

2nd edition, May 2003

Translation

OR

Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs

Indications relatives à l'aménagement des voitures aptes également au transport des handicapés dans leurs fauteuils roulants

Hinweise für die Ausstattung von Reisezugwagen, in denen auch Behinderte mit ihren Rollstühlen befördert werden können



Leaflet to be classified in Volume :

V - Rolling Stock

Application :

With effect from 1 January 1987 for coaches also suitable for conveying disabled passengers in their wheelchairs.

- point 1.1.2 (from 1.7.97)
- point 3.1.4.3 (from 1.1.98)
- point 3.2.1.1.2 (from 1.1.98)

All members of the International Union of Railways

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Important: the articles (points) in this leaflet have been renumbered in the new edition. The first digit of each point has been increased by one (i.e. 0 becomes 1, 1 becomes 2, and so on). Please take account of this when using cross-references from other leaflets.

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

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Summary

This leaflet contains basic indications for the design and layout of coaches specially adapted for the conveyance of disabled passengers in their wheelchairs. Depending on requirements, all or part of the leaflet may be taken into account in the design of such coaches.

1 - General

1.1 - General indications for use

- R 1.1.1 - This leaflet contains basic indications for the design and layout of coaches specially adapted for the conveyance of disabled passengers in their wheelchairs. Depending on requirements, all or part of the leaflet may be taken into account in the design of such coaches.
- O 1.1.2 - Trainsets designed for international traffic, procured or modified as a result of tenders called after 1-1-98, shall mandatorily comprise at least one cubicle with facilities for disabled persons, as specified in this leaflet.

The minimum requirements include provision of a toilet fitted out as per point 3.5 - page 8 and of a parking-area for a functional wheelchair as per point 3.1.6 - page 6.

1.2 - The characteristics of the layout shown in this leaflet relate to the requirements of passengers in wheelchairs. They are adapted to the special conditions of rail transport and to the structural limitations of rolling stock.

- R 1.2.1 - Application of this leaflet is based on the assumption of the operating conditions shown provisionally in Appendix I - page 25.

- R 1.2.2 - The indications in this leaflet should also be applied in the design of wheelchairs. It is assumed that the wheelchairs used for rail transport correspond to the following maximum conditions:

1.2.2.1 - Deceleration of $2,5 \text{ m/s}^2$ in the longitudinal direction of the vehicle (x).

1.2.2.2 - Acceleration of 3 m/s^2 in the transverse direction of the vehicle (y).

1.2.2.3 - Acceleration of 3 m/s^2 in the vertical direction of the vehicle (z) in addition to the effect of gravity.

1.2.3 - Wheelchair stability and surrounding area

- R 1.2.3.1 - Braked or moving wheelchairs should neither tilt nor slide longitudinally or transversely under the conditions specified in points 1.2.2.1 and 1.2.2.2.

- O 1.2.3.2 - Sharp edges and protruding parts should be avoided in and around the areas provided for wheelchairs.

- R 1.3 - The indications in this leaflet relate to wheelchairs operated manually by means of devices fixed on the rims of the large wheels.

1.3.1 - Wheelchairs of this type occupied by passengers, provided that they have the specified mobility and are within the dimensions indicated in this leaflet, may be accepted in coaches suitable for conveying wheelchairs without the need for additional special provisions.

1.3.2 - In principle, electrically powered wheelchairs that comply with these conditions may also be conveyed.

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- R 1.4** - The wheelchair-related provisions of this leaflet are based on national and international standards, where these have been defined, on existing constructional conditions and on experience gained during discussions with associations for the disabled.
 - R 1.5** - Given the specific characteristics of rail travel and its relatively low dynamic stress values, it is not necessary to provide locking or holding devices between the wheelchair and the coach.
 - R 1.6** - Use of coaches fitted with movable boarding systems (e.g. elevator platforms, ramps) should be subject to bilateral agreements.

2 - Wheelchair characteristics to be used as a basis for vehicle design purposes

2.1 - Overall dimensions of ISO wheelchair

O 2.1.1 - The dimensions to be chosen for the layout of coaches suitable for conveying wheelchairs are the overall dimensions of *ISO Standard 7193 "Wheelchairs - Maximum overall dimensions"* (see [Bibliography - page 27](#)).

O 2.1.2 - A wheelchair may be considered to comply with the ISO Standard when its main dimensions are equal to or less than the following values (see [Appendix A - page 10](#)):

- overall length : 1 200 mm
- overall width : 700 mm
- overall height : 1 090 mm

R 2.1.3 - When the wheelchair is occupied and the passenger is in a resting position, his or her feet may protrude beyond the overall length by up to 50 mm.

R 2.2 - General functional characteristics of wheelchairs

2.2.1 - In addition to the maximum dimensions shown in ISO Standard 7193, Appendix [A](#) also contains the dimensions of wheelchairs most commonly used by adults. The length of these wheelchairs is generally between 1 100 and 1 200 mm, the width between 600 and 700 mm (see *ISO 7193*).

2.2.2 - The commonly-found dimensions for an occupied wheelchair are shown in Appendix [B - page 11](#). These dimensions represent the averages for male and female passengers in wheelchairs.

2.2.3 - Appendix [C - page 12](#) shows the overall reach of passengers in wheelchairs. The illustrations given also show a number of typical movements made by passengers in wheelchairs within the area of their reach.

2.2.4 - The minimum turning-circle diameter for a wheelchair as laid down in the ISO Standard (see Appendix [A](#)) is 1 500 mm (see [Appendix E - page 14](#)).

This dimension is measured in the zone of the footrests of a wheelchair with its occupant.

2.2.5 - The centre of gravity of a wheelchair with its occupant is approximately 660 mm above the supporting surface of the footrests.

3 - Design and equipment of coaches suitable for conveying passengers in wheelchairs

3.1 - Basic dimensions for accessibility to wheelchair + occupant

- R 3.1.1 - The space required by an empty or occupied wheelchair is shown in Appendix E, figure 7 - page 14.
- R 3.1.2 - Given that the dimensions inside coaches are limited, wheelchairs with the maximum dimensions may require manoeuvring several times to negotiate narrow zones.
- O 3.1.3 - Figure 9 - page 15 of Appendix F also shows the minimum space required to negotiate a 90° corner (e.g. when moving from the side corridor to the entrance vestibule). Rounding of the inside angle facilitates movement.

3.1.4 - Minimum width of doors and clearances

- R 3.1.4.1 - Standard *ISO 7193* specifies that there must be a minimum free space of 50 mm, and preferably 100 mm, on each side to enable a passenger to manoeuvre a wheelchair manually using the rims of the large wheels. This corresponds to a door clearance of 800 mm, and preferably 900 mm.

Given the constraints inside coaches, it is permissible to reduce the clearance in internal doorways and other bottlenecks that can be negotiated head-on, but only over short distances.

- R 3.1.4.2 - Unless otherwise indicated in *UIC Leaflet 560* (see *Bibliography - page 27*), it is recommended that doors, access areas, centre aisles and side corridors to be negotiated by wheelchairs should have a minimum effective width of 800 mm.
- O 3.1.4.3 - This 800 mm width is mandatory for vehicles built after 1-1-98.
- O 3.1.4.4 - When the effective width is reduced up to 720 mm, passengers in wheelchairs must be able to propel themselves using the fittings in the coach (door frames, handles, etc.).
- O 3.1.4.5 - The minimum effective width defined in point 3.1.4.4 also applies to short appliances located in access areas, centre aisles and side corridors to be negotiated by wheelchair. Radiator covers, brackets, handrails and other appliances must not further restrict this effective width.

3.1.4.6 - Effective width of doors parallel to the direction of movement

- O 3.1.4.6.1 - The effective width necessary for doors parallel to the direction of the wheelchair (compartment doors, toilet doors, etc.) must be dimensioned as a function of the effective width of the access leading to them.
- R 3.1.4.6.2 - The table in Figure 9 of Appendix F also shows the minimum effective widths derived from experience as a function of the width of the corridor.

R 3.1.5 - Figure 10 - page 15 of Appendix F shows the dimensions recommended for an occupied wheelchair in the table and washbasin access-space at foot and knee height.

3.1.6 - Wheelchair standing and storing areas

3.1.6.1 - Standing areas for occupied wheelchairs

O 3.1.6.1.1 - Standing areas for wheelchairs must be designed in such a way that passengers in wheelchairs can position themselves in the longitudinal direction of the coach.

O 3.1.6.1.2 - The space required for a stationary occupied wheelchair is shown in Figure 7 - page 14 of Appendix E. A turning zone must be provided to permit access to the area.

R 3.1.6.1.3 - Point 3.1.5 applies to the area at foot level.

O 3.1.6.2 - The space required for standing an empty wheelchair waiting to be used is shown in Figure 7 of Appendix E.

R 3.1.6.3 - When an area is provided for storing a folded wheelchair, the dimensions of the wheelchair when folded are 1 200 x 350 x 1 090 mm.

3.2 - Layout of the area accessible to passengers in wheelchairs

3.2.1 - Operation of inside doors by passengers in wheelchairs

3.2.1.1 - Assisted opening and closing

R 3.2.1.1.1 - Railways are recommended to fit doors with assisted opening and closing. It is important to prevent passengers from being injured during closing.

O 3.2.1.1.2 - User-friendly door opening/closing devices within the area assigned to disabled persons are mandatory for coaches built on the basis of tenders called after 1.1.98.

3.2.1.2 - Height of handles and controls

O 3.2.1.2.1 - Door handles and other devices for operation and manoeuvre must be placed at a height of between 800 and 1 200 mm above floor level in the absence of indications to the contrary.

R 3.2.1.2.2 - Railways are recommended to adopt a fixture height of between 1 000 and 1 100 mm above floor level.

3.2.2 - Handrails

R 3.2.2.1 - Railways are recommended to provide handrails and handholds in entrance zones.

O 3.2.2.2 - Handrails and handholds must be placed at a height of between 800 and 1 100 mm above floor level.

R 3.2.2.3 - Railways are recommended to adopt a minimum fixture height of 900 mm.

R 3.2.2.4 - Railways are recommended to leave a free space of between 40 and 50 mm between handrails and handholds and the surface to which they are affixed.

3.2.3 - Ramps and steps

- R 3.2.3.1** - Sloping floors and steps must be avoided wherever possible in coaches suitable for conveying wheelchairs.
- O 3.2.3.2** - The maximum permissible height for slopes and steps inside the vehicle is shown in Appendix **D** - [page 13](#).
- O 3.2.4** - Projecting parts, acute angles and sharp edges must be avoided with respect to interior fittings.
- R 3.2.5** - Railways are recommended to protect doors, walls and inside fittings that could be damaged by wheelchairs against impact up to a height of approximately 400 mm above floor level.
- O 3.2.6** - Coaches whose fittings have been adapted for wheelchairs must be marked with a pictogram as specified in *UIC Leaflet 413, Appendix B*:
- outside and inside the entrances suitable for wheelchairs,
 - at the entrances to compartments suitable for wheelchairs,
 - at the entrances of toilets adapted for wheelchairs,
 - for all other fittings adapted to wheelchairs.

3.3 - Entrances and vestibules

- R 3.3.1** - The entrances to coaches suitable for conveying wheelchairs may be either normal entrances or special doors.

3.3.2 - Entrance steps and handrails

- O 3.3.2.1** - The position and dimensions of steps and handrails at entrances are governed by the provisions of *UIC Leaflet 560* ([see Bibliography - page 27](#)).
- R 3.3.2.2** - Where possible, all the levels of the entrance steps should be adjusted to the effective width of the entrance doors.
- O 3.3.3** - Given the different positions of the wheelchair depending on the exit side, the entrance vestibule of the adjacent zone must be designed in such a way that the wheelchair can turn through 180° in one or more manoeuvres.
- O 3.3.4** - The internal fittings of the entrance zone of coaches suitable for conveying wheelchairs must be such that a passenger in a wheelchair can circumvent uncovered entrance steps.

3.4 - Layout characteristics of passenger compartments adapted for wheelchairs

3.4.1 - Seat for accompanying person

- O 3.4.1.1** - A seat must be provided for the travelling companion of each passenger in a wheelchair.
- R 3.4.1.2** - These seats may be of the folding or hinged type.

- O **3.4.2** - In order to enable a passenger to transfer from his/her wheelchair to a seat, the seats provided for this purpose must have fold-back armrests.
- O **3.4.3** - Coat hooks for passengers in wheelchairs must be positioned at a height of approximately 1 200 mm above floor level.
- R **3.4.4** - The areas reserved for passengers in wheelchairs should preferably be in non-smoking zones.
- R **3.4.5** - Examples of compartments or areas provided in open centre-aisle coaches are shown in Appendix H - page 17.

3.5 - Layout characteristics of toilets

O 3.5.1 - Position of toilet doors

3.5.1.1 - In order to improve accessibility, toilet doors must be positioned in such a way that passengers entering in wheelchairs are not impeded by the toilet bowl or the washbasin.

3.5.1.2 - In the case of toilets located near entrances, toilet doors must be sufficiently far from the entrance steps.

- O **3.5.2** - The dimensions of the toilet must allow for the simultaneous presence of a travelling companion.

3.5.3 - Toilet bowl and accessories

- R **3.5.3.1** - The dimensions recommended for the toilet bowl are shown in Appendix G - page 16.

- O **3.5.3.2** - An area must be reserved for the wheelchair by the side of the toilet bowl.

- O **3.5.3.3** - There must be a handrail on each side of the toilet bowl. The handrail on the transfer side must in all cases fold back.

- O **3.5.3.4** - The minimum dimensions for the arrangement of the toilet bowl in front of a wall are shown in Appendix G.

- O **3.5.3.5** - The flush control, toilet-paper holder, a waste bin and a call device - if such a device is otherwise stipulated - must be installed within handreach by the side of the toilet bowl.

3.5.4 - Washbasin and accessories

- R **3.5.4.1** - The height of the washbasin and its distance from the wall can be calculated from point 3.1.5 - page 6 (see Appendix F, Figure 10 - page 15).

- O **3.5.4.2** - The effect of the weight of a passenger supporting himself or herself on the washbasin must be taken into account.

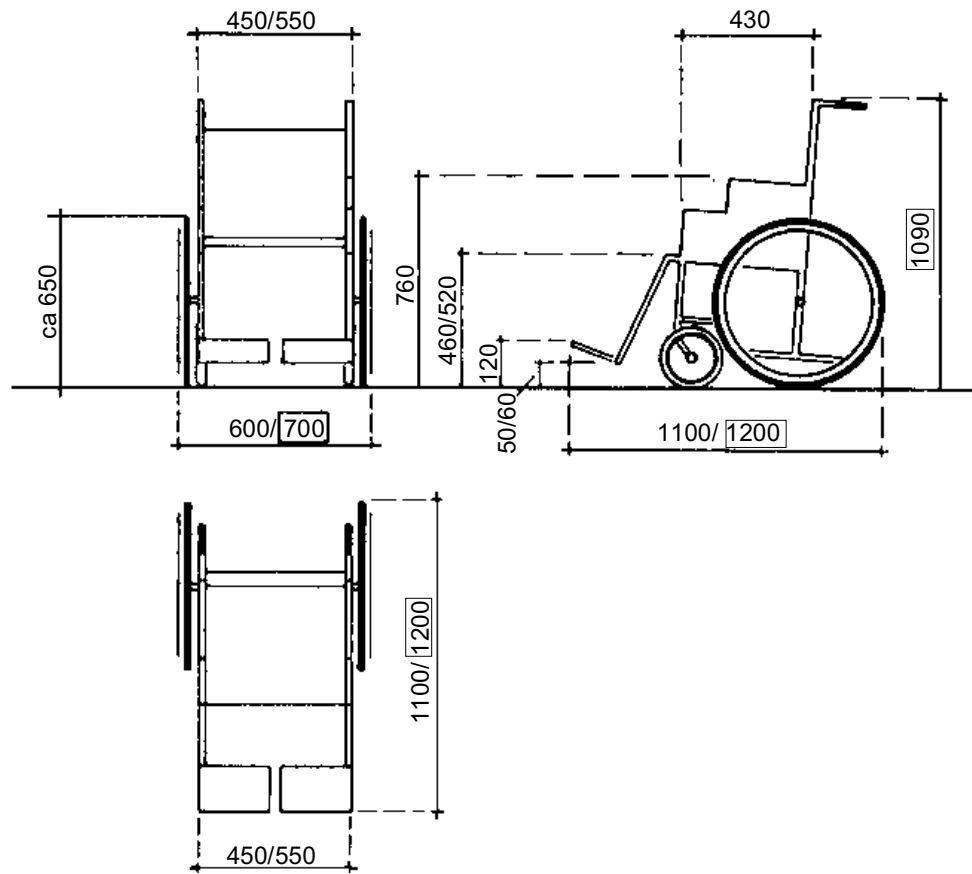
- R **3.5.4.3** - The minimum recommended dimensions of the washbasin are approximately 400 mm in length by 250 mm in width.

- O **3.5.4.4** - The tap control, soap dispenser, towel dispenser, waste bin for used towels and rubbish bin must be arranged within handreach.

3.5.5 - Toilet flush and tap controls

- O 3.5.5.1** - The flush and tap controls must be easy to operate.
- R 3.5.5.2** - Railways are recommended to fit power-assisted controls.
- O 3.5.6** - The mirror above the washbasin must be positioned in such a way that it also takes account of the eye height of a passenger in a wheelchair (see Appendix B - page 11).
- O 3.5.7** - See point 3.4.3 - page 8 for the arrangement of coat hooks.
- R 3.5.8** - Railways are recommended to fit toilets adapted for wheelchairs with a loudspeaker connected to the sound system specified in *UIC Leaflet 568* (see Bibliography - page 27).
- R 3.5.9** - Railways are recommended to enable disabled passengers to activate an emergency call signal that can be heard outside the toilet.
- R 3.5.10** - Examples of fittings for toilets adapted for disabled passengers in wheelchairs are given in Appendix H - page 17.

Appendix A - Wheelchair dimensions

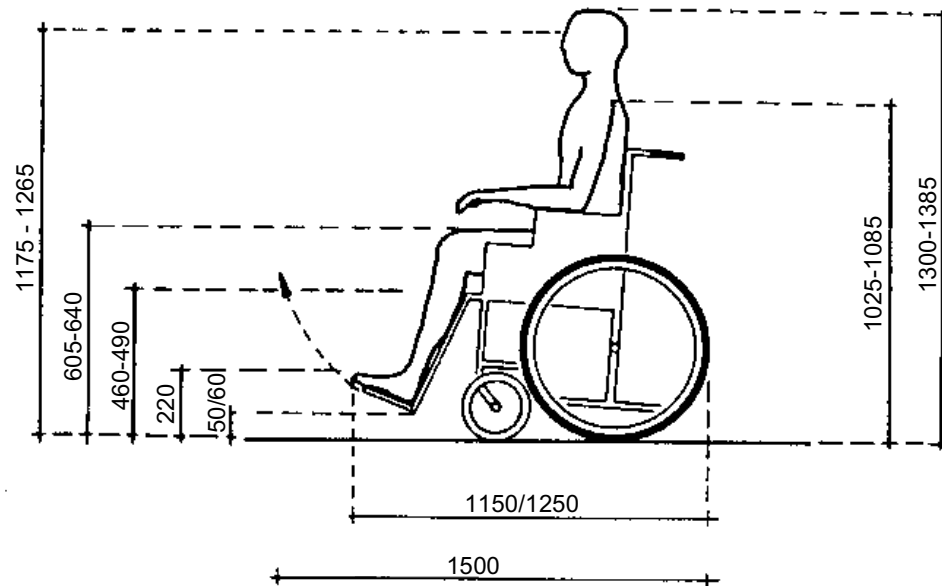


Dimensions shown in boxes = ISO 7193 maximum values

Fig. 1 - Wheelchair dimensions

(Extra dimensions taken from "Geboden Toegang, 7e Druk 1983")

Appendix B - Commonly-found dimensions for wheelchair + occupant



Dimensions = female and male averages according to DIN 33 402, January 1978 "Körpermaße des Menschen" and USA, 1979 "Human Dimension and interior space"

Fig. 2 - Commonly-found dimensions for wheelchair + occupant

(Dimensions taken partly from "Geboden Toegang, 7e Druk 1983")

Appendix C - Wheelchair + occupant

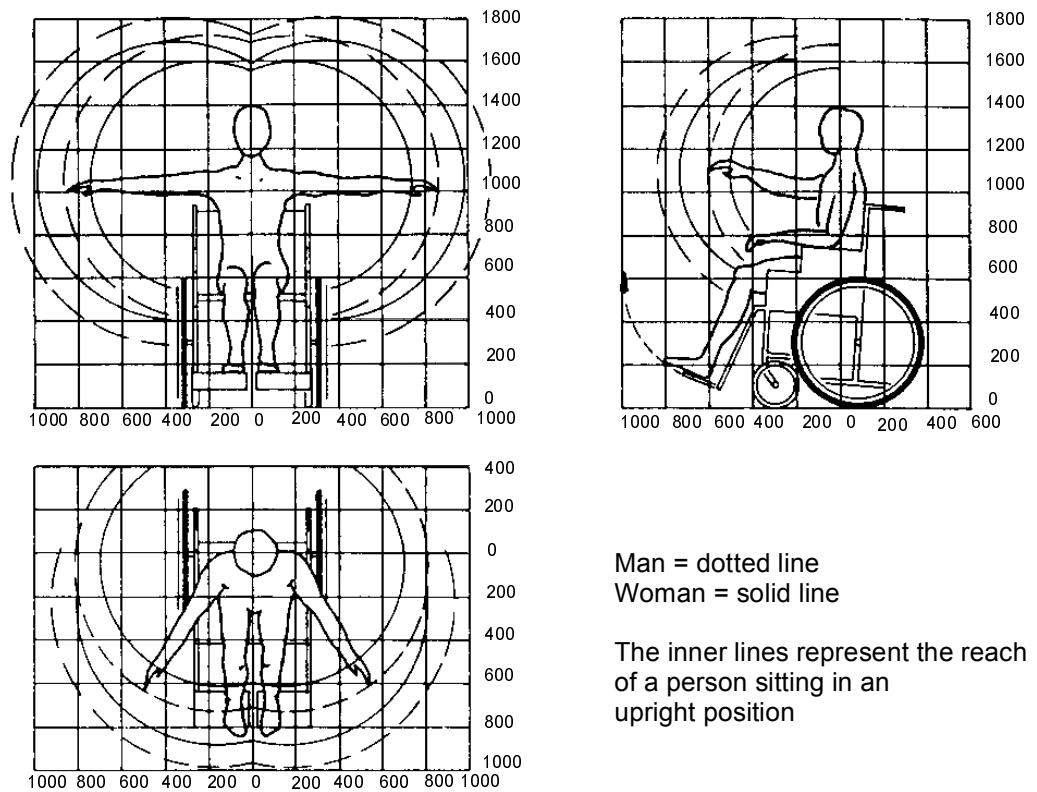


Fig. 3 - Reach

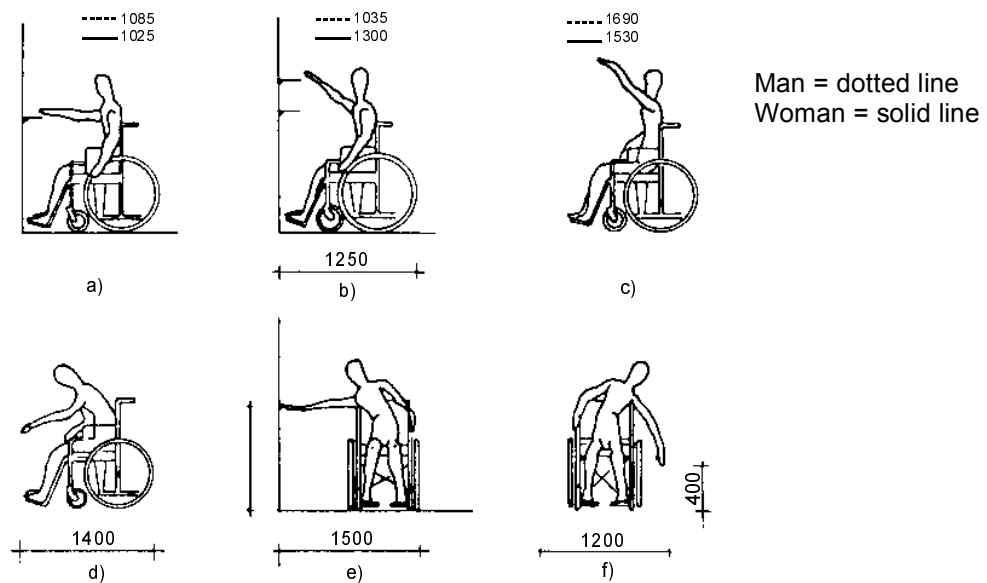
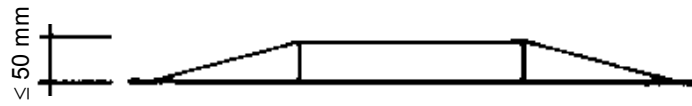


Fig. 4 - Examples

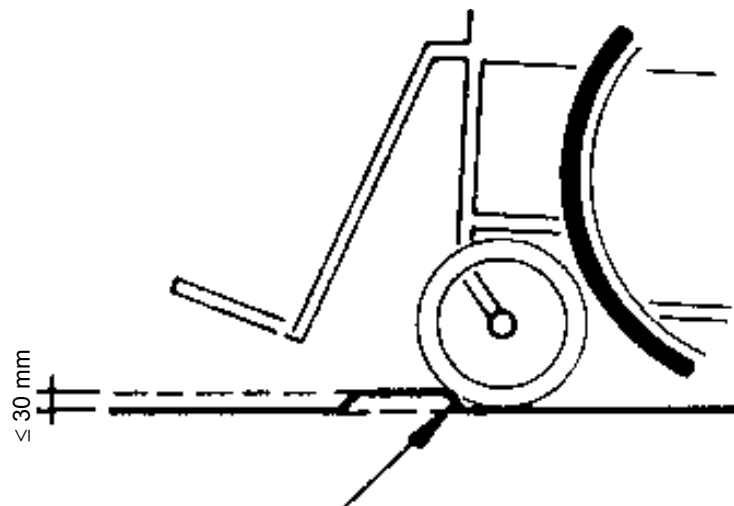
(Dimensions taken partly from "Geboden Toegang, 7e Druk 1983")

Appendix D - Maximum height difference for ramps and steps



Maximum slope of ramps 1 : 6

Fig. 5 - Ramps - Dimensions



Edges to be as rounded as possible

Fig. 6 - Steps - Dimensions

(Dimensions taken partly from "Geboden Toegang, 7e Druk 1983")

Appendix E - Basic dimensions of minimum space required by wheelchairs

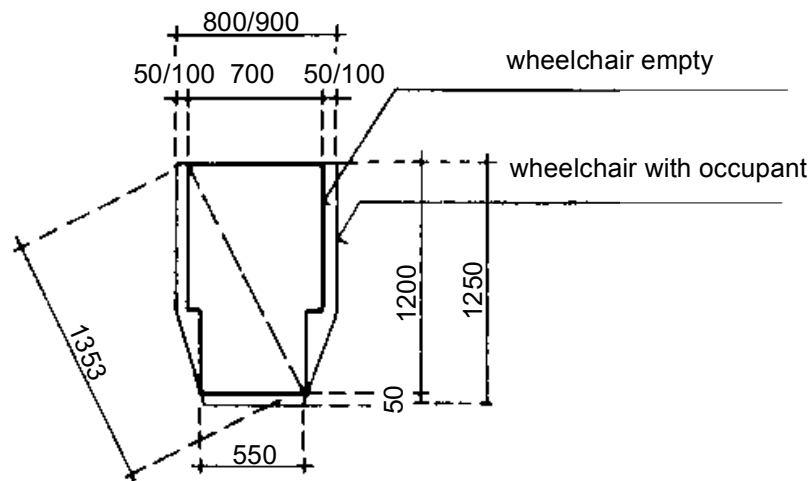


Fig. 7 - Space taken up by wheelchair with occupant/empty

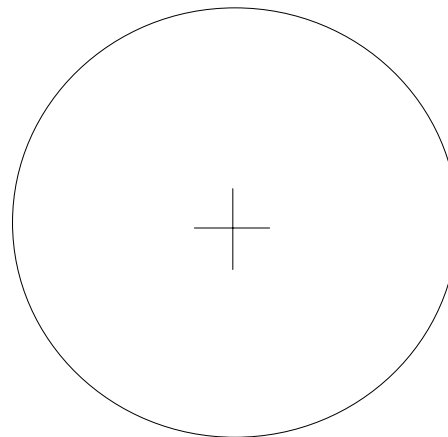
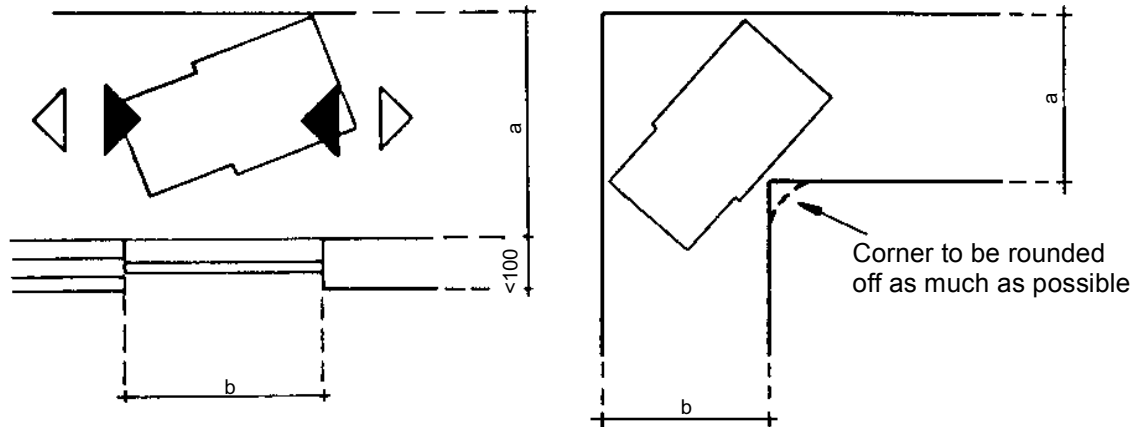


Fig. 8 - Turning circle \varnothing 1 500

(Dimensions taken partly from "Geboden Toegang, 7e Druk 1983")

Appendix F - Further dimensions of minimum space for wheelchairs



Corridor width a	1100	1000	900
Clearance width of door b or corridor width b	850	900	1000

(dimensions rounded off (in mm))

Fig. 9 - Clearance widths for 90° corners and sliding side doors in relation to corridor width (see Appendix H)

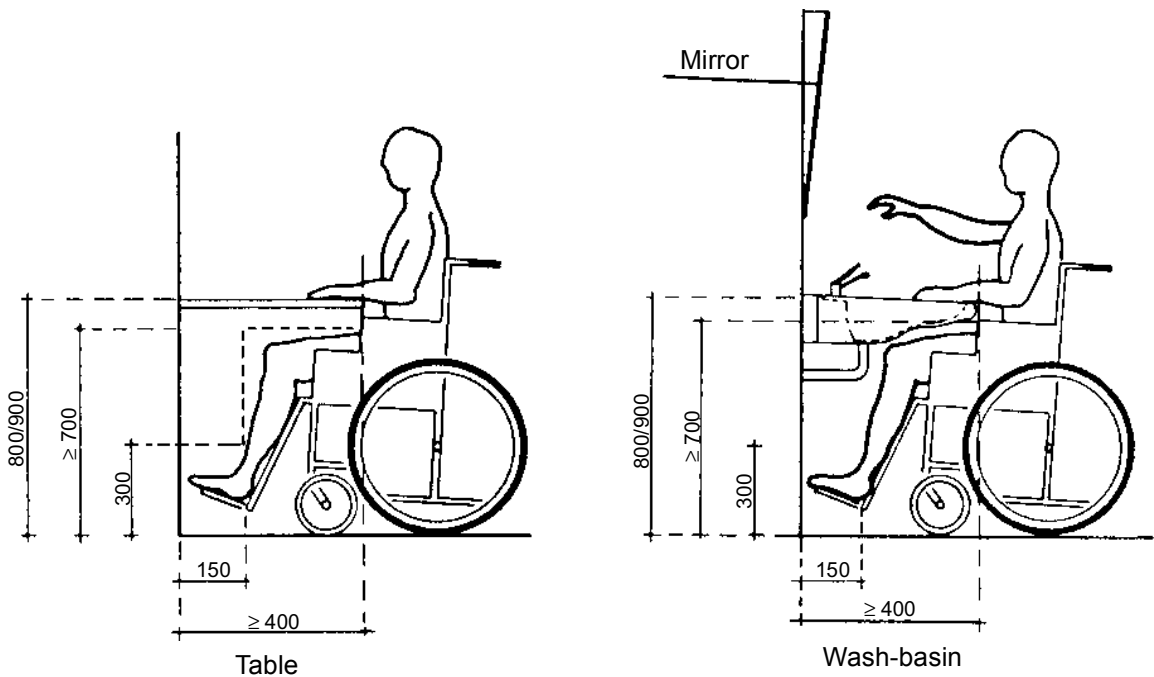


Fig. 10 - Table and wash-basin access space for wheelchair with occupant

(Dimensions taken partly from "Geboden Toegang, 7e Druk 1983")

Appendix G - Dimensions and position of toilet bowl

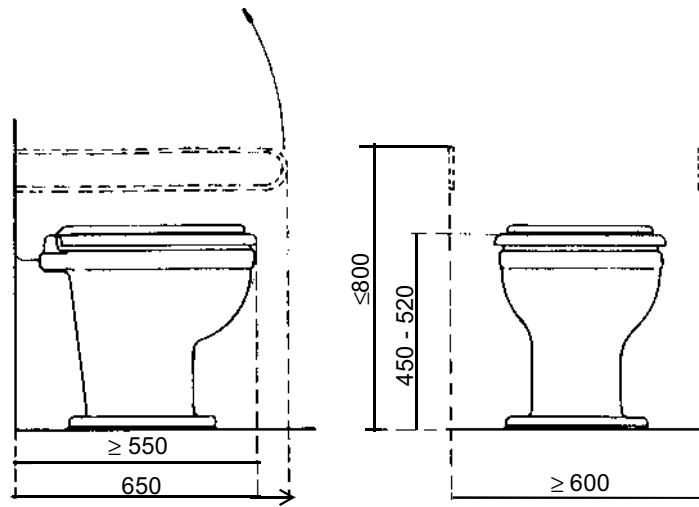


Fig. 11 - Dimensions

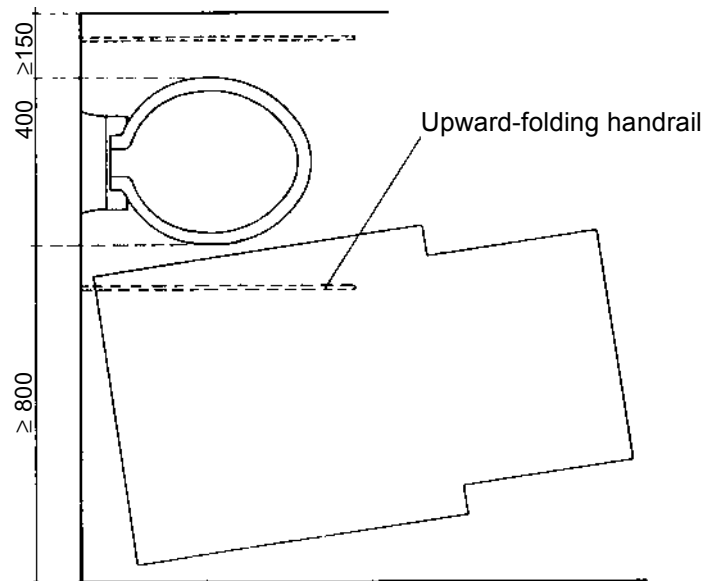
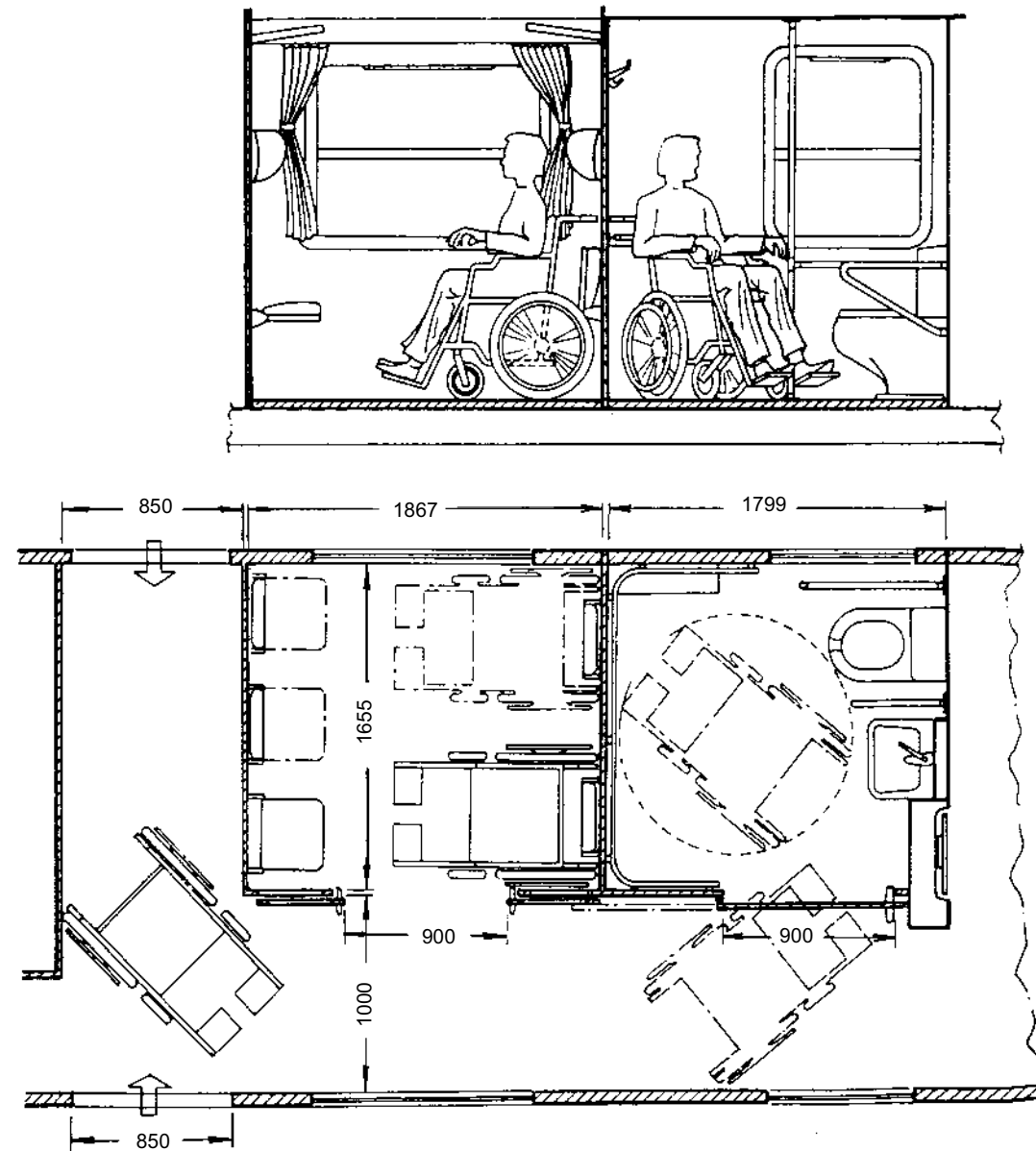


Fig. 12 - Position in front of a wall

Appendix H - Examples of coaches suitable for conveying passengers in wheelchairs

H.1 - Coaches suitable for conveying passengers in wheelchairs with the basic dimensions for standard coaches

Compartment coaches



Solution for conveying two disabled passengers travelling in wheelchairs over medium and long distances

*Fig. 13 - FS - Type UIC-X coach - 2nd class
Compartment and toilet adapted for wheelchairs*

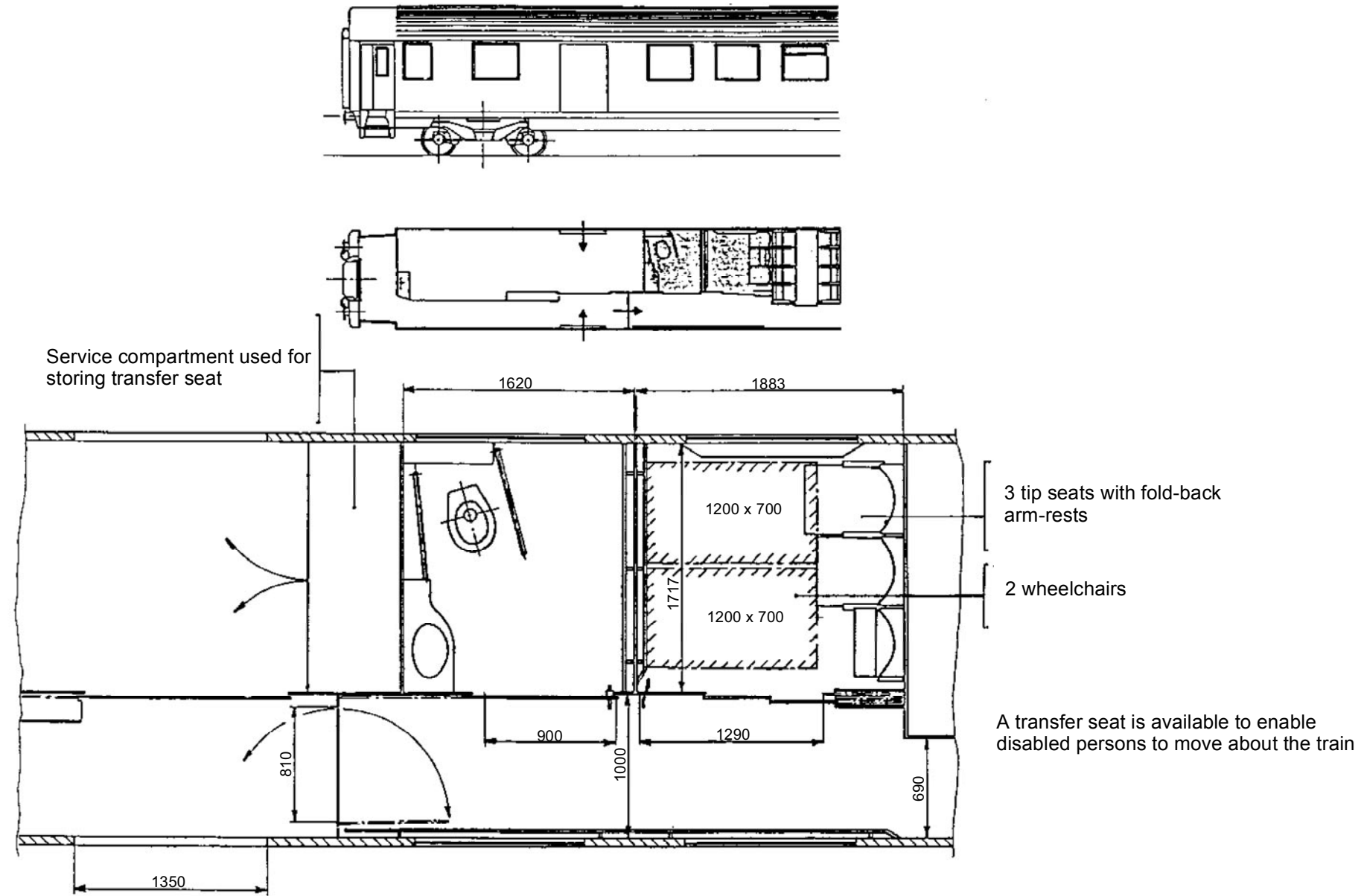


Fig. 14 - SNCF - Type B⁷ DUX coach

Open, centre-aisle coaches

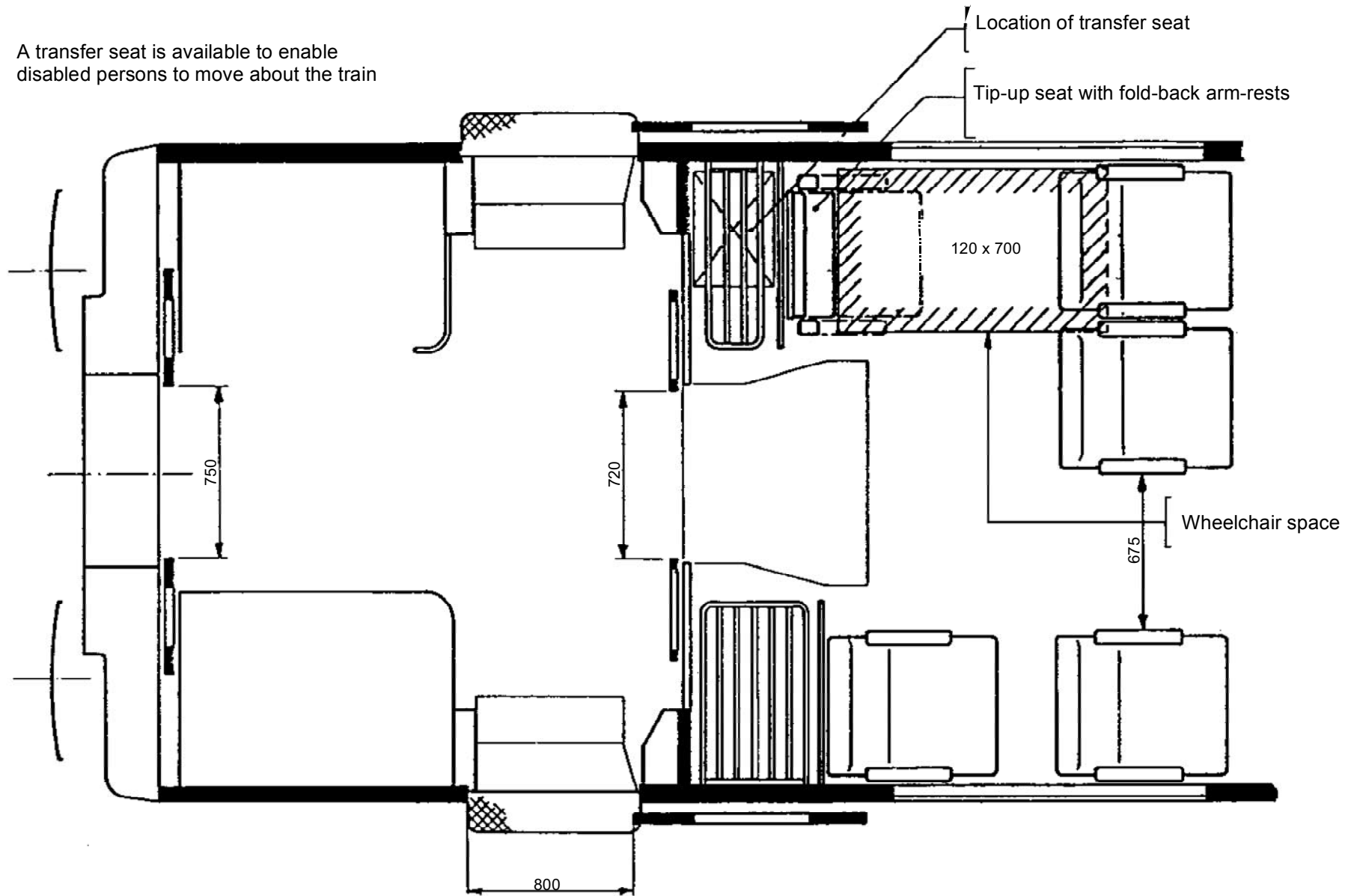


Fig. 15 - SNCF - 1st class compartment - Type VTU

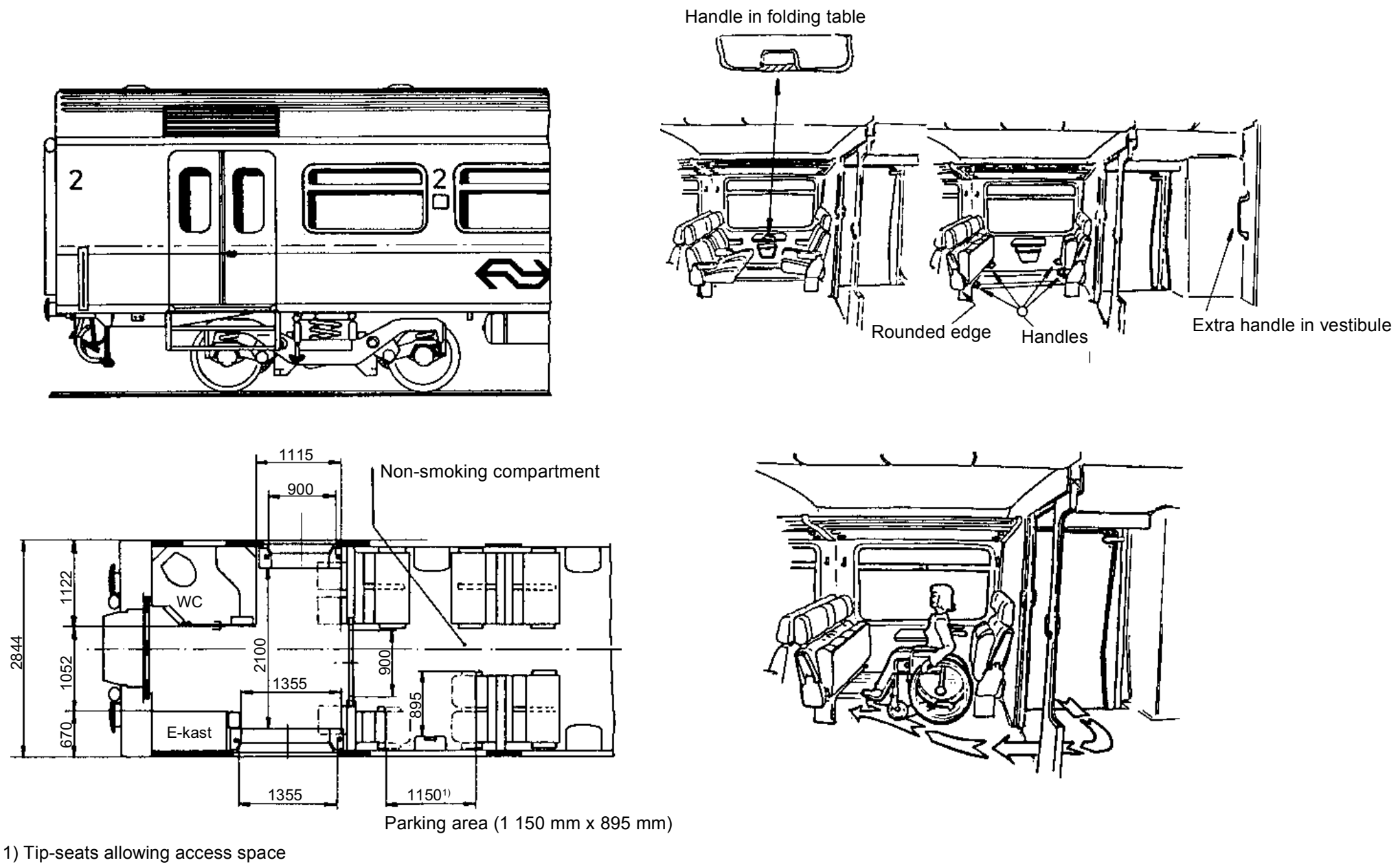


Fig. 16 - NS - Type ICR - 2nd class
Group of seats fitted for wheelchairs

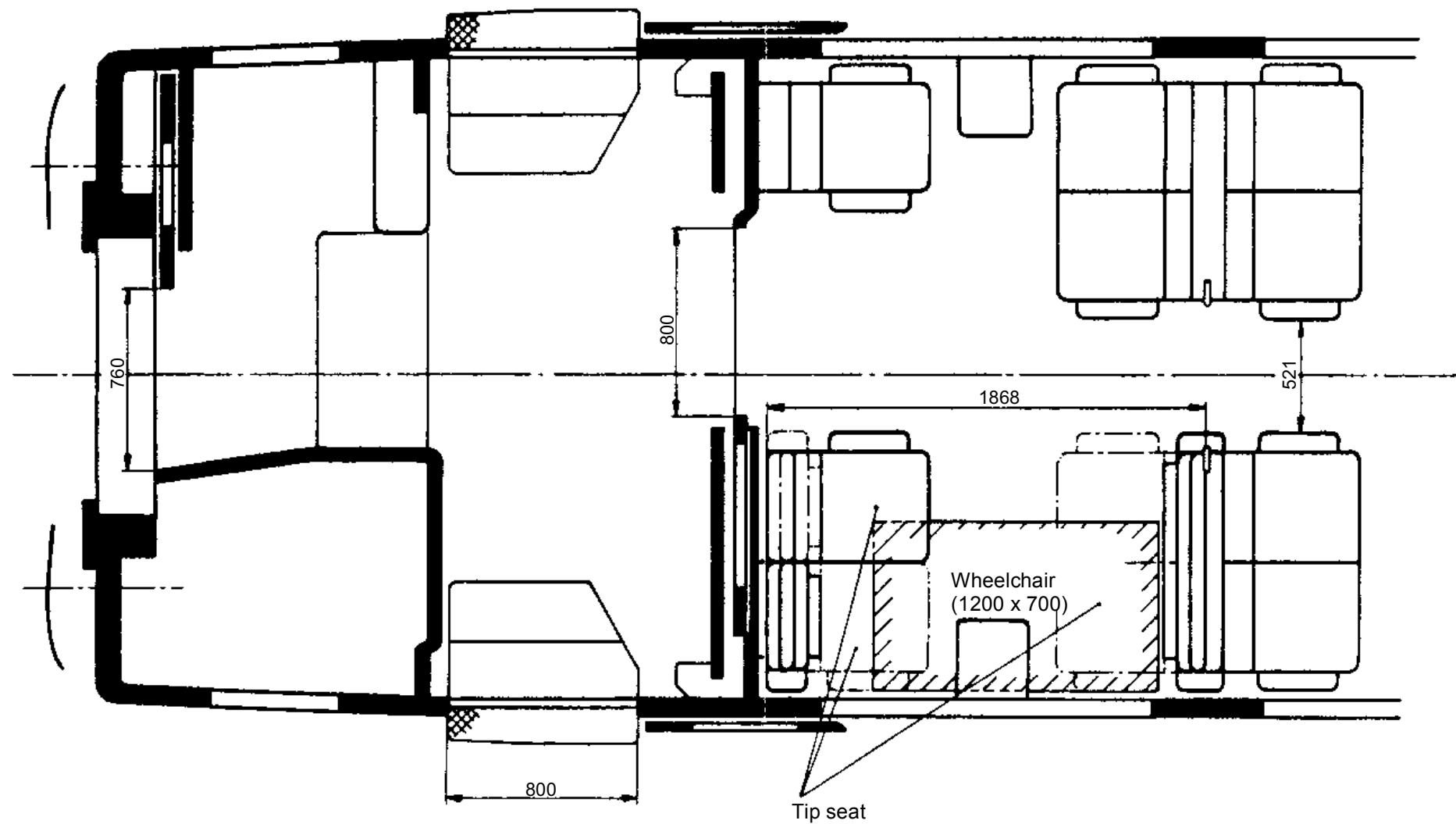


Fig. 17 - CFF / SBB - Compartment for the disabled - EW IV type - 2nd class
Group of seats fitted for wheelchairs

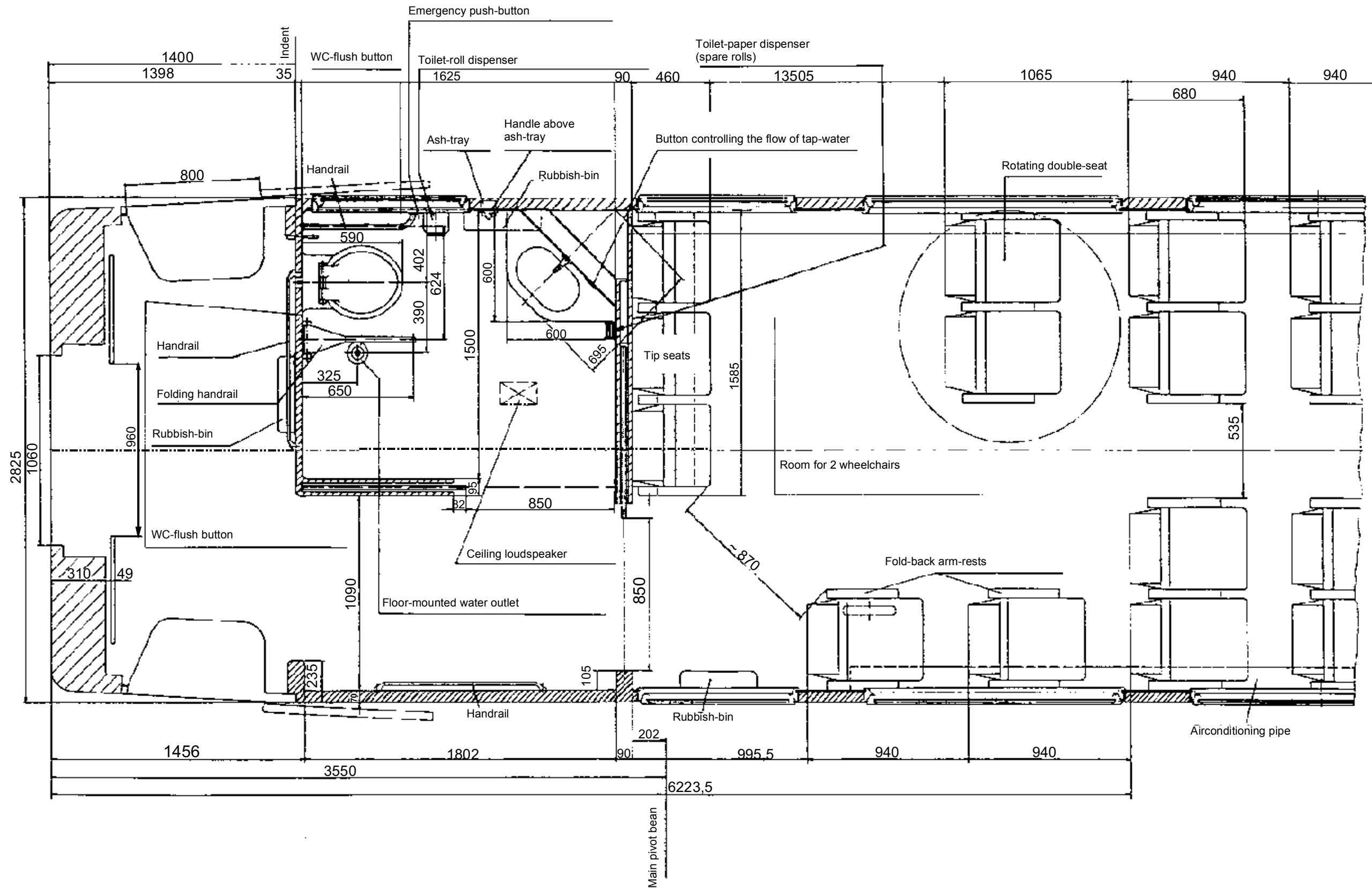


Fig. 18 - DB - Group of seats and toilet fitted for wheelchairs - Bpmz 291.5/6 Type - 2nd class

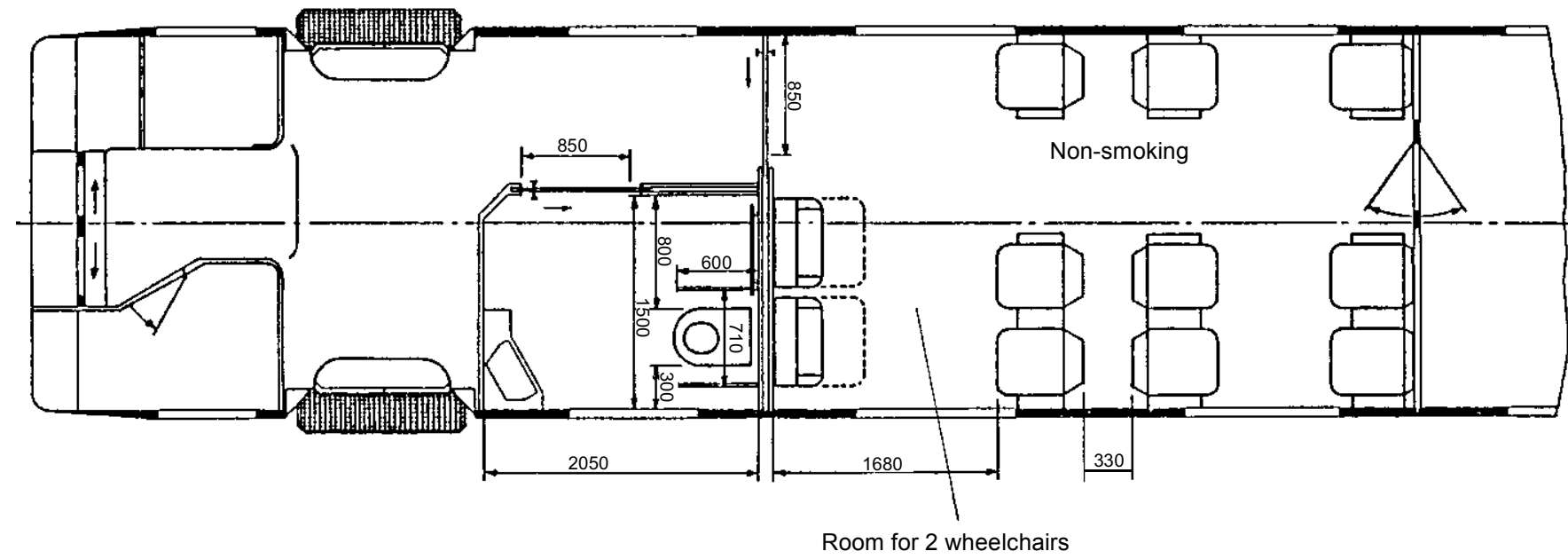


Fig. 19 - ÖBB - Coach for families and disabled persons - type AB p 36-35 - 1st and 2nd classes - End 1
Group of seats and toilet fitted for wheelchairs

H.2 - Other types of coach suitable for conveying wheelchairs

Open, centre-aisle coaches

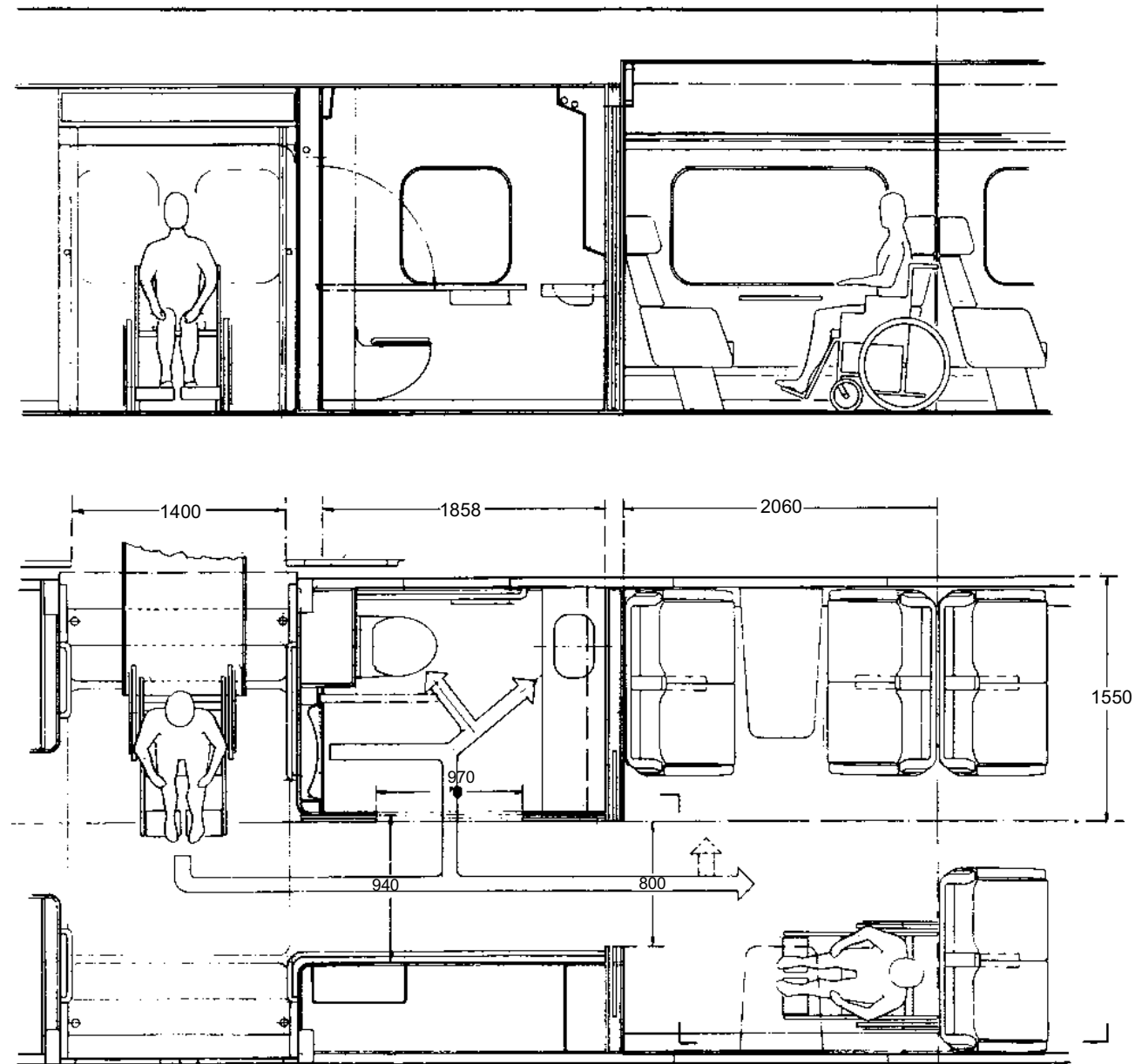


Fig. 20 - DSB - Long-distance coach - type IC/3, MF
Compartment and toilet adapted for wheelchairs

Appendix I - Operating conditions and recommendations relating to the conveyance of wheelchairs on board specially-fitted coaches

The purpose of this leaflet is to give designers of rolling stock an internationally coordinated approach to the definition of passenger compartments with reference to wheelchairs in specially fitted coaches and, by the same token, to provide disabled passengers in wheelchairs with a user-friendly means of transport as and when required.

The constructional design criteria for the vehicles in question presuppose compliance with the following universally recognised international regulations.

I.1 - General transport conditions

I.1.1 - It is assumed that wheelchair users usually travel with a companion and that they undertake a journey only after having given advance notice and having made a reservation.

I.1.2 - Light baggage carried on the wheelchair must be positioned by the user of the chair in such a way that the maximum ISO dimensions are not exceeded.

I.1.3 - Whenever possible, larger items of baggage should be registered before departure as accompanied baggage. However, if they have to be retained by the passenger, they must be transported separately from the wheelchair or in such a way that they can be removed from the chair easily on entering the coach and transferred by auxiliary staff directly inside the coach to the passenger's seat or to the dedicated wheelchair area.

I.2 - Boarding arrangements

I.2.1 - Weight restrictions

I.2.1.1 - The aggregate weight of an occupied wheelchair consists of the respective weights of the wheelchair and its occupant.

I.2.1.2 - Regulations on occupational safety recommend 55 kg as an acceptable load for occasional lifting by a man. This means in general that the acceptable load for two male attendants placing a wheelchair in a coach or taking it out is approximately 110 kg.

NB : This load is equivalent to the total weight of a folding wheelchair occupied by an average male person.

- folding wheelchair : 35 kg
- average male person : 75 kg
- total weight : 110 kg

I.2.1.3 - Manual loading should also be considered for cases of breakdown, impossibility of use or non-availability of local boarding devices. Advice notice must therefore be given of occupied wheelchairs that greatly exceed the total weight of 110 kg with an indication of the probable total weight.

I.2.1.4 - Electrically-powered wheelchairs generally exceed the total weight of 110 kg by a considerable margin and can therefore be transported only by special agreement.

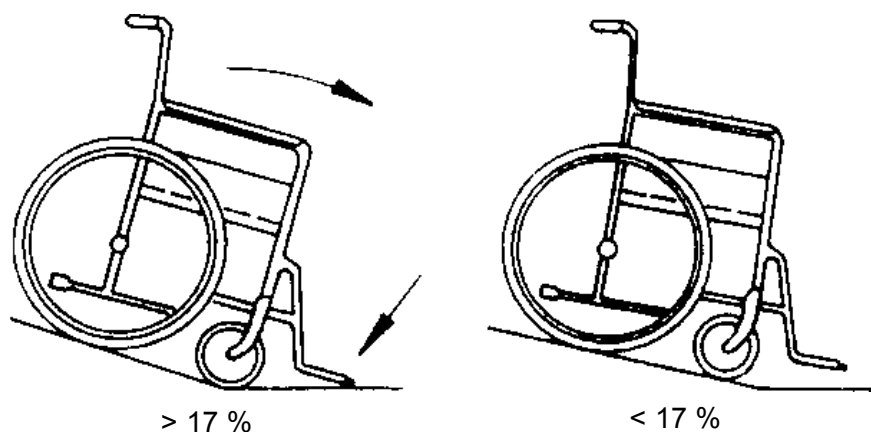
I.2.2 - Use of ramps for access to coaches

The difference in level between the top of the platform and the floor of the coach, which can vary widely depending on local conditions, means that access ramps can have differing slope/angles.

The maximum incline of between 5 and 12% generally recommended for ramps would give rise to impractical ramp lengths given the different levels encountered.

For this reason, the maximum permissible value is considered to be 17% which requires the presence of the mobile-ramp operator to assist disabled passengers in wheelchairs.

Ramps with slopes less than or equal to 17%



*Fig. 21 - Risk of the wheelchair tipping over should the foot-rest catch the bottom of the slope
(Dimensions taken partly from "Geboden Toegang, 7e Druk 1983")*

Bibliography

1. UIC leaflets

International Union of Railways

Leaflet 413: Measures to facilitate travel by rail, 9th edition, December 2000

Leaflet 560 : Doors, footboards, windows, steps, handles and handrails of coaches and luggage vans, 12th edition, March 2002

Leaflet 563 : Fittings provided in coaches in the interests of hygiene and cleanliness, 8th edition of 1.1.90 and 4 Amendments

Leaflet 566 : Loadings of coach bodies and their components, 3rd edition of 1.1.90 and addenda and 1 Amendment

Leaflet 568 : Loudspeaker and telephone systems in RIC coaches - Standard technical characteristics, 3rd edition of 1.1.96

2. Minutes of meetings

International Union of Railways

Traction and Rolling Stock Committee (Question 45/A/7a 6 - Transport of disabled passengers), June 1986

Rolling Stock Committee (Question 45A7.1.3 - Adaptation and enhancement of facilities on rolling stock and in international traffic. Transport of disabled passengers - Studies on vehicle-mounted boarding devices), April 1997

Passenger Commission (Point 10.1 - Adaptation of UIC Leaflet 565-3 "Indications for the layout of coaches suitable for conveying disabled passengers in their wheelchairs"), November 1997

3. International standards

ISO 7193

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Warning

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