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Leisure accommodation vehicles — Leisure homes — Habitation and stability requirements

*Véhicules habitables de loisirs — Résidences de loisirs — Prescriptions relatives à
l'habitabilité et à la stabilité*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8817 was prepared by Technical Committee ISO/TC 177, *Caravans*.

Annexes A and B form an integral part of this International Standard.

This International Standard is one of a series that is being published for leisure accommodation vehicles as habitations.

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Leisure accommodation vehicles — Leisure homes — Habitation and stability requirements

1 Scope

This International Standard specifies safety and functional requirements for three grades of leisure homes — “standard”, “high altitude” and “extra-high altitude” — used for temporary or periodic habitation, and that retain their mobility to enable them to be resited or transported at any time.

It also specifies degrees of resistance to snow loads and wind loads of the structure of a leisure home and the minimum information to be included in a Users' Handbook provided with a leisure home.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7418 : 1989, *Leisure accommodation vehicles — Vocabulary*.

ISO 7419 : 1984, *Leisure accommodation vehicles — Ventilation requirements*.

ISO 7420 : 1987, *Leisure accommodation vehicles — Oil-fired heating systems*.

ISO 7421 : —¹⁾, *Leisure accommodation vehicles — Liquefied petroleum gas systems*.

IEC 364-7-708 : 1988, *Electrical installations of buildings — Part 7: Requirements for special installations or locations — Section 708: Electrical installations in caravan parks and caravans*.

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 7418 apply.

4 Grades of leisure homes

4.1 Grading

There shall be three grades of leisure home:

- standard, for siting at altitudes of 700 m and below;
- high altitude, for siting at altitudes above 700 m and up to and including 1 200 m;
- extra-high altitude, for siting at altitudes above 1 200 m.

4.2 Requirements

All grades of leisure homes shall comply with the requirements of clauses 5 and 7 to 12. In addition the standard grade shall comply with the requirements of 6.1.1, the high altitude grade with the requirements of 6.1.2 and the extra-high altitude grade with the requirements of 6.1.3.

5 Design

5.1 Accommodation

The accommodation shall provide a living space, a space for meals, a kitchen, a sleeping area or areas and space for toilet and washing facilities.

NOTE — The living and meal areas may also provide the sleeping facilities.

5.2 Occupancy

Occupancy shall be described by stating the number of double and/or single berths, e.g. one fold-away double bed, one fixed single bed, two convertible seat/bunks, two children's bunks.

5.3 Ceiling height

Ceiling height, measured internally, shall be not less than 1 980 mm.

1) To be published.

5.4 Windows

The living space, the space for meals, the kitchen and the sleeping accommodation shall be provided with windows, the total glazed areas of which shall be not less than 10 % of their respective floor areas. Windows to the living space, the space for meals and the kitchen shall be openable to the extent of 5 % of those respective floor areas (see also 10.1.3).

5.5 Doors

An external door shall be provided which shall open outwards.

5.6 Glazing

Glass in windows and doors that is less than 800 mm above floor level shall be safety glass.

5.7 Heating requirements

5.7.1 Calculation

The method of calculation set out in annex B shall be used to calculate the heating needs for specific climatic conditions.

5.7.2 Winter use

For a leisure home intended for continuous or prolonged use in winter conditions, an average temperature difference of 35 K calculated as set out in annex B shall be achieved and any heating installation fitted or recommended shall achieve this.

5.8 Thermal insulation

5.8.1 External walls and roof

The external walls and roof, excluding glazed areas, shall be of such materials and be so constructed that the average coefficient of thermal transmittance, U , of a leisure home shall not exceed 1,7 W/(m²·K) (for calculation, see annex B).

5.8.2 Roof ventilation space

Any space immediately below the external roof skin shall be ventilated to the outside air.

NOTE — The design of the wall structure and the materials used should be such that condensation on the surface of the inner walls and partitions can be avoided without the need to raise the inside temperature or increase the ventilation beyond the levels required for health and comfort. Precautions should be taken to minimize water vapour condensing within the insulating material.

5.8.3 Floor

Underfloor insulation, if provided, shall be protected from attack by birds and animals.

6 Construction

NOTE — Materials used in the construction of a leisure home should comply with the requirements of relevant International Standards and should be of suitable nature and quality. The structure should be rain-proof, the floor being proof against moisture rising from the ground.

6.1 Snow loading

6.1.1 Standard grade

A standard grade leisure home resting on its normal supports shall be capable of resisting a snow load of 1 800 N/m² exerted uniformly over the roof.

6.1.2 High altitude grade

A high altitude grade leisure home resting on its normal supports shall be capable of resisting a snow load, or pressure of snow on the roof, (s_o), in newtons per square metre, exerted uniformly over the roof, determined from the following formula:

$$s_o = 96 \left[110 + \frac{(h - 500)}{2,5} \right]$$

where h is the altitude in metres.

6.1.3 Extra-high altitude grade

An extra-high altitude grade leisure home resting on its normal supports shall be capable of resisting a snow load, or pressure of snow on the roof, (s_o), in newtons per square metre, exerted uniformly over the roof, determined from the following formula:

$$s_o = 120 \left[110 + \frac{(h - 500)}{2,5} \right]$$

where h is the altitude in metres.

6.2 Wind loading

A leisure home (all grades) shall be provided with suitable holding-down points if, when resting on its normal supports, it is not capable of resisting, without overturning, a wind velocity of 30 m/s (108 km/h), measured 3 m above the ground, corresponding to a mean dynamic pressure of 315 N/m². The method of calculation of its resistance to overturning, the overturning force and the factors involved are set out in annex A.

6.3 Prevention of decay and corrosion

6.3.1 Timbers

Where directly exposed to the weather or used in a situation where intermittent wetting can occur, timber and related timber products shall be either inherently resistant to decay or be treated with a wood preservative.

6.3.2 Metals

Iron and steel components exposed to the weather or in a hostile environment shall be protectively coated against rusting. Where bimetallic corrosion is likely, the contact faces of dissimilar metals shall be electrically insulated from one another or be effectively sealed against the ingress of moisture.

6.4 Mobility

Permanent mobility of a leisure home shall be provided by wheels or skids and there shall be a means of attachment to a towing vehicle.

NOTE — If a drawbar is fitted, it may be removable.

7 Internal equipment

7.1 Wardrobe

At least one built-in wardrobe with a hanging rail, with a minimum length of 300 mm for a two-berth leisure home and a further 100 mm for each additional berth up to six shall be provided. The hanging space at either side of the hanging rail shall be not less than 225 mm and the hanging space below the rail shall be not less than 1 100 mm.

7.2 Tables

A table or tables shall be provided which shall have at least as many places as there are berths. They shall have a minimum width of 450 mm per place.

7.3 Sink

A leisure home shall be equipped with a fixed sink which shall be capable of connection to an external drainage system (see also 8.5.4.4).

7.4 Space for refrigerator

A leisure home shall have floor space of at least 540 mm × 600 mm with a minimum height of 860 mm for a refrigerator.

7.5 Cooking

Floor space of at least 540 mm width × 600 mm shall be provided for a free-standing cooking appliance.

7.6 W.C.

If a W.C. is fitted, it shall be capable of connection to an external drainage system.

7.7 Lighting

There shall be provision for gas or electric lighting in all areas of a leisure home.

7.8 Space heating

7.8.1 Provision of space heating

Fixed space heating (other than solid fuel space heating) shall be provided and shall be installed in accordance with the requirements in 7.8.1.1 and 7.8.1.2.

7.8.1.1 Installation by manufacturer

When a heating appliance is installed by a leisure home manufacturer, the following information shall be provided adjacent to the appliance:

Heating installation

Manufacturer:

Type:

Serial number:

Rated power: W

This installation can provide an average temperature difference of K

Year of installation

7.8.1.2 Installation by owner

In cases where a heating appliance is not installed by a leisure home manufacturer but where space and connections are provided, the following shall be shown on a notice near the connections:

To obtain an average temperature difference of K, installation of a heating appliance with a rated power of W is recommended.

7.8.2 Flue pipes

All appliances shall be securely fixed and flue pipes shall be constructed of non-combustible material (see 8.2 and 8.3).

8 Services

8.1 Electricity

A low voltage electrical installation shall be installed in accordance with IEC 364-7-708.

When the installation is connected to a 16 A socket outlet, then the outlet shall be in accordance with IEC 364-7-708.

8.2 Liquefied petroleum gas (LPG) systems

LPG systems shall be installed in accordance with the requirements of ISO 7421.

8.3 Oil-fired heating systems

Oil-fired systems shall be installed in accordance with the requirements of ISO 7420.

8.4 Solid fuel fired appliances

Solid fuel fired appliances shall not be installed.

8.5 Water supply and disposal

8.5.1 Water supply system

A leisure home shall be provided with a fresh-water supply system and a water supply storage tank or backflow prevention device.

8.5.2 Waste-water discharge

A leisure home shall be provided with a waste-water disposal system.

8.5.3 Materials and cleaning

Only non-toxic materials shall be used for fresh-water storage tanks and supply pipes which shall be capable of being easily flushed out and cleaned.

8.5.4 Couplings for mains fresh-water supply and waste-water outlets

8.5.4.1 Fixing of supply coupling

A supply coupling shall be fixed rigidly to a leisure home. When coupled to the mains, the pressure within the internal system shall be adapted to the pressure requirements of the water appliances installed. Where necessary a regulating device shall be fitted.

8.5.4.2 Location

Couplings shall be located at an easily accessible point on the outside of the leisure home. A sealing-off cover shall be supplied for each coupling and be secured to the coupling, e.g. by a chain.

8.5.4.3 Waste-water drainage

Outlets from waste-water pipes of showers, basins and sinks shall be provided and shall be capable of being connected to a mains drainage system.

8.5.4.4 Fixing of waste coupling

An outlet coupling shall be such that flexible piping can be connected to it if required. If the coupling is permanently fixed to the flexible piping, a securing device shall be fitted on the leisure home.

8.5.4.5 Markings

So that they are clearly visible and identifiable, fresh-water couplings, when fitted, shall be permanently marked as follows:

Supply — in blue;

Waste — in grey.

9 Ventilation

9.1 Permanent ventilation

Fixed ventilation shall be provided in accordance with the requirements of ISO 7419.

9.2 Additional ventilation

9.2.1 Larder and food storage cupboards

Cupboards or lockers for food storage, if provided, shall each be ventilated to the external air.

9.2.2 Fold-away beds

If, when folded away, a mattress and its bedding are totally enclosed, ventilators shall be incorporated to permit a flow of air through the enclosure. Such ventilators shall not communicate with the air outside the leisure home.

9.2.3 Wardrobes and bed lockers

Each wardrobe and bed locker shall be ventilated into the leisure home. Wardrobes shall be ventilated at the bottom and top and shall be designed to permit the free passage of air between the ventilators. Such ventilators shall not communicate with the air outside the leisure home.

10 Fire precautions

10.1 Means of escape

10.1.1 General

Every living space, the space for meals and sleeping areas shall each be provided with an emergency door or window which gives direct access to the open air. This includes each sleeping area formed as a result of permanent or temporary partitioning. It shall be possible to proceed to an emergency door or window without passing within 1 m of any cooking appliance.

10.1.2 Emergency doors

Emergency doors shall open outwards and shall give a clear opening of not less than 1 740 mm high and 700 mm wide. If an external sliding door is fitted, this shall be suitably screened to prevent its movement being obstructed and be clearly marked with an arrow indicating the direction of opening.

10.1.3 Emergency windows

10.1.3.1 The minimum clear opening of an emergency window shall be either

905 mm wide and 503 mm high; or

535 mm wide and 750 mm high.

No internal fitting shall project into the minimum clear opening and no opening shall be more than 900 mm above floor level.

10.1.3.2 Emergency windows shall be capable of being easily and quickly opened from the inside. Where top-hung, they shall open not less than 70° and shall automatically remain fully open. Locking devices of top-hung windows shall be located not more than 0,25 times the height of the frame from its lower edge.

10.1.3.3 Emergency exits shall not be provided by means of windows pivoted horizontally other than along their top edge.

10.1.3.4 No part of any furniture or equipment shall obstruct an entrance door or emergency exit.

10.2 Fire-extinguisher

A 1 kg powder fire-extinguisher shall be provided by the main exit door.

10.3 Protection adjacent to heat-producing appliances and equipment

Protection of surfaces adjacent to heat-generating appliances shall be achieved by ensuring that any heat-generating appliance to be fitted in a leisure home is certified by an approved body as complying with appropriate national, regional or International Standards with regard to safety and relevant installation requirements. Such appliances shall only be installed in accordance with the manufacturers' instructions.

11 Warning notice

11.1 Provision of warning notice

A permanent warning notice, not less than 200 mm × 130 mm, giving simple fire prevention advice and setting out the action to be taken in the event of fire shall be fixed inside the leisure home in a position where it can be easily seen. The notice shall be repeated in the Users' Handbook.

11.2 Wording of warning notice

The wording and layout of the warning notice shall be as follows, with the heading printed in red:

ADVICE TO OCCUPIERS

Ventilation

Do not obstruct the ventilators which are fitted; your safety depends on them.

In case of fire

- 1) **Get everyone out.**
- 2) **Turn off the outside gas valve.**
- 3) **Raise the alarm and call the Fire Brigade.**
- 4) **Tackle the fire if safe to do so.**

Fire precautions

Children — Do not leave them alone in the leisure home.

Means of escape — Make sure you know the location and operation of the emergency windows and doors. Keep all escape routes clear.

Combustible materials — Keep them clear of all heating and cooking appliances.

Fire fighting — In addition to the 1 kg powder fire-extinguisher by the main exit door, provide a fire blanket next to the cooker. Make yourself familiar with the instructions on your fire-extinguisher and the fire precaution arrangements on the site.

12 Users' Handbook

A Users' Handbook shall be provided with every leisure home containing, at least, the following information:

- a) Detailed specification of model, including altitude limits at which it can be sited.
- b) Warning instructions regarding fire and asphyxiation risks. These shall be as follows:
 - Turn off all gas equipment and cylinders while the unit is being moved.
 - Do not block ventilators.
 - Inspect flexible gas hoses regularly for deterioration. Renew with the approved type as necessary and, in any case, not later than the expiry date marked on the hose.
 - Use only portable fire-extinguishers of the dry powder type.
 - Do not use portable heating equipment. It is a source of danger and can cause fumes and asphyxiation.
- c) Details of LV (low voltage) and/or ELV (extra-low voltage) systems installed and warning against unauthorized modifications.
- d) Notices regarding proper functioning of all appliances provided and safety instructions relating to fixed installations provided. Where no heating appliances have been installed but space and connections have been provided for them, the type and rated power of heating appliances recommended to be fitted (see also 7.8.1.2).
- e) Location of ventilation openings and the method of cleaning any protective screens.

The Users' Handbook shall also carry the following statement:

WARNING — Do not carry out any modifications without first consulting the manufacturer of the leisure home or a qualified person.

The warning notice specified in clause 11 shall be repeated in full in the Handbook.

Annex A (normative)

Resistance to overturning — Method of calculation

The leisure home is considered to be sited with its floor horizontal and parallel to the ground and to be supported on its wheels and corner steadies or other fixed supports.

The factors required for the calculations are shown in figure A.1.

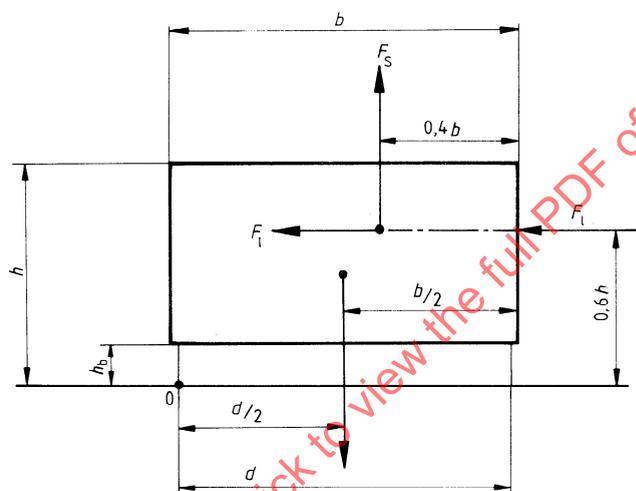


Figure A.1 — Diagrammatic indication of factors required for calculation of overturning moment

Key and further symbols to figure A.1

b is the overall width of the leisure home, in metres;

d is the width of the leisure home at its point of contact with the ground, in metres;

F_1 is the total horizontal component of the wind force, in newtons;

NOTE — This is assumed to act at a height of 0,6 times the overall height, h , of the leisure home and a value of $945 S_1$.

F_s is the vertical component of the wind force, in newtons;

NOTE — This is assumed to act at a distance of 0,4 of the overall width, b , of the leisure home from its windward side and have a value of $945 S_2$.

F_t is the resultant component of the wind force, in newtons, which is equal to $\sqrt{F_1^2 + F_s^2}$;

g is the acceleration due to gravity, taken to be $9,806\ 65\ \text{m/s}^2$;

h is the overall height of the leisure home, in metres;

h_b is the height of the base of the leisure home above the ground, in metres;

L is the overall length of the leisure home, in metres;

m is the mass as delivered of the leisure home, in kilograms;

m_t is the total mass of the leisure home when in use and fully occupied, in kilograms, which is equal to $1,2 m + (n \times 70)$;

n is the number of persons for which the leisure home is designed;

S_1 is the area of the side walls, which is equal to $(h - h_b) \times L$, in square metres;

S_2 is the area of the leisure home floor, which is equal to $L \times b$, in square metres;

The overturning moment is given, in newton metres, by

$$F_1 \times 0,6 h + F_s \left(0,6 b - \frac{b - d}{2} \right)$$

and the moment resisting overturning, in newton metres, by

$$m_t \times g \times \frac{d}{2}$$

To meet the requirement, the moment resisting overturning shall be more than the overturning moment. If it is not, then suitable holding-down points shall be provided.

CALCULATION EXAMPLE 1

Leisure home:

$$h = 2,63\ \text{m}$$

$$h_b = 0,4\ \text{m}$$

$$b = 2,97\ \text{m}$$

$$d = 2,67\ \text{m}$$

$$L = 6,27\ \text{m}$$

$$n = 4$$

$$m = 1\ 066\ \text{kg}$$

Side wall area:

$$S_1 = 6,27 \times (2,63 - 0,4) = 13,98\ \text{m}^2$$

Floor area:

$$S_2 = 2,97 \times 6,27 = 18,62\ \text{m}^2$$

$$m_t = (1,2 \times 1\ 066) + (4 \times 70) = 1\ 559\ \text{kg}$$

$$F_1 = 945 \times 13,98 = 13\ 211\ \text{N}$$

$$F_s = 945 \times 18,62 = 17\ 596\ \text{N}$$

$$F_t = \sqrt{13\ 211^2 + 17\ 596^2} = 22\ 003\ \text{N}$$

Overturning moment, in newton metres:

$$F_1 \times 0,6 h + F_s \left(0,6 b - \frac{b - d}{2} \right)$$

$$= 20\ 847 + 28\ 717$$

$$= 49\ 564$$

Moment resisting overturning, in newton metres:

$$m_t \times g \times \frac{d}{2}$$

$$= 1\ 559 \times 9,806 \times \frac{2,67}{2} = 20\ 408$$

Therefore, since the overturning moment is greater than the moment resisting overturning, this leisure home will not meet the resistance to overturning requirement and suitable holding-down points shall be provided.

CALCULATION EXAMPLE 2

Leisure home:

$$h = 1,98 \text{ m}$$

$$h_b = 0,45 \text{ m}$$

$$b = 3,66 \text{ m}$$

$$d = 3,36 \text{ m}$$

$$L = 10,67 \text{ m}$$

$$n = 6$$

$$m = 4\,763 \text{ kg}$$

Side wall surfaces:

$$S_1 = 10,67 \times (1,98 - 0,45) = 16,33 \text{ m}^2$$

Floor surface:

$$S_2 = 3,66 \times 10,67 = 39,05 \text{ m}^2$$

$$m_t = (1,2 \times 4\,763) + (6 \times 70) = 6\,135 \text{ kg}$$

$$F_l = 15\,431 \text{ N}$$

$$F_s = 36\,900 \text{ N}$$

$$F_t = \sqrt{15\,431^2 + 36\,900^2} = 39\,996 \text{ N}$$

Overturning moment, in newton metres:

$$F_l \times 0,6 h + F_s \left(0,6 b - \frac{b - d}{2} \right)$$

$$= 93\,829$$

Moment resisting overturning, in newton metres:

$$m_t \times g \times \frac{d}{2}$$

$$= 6\,135 \times 9,806 \times \frac{3,36}{2} = 101\,078$$

Therefore this leisure home will meet the resistance to overturning requirements and will not require holding-down points.

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