BS EN 1645-1:2012

BSI Standards Publication

Leisure accommodation vehicles — Caravans

Part 1: Habitation requirements relating to health and safety

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National foreword

This British Standard is the UK implementation of EN 1645-1:2012. It supersedes BS EN 1645-1:2004 + A1:2008 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee B/511, Buildings mobile and temporary.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Compliance with a British Standard cannot confer immunity from legal obligations.

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NORME EUROPÉENNE

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July 2012

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English Version

Leisure accommodation vehicles - Caravans - Part 1: Habitation requirements relating to health and safety

Véhicules habitables de loisirs - Caravanes - Partie 1: Exigences d'habitation relatives à la santé et à la sécurité

Bewohnbare Freizeitfahrzeuge - Caravans - Teil 1: Anforderungen an den Wohnbereich hinsichtlich Gesundheit und Sicherheit

This European Standard was approved by CEN on 16 June 2012.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

Figures

Tables

Foreword

This document (EN 1645-1:2012) has been prepared by Technical Committee CEN/TC 245 “Leisure accommodation vehicles”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by January 2013, and conflicting national standards shall be withdrawn at the latest by January 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1645-1:2004+A1:2008.

The main technical changes are:

a) Dimensions for locking systems of exterior doors added (see 5.6.1);

b) New clause on awning rail added (see 5.7);

c) Clear width of a bunk deleted (see 6.1.2);

d) Protection against falling out amended (see 6.1.3.1);

e) Informative annex on environmental aspects added (see Annex O);

f) Normative references updated.

EN 1645, *Leisure accommodation vehicles — Caravans* contains the following parts:

— *Part 1: Habitation requirements relating to health and safety* (the present document);

— *Part 2: User payload.*

This European Standard is one of a series covering the habitation aspects of leisure accommodation vehicles. It includes fourteen normative annexes and one informative annex.

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

Introduction

Figure 1 gives an overview of the relevant European Standards for caravans, motor caravans and caravan holiday homes.

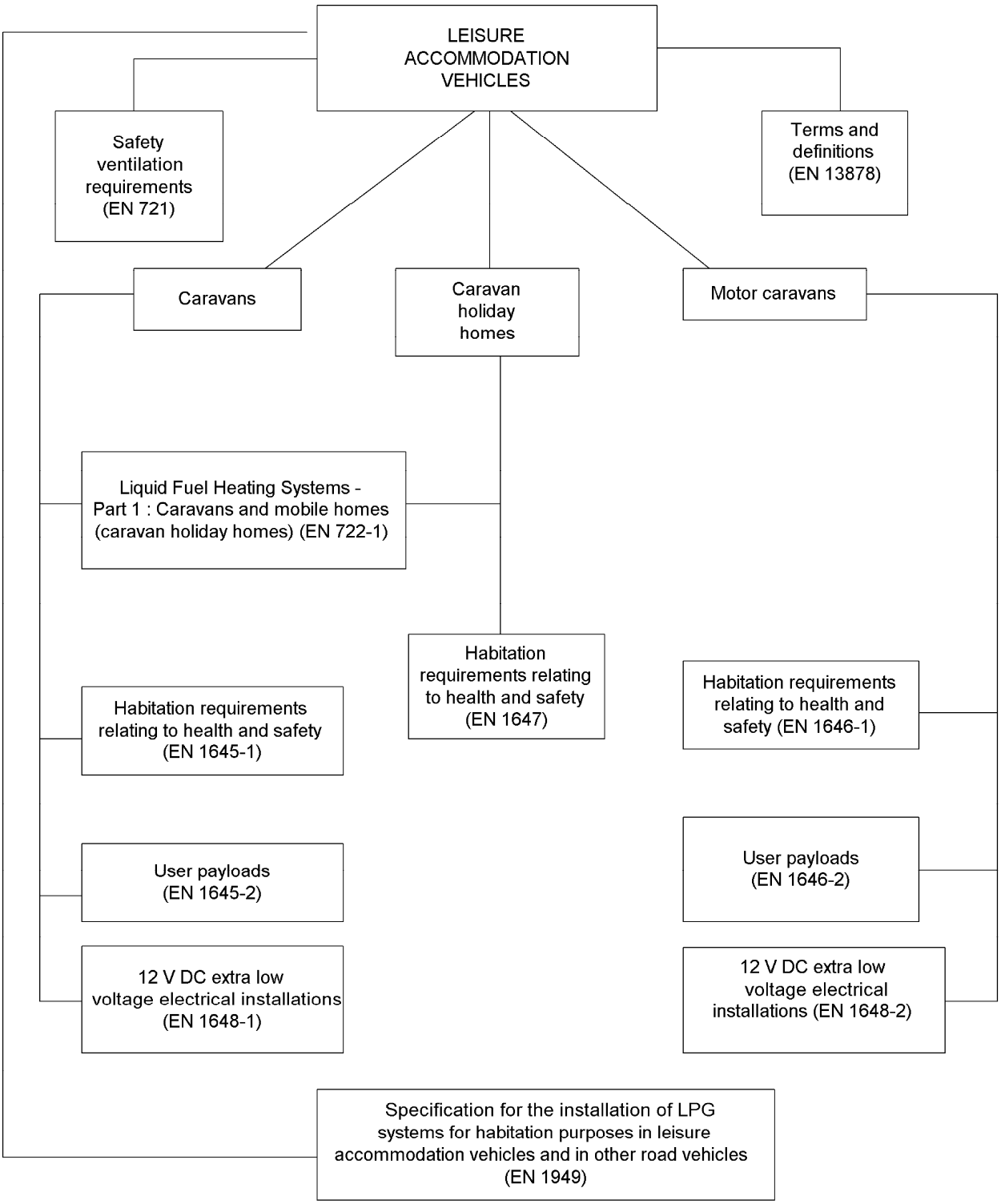


Figure 1 — Overview of relevant European Standards applying to leisure accommodation vehicles

1 Scope

This European Standard specifies requirements intended to ensure the safety and health of people when they use caravans for temporary or seasonal habitation.

It also specifies the corresponding test methods.

EN 1645-2 gives requirements relating to user payloads for caravans.

Requirements applicable to road safety are not included in the scope of this European Standard.

This European Standard is applicable exclusively to rigid and rigid folding caravans as defined in EN 13878.

2 Normative references

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

EN 721, *Leisure accommodation vehicles — Safety ventilation requirements*

EN 722-1, *Leisure accommodation vehicles — Liquid fuel heating systems — Part 1: Caravans and caravan holiday homes*

EN 1645-2, *Leisure accommodation vehicles — Caravans — Part 2: User payload*

EN 1648-1, *Leisure accommodation vehicles — 12 V direct current extra low voltage electrical installations — Part 1: Caravans*

EN 1949, *Specification for the installation of LPG systems for habitation purposes in leisure accommodation vehicles and accommodation purposes in other vehicles*

EN 13878:2003, *Leisure accommodation vehicles — Terms and definitions*

HD 60364-7-721, *Low-voltage electrical installations — Part 7-721: Requirements for special installations or locations — Electrical installations in caravans and motor caravans (IEC 60364-7-721)*

EN ISO 8936, *Awnings for leisure accommodation vehicles — Requirements and test methods (ISO 8936)*

ISO 4649:2010, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13878:2003 apply.

4 Testing

The tests described in Annex A to N are intended to verify that a caravan representative of a given model, including its fixtures and fittings, meets the requirements of this European Standard.

These tests are intended to simulate the most onerous conditions for the relevant characteristics.

NOTE It is recommended to take environmental aspects into account during development, production and disposal of caravans based on established knowledge and within the respective technical possibilities (see also Annex O).

5 Design and construction

5.1 Occupancy

The manufacturer shall designate the occupancy as the number of berths, both standard berths and additional berths, and shall include it in the User's Handbook and in his brochures. The occupancy is also needed to determine the ventilation requirements (see EN 721).

5.2 Rigidity

When stationary, with the floor horizontal and all corner steadies extended to the ground, an upward thrust of 1 500 N applied to one corner steady for a duration of 15 min shall not cause the caravan to distort to an extent that would make any door or window difficult to open.

Rigidity shall be tested in accordance with Annex A.

5.3 Corner steadies

Each caravan shall be equipped with four steadies, one at each of its four corners. Each steady shall be retractable and adjustable in height. Each steady shall be capable, when extended, of carrying a load of not less than 25 % of the maximum technically permissible laden mass of the caravan. An appropriate operating tool shall be provided.

A certificate, from the corner steady manufacturer or supplier shall accompany the caravan to be tested showing, either by calculation or by test, the loading capability of each type of corner steady.

5.4 Grab handles

Four external grab handles for manoeuvring the caravan shall be located externally to the body work, one on each side at the front and one on each side at the rear.

For those caravans with a maximum technically permissible laden mass not exceeding 750 kg, two grab handles at the front of the caravan one on each side are sufficient.

The hand clearance aperture of each grab handle shall be not less than 30 mm $\times$ 120 mm.

The grab handles shall be tested according to Annex B.

There shall be no visible permanent deformation or loosening of the grab handle and/or of its fixings.

5.5 Entrance steps

5.5.1 Heights

When the entrance height of the caravan, measured at maximum technically permissible laden mass**,** and standing on horizontal ground, exceeds 400 mm, the caravan shall either be fitted with an entrance step, attachable or integral with the structure of the caravan, or a separate entrance step(s) shall be provided.

The rise of the first tread shall not exceed 400 mm. The rise of any other tread shall not exceed 300 mm.

It is recommended that all separate step(s) be attached to the caravan when in use to improve their stability.

It is recommended that the rise of the steps be equal.

5.5.2 Minimum tread dimensions

The minimum tread dimensions shall be:

a) attachable or integral entrance steps: 150 mm going x 320 mm wide;

b) separate steps: 270 mm going x 450 mm wide.

5.5.3 Mechanical strength

An entrance step and any fixing devices shall be capable of withstanding a force of 2 000 N applied to any surface area of 100 mm × 150 mm of the tread.

After application of this force for a period of 5 min, any permanent deformation caused shall not exceed 5 mm.

The strength of each step shall be tested in accordance with Annex C.

5.5.4 Slip resistance test

5.5.4.1 Attachable or integral step

An attachable or integral step shall have a slip resistant surface. The slip resistance shall be tested in accordance with Annex D.

5.5.4.2 Separate entrance step

A separate step shall have a slip resistant surface. The slip resistant surface shall be tested in accordance with Annex D after having immobilised the feet or base of the step.

In addition, a separate step shall remain stable when tested in accordance with Annex E.

5.6 Doors

5.6.1 Dimensions

Exterior door openings for rigid caravans shall have a minimum clear height of 1 590 mm and a minimum clear width of 480 mm and corners of maximum radius of 90 mm. The locking system may intrude on the minimum width up to 30 mm and for a maximum height of 150 mm, regardless of the number of locks.

Exterior door openings for rigid folding caravans including caravans with an elevating roof shall have a minimum clear height of 1 300 mm and a minimum clear width of 480 mm and corners of maximum radius of 90 mm. The locking system may intrude on the minimum width up to 30 mm and for a maximum height of 150 mm, regardless of the number of locks.

5.6.2 Securing doors

Each exterior door shall be fitted with a locking device capable of keeping it closed when subjected to all forces caused by the movement of the vehicle in normal traffic conditions.

Interior doors shall be capable of being kept in a fixed position, open or closed, in the above conditions.

5.7 Awning Rail

Any awning rail shall permit the correct fitting of an awning complying with EN ISO 8936.

6 Internal equipment

6.1 Bunks

6.1.1 Mattress and/or upholstery

Bunks shall be provided with mattresses or be upholstered.

6.1.2 Clearance

The clear height over 2/3 of the surface area of the bunk shall be not less than 500 mm when measured from the compressed surface of the mattress or upholstery in accordance with the test in Annex F.

6.1.3 Protection against falling out

6.1.3.1 General

Any bunk where the uncompressed upper surface of the mattress or upholstery is placed at a height of more than 1 000 mm from the floor, shall be protected on all sides to prevent the occupant from falling out. Any gap between one element of protection and another shall conform to 6.1.7. No gap shall exceed 75 mm.

All protections shall be secured against unintentional loosening.

Upper bunks shall be provided with a label with the following wording:

"Not suitable for children under 6 years old without supervision".

6.1.3.2 Rigid protection

For rigid protection, the minimum height of the protection shall be at least 150 mm above the uncompressed upper surface of the mattress or upholstery. To allow entry, an access gap of 350 mm to 550 mm measured at its narrowest point shall be provided.

Where a rigid protection presents an apparent flexibility, its resistance shall be tested in accordance with Annex G.

A protection is considered as rigid if it is not bent more than 10 mm under a force of 100 N applied horizontally in the middle of the protection.

6.1.3.3 Protection by curtains or nets

Alternatively, the protection may be obtained by means of curtains or nets. The minimum height of the protection shall be at least 160 mm above the uncompressed upper surface of the mattress or upholstery, when the upper edge is loaded with 100 N in vertical direction downward.

To allow access to the bunk, the curtains or nets on at least one side of the bunk may be detachable, allowing an opening 350 mm to 550 mm.

Means of emergency exit from the bunk shall be accessible from the upper surface of the bunk.

The curtains or nets shall be capable of resisting a force of 100 N applied horizontally towards the outside of the bunk for 15 s to any point and this shall not result in any tearing nor detaching nor creating any gap larger than 60 mm at the lower edge of the protection.

The strength of the curtains or nets shall be tested in accordance with Annex G.

Any gap created during the resistance test shall be measured in accordance with Annex K.

6.1.4 Mechanical strength

A force of 1 000 N applied vertically downwards, for 1 h, from the midpoint of each side member of any bunk where the upper surface of the compressed mattress or upholstery is placed at a height of more than 500 mm from the floor, shall neither cause permanent deformation of more than 5 mm of the frame of the bunk nor damage the fixing of the bunk to the structure of the caravan.

The mechanical strength shall be tested in accordance with Annex H.

6.1.5 Security of folding bunks

If a bunk is designed to fold away, it shall be secured against unintentional folding away.

A folding bunk shall not unintentionally move from its stored position. Both conditions shall be tested in accordance with Annex I.

6.1.6 Access to upper bunks

A means of access to an upper bunk shall be provided, such as surfaces of furniture, foot holes in a solid component, handles or a ladder which shall be fixed or be able to be attached, to the bunk, in a safe manner.

The width of the treads between supports shall be at least 250 mm.

The distance between the top foothold and the uppermost part of the bed structure, e.g. the side rail or safety barrier, at the point of access, shall not be more than 400 mm.

When a ladder is used, the upper surfaces of the treads shall be equally spaced within a tolerance of ± 12 mm, and the unobstructed distance between consecutive treads shall be (225 ± 25) mm.

When tested in accordance with Annex J, the ladder shall not move when subjected to a downward static load of 1 000 N and a horizontal static load of 500 N; nor shall the ladder or its treads break or deflect permanently by more than 5 mm.

Where it is impractical to test the bunk ladder in the caravan, it is acceptable to test an identical configuration of the ladder, its method of fixing and its range of positions of use, outside the caravan according to Annex J.

6.1.7 Protection against entrapment

When ready for use, a bunk and its means of access shall not contain any open-ended tubing; nor shall there be projections, holes, loose washers, speed fixing nuts or crevices on which clothing or any part of the body could become snagged or trapped. Tension springs in the base structure are excluded. All edges, corners and projecting parts that are accessible shall be free from burrs and sharp edges.

If the base of a bunk is not covered by permanently fixed upholstery, any gap in the base not covered by the mattress shall not permit the passage of the cone (see K.1) beyond the point at which the diameter of the cone is 75 mm, when measured in accordance with K.2.

Any other gap or space within the structure of the bunk which is accessible from the upper surface of the bunk, including mattress where applicable, shall be between 12 mm and 25 mm or between 60 mm and 75 mm, (tested in accordance with K.3) or equal to or larger than 200 mm.

When a gap cannot be tested because a constructional feature prevents proper positioning of the cone, the constructional feature may be removed to the extent necessary to allow the tests to be carried out.

6.2 Cupboards

Bases of cupboards and shelves in cupboards at more than 1 000 mm from the floor of the vehicle at the place of measurement shall be provided with means to prevent their contents from sliding off.

Protection shall be appropriate for the items likely to be stored in the cupboards. Where an up-stand or lip is used as the method of protection, then this should be a minimum height of 5 mm.

6.3 Cooking appliance

A cooking appliance shall be installed.

7 Drinking water supply, storage and disposal of waste water

7.1 Couplings for drinking water supply

Couplings for drinking water supply shall be accessible on the outside of a caravan. A sealing off cover secured to the coupling or adjacent to it shall be supplied for each coupling.

7.2 Drinking water

7.2.1 Tanks

Water tanks, whether or not permanently fitted, shall be capable of being completely drained and cleaned.

7.2.2 Materials

All materials in contact with drinking water shall be of food contact quality.

NOTE For materials in contact with drinking water, attention is drawn to the requirements of Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption" and national requirements for the country of first destination.

7.2.3 Marking

The drinking water filling points shall be clearly identified in blue.

7.3 Waste water disposal tank

When a drinking water tank is fixed in the caravan, one (or more) waste water tank(s) of total capacity at least equal to 50 % of the drinking water tank capacity shall be provided. Any waste water tank shall be either fixed or moveable and it shall be capable of being flushed and cleaned. If moveable, a storage area shall be provided.

7.4 Toilet waste disposal

7.4.1 Discharge systems

Discharge from a toilet shall be collected in a closed system and shall not be discharged into a waste water disposal system. Any fixed tank intended to receive discharge from a toilet shall be fitted with a level indicator or early warning device that will indicate to the user that the tank will require emptying after a further three or four uses.

7.4.2 Outlets and couplings from toilet waste holding tanks

The internal diameter of a coupling taking discharge from a toilet-holding tank shall be a minimum of 70 mm. It shall have a bayonet type fitting to receive a 75 mm minimum internal diameter hose and a 1,5 m minimum length of such hose shall be provided.

These requirements do not apply to toilets with removable toilet waste holding tanks.

8 Appliances

8.1 Installation of appliances

Appliances shall be installed in accordance with the appliance manufacturer’s instructions.

NOTE It is essential that the appliances as well as their installation are installed in accordance with European Directives and Standards in force for the corresponding appliance.

8.2 Restriction concerning the supply of appliances

Portable appliances producing heat and non-room-sealed space heating appliances shall not be supplied with the caravan by the caravan manufacturer.

9 Classification of thermal insulation and heating

The thermal insulation and heating levels for specific climatic conditions shall be classified as follows:

a) grade 1: a caravan, including windows, doors and roof lights in which the average thermal transmittance (U) of the elements of construction shall not exceed 1,7 W/(m^2·K).

   There is no heating requirement for this grade.

b) grade 2: a caravan, including windows, doors and roof lights in which the average thermal transmittance (U) of the elements of construction shall not exceed 1,7 W/(m^2·K).

   An average temperature difference of at least 20 K between inside and outside temperatures shall be achieved when the outside temperature is 0 °C.

c) grade 3: a caravan, including windows, doors and roof lights in which the average thermal transmittance (U) of the elements of construction shall not exceed 1,2 W/(m^2·K).

   An average temperature difference of at least 35 K between inside and outside temperatures shall be achieved when the outside temperature is −15 °C.

   Precautions shall be taken to ensure that the fresh-water supply can be filled at the end of the stabilizing time of one hour according to Annex M. Then the fresh-water service shall operate when the outside temperature is −15 °C.

For the three grades, the average thermal transmittance coefficient (U) shall be calculated in accordance with Annex L or, for grades 2 and 3, tested in accordance with the method of test given in Annex M, according to the manufacturer's choice.

To ensure compliance with this clause, it is sufficient to test only one caravan with the largest plan area of a specified number of similar caravans. This caravan shall fulfil the following conditions:

1) the bodywork, materials used and cross sectional dimensions in similar positions for the walls, floor, roof and windows are identical (except for colour);

2) the caravan tested shall have the largest total window area;

3) the space heater shall have the smallest output;

4) all caravans shall have the same space heating system (convected air, blown air, hot water, etc.);

5) the caravan shall have the least number of heating outlets (air outlets, heat exchangers, radiators, etc.) of the smallest dimensions of the caravans;

6) all caravans shall have the same hot and cold water supply system and any tank(s) shall have the same method of protection against freezing.

10 Installations

10.1 Electricity

10.1.1 Low voltage

Low voltage electrical installations shall conform to HD 60364-7-721.

10.1.2 Extra low voltage

12 V direct current extra low voltage installations shall conform to EN 1648-1.

10.2 Liquefied petroleum gas (LPG)

LPG installations shall conform to EN 1949.

10.3 Liquid fuel

Installations of liquid fuel heating systems shall conform to EN 722-1.

11 Ventilation

Safety ventilation shall be provided and shall conform to EN 721.

12 Fire precautions

12.1 Means of escape

12.1.1 Emergency exits

Each separate living compartment, which can be closed off from the rest of a caravan other than by means of a loose textile curtain, shall be provided with an emergency exit giving direct access to the outside of the caravan in accordance with 12.1.4 or 12.1.6, as appropriate.

12.1.2 Escape path

It shall be possible to reach an emergency exit by means of an unobstructed escape path.

Objects such as drawers, doors, bunk ladders, etc that can be moved quickly and easily from the escape path, emergency exit or door with a single movement shall not be considered as obstructions.

An escape path shall be at least 450 mm wide.

12.1.3 Toilet compartments

Toilet compartments shall be equipped with an emergency exit unless the compartment door is situated less than 2 000 mm from an emergency exit of the caravan. This distance or sum of distances is measured from the door handle of the toilet compartment to the nearest part of the emergency exit aperture passing through the escape path.

12.1.4 Emergency doors

Emergency doors shall open outwards or slide horizontally, and shall provide a clear opening, free from obstruction, of the sizes specified in 5.6.1. The door lock(s), even if locked from the outside, shall be capable of being immediately opened from the inside. This requirement is considered as fulfilled if opening of the emergency doors can be performed in not more than two operations, in addition to opening curtains blinds or fly screens. The use of two hands for a simultaneous operation shall be considered as one operation. One operation is a train of movements effected without removing the hand from the element on which it is acting (e.g. 1,2 and 3 successively). See Figure 4.

12.1.5 Interior doors

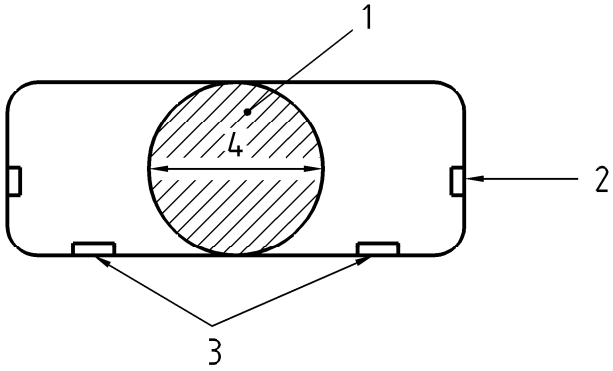
Opening mechanisms for interior doors shall be capable of being operated from both sides. When fitted, lever handles shall open interior doors by being pushed downwards.

Where an interior door between compartments is fitted with a locking mechanism on one side, an emergency unlocking system shall be fitted on the other side.

12.1.6 Emergency windows and emergency panels

Emergency windows and emergency panels shall open outwards or slide horizontally and shall provide a clear opening, free from obstruction, of not less than 0,25 m^2, with a minimum dimension in any one direction of 450 mm.

For compartments exclusively for the use of children and in which there are two bunks above the lower bunk, the minimum dimension in any one direction may be reduced to 350 mm so long as the clear opening shall be not less than 0,25 m^2. See Figure 2. Any projecting element should be deducted from the total area of the aperture (e.g. catches, locks, fixing for window stays, blinds).



Key

1 disc of rigid material of the minimum dimension to check the emergency exit
2 window stay fixing points
3 window catches
4 350 mm or 450 mm

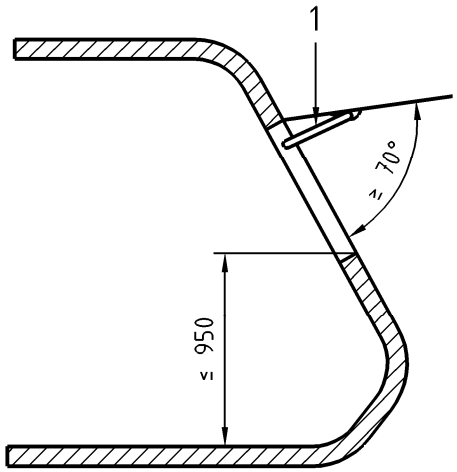
Figure 2 — Verification of the minimum dimensions of a window or escape panel

The lower edge of the opening of any emergency window or panel shall be not more than 950 mm above the floor level of the caravan.

If a bed or a bunk is permanently located immediately under an emergency window or panel, it may be considered as an access step to the emergency window or panel. The emergency window or panel shall not be more than 1 100 mm above the floor level of the caravan.

All outward opening emergency windows or emergency panels shall be hinged on their upper edge and shall be capable of opening through at least 70° and shall stay fully open until closed manually. See Figure 3.

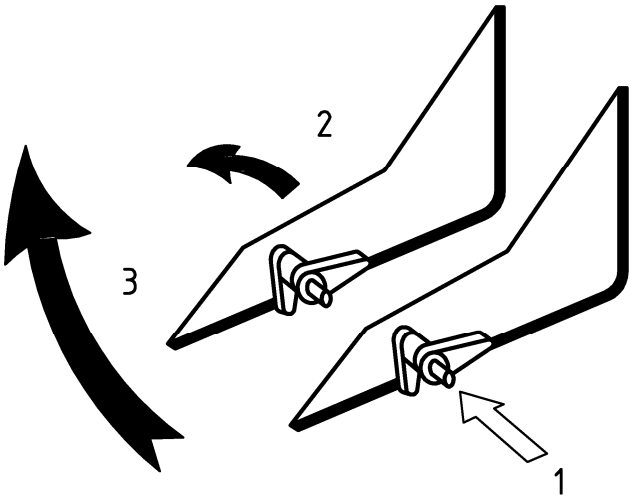
Dimensions in millimetres



Key
1 window stays capable of holding the window in its open position

Figure 3 — Positioning of window or escape panel

Opening of an emergency window or an emergency panel shall not require more than three operations in addition to opening curtains, blinds or fly screens. The use of two hands for a simultaneous operation shall be considered as one operation. After the final operation emergency windows or emergency panels shall remain fully open until closed manually. One operation is a train of movements effected without removing the hand from the element on which it is acting (e.g. 1, 2 and 3 successively). See Figure 4.



Key
1, 2, 3 successively performed movements

Figure 4 — Typical single operation of several continuous movements

12.1.7 Work surfaces

No work surface shall open towards an emergency exit in such a way as to obstruct the emergency exit or to reduce the clear opening.

12.1.8 Heating and cooking equipment

Equipment for heating or cooking shall not be mounted on doors, or installed in escape paths to emergency exits.

NOTE It is essential that protection of surfaces adjacent to heat generating appliances is achieved by ensuring that heating and cooking appliances are inspected and certified in accordance with the European Directives and Standards in force for these appliances.

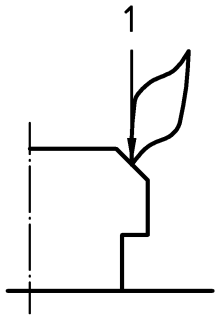
Such appliances shall be installed in accordance with the appliance manufacturer's instructions.

12.2 Protection of flammable elements

12.2.1 Rigid elements

All rigid elements manufactured from flammable materials shall be at a minimum distance of 200 mm from an open flame, measured from the point of emission of the flame (see Figure 5), except if these elements are protected by non-flammable material. Protection made of non-flammable material may be fixed or hinged but shall not be removable without tools.

Movable rigid elements shall be checked in their most adverse position.



Key
1 point of emission

Figure 5 — Point of emission of the flame

12.2.2 Non rigid elements

All non-guided elements such as curtains or non-guided blinds situated at less than 900 mm from the point of emission of the flame of a burner shall be inspected to ensure that they cannot be blown to within 300 mm, except when these elements are protected by non-flammable material.

The vertical dimensions of such non-flammable protection shall be the greater of:

a) 300 mm above the point of emission of the flame; or

b) equal to or higher than a line drawn between the point of emission of the flame and the closest point at which the element is suspended.

Elements shall be considered when they are open (pulled back) and disregarding any storage devices.

12.3 Hotplates

In the case of open flame hotplates, the following requirements shall be met:

a) the surface below the burner shall be non-flammable;

b) where there is a cover for the appliance which is likely to come into contact with the pan supports, the inner lining of that cover shall be of non-flammable material.

13 Warning notice

13.1 Provision of warning notice

A warning notice, worded at least in the language of the country where the caravan is first sold, not less than 200 mm by 130 mm, giving simple fire safety advice and setting out the action to be taken in the event of fire, shall be fixed inside the caravan in a position where it can be easily and readily seen. The inside of a wardrobe or toilet compartment door is permissible.

The height of the lettering for the headings, which shall be printed in red, shall be not less than 6 mm and for the text, in black, not less than 3 mm.

13.2 Content of warning notice

The content of the warning notice shall be as follows:

SAFETY ADVICE TO USERS

VENTILATION

Do not obstruct the permanent ventilation openings which are fitted, your safety depends on them.

IN CASE OF FIRE

1 – Get everyone out;

2 – Turn off outside gas valve and/or liquid fuel valve (if fitted);

3 – Disconnect the mains electricity supply;

4 – Raise the alarm and call the fire brigade;

5 – Fight fire if safe to do so.

FIRE PRECAUTIONS

CHILDREN: DO NOT LEAVE CHILDREN ALONE

MEANS OF ESCAPE: Make sure you know the location and operation of the emergency exits. Keep all escape routes clear.

COMBUSTIBLE MATERIALS: Keep them clear of all heating and cooking appliances.

FIRE FIGHTING: Provide one dry powder fire extinguisher of an approved type or complying with EN 3-7 of at least 1 kg capacity by the main exit door, and a fire blanket next to the cooker. Familiarise yourself with the instructions on your fire extinguisher and the local fire precaution arrangements

14 User's Handbook

Every caravan shall be provided with a User's Handbook, worded at least in the language of the country where the caravan is first sold and containing, at least the following information:

Detailed specifications

— Overall caravan body dimensions including shipping length.

— Data specified in EN 1645-2.

— Maximum static load at the coupling head.

— Explanation of thermal insulation and heating grade.

Systems, appliances and equipment

Systems diagrams, user instructions, safety precautions and, where applicable, input in kilowatts of appliances, for the following systems, appliances and equipment:

— location of emergency exits;

— toilet waste disposal;

— circuit diagrams for low voltage and extra low voltage electricity;

— liquefied petroleum gas;

— drinking water supply and waste water drainage;

— ventilation, to include location of openings and method of cleaning any protective screens;

— heating.

When no heating appliances have been factory installed but space and connections have been provided for them, the recommended room-sealed type and rated power of such appliances shall be stated.

If no refrigerator has been fitted, but space has been provided for one to be fitted later, indicate in the handbook in addition to the dimensions of this space, the provisions which have been made to connect the refrigerator to the electrical and/or gas installations.

Other operating instructions

How to connect and disconnect gas cylinders or containers.

Awning spaces and their use when discharging products of combustion exhaust into them.

Limitation on use of corner steadies.

Maintenance

Recommendations for periodic maintenance of the caravan bodywork, windows, doors, fittings, systems and appliances.

A statement worded as follows:

"In the interest of safety, replacement parts for an appliance shall conform to the appliance manufacturer's specifications and should be fitted by him or his authorized agent".

Warning instructions

These shall recommend the following:

— **use** upper bunks for sleeping only, with protection against falling out in position;

— **care** shall be taken against the risk of falling out, when upper bunks are used by children, especially under 6 years of age. These bunks are not suitable for the use by infants without supervision;

— **do not** obstruct ventilation;

— **inspect** flexible gas hose(s) regularly for deterioration and renew, as necessary, with the approved type, in any case not later than the expiration date marked on the hose(s);

— **provide** one dry powder fire extinguisher of an approved type or complying with EN 3-7 of at least 1 kg capacity by the main exit door, and a fire blanket next to the cooker. Familiarise yourself with the instructions on your fire extinguisher and the local fire precaution arrangements;

— **NEVER** use portable cooking or heating equipment, other than electric heaters that are not of the direct radiant type, as it is a fire and asphyxiation hazard;

— **NEVER** allow modification of electrical or LPG systems and appliances except by qualified persons. Care should be taken that any additional equipment or appliances are installed in accordance with the appliance/equipment manufacturer's instructions (e. g. air conditioning, satellite dish, bicycle rack, fuel cells).

The manufacturer shall inform the caravan user that heavy and/or voluminous items (e.g. TV, radio, etc.) shall be stored securely before travelling.

In addition, a list of safety measures to be taken before travelling, which shall include:

TURN OFF ALL GAS APPLIANCES, EXCEPT THOSE HEATING APPLIANCES DESIGNED TO FUNCTION WHILE THE VEHICLE IS IN MOTION.

Annex A
(normative)

Rigidity test (see 5.2)

A.1 Principle

This test method is used to determine the rigidity of a caravan.

A.2 Preparation and procedure

a) place the caravan on level solid ground;

b) ensure all doors and windows are closed;

c) extend to the ground the two front corner steadies and one rear corner steady and adjust them until the floor of the caravan is level within an accuracy of ± 2° (3,5 %);

d) place a load cell (see N.2) on the ground below the fourth steady. On top of the load cell place a load spreading platform 100 mm x 150 mm x 5 mm (see N.6);

e) adjust the fourth steady until a force of 1 500 N is being applied to the load cell;

f) maintain the load for a duration of 15 min;

g) enter the caravan and ensure that all external windows and doors open and close freely.

A.3 Expression of results

The caravan shall be considered to have passed the test and to be suitably rigid in accordance with the requirements of 5.2 if all the external doors and windows are capable of being manually opened and closed freely.

A.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The report shall state the following, if applicable:

a) which steady had been loaded during the test;

b) which door(s)or window(s) failed to open and close freely;

c) the nature of any failures.

Annex B
(normative)

Grab handle test (see 5.4)

B.1 Principle

This method of test is to determine that each grab handle is capable of withstanding for a duration of 15 min a horizontal force of 1 200 N applied to the grip according to Figure B.1, without visible permanent deformation or loosening of the grab handle or of its fixing elements.

B.2 Preparation and procedure

a) place the caravan on solid level ground; ambient temperature shall be (20 ± 10) °C;

b) using a device 100 mm wide (see N.8) and an adjustable connection, attach a load cell (see N.2) to the grip of the grab handle;

c) fix the caravan in position in such a way that when the test load is applied to the grab handle the caravan will not move;

d) apply a load of 1 200 N;

e) maintain the load (F) for a duration of 15 min;

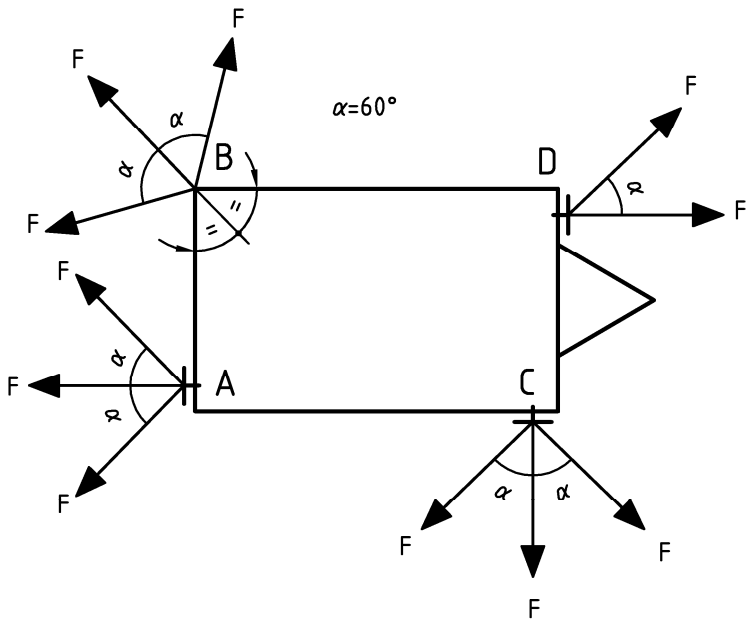
f) release the load, remove load cell and connections and inspect grab handle for any visible permanent deformation;

g) visually compare the profile of the tested grab handle with the profile of an untested grab handle of the same type;

h) manually and visually check the grab handle fixings and record any looseness;

i) repeat a) to h) for each different direction of force (F) appropriate to the handle as shown in Figure B.1;

j) repeat a) to i) for each different type of grab handle.



Key

A grab handle on rear side
B corner grab handle
C grab handle on side
D grab handle on front side
F force
$\alpha = 60°$

Figure B.1 — Plan of typical grab handle positions

B.3 Expression of results

The grab handles and their fixings shall be considered to have met the requirements given in B.1 if there is no visible permanent deformation to any of the grab handles tested and their fixings are not loose as recorded in B.2 h) after having been tested in accordance with B.2 a) to j).

B.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The report shall state the following, if applicable:

a) which grab handle(s) was (were) tested;

b) if there was any visible permanent deformation to a particular grab handle;

c) whether any particular grab handle or its fixings became loose.

Annex C
(normative)

Strength of Entrance Steps (see 5.5.3)

C.1 Principle

This method of test is used to determine the required strength of entrance steps, separate, attachable or integral.

C.2 Preparation and procedure

a) place the caravan step (separate, attachable or integral) adjacent to the test equipment (see N.7);

b) lower all corner steadies and adjust until the caravan is level within an accuracy of ± 2° (3,5 %);

c) place the load spreading platform on the front edge of the step as in Figure C.1 (see N.6);

Dimensions in millimetres

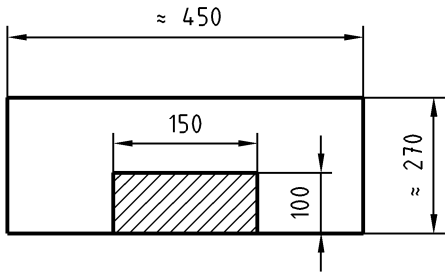


Figure C.1 — Typical location of the load spreading platform

d) fix the step testing device in place (see N.7) so that it can apply a load to the centre of the load spreading platform;

e) place a load cell (see N.2) on the spreading platform and wind down the thread of the test device (see N.7) until a force of 2 000 N is applied to the load cell;

f) maintain the load for a duration of 5 min and then remove equipment from the step;

g) observe any visible permanent deformation of the step and its fittings;

h) repeat operations c) to g) for each step tread.

C.3 Expression of results

A caravan has passed this test if the step(s) tested resist the force of the test without any permanent deformation in excess of 5 mm, and if the fixings of attached entrance steps have not become loose or detached.

C.4 Test report

A test report shall be prepared stating whether the caravan steps passed or failed the test.

If the steps failed the test, the test report shall state the following:

a) which step(s) became loose or detached from the caravan during the test;

b) which step(s) had a deformation in excess of 5 mm;

c) the position of the load at the time the step(s) failed the test.

Annex D
(normative)

Slip resistance test (see 5.5.4)

D.1 Principle

This method of test is used to determine the slip resistance of the surface of entrance steps, separate, attachable or integral (see Figure D.1).

D.2 Preparation and procedure

a) place the caravan step (separate, attachable or integral) in an horizontal position ± 2°(3,5 %) (see N.10);

b) carry out the test at an ambient temperature of (15 ± 10) °C;

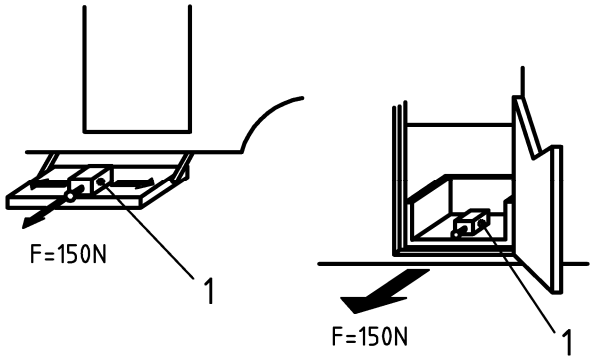
c) roughen the surface of the rubber sole of the friction test piece once before each test by placing it on a sheet of grade 60 to 63 emery paper and pull it, at a constant rate of (150 ± 10) mm/s, a distance of 300 mm across the surface of the emery paper;

d) spray evenly the top surface of the tread to be tested with a minimum of 1 litre of drinking water immediately prior to carrying out procedures e) and f);

e) place the friction test piece (see N.10) upon the step;

f) apply a horizontal force of 150 N for approximately 10 s, using load cell (see N.3), to the friction test piece during which there shall be no visually discernible movement of the friction test piece;

g) the above procedures e) and f) shall be carried out as many times as necessary to test the complete surface of the tread(s) of the step(s).



a) Attachable step b) Integral step

Key

1 friction test piece (see N.10)

Figure D.1 — Slip resistance test

D.3 Expression of results

The caravan shall be considered to have passed the test and for its step(s) to be suitably slip resistant in accordance with the requirements of 5.5.4 if during the test as described in D.2 there was no visually discernible movement of the friction test piece.

D.4 Test Report

A test report shall be prepared stating whether the caravan passed or failed the test.

The report shall state the following, if applicable:

a) the discernible amount of movement of the friction test piece on the step;

b) the position of the friction test piece on the step when movement was discerned.

Annex E
(normative)

Separate entrance step stability test (see 5.5.4.2)

E.1 Principle

This method of test is used to determine the stability of separate entrance steps.

E.2 Preparation and procedure

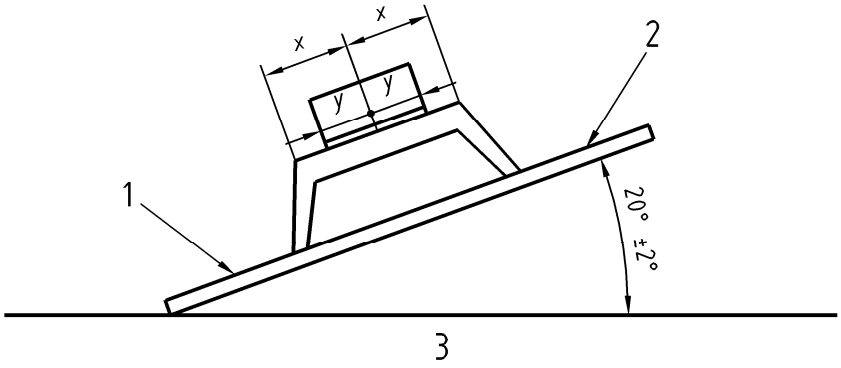
a) place a step testing plate of which the whole surface is covered with grade 60 to 63 emery paper on a level surface within an accuracy of ± 2° (3,5 %) (see N.9);

b) spray evenly the top surface of the plate with at least 1 l of drinking water immediately prior to carrying out procedures c) and d);

c) place the step to be tested on the plate so that its longest side is parallel to the edge of the plate that will remain in contact with the ground during the test and centrally on top of the step fix a mass of 30 kg (see N.10);

d) progressively incline the plate up to an angle of (20 ± 2)° as shown in Figure E.1;

e) observe whether there is any slipping of the step or any toppling over of the step and, if applicable, record at what angle it occurred.



Key
1 plate
2 emery paper 60 to 63 grade
3 horizontal surface

Figure E.1 — Stability test of separate entrance step

E.3 Expression of results

The steps shall be considered to be suitably slip resistant and stable in accordance with the requirements of 5.5.4.2 if during the test E.2 a) to e) the step did not slip or topple over.

E.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test. The report shall state the following, if applicable:

a) whether the step slipped and at what approximate angle this occurred;

b) whether the step toppled over and at approximately what angle this occurred.

Annex F
(normative)

Clear height over bunks (see 6.1.2)

F.1 Principle

This method of test is used to determine whether an adequate clear height exists over any bunk in a caravan.

F.2 Preparation and procedure

a) place a load spreading platform (see N.5) on the mattress or upholstery of the bunk so that the average height above the platform is maximised;

b) for bunks shorter than 1 700 mm, a load spreading platform 350 mm wide × the total length of the bunk shall be used;

c) place a total mass 75 kg weight (see N.4) on the platform so that the load is equally distributed over the area of the platform;

d) record any points where there is not a clear height of 500 mm above the base of the platform.

F.3 Expression of results

The caravan shall be considered to have passed the test and to have adequate clear space above the bunks in accordance with the requirements of 6.1.2 if a clear height of at least 500 mm exists above the compressed surface of the bunk over an area of at least 2/3 of the surface area of the bunk.

F.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The report shall state the following, if applicable:

a) which bunk(s) in the caravan failed the test;

b) the minimum height recorded for each bunk which failed the test.

Annex G
(normative)

Strength of protection against falling out of bunks (see 6.1.3.)

G.1 Principle

This method of test is used to determine the strength and fixation of protection against falling out of bunks.

G.2 Preparation and procedure

a) place the bunk in its operating position according to the manufacturer's instructions;

b) fix to a load cell (see N.3) a ball of 100 mm diameter (see N.11);

c) fix any protection for the occupant of the bunk against falling out in position according to the manufacturer's instructions;

d) using the load cell apply a force of 100 N horizontally (± 5°) outward from the bunk for 15 s;

e) observe if the curtains or nets tear or become detached or if (a) rigid protection(s) present(s) a permanent deformation;

f) repeat steps d) and e) in three different places of the protection;

g) repeat steps a) to f) for each bunk, as applicable.

G.3 Expression of results

The caravan shall be considered to have passed the test if, after this test has been completed on each bunk in the caravan, the curtains or nets did not tear or become detached or if the rigid protection(s) did not present a permanent deformation.

G.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The report shall state the following, if applicable:

a) which protection(s) failed the test and for what reason;

b) the nature of the failure, i.e. detachment or tearing or permanent deformation.

Annex H
(normative)

Mechanical strength of bunks (see 6.1.4)

H.1 Principle

This method of test is used to determine the mechanical strength of bunks, their frames and fixings when the compressed surface of the mattress or upholstery of the bunk is placed at a height of more than 500 mm from the floor.

H.2 Selection of bunk

Carry out the test procedures F.2 a), b) and c) described in Annex F to determine whether the compressed upper surface of the mattress or upholstery exceeds a height of 500 mm above the floor. If the resulting height is over 500 mm, proceed with the test for mechanical strength of bunk as described in H.3.

H.3 Preparation and procedure

a) place the load spreading platform (see N.5) flat on the surface of the centre of the bunk (± 200 mm) next to the long side member;

b) put a total mass of 100 kg weight on the load spreading platform within 200 mm of the midpoint of the long side of the bunk, as close as possible to the edge of the bunk (see N.4);

c) maintain the load for a duration of 1 h;

d) remove equipment and measure any permanent deformation of the bunk frame and check whether there is visible damage to the bunk fixings;

e) repeat steps a) to d) for each side of the bunk;

f) repeat the test for each bunk of the caravan, as applicable.

H.4 Expression of results

A caravan shall be considered to have passed this test if the bunk(s) tested resisted the force of the test without any permanent deformation in excess of 5 mm or any visible damage to the bunk fixings.

H.5 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The test report shall state the following, if applicable:

a) which bunk(s) failed the test and for what reason;

b) the extent and location of any permanent deformation of the bunk(s) in excess of 5 mm;

c) whether and where there was visible damage to the bunk fixings.

Annex I
(normative)

Security of folding bunks (see 6.1.5)

I.1 Principle

This method of test is used to determine that a folding upper bunk is secured against unintentional folding away.

I.2 Preparation and procedure

a) place the folding bunk in its operating position according to the caravan manufacturer's instructions;

b) attach the load cell (see N.3) to one outside corner of the bunk;

c) exert a force of 125 N vertically upwards;

d) observe whether the bunk becomes detached from its fixings;

e) repeat b), c) and d) fixing the load cell to the other outside corner and to one other location between the two outside corners;

f) repeat steps a) to e) for each folding bunk in the caravan;

g) place the folding bunk in its stored position according to the manufacturers instructions;

h) attach the load cell (see N.3) to the centre of the upper edge of the bunk in its stored position;

i) exert a force of 125 N perpendicular with a tolerance of ± 10° to the plane of the stored bunk.

I.3 Expression of results

The caravan shall be considered to have passed the test and for its bunks to be suitably secure against unintentional folding away and unintentional movement whilst stored in accordance with the requirements of 6.1.5. if on completion of the test procedure in I.2 there was no observed detachment of the bunk(s) from its fittings.

I.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The test report shall state the following, if applicable:

a) which bunk(s) failed the test;

b) the nature of the failure;

c) the position of the failure.

Annex J
(normative)

Safety of access to upper bunks (see 6.1.6)

J.1 Principle

This method of test is used to determine the safety of a ladder intended to provide access to upper bunks.

J.2 Preparation and procedure

J.2.1 General

a) place the caravan or configuration on level ground within an accuracy of ± 2° (3,5 %);

b) place the bunk to be tested in its operating position;

c) fix the ladder in position in accordance with the caravan manufacturer's instructions.

J.2.2 Attachment and deflection

The vertical components of the ladder shall not be blocked.

Apply a 1 000 N load vertically downwards to the centre of the mid-tread or in case of an equal number 500 N to each of the two mid-treads.

Apply a 500 N horizontal load in the four positions shown in Figure J.1 and in the order indicated. The 500 N load shall be removed before being applied in another position.

The duration of loading shall be 60 s.

The loads shall be applied to the vertical members at the height of the top tread or, if this is not possible, just above the top tread (the uppermost horizontal ladder component).

J.3 Expression of results

The caravan shall be considered to have passed the test if, during the test, the ladder does not move, and after the test has been completed on each bunk in the caravan, the ladder has not become loose, detached or broken, and there is no permanent deformation of its structure greater than 5 mm.

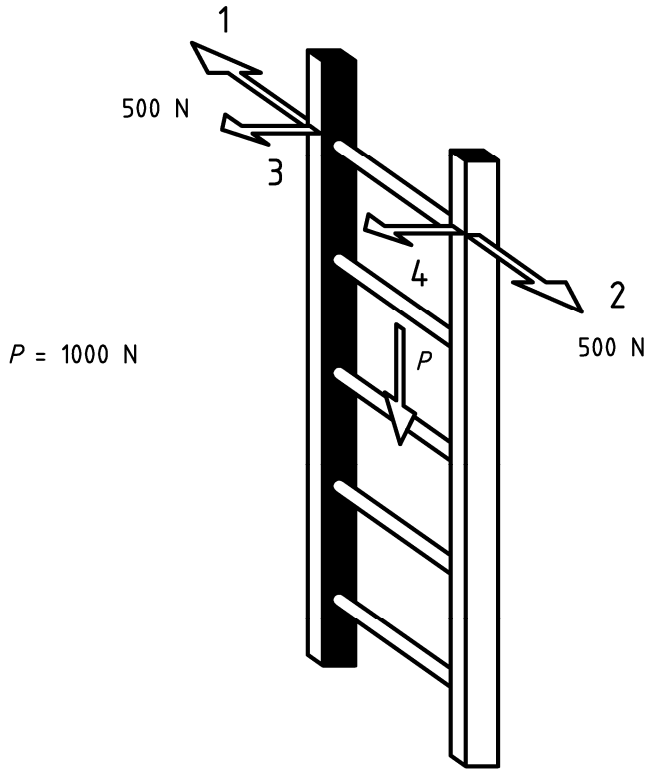
J.4 Test report

A test report shall be prepared stating whether the caravan passed or failed the test.

The report shall state the following, if applicable:

a) whether it failed the test J.2.2;

b) the nature of the failure i.e. loosening, breakage, detachment or deformation greater than 5 mm.



Key

1, 2, 3, 4, P directions to apply force for testing

Figure J.1 — Ladder attachment and deflection

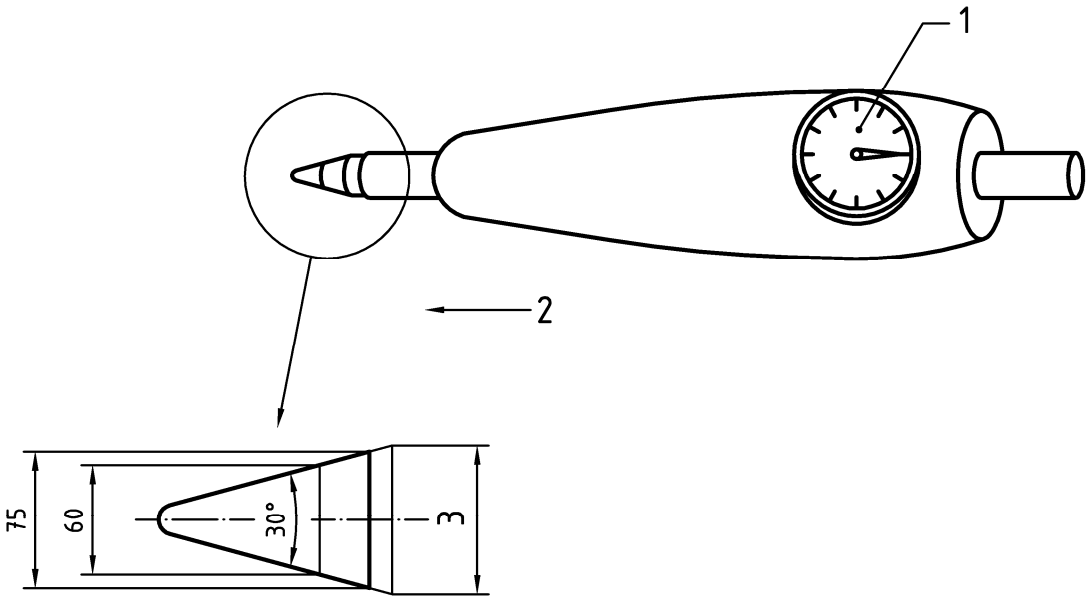
Annex K
(normative)

Measurement of gaps (see 6.1.7)

K.1 Cone measuring device

The cone measuring device (Figure K.1) shall consist of a cone with a smooth metal surface, mounted on a force gauge capable of giving an indication of an axial force of 100 N. Two lines shall be marked continuously round the surface of the cone, one where the diameter of the circular section of the cone is 60 mm and the other where the diameter is 75 mm.

Dimensions in millimetres



Key
1 force in N
2 direction of application of the force
3 diameter > 75 mm

Figure K.1 — Cone measuring device

K.2 Gaps in the base structure

Insert the point of the cone (see K.1) into the gap in such a way that its axis of symmetry is perpendicular to the plane that joins the boundaries of the gap. Advance the cone slowly and steadily further into the gap until the axial force of 100 N is indicated, under which condition the points of contact between the surface of the cone and the boundaries of the gap shall be the points where the diameter of the cone is 75 mm or at a position representing a smaller diameter.

Take measurements in as many places in any such gap as may be necessary to determine the most onerous conditions of dimension and distortion of the boundaries of the gap.

K.3 Measurement of gaps

Insert the point of the cone (see K.1) into the gap in such a way that its axis of symmetry is perpendicular to the plane that joins the boundaries of the gap. Advance the cone slowly and steadily further into the gap until an axial force of 100 N is indicated, under which condition the points of contact between the surface of the cone and the boundaries of the gap shall be on or between the points at which the diameter of the cone is 60 mm and 75 mm. Take measurements in as many places in any such gap as may be necessary to determine the most onerous conditions of the boundaries of the gap.

Annex L
(normative)

Thermal insulation – Method of calculation (see Clause 9)

L.1 Explanation of terms used

L.1.1 Thermal transmittance, U

Measure of thermal insulation of an element of structure indicating the quantity of heat which flows through a unit area in unit time per unit difference of temperature between the interior and exterior of the structure. It is expressed in watts per square metre kelvin where K is the temperature difference (thermodynamic temperature).

L.1.2 Thermal conductivity, λ

Property of a single material independent of thickness; it is a measure of the rate at which heat will flow through a material when a difference exists with the temperature of its surface. It is expressed in watts per metre kelvin.

L.1.3 Thermal resistance, R

Measure of the overall thermal resistance to heat of a material or combination of materials. It is expressed in square metres kelvin per watt.

L.1.4 Surface resistance, R_{si} and R_{se}

Thermal resistance of the interior or exterior surfaces, respectively. Heat is transferred at the surface by radiation and convection and the quantity is affected by the type of surface, the direction of heat flow and exterior air movement. It is expressed in square metres kelvin per watt.

Typical surface resistance values are as given in Table L.1.

NOTE Further information on physical quantities and definitions can be found in EN ISO 7345 [3].

Table L.1 — Typical surface resistance values

Surfaces		Value $m^2 \cdot K/W$
Interior surfaces R_{si}	walls	0,12
	roofs	0,10
	floors	0,17
Exterior surfaces R_{se}	walls	0,04
	roofs	0,04
	floors	0,04
Combined $R_{si} + R_{se}$	walls	0,16
	roofs	0,14
	floors	0,21

L.2 Objectives of calculation

The objectives are as follows:

a) to determine the thermal transmittance, U, of a caravan;

b) from a) to calculate the heating needs of the caravan for a given climatic condition.

A suggested way of recording details of the calculation is shown in Table L.5.

L.3 Method of calculation

L.3.1 General

The thermal transmittance of any part of the structure of a caravan is obtained by combining the thermal resistance of its component parts and the adjacent air layers. It is expressed in watts per square metre kelvin, see Formula (L.1):

$$U = \frac{1}{R_{si} + R_1 + R_2 + R_3 + ... + R_{se}} \quad \text{(L.1)}$$

where

R_1, R_2, R_3 are the thermal resistances of the components of that part of the structure (e.g. plywood, insulation, aluminium sheet).

L.3.2 Calculation of R_1, R_2, R_3

For each material used in the structure (e.g. plywood, insulation, aluminium sheet), the thermal resistance, R, is given, in square metres kelvin per watt, by Formula (L.2):

$$R = \frac{d}{\lambda} \quad \text{(L.2)}$$

where

d is the material thickness, in metres;

λ is the thermal conductivity.

Typical values of λ are as given in Table L.2.

Table L.2 — Typical thermal conductivity values

Material		Thermal conductivity λ W/(m·K)
Acrylic resin sheet		0,20
Aluminium		160
Carpet		0,055
Chipboard		0,15
Glass fibre wool		0,04
Glass reinforced plastic		0,34
Hardboard		0,15
Plywood		0,14
Polypropylene		0,24
Polystyrene	– expanded	0,034
	– extruded	0,033
Polyvinyl chloride		
	– floor covering	0,04
	– rigid	0,16
	– rigid foam	0,035
Polyurethane	– rigid foam	0,026

For air spaces, typical values of R are as given in Table L.3.

Table L.3 — Typical air space thermal resistances

Air space thickness mm	Thermal resistance, R $m^2 \cdot K/W$
5	0,11
10	0,14
20	0,16
50 to 100	0,17

L.3.3 Calculation of thermal transmittance for one caravan wall, U_w

The term "wall" is used in these calculations to denote the floor or roof as well as the side, front or rear walls. Where applicable it includes windows. Exit doors are regarded as part of the wall.

The thermal transmittance of one wall, U_w is calculated, in watts per square metre kelvin, by Formula (L.3):

$$U_w = \frac{U_{ww}(A_w - A_z) + U_z \times A_z}{A_w} \quad \text{(L.3)}$$

where

U_{ww} is the thermal transmittance of the wall, not including windows;

U_z is the thermal transmittance of the window(s);

A_w is the total area of the wall, including window(s);

A_z is the total area of the window(s).

Typical thermal transmittance values, U_z, for windows are given in Table L.4.

Table L.4 — Typical thermal transmittance for windows U_z

Material		U_z
Glass:	single glazed	5,7
	double glazed	3,0
Acrylic:	single glazed	5,3
	double glazed	2,7

L.3.4 Calculation of overall thermal transmittance of caravan, U_e

The overall thermal transmittance of the caravan, U_e, is calculated in watts per square metre kelvin, by Formula (L.4):

$$U_e = \frac{(U_{w1} \times A_{w1}) + (U_{w2} \times A_{w2}) + (U_{w3} \times A_{w3}) + \ldots}{A_{w1} + A_{w2} + A_{w3} + \ldots} \quad \text{(L.4)}$$

where

U_{w1} is the thermal transmittance of wall 1;

U_{w2} is the thermal transmittance of wall 2, etc;

A_{w1} is the total area of wall 1 including window(s);

A_{w2} is the total area of wall 2 including window(s), etc.

Thermal bridges are not taken into account in these conditions.

L.3.5 Losses of heat via the walls, k_w

Losses of heat via the walls, k_w, are given in watts per kelvin, by Formula (L.5):

$$k_w = U_e \times A_w \quad \text{(L.5)}$$

where

A_w is the total area of walls, i.e. $A_{w1} + A_{w2} + A_{w3} + A_{w4} + ...$;

U_e is the overall U value of the caravan as calculated in L.3.4.

L.3.6 Losses of heat due to renewal of air, k_v

Losses of heat due to renewal of air, k_v are given in watts per kelvin, by Formula (L.6):

$$k_v = 0{,}33 \cdot N \times V \quad \text{(L.6)}$$

where

N is the number of air changes per hour (minimum of one);

V is the volume of space, in cubic metres.

L.3.7 Rated power of heating appliances, P

The rated power of heating appliances, P, is given in kW, by Formula (L.7):

$$P = \frac{\left(k_w + k_v\right) \cdot \Delta T}{1\,000} \quad \text{(L.7)}$$

where

ΔT is the temperature difference between the required caravan interior temperature θ_i and the expected exterior temperature θ_e.

To this should be added a minimum of 10 % for preheating.

L.3.8 Temperature

As a basis for these calculations θ_i = 20 °C.

The minimum exterior temperature θ_{emin} below which the heating system cannot produce a temperature of 20 °C inside the caravan is given in degrees Celsius, by Formula (L.8):

$$\theta_{emin} = 20 - \frac{P}{k_w + k_v} \times 1\,000 \quad \text{(L.8)}$$

Table L.5 — Recording of thermal insulation calculations

CARAVAN MODEL ..... TYPE							
1	**2**		**3**		**4**		
Part of caravan	U W/(m^2 · K)		**Area** A m^2		**Losses,** k_w **(2) x (3)** W/K		
Wall 1							
Window 1							
Wall 2							
Window 2							
Front wall							
Window(s)							
Rear wall							
Window(s)							
Roof							
Window(s)							
Floor							
Total outer surface area of caravan (5) ..... m^2	Total		(5)		(6)		
Total losses via "wall" (6)..... W/K							
Total losses via "wall", k_w (6)	=..... W/K						
losses due to renewal of air, $k_v = 0{,}33 \times N \times V$	=..... W/K						
Total losses (7)	=..... W/K						
Thermal transmittance of "walls", U_e = (6)/(5)	=.....W/m^{2}K						
Rated power required P = (7) $\times$ ΔT/1 000	=..... kW						
Minimum rated power of heater = 1,1 $\times$ P	=..... kW						
External temperature, °C	10	5	0	- 5	- 15	- 25	- 35
Minimum temperature difference to maintain internal temperature, θ_i, at 20 °C	10	15	20	25	35	45	55
Temperature difference required, K							
Rated power required, kW							

Annex M
(normative)

Determination of the thermal transmittance for caravans – Test method (see Clause 9)

The determination of the thermal transmittance coefficient for caravans is carried out by measurement in a virtually draught-free room.

The internal temperature shall be (20 ± 2) °C, with the ambient temperature constant (tolerance ± 2 K) throughout the entire measuring period based on the desired thermal transmittance (U).

For U = 1,7W/(m^2 × K) 0 °C ambient temperature.

For U = 1,2 W/(m^2 × K) – 15 °C ambient temperature.

The thermal transmittance, U, is determined as follows:

$$U = \frac{P}{A \times T} \tag{M.1}$$

$$A = 2\,(L + B) \times H + 2\,L \times B \tag{M.2}$$

where

P is the heat power introduced, in W;

A is the outer surface area, in m^2;

T is the temperature difference, in K;

B is the width of caravan body, in m;

L is the average length of body, in m;

H is the average height of body, in m.

The caravan shall be equipped with the heater intended for that type of unit.

The internal temperature is measured at a reference point which is situated 1 m above the floor in the centre of the living compartment.

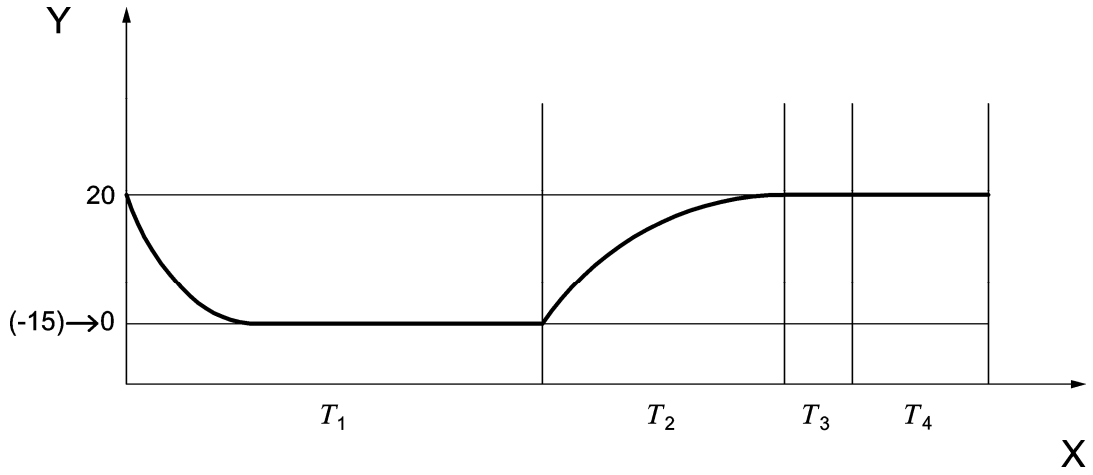
The temperature difference between the reference point and further comparison points of measurement shall be less than 7 K.

The comparative points of measurement are to be situated near the corners of the living compartment 200 mm away from the walls and at a height of 1 000 mm from the floor.

Measures shall take into account the air temperature. Temperature sensors shall be protected against heat transmission by radiation.

All adjustable ventilation openings are to be closed for the duration of the tests.

If the temperature tolerance values are exceeded measurements are to be repeated.



Key
Y ambient temperature
X time

T_1 is the cooling time ≥ 10 h;

T_2 is the heating time:

≤ 2 h for 20 K rise;

≤ 4 h for 35 K rise.

T_3 is the stabilizing time = 1 h (starts when internal temperature reaches 20 °C);

T_4 is the measuring time ≥ 2 h to measure consumption of thermal energy.

Figure M.1 — Test temperature diagram

Annex N
(normative)

Test equipment

N.1 General

All test equipment shall be capable of operating within an accuracy range of ± 10 %.

N.2 Load measuring cell

Load measuring cell capable of measuring compression loads in the range from 450 N to 2 200 N.

N.3 Load measuring cell

Load measuring cell capable of measuring extension loads in the range 500 N to 1500 N.

N.4 Certified weights

Sufficient certified masses to meet the requirements of Annex F and H.

N.5 Load spreading platform

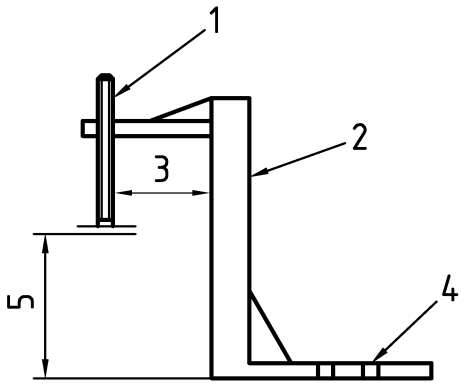
Load spreading platform 350 mm x 1 700 mm (corresponds to 2/3 of the surface of a mattress or upholstery of 500 mm × 1 700 mm) not less than 12 mm thick, weighing between 5 kg and 10 kg (typically marine plywood).

N.6 Load spreading platform

Load spreading platform 100 mm × 150 mm × 5 mm approximately, made of steel.

N.7 Step testing device

See Figure N.1.



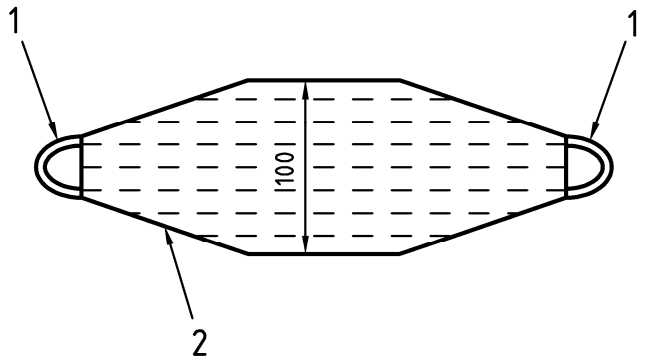
Key
1 threaded rod with hexagon end (e.g. corner steady actuating worm)
2 steel box section
3 for double steps this shall be 400 mm approximately
4 holes to allow fixing to ground
5 variable 250 mm to 450 mm

Figure N.1 — Typical step testing device

N.8 Flexible load spreading device

Webbing or soft leather strap 100 mm wide with a hook on each end to enable attachment of load cell. See Figure N.2.

Dimension in millimetres



Key
1 load cell attachment points
2 fabric or soft leather

Figure N.2 — Typical flexible load spreading device

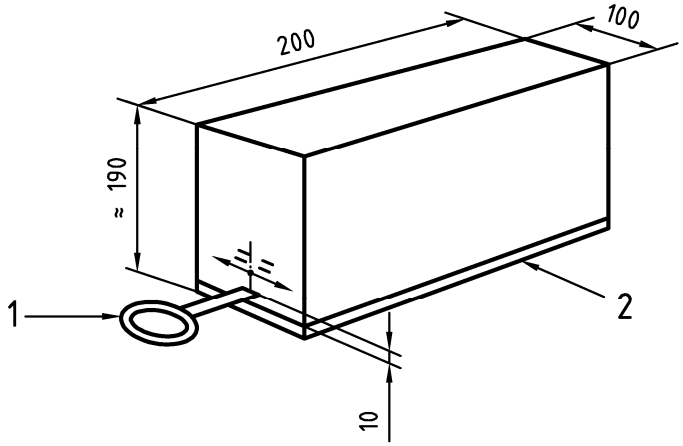
N.9 Step testing plate

A piece of rigid material at least 10 % larger than the maximum dimensions of the step(s) to be tested. This plate shall be completely covered with grade 60 to 63 emery paper.

N.10 Friction test piece

The friction test piece is comprised of a 30 kg steel block, 200 mm long x 100 mm wide x approximately 190 mm deep (depending on the density of the steel) with an 8 mm thick rubber sole bonded to its base. The rubber sole shall be as specified in ISO 4649:2010, B.2. A typical friction test piece is shown in Figure N.3.

Dimensions in millimetres



Key
1 pulling hook securely attached
2 8 mm rubber sole

Figure N.3 — Typical friction test piece

N.11 Ball

Ball made of wood, of 100 mm diameter capable of being attached to the cone measuring device (see N.12).

N.12 Cone measuring device

Cone measuring device as described in Annex K.

Annex O
(informative)

Environmental aspects

Every product affects the environment in the course of its life cycle from raw material acquisition through production, distribution and use, to disposal. The environmental impacts are consequences of the consumption of energy and resources and the generation of waste as well as the emission of substances into air, water and soil. The magnitude of the environmental impacts during the various life cycles depends on a number of choices made in the design of the product. These relate to aspects such as choice of materials, production methods and the possibility of maintenance and recycling. If possible, manufacturers and distributors of leisure accommodation vehicles should consider the environmental impact of their product, for example by:

a) Avoiding the use of environmentally harmful substances;

b) Selecting the best available technology and techniques to reduce consumption of energy and materials;

c) Considering use of recycled materials for product and packaging.

Bibliography

[1] Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption as amended by Regulations 1882/2003/EC and 596/2009/EC

[2] EN 3-7, *Portable fire extinguishers — Part 7: Characteristics, performance requirements and test methods*

[3] EN ISO 7345, *Thermal insulation — Physical quantities and definitions (ISO 7345)*

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