

EPR 008

STATIC VEHICLE TWIST TEST FOR ROAD/RAIL VEHICLES

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Document control

Version	Date	Summary of change
(RSP 008) 1.0	Sept 2003	
1.1	Nov 2005	RIC amended to RailCorp
1.2	Dec 2006	Position titles amended
1.3	July 2008	Document control page added
(EPR 0008) 1.0	Dec 2009	Reformatted and renumbered to EPR 0008
1.1	Oct 2011	Reference to EPR 008 FM 01 added

Summary of changes from previous version

Summary of change	Section

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1 Introduction

Before any rail vehicle is permitted to operate on the RailCorp network, the vehicles must comply with the RailCorp Minimum Operating Standards for Rolling Stock ESR 0001.

The static vehicle twist test is one of a number of vehicle compatibility tests that are conducted to ensure the vehicle complies with certain aspects of the Minimum Operating Standards for Rolling Stock.

2 Purpose

A static vehicle twist test is performed to determine whether the vehicle is torsionally resilient enough to be able to traverse a twisted section of track safely, without risk of significant wheel unloading and consequential derailment.

A twisted section of track is one where the track cant varies with distance, as on the entrance and exit of curves with superelevation.

In this test, the wheels along one side of the vehicle are lifted and packed in a ramp configuration to simulate the specified track twist, and the percentage reduction in wheel load of the wheel at the bottom of the ramp determined. For the vehicle to pass the test, the change in wheel load must be less than the specified percentage of the nominal wheel load.

3 Scope

The test shall be conducted on every road/rail vehicle prior to operation on the RailCorp network. The test shall also be conducted after any modification or replacement of suspension components, or any change in the mass distribution of the vehicle.

The test is also carried out during the annual re-certification of road/rail vehicles.

The static twist test is carried out to determine the percentage wheel unloading of the rail wheel at each of the four outer corners of the vehicle.

In this test, the wheels along one side of the vehicle are lifted and packed in a ramp configuration to simulate the specified track twist, and the percentage reduction in wheel load of the wheel at the bottom of the ramp determined. For the vehicle to pass the test, the change in wheel load must be less than the specified percentage of the nominal wheel load.

4 Application

This procedure is to be used by rolling stock manufacturers and testing personnel when assessing the vehicle for compliance with the RailCorp Minimum Operating Standards for Rolling Stock or following derailment of the vehicle.

5 References

ESR 0001, Minimum Operating Standards for Rolling Stock

ESR 0001 – 200.21 (RSU 283) Static Vehicle Twist Test

ESR 0001 – 700.12 (RSU 721) Static Vehicle Twist Test

ESR 0002 Road/Rail Vehicle Certification and Re-certification

EPR 008 FM 01 Road/Rail Vehicle Twist Test Recording Form

6 Equipment Required

- A straight level test site, preferably with rails embedded in concrete. The top of the rails should be level within +/- 1mm.
- Portable load cell and read out unit capable of weighing up to the rail wheel load of the test vehicle.
- Suitable jacking equipment to lift the road and rail wheels of the test vehicle.
- Suitable steel and / or aluminium packers to be inserted beneath the road and rail wheels of the test vehicle to simulate the specified track twist.
- Portable 240 Volt generator or suitable 240 Volt mains supply at the test site to power the load cell and readout unit, and the jacking equipment.
- Suitable extension leads and plug board for power supply.
- Tape measure and steel rule.
- Suitable chocks or wedges.
- Two Red flags.

7 Site Safety Evaluation

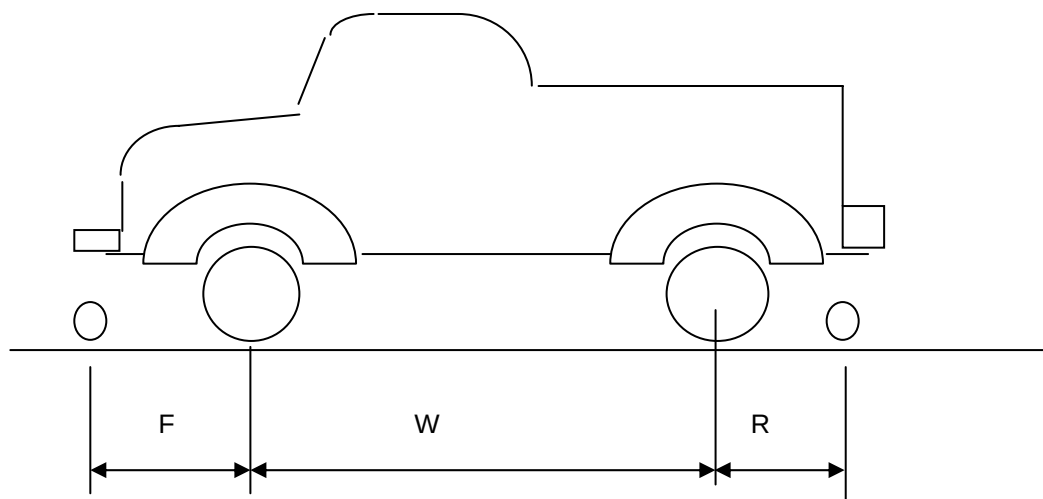
Conduct a safety site inspection and safety briefing in accordance with RSP-013 Static Test Site Safety Evaluation.

8 Test Vehicle Configuration

The test vehicle should be in full operational condition, and in the tare condition, with any tanks in the empty state. Spare tyres or any other equipment which will always remain on the vehicle should be left on the vehicle in the required position.

9 Procedure

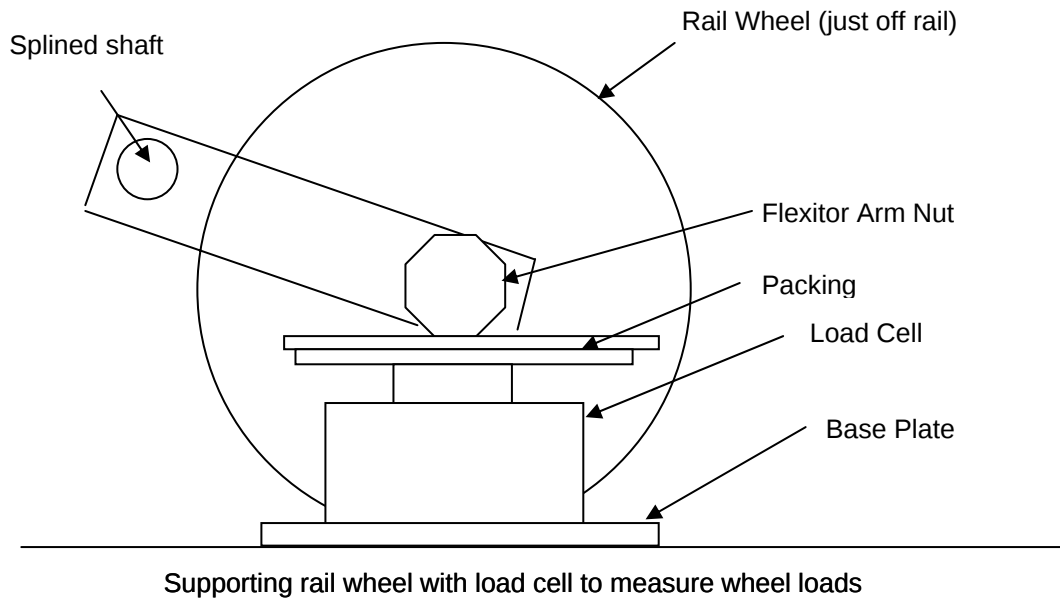
- a) Check that the test vehicle is in the minimum tare condition and locate the vehicle on the test site.
- b) Put the test vehicle on-track at the test site, ensuring that the front and rear rail wheel equipment is fully deployed with the wheel frame limit stops in contact with the vehicle chassis.
- c) Run the test vehicle back and forth over the test site to centralise the wheels and clear any obstructions from the track flangeways. Stop the vehicle on the test site in a suitable position for conducting the test.
- d) Place a red flag on the front and rear of the test vehicle, and place a chock or wedge at each side of one rail wheel on the opposite side of the vehicle to the wheel being weighed. Release the hand brake.
- e) Measure the vehicle wheel base over the road wheel centres, W, and the distance from the front road wheel centre to the front rail wheel centre, F. Similarly, measure the distance from the rear road wheel centre to the rear rail wheel centre, R. See the diagram below.



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- The diagram illustrates a cable-stayed bridge model. A horizontal base is supported by a vertical line labeled "Load Cell". A cable, labeled "W", runs from the base to a point on the bridge deck. The distance from the Load Cell to the point where the cable "W" attaches to the deck is labeled "P1". The cable "W" is labeled "1 in 100". A second cable, labeled "R", runs from the point where "W" attaches to the deck to a point further along the deck. The distance between these two points is labeled "P2". The cable "R" is labeled "1 in 250". A third cable, labeled "F", runs from the point where "R" attaches to the deck to a point further along the deck. The distance between these two points is labeled "P3". A fourth cable, labeled "4 m", runs from the point where "F" attaches to the deck to a point further along the deck. The distance between these two points is labeled "4 m".

$$P3 = [(F + W + R) - 4000] / 250 + 40$$

- g) Using the jack, raise the rail wheel at one corner of the vehicle, and position the load cell beneath the stub axle nut on the outer end of the flexitor arm. Use a steel plate beneath the load cell for support, and place sufficient packing between the flexitor arm nut and the load cell such that the rail wheel is just off the rail when the jack is released. See the diagram below.



- h) Push the zero button on the load cell read out unit before releasing the jack, and then release the jack, ensuring that the flexitor nut is supported centrally on the load cell. Check that the rail wheel can be rotated freely by hand without it touching the rail, and without the wheel / rail clearance being excessive.
- i) After ensuring that no personnel are on or leaning on the vehicle, record the wheel load displayed on the read out unit. This is the static wheel load W_s .
- j) With the load cell in position, using the jack, raise the road wheel and insert the packing P1 beneath the wheel. Release the jack.
- k) Using the jack, raise the next road wheel and insert the packing P2 beneath the wheel. Release the jack.
- l) Using the jack, raise the far rail wheel and insert the packing P3 beneath the wheel. Release the jack.
- m) Check that the load cell is still supporting the flexitor nut, and that the rail wheel can still be rotated without it touching the rail.
- n) Record the unloaded wheel load, W_u , displayed on the read out unit, ensuring that no personnel are on or leaning on the test vehicle.
- o) Calculate the percentage wheel unloading for the wheel being tested as follows:
$$\% \text{ Wheel Unloading} = (W_s - W_u) / W_s \times 100$$
- p) Starting at the high end of the vehicle, use the jack to remove all the packing from beneath the wheels.
- q) If the percentage wheel unloading exceeded 60%, increase the flexitor preload by removing the flexitor arm from the splined shaft and indexing the flexitor arm the required number of splines. Then repeat steps g) to o) for the same wheel.
- r) Repeat steps g) to o) for the remaining three rail wheels on the vehicle. If the flexitor units are adjusted, all four wheels must be retested.

Appendix A Road/Rail Vehicle Twist Test Recording Form

Below is a suggested form to record the measured wheel loads and percentage wheel unloading. Refer to EPR 008 FM 01

STATIC VEHICLE TWIST TEST

Test Date	
Test Location	
Test Vehicle	
Front Steerable Wheels on Rail	Yes / No
Road / Rail Manufacturer and Model	

TEST RESULTS

Wheel Position	Packing	Wheel Load (kg)	Percentage Unloading	Wheel
L1	0			
L1				
R1	0			
R1				
L4	0			
L4				
R4	0			
R4				