

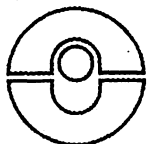
UIC Code

5 6 6

O R

3rd edition, 1.1.90

**Loadings of coach bodies
and their components**



International Union of Railways

O R

Leaflet to be classified in volumes:

- IV - Operating
- V - Transport stock

Amendments

1. 1.1.92	
Addendum 1.1.92	
2. 1.1.94	
Addendum 1.7.94.....	
.....	
.....	
.....	

Preliminary remarks:

Obligatory provisions are preceded by an asterisk: *

The double vertical line (II) in the margin denotes modifications introduced with effect from the date shown at the foot of the page.

Enforcement of this leaflet is subject to the conditions stipulated under the heading "Application" at the end of the document.

Note

This leaflet forms part of a set which also includes :

- Leaflet 440 : Loudspeaker systems in RIC coaches.
- Leaflet 515 : Coaches — Running gear.
- Leaflet 532 : Trailing stock — Signal lamp brackets — Coaches — Fixed electric signal lamps.
- Leaflet 550 : Power supply installations for passenger stock.
- Leaflet 551 : Steam heating.
- Leaflet 552 : Electric power supply for trains taken from the train cable.
- Leaflet 553 : Ventilation, heating and air-conditioning in coaches.
- Leaflet 554-1 : Power supply to electrical equipment on stationary railway vehicles from a local mains system or another source of energy at 220 V or 380 V, 50 Hz.
- Leaflet 555 : Electric lighting in passenger rolling stock.
- Leaflet 560 : Doors, entrance platforms, windows, steps, handles and handrails of coaches and luggage vans.
- Leaflet 561 : Means of intercommunication for coaches.
- Leaflet 562 : Baggage racks and coat hooks.
- Leaflet 563 : Fittings provided in coaches in the interests of hygiene and cleanliness.
- Leaflet 564-1 : Coaches — Windows made from safety glass.

O R

- Leaflet 564-2 : Regulations relating to fire protection and fire-fighting measures in passenger-carrying railway vehicles or assimilated vehicles used on international services.
- Leaflet 565-1 : Special comfort and constructional characteristics for sleeping cars accepted in international traffic.
- Leaflet 565-2 : Special comfort and constructional characteristics and rules of hygiene for restaurant cars accepted in international traffic.
- Leaflet 567-1 : Standard X- and Y-type coaches accepted for running on international services — Characteristics.
- Leaflet 567-2 : Standard Z-type coaches accepted for running in international traffic — Characteristics.
- Leaflet 567-3 : Constructional arrangements on coaches with a view to the application of the automatic coupler on the Member railways of the UIC and on the Member railways of the OSJD.
- Leaflet 567-4 : Standard open bogie van adapted for the conveyance of motor cars — Characteristics.
- Leaflet 568 : Loudspeaker and telephone systems in RIC coaches — Standard technical characteristics.
- Leaflet 569 : Regulations to be observed in the construction of coaches and vans suitable for conveyance by train ferry.
- Leaflet 580 : Inscriptions and markings, route indicators and number plates to be affixed on coaching stock used in international traffic.

Contents

- 0 - General
- 1 - Coach body
 - 1.1 - Design characteristics
 - 1.2 - Proof loads
 - 1.3 - Loads under service conditions
 - 1.4 - Vibration
 - 1.5 - Aerodynamic loads on pressure-resistant coach bodies, requirements and test loads
- 2 - Component part of coaches
 - 2.1 - Test loads
 - 2.2 - Loads under service conditions
 - 2.3 - Conditions for adjustable seats in special coaches
- 3 - Limit loads
 - 3.1 - Permissible stresses
 - 3.2 - Safety factors
 - 3.2.1 - Test loads
 - 3.2.2 - Loads under service conditions
- 4 - Test conditions and methods
 - 4.0 - General
 - 4.1 - Coach body
 - 4.2 - Component part of coaches
 - Appendix 1 - Position of the axial impact and traction stops
 - Appendix 2 - Layout of the flange mounting face
 - Appendix 3 - Maximum tension and compression forces, depending on the position and direction of the arm
 - Appendix 4 - Maximum compression forces, depending on the position and direction of the leg
 - Appendix 5 - Examples of hand and finger forces
 - Appendix 6 - Examples of torques which can be exerted by the hands
 - Appendix 7 - Test-loads for seats, folding tables and tip-up seats
 - Appendix 8 - Layout of spray nozzles for tests on external window glazing
 - Appendix 9 - Test loads on external doors of coaches and vans
 - Appendix 10.1 - Stability testing of movable chairs
 - Appendix 10.2 - Stability testing of movable chairs

OR

0 - General

This leaflet contains loadings for coaches used in international traffic, and for their components.

1 - Coach body

1.1 - Design characteristics

* 1.1.1 - The body of the passenger coach comprises the underframe, the side walls, the end walls and the roof, which together form a tubular beam.

* 1.1.2 - The end walls, strengthened by anti-collision pillars, shall be so joined to the headstocks, cantrail and roof that the maximum amount of energy produced by a collision is absorbed first by deformation of the end wall section before the passenger compartments are deformed.

* 1.1.3 - The coach body, in running order and mounted on the bogies, shall be so designed that under all conditions its natural frequencies differ from the hunting and pitching frequencies of the bogie, so that no resonance occurs throughout the speed range.

1.2 - Proof loads

1.2.1 - The coach body shall withstand the following proof loads without permanent deformation and without exceeding the permitted stresses:

* 1.2.1.1 - A static compressive load of:

- 2 000 kN minimum at buffer level, *
- 500 kN minimum diagonally at buffer level,
- 400 kN minimum at a level 350 mm above buffer centre line (1),
- 300 kN minimum at the level of the window guard-rail (1),
- 300 kN minimum at the level of the cantrail (1).

(1) Not applicable to the standard open bogie van fitted out for automotive transport.

The load, as shearing stress, must be applied on one wall at first; the point of application on the other must be at buffer height. ||

- 2 000 kN minimum on the automatic coupler buffing gear (1).

(On impact stop "c" (Appendix 1) or on flange bearing surface (Appendix 2)).

* 1.2.1.2 - A static tensile load of :

- 1 500 kN minimum on the "a" traction stops of the automatic coupler (design with traction stops) (Appendix 1) (1).
- 1 000 kN minimum on the "b" traction stops (design with traction stops) (Appendix 1) (1).
- 1 500 kN minimum on the "c" flange bearing surface of the automatic-coupler or on the fastening screws (design with flange) (Appendix 2) (1).

* 1.2.1.3 - A static verticle load of :

$$F_z = 1.3 (m_1 + m_2) \times g \text{ [N]}$$

evenly distributed.

Wherein :

m_1 = weight of coach body in running order

m_2 = number of seats (2) x 80 kg + area of side corridor and vestibules [m^2] x 4 x 80 kg

$g = 9.81 \text{ m/s}^2$.

(1) Conditions for the forces transmitted by the automatic coupler : see also UIC leaflet 567-3.

(2) Seats in compartments only or lounge coach.

OR

For the standard open bogie van for conveyance of motor vehicles, m_2 is as follows :

m_2 = maximum load of van = 15 t. The maximum load per tier of 10 t shall not be exceeded..

For conventional vans, m_2 is as follows :

$$m_2 = m_L \cdot F_L$$

wherein

$m_L = 300 \text{ [kg/m}^2\text{]} \triangleq$ minimum load per 1 m^2 of loading area

F_L = loading area including side corridor and vestibules [m^2].

1.2.1.4 - It is recommended that buffing tests be conducted as described under 4.1.3. These tests serve to check the calculations described in 2.1.4 and to test the functional safety of components fastened in and to the coach.

*** 1.2.2** - If during purely compressive or tensile testing the deflection is directed positively, i.e. downwards, the coach body shall withstand the following test loads without permanent deformation and without exceeding the permitted stresses :

1.2.2.1 - A static compressive load of :

2 000 kN at buffer or automatic coupler level applied at the same time as the vertical load specified under 1.2.1.3.

1.2.2.2 - A static tensile load of :

1 500 kN at the same time as the load specified under 1.2.1.3.

OR

1.2.2.3 - A vertical load from the weight of the vehicle when lifted beneath the headstock in the area of the side buffers, of

$$F_z = (m_1 + m_3) \times g \text{ N}$$

wherein:

m_1 = weight of the lifted part of the empty coach body in running order, lying on the bogie at the other end of the vehicle (equal to approx. half the weight of the coach body, when this is symmetrical),

m_3 = weight of the bogie at the end of the coach at which the vehicle is raised.

1.2.3 - It is recommended that a roof test-piece be subjected to a compression test until it collapses or buckles.

1.3 - Loads under service conditions

Loads occurring under service conditions may lead to material fatigue strength of the material:

$$F_z = 1.2 (m_1 + m_4) \times g \text{ N}$$

wherein:

m_1 = weight of the coach body in running order,

m_4 = payload.

The payload shall be determined as follows: (1)

- 1 passenger per seat,
- 2 passengers per m² in side corridors and entrance vestibules,
- 2 passengers per service compartment,
- 300 kg per m² of the luggage compartment,
- For open standard bogie vans for conveyance of motor vehicles: maximum load 15 t; a maximum load of 10 t per tier shall not be exceeded.

(1) The weight of a passenger, incl. luggage, shall be assumed as  81 kg.

OR**1.4 - Vibration**

It is recommended that behaviour under vibration be investigated by means of tests on fully-equipped passenger coaches in running order or on coach bodies.

1.5 - Aerodynamic loads on pressure-resistant coach bodies, requirements and test loads

(in abeyance).

2 - Component parts of coaches**2.1 - Test loads**

Component parts and their fastenings shall withstand the following test loads without permanent deformation and without exceeding the permitted stresses:

2.1.1 - Component parts mounted in coaches:*** 2.1.1.1 - General test loads****2.1.1.1.1 - For the weight of a passenger, assume:**

- 100 kg as maximum load,
- 80 kg as average load including luggage,
- 75 kg as average load without luggage.

2.1.1.1.2 - For assumed maximum loads and moments which a passenger may exert:

See Appendices 3 to 6.

*** 2.1.1.1.3 - When calculating the mechanical strength of fastenings of coach components, the values to be used for accelerations or forces are those given under points 2.1.4.1 and 2.1.4.2.**

2.1.1.1.4 - Components and their fastenings to be mounted inside vehicles may be designed for a longitudinal acceleration of 3 g on coaches fitted with hydrostatic or hydrodynamic buffers.

*** 2.1.1.2 - Special test loads:**

Luggage racks: 1000 N downwards per metre length and an exceptional load of 850 N as a single load exerted at any point on the front edge.

Umbrella racks: 250 N downwards per metre length.

Coat hooks : 300 N downwards,
250 N horizontally in each direction.

Seats (per seat), see Appendix 7 :

- 1 500 N horizontally at any point on the upper part of the supporting component (upper part of the seat back).
- 750 N vertically and/or horizontally at the front end of the armrest.
- 1 200 N upwards or 1 000 N downwards at the front edge of the seat (1).

Folding table : 750 N downwards at the centre of the table.

Tip-up seat : 1 000 N downwards at the centre of the seat.

Floor (2) :

The van shall be subjected to the load of a motor vehicle with a maximum weight of 2.5 t. Instead of a motor vehicle, the loads specified under 4.2.1.5 may be applied.

2.1.2 - Component parts mounted on coaches

* 2.1.2.1 - Special test loads :

- entrance and loading doors : 2 500 N/m² (3) or 1 900 N/m² (4) plus 800 N applied as a point load on the centre of the door leaf,
- intercommunicating doors : 2 400 N/m² (3)
1 800 N/m² (4).

Examples of the application of test loads to external doors are shown in Appendix 9 :

- windows : 2 500 N/m² (3) or 1 900 N/m² (4).

(1) According to seat construction.

(2) For the standard open bogie van for conveyance of motor vehicles.

(3) For V = 200 km/h on open track, including wind pressure of 700 N/m².

(4) For V = 160 km/h on open track, including wind pressure of 700 N/m².

O R

2.1.3 - Exceptional loads due to vandalism

Components subject to vandalism shall be tested on the basis of the loads occurring under service conditions.

2.1.4 - Buffing impact

*** 2.1.4.1** - To allow for the loads resulting from buffing impact the following accelerations, acting on the dead weight of the components, shall be assumed in design of the fastenings :

- longitudinally : 5 g
- transversely : 1 g
- vertically : c g (including gravity).

c = 3 at the coach end, falling linearly to 1.5 at the coach centre.

*** 2.1.4.2 - Design of fastenings (1)**

In calculating the mechanical strength of the fastenings of components on coaches, the following loads shall be taken as a basis :

- longitudinally : $F_x = m_1 \cdot 5 \text{ g [N]}$
- transversely : $F_y = m_1 \cdot g \text{ [N]}$
- vertically : $F_z = m_1 \cdot c \cdot g \text{ [N]}$

wherein

m_1 = the weight (kg) to be allowed for the component

g = acceleration due to gravity = 9.81 m/s²

c = see 2.1.4.1.

The resultant of the loads F_x , F_y , F_z shall be used.

(1) The calculations may be replaced by a buffing test.

2.1.4.3 - Recommended as permissible stresses for the calculation in accordance with 2.1.4.2 are those which result from application of the safety factors specified in 3.2.14.

2.2 - Loads under service conditions

*** 2.2.1** - Components and their fastenings mounted in and on coaches shall withstand the following loads under service conditions without exceeding the permissible stresses:

2.2.1.1 - The accelerations quoted below, resulting from the loads occurring in service, act (in addition to the acceleration due to gravity) on the components:

- longitudinally: $a_x = 1.6 \text{ m/s}^2$ for conventional braking
 $a_x = 2.5 \text{ m/s}^2$ for electromagnetic braking.
- transversely: $a_y = 1.5 \text{ m/s}^2$ transverse acceleration including non-compensated centrifugal acceleration.
- vertically: $a_z = 2 \text{ m/s}^2$ in addition to dead weight.

2.2.1.2 - The following loads acting on the components shall be taken as equal to: (1)

- longitudinally : $F_x = m_1 \cdot (\pm a_x) \text{ [N]}$
- transversely : $F_y = m_1 \cdot (\pm a_y) \text{ [N]}$
- vertically : $F_z = m_1 \cdot (1g \pm a_z) \text{ [N]}$

wherein :

m_1 = the weight [kg] allowed for the component
 $a_{x,y,z}$ = accelerations [m/s^2]
 g = acceleration due to gravity = 9.81 m/s^2 .

(1) For calculating the mechanical strength of coach body-bogie connecting parts, see point 2.6.2 of UIC Leaflet 515.

OR

The resultant of the loads F_x , F_y and F_z shall be used.

2.2.2 - See section 3 for permissible stresses under loading.

***2.3 - Conditions for adjustable seats in special coaches**

Adjustable seats may only be used in special coaches. They must comply with the following specifications:

***2.3.1** - Static strength (see Appendix 10.1).

*** 2.3.1.1** - A load of 100 kg shall be placed on the seatpan. A static force of 1000 N shall then be applied centrally widthwise against the backrest, for a period of 10 minutes at an angle of 90°.

*** 2.3.1.2** - A static force of 750 N shall be applied 10 times towards the outside on each armrest at an angle of 10° to the vertical, at a distance of 250 mm from the inner edge of the seatpan for 10 minutes.

*** 2.3.1.3** - No rupture or damage shall occur, and the assemblies must not have slackened.

The inner distance between armrests must not vary durably by more than 30 mm.

*** 2.3.2** - Stability tests (see Appendix 10.2).

*** 2.3.2.1** - For the purposes of the stability tests (backward and sideways) the seat must be protected against any sliding movement. The load defined in Appendix 10.2 shall be applied centrally to the seatpan, against the back of the seat, to prevent any movement on the seat in a horizontal direction.

1.7.94