

Nordic Requirement Specification

Adjustable beds for disabled children - requirements and test methods

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Introduction

This Nordic Requirement is intended to apply to the most common products, but certain products will have to fulfil further or other requirements, e.g. regarding ergonomics, depending on the product in question. The risk analysis should be used for determining if further or other requirements should be addressed for each specific product.

Due to the dissimilarity of disabilities to be alleviated, it is not possible to specify requirements for adjustable beds for children in such a way that any bed of this type is covered. The present Nordic Requirement is therefore intended to cover the major part of adjustable beds for children. Certain beds, e.g. those designed to meet special needs, might need to fulfil other or further requirements, e.g. regarding ergonomics or EMC, than specified in this Nordic Requirement.

Beds covered by the present Nordic Requirement differ from beds covered by the IEC standard on electrically operated hospital beds, e. g. due the following characteristics:

- beds for disabled children are intended to be used instead of domestic beds for permanent use, with the intention of alleviating or compensating for a disability or handicap and to facilitate better working conditions for attendants,
- beds for disabled children do not require the same level of strength and cleaning as hospital beds, due to the different application,
- beds for disabled children do not require the same electrical performance as hospital beds due to the different application,
- the IEC standard on electrically operated hospital beds only cover beds for adults.

1 Scope

This Nordic Requirement specifies essential requirements and related test methods for non-electrically and electrically operated adjustable beds, side rails, grab handles and lifting poles intended to be used by disabled children to alleviate or compensate for a disability or handicap.

The Nordic Requirement only applies to beds with a length of the mattress support platform from 1200 - 1800 mm.

The Nordic Requirement does not apply to lateral tilt beds and stand up beds.

The Nordic Requirement does not apply to beds intended for use in the diagnosis, treatment or monitoring of patients under medical supervision (covered by EN 60601-2-38 for electrically operated hospital beds for adults).

The Nordic Requirement does not apply to adjustable beds for disabled persons over 12 years (covered by EN 1970:2000).

The Nordic Requirement does not apply to ordinary beds for children, of which beds with an internal length from 900 - 1400 mm are covered by EN 716-1 and EN 716-2.

The Nordic Requirement does not apply to cots and folding cots for domestic use (covered by prEN 716-3). Part 3: Additional safety requirements and test methods for folding cots.

The Nordic Requirement does not take into account extreme heavy duty use of the bed.

2 Normative references

This Nordic Requirement incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Nordic Requirement, only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 71-3	Safety of toys - Part 3: Migration of certain elements
EN 1041	Information supplied by the manufacturer with medical devices
EN 1441	Medical devices - risk analysis

EN 716-1	Furniture - Children's cots and folding cots for domestic use - Part 1: Safety requirements
EN 716-2	Furniture - Children's cots and folding cots for domestic use - Part 2: Test methods
EN 55014	Limits and methods of measurement of radio disturbance characteristics of electrical motor-operated and thermal appliances for household and similar purposes, electric tools and electric apparatus
EN 60601-1	Medical electrical equipment - Part 1: General requirements for safety
EN 60601-1-2	Medical electrical equipment - Part 1: General requirements for safety - 2: Collateral standard: Electromagnetic compatibility - Requirements and test methods
EN 61000-3-2	Electromagnetic compatibility (EMC) - Part 3: Limits - Section 2: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
EN 61000-3-3	Electromagnetic compatibility (EMC) - Part 3: Limits - Section 3: Limitation of voltage fluctuation and flicker in low-voltage supply systems for equipment input current ≤ 16 A
EN 61000-4-3	Electromagnetic compatibility (EMC) - Part 4: Testing and measurement techniques - Section 3: Radiated radio-frequency, electromagnetic field immunity test
EN/ISO 3746	Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
prEN ISO 14253-1	Geometrical Product Specifications (GPS) - Inspection by measurement of workpieces and measuring equipment - Part 1: Decision rules for proving conformance or non-conformance with specification
ISO 2439	Polymeric materials, cellular flexible - Determination of hardness
IEC 529	Degrees of protection provided by enclosures (IP code).
GUM	Guide to the Expression of Uncertainty in Measurement - GUM - 1st edition 1995 issued by BIPM, IEC, ISO, IUPAC, IUPAP, OIML - ISBN 92-67-10188-9

3 Definitions and nomenclature

For the purposes of this Nordic Requirement the following definitions apply:

- 3.1 Adjustable bed:** Bed with one or more sections of the mattress support platform that can be adjusted in height and/or angle. The adjustment can be non-electrically or electrically operated.
- NOTE: Whenever the term "bed" is used it comprises accessories.
- 3.2 Bed board:** Mattress support platform and its frame, if any.
- 3.3 Control unit:** Device that controls the drives that activate various functions of electrically operated beds.
- 3.4 Grab handle:** Supporting structure for the disabled child when getting in and out of bed, and when turning from one side to the other in bed.
- 3.5 Hold-to-run control device:** Control device which initiates and maintains operation of operating elements, only as long as the manual control (actuator) is actuated. The manual control (actuator) returns automatically to the stop position when released.
- 3.6 Knock-down bed:** Bed intended to be disassembled into few main parts for storage or transportation.
- 3.7 Lifting pole:** Device suspended above the bed intended to enable the disabled child to change position by gripping it.
- 3.8 Moving parts:** Parts that are movable in relation to each other or in relation to a fixed part.
- 3.9 Normal reach for feet:** Parts under the bed which are placed at a distance of less than 120 mm from the vertical line of the outer edge of the bed board.
- 3.10 Normal reach for fingers:** Parts of the upper bed and parts under the bed which are placed at a distance of less than 200 mm from upper/lower part of the outer edge of the bed board as shown in figure 1.
- 3.11 Protection side rail:** Fold-away or removable high side rail to protect the disabled child from getting out of bed by itself.

NOTE: Whenever the term "side rail" is used it comprises protection side rail.

- 3.12 Safe working load (SWL):** Maximum permissible load (of disabled child, mattress, bed linen and accessories) to operate the bed safely.
- 3.13 Side rail:** Fold-away or removable rail intended to prevent the disabled child of falling out of the bed.
- 3.14 Trendelenburg:** With the mattress support platform in the flat position, tilting of the entire mattress support platform a minimum of 12° so that the children's head is lower than the circulatory centre point of the body.
- 3.15 Under bed clearance:** Space beneath the bedstead base which is not occupied by the castors, legs or other constructional parts.

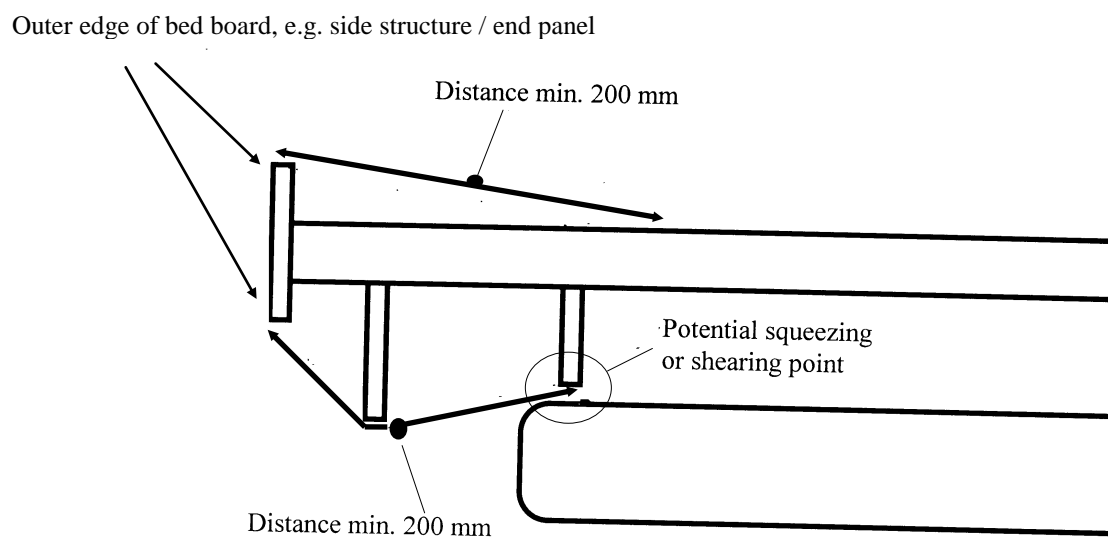


Figure 1: Normal reach for fingers

The nomenclature is given in figures 2 to 5 (the figures are only intended to illustrate the nomenclature).

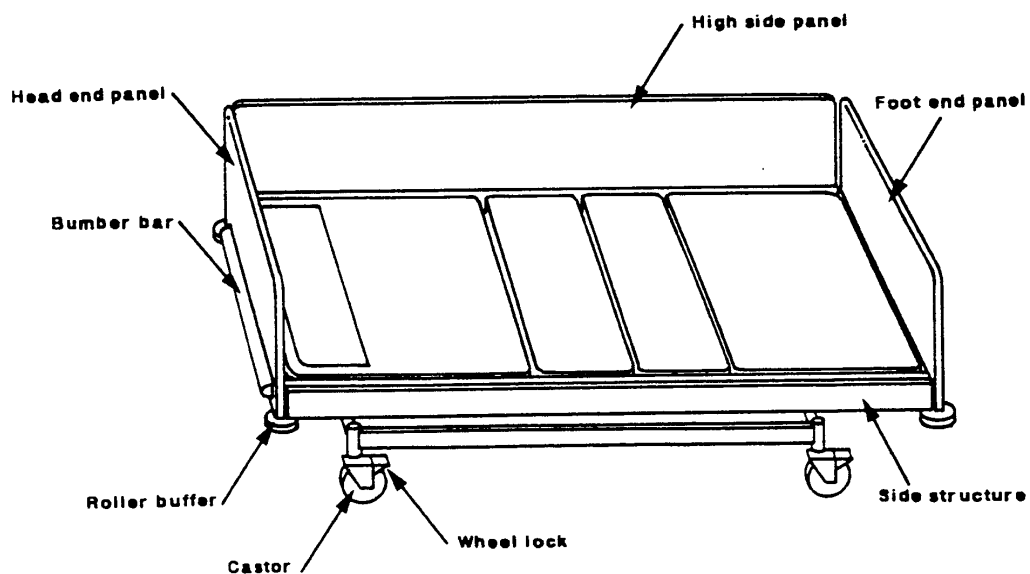


Figure 2: Nomenclature of bed (example, schematic presentation only)

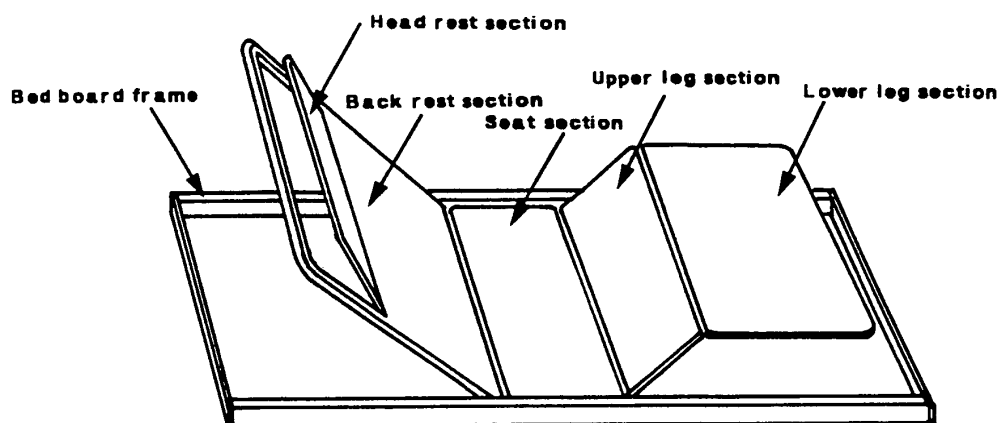


Figure 3: Nomenclature of bed board (example, schematic presentation only)

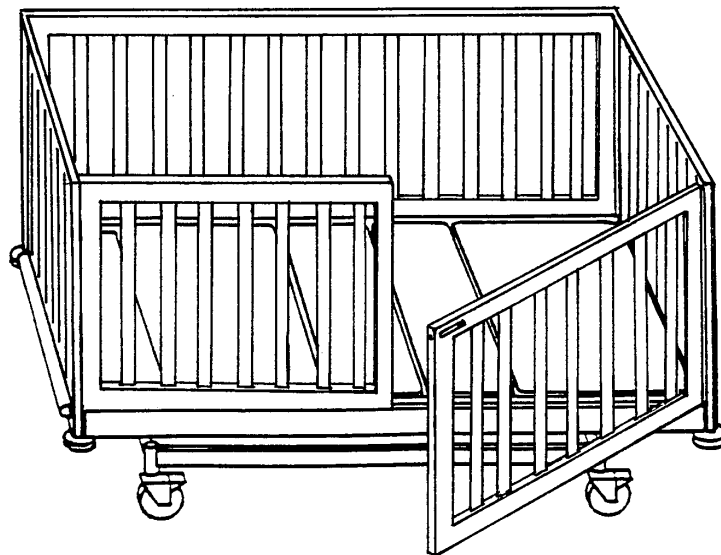


Figure 4: Protection side rails (example, schematic presentation only)

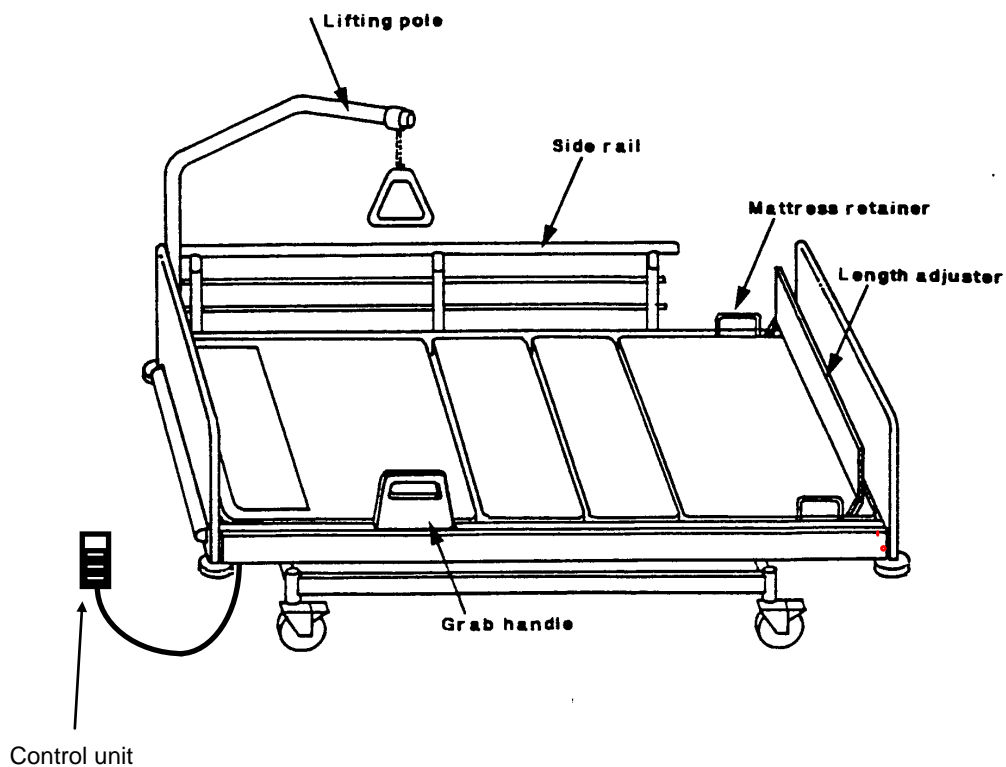


Figure 5: Nomenclature of accessories (example, schematic presentation only)

4 General safety requirements

To ensure that:

- the bed, when transported, stored, installed operated in normal use, and maintained according to the instructions for use, causes no safety hazard which could reasonably be foreseen and which is not connected with its intended application, in normal condition and in single fault condition,

a risk analysis in accordance with EN 1441 shall be carried out.

In particular, the following requirements apply:

- distances between moving parts within normal reach for fingers (see fig 1) of the disabled child, the attendant or other persons shall always be either maximum 4 mm or more than 25 mm,
- distances between moving parts and the floor within normal reach for feet of the disabled child, the attendant or other persons, shall always be either maximum 20 mm or fulfil the dimensional requirements given in figure 6,

NOTE: If this requirement cannot be fulfilled for beds equipped with “folding down” type side rails, a warning shall be given in the instructions for use and should also be marked on the bed.

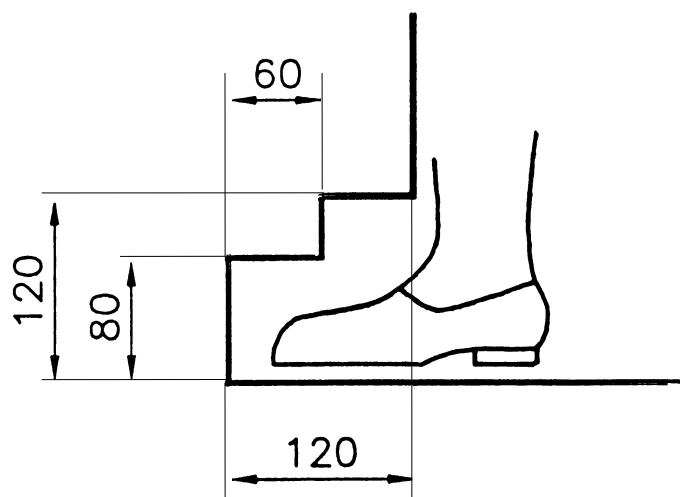
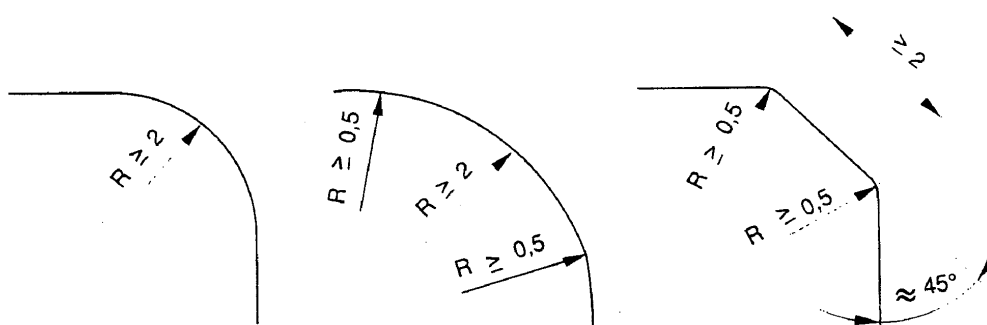


Figure 6: Minimum distances between moving parts and the floor

- distances between elements in bed board (slats) shall comply with the requirements for distances between elements in side rails (60 mm) (see 5.5.5),
- ledges and reliefs on the inside of a bed with protection side rails shall fulfil the requirements in EN 716-1, 4.2.2 and 4.2.3
- small parts that can be detached shall fulfil EN 716-1, 4.2.10.
- all edges and corners shall be smooth and shall have no burrs or sharp edges and protruding parts and traps shall be avoided according to EN 716-1, 4.2.1 (see figure 7) and 4.2.4.



Dimensions in millimetres

Figure 7. Examples for required minimum radii of edges and corners

which shall be checked by measurements, and:

- open ends of tubular components shall be capped or otherwise closed.

which shall be checked by visual inspection, and:

- the design of the bed shall allow mounting of side rails. Protection side rails and lifting poles are optional
- the design of the bed shall prevent incorrect assembly of knock-down parts and accessories,
- the design of the bed shall prevent unintentional activation of moving parts and accessories,
- single use components, e.g. wood screws or self tapping screws, shall not be used for the assembly of any components that are intended to be removed when disassembling for the purposes of transportation and storage,

- the materials of the bed cannot be of danger for the child, it shall fulfil the requirements of EN 71-3
- in case of malfunction in the drive system, it shall be possible to bring the back rest section to the horizontal position,
- a control unit shall be reachable by the disabled child and the attendant,
- a control unit shall have a hold-to-run function,
- a control unit shall be able to be used by both left and right hand
- it shall be possible to deactivate the functions of the control unit and it shall be described in the instruction for use.
- it shall not be possible to position the bed in a hazardous position for the disabled child. The position of Trendelenburg for medical treatment (see EN 60601-2-38) shall not be possible.

which shall be checked by inspection.

4.1 Safe working load

The safe working load of the bed shall be not less than 1000 N

The minimum safe working load shall consist of the sum of the following minimum forces:

- 700 N (corresponding approximately to a mass of 70 kg of the child);
- 150 N (corresponding approximately to a mass of 15 kg of the mattress);
- 150 N (corresponding approximately to a mass of 15 kg of accessories);

If any of the individual masses mentioned above is known to be higher than the masses mentioned in the brackets above, the actual safe working load used for testing shall be the given minimum safe working load plus the force calculated as being the difference in mass (kg) between the minimum mass (kg) and the actual known mass (kg) multiplied by 10 N/kg.

NOTE: If the loading is applied by loads, the mass of the loads shall be calculated by using the correct value of gravity.

4.2 Maximum mass of knock-down parts

The maximum mass of any main part shall be either less than 50 kg or the part shall be labelled with the actual mass which shall be mentioned in the instructions for use.

5 Specific safety requirements and related test methods

The requirements and test methods are specified in the following subclauses.

5.1 General test conditions

5.1.1 Preliminary preparation

The item shall be tested as delivered. If the item is of the knock-down type, it shall be assembled according to the instructions for use supplied with the item. If the item can be assembled in different ways, the most adverse combination shall be used for each test.

5.1.2 Test equipment

The forces in static strength tests shall be applied sufficiently slowly to ensure that no or negligible dynamic load is applied.

The test forces, unless otherwise stated, can be applied by any suitable device because results are dependent only upon correctly applied forces and loads, and not upon the apparatus.

5.1.3 Uncertainty of measurements and conformance with specifications

The uncertainty of measurements shall be evaluated and expressed by the laboratory performing the test in accordance with Guide to the Expression of Uncertainty in Measurement (GUM).

The conformance with specification is proven in accordance with prEN ISO 14253-1.

Conformance with specification is proved when the result of a measurement, complete statement, falls within the tolerance zone of a bed characteristic.

The same conformance can be proven similarly when the result of a measurement falls within the tolerance zone of a bed characteristic.

5.1.4 Sequence of testing

The tests shall be carried out in the sequence of the sub clauses in the clause of the Nordic Requirement, if not otherwise stated. All tests specified shall be carried out on the same sample. With the exception of electrotechnical tests in 5.11 and 5.12 which can be carried out on a second sample.

5.1.5 Visual inspection

Visual inspection shall be carried out with normal or corrected to normal vision.

5.2 Test environment and apparatus

5.2.1 Ambient condition

Unless otherwise specified the tests shall be carried out in indoor ambient conditions:

- with temperatures between 15°C and 30°C;
- with humidity between 20 RH and 85 RH.

5.2.2 Floor surface

A rigid, horizontal and flat surface.

NOTE: Uncertainty in rigidity, level and flatness influence the uncertainty of measurement for specific characteristics.

5.2.3 Test mattress

The mattress recommended for use with the bed by the manufacturer shall be used for testing. Alternatively a test mattress as specified below shall be used.

The test mattress shall be of flexible polyether foam. Its thickness shall be 100 mm, its density shall be $(30 \pm 2) \text{ kg/m}^3$ and its indentation hardness index shall be (170 ± 20) with A40 according to ISO 2439. The size of the mattress shall be more or less the same as the size of the mattress support platform tested.

The test mattress shall have a cover with the following characteristics:

- Composition: pure cotton;
- Weave in plain: 1/1;
- Mass per unit area: $(100 - 200) \text{ g/m}^2$;
- Warp and weft: $(20 - 30) \text{ threads/cm}$;
- Finishing: washed, no finishing agents;
- Cover make up: tight fit, but no restriction on the foam.

Each test mattress shall be used for no more than 10 complete bed tests.

5.2.4 Loading pad

A rigid circular object, (355 ± 5 mm) in diameter, the face of which has a convex spherical curvature of 800 mm radius with a 20 mm front edge radius (see figure 8).

Dimensions in millimetres

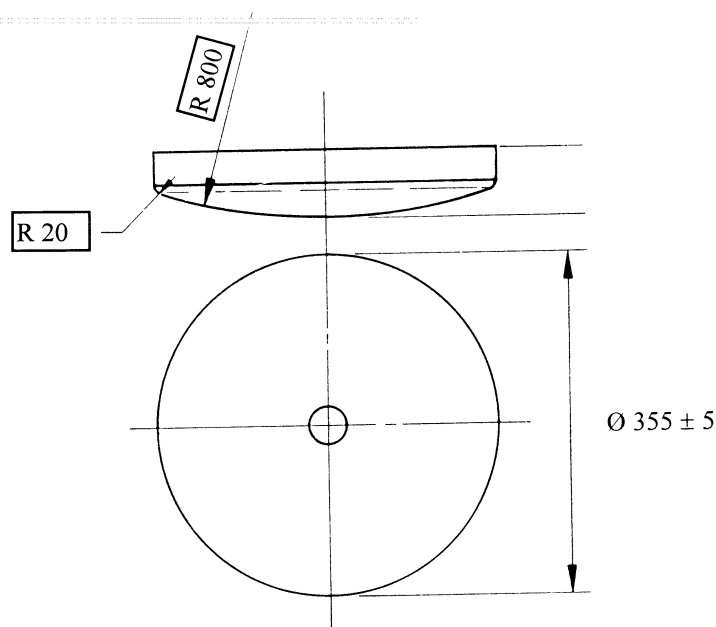


Figure 8 - Loading pad

5.2.5 Impactor

See figure 9.

5.2.5.1 Body of impactor

A circular body, approximately 200 mm in diameter, separated from the striking surface by helical compression springs and free to move to it on a line perpendicular to the plane of the central area of the striking surface.

The body and associated parts minus the springs shall have a mass of $(17 \pm 0,1)$ kg and the whole apparatus, including mass, springs and striking surface, shall have a mass of $(25 \pm 0,1)$ kg.

5.2.5.2 Springs

Springs, which shall be such that the combined spring systems have a nominal spring rate of $(6,9 \pm 1)$ N/mm and the total friction resistance of the moving parts is between 0,25 N and 0,45 N.

The spring system shall be compressed to an initial load of (1040 ± 5) N, measured statically, and the amount of spring compression movement available from the initial compression point to the point where the springs become fully closed shall be not less than 60 mm.

5.2.5.3 Striking surface

The striking surface shall be a rigid circular object, (200 ± 5) mm in diameter, the face of which has a convex spherical curvature of 300 mm radius with a 12 mm front edge radius.

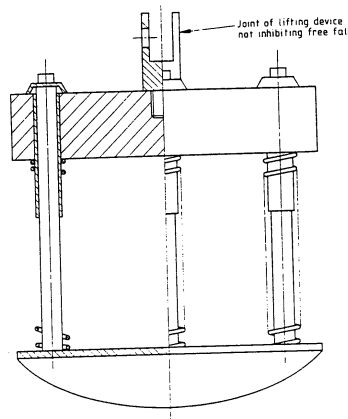


Figure 9 - Impactor

5.2.6 Cones for determining distances between elements and openings

Cones (see figure 10) with an external diameter of 150, 60, 7 mm made of plastics or other hard, smooth material mounted on a force-measuring device.

Dimensions in millimetres

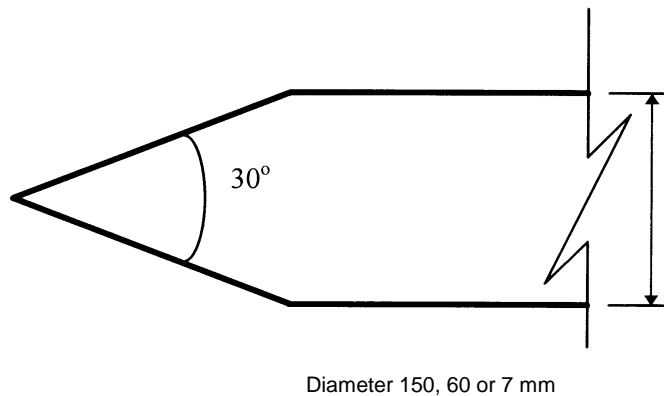


Figure 10 - Test cones

5.3 Stability

5.3.1 Requirements for stability

When tested in accordance with 5.3.2 the bed shall not overbalance.

5.3.2 Test methods for stability

5.3.2.1 Loading onto the bed

Depending on the device to be tested, use one of the following procedures:

- If the bed is with fixed height, place the bed, with the test mattress (see 5.2.3), onto the floor. Position any wheel and any equipment in the most adverse position.
- If the bed is with adjustable height, place the bed, with the test mattress (see 5.2.3), onto the floor. Adjust the height to, and position any wheel and any equipment in the most adverse position.

The tilting tendencies shall not be restrained.

Distribute uniformly a force of at least 1500N, (if the safe working load of the child exceeds 700 N the additional load shall be added) over the whole length of the side of the bed board with the centre of the force 125 mm from the outer edge of the bed board (see figure 11).

Examine whether the bed overbalances during the test.

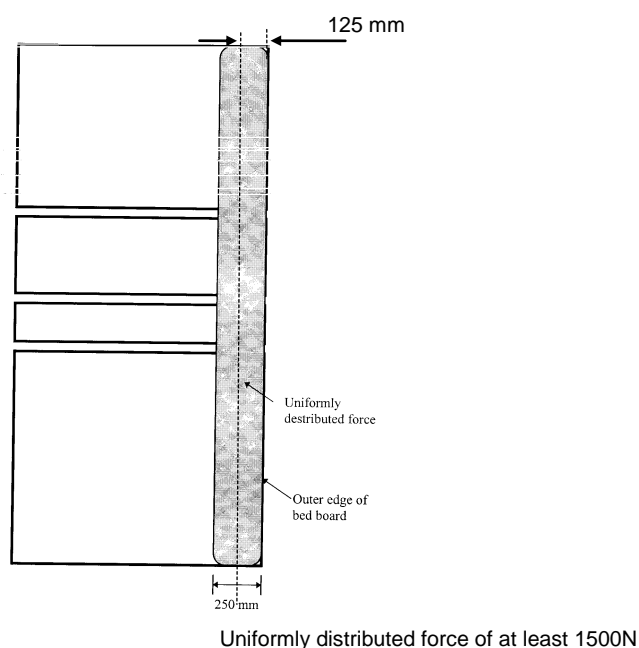


Figure 11 - Stability test by loading the side of the bed board

Distribute uniformly a force of at least 700 N, (if the safe working load of the child exceed 700 N the additional load shall be added) over the whole width of the foot end / head end of the bed with the centre of the force 125 mm from the outer edge of the mattress support platform (see figure 12).

Examine whether the bed overbalances during the test.

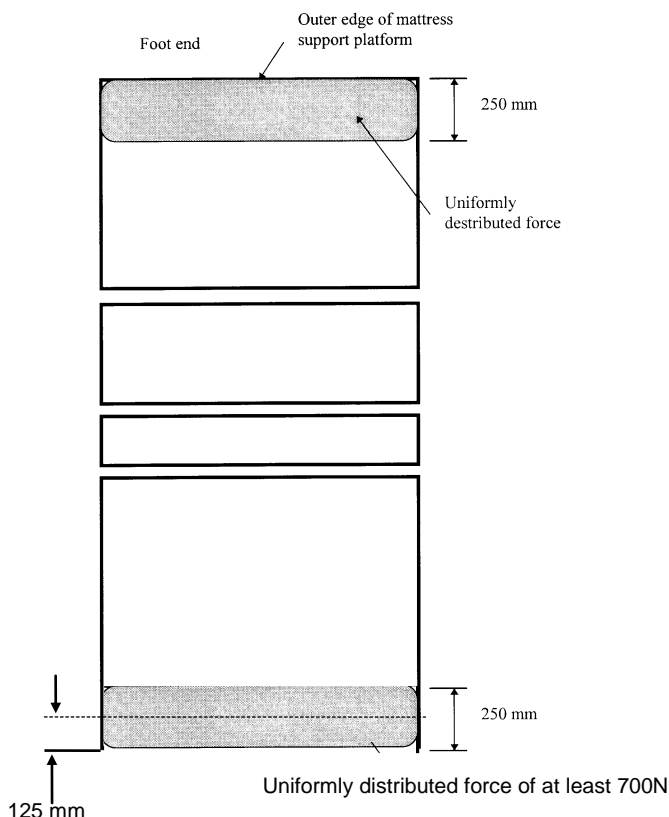


Figure 12 - Stability test by loading the foot end of the bed

5.3.2.2 Loading into lifting pole

This test shall be carried out just before the test (with the loading of 1000 N) in 5.4.16.

Place the bed, with the test mattress (see 5.2.3), onto the floor. Adjust the height to, and position any wheel and any equipment in the most adverse position. The tilting tendencies shall not be restrained.

Position the lifting pole in the most adverse position in which it is intended to be used by the disabled person.

Apply a vertical downward force of at least 700 N, (or the actual safe working load of the child if greater) onto the handle of the lifting pole.

Examine whether the bed overbalances during the test.

5.3.2.3 Loading into side rail

Place the bed, with the test mattress (see 5.2.3), onto the floor. Adjust the height to, and position any wheel in, the most adverse position. The tilting tendencies shall not be restrained.

Position the side rail in the most adverse position (open) in which it is intended to be used by the child.

Apply a vertical downward force of 700 N onto the outer most point of the side rail.

Examine whether the bed overbalances during the test.

NOTE: If the bed does not fulfil this requirement a warning shall be given in the instructions for use and should be marked on the bed.

5.4 Strength and durability

5.4.1 Requirements for downwards static load onto mattress support platform

When tested in accordance with 5.4.2 the bed shall still function normally and present no hazards.

5.4.2 Test methods for downwards static load onto mattress support platform

Adjust the bed board to its most adverse position place the test mattress in the bed. Place a loading pad (see 5.2.4) with a load of at least 700 N, (if the safe working load of the child exceed 700 N the additional load shall be added) at any position of the bed board for 30 minutes.

5.4.3 Requirements for downwards static load onto beds

When tested in accordance with 5.4.4 the bed shall still function normally and present no hazards after removal of the test load.

5.4.4 Test methods for downwards static load onto beds

Place the test mattress (see 5.2.3) onto the bed board, in its flat position. If height adjustable, the bed board shall be placed in the middle of the possible range of the adjustment.

Apply a vertical load of 2 times the safe working load (see 4.1) or 2400 N whichever is the greatest (excluding the mass of the mattress placed onto the bed) equally distributed over the mattress for one hour. Remove the test load and the test mattress .

Examine whether the bed functions normally and presents no hazards after the test.

5.4.5 Requirements for the durability of beds

When tested in accordance with 5.4.6 the bed shall still function normally and presents no hazards after removal of the test load.

5.4.6 Test methods for the durability of beds

Place the test mattress (see 5.2.3) onto the bed board, in its flat position. If height adjustable, adjust the height to the most adverse position.

Apply the loading pad (see 5.2.4) 10.000 times at the position shown in figure 13, position A, 3-4 sec. with a cycle of 8 - 10 times per min, with the safe working load of the child (at least 700 N, see 4.1).

Remove the test mattress and examine the specimen to determine if it still functions normally and present no hazards.

5.4.7 Requirements for vertical impact onto beds

When tested in accordance with 5.4.8 the bed shall still function normally and present no hazards.

5.4.8 Test methods for vertical impact onto beds

Place the test mattress (see 5.2.3) onto the bed board/ in a position in which moving elements are free of supporting elements and their inclination is less than 7° in relation to horizontal. If height adjustable, adjust the height to the most adverse position.

Drop the impactor (see 5.2.5) 10 times from a distance of 180 mm above the test mattress, perpendicular onto the test mattress, at each of the selected points of impact (see figure 13, positions B). The impactor shall be permitted to fall freely but guided by a guide or guide rail.

Remove the test mattress and examine the specimen to determine if the bed still functions normally and presents no hazards.

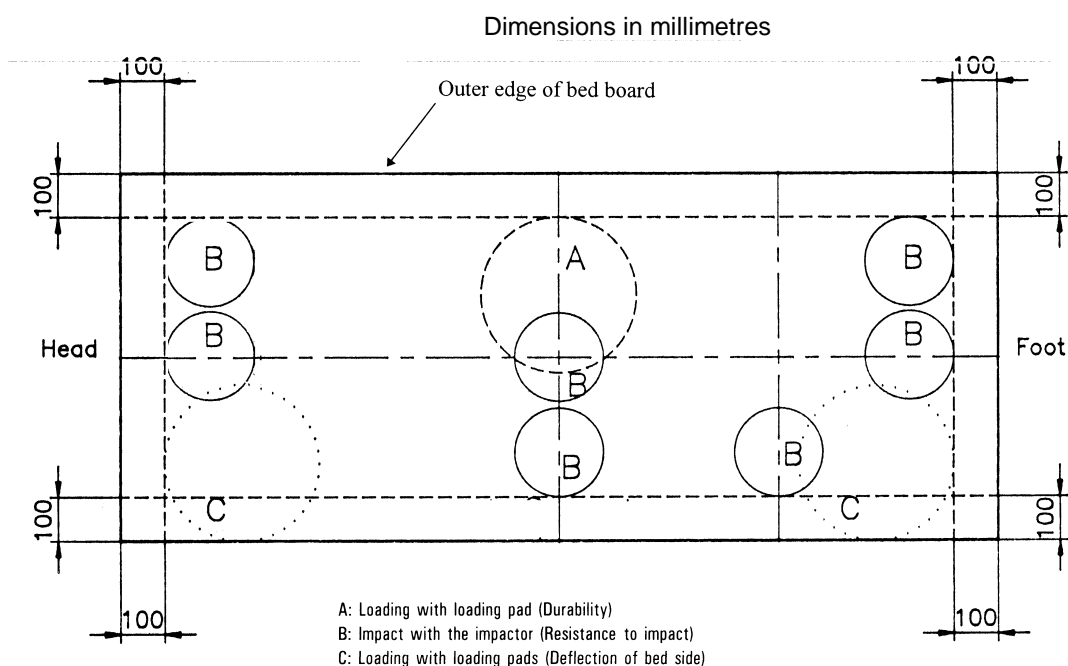


Figure 13 - Impact and loading positions of the bed board

5.4.9 Requirements for the deflection of the bed side

When loaded in accordance with 5.4.10 the deflection of the side of the bed board shall present no hazards during and after application of the load.

The deflection shall not be greater than 40 mm during application of the load and not greater than 10 mm measured in relation to the floor after removal of the load.

5.4.10 Test methods for the deflection of the bed side

Place the test mattress (see 5.2.3) onto the bed board in its flat position. Adjust the height to the most adverse position.

Apply the two loading pads (see 5.2.4) as shown in figure 13, positions C, each with a load of 750 N. Examine the specimen during and after application of the loads to determine if the deflections present any hazards.

5.4.11 Requirements for the height adjustment mechanisms

When tested in accordance with 5.4.12 the bed shall still function normally and present no hazards.

The operation of the height adjustment mechanism shall not cause a change of more than 2° of the mattress support platform in relation to horizontal.

5.4.12 Test methods for the height adjustment mechanisms

Place the test mattress (see 5.2.3) onto the bed board in its flat position. Apply a vertical load of 1 time the safe working load (see 4.1) excluding the mass of the mattress placed onto the bed equally distributed over the mattress. The bed is raised and lowered completely 3000 times in accordance with the procedure stated in the instructions for use. Remove the test load and the test mattress. Examine the specimen to determine if it still functions normally and presents no hazards.

Record any change of the angle of the mattress support platform.

5.4.13 Requirements for the strength and rigidity of side rails and grab handles

When tested in accordance with 5.4.14 the side rail and grab handle shall still function normally and present no hazards. Any locking mechanism of the side rail shall still be locked.

The deflection of the side rail/grab handle shall not be greater than 50 mm during application of the loads and not greater than 10 mm at any point in relation to the bed board after removal of the loads.

The deflection for direction F (fig 14) shall not be greater than 70 mm during the application of the loads and not greater than 10 mm at any point in relation to the bed board after removal of the loads.

NOTE: The above mentioned deflection should not be greater than 50 mm.

5.4.14 Test methods for the strength and rigidity of side rails and grab handles

If not permanently mounted, position the side rail/grab handle onto the bed in accordance with the instructions for use.

Position the side rail in the highest, upright position. The side rail shall be positively latched.

Apply a horizontal outward force of 500 N ten times for 30 s onto the side rail/grab handle in the most adverse point of its total length (in relation to deflection during application of loads and in relation to permanent deformation) at the highest point of the side rail/grab handle.

Repeat the procedure as the horizontal outward force is substituted by:

- a horizontal inward force of 500 N, and then
- a vertical downward force of 750 N, and then
- a vertical upward force of 500 N, and then
- a horizontal longitudinal force of 500 N in both directions.

If the side rail has a locking mechanism, those of the forces as given above which will result in shear forces in the locking mechanism, shall also be applied to the element closest to the locking mechanism in any fixed height position.

NOTE: For protection side rails (not intended to be opened by the child):

Locking or attachment mechanisms may be considered as inoperable by a child if at least one of the following conditions is fulfilled:

folding or detachment is only possible when two independent locking mechanisms are operated simultaneously;

or

release of the locking or attachment mechanism requires a specified minimum force or the use of tool

or release of locking or attachment mechanism requires two consecutive actions, the first of which must be maintained while the second is carried out.

Locking and attachment mechanisms must continue to meet these requirements and support the design loads after being subjected to repeated opening and closing.

NOTE: Be aware that the locking mechanism also in certain circumstances should be easily opened by disabled parents.

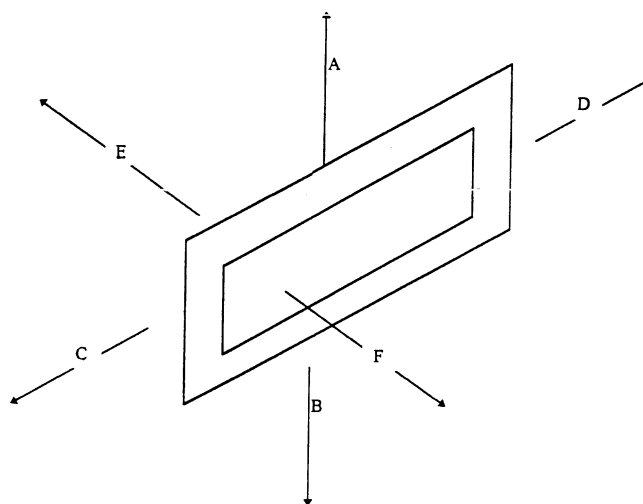


Figure 14 - Directions for application of forces onto side rails and grab handles

Apply a force of 350 N ten times for 30 s onto the weakest point/element (in relation to deflection during application of loads and in relation to permanent deformation) of the side rail in the most adverse direction.

Examine the side rail/grab handle and check that the side rail/grab handle still functions normally and present no hazards.

5.4.15 Requirements for the lifting pole

When tested with a downward force of 500 N and with a horizontal force of 350 N in accordance with 5.4.16 the lifting pole and its fastenings shall still function normally and present no hazards.

When tested with a downward force of 1000 N in accordance with 5.4.16 the fastenings shall still function normally and present no hazards.

The deflection of the lifting pole shall not be greater than 100 mm during application of the 500 N downward load and the permanent deformation not more than 20 mm after the durability test with 500 N downward load measured in relation to the mattress support platform.

5.4.16 Test methods for the lifting pole

Position the lifting pole to the bed in its most adverse position intended for use.

Apply a vertical downward force of 500 N 1000 times onto the handle of the lifting pole. Examine the lifting pole and its fastenings during and after application of the force and record deflection and deformation.

Apply perpendicular to the bed side a horizontal force of 350 N to the outermost suspension point for the handle. Examine the lifting pole and its fastenings during and after application of the force.

Apply a downward load of 1000 N to the outermost suspension point for the handle. Examine the lifting pole and its fastenings during and after application of the load.

NOTE: The test with application of the 1000 N is a test of the fastenings of the lifting pole and not of the lifting pole as such, therefore any permanent set of the lifting pole is allowed for this test.

5.5 Linear and angular dimensions

5.5.1 Height of bed

If adjustable, the height of the upper most part of the mattress support platform in the centre point of the symmetry axis of the bed board in its flat position shall at least be adjustable from 400 mm to 800 mm above the floor.

NOTE: To allow children to transfer e.g. to a wheelchair a minimum height of max. 300 mm is recommended

NOTE: Beds without the possibility of adjustment of the height are only suitable for children not needing attendants.

5.5.2 Height of seat section

The mattress top shall, with mattress support platform in any position, at seat section be at least 20 mm higher than any construction part e.g. bed board frame, side structure or lowered side rail.

5.5.3 Under bed clearance

With the mattress support platform lowered to any position higher than 400 mm from the floor, the height of the under bed clearance shall be at least 150 mm at a length of at least 500 mm positioned on each side of the symmetry plane of the mattress support platform, (see figure 15).

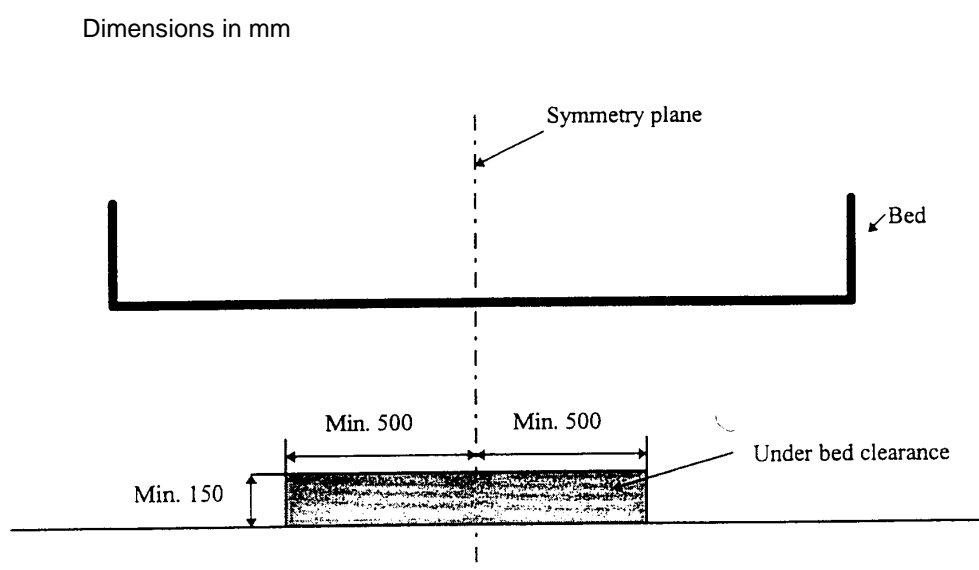


Figure 15 - Under bed clearance

5.5.4 Angles of mattress support platform

It is not required that a bed shall have an adjustable mattress support platform. But if it has an adjustable mattress support platform it shall fulfil the requirement relevant for the actual type.

5.5.4.1 Two section mattress support platform (see fig. 16).

The angle A between the back rest section and the bed board frame shall at least be adjustable within the range of 0° (horizontal) and 70° .

It must not be possible to adjust the back rest section to more than 85° (on account of children with lack of head control).

If adjustable, the angle B between the leg section and horizontal shall be adjustable between 0° and at least 12° .

The angle C between the back rest section and the leg section shall be greater than 90° .

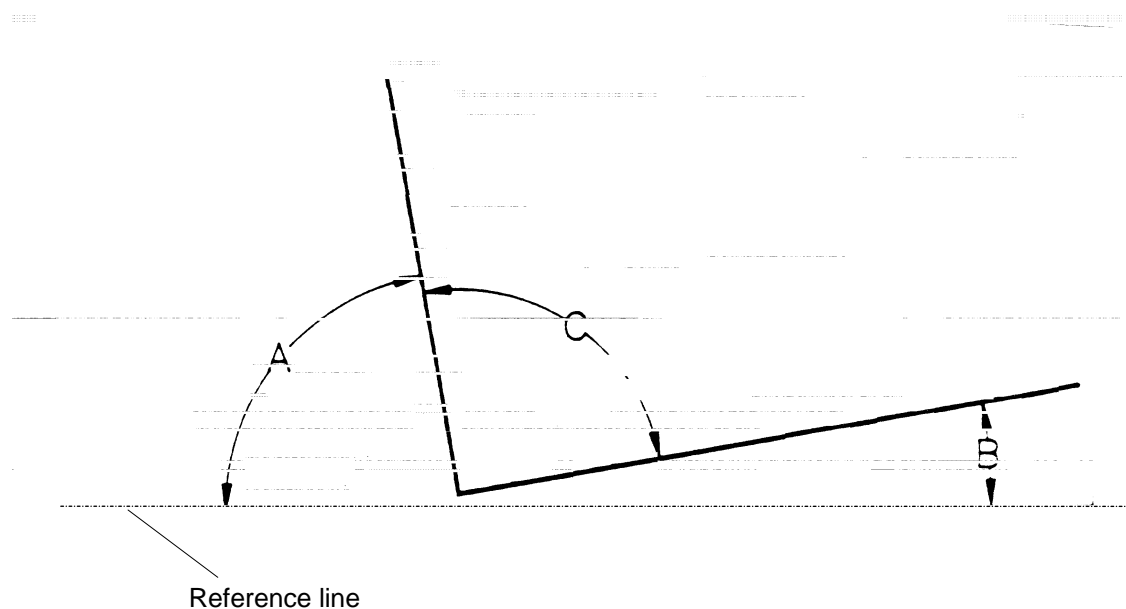


Figure 16 - Angles of two section mattress support platform

5.5.4.2 Three section mattress support platform (see fig. 17 and 18).

The angle A between the back rest section and the bed board frame shall at least be adjustable within the range of 0° (horizontal) and 70° .

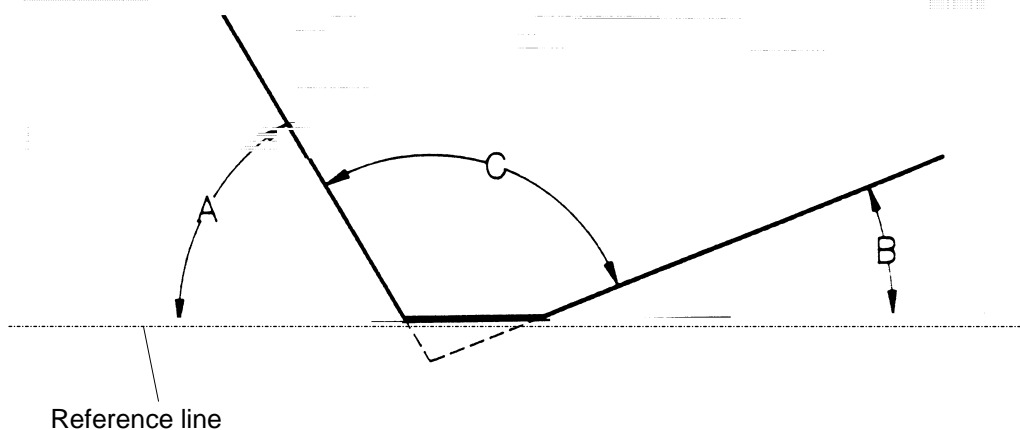
It must not be possible to adjust the back rest section to more than 85° (on account of children with lack of head control).

The angle B between the upper leg section and horizontal shall be adjustable between 0° and at least 12° .

The angle C between the back rest section and the upper leg section shall be greater than 90° .

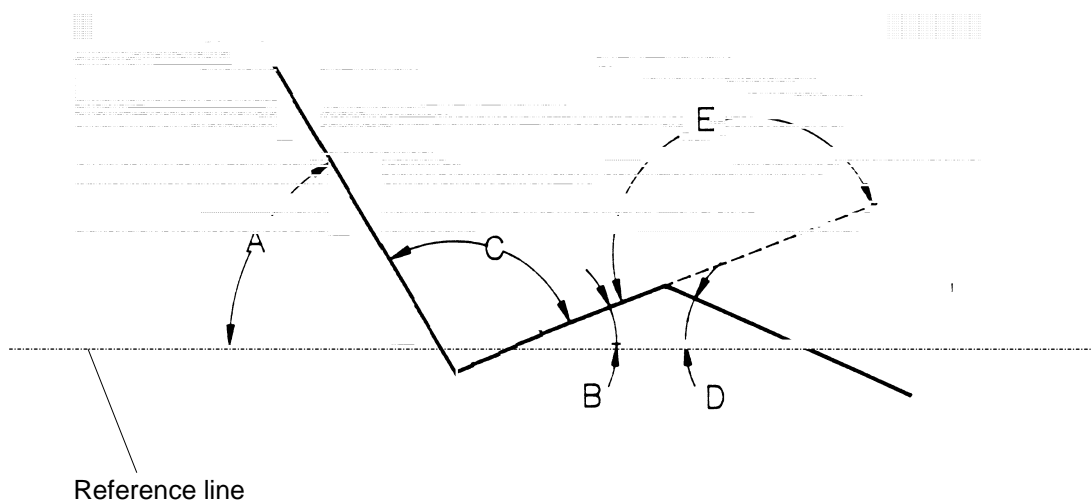
The angle D between the lower leg section and horizontal shall be adjustable between 0° and at least 20° under horizontal.

The angle E between the upper side of the upper leg section and the upper side of the lower leg section shall be at least 180° .



Reference line

Figure 17 - Angles of three section mattress support platform



Reference line

Figure 18 - Angles of three section mattress support platform

5.5.4.3 Four section mattress support platform (see fig. 19).

The angle A between the back rest section and the bed board frame shall at least be adjustable within the range of 0° (horizontal) and 70° .

It must not be possible to adjust the back rest section to more than 85° (on account of children with lack of head control).

The angle B between a line drawn between the turning point of the back rest section/seat section and the turning point of the upper/lower leg section and horizontal shall be adjustable between 0° and at least 12° .

The angle C between the back rest section and a line drawn between the turning point of the back rest section/seat section and the turning point of the upper/lower leg section shall be greater than 90° .

The angle D between the lower leg section and horizontal shall be adjustable between 0° and at least 20° under horizontal.

The angle E between the upper side of the upper leg section and the upper side of the lower leg section shall be at least 180° .

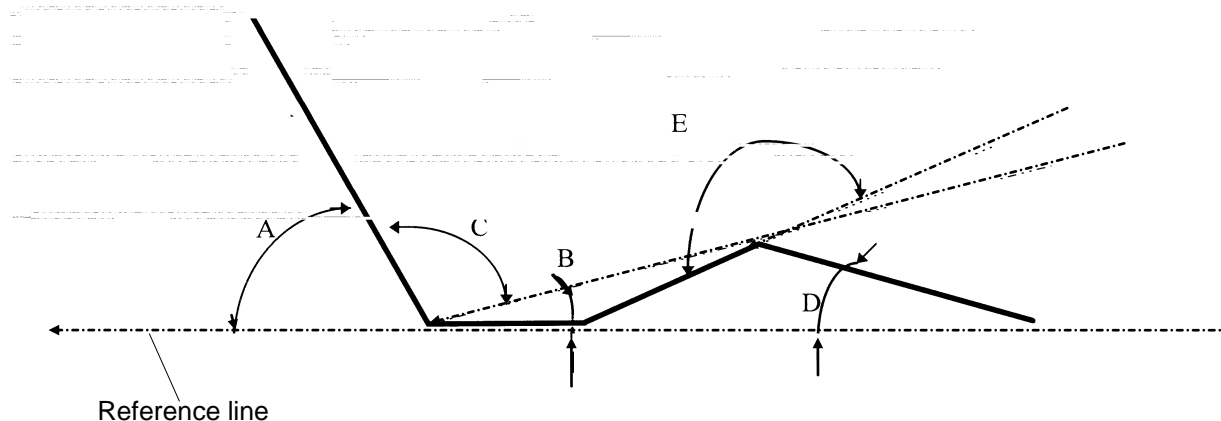


Figure 19 - Angles of four section mattress support platform

5.5.5 Dimensions of side rails, grab handles and end panels

Distances (see figures 20 and 21) between elements of side rails/grab handles/end panels and between side rails/grab handles/end panels and elements of the bed/accessories shall fulfil the requirements given in table 1.

When the sides or ends are made of mesh, it shall not be possible for the 7 mm cone (see figure 10) to pass through the holes of the mesh.

Table 1: Dimensions of side rails/grab handles/end panels		
Designation	Dimension	Requirement mm
A	The greatest dimension in at least one direction between elements inside of the perimeter of the side rail/grab handle/end panels in all normal use positions	$A \leq 60$
B	Thickness of normal use mattress as specified by the manufacturer without compression	As specified by the manufacturer
C	Height of the top of the side rail/end panel above the mattress without compression and with the bed board in flat position Side rails(normal)/end panels Protection side rails/end panels NOTE: The 650 mm are only sufficient for smaller children . A risk assessment must be carried out in the actual situation	$C \geq 220$ mm $C \geq 650$ mm
D	Distance between the head end panel/foot end panel/ accessories and the side rail/grab handle with the bed board in flat position. Applies also if the end panels are extended.	$D \leq 40$ or $D \geq 250$
E	Distance between segmented side rails with the bed board in flat position	$E \leq 40$ or $250 \leq E \leq 400$
F	The greatest dimension in at least one direction of any accessible opening below the side rail/end panel, either	if D or $E \geq 250$ then: $F \leq 40$ if D or $E \leq 40$ then: $F \leq 60$
G	The length of side rail(s)(normal) Protection side rails	$G \geq 2/3 H$ $G \geq H$
H	The distance between the head end panel and the foot end panel without extensions of the panels.	No requirements

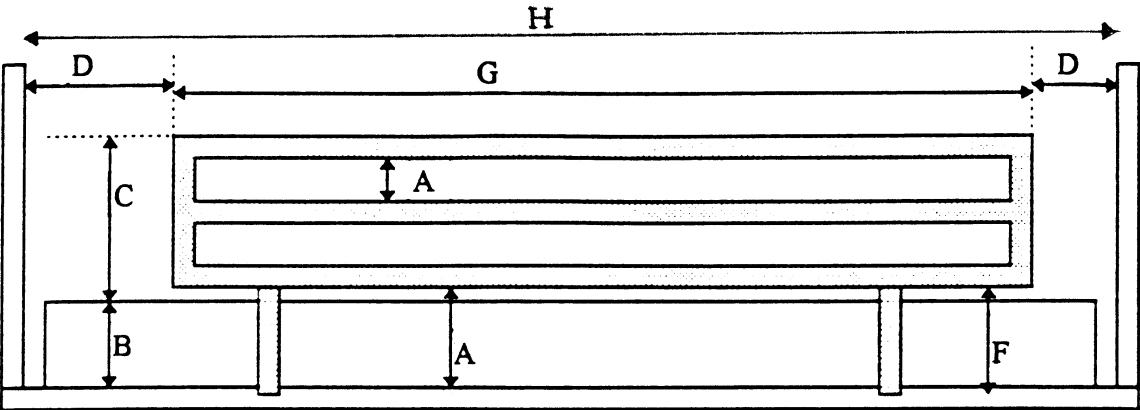


Figure 20 - Dimensions of single piece side rails (example, schematic presentation only)

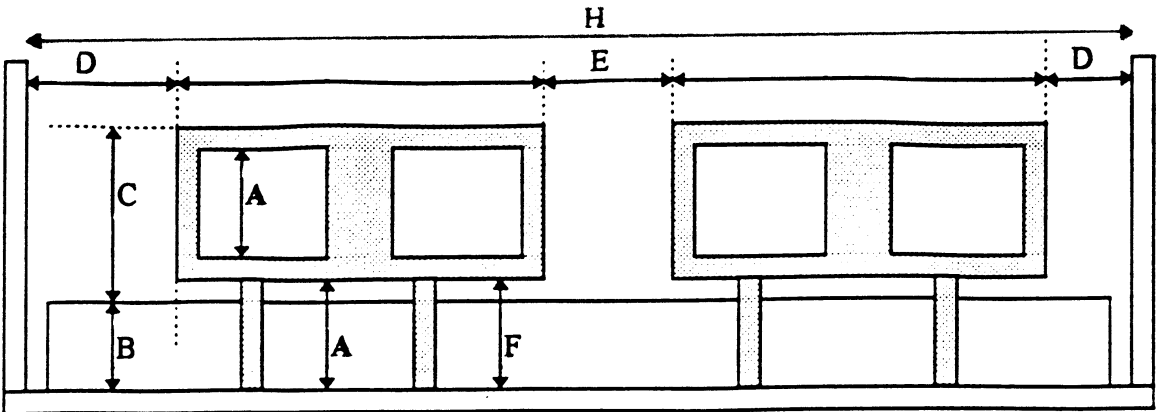


Figure 21 - Dimensions of segmented side rails (example, schematic presentation only)

5.5.6 Test methods for determining the distance between any elements of the side rail/grab handle/end panels and between any elements of the side rail/grab handle/end panels and their supporting structure and distances between elements of bed board (slats)

Press the cone of 60 mm as specified in 5.2.6 between any elements of the side rail/grab handle/end panel and/or between any elements of the side rail/grab handle/end panel and their supporting structure and between elements of the bed board (slats, see 4.) with 30 N. Check that any distance between elements fulfils the requirement of 5.5.5 during application of the force.

5.5.7 Dimension of handle for lifting pole

If handle contains a hole, the cone of 150 mm in diameter as specified in 5.2.6. must not pass through the hole during application of a force of 30 N, (see fig. 22). To prevent traps for parts of human body the distance between any open structures in the handle shall be less than 40 mm.

NOTE: The dimension of the handle should allow a two hand grip

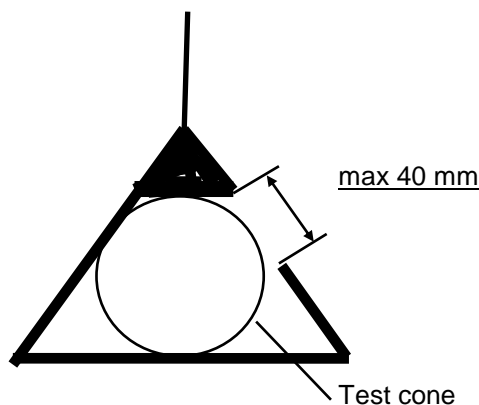


Figure 22 - Dimension of handle for lifting pole.

5.5.8 Dimensions of the control unit

The activating area (buttons if supplied) shall at least cover an area of 175 mm². Any distance between the activating areas shall be more than 10 mm.

NOTE: The buttons may have any shape, e.g. they need not to be circular.

(Regarding unintentional activation of moving parts, see General requirements, 4.)

5.5.9 Dimensions of handles and pedals

All handles and pedals shall be reachable from normal working positions and be placed so they allow operations to be carried out in a safe and ergonomic manner.

The free distance between any handle (those parts intended to be grabbed) requiring an operating force of more than 10 N and any construction part shall be more than 35 mm, during operation.

The free distance between the upper side of any pedal (those parts intended to be stepped on) and any construction part shall be more than 75 mm.

The diameter of operating handles requiring an operating force of more than 10 N shall be between 19 mm and 43 mm.

Pedals shall be placed not more than 300 mm over the surface of the floor.

5.6 Operating forces

In the case of electrically operated functions, the force to operate the control unit buttons shall be less than 2,5 N.

In the case of non-electrically operated functions, the force to release/lock handles, (applied at the centre of the handle) shall be no more than 10 N and the force required to lift any part of the bed board (applied at the centre of the handle), shall be no more than 200 N, when loads are fixed to the bed board as shown in figure 23 (for 4-sectioned mattress support platform), with their centre of gravity in the middle of the sections.

For 2-sectioned mattress support platforms:

the load shall be positioned with 45% at the back rest section and 55% at the leg section.

For 3-sectioned mattress support platform:

the load shall be positioned with 45% at the back rest section, 25% at the seat section and 30% at the leg section (for the type similar to fig. 17).

the load shall be positioned with 45% at the back rest section, 40% at the seat section and 15% at the leg section (for the type similar to fig. 18).

The static force to operate pedals at the centre of the pedal shall be no more than 300 N when loads are fixed to the bed board, as specified above, with their centre of gravity in the middle of the sections.

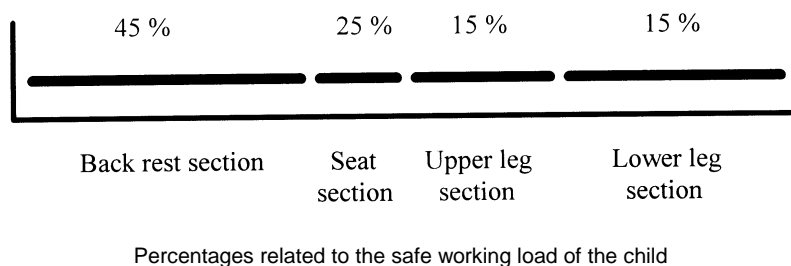


Figure 23 - Loading of bed board

5.7 Operating speed and time

If electrically operated, the average speed of height adjustment of the mattress support platform shall be within 10 mm/s to 30 mm/s when loaded as specified in 5.6.

If electrically operated, the time to adjust other sections of the mattress support platform shall be less than 30 s, when loaded as specified in 5.6.

It shall take more than 3 s to raise the back rest section to an upright position when unloaded and without the mattress, and more than 3 s by normal operation to lower it to horizontal position, when fitted with the mattress and loaded as specified in 5.6.

5.8 Immobilization

For beds provided with wheels, it shall be possible to immobilize it so that the fastenings of the wheels will not move more than 10 mm when tested in accordance with 5.9.

5.9 Test method for immobilization

Place the bed on a flat and rigid vinyl covered surface. Immobilize the unloaded bed as described in the instructions for use. Position the wheels in the most adverse position. If adjustable in height, position the bed board in the highest position. Apply a horizontal force of 270 N for 30 s in the most adverse point of the bed. Record the movement of the fastenings of the wheels.

5.10 Electrotechnical requirements

The requirements specified in EN 60601-1 apply when subjects are not covered by this particular Nordic Requirement.

The following paragraphs of EN 60601-1 are not to be tested, as the subjects are covered by this Nordic Requirement

21	Mechanical strength
22	Moving parts
23	Surfaces corners and edges
24	Stability in normal use
28	Suspended masses
56	Components and general assembly

The bed shall be double insulated if another concept is not applied, to ensure the same level of safety in normal use and in single fault conditions.

The degree of protection of electrotechnical parts provided by enclosures shall be at least IPX 4, in accordance with IEC 529.

NOTE: It is recommended that in most situations the length of cable for power supply should be within 3 m and 3,5 m from the furthest edge from the fixation of the cable on the bed.

5.11 EMC requirements

The equipment shall fulfil the requirements specified in EN 60601-1-2 and shall in addition fulfil the following.

5.11.1 Emission

The requirements of EN 61000-3-2 apply if applicable as specified in EN 61000-3-2.

The requirements of EN 61000-3-3 apply if applicable as specified in EN 61000-3-3.

5.11.2 Immunity

Nordic Requirements are only applicable to beds containing electronic devices/components.

The bed shall in addition to the requirements in EN 61601-1-2, Clause 36.202.2.1 also be tested with a field strength of 20 V/m in the frequency range of 800 MHz to 2 GHz. The test shall be performed in accordance with EN 61000-4-3.

If, as a result of application of this test, the bed becomes dangerous or unsafe, the bed shall be deemed to have failed the test. Furthermore, unintentional movements of any parts of the bed are not allowed during the test.

5.12 Noise

The weighted sound power level shall be measured in accordance with ISO 3746 and marked on the bed or in the instructions for use.

6 Instructions for use

The bed shall be accompanied by instructions for use which shall include the following information as a minimum:

- a) Name of the manufacturer and dealer if not same
NOTE: A trademark or logo is not sufficient to specify the manufacturer;
- b) The address and telephone number of the manufacturer;
- c) The intended use, e.g. that the bed is intended for disabled children of a certain length, if the protection side rails are intended not to be opened by the child.
- d) Full operating, e.g. how to immobilize a bed supplied with wheels, installation, e.g. that care should be taken, so that an electrically operated bed is placed with a distance to the power supply plug, and assembly instructions;
- e) Requirements on inspection and servicing;
- f) Cleaning and maintenance instructions;
- g) Overall dimensions and mass, including the mass of main parts and recommended dimension of mattress
- h) Safe working load specified in loads for child, mattress, accessories (see 4.1);
- i) Safety precautions and any warnings, e.g.
 - a warning that precautions shall be taken if accessories not listed are used;
 - a warning, that the thickness of the mattress must not exceed the marking of the bed side (see 7.k)
- j) Description of all symbols used for marking;
- k) The weighted sound power level (see 5.12) if not included in the marking;
- l) Identification of those accessories that are intended to be used with the bed.

If electrically driven, the bed shall also be followed by instructions for use in accordance with the requirements of EN 60601-1.

NOTE: Further guidance on instructions for use can be obtained from EN 1041.

7 Marking

The bed shall be clearly and permanently marked with the following information:

- a) Name, address and telephone number of the manufacturer;
- b) Product identification (model number or reference);
- c) Lot and individual production number;
- d) Year and month of production;
- e) The mass of any main part with a mass of more than 50 kg (see 4.2);
- f) Safe working load (as specified in 4.1);
- g) Electrical protection class (class I, II or III in accordance with EN 60601-1);
- h) The functions of controls;
- i) The weighted sound power level (see 5.12) if not included in the instructions for use;
- j) The class of IPX (see 5.10);.
- k) Indication of max. height of mattress (e.g. on the end panel).

If electrically driven, the bed shall also be marked in accordance with the requirements of EN 60601-1.

NOTE: Further guidance on marking can be obtained from EN 1041.