AUSTRALIAN RAIL TRACK CORPORATION LTD

Discipline
**Engineering Standard**

Category
**Rolling Stock**

# Static Vehicle Weigh Test

# WOS 01.C

Applicability

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|---|---|
| **ARTC Network wide** | |
| **New South Wales** | ✓ |
| **Western Jurisdiction** | |
| **Victoria** | |

Primary Source
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## Contents

This appendix is set out as follows:

## WOS 01.C - Static vehicle weigh test

### C[1] Scope of the test

This section describes the procedure recommended for the weighing of all rail vehicles, and the method of assessing measured results, including allowable limits.

The weighing facility used shall be capable of measuring individual wheel loads.

### C[2] Weighing test procedure

The weight of the vehicle in working order and the vertical load exerted by each wheel on the track shall be measured, with due regard as to the accuracy of the measuring equipment.

Either conventional mechanical or electronic/load cell weighing methods may be used.

Track at the weighing site must be level in the horizontal plane within 1 mm for at least 20m. either side of the site and nominally tangent.

C2.1 **Vehicle Inspection**

Prior to the weighing operation, the following shall be checked:-

C2.1.1 All axle box clearances must be equal to or greater than the minimum allowable dimension. This may be checked using sufficiently long feeler gauges or by running the vehicle over an obstruction placed on the railhead, and observing free motion of the axle boxes relative to the hornguides.

C2.1.2 All equipment fitted to the bogies of vehicles must be in the running condition, which includes the correct fitment of all dampers, traction rods, torsion bars and levelling valves which are applicable.

C2.1.3 Vehicles with semi-permanent couplers shall remain coupled throughout the weighing operation.

C2.1.4 The car body of the vehicle must be located centrally in the lateral direction with respect to both bogies and track.

C2.1.5 For vehicles fitted with an air spring secondary suspension, the spring height at each side of each bogie, when on level track, must be set at the correct spring design height as specified by the spring manufacturer.

**Note:** Prior to and during the weighing process, air springs shall be kept fully inflated at the correct level by a vehicle main reservoir air supply.

C2.1.6 Vehicle heights shall be measured from railhead to a reference point on the car body and must be within allowable limits for the vehicle being weighed.

**Note:** Vehicle height shall not be altered by adjustment of levelling valves on vehicles so equipped, unless the air spring height is incorrect.

C2.1.7 All brakes must be released on the vehicle being weighed. Brakes shall not be applied on any vehicle being weighed, at any time during the weighing operation, including shunting on and off the weighbridge.

**Note:** Particular attention shall be given to ensure that spring parking brakes are released either manually or by maintaining a main reservoir air supply on the vehicle, for vehicles so equipped.

## C2.2 Vehicle Weighing Procedure

For consistency in the method of weighing vehicles, it is recommended that the following procedure shall be followed.

C2.2.1 The vehicle shall be run at reduced speed on to the weighbridge.

C2.2.2 Whilst the vehicle is on the weighbridge, no alteration or adjustment shall be made to the state of the vehicle (body or suspension) including artificial blows, shaking or other procedure unless the vehicle is run over a minimum distance of 200 m after the above mentioned adjustment is carried out and immediately prior to reweighing the vehicle.

**Note:** No personnel are to be permitted in the vehicle during the weighing process.

C2.2.3 The weighing procedure shall consist of four independent weighings as follows:-

- Weigh (1) - direction A
- Weigh (2) - direction B
- Weigh (3) - direction A
- Weigh (4) - direction B

That is, the direction which the vehicle approaches the weighbridge shall alternate between successive weighings.

Also where possible, the vehicle must be run over a minimum distance of 200 m immediately before each weighing.

This will eliminate, as far as possible, errors resulting from friction in the vehicle suspension system.

## C2.3 Analysis of measured results – total vehicle

C2.3.1 The weighing uncertainty, E shall be calculated as follows:

After calculating the total vehicle mass for each of the weighings of clause 2.2.3, the weighing uncertainty shall be determined by taking the difference between the maximum total vehicle mass, Mmax, and the minimum total vehicle mass, Mmin, and dividing the result by two.

That is, $E = 0.5 (M_{max} - M_{min})$.

C2.3.2 The 'average total vehicle mass, Ma' referred to in clauses 2.3.3, 2.3.4, 2.4.2 and 2.4.3 shall be calculated using all the total vehicle masses, as determined in clause 2.3.1 for each of the weighings of clause 2.2.3.

That is, Ma = 0.25 [ (M1) + (M2) + (M3) + (M4) ]

C2.3.3 For the vehicle weighed in the tare and fully loaded condition and in running order, the 'average total vehicle mass, Ma' minus the weighing uncertainty E, shall not exceed the maximum specified mass.

## C2.4 Analysis of measured results – individual wheels

### C2.4.1 Wheel Load P

For each wheel in turn the average wheel load shall be determined using that wheel's individual load from each of the weighings of clause 2.2.3. For further reference in this specification, this individual average wheel load shall be referred to as 'Wheel Load P'.

That is, P = O.25 [ P(1) + P(2) + P(3) + P(4) ]

### C2.4.2 Driving Axles - Axle to Axle Load

The following is recommended for vehicles with driving axles:

The sum of the two Wheel Loads P at each driving axle in turn, shall not deviate by more than ~ 2% from the average axle load, (determined by dividing the 'average total vehicle mass', Ma by the number of axles), for driving axles intended to exert the same tractive effort.

In summary, for each driving axle in turn,

$$(P\ 1 + P2)\ max = \frac{1.02}{A}(Ma + E)$$

$$(P\ 1 + P2)\ min = \frac{0.98}{A}(Ma - E)$$

Where,

P1, P2 = wheel loads on the same driving axle.

A = Total number of axles on vehicle being weighed.

E = weighing uncertainty.

(P 1 + P2) max shall not exceed the maximum allowable axle load.

### C2.4.3 Non driving axles - axle to axle load

For vehicles with non driving axles:

The sum of the two Wheel Loads P at each driving axle in turn, shall not deviate by more than ~ 6% from the average axle load, (determined by dividing the 'average total vehicle mass', Ma by the number of axles).

In summary, for each non driving axle in turn,

$$(P3 + P4)\ max = \frac{1.06}{A}(Ma + E)$$

$$(P3 + P4)\ min = \frac{0.94}{A}(Ma - E)$$

Where,

P3, P4 = wheel loads on the same non driving axle.

A = total number of axles on vehicle being weighed.

E = weighing uncertainty.

(P3 + P4) max shall not exceed the maximum allowable axle load.

### C2.4.4 Wheel load across an axle

For a given axle, the measured wheel load P must not deviate by more than ~ 4% from the average load per wheel of this axle.

In summary for each axle in turn:

$$P\ max = 0.52\left(P1 + P2 + \frac{E}{A}\right)$$

$$P\ min = 0.48\left(P1 + P2 - \frac{E}{A}\right)$$

Where,

P max, P min = Maximum and minimum allowable wheel loads P, respectively.

P1, P2 = The two wheel loads associated with each axle in turn.

E = Weighing uncertainty.

A = Total number of axles on vehicle being weighed.

### C2.4.5 Vehicle mass side to side

Notwithstanding Clause 2.4.4, the sum of measured wheel loads P along one side of the vehicle must not deviate by more than ~ 2% from the average of the sum of all wheel loads P on both sides of the vehicle.

In summary,:

$$R\ max = L\ max = \frac{1.02}{2}(L + R + E)$$

$$R\ min = L\ min = \frac{0.98}{2}(L + R - E)$$

Where,

R max, L max= Maximum permissible sum of ‘wheel loads P’ on right and left hand sides of vehicle respectively.

R min, L min= Minimum permissible sum of the ‘wheel loads P’ on right and left hand sides of vehicle respectively.

R, L = Sum of ‘wheel loads P’ on right and left hand sides of vehicle respectively.

E = Weighing uncertainty.