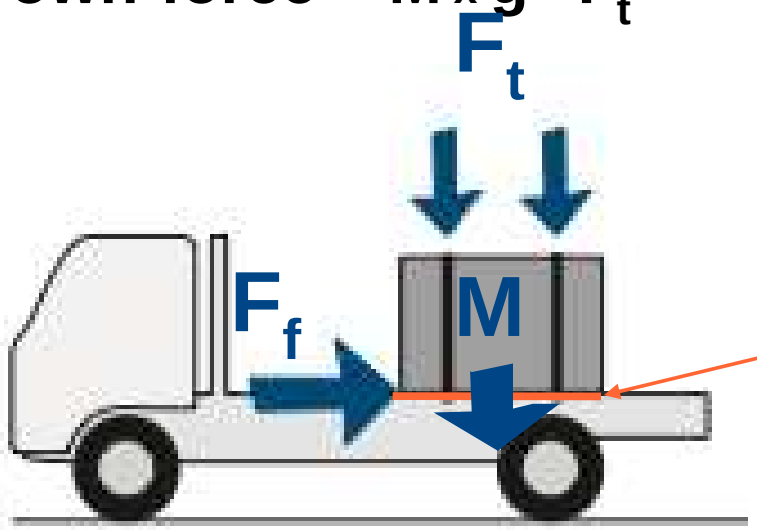
Friction is a function of only:

- The **friction coefficient** – the "grip" between two surfaces, and
- The **down-force**

$F_f = \mu \times$ **Down-force**

Down-force = M x g + F_t

- Down-force is a combination of:
  - The weight of the object
  - +
  - The vertical force down from lashing tension

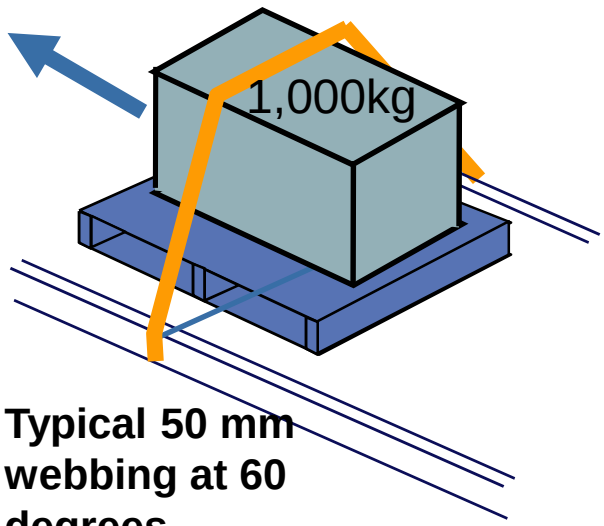


*Friction factor between the surfaces, "**μ**"*

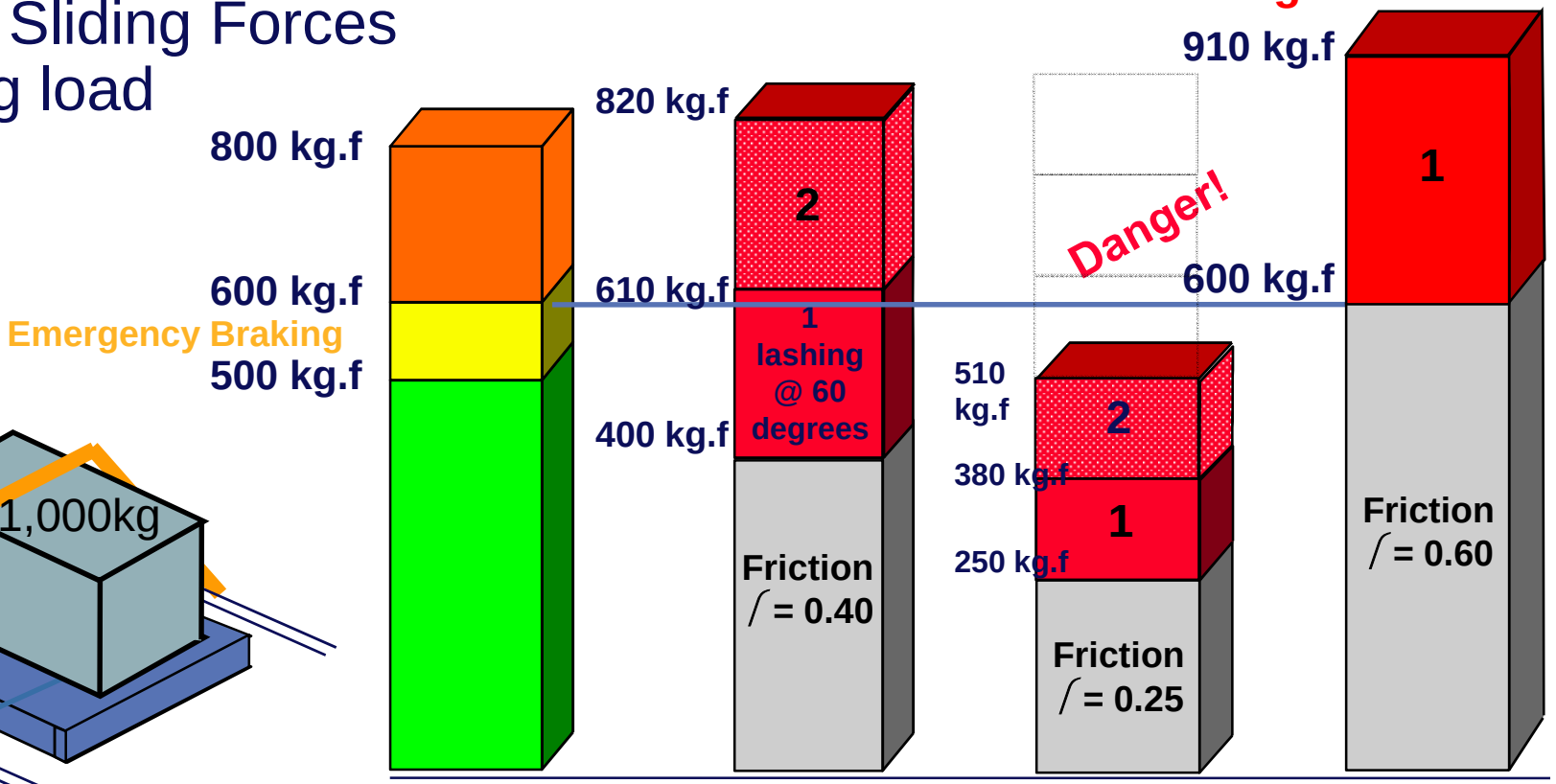
3. Tie-down Restraint – Case Study

Friction is more important than the number of lashings!

Forward Sliding Forces - 1000 kg load



Typical 50 mm webbing at 60 degrees



About 4-5 Australians die each year because of LR fails...

6th Dec 2014

Rollover Risks & LR Lessons

- Speed x Speed is what counts
- Beware a Swerve !
- Only ERP can save rollovers, and that is only sometimes (80 – 90%)
- New Load Restraint Guide still has same Performance Standards
- New Guide gives better SAFETY advice
- For Tie Down, Friction dominates all else
- Low Friction = High Risk!

This B-Double rolled over carrying 68,000 empty wine bottles
High CoG + ~13 km/hr too fast at country roundabout

Questions?