BS EN 16286-1:2013

BSI Standards Publication

Railway applications — Gangway systems between vehicles

Part 1: Main applications

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National foreword

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The UK participation in its preparation was entrusted by Technical Committee RAE/3, Railway Applications - Rolling Stock Products, to Panel RAE/3/-/8, Railway applications - Passenger gangways.

The UK committee draws users' attention to the distinction between normative and informative elements, as defined in Clause 3 of the CEN/CENELEC Internal Regulations, Part 3.

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200 km/h has an equivalent value of 125 mile/h.

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Bahnanwendungen - Übergangssysteme zwischen Fahrzeugen - Teil 1: Hauptanwendungen

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Foreword

This document (EN 16286-1:2013) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2013, and conflicting national standards shall be withdrawn at the latest by September 2013.

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For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This series of European Standards EN 16286, *Railway applications — Gangway systems between vehicles,* consists of the following parts:

— *Part 1: Main applications*

— *Part 2: Acoustic measurements*

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

The railway system requires technical rules for train concepts with flexible connections which allow passage from one vehicle to the next vehicle (or between vehicle modules). This standard describes main requirements for the design and validation of gangway systems.

The requirements set out in this standard are based on long-term existing practices and procedures developed and currently in use by railway undertakings and industry. The application of these systems has changed over the years.

For many years the majority of gangway systems consisted of rubber tubes pressed together when coaches were coupled. This solution is standardized in UIC leaflet 561 with the aim to reconfigure train sets. Main requirements of this leaflet have been incorporated in this standard as Annex A.

UIC Leaflet 561 is to date the only reference document available, but does not cover project specific solutions, which have been developed for each train set; for example, for multiple units, metros or tramways. The aim of EN 16286-1 is to close this gap and to cover the complete range of gangway systems.

1 Scope

This European Standard defines the technical and safety requirements applicable to gangway systems used in all railway vehicles such as tram, tram trains, coaches, metro, suburban, main line and high speed trains that carry passengers. A gangway system gives comfortable passage from one vehicle to the other and consists of a flexible component which allows relative movement between vehicles.

It also defines:

— the requirements for the safety for passengers and/or staff in the gangway while the train is running;

— the assessment methods as well as pass/fail criteria for gangways installed on vehicles.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12663-1, *Railway applications — Structural requirements of railway vehicle bodies — Part 1: Locomotives and passenger rolling stock (and alternative method for freight wagons)*

EN 15551, *Railway applications — Railway rolling stock — Buffers*

EN 15663, *Railway applications — Definition of vehicle reference masses*

EN 15566, *Railway applications — Railway rolling stock — Draw gear and screw coupling*

EN 16286-2, *Railway applications — Gangway systems between vehicles — Part 2: Acoustic measurements*

EN 45545 (all parts), *Railway applications — Fire protection on railway vehicles*

EN 50125-1, *Railway applications — Environmental conditions for equipment — Part 1: Equipment on board rolling stock*

EN ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method (ISO 6946)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
nominal geometric dimensions

Note 1 to entry: Nominal dimensions are defined on straight level track, vehicle suspension in nominal condition, and the mass in working order.

3.1.1
length
distance between mounting interfaces of gangways at vehicle ends

3.1.2
width
distance between lateral inner face of the passage

Note 1 to entry: The width is often measured at shoulder height.

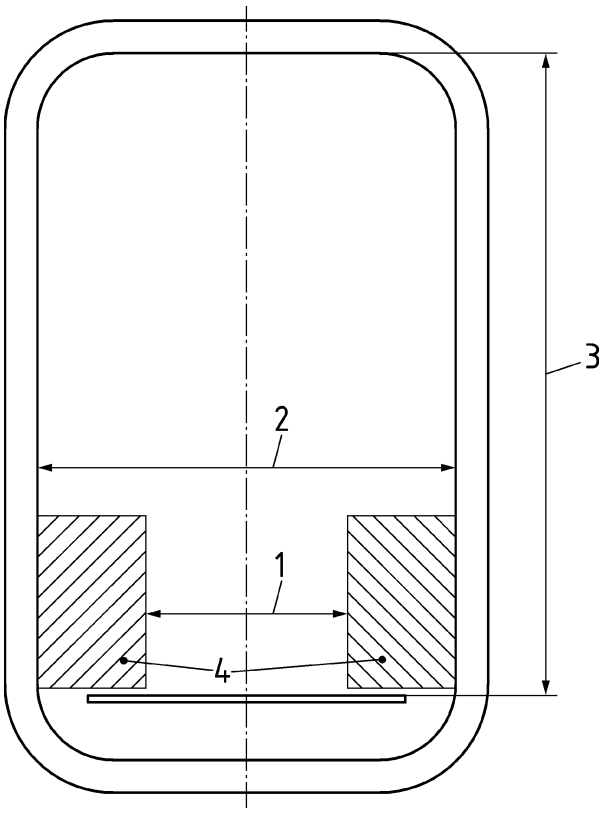
Note 2 to entry: See Figure 1.

3.1.3
horizontal clearway
unobstructed distance between lateral inner face of the bottom area of the gangway system

Note 1 to entry: See Figure 1.

3.1.4
vertical clearway
unobstructed distance between gangway floor level to the top of the passage (panel, ceiling, etc.)

Note 1 to entry: See Figure 1.



Key

1 horizontal clearway
2 width
3 vertical clearway
4 skirts, inner panel, etc.

Figure 1 — Clearway – design example

3.1.5
outer gangway width
overall outer width of the gangway

3.1.6
outer gangway height
overall outer height of the gangway

3.1.7
vehicle floor height
distance between floor level of the vehicle and top of the rail

3.1.8
gangway floor height
distance between floor level of the gangway and top of the rail

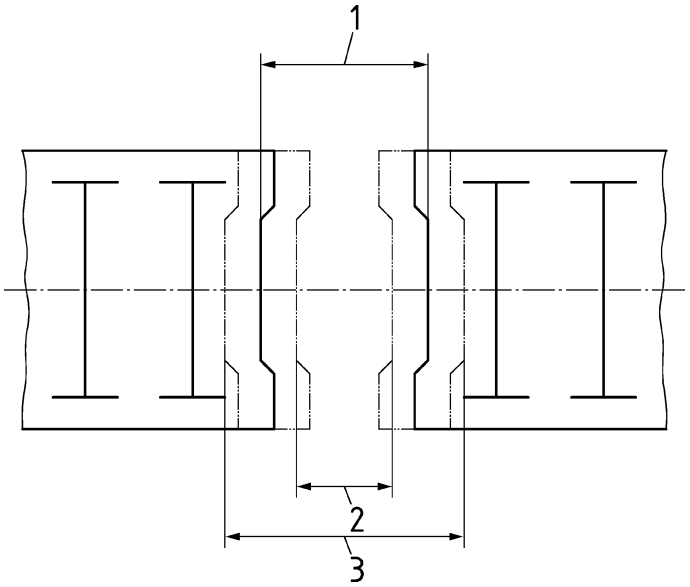
3.1.9
reference point
intersection of floor level with vehicle centre plane at the vehicle end

3.2
relative movements of the vehicles

Note 1 to entry: Real relative movements of the vehicles might consist of any combination of the movements defined in 3.2.1 up to and including 3.2.7.

3.2.1
longitudinal displacement
deflection of the length of the gangway in longitudinal direction on track

Note 1 to entry: See Figure 2.



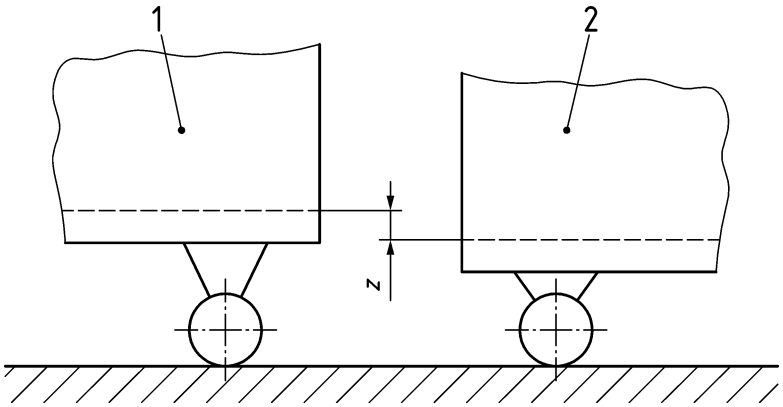
Note 1 to entry: Longitudinal displacement is generated, for example, by buff and draw of the connected coupling system.

Key
1 length
2 compressed length x_b
3 extended length x_d

Figure 2 — Longitudinal displacement

3.2.2
vertical displacement z
vertical distance between reference point of vehicle 1 and reference point of vehicle 2

Note 1 to entry: See Figure 3.



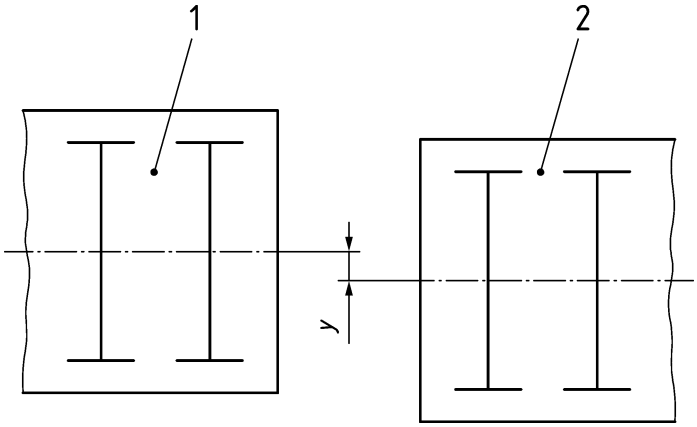
Key

1 vehicle 1
2 vehicle 2
z vertical displacement

Figure 3 — Vertical displacement

3.2.3
lateral displacement y
lateral distance between reference point of vehicle 1 and reference point of vehicle 2

Note to entry: See Figure 4.



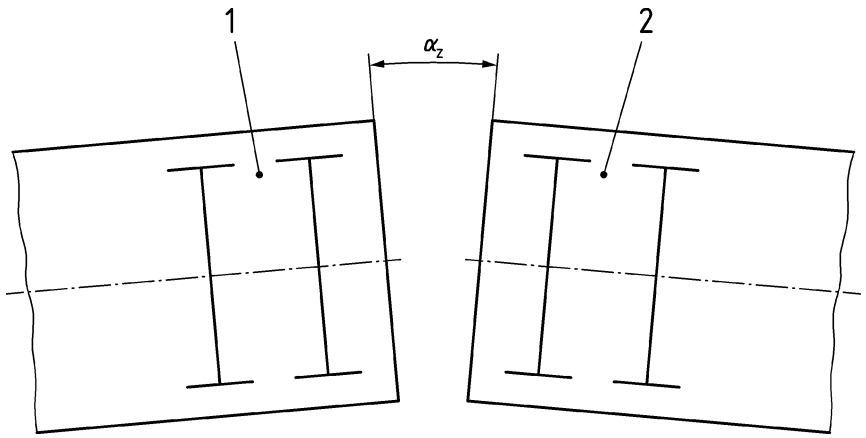
Key

1 vehicle 1
2 vehicle 2
y lateral displacement

Figure 4 — Lateral displacement

3.2.4
yaw angle α_z
angle between the vehicle ends measured around z-axis

Note 1 to entry: See Figure 5.

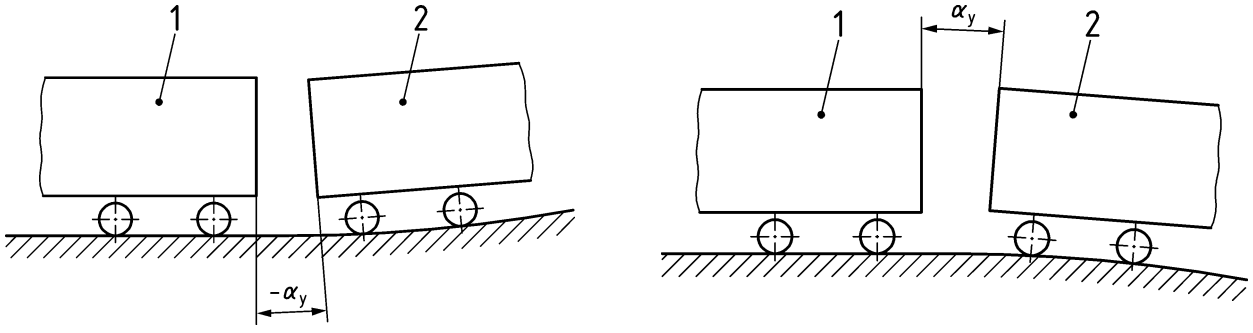


Key
1 vehicle 1
2 vehicle 2
α_z yaw angle

Figure 5 — Yaw angle

3.2.5
pitch angle α_y
negative or positive angle between vehicle ends, measured around the y-axis

Note 1 to entry: See Figure 6.



a) negative angle (concave) **b) positive angle (convex)**

Key
1 vehicle 1
2 vehicle 2
α_y pitch angle

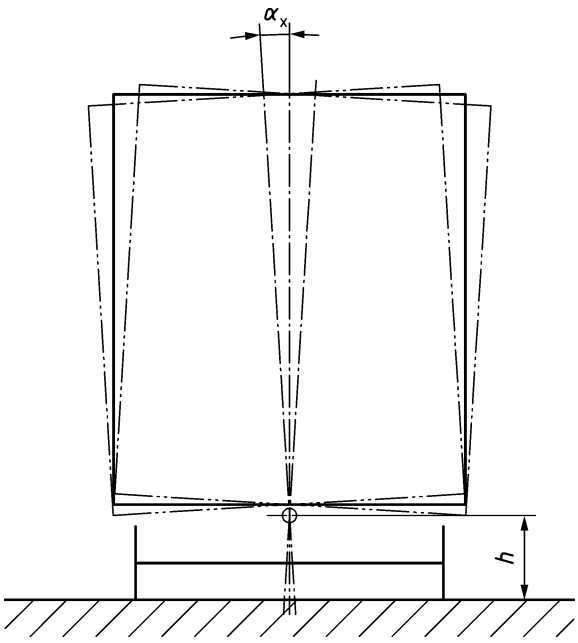
Figure 6 — Pitch angle

3.2.6
roll angle α_x
rotation around the longitudinal x-axis (roll centre) that defines the angle between vehicle centre plane 1 and vehicle centre plane 2

Note 1 to entry: See Figure 7.

3.2.7
roll centre height h
vertical distance from top of rail to the roll centre

Note 1 to entry: See Figure 7.



Key
h roll centre height
α_x roll angle

Figure 7 — Roll angle

3.3
vehicle connection types

3.3.1
vehicle connection by coupling system
vehicle connection where the relative movements of vehicles are influenced by more than one pivot point

3.3.2
vehicle connection by articulation
vehicle connection where the relative movements of vehicles are influenced by one pivot point

3.4
gangway system
articulating assembly allowing transit between vehicles

Note 1 to entry: Such gangway systems are often simply called gangway.

3.4.1
primary parts of a gangway system

3.4.1.1
flexible components
articulating environmental envelope surrounding the passageway

3.4.1.2
bridge system
floor structure capable of carrying passengers and staff and accommodating relative movements between vehicles

Note 1 to entry: This is also called tread plate, bridge plate, rubber bridge system, rotation plate or chain bridge.

3.4.2
secondary parts of a gangway system

3.4.2.1
skirts
projections from the inner sidewall above floor level preventing formation of gapping hazards

3.4.2.2
side panel
vertical cover of the inner sidewall

3.5
types of gangway systems

3.5.1
intermediate gangway system
gangway system, which is located between vehicles of a dedicated train set

3.5.2
front end gangway system
gangway system, which is located on a vehicle end with driver's cab of a dedicated train set

4 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

TOF Top of floor

TOR Top of rail

HVAC Heating, ventilation and air conditioning

PRM People with reduced mobility

5 General

5.1 Description of the system

A gangway is a system located between two vehicles. This system accommodates all relative movements between the two vehicles by its design and allows the passage from one vehicle to the next vehicle. It protects passengers and staff from falling out of the train and protects against external environmental conditions.

Additional features may be added according to the specification.

Flange intercommunication connections are specific types of intermediate gangways, typically used for coaches and vans. They are described in Annex A.

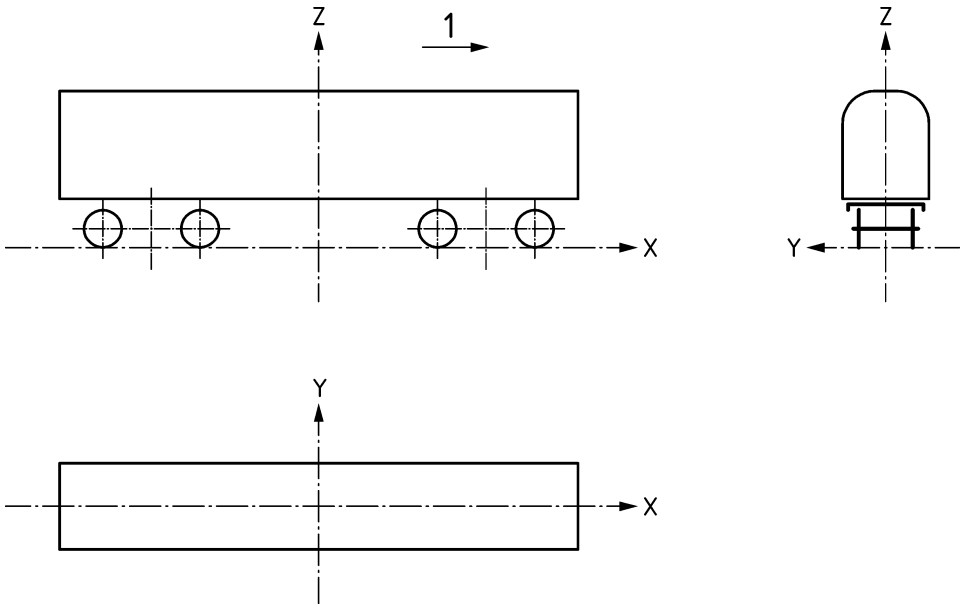
5.2 Environmental resistance

The design of gangways shall take into account the environmental conditions to which they will be subjected.. Environmental parameters, described in EN 50125-1, shall be considered in the specification for the gangway.

6 Vehicle body coordinate system

The coordinate system is shown in Figure 8. The positive direction of the x-axis (corresponding to vehicle body longitudinal axis) is in the direction of movement. The positive direction of the z-axis (corresponding to vehicle body vertical axis) points upwards. The y-axis (corresponding to vehicle body transverse axis) is in the horizontal plane completing a right hand coordinate system.

NOTE Conventional coach pictured, but gangways can also connect modules of a multi-moduled vehicle typically in tram applications.



Key

1 direction of movement
x longitudinal axis
y lateral axis
z vertical axis

Figure 8 — Vehicle body coordinate system

7 Technical requirements

7.1 General

A specification for the gangway with the following minimum requirements shall be established.

7.2 Weight

The maximum weight of the gangway system should be defined in the specification.

NOTE System architecture, dimensional and acoustic requirements have an important influence on the weight.

7.3 Geometry

7.3.1 Outer gangway dimensions

The outer gangway dimensions shall respect the vehicle gauge.

7.3.2 Clearway

The volume as shown in Figure 9 shall be maintained as clearway over the length of the gangway as well as in associated gangway doors measured on straight and level track.

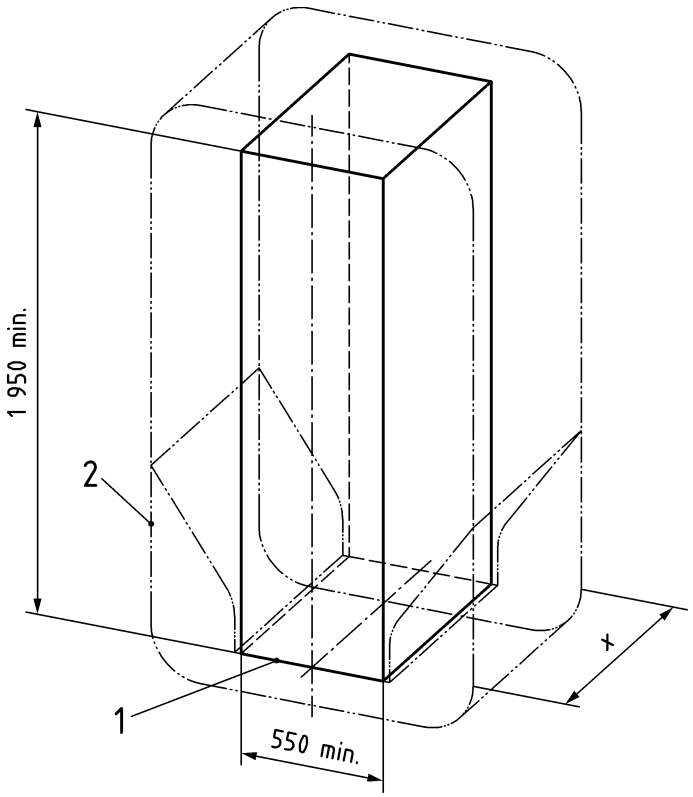
The horizontal clearway shall maintain a minimum of 550 mm.

The vertical clearway shall maintain a minimum of 1 950 mm.

Where the infrastructure (gauge or vehicle profile) does not allow this, an exception may be accepted by the authorities for both values.

NOTE For front end gangway systems, the essential requirement for drivers' sight line in combination with small vehicle profiles might necessitate a reduction of these values.

Dimensions in millimetres



Key

1 TOF
2 gangway shape
x length of the gangway

Figure 9 — Volume representing the clearway between connected vehicles

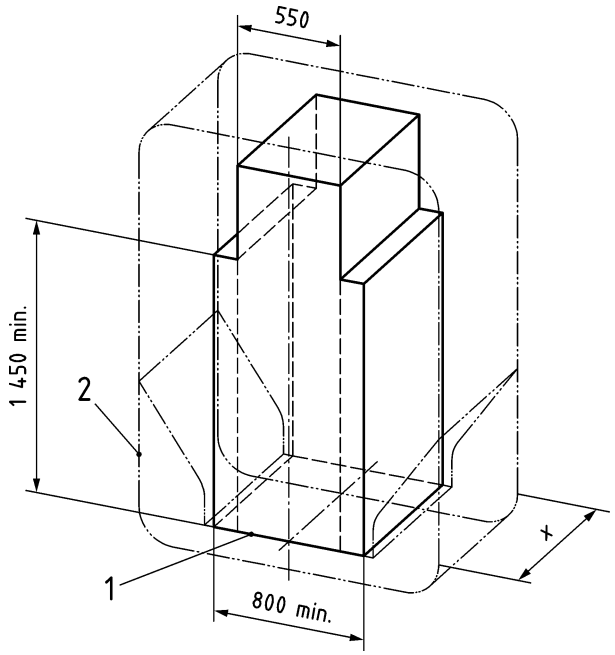
7.3.3 Clearway for wheelchairs

Passage of wheelchairs through the gangway may be required as an option. This option is taken into account for certain vehicle architecture, for example, for escape routes and access to toilet facilities.

The volume as shown in Figure 10 shall be maintained as clearway over the length of the gangway, as well as in associated gangway doors under each service condition, e.g. curves.

In addition to 7.3.2, the horizontal clearway for wheelchairs shall maintain a minimum of 800 mm up to a minimum height of 1 450 mm.

Dimensions in millimetres



Key

1 TOF
2 gangway shape
x length of the gangway

Figure 10 — Volume representing the clearway between connected vehicles for wheelchairs

7.3.4 Length

The length of the gangway shall be chosen in such a way that the gangway has the capability to allow all relative movements of the vehicle.

7.3.5 Steps and ramps

Discontinuities within the floor transition from one vehicle to the gangway, as well as from the gangway to the connected vehicle, should be minimised to facilitate passage without trip and stumble hazards. Sudden height changes shall be less than 15 mm high in nominal position and have chamfered or rounded edges.

Ramps up to a length of 600 mm shall not exceed a maximum gradient of 10,2° (18 %).

Ramps with a length from 600 mm to 1 000 mm shall have a maximum gradient of 8,5° (15 %). Ramps with a length more than 1 000 mm shall have a maximum gradient of 4,47° (8 %).

7.4 Relative movements

Maximum movements shall be defined in the specification. The particular conditions (service or depot) shall be considered.

During design, movement studies with the relevant and extreme movements shall be carried out for service and depot conditions.

NOTE 1 In depot conditions, interior safety requirements can be relaxed considering that no passengers but trained staff can be present.

A movement study shall be carried out to ensure that the gangway system performs all required movements without any damage. The requirements described in 7.3 and 7.5.3 shall be verified.

Table 1 gives relevant relative movements for different types of vehicle connections.

Table 1 — Relevant relative movements for types of vehicle connections

Connection types	**longitudinal displacement**		**vertical displacement**	**lateral displacement**	**yaw angle**	**pitch angle**	**roll angle**	**combinations**
	compressed length x_b	**extended length** x_d	z	y	α_z	α_y	α_x	
vehicle connection by coupling system	X	X	X	X	X	X	X	X
vehicle connection by articulation	0 [a]	0 [a]	0 [a]	0	X	X	X	X
NOTE X = applicable; 0 = not applicable.								
[a] Certain concepts allow values.								

It is recommended to record the derivation of the values.

The movements to be considered are, for example:

— longitudinal displacements caused by coupler and energy absorbing systems;

— vertical displacements (loading, wheel wear, degraded suspension conditions);

— lateral displacements caused by s curves and lateral clearance of bogies and wheel/rail;

— yaw angle caused by curve negotiation, curve entrance;

— pitch angle caused by crest and hollow and uneven wheel wear in one vehicle;

— roll angle caused by cant in curves or lateral acceleration;

— derailment and rerailment, lifting scenarios;

— dynamic effects.

NOTE 2 This list is not exhaustive.

The driver's view, defined in conformance with the existing standards, shall not be reduced by the front end gangways when uncoupled.

7.5 Load requirements

7.5.1 General

Any flexible elements (e.g. skirts), used on the floor and sides shall be strong and stiff enough to provide safe support to passengers and staff.

7.5.2 Vertical load applied to bridge system

Loading capability of the floor may be demonstrated by calculation or test. A static passenger load according to EN 15663 and applicable accelerations according to EN 12663-1 on the floor area of the bridge system shall be taken into account for service condition.

The bridge system shall withstand a static load of 800 N applied over a surface of 100 mm x 200 mm at any point of the bridge system.

Additional, special loads may be defined in the specification.

The relevant acceptance criteria according to EN 12663-1 are:

— to verify the strength of the structure when subjected to the maximum loads;

— to verify that no significant permanent deformation is present after removal of the maximum loads.

7.5.3 Dynamic loads on gangway system and fixation

Accelerations, defined in EN 12663-1 for equipment attachments, as well as forces generated by the relative movements shall be taken into account.

7.5.4 Horizontal load

The gangway sidewall of the clearway shall carry a load simulating a person leaning against the sidewall. Concentrated perpendicular loads acting from within the gangway shall be applied without causing any permanent deformation:

— a load of 15 % x 80 kg x 9,81 m/s^2 = 120 N representing a hand of a person over an area of 0,1 m x 0,1 m on any area of the surface of the gangway;

— a load of 80 kg x 9,81 m/s^2 = 800 N representing the shoulders of a person over an area of vertical extension of 0,2 m and a horizontal extension of 0,5 m centered at 1,3 m above floor level anywhere on that line.

The gangway shall stay in the gauge of the vehicle.

7.5.5 Aerodynamic loads

The gangway shall be capable of resisting against aerodynamic loads that occur when trains are crossing in open air and tunnels, without showing any permanent deformation.

The aerodynamic loads shall be defined in the specification. Verification shall be demonstrated by test or by analogy. The requirements given in EN 14067-4 are not applicable to metros, suburban trains, tram trains and

trams if they are in operation on their independent networks. Requirements for these vehicles shall be defined considering the application.

Pending the publication of the revision of EN 14067-4, values given in UIC 566 and UIC 660 may be used as orientation.

7.5.6 Pressure tightness

If applicable, the pressure P and the pressure difference ΔP per time interval shall be specified to meet the overall vehicle requirements. The values for over pressure and under pressure shall be specified.

7.6 Water tightness

There shall be no ingress of water caused by rain, melting snow and cleaning procedures from outside through the gangway systems and its interface with the vehicle into the passenger area.

Vehicles with gangway systems which are not able to fulfil these requirements (e.g. flange intercommunication connections described in Annex A) shall be equipped with water tight gangway doors or other measures to avoid problems with water that enters via the gangway.

Drainage may be provided to prevent accumulation of liquids within the gangway.

7.7 Crash behaviour

In case of crash scenarios, the components of the gangway system shall not prevent the function of the energy absorber elements or anti climbers. The minimum length of compressed gangway components shall be taken into account.

7.8 Earthing

If the earthing concept for the vehicle has requirements for the gangway, they shall be included in the specification.

7.9 Other requirements

The following hazards shall be addressed:

— trapping and squeezing:

  The gangway shall provide a safe through passageway for passengers and staff. Under service conditions, relative movements shall not lead to squeezing or trapping hazards for passengers and staff.

  Gaps occurring due to relative movements under service conditions should be avoided or covered (e.g. by skirts, side panel, etc.) to prevent trapping.

— slip resistance:

  Areas of the floor system that are not sliding surfaces shall have a slip resistant surface finish which maintains the friction level in both wet and dry conditions.

  Pending the publication of the series of standards for "Design for PRM use", national or other available standards may be applied, which provide definition and relevant test method of the friction coefficient for the floor.

— unauthorised operation of locking devices.

7.10 Fire resistance

The gangway shall be designed according to the EN 45545 series.

7.11 Acoustic requirements

Sound reduction index R shall be defined in the specification in accordance with EN 16286-2.

No squeaks, whistles, bangs or rattles shall be generated by the gangway system in operation.

7.12 Thermal insulation

The calculation of the coefficient for thermal insulation shall be performed according to EN ISO 6946 or other internationally accepted standards.

7.13 Lifetime

The lifetime of a gangway shall be defined and ensured by appropriate maintenance programs.

8 Interfaces with the vehicle

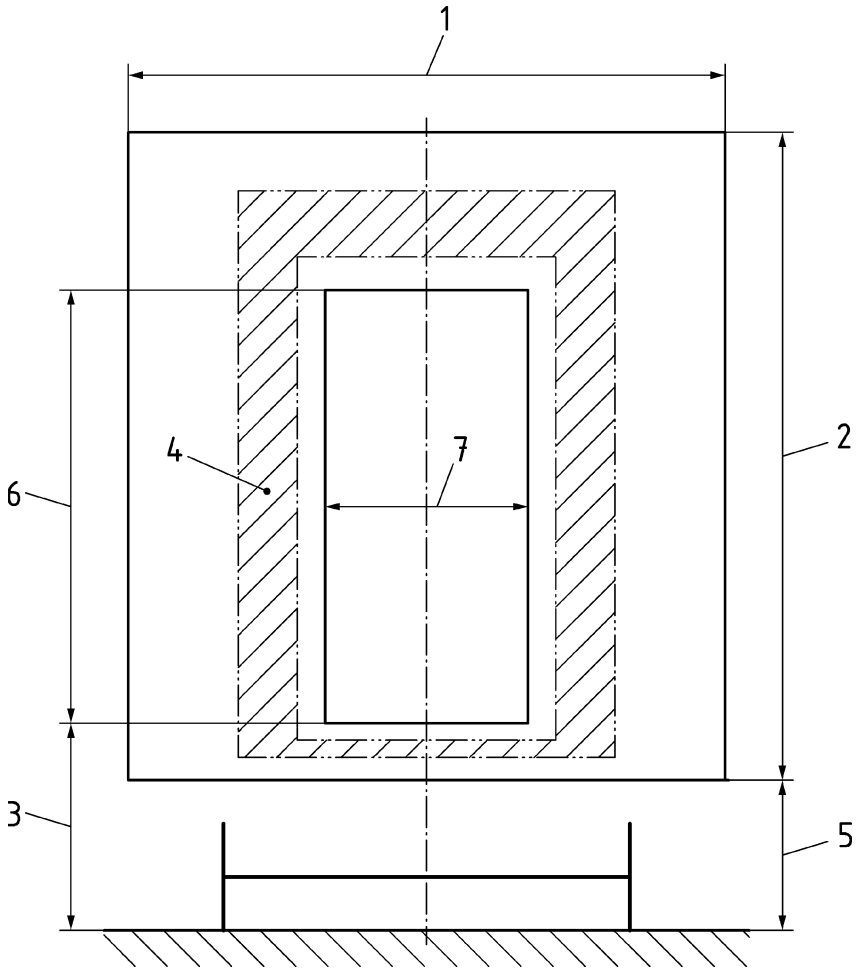
8.1 General

This clause gives design guidance and requirements for the interface definition between gangway system and vehicle.

8.2 Mechanical interfaces

The gangway system will be fixed on the vehicle body end wall. An interface drawing with the information given in Figure 11 should be agreed. Details can be provided in form of 3D model envelope, 2D drawings or clearly defined dimensions and should include primary dimensions.

Some vehicle designs require a recess at the end wall for the integration of a gangway. The recess should not interfere with the gangway during gangway movements.



Key

1 vehicle width
2 vehicle body height
3 distance from TOR to TOF
4 space envelope for gangway connection/fixation
5 distance from TOR to vehicle body under frame
6 aperture height of the vehicle body
7 aperture width of the vehicle body

NOTE The above is representative of an example. Alternative complex profiles might be required for the gangway.

Figure 11 — Mechanical interfaces

Surfaces of the interfaces should fulfil the requirements for tightness and should be agreed in the specification. The surface in this interface area should have no steps.

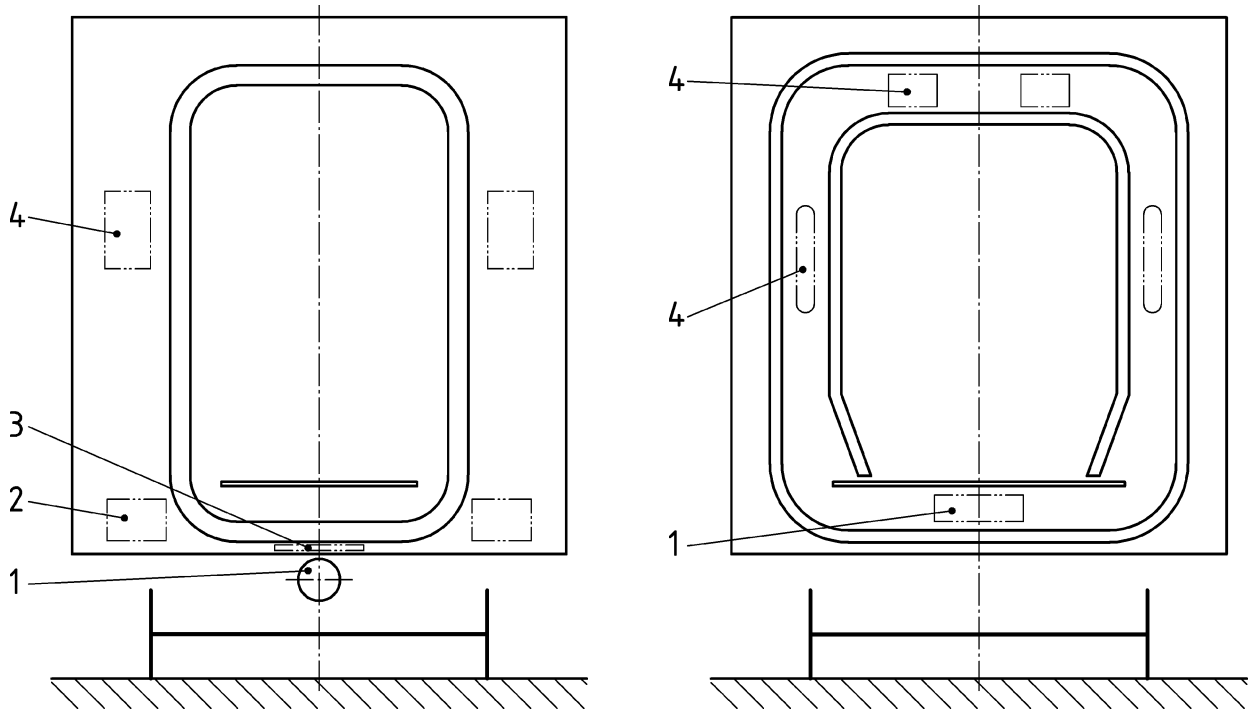
NOTE A typical value of the flatness of the mounting surface is 1,5 mm per each 500 mm.

8.3 Adjoining components

8.3.1 General

For the design of the gangway, the position and the space envelope of all adjoining components should be specified, as they may influence the shape of the gangway system. Vehicle connections influence or may interfere with gangway systems as they have different movements.

Some examples of adjoining components are given in Figure 12.



a) Design example 1 **b) Design example 2**

Key

1 coupling or articulation
2 anti climber/crash absorber
3 gangway support
4 cables, air ducts, etc.

Figure 12 — Location of joining components

8.3.2 Vehicle connections

There are several types of vehicle connections, which may be located within or outside the gangway system.

Examples for vehicle connections are:

— mechanical (articulation/manual, short or automatic coupler);

— electrical (cables for data transmission or energy supply);

— pneumatic (pipes and hoses for air brake pressure/HVAC ducts);

— hydraulic (pipes and hoses for fuel).

Coupler ancillaries may be attached to the coupler, e. g. pneumatic and electrical connections, cables, brackets and support equipment.

8.3.3 Gangway doors

Gangway doors may be located at the vehicle body end wall close to the opening of a gangway. They may have different purposes, such as:

— partition door in case of a fire;

— separation of the gangway area;

— closure of the vehicle body to prevent passengers and staff falling out in case of a train split.

In their open position they shall provide the clearway as required in 7.3.

8.3.4 Tail and head lights

The gangway shall not cover tail and head lights at the end of a unit. Their positions are described in EN 15153-1.

9 Testing

9.1 Weight measurement

The weight of the gangway system shall be measured and recorded.

9.2 Movement test

Movement testing shall be conducted as a type test using a gangway installed on a test rig that represents the interface of the adjacent vehicle. The purpose of this test is to simulate all the required relative movements.

A test procedure including drawings with representative movement scenarios shall be established. This will involve definition of the magnitude of maximum and typical movements. Gangway performance levels, in terms of permissible floor gapping and step heights, proximity to other vehicle equipment, accessibility, perceived security etc should be agreed prior to testing by reference to an approved test protocol.

Each defined worst case condition shall be tested and recorded in a test report. The ability of the gangway system to accommodate the displacement shall be assessed and approved using the following criteria:

— movement condition is achieved;

— no cracks either in bellow or frame material;

— no permanent deformation;

— no interference of mechanical components;

— no interference with adjoining components;

— clearway respected;

— no gaps and traps in service conditions.

9.3 Wheelchair and service trolley test

If applicable, the passage of wheelchairs and service trolleys shall be checked during movement tests. No entrapment of the wheelchair/service trolley shall occur during service conditions. The clearway for wheelchairs defined in 7.3.3 shall be respected.

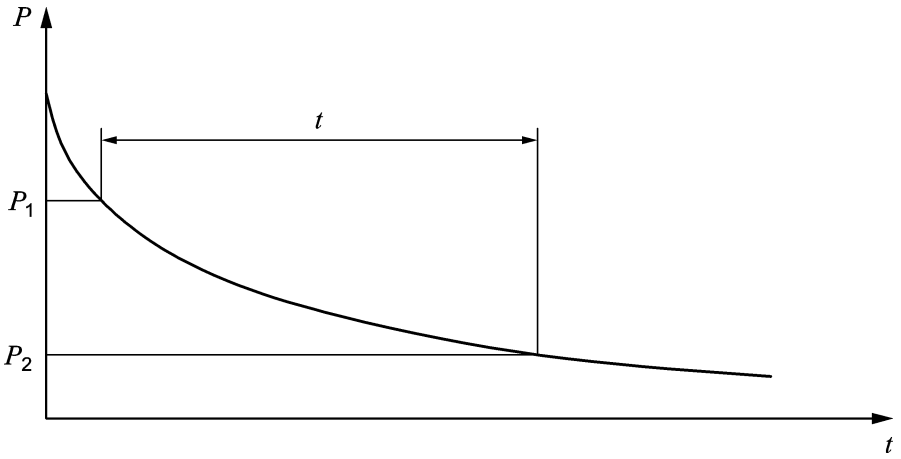
9.4 Pressure tightness test

If applicable, the test should be organised as follows:

A single gangway, sealed at both ends, is blown up to an excess pressure P_1. The incoming air is then cut off and the time t taken for the pressure to fall to value P_2 is measured. These pressures shall be defined in accordance with the specification.

The same test is carried out under suction.

The values are shown in Figure 13.



Key

t time in seconds

P pressure in Pa

P_n under or over pressure

Figure 13 — Pressure tightness test

Design measures shall be taken into account to ensure that the pressure tightness is kept throughout the life cycle of the coach.

9.5 Water tightness test

This test shall be conducted as a static type test using a gangway installed on a test rig that represents the interface of the adjacent vehicle. Test conditions are shown in Table 2.

Table 2 — Test conditions

Test conditions	Supplier type test
Number of nozzles	depending on dimension of the gangway [a]
Delivery rate	12 l/min per nozzle (± 0,5 l/min)
Pressure	3 bar ± 0,5 bar
Distance between gangway and nozzles	500 mm ± 50 mm
Distribution of the nozzles	in one row at each side and the top to ensure uniformly distribution of water
Cross section of the nozzles/spray angle	full cone 90˚ or similar [a]
Duration of the test	15 min
[a] The number of nozzles and angle of the cone should be chosen to ensure that the water covers the complete surface of the gangway system except the bottom area.	

NOTE Water test arrangements according to EN 14752 fulfil the test conditions described in Table 2 but do not cover the roof area which is necessary for the gangway.

The total delivery rate of water and the pressure shall be recorded before and after the test.

The pass/fail criteria are as follows:

— After testing, the gangway system shall be inspected for ingress of water.

— Trickles or drops coming off continuously from the outer sealing and/or the outer bellow have to be assessed as a leakage.

— Single drops (up to 10 drops within the sprinkling time of 15 min) are permitted. In addition, condensation caused by the temperature differences between inside and outside is permissible. No drops are allowed within the clearway of the gangway system.

A test description and the results shall be recorded in a test report.

9.6 Acoustic measurements

The measurements to obtain sound reduction index shall be performed according to EN 16286-2.

Proof of analogy may be accepted.

10 Maintenance

10.1 General

Documentation shall be provided and include information to maintain the gangway system in a safe and reliable condition throughout the agreed lifetime. It shall be incorporated in manuals for the vehicles. The content of documentation shall be agreed in the specification.

The following aspects shall be included:

10.2 Installation

The handling for mounting and dismounting of the gangway system has to be considered. A method description shall be provided, considering the local infrastructure and the use of any special tools.

Devices for uncoupled situations to fix the gangway in a stable position as well as means of protection to close the vehicle body shall be considered.

10.3 Operational handling

If connecting and disconnecting in stations is required, documentation shall be provided describing the method and timing.

10.4 Cleaning of a gangway

Cleaning agents and methods shall be defined in the specification. The possibility to clean the area underneath the floor should be considered.

10.5 Removal of graffiti

In case that removal of graffiti shall be considered, detailed requirements shall be defined in the specification.

10.6 Vandalism

If there are requirements for vandalism resistance they shall be defined in the specification.

Annex A
(normative)

Flange intercommunication connections

A.1 General

Flange intercommunication connections have been used over years in service for coaches. They may be used without further testing under the following conditions for single deck coaches:

— limited to a speed of 200 km/h;

— equipped with manual couplers according to EN 15566 and buffers according to EN 15551;

— with the geometries according to Table A.1.

Table A.1 — Geometry of coaches

	X-type [a]	**Y-type** [a]	**Z-type** [b]	
Length over	26 400 mm	24 500 mm	26 400 mm	26 400 mm
Pivot distance	19 000 mm	17 200 mm	19 000 mm	18 306 mm
Roll center height	0,7 m			0,5 m
Wheel base	max. 2 600 mm			
Wheel diameter	920 mm new / 860 mm worn			

[a] According to UIC-leaflet 567-1

[b] According to UIC-leaflet 567-2

A.2 Construction requirements

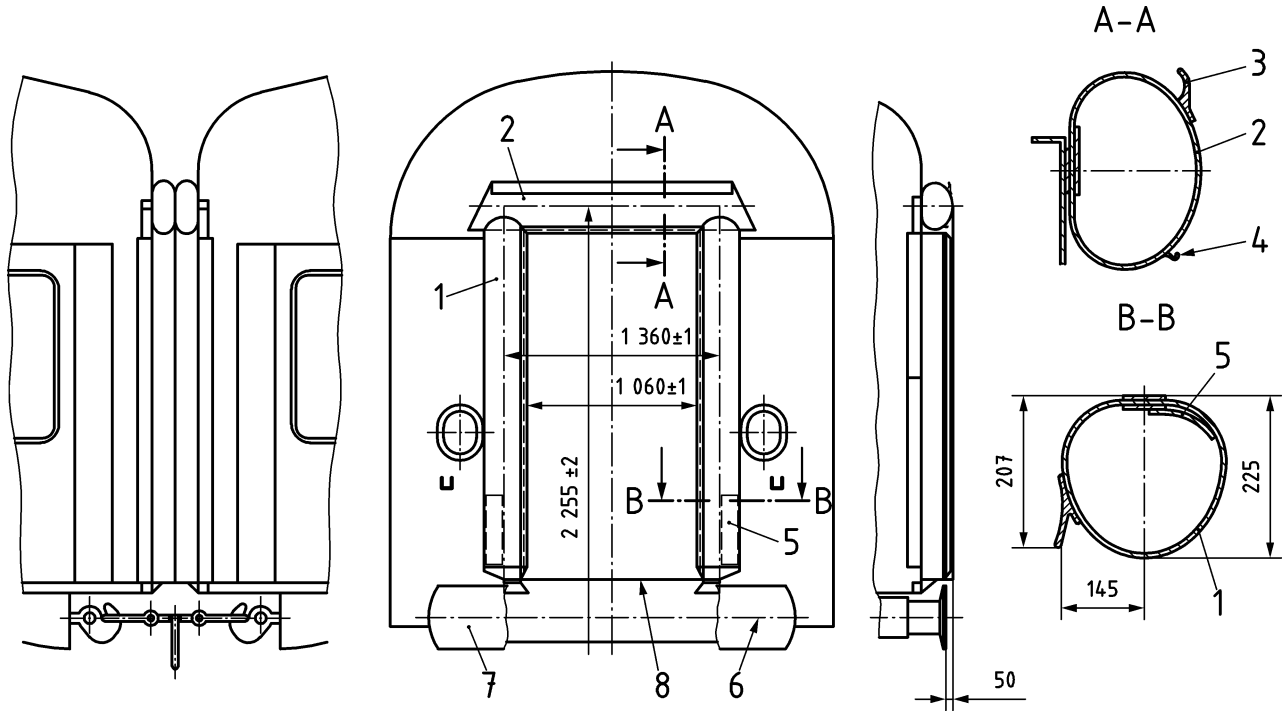
Flange intercommunication connections consist of three rubber flanges (one horizontal flange above and two parallel vertical flanges beside the gangway door). The method by which they are fixed to the end wall shall preclude rain water penetration. The flanges and lips (waterproof flaps) shall comply with Figure A.1.

In their uncoupled state (Figure A.1), the distance between the contact face of buffers and flanges shall not be more than 50 mm.

The vertical flanges shall be bevelled at their lower end as shown in Figure A.1, in order to prevent them from being damaged by the buffer heads. In case of major transversal displacement between coaches, when the buffers are compressed; the lower ends shall include a clearance in order to ensure that the gangway has the required free-play.

Reinforcement plates shall be placed at the lower end of the vertical flanges to prevent any excessive transversal displacement and the reduction of the clearway width (see Figure A.1, cross section B-B).

Dimensions in millimetres



Key

1 side flange (cross section B-B)
2 upper flange (cross section A-A)
3 upper waterproof flaps
4 lower waterproof flaps
5 elastic plate
6 1 060 mm above TOR
7 buffer
8 TOF

Figure A.1 — Flange intercommunication connection

The bridge plate shall be of the retractable type and designed as in Figure A.2.

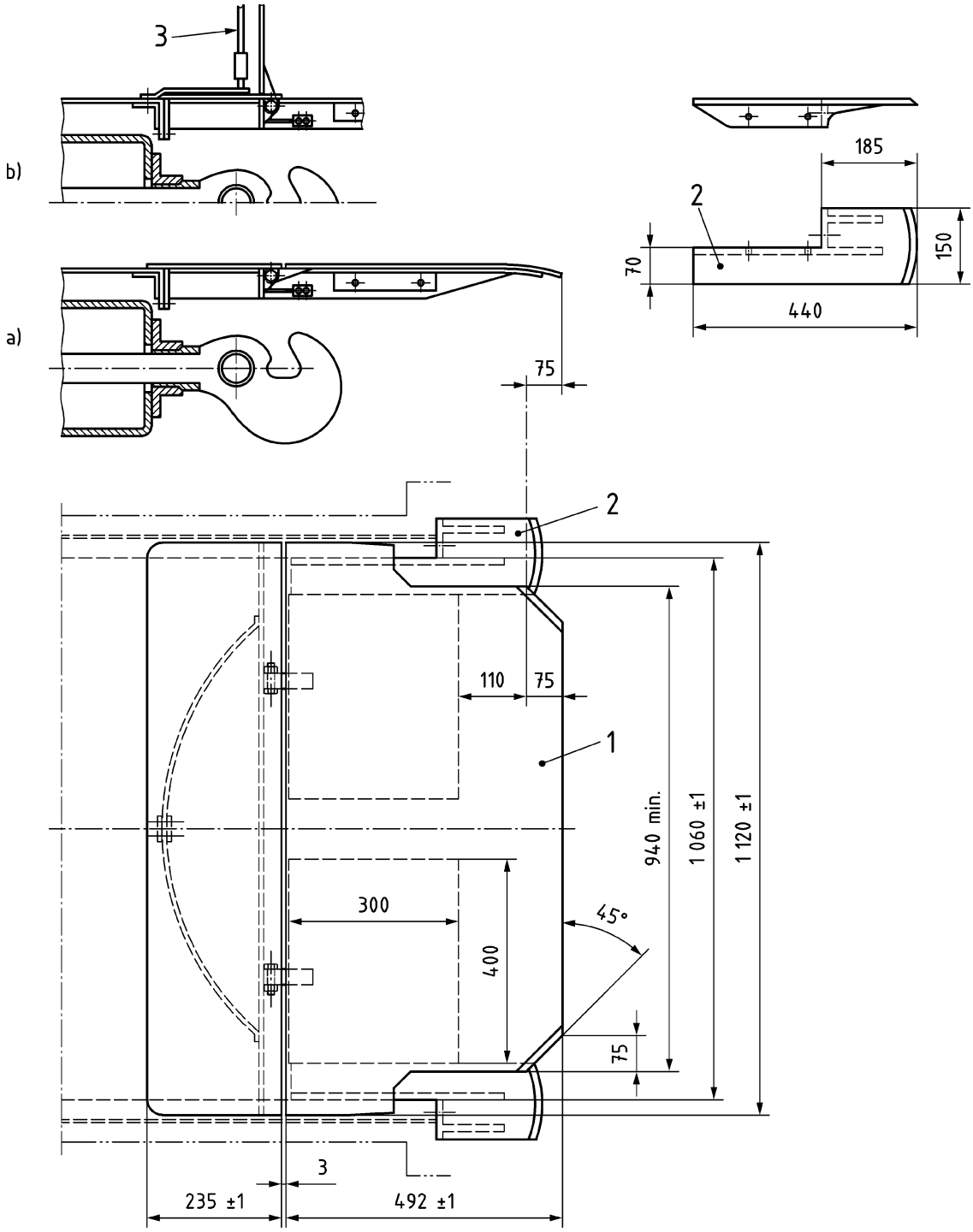
The gaps on both sides of the bridge plate shall be closed by side covers. These shall be made of resilient material and bolted to the vehicle underframe.

The bridge plate shall protrude 75 mm over the contact plane of the buffers when non-compressed, and shall overlap with the opposite bridge plate over a distance of 150 mm. The gangway shall automatically return when the cause of its displacement has ceased to exist.

Bridge plates shall not include items likely to become distorted when in service and to impede the free movement of the gangway.

The front corners of the bridge plate shall be bevelled in accordance with Figure A.2.

Dimensions in millimetres



Key

1 bridge plate
2 side cover
3 gangway door
a) situation in service with open gangway doors
b) situation in service with closed gangway doors

Figure A.2 — Bridge plate for flange intercommunication connection

The bridge plate shall be easy to raise and be fixed with a device in the upright position to prevent an unintended drop back. This device shall be visible from the inside of the coach and always placed on the left-hand side of the gangway. When the bridge plate is in an upright position, the gangway door shall be automatically locked to prevent passengers and staff from falling off.

It shall be possible for staff only to lower the bridge plate from inside the coach. To this end, it shall be possible to open a door with two panels at least 150 mm and a door with one panel at least 120 mm. The maximum opening in both cases shall be 200 mm.

Gangway doors shall leave a horizontal clearway of at least 750 mm when open. It is recommended to leave a horizontal clearway of 960 mm. Each panel of the gangway door shall be fitted with one window. At least on one panel an opening device inside and outside shall be provided.

Annex B provides further requirements for interconnecting gangways for coaches travelling at speeds of up to 200 km/h on high speed lines with tunnel sections.

Annex B
(informative)

Interconnecting gangways for coaches travelling at speeds of up to 200 km/h on high-speed lines with tunnel sections

For coaches travelling at speeds of up to 200 km/h on high-speed lines with tunnel sections, interconnecting gangways with improved pressure tightness have been in use since 1990. An example is given in Figure B.1.

Any gaps between the elements of the interconnecting gangway are sealed carefully. By pressing the flanges (sliding plates) of each gangway half together, an improved tightness of the interconnecting gangway will be achieved.

The minimum recommended clearway width is 990 mm in straight track. Clearway width shall at no point fall below 750 mm (curves, s-curves).

The bridge plate shall be protected against any tendency to rise when one train crosses another.

Dimensions in millimetres

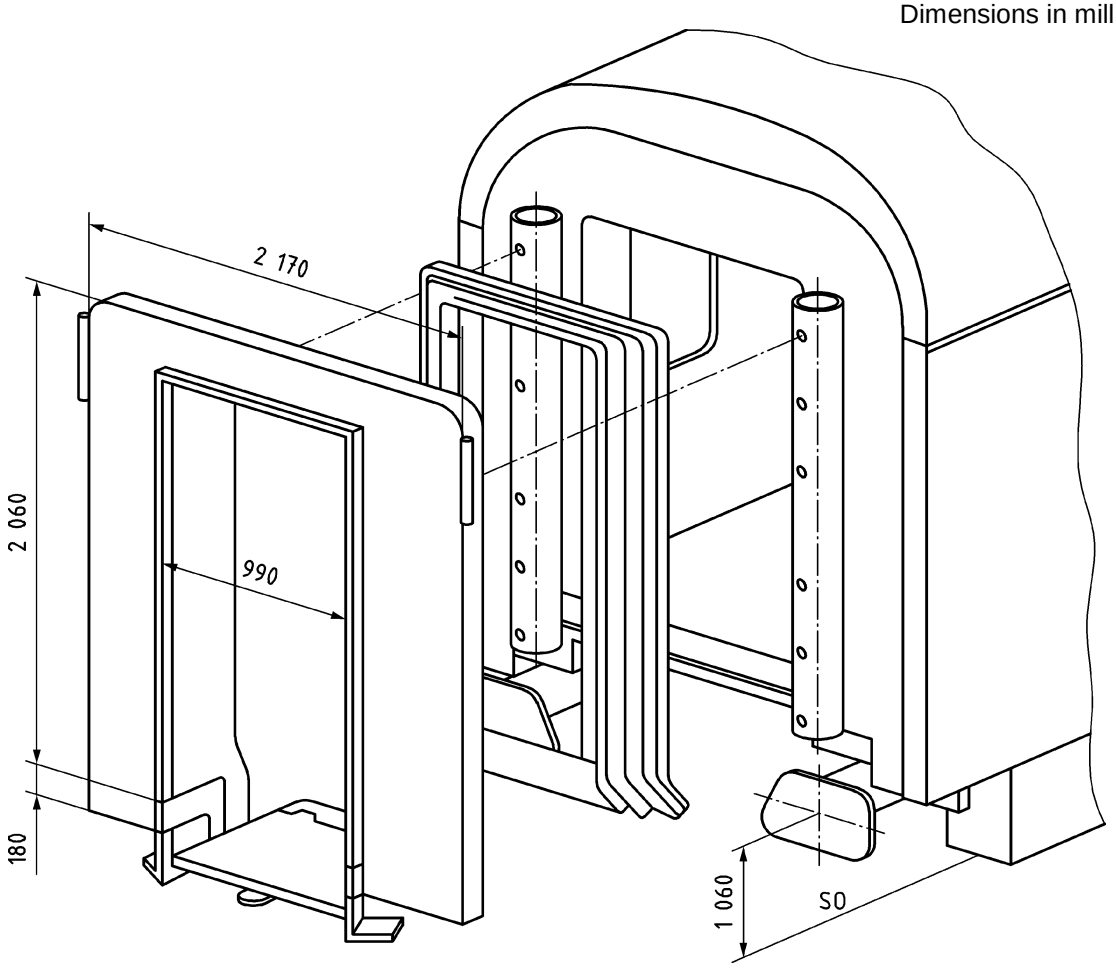


Figure B.1 — Pressure-tight intercommunication – Design example

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the Directive 2008/57/EC[1)].

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for HS Rolling Stock, Table ZA.2 for CR Locomotives and Passenger Rolling Stock and Table ZA.3 for CR/HS TSI relating to 'persons with reduced mobility', confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 – Correspondence between this European Standard, the HS TSI RST published in the OJEU dated 26 March 2008 and Directive 2008/57/EC

Clause/subclauses of this European Standard	Chapter/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
The whole standard is applicable.	4. Characterisation of the subsystem 4.2 Functional and technical specification of the subsystem 4.2.2.3 Strength of vehicle structure 4.2.7.2 Fire safety §4.2.7.2.2 Measures to prevent fire 4.2.7.2.3 Measures to detect / control fire §4.2.7.2.3.3 Fire resistance	Annex III, Essential requirements 1 General requirements 1.1 Safety Subclauses 1.1.3, 1.1.4, 1.1.5 1.2 Reliability and availability 1.3 Health Subclause 1.3.2 1.4 Environmental protection Subclause 1.4.2 2 Requirements specific to each subsystem 2.4 Rolling stock 2.4.1 Safety §1, 8.	Although this TSI does not deal with any specific requirements related to gangways, the use of this EN for HS RST allows fulfilling some other TSI requirements linked to crashworthiness and fire safety. Through the subclause 7.3 of this EN, geometry, requirements of PRM TSI are fulfilled.

1) This Directive 2008/57/EC adopted on 17th June 2008 is a recast of the previous Directives 96/48/EC "Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and revisions thereof by 2004/50/EC 'Corrigendum to Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system"

Table ZA.2 - Correspondence between this European Standard, the CR LOC and PASS RST TSI published in the OJEU dated 26 May 2011 and Directive 2008/57/EC

Clause/subclauses of this European Standard	Chapter/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
The whole standard is applicable.	4.Characterisation of the Rolling stock subsystem 4.2 Functional and technical specifications of the subsystem. 4.2.2 Structure and mechanical parts § 4.2.2.3 Gangways §4.2.2.5 Passive safety 4.2.5 Passenger related items § 4.2.5.8 Inter-unit doors Annex A 4.2.10 Fire safety and evacuation §4.2.10.1 General and Categorisation	Annex III, Essential requirements 1 General requirements 1.1 Safety Subclauses 1.1.3, 1.1.4, 1.1.5 1.2 Reliability and availability 1.3 Health Subclause 1.3.2 1.4 Environmental protection Subclause 1.4.2 2 Requirements specific to each subsystem 2.4 Rolling stock 2.4.1 Safety §1, 8.	Through the subclause 7.3 of this EN, geometry, requirements of PRM TSI are fulfilled

Table ZA.3 - Correspondence between this European Standard, the CR/HS TSI relating to 'persons with reduced mobility' (PRM), published in the OJEU dated 7 March 2008 and Directive 2008/57/EC

Clause/subclauses of this European Standard	Chapter/§/annexes of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
Subclause 6.3	**Annex B 4.** Characterisation of the subsystems Annex C 4.2 Subsystem rolling stock Annex D 4.2.2 Functional and technical specifications §4.2.2.7 Clearways §4.2.2.9 Height changes Annex E	Annex III, Essential requirements 1 General requirements 1.1 Safety Subclauses 1.1.3, 1.1.4, 1.1.5 1.2 Reliability and availability 1.3 Health Subclause 1.3.2 1.4 Environmental protection Subclause 1.4.2 2 Requirements specific to each subsystem 2.4 Rolling stock 2.4.1 Safety §1, 8.	

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

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[1] UIC 560, *Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans*

[2] UIC 561, *Means of intercommunication for coaches*

[3] UIC 566, *Loadings of coach bodies and their components*

[4] UIC 567-1, *Standard X and Y coaches accepted for running on international services*

[5] UIC 567-2, *Standard Z-type coaches accepted for running in international traffic — Characteristics*

[6] UIC 660, *Measures to ensure the technical compatibility of high-speed trains*

[7] EN 14067-4, *Railway applications — Aerodynamics — Part 4: Requirements and test procedures for aerodynamics on open track*

[8] EN 14752, *Railway applications — Bodyside entrance systems*

[9] EN 15153-1, *Railway applications — External visible and audible warning devices for trains — Part 1: Head, marker and tail lamps*

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[11] EN 50153, *Railway applications — Rolling stock — Protective provisions relating to electrical hazards*

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