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National Standards of the People's Republic of China

GB 13094–200x
Replacing GB 13094–1997

The safety requirements for bus construction

(Draft for Approval)

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Issued by **The General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China**

The Standardisation Administration of the People's Republic of China (SAC)

Contents

Foreword

All the technical contents of this Standard are mandatory.

This Standard and Directive 2001/85/EC, "Special provisions for vehicles used for the carriage of passengers comprising more than eight seats in addition to the driver's seat" (English version) promulgated by the European Parliament and the European Council are non-equivalent.

This Standard replaces GB 13094-1997, "The safety requirements for bus construction."

Compared with GB 13094-1997, the major changes of the Standard are as follows:

a) The scope of the Standard has been re-determined in relation to the number of passengers, and is linked with the scope of GB 18986–2003, "The Safety Requirements for Light Bus Construction". It is clearly specified that sleeper buses are not included (Section 1 of the 1997 version; Section 1 of this version).

b) The following terms and definitions have been revised:

— gangway (Subsection 3.5 of the 1997 version; Subsection 3.1 of this version);

— access passage (Subsection 3.6 of the 1997 version; Subsection 3.2 of this version);

— exit (Subsection 3.4 of the 1997 version; Subsection 3.6 of this version);

— emergency exit (Subsection 3.3 of the 1997 version; Subsection 3.7 of this version);

— emergency window (Subsection 3.1 of the 1997 version; Subsection 3.9 of this version);

— escape hatch (Subsection 3.2 of the 1997 version; Subsection 3.11 of this version).

c) The following terms and definitions have been supplemented:

— driver's compartment (see Subsection 3.3);

— separate compartment (see Subsection 3.4);

— double doors (see Subsection 3.5);

— emergency door (see Subsection 3.8);

— double or multiple windows (see Subsection 3.10);

— power-operated service door (see Subsection 3.12);

— automatically operated service door (see Subsection 3.13);

— starting prevention device (see Subsection 3.14);

— member of the crew (see Subsection 3.15);

— passenger with reduced mobility (see Subsection 3.16);

— wheelchair user (see Subsection 3.17);

— priority seat (see Subsection 3.18);

— demountable seat (see Subsection 3.19);

— boarding device (see Subsection 3.20);
— kneeling system (see Subsection 3.21);
— lift (see Subsection 3.22);
— ramp (see Subsection 3.23);
— portable ramp (see Subsection 3.24);
— mass of the vehicle in running order (see Subsection 3.25);
— In order to ensure a clear understanding of “front”, “rear”, “forward”, “foremost”, “backward” and “rearmost” which appear in the clauses of the Standard several times, they are specified clearly (see Subsection 3.26).

d) The technical requirements for the suitable facilities provided for passengers with reduced mobility have been increased (see Subsections 4.1.3 and 4.5.5.4, and Appendix A);

e) The requirements and test methods for the strength of the superstructure of buses have been revised (see Subsection 4.2 of the 1997 version; Subsection 4.2 of this version);

a) The requirements and confirmation methods for the stability of buses during lateral inclination have been increased (see Subsection 4.3 and Appendix B);
b) The requirements in terms of the non-combustibility of conducting wire have been increased (see Subsection 4.4.4.1);
c) The separation methods and requirements for the minimum number of exits have been revised (see Subsection 4.4.1.2 of the 1997 version; Subsection 4.5.1.1 of this version);
d) The requirements for the minimum number of service doors have been revised (see Subsection 4.4.1.1 of the 1997 version; Subsection 4.5.1.2 of this version);
e) The stipulations for the positions of service doors have been revised (see Subsection 4.4.2.1 of the 1997 version; Subsections 4.5.1.3 and 4.5.1.4 of this version);
f) The stipulations for double doors and double or multiple windows, which are regarded as two bus doors and two emergency windows respectively, have been increased (see Subsection 4.5.1.5);
g) The stipulations for the emergency exits at the front and rear or the provision of an escape hatch have been increased (see Subsection 4.5.1.7);
h) The stipulations for the minimum number of safety roof windows have been revised as have the stipulations for the minimum number of escape hatches (i.e. safety roof windows and/or floor exits) (see Subsection 4.4.1.3 of the 1997 version; Subsection 4.5.1.8 of this version);
i) The related stipulations for the additional seat near the exit of the driver's compartment and the driver have been increased (see Subsections 4.5.1.11–4.5.1.13);
j) The minimum dimensions of exits, the minimum width of double doors and the net area of emergency windows and escape hatch holes have been revised (see Subsection 4.4.3.1 of the 1997 version; Subsection 4.5.2 of this version);
k) The stipulations for the service doors of urban buses, which should be openable by passengers from the outside, have been increased (see Subsection 4.4.4.3 of the 1997 version; Subsection 4.5.3.1 of this version);
l) The detailed anti-pinch requirements for power-operated service doors have been revised/supplemented, and the measurement methods of door closing force have been increased (see Subsection 4.4.5.3 of the 1997 version; Subsection 4.5.4.6 of this version and Appendix C);
m) The additional requirements for automatically operated service doors have been increased (see Subsection 4.5.5);
n) The requirements for emergency doors, emergency windows, escape hatches and extendable steps have been made more comprehensive (see Subsections 4.4.6, 4.4.7, 4.4.8 and 4.4.9 of the 1997 version; Subsections 4.5.6, 4.5.7, 4.5.8 and 4.5.9 of this version);
o) The requirements for the height between the lower edge of the side windows of

vehicle and the floor below it have been increased (Subsection 4.5.7.5);

p) The stipulations for the interior layout of buses and handrails have been revised (see Subsections 4.5 and 4.7 of the 1997 version; Subsections 4.6 and 4.10 of this version);

q) The stipulations for the articulated section and direction-maintenance of articulated buses, heating devices inside the compartment, moveable covers and visual entertainment have been increased (see Subsections 4.8, 4.9, 4.12.2, 4.13 and 4.14);

r) The stipulations for the indication of luggage mass have been increased (see Subsection 4.15);

s) The requirements for the axle load mass, laden mass and manoeuvrability of vehicles have been deleted (see Subsections 4.1 and 4.6 of the 1997 version);

t) The quantitative requirements for clean air per capita inside the bus have been deleted (see Subsection 4.5.4.3 of the 1997 version, and Subsection 4.16 of this version).

The requirements for the transition periods for enforcement of this Standard are as follows:

a) Regarding new bus models produced, the following clauses shall be implemented as from 36 months after the enforcement of the Standard;

— Subsection 4.2, whereby Grade II and Grade III buses should abide by the stipulations of GB/T 17578;

— Subsection 4.3, containing stipulations for the stability of buses during lateral inclination.

b) Regarding existing models of buses produced, implementation shall be effective as from 36 months after the enforcement of the Standard;

c) The stipulations of Subsection 4.5.9.4 relating to extendable steps shall be implemented as from 12 months after the enforcement of the Standard.

Appendix A, Appendix B and Appendix C of the Standard are normative appendices.

The Standard was proposed by the National Development and Reform Commission.

The Standard is kept by the National Automotive Standardisation Technical Committee (SAC/TC114).

The units responsible for the drafting of the Standard are: Urban Vehicle Committee, Scientific Techniques Committee, Ministry of Construction; and China Highway Vehicle Machinery Headquarters.

The units involving in the drafting of the Standard are: Zhengzhou Yutong Bus Co. Ltd, National Automobile Quality Supervision and Test Centre (Xiangfan), Xi'an Silver Bus Corporation, Dandong Huanghai Bus Co. Ltd, Xiamen Kinlong United Vehicle Industrial Co. Ltd, Commercial Vehicle Research and Development Centre of Dongfeng Automobile Co. Ltd, Kinlong United Vehicle Industrial (Suzhou) Co. Ltd, Shanghai Sunwin Bus Co. Ltd, Zhongtong Bus and Holding Co. Ltd, FAW Bus and Coach Co. Ltd, Dongfeng Hangzhou Motor Co. Ltd, Yangzhou Yaxing Motor Coach Co. Ltd, Anhui

Ankai Automobile Co. Ltd, Chengdu Bus Corporation, Guilin Daewoo Bus Co. Ltd, Mudan Automobile Co. Ltd, Xiamen Golden Dragon Coach Co. Ltd, Beijing North Neoplan Bus Corporation, Jinhua City Neoplan Bus Co. Ltd, Sichuan FAW Toyota Motor Co. Ltd, Yaxing-Benz Co. Ltd and Chongqing Communications Research and Design Institute.

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The previous versions of the Standard, which are replaced by this Standard, are:

GB/T 13094-1991 and GB 13094-1997.

The Safety Requirements for Bus Construction

1 Scope

The Standard specifies the safety requirements for bus construction.
The Standard is applicable to Grade I, Grade II and Grade III single-decker buses in Category M_2 and Category M_3.
The Standard is inapplicable to sleeper buses, school buses and special-use buses.

2 Normative references

The provisions of the following documents become provisions of this standard after being referenced. For dated reference documents, all later amendments (excluding corrigenda) and versions do not apply to this standard; however, the parties to the agreement are encouraged to study whether the latest versions of these documents are applicable. Where the references are not dated, the latest versions apply to this standard.

GB/T 3730.2-1996 Road vehicles – Masses – Vocabularies and codes
GB/T 4780-2000 Terms for motor vehicle bodies
GB 8410 Flammability of automotive interior materials
GB/T 10001.1 Public information graphical symbols for use on signs – Part 1: Common symbols (GB/T 10001.1-2000, neq ISO 7001: 1990)
GB/T 12428 Laden mass calculation of buses
GB/T 15089 Classification of power-driven vehicles and trailers
GB/T 17578 Strength requirements for the superstructure of buses
GB 18986 The safety requirements for light bus construction
GB/T 19260-2003 Structure requirements for low-floor city-buses and low-entry city-buses
QC/T 730-2005 Road vehicle low-tension cables with thin wall insulation

3 Terms and definitions

The terms and definitions determined in GB/T 3730.2-1996, GB/T 15089 and GB 18986, as well as the following terms and definitions, are applicable to this Standard.

3.1 “Gangway”

The walking area for passengers to walk from a certain (row) seat to another (row) seat, to the access passage of the service door and to the passenger standing area. It does not include:

a) The space of 300 mm in front of the seats. The dimensions for seats facing the lateral surface and located above the wheel cover can be reduced to 225 mm;

b) The space above the steps;

c) The walking space provided only for entering a certain (row) seat or rows of face-to-face seats.

Remarks: This is different from Subsection 3.56 of GB/T 4780-2000.

3.2 "Access passage"

The extended space from the service door to the outer edge of the top step inside the bus. If a bus has no steps, the access passage refers to the space from the service door to 300 mm inside.

3.3 "Driver's compartment"

The space exclusively for the use of driver at all times including emergencies, including the space of the driver's seat, steering wheel, controller, panel and other space occupied by the devices necessary for driving or controlling the bus.

Remarks: This is different from Subsection 3.21 of GB/T 4780-2000.

3.4 "Separate compartment"

A space inside the bus for passengers or a member of the crew to use during the running of the bus. The space is separated from the adjacent passenger compartment, but may have an access door between the two.

3.5 "Double door"

A door that can provide two access passages or the equivalent.

3.6 "Exit"

The service door or emergency exit.

3.7 "Emergency exit"

An emergency door, emergency window or escape hatch.

3.8 "Emergency door"

A door serving as an exit for passengers only in abnormal and emergency circumstances.

3.9 "Emergency window"

A window serving as an exit window for passengers only in emergency circumstances. The window cannot be framed with glass.

3.10 "Double or multiple window"

A two-part or multiple-part emergency window that can be divided on a perpendicular line (or perpendicular surface), each part of which meets the dimension and manoeuvrability requirements of the emergency window.

3.11 "Escape hatch"

An exit in the roof or floor of the bus serving as an emergency exit for passengers only in emergency circumstances. It is a safety roof skylight or floor exit only.

3.12 "Power-operated service door"

A service door powered by energy other than manpower. If it does not open and close automatically, the door should be remote-controllable by the driver or a member of the crew.

3.13 “Automatically operated service door”

A power-operated service door which can be opened by passengers and then automatically closed after the driver turns on the control.

3.14 “Starting prevention device”

A device which can automatically prevent a static vehicle from being started.

3.15 “Member of the crew”

An auxiliary member of the crew apart from the driver (such as an assistant driver, bus attendant or tourist guide).

3.16 “Passenger with reduced mobility”

A passenger who has difficulties in using transportation, such as handicapped persons (including the visually impaired, mentally handicapped or physically handicapped), patients, wheelchair users, short persons, the elderly, pregnant women and people holding a baby or a child.

3.17 “Wheelchair user”

A person who is limited by a physical condition and has to use a wheelchair for mobility.

3.18 “Priority seat”

A clearly indicated seat with extra space provided for passengers with reduced mobility.

3.19 “Demountable seat”

A seat that can be easily demounted from the bus.

3.20 “Boarding device”

A device that offers convenience for wheelchair users to get on the bus, such as a lift, ramp, etc.

3.21 “Kneeling system”

A system that can lower the bus body and restore it to the normal operating position and height.

3.22 “Lift”

A device or system with an ascending and descending platform to enable a passenger and wheelchair to get on and off the bus obstacle-free between the ground (or roadside/road shoulder) and the floor of the passenger compartment.

3.23 “Ramp”

A bridge device between the floor of the passenger compartment and the ground (or roadside/road shoulder).

3.24 “Portable ramp”

A ramp that can be separated from the vehicle structure and dismounted by the driver

or a member of the crew.

3.25 “Mass of the vehicle in running order”

The mass of the vehicle not laden with passengers and/or laden with cargo in running order, including the mass of the vehicle’s fittings and the mass of the driver and the member of the crew (if the seat for a member of the crew is installed).

3.26 “Front” and “rear”

A suitable definition of the normal driving directions of the vehicle, like front or rear, “forward”, “backward”, “foremost”, “rearmost”, etc, should be established.

4 Requirements

4.1 General Requirements

4.1.1 If a vehicle belongs to more than one type of Grade I, Grade II and Grade III bus at the same time, the vehicle should meet the relevant clauses of the Standard according to each type to which it belongs.

4.1.2 Unless specified in other stipulations, the measurements indicated in the Standard should be carried out when the bus has the mass of a vehicle in running order (with a seated member of the crew or the relevant allocated mass) and is stationary on flat, horizontal ground. If the vehicle is equipped with a kneeling system, it should be adjusted to the normal height of the vehicle during running.

Regarding the requirement of the Standard that a certain surface inside the vehicle should be horizontal or situated at a certain angle when the bus is at the mass of a vehicle in running order, a surface inclination or angle exceeding the stipulation is allowed if the bus is at the mass of a vehicle in running order only when a vehicle with mechanical suspension meets the requirements under the laden conditions announced by the manufacturer. If the vehicle is equipped with a kneeling system, the system should not be set in operation.

4.1.3 If the bus is equipped with a device to assist passengers with reduced mobility or wheelchair users, it should meet the stipulations of Appendix A.

4.2 Strength of superstructure

The superstructure of the bus should possess sufficient strength and rigidity. Grade II and Grade III buses should meet the stipulations of GB/T 17578.

4.3 Stability of buses during lateral inclination

4.3.1 The stability of vehicles during lateral inclination refers to the requirement that the vehicle does not overturn when it is placed horizontally on the test platform and is inclined 28^{o} towards the left and right sides.

4.3.2 When performing the stability test on vehicles during lateral inclination, the bus should be situated at the mass of the vehicle in running order. In addition, there should be:

4.3.2.1 A load Q on each passenger's seat. If the vehicle is presumed to have standing passengers and a standing member of the crew, the relevant load should be evenly distributed in the corresponding standing zone, and the height of the centre of mass should be 875 mm above the floor. If the vehicle is equipped with a roof luggage rack, it should be laden with a mass specified by the manufacturer, and the value should not be less than RVx. There should be no luggage in the luggage rack and luggage compartment inside the bus.

The numerical value of Q, R and Vx shall be fixed according to GB/T 12428.

4.3.2.2 If the vehicle has a changeable number of seats, standing passengers, and is designed to load one or more wheelchairs, then the load as mentioned in Subsection 4.3.2.1 in the passenger compartment to which the changes apply should be calculated using the greater value in accordance with the following stipulations:

a) The mass of the passengers in the compartment including the mass of any demountable seats;

b) The mass of the number of standing passengers in the compartment;

c) The total mass of wheelchairs and their users in the compartment is 250 kg, and the height of the centre of mass from the floor in the centre of each wheelchair space is 500 mm;

d) The mass of sitting passengers, standing passengers and wheelchair users, and the combined mass under these possible circumstances.

4.3.3 The height of the block which is used to prevent the vehicle from sliding off should not be greater than 2/3 of the distance between the surface of the front tyre before lateral turnover (when the vehicle is laden according to the stipulations of Subsection 4.3.2) and the rim of the wheel.

4.3.4 During the lateral inclination test on the vehicle, the parts of the vehicle which are not in contact with anything in situations of normal use should not be in contact with anything, and should not be damaged or displaced.

4.3.5 Calculation methods can be used to perform the confirmation (see the calculation methods in Appendix B). Under the conditions of Subsections 4.3.1 and 4.3.2, the vehicle should not turn over. When doing the calculation, the following parameters should be considered:

a) Mass and dimensions;

b) Height of the centre of mass;

c) Rigidity of spring;

d) Vertical rigidity and horizontal rigidity of tyre;

e) Control properties of air pressure in the air spring;

f) Position of the moment centre;

g) Torsional strength of vehicle body.

4.4 Fire prevention measures

4.4.1 Engine compartment

4.4.1.1 The engine compartment should use soundproof and heatproof materials that meet the stipulations of GB 8410, but should not use materials that can absorb fuel, lubricant or other combustibles and that have no anti-penetration covering layer.

4.4.1.2 The layout of the engine compartment should be reasonable, and should adopt the preventive measure of attaching an oil drainage hole, etc. Try to avoid any concentration of fuel, lubricant or other combustibles in the engine compartment.

4.4.1.3 Heatproof materials should be installed between the engine compartment or other heat sources (such as a speed retardant or interior heating device, but not including the hot water circulation device) and other parts of the vehicle. Fixing clips, washers, etc for connecting with the heatproof material should also be fireproof.

4.4.2 Fuel tank

4.4.2.1 The fuel tank should be firmly fixed. It should be installed in a position where it can be protected by the structure of the vehicle body in the event of a front or rear crash accident involving the vehicle. Meanwhile, the distance of any part of the fuel tank from the front end of the vehicle should not be less than 600 mm, and from the rear end of the vehicle should not be less than 300 mm.

4.4.2.2 No part of the fuel tank should exceed the total width of the vehicle body.

4.4.2.3 The fuel inlet should only be used from the outside of the bus. Its distance from the service door or emergency door should not be less than 500 mm (for a fuel tank) or 250 mm (for a diesel tank). It should not be installed in a position where fuel can be spilled onto the position of the engine or exhaust system when fuel is being put in.

4.4.2.4 If the fuel inlet is situated on the lateral surface of the vehicle, when the fuel cap is closed it should not protrude from the surface of the vehicle body.

4.4.2.5 The fuel cap should not accidentally open.

4.4.3 Fuel supply system

4.4.3.1 The fuel supply system should not be installed in the driver’s compartment or the passenger compartment.

4.4.3.2 The layout of the fuel hose and other parts of the fuel supply system should be reasonable, reliable and protective.

4.4.3.3 It should not be possible for the torsion, bending and vibration of the structure of the vehicle body or the power assembly to cause the fuel supply pipeline to be situated so that it bears an abnormal amount of force.

4.4.3.4 When the rigid parts of the fuel supply system are combined with the soft pipeline, care should be taken to ensure that there is no leakage in different running modes.

4.4.3.5 Once any part of fuel supply system has suffered a fuel leakage, the fuel should flow straight to the ground, and should not drop onto the exhaust system or the

high-pressure electrical equipment.

4.4.4 Electrical equipment and lead

4.4.4.1 The lead should meet the loading requirements, possess good insulation performance, and meet the requirements for the anti-spread nature of lead in QC/T 730-2005. The electrical equipment and the lead should be able to resist the ambient temperature and humidity. They should especially be able to resist the temperature inside the engine compartment and the damage that may be caused by different kinds of pollutants.

4.4.4.2 In addition to the starter, ignition coil (compulsory ignition), glow plug, engine turn-off device, charging circuit and the ground wire of storage batteries, the power supply circuit of each item of electrical equipment should have a fuse or circuit breaker. But for power supply circuits of equipment with a low level of power consumption, if the total rated current does not exceed 16A, a public fuse or public circuit breaker can be installed for protection.

4.4.4.3 The lead should be well-protected, and safely fixed at positions where it cannot be scratched, rubbed or corroded. Unless professional insulation and protection are provided (such as an electromagnetic coil for the control of the exhaust valve), the lead should not have contact with the fuel pipe and exhaust system, or should not bear too high a temperature.

4.4.4.4 When there are circuits inside the bus with a voltage exceeding 100V (root mean square value), a manual circuit breaker switch for cutting off the circuits from the major power source should be installed on the live wire of the circuits, so that these circuits can be cut off from the major power source. But they should not be cut off from the power supply circuit of the compulsory lighting outside the bus. The switch should be situated at a position that is accessible to the driver inside the bus. This stipulation is inapplicable to the high-pressure ignition circuit or the interior circuit of the equipment unit in the bus.

4.4.5 Storage battery

4.4.5.1 All the storage batteries should be firmly installed and easily accessible.

4.4.5.2 The storage battery box should be separated from the passenger compartment and the driver's compartment, and should be ventilated from the outside.

4.4.5.3 The binding post of the storage battery should not be subject to any danger of a short circuit.

4.4.6 Fire extinguisher

4.4.6.1 One or more fire extinguishers should be provided and installed in each space of no less than 1.5×10^7 mm^3. One of them should be close to the driver's seat.

4.4.6.2 The fire extinguisher should be installed in a position that can be easily seen or clearly indicated so that it can easily be used in emergency circumstances.

4.4.7 Material

4.4.7.1 Within 100 mm around the exhaust system or any other obvious heat source, there should be no combustible material, unless it is effectively sheltered.

4.4.7.2 The material of the interior decoration inside the vehicle body should meet the stipulations of GB 8410.

4.5 Exit

4.5.1 Number of exits and their positions

4.5.1.1 Minimum number of exits

In order to meet the escape needs of passengers and external rescue in emergency circumstances, the minimum number of exits for each separate compartment (exclusive of the toilet or kitchen) should meet the stipulations of Table 1.

Table 1 Minimum number of exits for each separate compartment

Number of passengers in each separate compartment	Minimum number of exits
1-8	2
9-16	3
17-30	4
31-45	5
46-60	6
61-75	7
76-90	8
91-110	9
111-130	10
> 130	11
No matter how many escape hatches there are, they are counted as one emergency exit.	

4.5.1.2 The minimum number of service doors is indicated in Table 2.

Table 2 Minimum number of service doors

Bus Type	Grade I			Grade II, Grade III	
Bus Length L (m)	$L \leq 10$	$10 < L \leq 13.7$	$L > 13.7$	$L \leq 12$	$L > 12$
Minimum number of service doors	1	2	3	1	2

4.5.1.3 In Table 2, when the requested number of service doors is two, they should be separately installed. The distance between the centres of their area or their horizontal-vertical surfaces should not be less than 40% of the total length of the passenger compartment. If one of the service doors is a double door, the distance should be measured at the farthest distance between the two doors.

4.5.1.4 Service doors should be located on the right-hand side of the vehicle. At least one of them should be in the front half of the vehicle. But for buses running in the bus-only lane in the central part of the road, when it is necessary for them to let

passengers get on and off by the left-hand side of the vehicle due to the position of the bus stop, the bus may be designed with a service door on the left-hand side, and then no service door may be installed on the right-hand side of the vehicle. A service door may be installed at the rear (non-service door) of the bus for wheelchair users.

4.5.1.5 A double door should be counted as two doors. Each double or multiple window should be counted as two emergency windows.

4.5.1.6 The number of exits on the left and right-hand sides of the bus should be basically the same. Between the exits on the same side, suitable space should be left along the length of the vehicle.

4.5.1.7 There should be at least one emergency exit at the front or rear of the bus, but this requirement can also be met through the installation of an escape hatch.

4.5.1.8 Grade II and Grade III buses should be installed with an escape hatch. The minimum number of escape hatches is shown in Table 3.

Table 3 Minimum number of escape hatches of Grade II and Grade III buses

Number of passengers	Number of escape hatches
≤ 50	1
> 50	2

4.5.1.9 If an escape hatch is installed in the roof or the floor, it should be located in the central area of the vehicle (the length of the area is equivalent to 1/2 of the vehicle length). If two escape hatches are installed, the distance between their adjacent sides (measured when parallel to the vertical axis of the vehicle) should be at least 2 m.

4.5.1.10 The minimum number and the positions of the exits in each rigid section of an articulated bus is determined as if it were a single vehicle (except for the stipulations of Subsection 4.5.1.7).

4.5.1.11 If there is no gangway for entering the passenger compartment that meets one of the conditions specified in Subsection 4.6.5.2 in the driver's compartment, the latter is regarded as a separate compartment and should meet the following conditions:

4.5.1.11.1 In the driver's compartment, there should be two exits which are not located on the same side. When one of the exits is the window, it should meet the stipulations for an emergency window specified in Subsections 4.5.2 and 4.5.7.

4.5.1.11.2 If the abovementioned two exits are the bus doors, 1-2 additional passenger seats may be installed near the driver. If the driver's seat, steering wheel, engine cover, gearshift rod and manually operated control part do not create overly great obstacles, the driver's door should be regarded as the emergency door for the passengers in these seats. The bus door provided for these additional passengers should be regarded as the emergency door of the driver. If a door or gangway that meets the dimensions for emergency doors as specified in Subsection 4.5.2 is installed between the driver's

compartment and the passenger compartment, a maximum of five additional seats may be installed in the zone close to the driver. The abovementioned additional seats and their space should meet all the requirements of the Standard.

4.5.1.11.3 The door indicated in Subsection 4.5.1.11.2 should not be counted in the requirement for the number of service doors specified in Subsection 4.5.1.2, and also need not meet the requirements of Subsections 4.5.2-4.5.6, 4.6.1, 4.6.2 and 4.6.7.

4.5.1.12 If the driver's seat and any of its neighbouring seats meet one of the conditions specified in Subsection 4.6.5.2 that the gangway and the main passenger compartment are connected, an external exit does not need to be established in the driver's compartment. If there is a driver's door or other exits (no matter how many exits) in the driver's compartment, it can be counted as an exit from the main passenger compartment, but has to meet the following conditions:

— Any person using this exit is not required to walk out from between the steering wheel and the driver's seat;

— The exit meets the dimensional requirements for emergency exits specified in Subsection 4.5.2.

4.5.1.13 Under the circumstances set out in Subsection 4.5.1.12, a door or separate facility (the facility can be rapidly demounted by the driver in an emergency) may be installed between the driver's seat and the passenger compartment, but the driver's door should not be counted as a passenger exit.

4.5.2 Minimum dimensions of exit

The minimum dimensions of each kind of exit should meet the stipulations of Table 4.

<table>
<tr><th colspan="2">Bus Type</th><th>Grade I</th><th>Grades II, III</th><th>Remarks</th></tr>
<tr><td rowspan="2">Service Door</td><td>Net Height mm</td><td>1,800</td><td>1,650</td><td></td></tr>
<tr><td>Net Width mm</td><td colspan="2">Single Door: 650
Double Door: 1200</td><td>Measure at the range of 800-1,100 mm from the ground;
The dimension can be reduced by 100 mm at the point of the handrail.</td></tr>
<tr><td rowspan="2">Emergency Door</td><td>Net Height mm</td><td colspan="2">1,250</td><td></td></tr>
<tr><td>Net Width mm</td><td colspan="2">550</td><td>Measure at 1/2 of the height of the emergency door.</td></tr>
<tr><td>Emergency Window</td><td>Area mm^2</td><td colspan="2">$4.0x10^5$</td><td>A 500 mm x 700 mm rectangle can be internally connected within this area;
A rectangle with a height of 350 mm, width of 1,550 mm and a 4-angle curvature radius of no more than 250 mm can also be internally connected to the emergency window at the rear margin of vehicle.</td></tr>
<tr><td>Escape Hatch</td><td>Net Area of Hatch mm^2</td><td colspan="2">$4.0x10^5$</td><td>A 500 mm x 700 mm rectangle with a 4-angle curvature radius of 200 mm can be internally connected within this area</td></tr>
<tr><td colspan="5">Remarks: When measuring the above dimensions, the compressible, deformable part of the sealant may be</td></tr>
</table>

included.

4.5.3 Technical requirements for service doors

4.5.3.1 When the bus is static, the service door should be openable from inside the bus. In emergencies, the passengers should also be able to open it from the outside of the bus. Even if the bus door is locked from the outside, it must still be possible to open it inside the bus. The distance from the door opening device outside the bus to the ground should not be greater than 1,800 mm.

4.5.3.2 For hinged or rotating single-plate manually operated service doors, when the vehicle moves forward, if the opened bus door has touched a static object, it should automatically close.

4.5.3.3 If a manually operated service door is installed with a spring lock, it should be of the two-level type.

4.5.3.4 At the inner side of the service door, there should be no mechanism covering the internal steps when the service door is being closed. This requirement does not apply when the door control mechanism and other devices installed on the inner side of the bus door occupy the concave part of steps when the service door is being closed. But the area it occupies should not form an additional floor available for passengers to stand in, and the mechanism and equipment should not create any danger to passengers.

4.5.3.5 The driver sitting in his/her seat should be able to observe the passengers' situation inside, outside and around any non-automatically operated service door. If the passengers cannot be directly observed, optical or auxiliary devices in other forms should be installed.

4.5.3.6 Under normal circumstances, when the service door opens inwardly, its structure should guarantee that the act of opening does not cause any harm to passengers. If necessary, a suitable protective device should be installed.

4.5.3.7 If a service door is adjacent to the door of a toilet or the doors of other internal compartments, it should be possible to prevent the service door from being operated by mistake. This requirement is inapplicable to service doors which can be automatically locked at a speed of above 5 km/h.

4.5.4 Additional technical requirements of power-operated service doors

4.5.4.1 In emergencies, when the vehicle is static, each power-operated service door, regardless of whether power is being supplied to it or not, should be openable from inside the bus by the emergency controller of the bus door. When the bus door has not been locked, it can be opened from the outside of the bus. The requirements for the emergency controller of a bus door are as follows:

a) In times of operation, it has greater priority than all other controls of the opening and closing of the bus door;

b) The control part inside the bus should be installed on the bus door, or at a distance of no more than 300 mm from the bus door, and at a height of no less than 1,600 mm from the first ascending step;
c) It can be easily seen and clearly distinguished by passengers close to the bus door. If the control part is attached to the normal opening and closing device of the bus door, there should be a clear indication showing that it is for use in emergencies.
d) It can be operated by a person in front of the bus door.
e) It can directly open the bus door, or the bus door can be easily opened by hand.
f) It may be protected by a device that can be easily removed or broken (for operation of the emergency controller). When the controller is in operation or the protective cover on the emergency controller has been removed, the driver should be alerted by sound and visual signals.
g) When a driver-operated bus door does not meet the requirements of Subsection 4.5.4.6.2, it should meet these requirements: after the bus door is opened by the operation of the controller, the bus door should be situated at the normal opening position; and before the driver operates the door closing control, the bus door will not be closed.

4.5.4.2 A device which prevents the external emergency controller from functioning and thus locks the service door on the outside can be provided for the driver to operate in his/her seat. Before the engine is started or the bus speed reaches 20 km/h, the external emergency controller should automatically function again. At the same time, the clearance of its function should not happen automatically, unless the driver operates it again.

4.5.4.3 For each driver-operated service door, the driver should be able to operate the control part in his/her seat. The control part (not including a control part operated by foot) should be clearly indicated and obviously distinguished from any other indication.

4.5.4.4 Each power-operated service door should be able to turn on a visual warning device. When situated at the normal driving position and in any lighting environment, the driver should be able to see the device clearly, so as to remind the driver that the bus door has not been completely closed. This warning device should give a signal when the bus door is between the position where the rigid structure of the bus door is completely opened and at 30 mm from the position where it is completely closed. Multiple bus doors can jointly use a warning device. But a front service door that does not meet the requirements of Subsection 4.5.4.6.1 is not required to install this warning device.

4.5.4.5 The control part for the driver to open and close the power-operated service door should be able to let the driver perform reverse motion of the bus door at any

time in the door closing or door opening process.

4.5.4.6 The structure and control system of each power-operated service door should not harm or pinch passengers when the door is being closed.

4.5.4.6.1 Apart from the front service door, if the following two requirements are met, this stipulation is satisfied:

4.5.4.6.1.1 At any measurement point indicated in Appendix C, the pinching force of a bus door when closing shall not exceed 150 N; otherwise, the bus door should be automatically re-opened completely (except in the case of an automatically operated service door), and the opening position should be maintained until the door closing control is operated. The test methods are shown in Appendix C. Within a short period, the peak force can be as high as 150 N, but shall not exceed 300 N. The re-opening system can be inspected by a test rod with a cross-section with a height of 60 mm, width of 30 mm and round-corner radius of 5 mm.

4.5.4.6.1.2 If the bus door pinches the wrist or finger of a passenger:

a) The bus door should automatically re-open until it is completely opened (except automatically operated service doors), and should be kept open until the door closing control is operated, or
b) The wrist or finger of the passenger can be easily taken out and does not get hurt. This requirement can be inspected by hand or by using a test rod (see Subsection 4.5.4.6.1.1), with on the length of 300 mm, the thickness of the test rod is gradually decreased from 30 mm to 5 mm. It should not be polished or lubricated. If the test rod is pinched by the door, it can be taken out easily, or
c) The bus door should be kept at a position that allows a test rod with a cross-section at a height of 60 mm, width of 30 mm and round-corner radius of 5 mm to pass through freely. The distance between this position and the position where the bus door is completely closed should not be greater than 30 mm.

4.5.4.6.2 For the front service door, if one of the following requirements is met, this stipulation has been satisfied:

a) The requirements of Subsection 4.5.4.6.1 are satisfied; or
b) Soft sealing tape should be installed on the door, but should not be too soft, so as to ensure that when the bus door is closing and squeezing the test rod as mentioned in Subsection 4.5.4.6.1, the rigid structure of the bus door cannot reach a completely closed position.

4.5.4.7 When the power-operated service door only relies on the continuous supply of power to keep closing, there should be a visual warning device to inform the driver of any malfunctioning power supply to the bus door.

4.5.4.8 If equipped with a starting prevention device, the vehicle cannot be started when the bus door is open.

4.5.4.9 For a vehicle not equipped with a starting prevention device, if the vehicle is

started when the power-operated service door has not been completely closed, the sound alarm for the driver should be activated. As regards service doors that meet the requirements of Subsection 4.5.4.6.1.2 c), the sound alarm device should function when the speed exceeds 5 km/h.

4.5.5 Additional technical requirements of automatically operated service doors

4.5.5.1 Use of door opening control

a) Except for emergency controllers of bus door as specified in Subsection 4.5.4.1, the door opening control part of each automatically operated service door should only be used and cleared by the driver in his/her seat.

b) The use and clearance of the door opening control part can be directly controlled by a switch, and can be indirectly controlled, e.g. the opening and closing of the front service door.

c) When the driver uses the door opening control part, there should be a display inside the bus. Whenever the bus door is opened from the outside, there should also be a display outside the bus. The display (e.g. fluorescent display button, fluorescent display sign) should be on the relevant bus door or around the bus door.

d) When the switch is directly used, the functional situation of the system should be clearly displayed to the driver. The switch should be specifically indicated, and it should not be possible to confuse its appearance with that of other control parts.

4.5.5.2 Opening of the automatically operated service door

4.5.5.2.1 After the driver uses the door opening control, the passenger can open the service door as follows:

a) Operate from the inside of the bus, e.g. press the button or through a grating;

b) Operate from the outside of the bus (except bus doors indicated with “exit only”), e.g. press the fluorescent display button, the button below the fluorescent display sign or any similar device indicated with the relevant description.

4.5.5.2.2 By pressing the button mentioned in Subsection 4.5.5.2.1 a) a stored message can be sent out. After the driver uses the door opening control part, the bus door is opened.

4.5.5.3 Closing of the automatically operated service door

a) After the automatically operated service door has been opened for a certain interval, it closes automatically. If there is a passenger going through the door during this interval, the safety device (i.e. step contact sensor, grating or one-way valve, etc) should ensure that the closing of the door is extended by a sufficient period.

b) If there is any passenger getting in or out of the bus when the door is closing, the closing process should be terminated immediately, and the bus door should resume the opening position. The resumption action is activated by one of the

safety devices mentioned in Subsection 4.5.5.3 a) or other devices.

c) For service doors which have been automatically closed according to Subsection 4.5.5.3 a), unless the driver has released the use of the door opening control part, the service door can be opened by a passenger again according to Subsection 4.5.5.2.

d) After the door opening control of the automatically operated service door has been released by the driver, the opened bus door should be closed according to Subsections 4.5.5.3 a) and 4.5.5.3 b).

4.5.5.4 Extension of the automatic door-closing process of the indicated special-use service door (e.g. for passengers with reduced mobility, etc)

a) The driver and passenger should be able to operate a specific button to implement the extension of the automatic door-closing process.

b) The extension of the automatic door-closing process should be shown to the driver (e.g. through a visible indicator).

c) The driver should be able to resume the automatic door-closing process at any time.

d) After that, the closing of the bus door should meet the requirements of subsection 4.5.5.3.

4.5.6 Technical requirements of emergency doors

4.5.6.1 When the vehicle is stopped, the emergency door should be openable easily from the inside and outside of the vehicle. The door may be locked from the outside of the vehicle, but it should be guaranteed that the door can always be opened from the inside of the vehicle by using a normal door opening device.

4.5.6.2 When using the emergency door, it should not be power-operated, provided that after the emergency controller mentioned in Subsection 4.5.4.1 is turned on, the door can be opened and kept in the normal open position until the driver operates the door closing device again. The emergency door should be of the sliding type.

4.5.6.3 The opening device of emergency doors outside the bus should be installed at a height of 1,000-1,800 mm from the ground, and its distance from the emergency door should not be greater than 500 mm. The opening device of emergency doors inside the bus should be installed at a height of 1,000-1,500 mm from the surface of the lower floor (or step), and its distance from the emergency door should not be greater than 500 mm. But this stipulation is inapplicable to situations where the control part of the opening device is installed in the driver’s compartment.

4.5.6.4 An articulated emergency door on the lateral surface of the vehicle should be articulated at the front end and able to open outwards. After the emergency door is opened, it should satisfy one of the following two conditions:

— Maintain an opening angle of at least 100^{o} (a positioning belt, chain or other restriction devices may be used);

— The testing and measurement tools of the access passage can freely pass through the door and reach the outside of the vehicle.

4.5.6.5 If the emergency door is located near the door of the toilet or other internal compartments, it must be possible to prevent it from operating by mistake. This requirement does not apply to emergency doors that can be automatically locked at a speed of above 5 km/h.

4.5.6.6 All the emergency doors should be provided with a sound device, so as to remind the driver that the emergency door has not been completely closed. The alarm device should be turned on by the motion of the locking device of the door (e.g. door bolt or handle), instead of the motion of the door itself.

4.5.7 Technical requirements of emergency window

4.5.7.1 An articulated or ejectable emergency window should be opened outwards. The form of ejection should be such that the entire window does not separate from the vehicle during operation. It must be possible to prevent the ejectable emergency window from being operated by mistake.

4.5.7.2 It must be possible to open the emergency window rapidly from the inside or outside of the bus, or it should be made of safety glass (but not layered glass or plastic material) that can be broken easily. A tool should be provided near each emergency window for breaking the emergency window easily.

4.5.7.3 For emergency windows that can be locked from the outside of the bus, it should be structurally guaranteed that the window can always be opened from the inside of the bus.

4.5.7.4 For emergency windows which are horizontally articulated at the upper end, there should be a suitable mechanism to keep them open completely. An articulated emergency window when opened should guarantee that passengers can get in and out of the bus smoothly.

4.5.7.5 The height from the lower edge of the side window of the vehicle to its lower floor surface (exclusive of any partial change, such as the partial deformation caused by the wheel or driving device, etc) should not be greater than 1,200 mm and should not be less than 650 mm. If there is a protective device at the height of 650 mm from the floor installed to prevent passengers from falling out of the bus through the hole of the side window, the minimum height from its lower edge to the floor is 500 mm. But for the emergency window, the area of its hole above its protective device should not be smaller than the minimum dimensions specified for emergency windows.

4.5.7.6 For articulated emergency windows which cannot be clearly seen by the driver in his/her seat, an alarm device should be installed. The alarm device should be turned on by the motion of the window lock (instead of the motion of the window itself). When the emergency window is not completely closed, the driver should be reminded.

4.5.8 Technical requirements of escape hatch

4.5.8.1 An escape hatch when opened should guarantee that passengers can get in and out of the bus smoothly.

4.5.8.2 A safety roof window should be ejectable, articulated, or made of safety glass which can be broken easily. The floor exit should be articulated or ejectable, and installed with a sound alarm device. When it is not completely closed, the driver should be reminded. The alarm device should be turned on by the motion of the locking device of the floor exit (instead of the motion of the floor exit). It should be possible to prevent the floor exit from being operated by mistake. This requirement does not apply to floor exits that can be automatically locked at a speed of above 5 km/h.

4.5.8.3 The form of ejection of the escape hatch is that the entire escape hatch should not be separated from the vehicle during operation, and the ejection should not cause danger to people outside the bus. It should be possible to prevent an ejectable escape hatch from being operated by mistake. An ejectable floor exit should only be ejected towards the passenger compartment.

4.5.8.4 The articulated escape hatch should be articulated at the front or rear end of vehicle, and should be opened at 100^{o} minimum. The articulated floor exit should be folded towards the passenger compartment.

4.5.8.5 The escape hatch needs to be easily opened or removed from the inside or outside of the bus. The escape hatch may be locked, but it should be guaranteed that the escape hatch can always be opened or removed from the inside of the bus by using a normal opening or removing mechanism. A tool should be provided near a breakable safety roof window for breaking the safety roof window easily.

4.5.9 Technical requirements of extendible steps

If extendible steps are installed, the following requirements should be met:

4.5.9.1 Extendible steps should simultaneously work with the relevant service door or emergency door.

4.5.9.2 When the bus door is closing, the extendible steps should not protrude from the surface of the vehicle body more than 10 mm.

4.5.9.3 When the bus door is opening, the extendible steps should be situated at the outstretched position in an area meeting the requirements of Subsection 4.6.7.

4.5.9.4 When the extendible steps are situated at the outstretched position, it should not be possible to start the vehicle under its own power.

4.5.9.5 When the vehicle is running, the power-operated extendible steps should not be stretched out. If the operation device becomes invalid, the steps should be drawn back and kept in their original position. When the operation device is invalid or the steps are damaged, this should not hinder the operation of the bus door.

4.5.9.6 When a passenger stands on the power-operated extendible steps, the relevant

bus door should not be closed. A heavy load of 15 kg can be placed on the centre of the steps for inspection. This requirement is inapplicable to any bus doors that are within the driver's direct line of sight.

4.5.9.7 The motion of extendible steps should not cause any physical damage to anyone inside or outside the bus. On the surface of the extendible steps, there should be alternate yellow and black stripes to warn the passengers.

4.5.9.8 The exterior angles of extendible steps should be round corners with a radius of no less than 5 mm. Their upper and lower edges should be round corners with a radius of no less than 2.5 mm.

4.5.9.9 When the service door is opened, the extendible steps should be able to touch the ground and remain in an outstretched position. When a heavy load of 136 kg is placed on the centre of the extendible steps of a single door, or when a heavy load of 272 kg is placed on the centre of the extendible steps of double doors, no point on the steps should exceed 10 mm bending.

4.5.10 Indication

4.5.10.1 At each emergency exit, the words "Emergency Exit" or the internationally used symbol should be displayed inside the bus.

4.5.10.2 The emergency controllers of service doors and all the emergency exits should be indicated with symbols or legible words inside the bus.

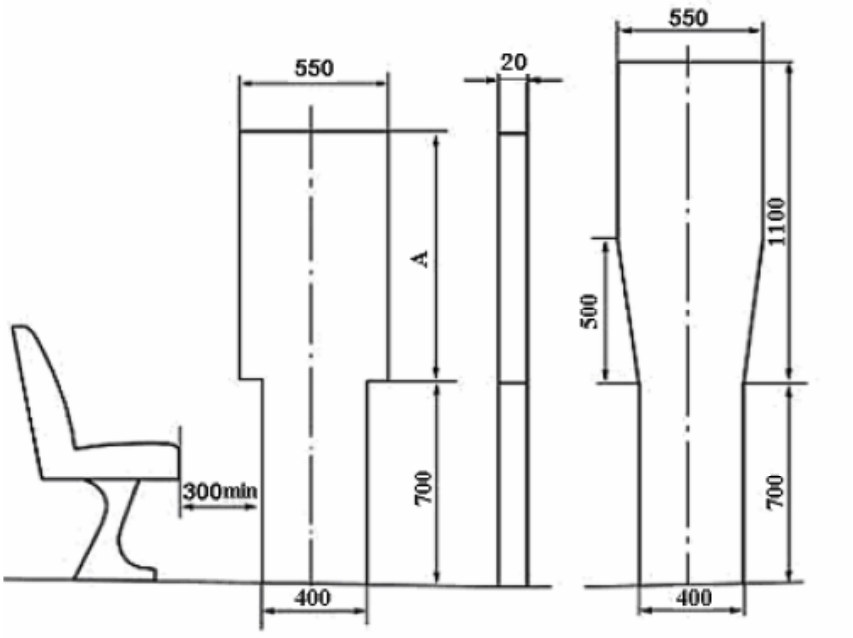
4.5.10.3 At each emergency controller of exits or near that point, there should be a clear description of the related operation methods.

4.6 Interior layout of bus

4.6.1 Access passage of service door

4.6.1.1 From the service door to the space extending back inside the bus, the vertical plate 1 (see Figure 1a and Table 5) should be able to pass freely. When the vertical plate 1 is at the starting position, the inner plate close to the vehicle should cut the outermost edge of the opening of the bus door. When it is moved, it should be kept perpendicular to the direction of passengers moving in and out.

4.6.1.2 Vertical plate 1 can be replaced by vertical plate 2 (see Figure 1b).



(a) (b) Replacement

Remarks: The top width can be decreased from 550 mm to 400 mm. The angle between the transitional oblique surface and the horizontal plane should not exceed 30°.

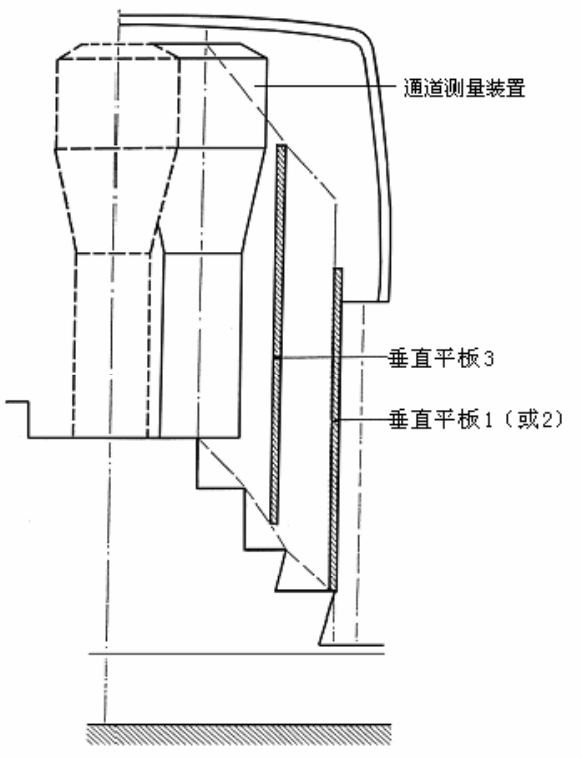
Figure 1 Illustration 1 for access passage of service door

Table 5 Height A of upper plate of the vertical plate 1 Unit: mm

Vehicle Type	Type I	Type II	Type III
Value A	1,100	950	850

4.6.1.3 When the central line of the vertical plate 1 (or 2) moves from the beginning position by 300 mm, the bottom of the plate should touch the surface of the step, and remain in this position.

4.6.1.4 Use the cylinder to inspect the gangway space (see Figure 4 and Table 6), and move it from the gangway and along the direction of the passengers departing the vehicle until its central line reaches the vertical plane of the outer edge of the top step, or the vertical plate 1 (or 2) contacting the upper cylinder (whichever comes first), and maintain in this position (see Figure 2).



—————— Gangway measurement device

——— Vertical plate 3

—— Vertical plate 1 (or 2)

Figure 2 Illustration 2 for access passage of service door

4.6.1.5 Vertical plate 3 should be able to freely pass through (see Figure 2) the gap between the cylinder at the above position and the vertical plate 1 (or 2) at the position mentioned in Subsection 4.6.1.3. The shape and dimensions of vertical plate 3 should be the same as the central cross-section of the cylinder mentioned in Subsection 4.6.5.1, but its thickness should not be greater than 20 mm. Move vertical plate 3 from the position intersecting with the cylinder to its outer plate surface, and let it touch the vertical plate 1 (or 2). Its bottom edge should touch the surface formed by the outer edges of the steps. The direction of movement should be consistent with the direction of the passengers going through the service door in either direction.

4.6.1.6 The net space for the abovementioned measurement device to pass through freely should not include the area of 300 mm in front of an uncompressed seat cushion of the upward or backward seat, or 225 mm in front of a seat installed above the wheel cover, and the space with its height from the floor to the highest point of the

seat cushion.

4.6.1.7 A folded seat should be measured when the seat is at the opened position.

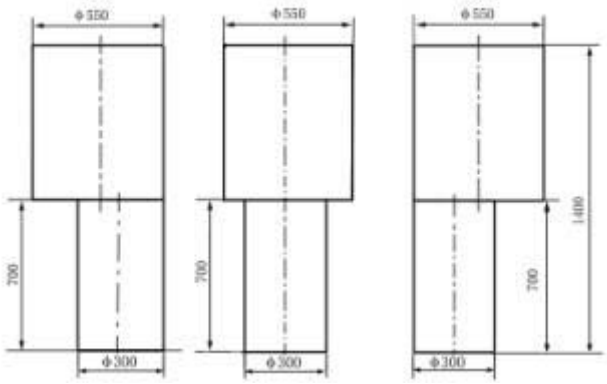
4.6.1.8 Regarding folded seats dedicated for members of the crew, if the following requirements are met, the seat may be measured at the folded position:

a) It is clearly indicated in the bus that this seat is only provided for the use of the member of the crew;
b) When the seat is not used, it should be possible to fold it automatically, so as to meet the requirements of Subsections 4.6.1.1 to 4.6.1.5.
c) No matter whether the seat is situated in the use position or folded, no part of it should be located in front of the vertical plane of the line connecting the centre of the driver's seat cushion (when the seat is at the most backward position) with the centre of the right rear view mirror outside the bus.

4.6.1.9 When the bus is situated at the mass of the vehicle in running order and the kneeling system is idle, the slope of the floor of the access passage should not exceed 5%.

4.6.2 Access passage of emergency door

4.6.2.1 In the free space between the access passage and the emergency door, piled up cylinders (see Figure 3) should be able to pass through freely.



Remarks: The top diameter of the upper cylinder can be decreased to 400 mm. The angle between its transitional oblique surface and the horizontal plane should not exceed 30^{o}.

Figure 3 Measurement device of the access passage of the emergency door

4.6.2.2 The bottom of the lower cylinder should be within the projection of the upper cylinder, and it should be possible to displace both correspondingly.

4.6.2.3 When a folded seat is installed in the access passage, the free space for the piled up cylinders to pass through should be measured when the seat is situated at the opened position. If the seat can be folded automatically when not in use, the space where the seat is situated may be measured at the folded position.

4.6.2.4 The cylinder specified in Subsection 4.6.5.1 (see Figure 4) can be used to replace the piled up cylinders.

4.6.3 Manoeuvrability of emergency window

4.6.3.1 Each emergency window should meet the requirement that the relevant measurement tool can be moved from the gangway to the outside of the bus through the emergency window.

4.6.3.2 The direction of the measurement tool's movement should be consistent with the direction of the passengers' escape from the vehicle. Its front surface (maximum surface between two ends) should remain perpendicular to the direction of movement.

4.6.3.3 The measurement tool is a sheet with dimensions of 600 mm x 400 mm, and its round corner radius is 200 mm. But if the emergency window is at the rear of the vehicle, its dimensions can be changed to 1,400 mm x 350 mm, and the round corner radius changed to 175 mm.

4.6.4 Manoeuvrability of escape hatch

4.6.4.1 Safety roof window

Except in the case of Type I buses, at least one safety roof window should satisfy the following accessibility requirements. Use a 4-equal-sided cone, which forms 20^{o} between its lateral surface and the vertical surface, at a height of 1,600 mm (no restriction for the length of the sides), for measurement. Keep the axis of the cone perpendicular. When its upper bottom surface is located within the opening zone of the safety roof window and is not lower than the height of the outer surface of the bus roof, its lower bottom surface should be able to touch the seat or the relevant supporting part. The supporting part can be folded or moved, but can be locked in the required use position.

4.6.4.2 Floor exit

4.6.4.2.1 At the upper part of the floor exit, there should be a net space equivalent to the height of the gangway (see Figure 4). The space should meet the condition that the testing and measurement tool (a sheet with dimensions of 600 mm x 400 mm and round corner radius of 200 mm) can smoothly go from the height of 1 m above the floor and directly reach the floor. When passing through, the plate should be kept horizontal.

4.6.4.2.2 Any heat sources or moving parts should not be less than 500 mm from the floor exit.

4.6.5 Gangway

4.6.5.1 The gangway should allow the measurement device (see Figure 4 and Table 6) to pass through freely. When passing through, if handles for standing passengers or any other soft object (e.g. a seat belt) is touched, it can be moved away from them.

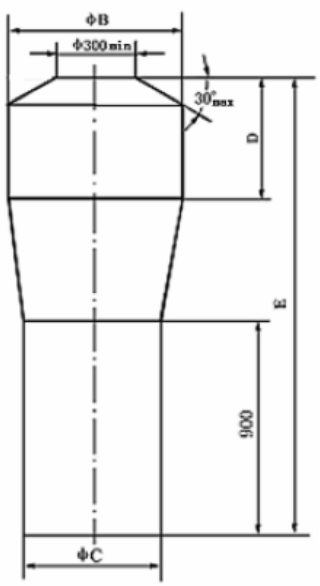


Figure 4 Gangway measurement device

Table 6 Dimensions of gangway measurement device

Vehicle Type	Grade I	Grade II	Grade III
Diameter C of lower cylinder	450	350	300
Diameter B of upper cylinder	550	550	450
Diameter D of upper cylinder	500[o]		
Total height E	1,900 [a]	1,800 [a]	
a At the gangway behind the following positions, the height D of the upper cylinder can be reduced (the total height E of the measurement device shall be reduced accordingly) by 100 mm: — the traverse vertical plane at the point 1.5 m in front of the central line of the rear axle (referring to the foremost rear axle if there is more than one rear axle); — the traverse vertical plane at the point of the rear edge of the service door (referring to the rearmost service door if there is more than one service door).			

4.6.5.2 If there is no exit in front of the seat:

a) If it is a front-facing seat, the gangway measurement device specified in Subsection 4.6.5.1 should be at least moved forward to intersect with the traverse vertical plane of the foremost point of the seat back on the foremost row, and should be kept at this position. Beginning from the position of contact with the gangway measurement device, vertical plate 4 with its surface facing forward is moved forward 660 mm (see Figure 5a).

b) If it is a seat facing the lateral side, the gangway measurement device should be at least moved forward to intersect with the vertical plane of the centre of the foremost seat (see Figure 5b).
c) If it is a rear-facing seat, the gangway measurement device should be at least moved forward to intersect with the traverse vertical plane of the front end of the seat cushion on the first row (see Figure 5c).
d) For Grade II and Grade III front-engine buses smaller than 7.5 m, the gangway measurement device specified in Subsection 4.6.5.1 should be at least moved forward to 300 mm behind the engine cover. The rest of the measurements should be finished using vertical plate 4. In the measurement process, the plate surface should be kept forward.

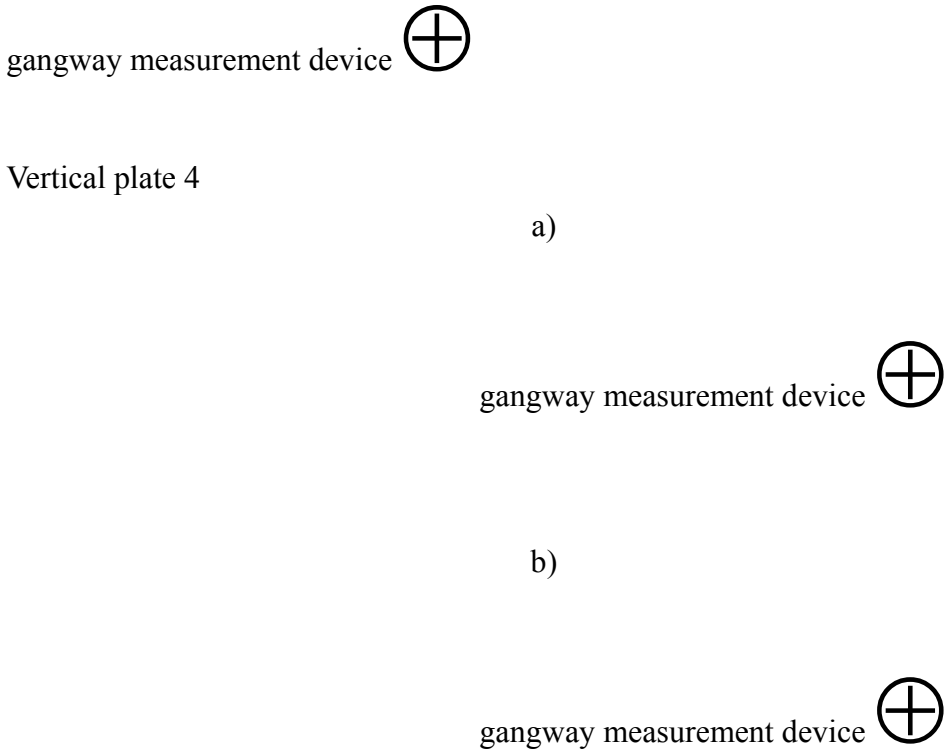


Figure 5 Front boundary of gangway

4.6.5.3 For Grade I buses, in the gangway behind the following positions, the diameter of the lower cylinder of the gangway measurement device can be decreased from 450 mm to 400 mm:

— the traverse vertical plane at the point of 1.5 m in front of the central line of the rear axle (referring to the foremost rear axle if there is more than one rear

axle);

— the traverse vertical plane at the point of the rear edge of the rearmost service door.

4.6.5.4 For Grade III buses, if the seats on one side or both sides of the gangway can be horizontally moved, and a person standing in the gangway can easily access the control part of each seat (even if a person is seated in it) and operate it, and make it resume (it should automatically resume, if possible) the position where the minimum width of the gangway is 300 mm, then the diameter of the lower cylinder of the gangway measurement device can be decreased to 220 mm.

4.6.5.5 In articulated buses, the gangway measurement device specified in Subsection 4.6.5.1 should be able to pass through the articulated section without obstacles. The soft covering roofs (including the folded roof) may not be brought into the gangway.

4.6.5.6 Steps may not be installed in the gangway. The width of steps should not be less than the gangway width at their top.

4.6.5.7 No folded seat for passengers may be installed in the gangway.

4.6.5.8 A horizontally moveable seat may not occupy the space of the gangway, except in Grade III buses that have met the stipulations of Subsection 4.6.5.4.

4.6.5.9 The surface of the gangway and access passage should be slide-proof.

4.6.6 Slope of gangway

When the vehicle has the mass applicable in running order and the kneeling system is idle, the slope of the gangway should not exceed:

4.6.6.1 Vertical slope:

— Grade I and Grade II buses: 8%;

— Grade I and Grade II low-floor buses with the total length of the gangway by the central line of the 2nd and the 3rd axles (if there is a 3rd axle) being 2 m: 12.5%;

— Grade III buses: 12.5%.

4.6.6.2 Horizontal slope (perpendicular to the surface of the vertical axis of the vehicle: 5%.

4.6.7 Steps

4.6.7.1 The maximum height, minimum height (the kneeling system is idle) and minimum depth of the service door and service steps inside the vehicle are shown in Table 7 and Figure 6.

Table 7 Maximum height, minimum height and minimum depth of steps

Vehicle Type		Grade I	Grade II, Grade III
First step	Maximum depth from ground D_{max}	360[o]	380 [b, c]
	Minimum depth A_{min}	300	
Other steps	Maximum height E_{max}	250 [d]	350

	Minimum height E_{min}	120
	Minimum depth A_{min}	200
a If a mechanical suspension is adopted: D_{max} is 380 b At least one service door has a D_{max} of 380, and other service doors' D_{max} is 400. c If mechanical suspension is adopted: D_{max} is 380 d The E_{max} of the service door behind the axle is 300.		

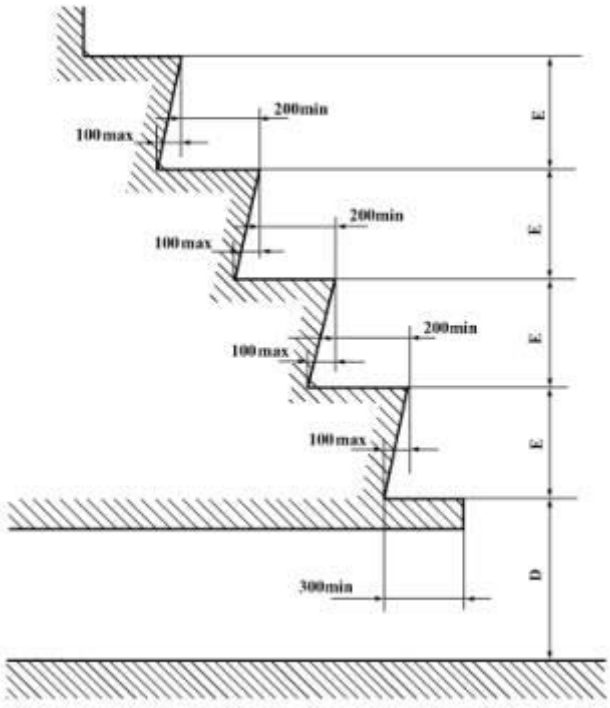


Figure 6 Steps for passengers

4.6.7.2 The transition between the downward concave gangway and the seat compartment should not be used as steps, but the vertical distance between the gangway surface and the floor of the seat compartment should not exceed 350 mm.

4.6.7.3 The height of a step should be measured at the centre of its width. The manufacturer should especially consider how passengers with reduced mobility will get in and out of the bus, and should pay particular attention to minimising the height of each step.

4.6.7.4 The height from the first step to the ground should be measured when the bus is at the mass of the vehicle in running order and is stopped on horizontal ground. When measured, the wheel layout and the air pressure should meet the manufacturer's stipulations for the maximum mass of the designed load.

4.6.7.5 As regards the other steps, each step can be extended to 100 mm maximum of the vertical projection zone of its adjacent steps, and the projection of the walk-down step should leave a free surface with a depth of at least 200 mm (see Table 7 and Figure 6). The design of all the steps' outer edges should reduce the risk of a passenger stumbling as much as possible, and an obvious coloured warning should be

added.

4.6.7.6 The dimensions of steps should meet the condition that when the relevant rectangles specified in Table 8 are placed on each step, the part of the rectangle exceeding the step should not be greater than 5% of its area. For the steps of double doors, each half should meet this requirement.

Table 8 Dimensions of rectangles for measuring the steps

Step		Dimensions of rectangle
Area	The 1st step	400 x 300
	Other steps	350 x 200

4.6.7.7 The surface of steps should be slide-proof.

4.6.7.8 When the bus is at the mass of the vehicle in running order and is stopped on a flat horizontal plane, under normal running conditions (the kneeling system is idle), the maximum slope of steps in any directions should not exceed 5%.

4.6.8 Service seat and sitting space

4.6.8.1 Height of seat cushion

The height I between the uncompressed seat cushion and the floor (the distance from the floor to the horizontal cross-section on the surface of the seat cushion) should not be less than 400 mm and not greater than 500 mm. But at the points of the wheel cover and engine compartment, the height can be reduced to no less than 350 mm (see Figure 7).

4.6.8.2 Space between seats

4.6.8.2.1 Seats facing the same direction: the space is horizontally measured in the range from the plane of the highest point of the surface of the seat cushion, to the height of 620 mm above the floor. The distance H from the front part of a seat back to the rear part of the seat back in the previous row should not be less than the numerical value specified in Table 9.

Table 9 Distance H between seats facing the same direction

Vehicle Type	H Value
Grade I	650
Grade II, Grade III	680

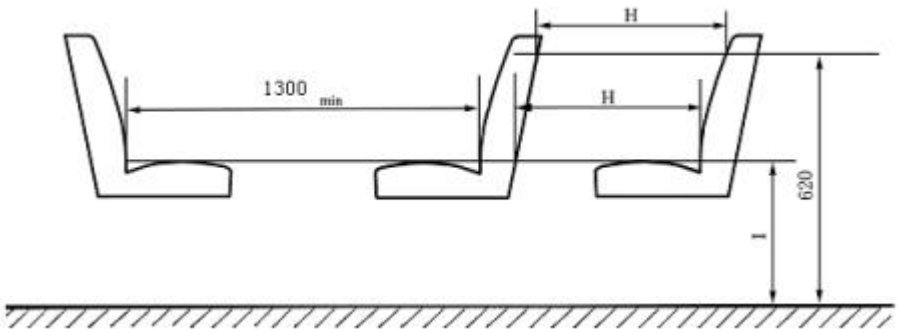


Figure 7 Space between seats

4.6.8.2.2 For facing seats arranged in rows, the space is measured on the plane passing through the highest points of seat cushions. The minimum distance between the front surfaces of two facing seat backs should not be less than 1,300 mm.

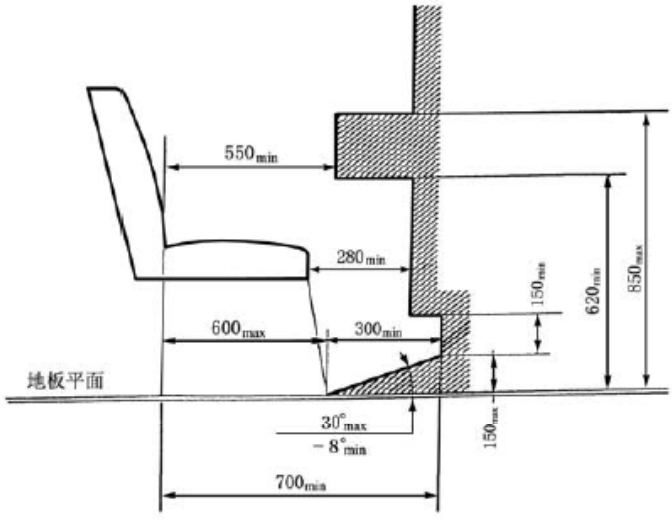
4.6.8.2.3 All the data should be measured within the vertical plane of the central line going through the (single) seat, and the seat cushion and the seat back are both uncompressed.

4.6.8.2.4 When measured, the seat back angles of seats with an adjustable seat back angle and the adjustable driver's seat as well as other adjustment of seats should be situated at the normal-use position specified by the manufacturer.

4.6.6.2.5 When measured, folded tables installed in seat backs should be situated in the folded position.

4.6.8.3 Space for sitting passengers

4.6.8.3.1 Passenger seats situated behind the separating object or another rigid structure other than a seat should meet the requirements for the minimum net space in front of the seat indicated in Figure 8. In front of the seat, a nearly inclining separating plate can occupy this space. If suitable foot space is left for the passenger, partial occupation of the space by the seat leg is allowed.



Floor plane

Figure 8 Space for sitting passengers

4.6.8.3.2 If there is a priority seat as defined in Subsection 3.18, it should meet the stipulations of Subsection A.1.2 in Appendix A. Its minimum net space should not be less than 110% of the minimum net space indicated in Figure 8.

4.6.8.4 Free space above seat

4.6.8.4.1 Each seat has a vertical net space. It should not be less than 900 mm above the plane at the highest point of the uncompressed seat cushion, and should not be less than 1,350 mm above the floor where the passenger places their feet after being seated (see Figure 9). At the point of the wheel cover and the point of the rear row of seats, the space can be reduced to 1,250 mm.

4.6.8.4.2 This net space should include the following entire horizontal zone:

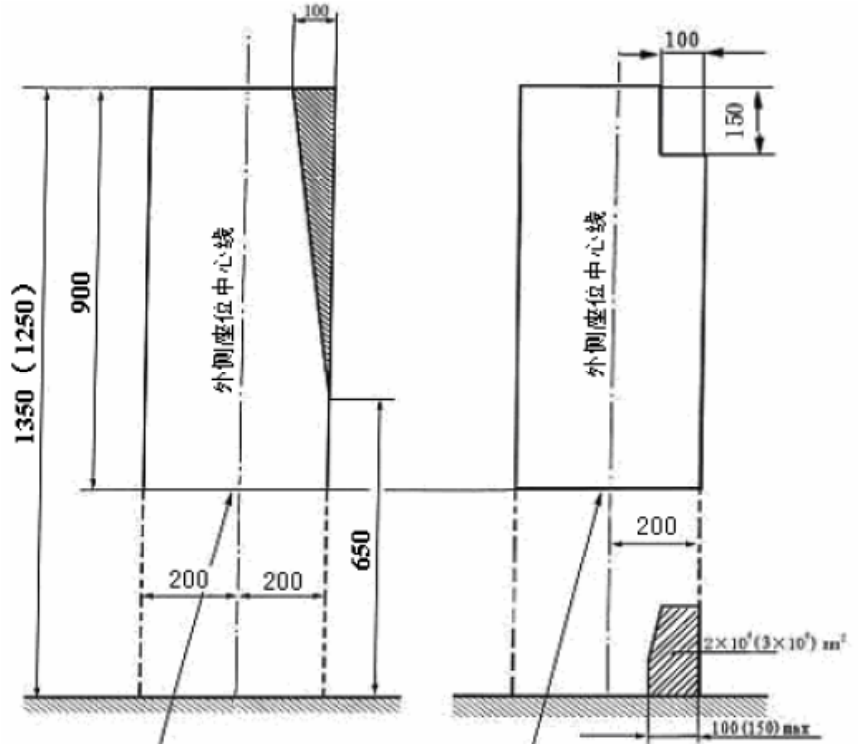
a) Traverse zone: between the longitudinal vertical planes at the point of 200 mm by each of the two sides of the central vertical plane of the seat.
b) Longitudinal zone: between the traverse vertical plane of the rearmost point at the upper part of the seat back and the traverse vertical plane at 280 mm extending forward from the front end of the uncompressed seat cushion. The measurement is carried out at the central vertical plane of the seat.

4.6.8.4.3 The net space can exclude the following zones:

a) The rectangular zone at the height of 150 mm and width of 100 mm of the cross-section with the upper part of the outer seat being adjacent to the lateral margin (see Figure 10)
b) An upside-down triangular zone of the cross-section with the upper part of the outer seat being adjacent to the lateral margin. The vertex of the triangle is located at 650 mm above the floor and its bottom width is 100 mm (see Figure 9).
c) The zone of a cross-section with the outer seat leg being close to the lateral margin. The area of the cross-section should not exceed 2 x 10^4 mm^2 (3 x 10^4 mm^2 for Grade I low-floor buses) and its greatest width should not exceed 100 mm (150 mm for Grade I low-floor buses) (see Figure 10).

4.6.8.4.4 This net space should allow occupation by another seat back and its supporting object and as well as the attached device (e.g. a folded table).

Central line of outer seat Central line of outer seat



Highest point of seat cushion in free status Highest point of seat cushion in free status

Figure 9 Free space above the seat

Figure 10 Permitted occupation in the space of the outer seat

4.6.9 Contact between the driver and the member of the crew

For buses with no gangway installed between the driver's compartment or passenger compartment and the crew member's compartment, a means of communication and contact should be provided between the driver's compartment and the crew member's compartment.

4.6.10 Hot and cold drinks machine and cooking equipment

4.6.10.1 A hot and cold drinks machine and cooking equipment should be equipped with protective facilities, preventing high-temperature food or drinks from spilling onto passengers during emergency braking or turning of the bus.

4.6.10.2 In buses installed with a hot and cold drinks machine or cooking equipment, all the service seats should have appropriate devices installed for passengers to use for placing the hot food or hot drinks when the vehicle is running.

4.6.11 Internal compartment door

Each door giving access to the toilet or the door of another internal compartment should meet the following requirements:

4.6.11.1 If the opening of the internal compartment door would obstruct the escape of passengers in an emergency, it should be possible to close it automatically, and it should not be installed with any device that keeps it open.

4.6.11.2 The opening of the internal compartment door should not block any service

door, emergency exit, fire extinguisher, or the opening handle, the control part of the first-aid box, or the necessary signs.

4.6.11.3 Methods for opening the door from the outside of the compartment in an emergency should be provided.

4.6.11.4 It should be guaranteed that the door can always be opened from the inside, otherwise it must not be lockable from the outside.

4.7 Interior lighting of bus

4.7.1 The interior lighting of the bus should cover the following zones:

- All the passenger compartments, the crew member's compartment, the toilet and the articulated sections of an articulated bus;
- All the steps;
- The access passages to all the exits and the zones close to the service doors;
- The interior signs of all the exits and the interior control parts;
- All the points where there are obstacles.

4.7.2 There should be at least two interior lighting circuits. When one circuit malfunctions, it should affect the lighting of another circuit. A circuit that is only used for normal lighting at the entrance and exit can become one of the main lighting circuits.

4.7.3 Measures should be taken to protect the driver from being affected by the interior lighting of the bus and reflected light.

4.8 Articulated section of an articulated bus

4.8.1 The articulated section connecting each rigid section of the vehicle should structurally bend on at least a horizontal axis and rotate on a vertical axis.

4.8.2 For articulated buses, when the mass of the vehicle in running order is static on a horizontal plane, the width of the uncovered gap between the floor of the rigid section and the floor of the rotating part (or its substitute part) should not exceed:

- 10 mm (when all the wheels of the vehicle are on the same surface);
- 20 mm (when the wheel parking surface of the axle of the neighbouring articulated section is 150 mm higher than the wheel parking surface of other axles).

4.8.3 The horizontal height difference between the floor of the rigid section and the floor of the rotating part (measured at the articulated point) should not exceed:

- 20 mm (when all the wheels of the vehicle are on the same surface);
- 30 mm (when the wheel parking surface of the axle of the neighbouring articulated section is 150 mm higher than the wheel parking surface of other axles).

4.8.4 In articulated buses, there should be facilities provided to avoid passengers coming into contact with the following parts of the articulated section:

- Any uncovered floor gap which does not meet the requirements of Subsection

4.8.2;

- A floor that cannot support the mass of the passengers;
- Points where danger is caused to passengers by the movement of enclosures / boards.

4.9 Direction maintenance of articulated buses

When an articulated bus is running in a straight line, the longitudinal central planes of different rigid parts should be similarly assembled as a continuous plane without any inclination.

4.10 Handrails and handles

4.10.1 General requirements

4.10.1.1 The handrails and handles should be strong enough.

4.10.1.2 The handrails and handles should not cause any danger of injury to passengers.

4.10.1.3 The cross-sections of handrails and handles can be held tightly by passengers easily. Each handrail should be at least 100 mm long to accommodate the hands, and the minimum circumference of its cross-section should be no less than 20 mm and no greater than 45 mm. The circumference of the cross-section of each of the handrails of bus doors and seats, and the handrails inside the access passage of Grade II and Grade II buses, may be 15 mm minimum, while the circumference of the cross-section of handrails in the opposite direction should be 25 mm minimum. Where a handrail bends the transition should be smooth, and it should not bend drastically.

4.10.1.4 The gap between the handrail or handle and the part that is adjacent to the vehicle body or the lateral margin should not be less than 40 mm. But for the handrails of bus doors and seats, as well as the handrails in the gangway of Grade II and Grade III buses, the minimum gap can be 35 mm.

4.10.1.5 The surface of each handrail, handle or upright pole should be brightly coloured and slide-proof.

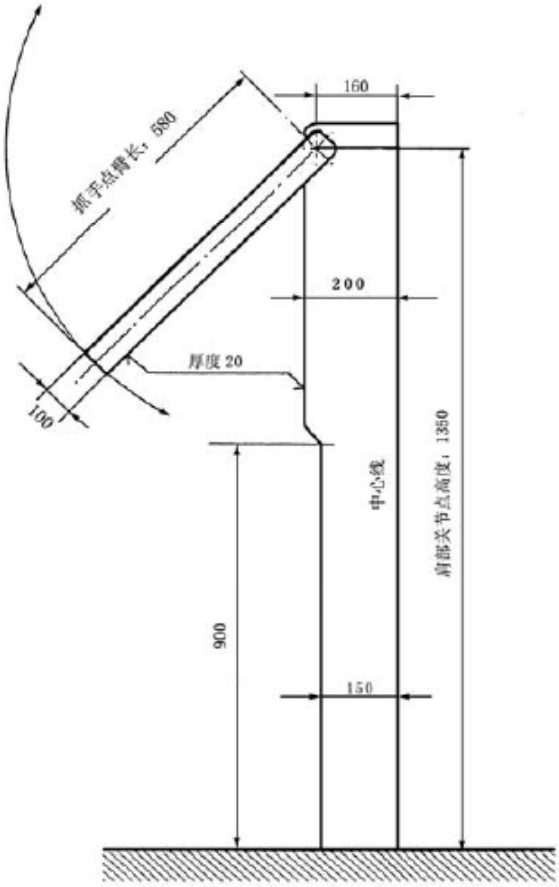
4.10.2 Handrails and handles for standing passengers

4.10.2.1 There should be a sufficient number of handrails or handles to correspond to each position of a passenger in a standing zone. If suspended belts or suspended rings are adopted, they can be regarded as handles, but should be kept in position by suitable means. Place the measurement devices shown in Figure 11 (the moveable arm can freely wind its articulated axis to turn) at each position in the passenger standing zone. If the moveable arm can at least touch two handrails or handles, this requirement is met.

4.10.2.2 The distance from the two handrails or handles mentioned in Subsection 4.10.2.1 to the floor should not be at a height of less than 800 mm, and should not be greater than 1,900 mm; and between them, there should be at least one handrail or handle at a distance from the floor of no more than 1,500 mm from the floor. As

regards the zone around the bus door, if the opened bus door or bus door mechanism would obstruct the use of handrails or handles, the maximum height of 1,500 mm will not be required.

4.10.2.3 In the passenger standing zone where there is no seat separating the lateral margin from the rear margin of the bus, a horizontal handrail should be installed parallel to the lateral margin or the rear margin. Its height should be 800 mm to 1,500 mm above the floor.



Length of the arm of hand holding points: 580
Thickness 20
Central line Height of shoulder
Joint points

Figure 11 Measurement device to simulate a standing passenger

4.10.3 Handrails and handles of service door

4.10.3.1 A handrail and/or handle should be installed by each side of the opening of a bus door. A central upright pole or handrails should be installed at double doors.

4.10.3.2 The handrails of service doors should provide holding points for standing passengers around the area or on each step. The holding points should be at the height

of 700 mm to 1,200 mm vertically above the ground or the surface of each step. In the horizontal direction:

- To provide convenience for passengers standing on the floor, the distance from the outer edge of the first step to the inner edge should not exceed 400 mm;
- To provide convenience for passengers climbing up the steps, the positions of holding points should not outwardly exceed the outer edge of this step, and should not inwardly exceed its outer edge by 600 mm.

4.10.4 Handrails of priority seats

At the height of 800-900 mm above the floor surface between the priority seat mentioned in Subsection 4.6.8.3.2 and the service door, there should be a handrail for people getting on and off the bus. Handrails may appear at intervals for entering the wheelchair zone, the seats above the wheel covers, and passages such as the access passage or gangway, but the interval should not exceed 1,050 mm. At the interval, at least one side should be installed with a vertical handrail.

4.11 Protection in the step zone

In order to prevent seated passengers from falling into the step zone, for example because of emergency braking, a protective device or safety belts should be installed. The protective device should be at a height of at least 800 mm above the floor where the passenger places their feet. The side of the vehicle body should extend towards the bus to exceed at least 100 mm from the vertical central line of the seat, or extend to the erected plate of the innermost step (take the smaller dimension of these two).

4.12 Protection of passengers

4.12.1 If there is no luggage shelf or luggage compartment inside the bus, protective measures should be reasonably designed and adopted so as to prevent luggage from falling and hurting passengers when the bus is turning or braking (especially during emergency braking).

4.12.2 If the heat dissipation surface is covered by a heatproof material with no toxic gas produced, and the passengers cannot come into direct contact with the hot surface, then a non-hot-water-circulated warming device can be installed.

4.12.3 Grade II and Grade III buses should be provided with a space of no less than 7×10^6 mm^3 for installing one or more first aid boxes. Out of its length, width and height, the smallest dimension should not be less than 80 mm. The point of installation should be clearly and easily seen or clearly indicated. It should be easily accessible.

4.13 Moveable cover plate

If there is a moveable cover plate (not for the floor exit of the escape hatch) installed on the floor of the vehicle, it should be installed tightly and firmly, and moved or opened with the help of a tool or a spoon. Its lifting or closing device should not protrude from the floor surface more than 8 mm (if situated in a position not used by

passengers, this requirement does not need to be met). The protruding edges should have round corners.

4.14 Visual entertainment device

The visual entertainment device should be installed outside the driver's line of sight when seated in the normal driving position.

4.15 Indication of luggage mass

There should be an indication in clear and visible points of the mass of loadable luggage when the vehicle is carrying the maximum number of passengers and a member of the crew, but not exceeding the maximum designed loading mass or the allowed axle load. The luggage mass should include:

— Luggage mass B inside the luggage compartment;

— Luggage mass Bx on the roof luggage rack (if the bus is equipped with a roof luggage rack).

4.16 Interior ventilation of bus

If the bus cannot be ventilated naturally, a compulsory ventilation device should be installed.

Appendix A

(Normative Appendix)

Additional technical requirements for provision of buses with suitable equipment for passengers with reduced mobility

A.1 Requirements

A.1.1 Steps

The height of steps should meet the requirements of Table A.1.

Table A.1 Height of steps

Position of Steps	Vehicle Type	Height of Steps (mm)
The first step from the ground for buses with at least one service door [a)]	Grade I	≤ 250 [b)]
	Grade II, Grade III	≤ 320
Other steps to service doors, steps inside the gangway and access passage [c)]	Grade I, Grade II, Grade III	≤250
a) Can combine with the use of a kneeling system and/or extendible steps to meet this requirement; b) For Grade I buses with double doors (one entry and one exit), the height of the first step from the ground is ≤ 270 mm; c) The transitional steps from the gangway to the sitting zone are not counted as steps.		

A.1.2 Priority seat and its neighbouring devices

A.1.2.1 Priority seats provided for passengers with reduced mobility should be designed to be front-facing or rear-facing, and should be close to the service door. The number of priority seats on Grade I buses should not be less than 4, and the number of priority seats of Grade II and Grade III buses should not be less than 2.

A.1.2.2 Handrails or handles should be installed around the priority seat for passengers to hold conveniently.

A.1.3 Communication device

A.1.3.1 The priority seats and the wheelchair zone should be equipped with communication devices. Their central height should be within the range of

700-1,200 mm above the floor.

A.1.3.2 The central height of communication devices installed in the low-floor area without any seats should be within the range of 800-1,500 mm above the floor.

A.1.3.3 The control parts of all the internal communication devices inside the bus can be operated by palm, and should be shown by two contrasting colours (or multiple colours) and sound.

A.1.3.4 If the vehicle is equipped with a ramp or lifting mechanism, a communication device for contacting the driver should be installed near the bus door outside the bus. It should not be more than 1,300 mm above the ground.

A.1.4 Signs

A.1.4.1 For vehicles with a wheelchair zone and priority seating, apart from posting visible signs outside the bus at the front on the right-hand side of the vehicle and at points near the service doors, there should be signs posted inside the bus at points near the wheelchair zone and priority seats.

A.1.4.2 The wheelchair user sign should meet the stipulations of GB/T 10001.1. The priority seat user sign should meet the requirements of Figure A.1.

Figure A.1 Priority seat user sign

A.1.5 Slope

For the gangway from the priority seat (or wheelchair zone) to at least one entry and one exit (or one combined entry and exit), and for the floor of the priority seat zone (or wheelchair zone), the vertical slope should not exceed 8%. The surface of the floors of these slope zones should be slide-proof.

A.1.6 Adaptability of wheelchair

A.1.6.1 Each wheelchair user should be provided with a special space of at least 750 mm wide and 1,300 mm long inside the passenger compartment. Its longer side should be in the front-rear direction, and the surface of the floor should be slide-proof. For wheelchair spaces designed for front-facing wheelchair users, the top of the seat back in the previous row can protrude into the space of the wheelchair zone, but the remaining wheelchair space other than the protruding part should meet the requirements of Figure A.2.

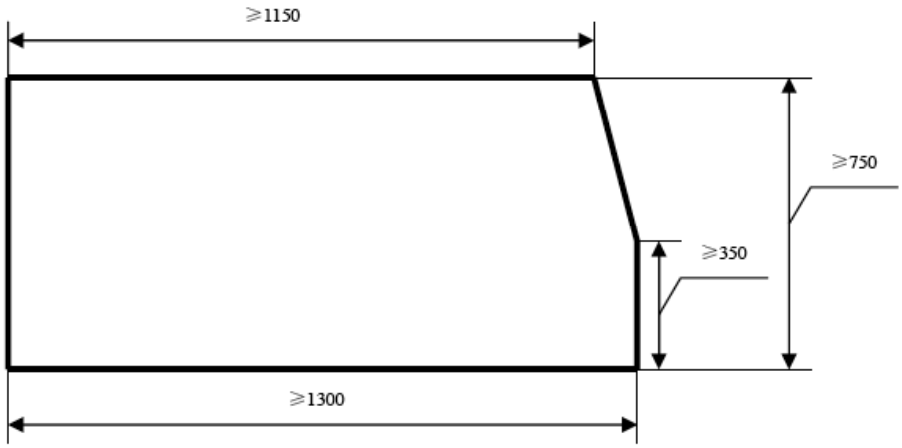
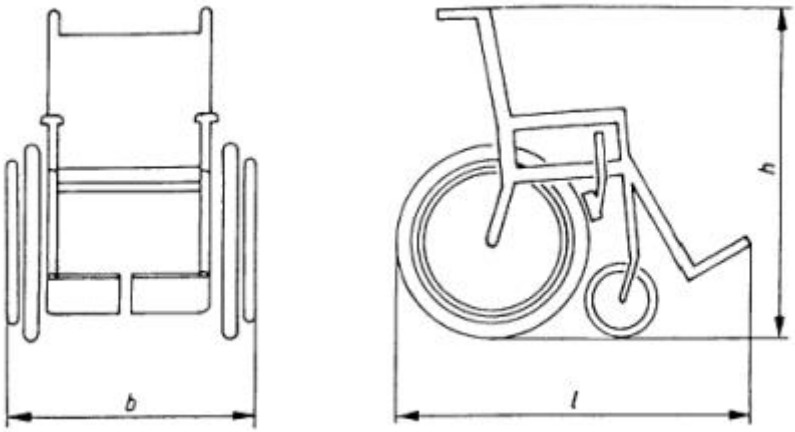


Figure A.2 Wheelchair space designed for front-facing wheelchair user

A.1.6.2 There should be at least one door available for wheelchair users to pass through. Grade I buses shall have a service door for wheelchairs to get in and out. The door for wheelchairs to get in and out should be combined with the use of a kneeling system, lift or ramp that meets the requirements of this appendix.

A.1.6.3 A wheelchair door which is not a service door should have a minimum height of 1,400 mm. All the doors for wheelchairs to get in and out should have a minimum width of 900 mm. When measured at the point of the handrail, the width can be decreased by 100 mm.

A.1.6.4 The basic dimensions of wheelchairs are shown in Figure A.3.



l = 1,200 mm; b = 700 mm; h = 1,090 mm

Remarks: When the wheelchair user is sitting on the wheelchair, the total length l shall be increased by 50 mm, and the height h measured from the floor shall be 1,350 mm.

Figure A.3 Basic dimensions of wheelchairs

A.1.7 Wheelchair seat space

A.1.7.1 The folded seat installed in the wheelchair zone should not occupy the wheelchair zone if not in use.

A.1.7.2 The wheelchair zone should be installed with a demountable seat which can be easily demounted by the driver or a member of the crew.

A.1.7.3 If the leg stretching space of a seat occupies the wheelchair zone, or the parts of a folded seat occupy the wheelchair zone when in use, there should be a sign saying “Please vacate this zone for a wheelchair user” at a visible point near the zone. The sign should be clear, and the height of the lettering should not be less than 50 mm.

A.1.8 Restraint system for the wheelchair and its user

A.1.8.1 Structure of restraint system

A.1.8.1.1 For vehicles whose passenger seats do not need to have a passenger restraint system, the restraint system of the wheelchair zone should meet the stipulations of either (a) or (b) as follows:

a) A restraint system should be equipped in the wheelchair zone to ensure the stability of the wheelchair;

b) The design of the wheelchair zone should satisfy the condition that there is a supporting part or seat back for the rear-facing wheelchair to lean on, and the activities of the wheelchair user will not be restricted. The concrete requirements are as follows:

— The wheelchair zone should be situated at one side or by the lateral wall of the vehicle;

— The supporting part or seat back being perpendicular to the vertical axis of the vehicle should be situated at the front end of the wheelchair zone;

— The supporting part or seat back should be purposely built for the wheels or seat back of the wheelchair to stop against and lean on, so as to avoid the wheelchair turning over;

— The supporting part or the seat back of the previous row should be able to bear the force of 2,500±200 N of each wheelchair. This force should be horizontally applied forward to the central part of the supporting part or seat back, and maintained for no less than 1.5 s;

— On the vertical side or interior wall of the wheelchair zone, there should be handrails or handles installed for wheelchair users to hold easily;

— On the rear horizontal side of the wheelchair zone, there should be extendible handrails or relevant devices installed for wheelchair users to hold easily, so as to avoid the wheelchair turning over;

— A sign should be fixed in the wheelchair zone. The contents of the sign should be “This zone is exclusively for wheelchairs. Wheelchairs have to stop against and lean on the supporting parts or seat backs, and their brakes must be applied.”

A.1.8.1.2 When passengers’ seats are required to have a restraint system, each

wheelchair zone should be provided with a restraint system to restrain the wheelchairs and their users. This restraint system and its positioning should be designed to be able to bear a force equivalent to the force specified in the restraint system for passengers' seats and their passengers. The method of having a separate restraint system for the wheelchair and the wheelchair user can be adopted. The method of having a combined restraint system for the wheelchair and the wheelchair user can also be adopted.

A.1.8.1.3 In an emergency, any restraint systems of wheelchair space must be easily releasable.

A.1.8.2 Requirements for the performance of the restraint system

A.1.8.2.1 A restraint system which meets the stipulations of Subsection A.1.8.1.1 (a) should also be able to complete the test in Subsection A.2.1 and meet the requirements of Subsection A.1.8.2.3.

A.1.8.2.2 A restraint system which meets the stipulations of Subsection A.1.8.1.2 should also be able to complete the forward and backward force-adding tests of the relevant structure in Subsection A.2.2, and meet the requirements of Subsection A.1.8.2.3.

A.1.9 Door control

For any opening control near the bus door for the wheelchair to get in and out, no matter whether it is inside or outside the bus, its central height measured from the floor or the ground should not be greater than 1,300 mm.

A.1.10 Lighting

Suitable lighting equipment should be provided at points around the inside and outside of the bus, enabling passengers with reduced mobility to get on and off the bus. Any lighting equipment that may affect the driver's vision should only be used when the bus is stopped.

A.1.11 Boarding device

A.1.11.1 General rules

A.1.11.1.1 The control for turning on the boarding device should be clearly indicated. The extending and descending of the boarding device should be indicated to the driver by means of the warning light.

A.1.11.1.2 If the safety device malfunctions, the lift, ramp and kneeling system should be idle, unless they can be safely operated manually. The form and position of the emergency operation mechanism should be clearly indicated. If the power malfunctions, the lift and ramp have to be operated manually.

A.1.11.1.3 When the access passage of either the service door or the emergency door is blocked by the boarding device, the following two conditions should be satisfied from the inside and outside of the bus:

— The boarding device does not obstruct the door opening handle or other devices;

— In an emergency, the boarding device can be rapidly removed from the entry of the bus door.

A.1.11.2 Kneeling system

A.1.11.2.1 The kneeling system should have an exclusive switch that can be distinguished clearly, and is directly controlled by the driver.

A.1.11.2.2 The actions of the kneeling system should be caused by the direct control of the driver, and its ascending or descending status should be clearly shown.

A.1.11.2.3 It should be possible to stop and rapidly resume the descending or ascending process. The switch should be situated at a point accessible by the hands of the driver when sitting in his/her seat, and should be close to other parts that operate the kneeling system.

A.1.11.2.4 When the vehicle is lower than the normal height, the speed of the bus should not exceed 5 km/h. When the movement of the service door is obstructed, the kneeling system should not work.

A.1.11.3 Lift

A.1.11.3.1 General rules

A.1.11.3.1.1 The lift may only be operated when the vehicle is static. Before the platform rises and falls, the device for preventing the downward rolling of wheels should be able to work automatically.

A.1.11.3.1.2 The width of the lift platform should not be less than 800 mm, its length should not be less than 1,200 mm and its laden capacity should not be less than 300 kg.

A.1.11.3.2 Additional requirements for power-operated lifts

A.1.11.3.2.1 In the control process of power-operated lifts, when the operation control is released, the movement should be stopped immediately, and can be displaced back in any single direction.

A.1.11.3.2.2 There should be a safety mechanism (e.g. reverse mechanism). When the movement of the lift is restricted or clashes with an object, the safety mechanism should function.

A.1.11.3.2.3 When any single safety mechanism starts working, the lift should stop working immediately, and movement in the reverse direction should be started immediately.

A.1.11.3.3 Operation of power-operated lift

A.1.11.3.3.1 When the lift is installed at the service door within the direct line of sight of the driver, the lift can be operated by the driver in his/her seat.

A.1.11.3.3.2 Under other circumstances, the control should be adjacent to the lift, and can only be turned on and off by the driver.

A.1.11.3.4 Manual lift

The control of a manual lift should be adjacent to the lift, and should be light and easy

to operate.

A.1.11.4 Ramp

A.1.11.4.1 General rules

A.1.11.4.1.1 A ramp can only be used when the vehicle is static. When the service door is closed, the ramp should not be able to work. When the ramp is not drawn back, the service door or the door for wheelchairs to get in and out should not be closed.

A.1.11.4.1.2 The round corner radius of the edge of the ramp should not be less than 2.5 mm, and the round corner radius of the turning angle should not be less than 5 mm.

A.1.11.4.1.3 The width of the ramp should not be less than 800 mm. When the ramp is placed on the road shoulder at a height of 150 mm, its slope should not be greater than 12%, and the lift should be able to achieve this slope.

A.1.11.4.1.4 When the length of the ramp for use exceeds 1,200 mm, there should be a device to prevent wheelchairs from rolling off the edge.

A.1.11.4.1.5 The loading capacity of the ramp should not be less than 300 kg.

A.1.11.4.1.6 The extension and retraction of the ramp may be operated manually or powered.

A.1.11.4.2 Additional technical requirements for power-operated ramps

A.1.11.4.2.1 The extension and retraction of the ramp should be indicated by a flashing yellow light and sound signal. The outer edge of the ramp should be clearly indicated with warning signs in alternate red and white colours.

A.1.11.4.2.2 A safety device should be installed to protect the horizontal extension movement of ramp.

A.1.11.4.2.3 When the safety device is activated, the movement of the ramp should be able to stop immediately.

A.1.11.4.2.4 When the mass of the load is not less than 15 kg, the horizontal movement of the ramp should be stopped.

A.1.11.4.2.5 When the ramp is stretched out and encounters a resistance of 150 N, it should be able to draw back automatically.

A.1.11.4.2.6 If the ramp is situated at the service door within the direct line of sight of the driver, it is suggested that the ramp be operated by the driver in his/her seat. Under other circumstances, the control should be adjacent to the ramp, and may only be turned on and off by the driver.

A.1.11.4.3 Operation of manual ramps

Manual ramps should be light and easy to operate.

A.2 Test methods of restraint system

A.2.1 For vehicles whose passenger seats are not required to have a passenger restraint system, the static test of the restraint system of the wheelchair zone should be carried out according to the following requirements:

a) Apply a force of 2,500±200 N per wheelchair to the restraint system;
b) If the restraint system does not connect with the ground, the force should be horizontally applied forward. If it connects with the ground, the force forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane, and should be applied forward;
c) The test force should be maintained for no less than 1.5 s.

A.2.2 When the passenger seats are required to have a passenger restraint system, the static test of the restraint system of each wheelchair zone should be carried out according to the following requirements:

a) Respectively apply the test force forward and backward on the restraint system;
b) The test force should be maintained for no less than 0.2 s.

A.2.2.1 When the restraint systems for wheelchairs and for wheelchair users are separate, force should be applied forward:

a) M2 vehicle type:

— Girdle: apply the test force of 11,100±200 N on the restraint system of the wheelchair user. If the restraint system does not connect with the ground, the test force should be applied forward within the horizontal plane of the vehicle. If the restraint system connects with the ground, the test force forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and the force should be applied forward;
— 3-point seat belt: the girdle's test force of 6,750±200 N should be applied forward within the horizontal plane of the vehicle. The trunk's test force of 6,750±200 N should be applied forward within the horizontal plane of the vehicle;
— Restraint system of wheelchair: the test force of 17,150±200 N forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and the force should be applied forward;
— Different forces should be applied at the same time.

b) M3 vehicle type:

— Girdle: apply the test force of 7,400±200 N on the restraint system of the wheelchair user. If the restraint system does not connect with the ground, the test force should be applied forward within the horizontal plane of the vehicle. If the restraint system connects with the ground, the test force forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of vehicle and the force should be applied forward;
— 3-point seat belt: the girdle's test force of 4,500±200 N should be applied forward within the horizontal plane of the vehicle. The trunk's test force of 4,500±200 N should be applied forward within the horizontal plane of the vehicle;
— Restraint system of wheelchair: the test force of 11,300±200 N forms an angle

of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and the force should be applied forward;

— Different forces should be applied at the same time.

A.2.2.2 Regarding the restraint system for the combination of wheelchair and wheelchair user, force should be applied forward.

a) M2 vehicle type:

— Girdle: apply the test force of 11,100±200 N on the restraint system of the wheelchair user. The test force forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and the force should be applied forward;

— 3-point seat belt: the girdle's test force of 6,750±200 N forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and should be applied forward. The trunk's test force of 6,750±200 N should be applied forward within the horizontal plane of the vehicle;

— Restraint system of wheelchair: the test force of 17,150±200 N forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and should be applied forward;

— Different forces should be applied at the same time.

b) M3 vehicle type:

— Girdle: apply the test force of 7,400±200 N on the restraint system of the wheelchair user. The test force forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and the force should be applied forward;

— 3-point seat belt: the girdle's test force of 4,500±200 N forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle. The trunk's test force of 4,500±200 N should be applied forward within the horizontal plane of the vehicle;

— Restraint system of wheelchair: the test force of 11,300±200 N forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle, and should be applied forward;

— Different forces should be applied at the same time.

A.2.2.3 Application of force to the rear part: the test force of 8,100±200 N forms an angle of $45^{o} \pm 10^{o}$ with the horizontal plane of the vehicle. Apply the force on the restraint system of wheelchair users at the rear of the vehicle.

Appendix B

(Normative Appendix)

Confirmation of the calculation of

static lateral inclination limits

B.1 The confirmed calculation method can be adopted to prove that a vehicle meets the requirements of Subsection 4.3 of the Standard.

B.2 The inspection body can carry out the test on certain parts of the vehicle, so as to confirm certain suppositions in the calculation process.

B.3 Preparation for the calculation

B.3.1 The vehicle should be represented by a spatial system.

B.3.2 Due to the difference in the position of the centre of gravity as well as the rigidity of the suspension and tyres of different vehicles, under the lateral acceleration function, the axle of one side of the vehicle does not rise up at the same time. Therefore, the lateral inclination of the vehicle body on a single axle should be determined by the supposition that the wheels of other axles are still kept on the ground.

B.3.3 In order to simplify the problems, the centre of gravity of the non-suspended mass should be supposed to be located within the vertical central plane of the vehicle. Due to axle deflection, minor movement of the central position of the vehicle's rotation can be ignored. Adjustment for air suspension is not considered.

B.3.4 The following parameters should be considered in the calculation as a minimum:

The parameters of the vehicle, such as the axle distance, wheel distance and suspended / non-suspended mass; the position of the centre of gravity of the vehicle; the rigidity, deflection and resilience of the suspension spring of the vehicle, and the non-linear effects to be considered; horizontal and vertical rigidity of tyres; the turning of the superstructure, and the position of the axle's rotation centre.

B.4 Correctness of calculation method

B.4.1 The correctness of the calculation method should be agreed by the inspection body, taking equivalent tests on similar vehicles as the basis.

Appendix C

(Normative Appendix)

Measurement of pinching force of power-operated doors

C.1 Scope of application

This appendix is applicable to power-operated doors.

C.2 Definition

C.2.1 The closing of power-operated door is a dynamic process. When an obstacle is touched in the door closing process, a dynamic reaction is caused. This process (relative time) is determined by several factors (i.e. mass of door, acceleration, dimension, etc). Pinching force F(t) is a time function. It is measured at the closing edge of the door (see Subsection C.3.2).

C.2.2 Peak force F_S is the maximum value of the pinching force.

C.2.3 Effective force F_E is the mean of pinching force in relation to the pulsing period.

$$F_E=\frac{1}{T}\int_{t_1}^{t_2} F(t)dt \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (1)$$

C.2.4 Pulsing period T is the period between t_1 and t_2.

$$T=t_2-t_1 \qquad \cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots\cdots (2)$$

In this equation t_1 — The moment of time with pinching force exceeding 50 N at the place where sensing starts;

t_2 — The moment of time with pinching force being less than 50 N at the place where sensing ends.

C.2.5 The relationship of the abovementioned parametric pulsing is shown in Figure C1:

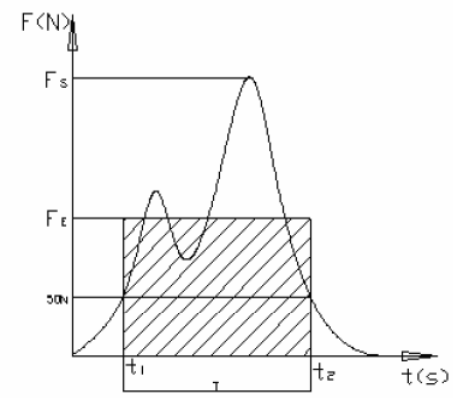


Figure C1 Functional relationship between pinching force F(t) and time

C.2.6 The pinching force F_C is the effective technical mean after repeated measurement at the same measurement point several times:

$$F_C = \frac{\sum_{i=1}^{n} F_E}{n} \qquad \cdots\cdots (3)$$

C.3 Measurement

C.3.1 Measurement conditions:

C.3.1.1 The temperature of measurement is 10-30^{o}C.

C.3.1.2 The vehicle should be stopped on a horizontal plane.

C.3.2 Measurement points

C.3.2.1 The main closing side of the bus door: one of the points is at the centre of the bus door, and the other point is at 150 mm above the bottom of the bus door.

C.3.2.2 The bus door is equipped with an anti-pinch device for the opening process. At the subordinate side of the bus door, this point is the most dangerous pinching point.

C.3.3 Take the measurement at each measurement point three times. Confirm the pinching force according to Subsection C.2.6.

C.3.4 The deviation between the reading figure and the rated value is ± 3%.

C.4 Measurement device

C.4.1 The measurement of pinching force can be performed with a numerical force-testing instrument.