

Wolf Trailer Company, Inc.

Roll-Coupling: Improving Transportation Safety and Productivity

Roll-coupling is an advancement in technology that improves transportation safety and productivity. It reduces traffic congestion, unnecessary fuel consumption and exhaust emissions.

*Prepared for the
Task Force on Vehicle Weights and Dimensions Policy
November 30, 2011*

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The Problem

.....and why roll-coupling needs to be encouraged!



Example of couplers being used in these applications

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Combinations Currently Lacking Roll-Coupling

Truck/Pony Trailer



Truck/Full Trailer



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Load Transfer Ratio (LTR) Performance

Measure

"The Load Transfer Ratio performance measure is the fractional change in load between left- and right-hand side tires in an obstacle avoidance maneuver.

The load transfer ratio should not exceed 0.60, which is equivalent to an 80% - 20% left-right division of wheel loads.

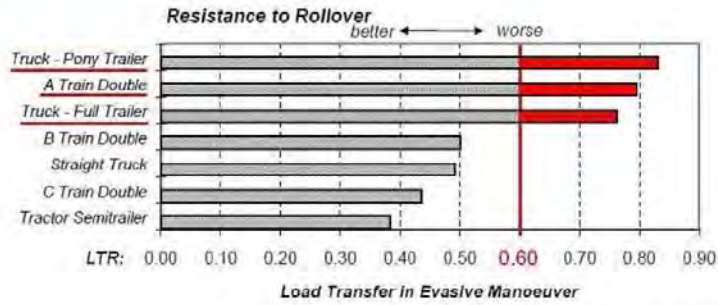
This is a particularly significant performance measure for any vehicle with a high payload center of gravity, double and triple trailer combinations and truck-trailer combinations"

J. R. Billing, C.P. Lam

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Roll-Stability Comparisons

Rollover

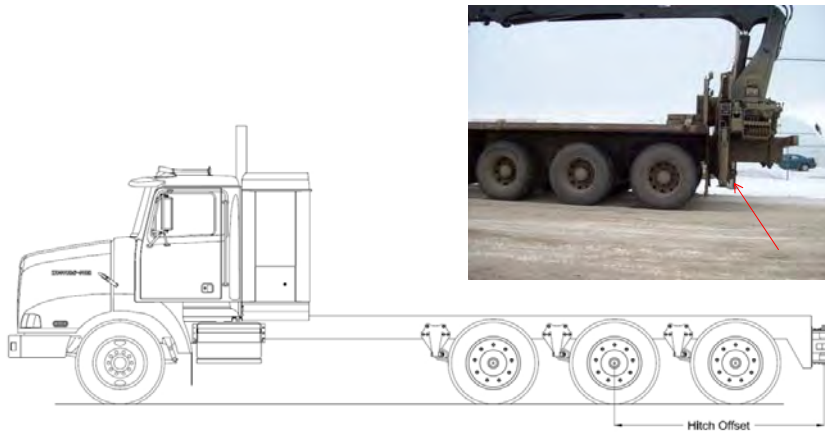


"Performance Based Truck Size and Weight Regulations: A Layman's Guide" 1996

John Pearson, P.Eng., TAC

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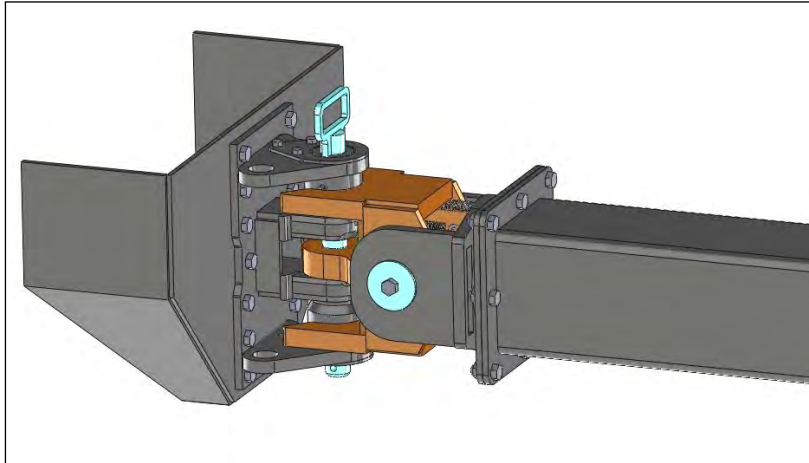
Hitch Offset Issue re Tridem Drives



MoU limits HO to 1.8m but tridem drives require at least 2.5m

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The Solution: Roll-Coupling



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The Question in 2007

If roll-coupled trailers can meet critical TAC safety performance measures, will TAC amend the MoU to enable them to carry full loads?

In response, a research project was launched and the BC representative on the Task Force agreed that CVSE would host the project.

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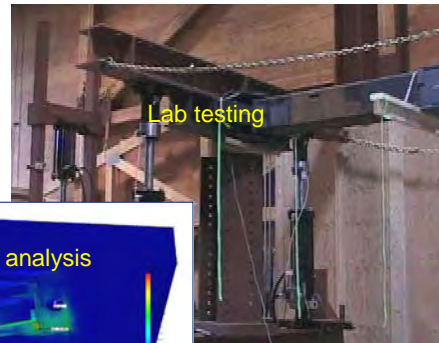
Research Partners

*Government of British Columbia (CVSE)
Wolf Trailer Company
FPInnovations (Feric)
Innovative Vehicle Testing Ltd. (IVT)
Industry (construction & forestry)*

In 2009, an additional project was initiated with the Government of Saskatchewan to address the effect of roll-coupling trailers with tri-drive trucks having hitch offsets up to 3.5 m.

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Establishing the Solution



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Truck Frame Testing



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Combination Vehicle Testing



Vehicles in combination were tested to verify simulation results

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Vehicle Stability Testing

- Vehicle stability testing undertaken to quantify the effect of roll-coupling
- Tilt table test



LTR Comparisons

	TAC Prescribed Performance Standard	Tandem Truck Tridem Pony Roll-Coupled	
		No	Yes
Load Transfer Ratio (LTR):	<0.60	0.725	0.524
Gross Combination Weight (kg):		47,100	50,100

In-service Evaluations and Road Trials



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Conclusions (FP Innovations)

- 1) *We recommend allowing full axle group weights for roll-coupled pony trailers.*
- 2) *Allow roll-coupled full trailer configurations to carry full axle weights (34,000 kg for 4-axle trailer; 26,100 kg for 3-axle trailer).*
- 3) *Roll-coupling hardware is the only option that will enable the performance criteria to be achieved under current dimensional allowances in Western Canada and that will also facilitate straightforward regulation enforcement.*

*Séamus P.S. Parker, R.P.F., P.Eng.
James Sinnett, B.Sc.M.E.
FPInnovations - Feric*

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Roll-Coupled Vehicles in Western Canada



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Inquiries from Across Canada

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November 2011

WEST

B.C. approves higher payloads for pony trailers with roll-coupling hitch connection

Using a roll-coupling hitch to connect a tridem pony trailer to the towing vehicle now allows three extra tonnes of payload

By James Menzies
VERNON, B.C. — After years of stability testing and hundreds of thousands of dollars in research and development, Wolf Trailer Company has convinced B.C.'s Commercial Vehicle Safety and Enforcement Branch to increase the maximum allowable weights for tridem pony trailers.

B.C. now allows full weights of 24 tonnes, provided the pony trailer is connected to the towing vehicle by a roll-coupling hitch system. That's a three-tonne increase over previous weights, says Eric Amlin, a former researcher with the Forest Engineering Research Institute of Canada (FERIC) and now a technical consultant

with Wolf Trailer Company.

The increased weight allowance will benefit truckers in the forestry, construction and oilfield sectors, he noted. And better yet, the combination, when used with a roll-coupling hitch system — is actually more stable than the same configuration connected via pintle hook, even at the lower weights.

"Roll-coupling the trailer to the truck at the higher weights is a more stable vehicle than the truck without roll-coupling at the lower weights," Amlin told *Truck News*.

And there has been ample testing done to support that theory. FERIC began examining the stability of vehicle combinations using roll-coupling



SAFER AND MORE PRODUCTIVE: A roll-coupling hitch design like this one (inset) allows for three extra tonnes of payload on tridem pony trailers in B.C.

hitch systems several years ago and at the same time, Wolf Trailer Company was doing its own research and devel-

opment on just such a device.

"Individually of each other, we both came to the conclusion that roll-coupling would be the best way to improve

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Moving Forward

Roll-coupling enables :

- *all truck/trailer combinations to be more productive while complying with the critical TAC performance standards.*
- *vehicles that are otherwise too unstable to carry full loads to increase productivity up to 20%.*
- *fewer loaded trips = reduces traffic congestion, “greener”*

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Moving Forward

A “Roll-Coupling Standard” has been submitted and the request is:

- a)that the Task Force embed this standard in the MoU.*
- b)amend the MoU to exclude roll-coupled vehicles from reduced weight caps for pony trailers and full trailers.*

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Moving Forward

Elements of the Proposed Standard for Roll-Coupling Hitches (other than fifth wheels)

Static Load Rating – 1) 400 kN in the longitudinal direction,
2) 90 kN in the vertical direction,
3) 40 kN in the lateral direction.

Ultimate Strength - The torsional yield strength of the hitch, drawbar and trailer structure shall be sufficient to withstand an applied torsional load of 140 kN-m

Torsional Stiffness - The drawbar shall have a torsional stiffness of at least 4 kN-m/degree with respect to the longitudinal

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MoU

Amending the MoU will:

- 1) Harmonize regulation of roll-coupled pony trailers and full trailers in Canada.*
- 2) Encourage industry to start phasing in safer and more productive vehicles.*
- 3) Provide assurance to industry that roll-coupled vehicles are a permanent alternative to weight caps to improve safety.*

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Thank You



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