

Australian/New Zealand Standard™

Bunk beds and other elevated beds



AS/NZS 4220:2010

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee CS-003, Safety Requirements for Children's Furniture. It was approved on behalf of the Council of Standards Australia on 11 March 2010 and on behalf of the Council of Standards New Zealand on 19 March 2010.
This Standard was published on 6 April 2010.

The following are represented on Committee CS-003:

Australian Chamber of Commerce and Industry
Australian Competition and Consumer Commission
Australian Industry Group
Australian Retailers Association
Consumer Affairs Victoria
Consumers Federation of Australia
CHOICE
Department of Commerce Consumer Protection
Department of Health (South Australia)
Department of Tourism, Fair trading and Wine Industry Development, Qld
Furniture Association of New Zealand
Furntech–AFRDI
Infant Nursery Products of Australia
Kidsafe
New Zealand Retailers Association
Office of Fair Trading Department of Commerce, NSW
Westmead Children's Hospital

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.saiglobal.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR AS/NZS 4220.

Australian/New Zealand Standard™

Bunk beds and other elevated beds

Originated as AS/NZS 4220:1994.
Previous edition 2003.
Third edition 2010.

COPYRIGHT

© Standards Australia/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Jointly published by Standards Australia, GPO Box 476, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6140

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CS-003, Safety Requirements for Children's Furniture to supersede AS/NZS 4220:2003. The original edition was motivated by concern expressed by the then South Australian Department of Human Services and Departments of Fair Trading about the number and severity of injuries suffered by children falling from or otherwise injured by bunk beds. Similar concerns had been expressed overseas.

The objective of this Standard is to provide regulatory authorities with safety requirements and to provide manufacturers with functional, durability, stability and performance criteria to meet these safety requirements, in order to reduce the likelihood of deaths or injuries to children.

The following were the major objectives for this revision:

- (a) To increase the minimum vertical distance between the upper surface of the guardrail and the upper surface of the mattress base to a minimum of 360 mm from the 260 mm specified in the 2003 edition.
- (b) To discourage the creation of large gaps in guardrails in order to prevent the inadvertent formation of dangerous smaller gaps that may arise when a mattress is fitted. Of particular concern were gaps formed where the top, outside edge of the mattress forms the bottom edge of an entrapping space.
- (c) To place a maximum limit on the number of permissible access openings in guardrails.
- (d) To expand and improve the section on climbing access.
- (e) To reduce from 800 mm to 700 mm the maximum height above the floor of the upper surface of the mattress base, i.e. the minimum height at which the provisions of this Standard apply.
- (f) To increase the severity of load testing of guardrails.
- (g) To improve both the accuracy and clarity of the figures used in the Standard.

The term 'normative' has been used in this Standard to define the application of the appendix to which it applies. A 'normative' appendix is an integral part of a Standard.

CONTENTS

	<i>Page</i>
1 SCOPE	4
2 REFERENCED DOCUMENTS	4
3 DEFINITIONS	4
4 MATERIALS	5
5 CONSTRUCTION	7
6 SAFETY AND PERFORMANCE REQUIREMENTS	13
7 INFORMATION LEAFLET	15
8 MARKING	16

APPENDICES

A FALL-THROUGH AND ENTRAPMENT HAZARDS	18
B STABILITY	21
C FASTENING OF UPPER BED TO THE SUPPORTING STRUCTURE	23
D FATIGUE TEST ON JOINTS	24
E IMPACT TEST	27
F STATIC LOAD ON GUARDRAILS	29
G IMPACT LOAD ON GUARDRAILS	31
H ACCESS DEVICE ATTACHMENT	34
I STATIC LOAD ON TREADS	36
J IMPACT LOAD ON TREADS	37

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard
Bunk beds and other elevated beds

1 SCOPE

This Standard specifies safety requirements for bunk beds and other elevated beds. These include material, construction, design, and performance requirements.

NOTE: Where this Standard uses term 'bunk bed' it includes all beds within the scope of this Standard.

2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS

- 2281 Flexible cellular polyurethane for seat cushioning and bedding
4685 Playground equipment
4685 Part 1: General safety requirements and test methods

AS/NZS

- 4491 Timber—Glossary of terms in timber-related Standards

AS/NZS ISO

- 8124 Safety of toys
8124.1 Part 1: Safety aspects related to mechanical and physical properties
(ISO 8124-1:2000, MOD)
8124.3 Part 3: Migration of certain elements

3 DEFINITIONS

For the purpose of this Standard, the definitions below apply.

3.1 Access device

A rung-type ladder, step-type ladder, or other style of climbing aid provided for any bed in which the upper surface of the mattress base is more than 700 mm from the floor.

3.2 Access opening

Opening in the guardrail that may or may not be accompanied by an access device.

3.3 Bunk bed and elevated bed**3.3.1 Bunk bed**

A set of components that is or can be assembled as beds, one stacked over the other (see Figure 1); or

3.3.2 Elevated bed

Any elevated bed, other than a hospital bed, in which the upper surface of any mattress base is 700 mm or higher above the floor surface.

3.4 Climbing access opening

Opening in the guardrail that accommodates an access device.

3.5 End rail

A lateral component, fastened between a pair of structural uprights.

3.6 Gap

An opening bounded either by solid components of a bunk bed (see A in Figure 2) or by solid components of the bunk bed and a straight imaginary boundary joining solid components in such a manner as to result in a maximum bounded area (see B in Figure 2).

3.7 Grip

A component with a dimension that allows a child's hand to securely grip the component for support (see Figures 3A and 3B).

3.8 Guardrail

A component of the bunk bed intended to prevent an occupant from falling off the bed.

3.9 Sharp edge

An edge that fails the appropriate test specified in Clause 5.10.

3.10 Sharp point

A point that fails the appropriate test specified in Clause 5.10.

3.11 Mattress base

The surface on which the mattress is supported.

3.12 Side rail

A longitudinal component, fastened between a pair of structural uprights (e.g. corner posts) by which the mattress base may be supported.

3.13 Structural uprights

Components to which other components such as the end and side rails are fastened to form a rigid structure. The structural uprights are intended to support the mass of the bunk bed and its contents (including the occupants).

NOTE: A common type of structural upright is the corner post as shown in Figure 1.

3.14 Tread

A step or rung of a ladder or other structure designed for climbing.

4 MATERIALS

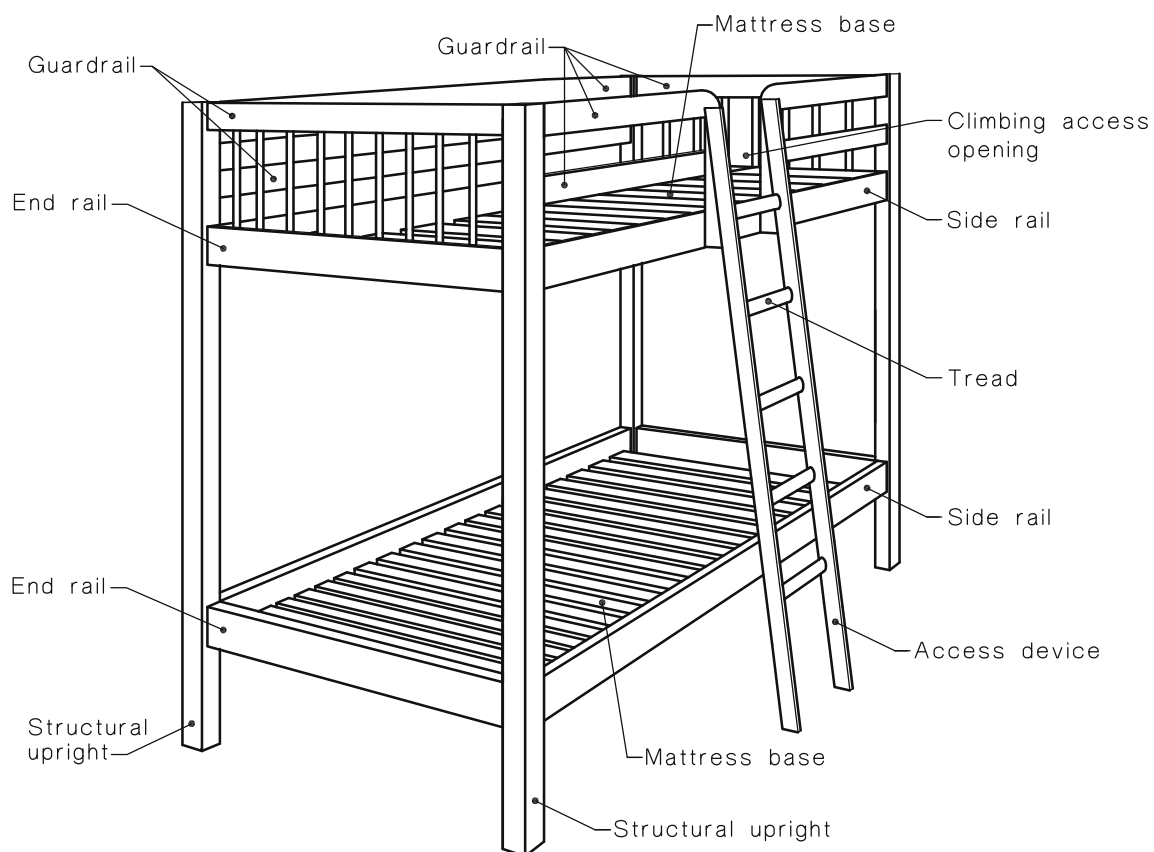
4.1 Timber

Timber used in bunk beds shall not contain splinters, loose knots, compression failures, pith or reaction wood as defined in AS/NZS 4491 and shall be free from decay and insect attack, which would affect its safe handling or structural integrity and free from the addition of preservatives chemicals such as copper chrome arsenate (CCA).

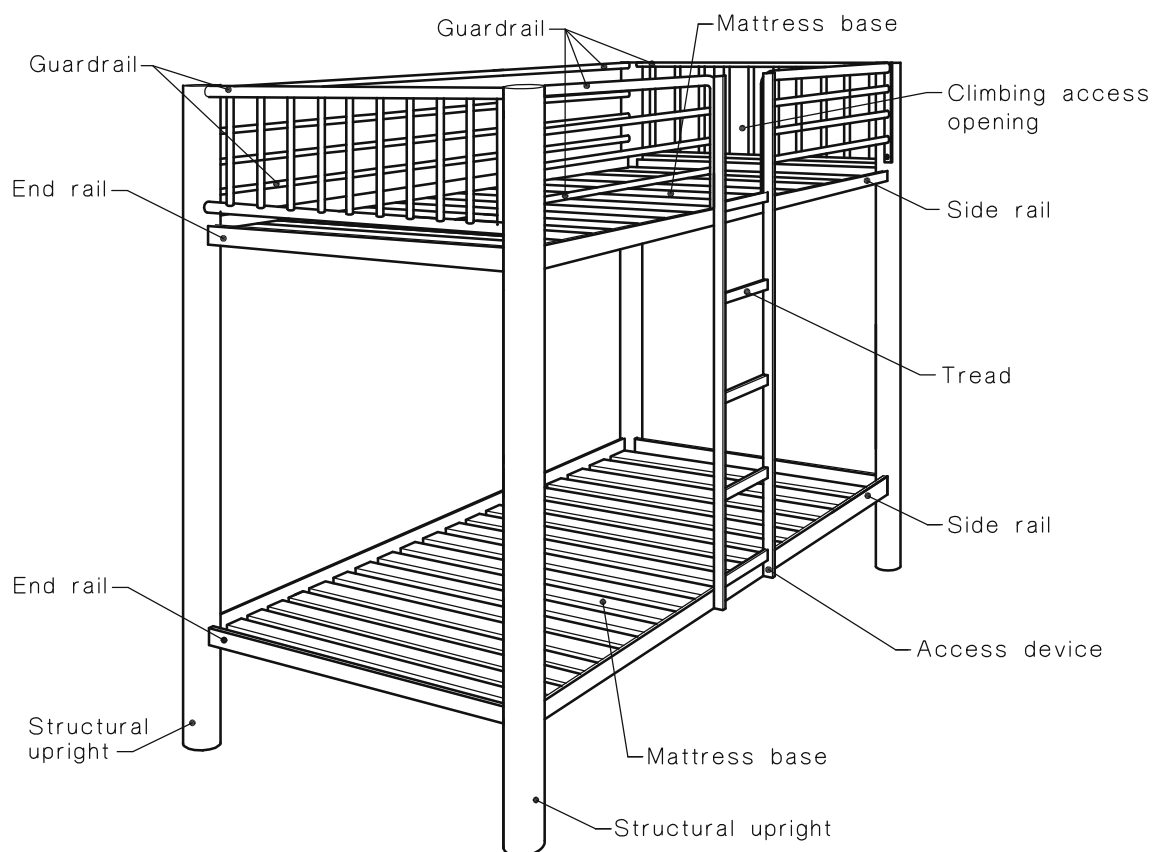
NOTE: It is recommended that the moisture content not exceed 13%. High moisture content can cause adhesive failure and excessive shrinkage, which would affect the structural integrity of the bunk.

4.2 Metals

All exposed metal components, including springs, nuts, bolts, and washers, shall be either made of corrosion-resistant material or be protected against corrosion.



(a) An example of a timber bunk bed



(b) An example of a metal bunk bed

FIGURE 1 BUNK BEDS

COPYRIGHT

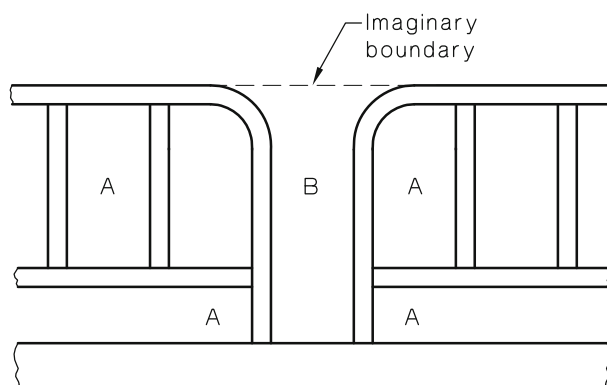


FIGURE 2 TYPICAL GAPS (see Clause 3.6)

4.3 Coatings and plastics components

All coatings and plastics components shall comply with the relevant toxicological requirements specified in AS/NZS ISO 8124.3.

5 CONSTRUCTION

5.1 General

The following requirements apply:

- (a) All components of the bunk bed intended by the manufacturer to remain permanently fixed shall be fastened so that they either cannot be disassembled or they require the use of a tool to enable partial or total disassembly.
- (b) All joints shall be close fitting.
- (c) Welds, where present, shall be smooth and free from flux, slag and spatter.

5.2 Fasteners

All fasteners (e.g. screws, nails, dowels, nuts, bolts) shall be fastened so that they are flush, recessed, domed or otherwise suitably finished relative to their surrounding components, and shall not present any sharp points, sharp edges or snag hazards.

5.3 Play and other integrated features

Bunk beds shall not be designed with play features unless those features are located at a height above the floor that is less than 700 mm. When present, play features located at a complying height shall also comply with all relevant Australian/New Zealand Standards, including AS/NZS ISO 8124 series and AS 4685 series.

All additional built-in features supplied with the bed, e.g. desks, workstations, cupboards, shelves, drawers, and similar, shall be subject to the requirements of this Standard.

5.4 Maximum height

The maximum height of a bunk bed having—

- (a) an upper bed supported over a lower bed shall not exceed 1350 mm, as measured by the vertical distance between the floor and the upper surface of the mattress base; or
- (b) an elevated bed supported over a play area, furniture (e.g. a workstation) or other feature, shall not exceed 1450 mm, as measured by the vertical distance between the floor and the upper surface of the mattress base.

NOTES:

- 1 Although it was recognized that increasing the permissible height of a bunk bed increases the risk of serious injury, the increased height in Item (b) was allowed because these types of bunks are intended for an older child (see Clause 8.1(c)) where the fall-out hazard is reduced. The increased height was considered necessary to enable the space below the elevated bed to be functional bearing in mind the height of an older child.
- 2 Designers are encouraged to keep the overall height as low as possible.

5.5 Minimum distance between beds

Where a bunk bed has an upper bed supported over the lower bed so that their mattress bases are in parallel alignment, the vertical distance between the upper surface of the lower mattress base and the lower surface of the upper mattress base shall be at least 750 mm.

NOTE: This requirement does not apply if the mattress bases are above one another but transversely aligned or longitudinal aligned but off-set by at least half the length of the lower bed.

5.6 Mattress support elements (mattress base components)

All components of the bunk bed that are used to support or constrain a mattress shall be so fixed that they shall not be capable of lateral or vertical movement by more than 5 mm from their intended positions at joints or fixing points under the application of a force of 500 N in any direction at or near the joint.

NOTE: The purpose of this requirement is to ensure that mattress supports, e.g., slats, cannot be slid or lifted out of place.

5.7 Safety barriers**5.7.1 General**

Any bunk bed in which the upper surface of the mattress base is 700 mm or more above the floor shall have guardrails that form a roll-out protection on all sides of the bed.

5.7.2 Guardrails

The following requirements and recommendations apply to guardrails:

- (a) The guardrails may be permanently fixed to the bunk bed structure or attached in such a manner as to allow temporary removal and replacement. If a guardrail is detachable, it shall be incapable of removal by a force of 500 N applied to the guardrail in any direction.

If guardrails are detachable, they shall be attachable in only the correct position, ensuring compliance with Clause 5.7.2(b)(ii).

NOTE: Although the above requirement is intended to ensure that a child cannot easily detach the guardrail, it does not imply that it cannot be easily detached by an adult. For example, the guardrail could be attached by two fastening devices that require simultaneous operation to detach it. The fastening devices could then be spaced an adult's arm span apart, in order to prevent a child detaching the guardrail. Alternatively, such fastening device could be so positioned that it is inaccessible to a child who is occupying the bed.

If fastening devices are used, the minimum force or torque required to operate the devices shall be as follows:

- (i) Push or pull force. 70 N.
 - (ii) Hand-hold twist. 2 Nm.
 - (iii) Finger and thumb twist. 0.5 Nm.
- (b) The following apply to access openings in the guardrail, climbing access openings in the guardrail, and climbing devices that may be used to access these openings:

- (i) At least one climbing access opening shall be provided for climbing access to the bed. It shall be located directly above an access device (ladder, steps or other means of climbing). Access devices shall comply with Clause 5.8. Climbing access openings shall have a minimum width of 300 mm and a maximum width of 400 mm, at all heights up to 360 mm above the mattress base. They may open to more than 400 mm at heights above 360 mm but shall attain full height within a distance not more than 200 mm from the point of minimum access width (see Figure 4).
- (ii) To aid safe access to and egress from the elevated bed climbing access openings shall have hand holds of cross-sectional dimension in the range 19–39 mm (see Figure 3A), on both sides. These hand holds may also be in the form of transition grip aids on both sides (see Figure 3B). Transition grip aids shall allow full circumferential grip and have diagonal dimensions in the range 19–39 mm.
- (iii) Additional access openings may be provided for entering or servicing the bunk bed. These may or may not be accompanied by a climbing access device. If they are, or are intended to be, accompanied by a climbing access device they shall comply to the dimensional requirements specified in 5.8.2(b)(i). If they are not intended to be accompanied by a climbing access device they shall comply with the entrapment hazard provisions of this Standard and shall not be greater in width than 400 mm (see also Figure 2).
- (iv) Because access openings and climbing access openings represent discontinuities in the guardrails and reduce the effectiveness of roll-out protection, the number of such openings should be kept to a minimum. The maximum number of openings shall be four in total. There shall be a maximum of two per side rail and one per end rail. Openings in side rails shall not be closer than 600 mm to other openings in side rails. Where an end opening is continuous with a side opening it is to be treated as a single opening and measured across its diagonal. In terms of the requirements concerning the maximum number of openings per side, an end opening that is continuous with a side opening shall be counted as forming an opening on the side to which it predominantly belongs.

NOTE: In the event that the plan form of a bunk is not of a typical oblong style then discretion may be exercised in the application of this clause. For example, a double bunk that is approximately square in plan may be allowed two access openings along the end rail and along the side rail. In this, or similar cases, the requirement that there be no more than four openings in total still applies.

- (c) The minimum vertical distance between the upper surface of the guardrail and the upper surface of the mattress base, shall be not less than 360 mm (see Figure 4).
- (d) When tested in accordance with the appropriate steps in Appendix A, except for those gaps allowed by Clause 5.7.2(b), any gap formed within the guardrail itself shall not allow the passage of the 95 mm diameter probe.

NOTE: See Clause 6.1 for entrapment hazards

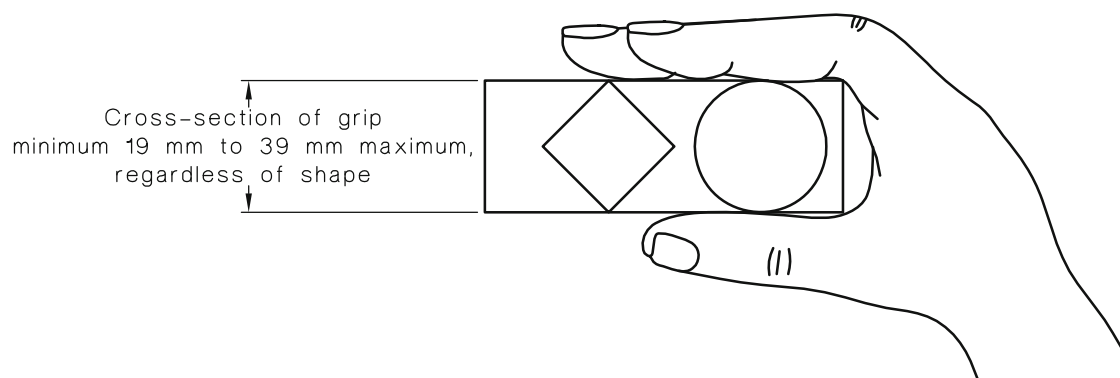


FIGURE 3A GRIP

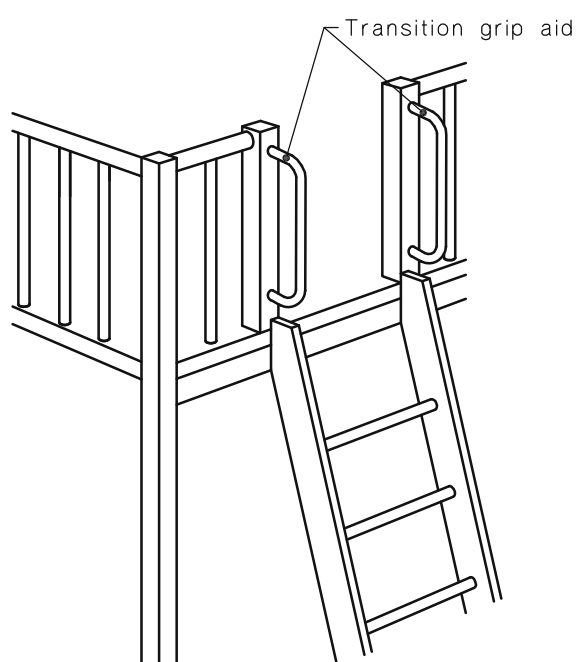
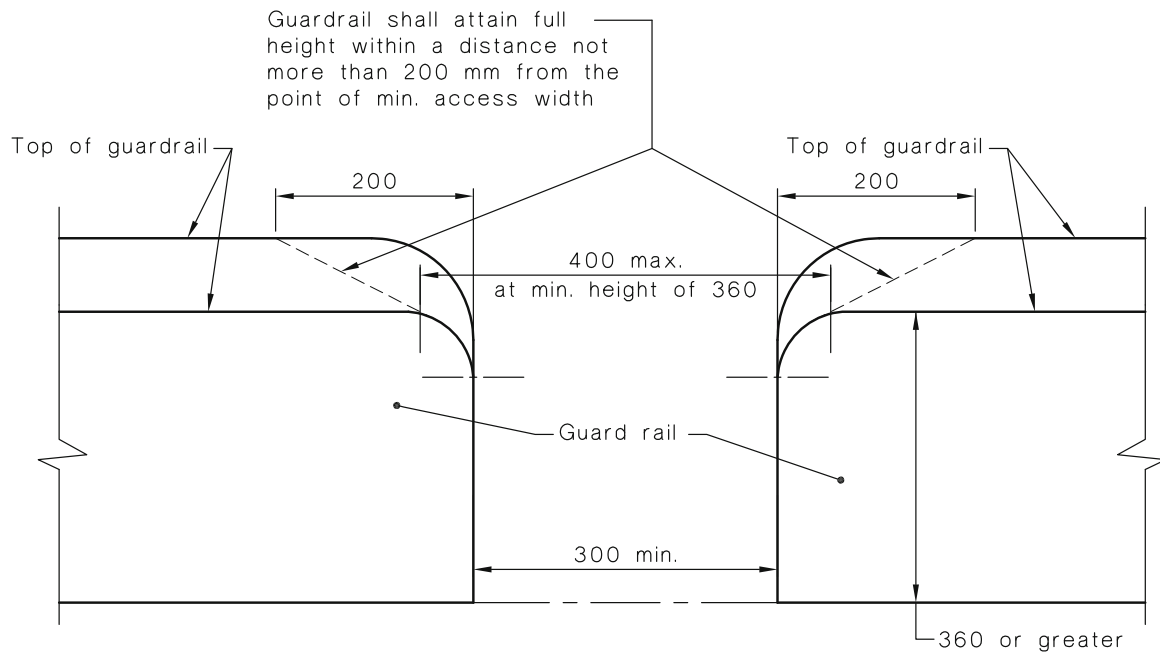


FIGURE 3B TRANSITION GRIP AID



DIMENSIONS IN MILLIMETRES

FIGURE 4 DETAILS OF CLIMBING ACCESS OPENING AND GUARDRAILS

5.8 Climbing access

5.8.1 General

The following requirements apply:

- An access device shall be provided for any bunk bed. The access device shall lead to an opening in the guardrail as defined in Clause 5.7.2(b).
- Rung-type ladders shall have rungs and stiles, or handrails, that conform to the requirements for grip in accordance with Clause 5.8.3. Step-type ladders shall have handrails that conform to the requirements for grip in accordance with Clause 5.8.3.
- A straight rung-type ladder shall be inclined at an angle between 65 and 90 degrees to the horizontal, with a preferred incline between 70 and 75 degrees. A straight step-type ladder shall be inclined at an angle between 60 and 65 degrees to the horizontal.
- An access device shall be positioned or positionable such that any gap between it and other components of the bed conform to Clause 6.1.
- Where the access device is not an integral part of the bed construction it shall be attached to the bed sufficiently well to meet the requirements of Appendix H.

5.8.2 Rungs and steps ('Treads')

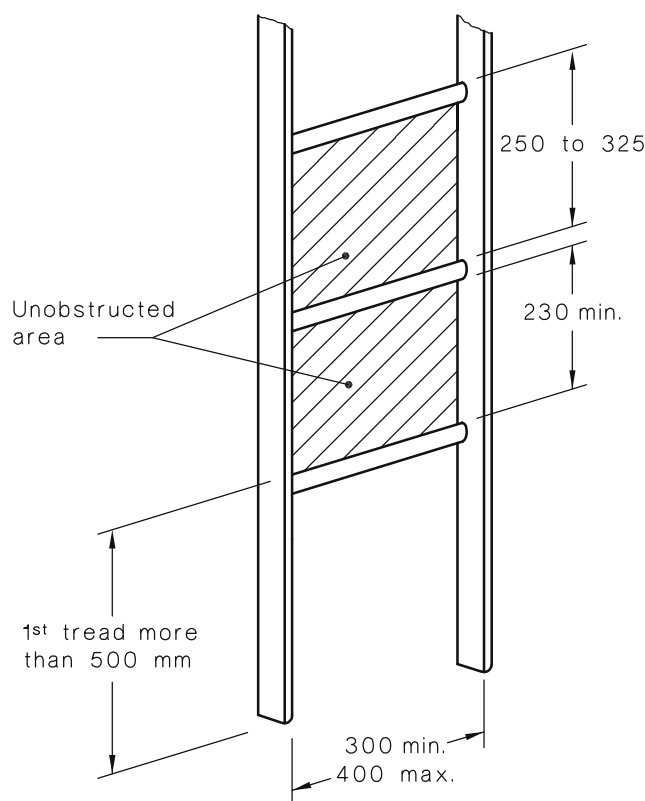
Treads shall—

- be non rotating and spaced so that the upper surfaces of two successive treads is equally spaced within a tolerance of ± 20 mm;
- be spaced so that the upper surfaces of two successive treads is within the range of 250–325 mm (see Figure 5);
- where they are rungs, only be spaced so that the distance between the upper surface of the tread and the underside of the next tread above is at least 230 mm (see Figure 5);
- where they are rungs, only be unobstructed within the space of the upper surface of a tread and the underside of the next tread above.

- (e) where they are steps, there shall be no obstruction within the space between the upper surface of a tread and the underside of the next tread above, other than the vertical panel between step levels;
- (f) be spaced so that the unobstructed step depth is at least 90 mm. The depth of step treads shall be at least 90 mm.
- (g) be horizontal to within ± 3 degrees and have a useable width of at least 300 mm (see Figure 5); and
- (h) be at least 500 mm above the floor.

NOTE: This Clause is intended to discourage under age children from gaining access to an elevated position.

In-built drawers shall not be included in the vertical panels risers between the step levels, unless those drawers are self closing.



DIMENSIONS IN MILLIMETRES

FIGURE 5 ACCESS DIMENSIONS

5.8.3 Grip for access devices

The rungs and stiles, or handrails, of rung type access devices (i.e. ladders), shall be designed such that at least one dimension, either depth, thickness or diameter, does not exceed 39 mm, to enable a child to firmly grip them. Step type access devices (i.e. stairs) shall have handrails on either side that also have at least one dimension of the handrail—width, thickness or diameter—that does not exceed 39 mm.

5.9 Tube end openings

All openings at the ends of tubes shall be suitably capped or plugged.