

13th edition, April 2007

Translation

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Brake - Regulations governing the equipment of trailing stock

*Frein - Prescriptions relatives à l'équipement du matériel remorqué
Bremse - Vorschriften über die Ausrüstung der Wagen*



UNION INTERNATIONALE DES CHEMINS DE FER
INTERNATIONALER EISENBAHNVERBAND
INTERNATIONAL UNION OF RAILWAYS

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12th edition, June 2003	Addition of new references in points E1 and E2
13th edition, April 2007	Publication of the Appendix E on the UIC website. Update of points 1.3 and 3.2 Adaptation to the RID

The person responsible for this leaflet is named in the UIC Code

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Summary

This leaflet sets out the basic provisions and the minimum conditions with which the braking equipment of coaches¹ and wagons must comply in order to be accepted for running in international service. Additional regulations as well as provisions and other details specific to the different types of braking equipment and related components are defined in other UIC leaflets in series 54.

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1. Vehicles in the context shall be taken to include all passenger coaches, vans, mail vans and car-carrying wagons with the standard numerical codes defined in UIC Leaflet 438-1.

1 - Compressed-air brakes

1.1 - Coaches and wagons

1.1.1 - In order to reduce the risks of slide and at the same time minimise impacts and reactions, any vehicle whose braked weight may exceed 1,25 times the weight on rails in the passenger braking position must, unless otherwise specified in point **1.2.3 - page 3** hereinafter, be mounted with a reversing system for bringing the vehicle braked weight down to a lower value than that stipulated previously, while observing the conditions described in points **1.2.2 - page 2** and **1.3.6 - page 4**.

1.1.2 - All vehicles fitted with a compressed-air brake since 1.1.1953 must be fitted with a brake-rod adjuster to ensure automatic offsetting of play in the brake shoes and/or linings.

1.1.3 - It must be possible on vehicles fitted with compressed-air brakes for the brake rigging to be isolated from the pipe by activating one single handle in such a way that the brake becomes inoperative after emptying and that the vehicle can then be used as a through brake-pipe vehicle.

1.1.4 - For functional reasons, the vehicle length to be served by a distributor may not exceed 31 metres.

1.1.5 - The presence of one isolation handle per distributor will be accepted for vehicles fitted with several distributors.

1.1.6 - For vehicles built from 1 January 1991, the brake isolation handle must be accessible from both sides of the vehicle even when it is laden.

1.1.7 - The handles for operating the braking-system changeover devices must be readily identifiable and easy to operate from both sides of the vehicle.

1.1.8 - Disc-braked vehicles must be fitted with brake linings of the type(s) accepted in international traffic for the maximum permitted vehicle speed, in accordance with *UIC Leaflet 541-3* (see [Bibliography - page 16](#)).

1.1.9 - Vehicles fitted with brake-shoe inserts in composite material must be mounted with K brake-shoe inserts of the type(s) accepted in international traffic in accordance with *UIC Leaflet 541-1* (see [Bibliography - page 16](#)).

1.1.10 - Vehicles built or converted after 1.1.2004 shall be fitted with a compressed-air brake as listed in Appendix **E - page 15**.

1.2 - Coaches

1.2.1 - Coaches and all units of multiple coaching stock must be fitted with at least one passenger train brake accepted in international traffic, and incorporate a main brake pipe and a main air-supply pipe as well as the corresponding stop cocks and connections.

It is recommended to paint the main brake stop cocks in red, and the main air-supply pipe in a light colour (white or yellow).

1.2.2 - The braked weight of coaches braked under "P" conditions must be at least equal to 1,05 times the vehicle tare.

1.2.3 - Point **1.1.1** - **page 2** is not mandatory for coaches fitted with:

- a high-performance brake with two-stage shoe loading, giving a braked weight not exceeding 1,7 times the tare on rails,
- combination shoe and disc brakes, giving a braked weight not exceeding 1,7 times the tare on rails,
- wheel slip prevention equipment.

1.2.4 - Coaches must be fitted with an emergency handle.

1.2.4.1 - Emergency-signal handles for operating the continuous brake must be fitted in passenger coaches, in such a way that passengers can see and easily access them without having first to open a door. Emergency handles must be identified the marking stipulated in *UIC Leaflet 545* (see **Bibliography - page 16**).

Emergency-signal handles accessible to passengers must be lead sealed.

1.2.4.2 - There is no need for the handles to be located on the platform at vehicle ends or in lavatories and washrooms.

1.2.4.3 - The service compartments in baggage vans and mail vans must be fitted with an emergency brake valve or an emergency-signal handle. If there is an emergency brake valve in the side corridor of a vehicle or baggage van, there is no need for an emergency handle as well. If the valve is located in the side corridor of a coach, baggage van or mail van, a sign similar to the one stipulated above for the emergency handle must be placed next to the valve.

The central-brake emergency and operating valves must be installed so as to make them inaccessible to passengers.

1.2.4.4 - The emergency brake installation must be such that, once the brake has been applied, passengers cannot activate the re-set mechanism. If this mechanism is housed in a box, the latter must be marked as stipulated in *UIC Leaflet 545*.

1.2.5 - All coaches must be fitted with a release valve (preferably non automatic) which can be activated from both sides of the vehicle.

1.2.6 - Depending on the maximum scheduled speed for the coaches, the additional brake equipment mentioned in **Appendix D - page 14** shall be authorised and installed alongside the basic equipment.

1.3 - Wagons

1.3.1 - Wagons must be fitted at least with a main brake pipe, stop cocks and related connections. Through brake-pipe wagons will no longer be accepted in international traffic from 1.1.1995.

1.3.2 - With effect from 1.1.1998, all wagons must be fitted with a P/G braking system accepted in international traffic.

1.3.3 - Wagons to be built must be fitted with a P/G braking system accepted for international traffic (type from the 1954 admittance date) and equipped with a passenger/freight changeover mechanism.

1.3.4 - Wagons bearing the **S** or **SS** label, must be fitted with a compressed-air brake incorporating both a P position for passenger brake mode and a G position for freight brake mode.

1.3.5 - Wagons bearing the **SS** label must be equipped with a self-adjusting load proportional braking system as per *UIC Leaflet 541-04, point 2.1* (see [Bibliography - page 16](#)) and providing in general for $\lambda = 100\%$ up to the SS limit load.

The restriction of $\lambda = 90\%$ for 20 t axle loads applies only to wagons equipped with brake blocks.

Special equipment must be installed for brakes with a higher braking power.

New wagons equipped with composite brake blocks and bearing the SS label must be equipped with a modified relay valve combination (also known as kink valve).

1.3.6 - For wagons where the load is unevenly distributed in general, it is recommended that a self-adjusting load-proportional brake be fitted at each end of the wagon.

1.3.7 - Self-adjusting braking equipment for **S** wagons fitted on wagons bearing the **S** label must comply with point 2.2 of *UIC Leaflet 541-04*.

1.3.8 - Labelling of wagons equipped with a self-adjusting load-proportional braking system and the braked weight symbol are stipulated in *UIC Leaflet 545*. The *UIC Leaflet 541-04* specifies the characteristics of self-adjusting load-proportional braking systems.

1.3.9 - For all authorised load conditions, the wagon braking mechanism must ensure compliance with the following minimum braked-weight percentages (ratio of braked weight in each braking position to total weight on rails).

NB : In the case of existing wagons equipped only with brakes for freight trains and where not all axles are braked, only the wagon's braked axle-load shall be used for calculating the tare and load valves.

	Minimum brake-weight percentage λ		
	P position		G position
	S	SS	
I - Wagons without "empty-loaded" changeover device or without self-adjusting load-proportional braking equipment. (Wagons with invariable total weight on rails or a maximum load and tare which are such that the values given opposite can be observed ^a).	65	100 ^b	60 ^c
II - Wagons fitted with the "empty-loaded" changeover device (manual or automatic)			
a) Existing wagons irrespective of the braking system ("empty" or "loaded") used:			
- fitted prior to 1.1.1951	50	-	50
- fitted between 1.1.1951 and 31.12.1980	60 ^d	-	50
b) Wagons built after 1.1.1981 irrespective of the braking system ("empty" or "loaded") used:	65 ^{c d}	-	60 ^{c d}
III - Vehicles fitted with self-adjusting load-proportional braking devices	65 ^e	100 ^b	
IV - Wagons which can run empty at 120 km/h in the "empty" position		100	

a. These wagons must, in addition, meet the stipulations of point 1.1.1.

b. Limit of 18 t per axle for vehicles braked only by blocks (see point 1.3.5).

c. 57% brake-weight percentage shall be allowed for wagons with 22,5 t axle-loads, built before 31.12.1987

d. For wagons, the braked-weight percentages may, within the changeover range, drop to 55%.

e. This device must, in addition, meet the stipulations of points 1.3.7 and 1.3.11.

1.3.10 - For braking mechanisms varying automatically in relation to the load, and used either in the P or G position, the braked weight obtained must be at least equal to the total weight on rails for as long as this weight does not exceed the design braked weight that the mechanism can produce.

For wagons fitted with such mechanisms prior to 1 January 1951 and where the distributor only caters for freight running conditions, the braked weight may be lower than the total weight on rails under certain load conditions.

1.3.11 - All wagons fitted with a compressed-air brake must have a quick-release valve from among the types listed in *UIC Leaflet 541-1* (see [Bibliography - page 16](#)). This valve shall be user-identifiable by a special handle next to the throw rod.

The lever to activate the quick-release valve must be protected against interference from foreign bodies during train running and thereby against inadvertent release using a finder sleeve or other suitable device.

1.3.12 - All new and revised wagons must be equipped with the following pneumatic connections in accordance with *UIC Leaflet 543-1, point 1.1.3*

- a test connection for the measurement of C pressure for each separately controlled brake cylinder pressure

and in addition in case of wagons

- with automatic mechanical or pneumatic two stage "empty-loaded" devices

or

- with automatic load-proportional braking (pneumatically operated)

a test connection T

1.4 - Multi-vehicle sets (additional provisions)

1.4.1 - Wagons built before 1.1.1992 and comprising several permanently-coupled units (multiple wagon sets) conforming to *UIC Leaflet 572* (see [Bibliography - page 16](#)), with a maximum length of 31 m, may only be fitted with one distributor.

1.4.2 - Every single unit forming part of a multiple wagon set built as from 1.1.1992, and incorporating a centre coupler with a minimum yield strength of 1 000 kN, shall be fitted with a compressed-air brake of identical design operating independently on each unit.

1.4.3 - It shall be possible for a multiple wagon set with a maximum length of 31 m, built as from 1.1.1996 and incorporating a centre coupler with a minimum yield strength of 1 200 kN, to be fitted with a single distributor.

1.4.4 - Multiple wagon sets exceeding 31 m in length must be fitted with two or more distributors of identical design, so as not to exceed 31 m per distributor.

1.4.5 - When multiple wagon sets require the braked weight to be adapted to the load, each unit must be fitted with an automatic continuous braking system.

This provision applies to new and converted wagons worked as multiple wagon sets after 1.1.2001.

1.4.6 - The centre coupler must comply with the conditions set out in *UIC Leaflet 572, point 2.1.3*.

2 - Screw brakes

2.1 - Coaches and wagons

2.1.1 - On vehicles with continuous compressed-air brakes and screw brakes, it must be possible to operate each brake as an independent unit.

2.1.2 - Screw brakes should brake at least half of all axles and a minimum of two.

2.1.3 - The screw-brake handles or brake wheels must be designed in a way that enables the brakes to be operated by turning the handle or brake wheel clockwise.

2.2 - Coaches

2.2.1 - Coaches and vans must be fitted with a screw brake which can be operated from inside the vehicle using a brake wheel for this purpose.

2.2.2 - The screw-brake system must be designed so that the vehicle, when empty, can still be securely stopped on a 35 ‰ slope, with a force of 0,5 kN exerted on the brake wheel (not mandatory for disc-braked vehicles built before 31.12.83).

2.2.3 - The braked weight is determined in accordance with the conditions stipulated in *UIC Leaflet 544-1* (see [Bibliography - page 16](#)) and must be shown on the outside of the vehicle in conformity with *UIC Leaflet 545, point 10*.

2.3 - Wagons

2.3.1 - The percentage of wagons to be fitted with screw brakes is stipulated in *UIC Leaflet 535-3* (see [Bibliography - page 16](#)).

2.3.2 - On wagons, use shall solely be made of a handle or brake wheel to operate the screw brakes. However, a brake wheel only may be used for brakes that can be ground-operated.

2.3.3 - It must be possible for ground-operated screw brakes to be activated by one person located on either side of the wagon.

2.3.4 - For wagons to be built, the screw-brake rigging shall be designed in such a way that a force of 0,5 kN exerted at the wheel or handle produces a braked weight of 20 t under maximum load, calculated in accordance with the provisions of *UIC Leaflet 544-1*.

For ground-operated screw brakes, the braked weight shall be shown in a red-coloured frame to denote that this sign does not apply to the braking of a moving train.

NB : This minimum braked weight is not required:

- for existing wagons,
- for special wagons where, for design considerations, the tolerances allowed under point 2.3.5 cannot be obtained.

2.3.5 - For wagons to be built, the amplification ratio applicable shall be 1 400:1 as a rule. In special cases, an amplification ratio of up to a maximum of 1 500:1 shall be accepted.

2.4 - Multiple wagon sets (additional provisions)

On wagons comprising several permanently-coupled units, the screw brake must brake a sufficient number of axles (at least two concentrated on one unit) in order to comply with the provisions of point 2.3.4 - page 7 under conditions of optimum reliability.

3 - Spark arresters

3.1 - Coaches

Spark arresters must be mounted above the shoe-braked wheels of coaches with floors made of inflammable materials.

3.2 - Wagons

The spark arresters described below must be mounted above the braked wheels of all wagons built from 1.1.1975 with floors made of inflammable materials. This provision is also applicable for flat wagons without flooring or with gaps in the flooring to house the braked wheels, with the exception of wagons used solely for the carriage of steel products.

3.2.1 - Axle wagons

3.2.1.1 - The spark arresters of wagons used for carrying products and objects in RID class 1, sections 1.1, 1.2, 1.3, 1.5 and 1.6 must be designed and positioned in accordance with the provisions of Appendix A - page 11, including in case of products carried in large containers.

The upper part of these plates is usually curved and must be 300 mm wide. The distance between the inside edges of plates positioned over the wheels of the same axle must measure 1 120 mm.

These plates must have a 250 mm-high vertical part towards the external side of wagons, with a 50 mm overlapping lower edge sloping outwards at a 45° angle.

If the upper part is curved, there must be a minimum distance of 20 mm between the uppermost part of the plate and the wagon floor, and a minimum distance of 180 mm between plate ends and floor. If the upper part is flat, this minimum distance must be 80 mm over the whole width of the plate.

These plates must be removable to permit workshop inspection of the axle-guard securing system.

Wagons fitted with spark arresters that comply with the provisions of the above five points must bear a special marking as defined in the RIV.

3.2.1.2 - The spark arresters of wagons that are not intended for carrying products and objects in RID class 1, sections 1.1, 1.2, 1.3, 1.5 and 1.6 must be designed and positioned in line with Appendix A or Appendix C - page 13.

The upper part of these plates is usually curved and must be 315 mm in width. The distance between the inside edges of plates positioned above the wheels of the same axle must measure 1 120 mm.

These plates must have a vertical part measuring 110 ± 5 mm in height towards the external side of the wagon, with an overlapping 32 mm - long lower edge sloping outwards at a 30° angle.

If the upper part is curved, there must be a minimum distance of 20 mm between the uppermost part of the plate and the wagon floor, and a minimum of 180 mm between plate ends and floor. If the upper part is flat, this minimum distance must be 80 mm over the whole length of the plate.

3.2.2 - Bogie wagons

Spark arresters must be designed and positioned as shown in Appendix B - page 12.

The plates shall be flat and measure 425 mm in width.

The distance between their inside edges must be 1 100 mm \pm 10 mm.

The space between the plate and the floor must be a minimum of 80 mm.

3.2.3 - Provisions common to axle wagons and bogie wagons

Spark arresters must be at least 2 mm thick; their length must not be less than the diameter of the maximum permissible running tread, plus 200 mm. They must be placed symmetrically in relation to the centreline of the axle.

The distance between plate underside and wheel flange must not be less than 15 mm when the body of the wagon has dropped completely (broken spring).

The above distance may only be less than 15 mm when passing over a train ferry ramp. However, in this case a minimum distance of 5 mm must be observed, the wagon being at a standstill and loaded up to the load limit.

If it is not possible to comply with the layout and dimensions described above because of the way the underframe is built, the plates may be shortened, folded or cut when underframe parts are near to them, provided a floor protection which is at least equivalent is ensured.

For flat wagons with no floor or with gaps in the floor where the braked wheels are housed, the distance between the plates and the inflammable parts of the vehicle or its load must not be less than 80 mm. In addition, these plates must be reinforced so that they can withstand the weight of a person without this causing permanent bending.

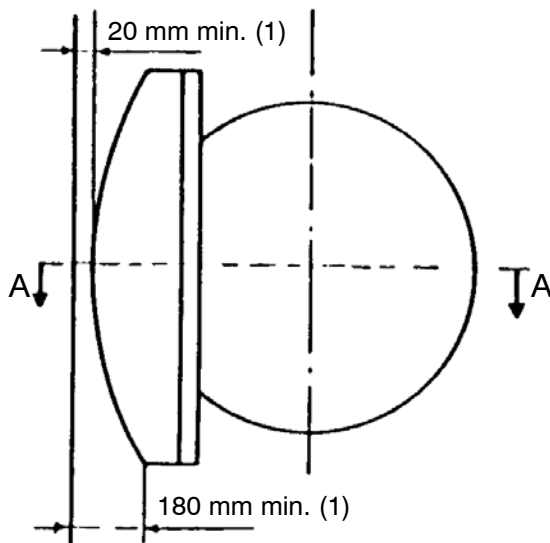
All wagons with an inflammable floor and all flat wagons with no floor or with gaps in the floor, built before 1.1.75, which:

- are not shielded against sparks,
- are painted with fireproof paint,
- or have spark arresters placed directly underneath the flooring,

must be equipped with spark arresters designed and positioned as described above (for wagons used to carry products and objects in RID class 1, sections 1.1, 1.2, 1.3, 1.5 and 1.6, including in case of products carried in large containers).

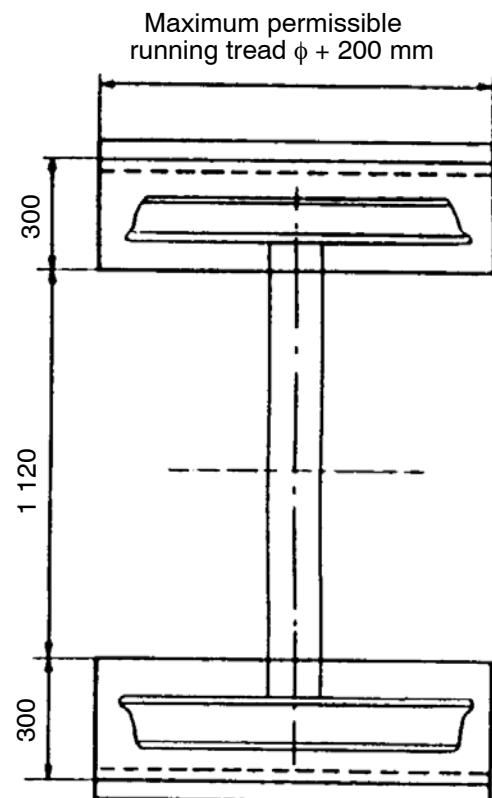
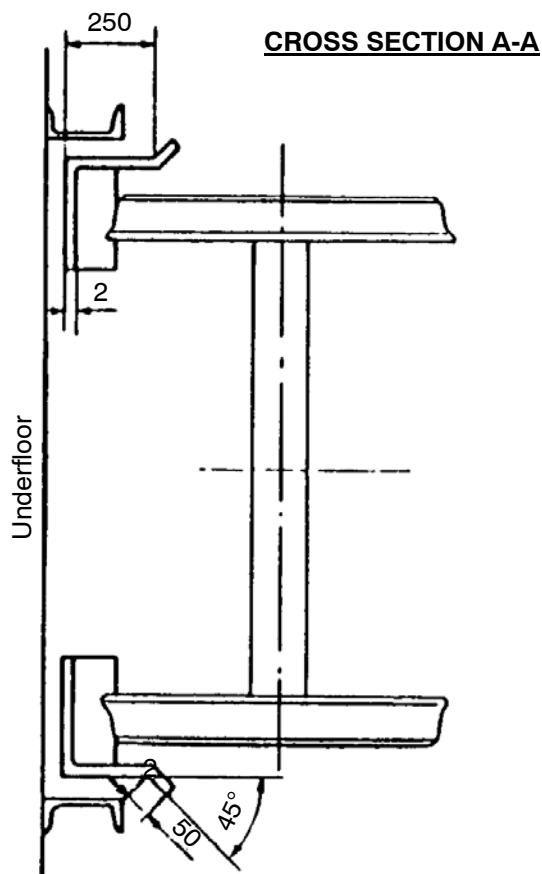
Spark arresters which are not placed directly underneath the flooring and which do not comply with the provisions applicable since 1.1.75, must be replaced with the plates described above as soon as they are damaged.

Appendix A - Spark arrester plates for axle wagons

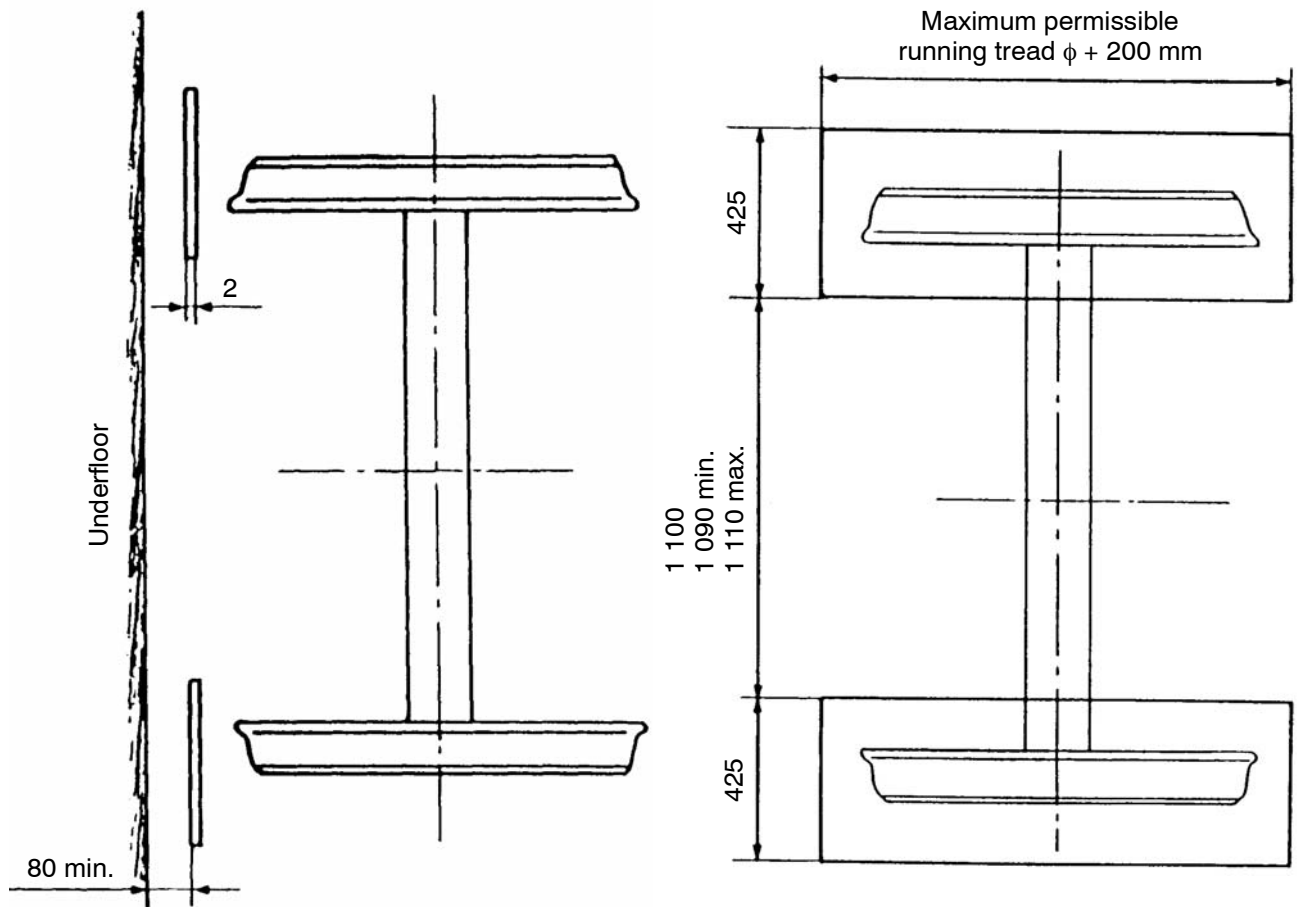


(1) Remark:

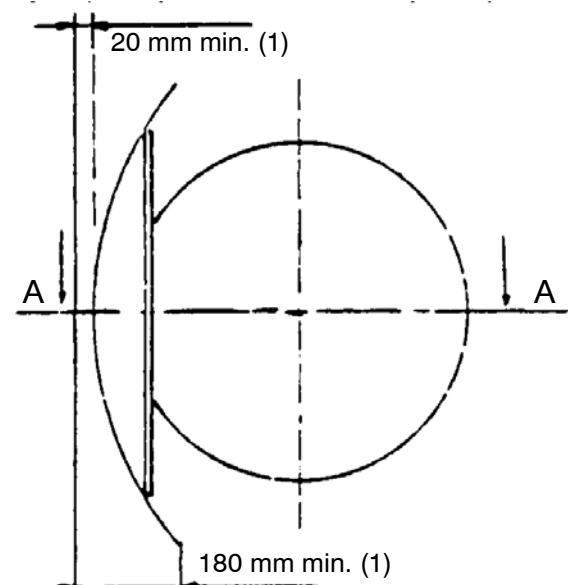
If a minimum distance of 80 mm can be complied with over the whole length of the plate, the upper part of the plate can be flat.



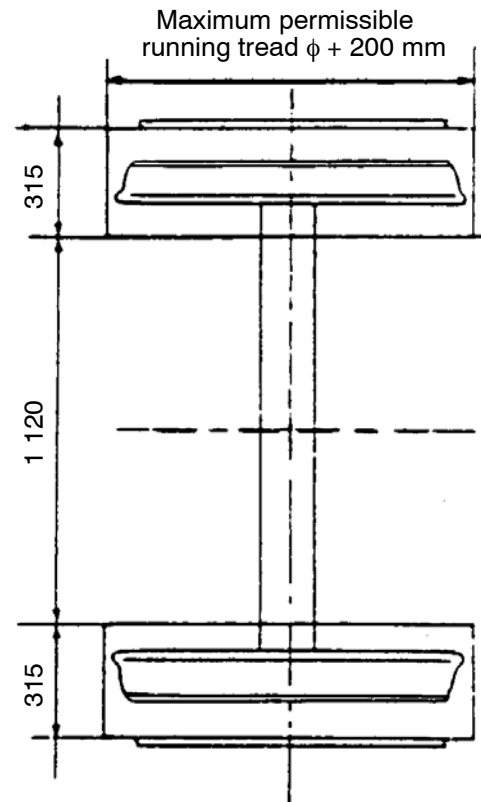
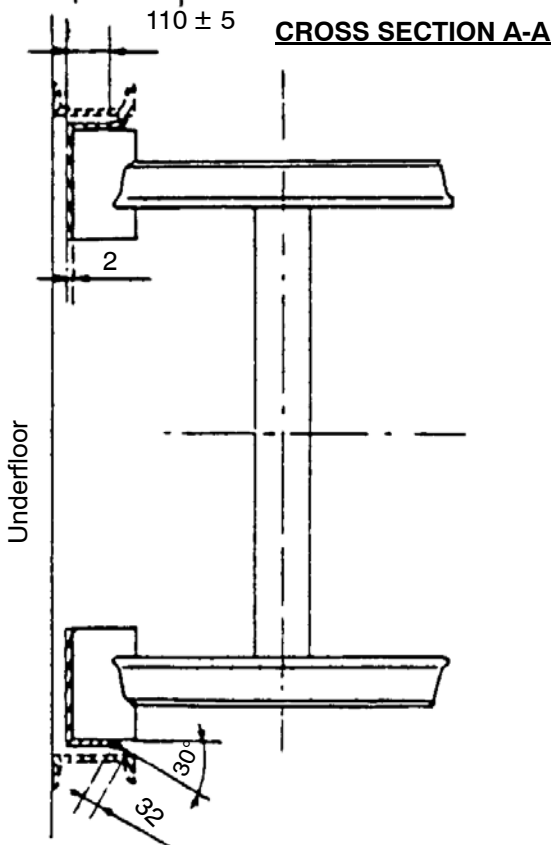
Appendix B - Spark arrester plates for bogie wagons



Appendix C - Spark arrester plates for axle wagons (not used for carrying products and objects in RID Class 1, Sections 1.1, 1.2, 1.3, 1.5 and 1.6)



(1) Remark:
If a minimum distance of 80 mm can be complied with over the whole length of the plate, the upper part of the plate can be flat.



Appendix D - Options permitted in brake equipment for coaches

Brake equipment for coaches ^a	Speed range V_{max} [Km/h]		
	120....140	>140....160	>160....200
1. Compressed-air brake equipment			
UIC pneumatic brake (passenger) P-braking conditions	○	✕	✕
UIC high-performance pneumatic brake Braking condition	◐	●	●
2. Mechanical brake equipment			
Shoe brake	⊗	⊗	⊠
Disc brake	⊗	⊗	●
Additional shoe brake	○	○	○
3. Additional brake equipment			
Pipe discharge accelerator	◐	◐	◐
Magnetic brake	◐	◐	◐
EP brake	○	◐	◐
Emergency brake override signal	◐	◐	◐
Key			
● Vital equipment			
◐ Equipment mandatory on some RUs			
○ Equipment optional			
⊗ Equipment authorised as alternative			
✕ Inadequate equipment			
⊠ Non-authorised equipment			

a. Applicable with effect from 1.1.1980 for newly-built coaches and coaches re-engineered to operate within this speed range.

Appendix E - Compressed-air brakes authorised in international traffic

E.1 - Compressed-air brakes for passenger and freight trains authorised for vehicles built and modified after 1.1.2004

The list of compressed air-brakes authorised in international traffic is available on the UIC website [http://www.uic.asso.fr/ Activities/Technology&Research/Products/Catalogue](http://www.uic.asso.fr/Activities/Technology&Research/Products/Catalogue) of products technically approved by UIC.

E.2 - Compressed-air brakes for passenger and freight trains still authorised for vehicles modified after 1.1.2004

The list of compressed air-brakes authorised in international traffic is available on the UIC website [http://www.uic.asso.fr/ Activities/Technology&Research/Products/Catalogue](http://www.uic.asso.fr/Activities/Technology&Research/Products/Catalogue) of products technically approved by UIC.

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1. UIC leaflets

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UIC Leaflet 432 : Wagons - Running speeds - Technical conditions to be observed, 10th edition, January 2002 (11th edition under preparation)

UIC Leaflet 438-1 : Identification marking for passenger rolling stock, 3rd edition, April 2004

UIC Leaflet 535-3 : Equipping of wagons with devices for passing from one to the other and with screw brakes, 1st edition of 1.1.76 - Reprint dated 1.7.95

UIC Leaflet 540 : Brakes - Air brakes for freight trains and passenger trains, 5th edition, November 2006

UIC Leaflet 541-04 : Brakes - Regulations concerning the manufacture of brake components - Self-adjusting load-proportional braking system and automatic "empty-loaded" control device, 3rd edition, November 2006

UIC Leaflet 541-05 : Brakes - Specifications for the construction of various brake parts - Wheel Slide Protection device (WSP), 2nd edition, November 2005

UIC Leaflet 541-1 : Brakes - Regulations concerning the design of brake components, 6th edition, November 2003

UIC Leaflet 541-2 : Dimensions of hose connections (brake hoses) and electric cables; types of pneumatic and electric connections and their positioning on wagons and coaches equipped with automatic couplers of the UIC and OSJD Member Railways, 1st edition of 1.7.81 and 2 Amendments

UIC Leaflet 541-3 : Brakes - Disc brakes and their application - General conditions for the approval of brake pads, 6th edition, November 2006

UIC Leaflet 541-4 : Brakes - Brakes with composition brake blocks, 2nd edition of 1.1.90 and 3 Amendments (3rd edition under preparation)

UIC Leaflet 542 : Brake parts - Interchangeability, 4th edition of 1.1.82 and 4 Amendments

UIC Leaflet 543-1 : Brakes - A study of minimum standards for maintenance of goods wagon brakes, 1st edition under preparation

UIC Leaflet 544-1 : Brakes - Braking power, 4th edition, October 2004

UIC Leaflet 545 : Brakes - Inscriptions - Marks and signs, 7th edition, April 2002 (8th edition under preparation)

UIC Leaflet 546 : Brakes - High power brakes for passenger trains, 5th edition of 1.1.67 - Reprint dated 1.1.80 incorporating 5 Amendments

UIC Leaflet 572 : Wagons composed of permanently-coupled units (multiple wagons) and articulated wagons, 1st edition of 1.1.90 and 4 Amendments

2. Minutes of meetings

International Union of Railways (UIC)

"Traction and Rolling Stock" Committee : Question 5/T/FIC - Approval of amendments and additions to Leaflet 543, Budapest, June 1987

Question 5/T/FIC - Revision of Leaflet 543 "Regulations relative to the equipment of trailing stock", New edition

Sub-Committee for "Braking" : Other business - Future maximum speed of freight trains, Paris, April 1990

"Traction and Rolling Stock" Committee : Question 45/Z/4 - Future maximum speed of international freight trains, Paris, June 1990

Sub-Committee for "Braking" : Question 5/T/FIC - Revision of leaflets. Amendment to Leaflet 543 as a result of the redefinition of the SS brake ($\lambda = 100\%$ of the braked weight for an axle load of 18 t), Paris, January 1992

"Rolling Stock" Committee : Question 5/T/FIC - Revision of Leaflets. Adaptation of the conditions specified in paragraph 1.4 "Multiple vehicle sets" in Leaflet 543, to Leaflet 572 "Wagons composed of permanently-coupled wagons (multiple wagons) and articulated wagons", Berlin, May 1995

"Rolling Stock" Committee : Question 5/T/46 - Item 5.1 - Brake equipment for coaches (and high-speed wagons) worked in international traffic, Paris, September 1997

Sub-Commission 5T for "Braking" : Question 5/T/36 - Point 3 - Conditions for approval of brake components, Opatija, June 2001

Sub-Commission for "Braking" : Question 5/T/36 - Point 3 - Conditions for approval of brake components, Paris, January 2003

Sub-Commission for "Braking" : Question 5/T/36 - Point 5 - Conditions for approval of brake components, Skopje, March 2003

SG5 "Braking and running gear" - point 2.3 - Amendment to UIC Leaflet 543, Paris, June 2006

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