

Australian/New Zealand Standard™

Furniture — School and educational

**Part 3: Storage furniture — Strength,
durability and stability**



AS/NZS 4610.3:2020

This Joint Australian/New Zealand Standard™ was prepared by Joint Technical Committee CS-088, Furniture – Domestic & Commercial. It was approved on behalf of the Council of Standards Australia on 10 March 2020 and by the New Zealand Standards Approval Board on 4 March 2020.

This Standard was published on 20 March 2020.

The following are represented on Committee CS-088:

- Australasian Furnishing Association
- Australian Chamber of Commerce and Industry
- Furniture and Cabinetmaking Association of New Zealand
- Furntech — Australasian Furnishing Research & Development Institute
- Human Factors and Ergonomics Society of New Zealand
- National Retail Association
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This Standard was issued in draft form for comment as DR AS/NZS 4610.3:2019.

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ISBN 978 1 76072 781 9

Australian/New Zealand Standard™

Furniture — School and educational

Part 3: Storage furniture — Strength, durability and stability

Originated as AS/NZS 4610.3:1999.
Revised and republished as AS/NZS 4610.3:2020.

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Preface

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee CS-088, Furniture — Domestic and Commercial, to supersede AS/NZS 4610.3:1999, *Furniture — School and educational, Part 3: Tables and storage furniture — Strength, durability and stability*.

The objective of this Standard is to provide educational authorities, purchasers, specifiers, users, manufacturers and consumers with requirements for school and educational storage furniture that specifies strength, durability and stability requirements to assist in selection and evaluation.

This Standard is Part 3 of the AS/NZS 4610 series consisting of the following:

AS/NZS 4610.1, *Furniture — School and educational, Part 1: Tables — Strength, durability and stability*

AS/NZS 4610.2, *Furniture — School and educational, Part 2: Chairs — Strength, durability and stability*

AS/NZS 4610.3, *Furniture — School and educational, Part 3: Storage furniture — Strength, durability and stability* (this Standard)

The major changes in this edition are as follows:

- (a) Tests for hanging rails, locks, totes, dynamic stability and castors have been added.
- (b) A formaldehyde emissions requirement has been added for materials used in construction.
- (c) The use of size marks to determine test levels for storage furniture has been considered inappropriate and have been replaced with test levels of either “Normal” or “Severe”.

The terms “normative” and “informative” are used in Standards to define the application of the appendix to which they apply. A “normative” appendix is an integral and mandatory part of the Standard, whereas an “informative” appendix is only for information and guidance.

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Australian/New Zealand Standard

Furniture — School and educational

Part 3: Storage furniture — Strength, durability and stability

Section 1 Scope and general

1.1 Scope

This Standard specifies strength, durability and stability requirements for free standing storage furniture for use in educational institutions.

Storage furniture includes items such as, cupboards, bookcases, shelving units, bag and tote storage units and lockers, magazine racks, teaching units, and trolleys. Storage furniture may be static or mobile.

Storage furniture may be fully assembled or require full or partial assembly.

The following are not covered by this Standard:

- (a) Wall mounted units, specialized library shelving units, filing cabinets, lecterns and similar items.
- (b) Electrical conformance, power and cable management.
- (c) Components made of glass.

NOTE Testing of glass is not covered in this Standard.

1.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document.

NOTE Documents referenced for informative purposes are listed in the Bibliography.

AS ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO 48-4, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

ISO 48-5, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 5: Indentation hardness by IRHD pocket meter method*

1.3 Terms and definitions

For the purpose of this Standard the following definitions apply.

1.3.1

accuracy

degree of closeness to the true value or the specified value of whatever dimension is being measured, or force applied

1.3.2

clear space

internal height of a drawer defined by the height of a box that just allows the drawer to be closed

1.3.3 damper

component or function of a component that absorbs energy and cushions the opening or closing of a door, drawer or flap

Note 1 to entry: See also *self-closing devices* ([1.3.21](#)), *self-assist closing device* ([1.3.22](#)), *self-opening devices* ([1.3.23](#)) and *self-assist opening device* ([1.3.24](#)).

1.3.4 deflection

maximum displacement of a component measured under load at the time specified in the test

Note 1 to entry: The residual or permanent effect of the load or forces applied is deformation.

1.3.5 deformation

permanent change in shape or size due to the application of loads or forces

1.3.6 drawer

box like storage compartment without a lid and made to slide horizontally in and out of a unit with the aid of a runner and fitted with an out-stop

Note 1 to entry: See also *tote* ([1.3.32](#)) and *pencil drawer* ([1.3.16](#)).

1.3.7 durability loading

reiterated application to the unit in a steady and gradual manner, of the load which is likely to occur most frequently

1.3.8 extendible member

flat or near flat shelf-like component that slides in and out of a unit with the aid of a runner and fitted with an out-stop

1.3.9 flap

door hinged at either the top or bottom that is opened by pulling up from the bottom or down from the top

1.3.10 guide

channel or similar in or on which a tote slides for storage and removal from a unit

1.3.11 headroom

an unrestricted space of less than 1 050 mm above the floor of the unit

Note 1 to entry: See also *unrestricted headroom* ([1.3.35](#)).

1.3.12 internal volume

volume of a drawer defined by the size of a box that touches both sides, both ends and a height that just allows the drawer to be closed

1.3.13 lock

device that prevents a latch from opening without a key, code or similar

1.3.14**latch**

an automatic or manual device that keeps a door, drawer or flap in an open or closed position, but not locked

Note 1 to entry: An automatic latch requires a force in the direction of travel to actuate.

Note 2 to entry: A manual latch requires at least one hand motion in other than the direction of travel to actuate.

Note 3 to entry: Gas struts are not considered as latches.

1.3.15**out-stop**

physical stop that prevents a drawer or extendible member from being fully removed from its track accidentally

Note 1 to entry: See also *tote-stop* ([1.3.33](#)).

1.3.16**pencil drawer**

drawer with a clear space height of between 20 mm and 50 mm and a functional load at “Normal” level as specified in [Table 7.2\(B\)](#) of less than 4 kg

Note 1 to entry: Unless otherwise stated, test pencil drawers as drawers.

Note 2 to entry: See also *tote* ([1.3.32](#)) and *drawer* ([1.3.6](#)).

1.3.17**precision**

degree to which repeated measurements show the same results

Note 1 to entry: Precision is usually expressed as a $\pm$ % about the true value or the specified value of whatever dimension is being measured, or force applied.

1.3.18**roll front — horizontal**

vertically mounted segmented door that is pulled horizontally to close and pushed horizontally to open

Note 1 to entry: A horizontal roll front is usually guided in horizontally mounted tracks at the top and bottom of the door.

1.3.19**roll front — vertical**

horizontally mounted segmented door on a roller that is raised to open and lowered to close

Note 1 to entry: A vertical roll front is usually guided in vertical tracks at each side of the door.

1.3.20**runner**

device to facilitate fluid motion during opening and closing of a drawer or extendible member

Note 1 to entry: A runner often incorporates an out-stop.

1.3.21**self-closing device**

component or function of a component that closes a door, drawer or flap without assistance from a partially or fully open position

Note 1 to entry: Self-closing devices incorporate a damper at the point of activation.

1.3.22**self-assist closing device**

component or function of a component that assists in closing a door, drawer or flap from a partially or fully open position

Note 1 to entry: Self-assist closing devices do not incorporate a damper.

1.3.23**self-opening device**

component or function of a component that partially or fully opens a door, drawer or flap without assistance

Note 1 to entry: Self-opening devices may incorporate a damper.

1.3.24**self-assist opening device**

component or function of a component that assists in opening a door, drawer or flap from a partially or fully open position

Note 1 to entry: Self-assist opening devices may incorporate a damper.

1.3.25**shall**

indicates that a statement is mandatory

1.3.26**should**

indicates a recommendation

1.3.27**sliding door**

door that is opened or closed by sliding sideways

Note 1 to entry: This door usually slides in or is suspended from a guide track at the top and bottom.

1.3.28**stability**

ability of a unit to withstand overturning when forces are applied to it

1.3.29**static loading**

steady and gradual application of a load, up to the maximum that the unit may be required to withstand, and repeated a sufficient number of times to test the strength of the unit

1.3.30**teaching unit**

mobile unit that incorporates a whiteboard, display board or similar at the top, a storage area at the bottom, and often additional storage at the back

1.3.31**tolerance**

allowable difference from a specified value

Note 1 to entry: Tolerances may be expressed as values or percentages.

1.3.32**tote**

tub or tray similar to a drawer in which goods are intended to be stored and transported from place to place

Note 1 to entry: The tub or tray is often made from plastic.

Note 2 to entry: See also *drawer* (1.3.6).

1.3.33

tote-stop

physical impediment that restricts a tote from coming off its track or guide accidentally but allows for easy removal of the tote

Note 1 to entry: See also *out-stop* (1.3.15).

1.3.34

unit

any fully assembled test item covered by the scope of this Standard

1.3.35

unrestricted headroom

unrestricted space of 1 050 mm or greater between the floor of the unit and the next component above the floor

1.4 General

1.4.1 Testing laboratories

Other than the requirements for measurement uncertainty, laboratories that perform the tests outlined in this Standard shall meet the requirements of AS ISO/IEC 17025.

NOTE For example, accreditation bodies which are signatories to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA) for testing laboratories are able to offer accreditation against the requirements of AS ISO/IEC 17025. A listing of ILAC signatories is available from the ILAC website (www.ilac.org). In Australia and New Zealand, the National Association of Testing Authorities (NATA) and International Accreditation New Zealand (IANZ) are signatories to the ILAC MRA.

1.4.2 Materials

Storage units shall be assessed without regard to material types used in manufacture.

1.4.3 Units requiring assembly

Units shall be tested as supplied. Where units are supplied other than fully assembled, clear and comprehensive assembly instructions shall be provided. The unit shall be assembled in accordance with the instructions. If instructions allow the furniture to be assembled in different ways, the method determined most adverse shall be used. Fastenings shall not be retightened once testing has commenced.

Only fully assembled items shall be tested.

1.4.4 Units attached to floor or wall

Where units are recommended to be attached to the floor or wall they shall be supplied with all necessary hardware and instructions to complete the attachment to the unit. The instructions shall also include minimum guidance on suitable attachment methods to either or both the floor and wall. Units shall be tested in their freestanding condition, ie without attachments.

1.4.5 Formaldehyde emissions

Composite or engineered wood products, used in the construction of the unit, shall have a formaldehyde emission class equal to or better than E1 (or equivalent from an alternative standard).

NOTE Examples of composite or engineered wood products are, but not limited to, plywood, particle board, MDF and compact laminate. Table 1.4.5 includes relevant standards for procedures and requirements but is not an exhaustive list of applicable standards.

Table 1.4.5 — Formaldehyde emissions from composite or engineered wood products

Composite wood product	Standard for testing procedure	Standard for formaldehyde emission requirement
Plywood, laminate and veneer products	AS/NZS 2098.11	E1 Class in accordance with AS/NZS 2269.0
Particleboard and other board products	AS/NZS 4266.1 ^a	E1 Class in accordance with AS/NZS 1859.1
Dry processed fibreboard products	AS/NZS 4266.1 ^a	E1 Class in accordance with AS/NZS 1859.2
^a Refer to Section 17, Formaldehyde emission — Desiccator method.		
NOTE E1 class formaldehyde emissions are less than those emitted by a material classed as E2, but higher than those emitted by a material classed as E0 or Super E0.		

1.4.6 Test levels

One of the following two test levels shall be used:

- (a) “Normal” — For everyday use in supervised environments.
- (b) “Severe” — Where an increased level of strength and durability may be required or in unsupervised environments where a level of misuse may occur.

NOTE In strength and durability testing the forces and/or cycles used at severe level will typically be 25 % greater than those used at normal level.

1.4.7 Accuracy and precision

Unless otherwise stated, all forces shall have an accuracy of ± 2 % and a precision of ± 5 %, that is, all force application devices shall be initially set to apply ± 2 % of the specified value and all subsequent applications of force shall fall within ± 5 % of the specified value. All masses shall have an accuracy of ± 2.0 %. All dimensional measuring instruments shall have an accuracy of ± 1 mm. All angular measuring instruments shall have an accuracy of $\pm 1^\circ$.

1.4.8 Loads, forces and application rates

In strength tests, unless otherwise stated, the loads or forces shall be applied for between 10 s and 15 s per application. There shall be negligible impact force.

In durability testing, unless otherwise stated, the rate of application shall be 10 ± 2 cycles per min. Forces shall be maintained for 2 ± 1 s. The forces shall be applied sufficiently slowly to ensure kinetic heating does not occur.

All loads and forces shall be applied using equipment that does not inhibit the natural deformation of the component under the action of those loads and forces.

Where used, all loading pads shall be capable of pivoting in relation to the direction of the applied force. The pivot point shall be as close as practically possible to the load surface.

1.4.9 Test conditions

Testing shall be carried out in indoor ambient conditions between 15 °C and 30 °C.

1.4.10 Test samples

Units shall be a minimum of 4 weeks old before commencement of testing.

1.4.11 Order of testing

The applicable tests in [Sections 4](#) and [5](#) shall be performed in clause sequence and on the same unit unless otherwise stated.

However, to reduce testing time, durability tests can be carried out on more than one feature at a time as long as one test could not be considered to affect the result of the other, e.g. door and drawer durability tests. In such cases the requirement to perform the tests in clause sequence may be ignored.

Where a unit is fitted with a number of flaps, drawers, doors or shelves that are identical in every respect apart from the direction of opening and closing, it will only be necessary to test one of each shelf, drawer, flap and similar as a representation of the other(s).

For components that have a dual function it shall be necessary to test each function on the same component. For example, a shelf that can be pulled out on runners, shall be tested for shelves as well as the wear and durability tests for drawers and runners.

Section 2 General inspection and failure criteria

2.1 Pre and post test inspection

Prior to the commencement of testing and after each test, units shall be inspected and any of the following attributes noted:

- (a) Significant fractures or cracks.
- (b) Significant deformation that adversely affects its appearance or function.
- (c) Significant impairment of the operation of any mechanical part.
- (d) Loose joints intended to be tight.
- (e) Movable parts that do not open or close freely, or catches that do not operate smoothly.
- (f) Significantly loosened or dislodged screws.

2.2 Failure criteria

After each test, any product that fails to meet the specific requirements of that test (specified in [Sections 4](#) and [5](#)), or exhibits any of the attributes listed in [Clause 2.1](#), shall be determined to have failed that test.

Section 3 Test report

The test report shall include, at a minimum, the following:

- (a) Name and address of the test facility.
- (b) Date of completion of testing.
- (c) Reference to this Standard, i.e. AS/NZS 4610.3.
- (d) Details of the unit being tested and a minimum of one image.
- (e) Test level of “Normal” or “Severe” as applicable.
- (f) Details of any deviations from this Standard.
- (g) Results of the tests conducted.

Section 4 Strength and durability performance requirements

4.1 General

Where certain designs and features of units are not explicitly covered in the test procedures of this Standard, the intent of the tests should be carried out as far as possible as described and deviations from the test procedure included in a test report.

4.2 Tests for shelves and horizontal surfaces

When tested in accordance with [Appendix A](#), the shelf or horizontal surface shall not show any of the following specific failure criteria:

- (a) *Retention of shelves test* — The shelf shall not become detached from any of the supports.
- (b) *Strength and displacement of shelves and shelf supports test* — The supports shall not fully dislodge. The shelf at any of the support points shall not be displaced by more than 3 mm from the original position.
- (c) *Deflection of shelves test* — The loaded deflection of shelves or horizontal surfaces shall not exceed span in (mm) divided by 150. In addition, the shelf or horizontal surface shall not show permanent deformation in excess of span in (mm) divided by 250.

4.3 Tests for pivoted doors

Pivoted doors shall be tested in accordance with [Appendix B](#).

4.4 Tests for sliding doors and horizontal roll fronts

Sliding doors and horizontal roll fronts shall be tested in accordance with [Appendix C](#).

4.5 Tests for vertical roll fronts

Vertical roll fronts shall be tested in accordance with [Appendix D](#).

4.6 Tests for top and bottom pivoted flaps

Top and bottom pivoted flaps shall be tested in accordance with [Appendix E](#).

4.7 Tests for drawers and extendible members

Drawers and extendible members shall be fitted with an out-stop.

When tested in accordance with [Appendix F](#), the drawer or extendible member shall not show any of the following specific failure criteria:

- (a) *Strength of drawers and runners test* — The drawer shall be capable of accepting the required force and remain within, or attached to, the runners.
- (b) *Slam shut and open tests* — The drawer shall not override the out-stop.
- (c) *Durability of drawers and runners test* — The force required, before and after the test, to open and close the loaded drawer or extendible member shall not exceed 50 N.

4.8 Tests for totes

When tested in accordance with [Appendix G](#) the tote shall run freely in the runners or guides when replaced in a unit.

4.9 Tests for strength of unit

The strength of the unit shall be tested in accordance with [Appendix H](#).

4.10 Strength and deflection of hanging rails

When tested in accordance with [Appendix I](#), the unit shall not show any of the following specific failure criteria:

- (a) *Strength and dislodgement test* — Rail shall not dislodge.
- (b) *Deflection, deformation and dislodgement test:*
 - (i) Loaded deflection shall not exceed 5 mm or 0.75 % of the distance between supports, whichever is the greater.
 - (ii) Permanent deformation shall not exceed 2 mm or 0.25 % of the distance between supports, whichever is the greater.
 - (iii) Rail shall not dislodge from the supports.

4.11 Lock and latch tests

When tested in accordance with [Appendix J](#), the unit shall not show any of the following specific failure criteria:

- (a) *Strength of locks and latches test* — At the conclusion of the test, doors, flaps and drawers shall remain closed. The lock or latch shall be undamaged and function as intended.
- (b) *Durability of locks test* — At the conclusion of the test, the lock shall remain undamaged and functional.

4.12 Castors and wheels test

Castors shall be tested in accordance with [Appendix K](#).

Section 5 Stability performance requirements

5.1 Unloaded horizontal impact test

When tested in accordance with [Appendix L](#), the unit shall not overturn.

5.2 Vertical stability tests for an unloaded unit

When tested in accordance with [Appendix M](#), the unit shall not overturn.

5.3 Overturning test for a loaded unit

When tested in accordance with [Appendix N](#), the unit shall not overturn.

5.4 Dynamic stability for units with castors or wheels

When tested in accordance with [Appendix O](#), the unit shall not overturn.

Section 6 Labelling and markings

Each unit shall be clearly and durably marked or have a durable label attached to show at least the following information:

- (a) The Standard to which it was tested, i.e. AS/NZS 4610.3.
- (b) The test level of “Normal” or “Severe” as applicable.

Section 7 Strength and durability summary tables

7.1 General

Where designs and features of units are not explicitly addressed in the test procedures, the intent of the tests shall be carried out as far as possible as described and deviations from the test procedure included in the test report.

7.2 Test loads, forces and and cycle requirements

Tables 7.2(A) to 7.2(D) specify the following:

- (a) Requirements for strength and durability tests for units.
- (b) Loads applied to components other than the component being tested.
- (c) Loads applied to components being tested.
- (d) Steel impact plates.

These are referenced in [Appendices A](#) to [K](#).

Table 7.2(A) — Requirements for strength and durability tests

Clause	Title of test	Test units	Test level	
			Normal	Severe
A.4.2	Retention of shelves on shelf supports	Force (N)	50	60
A.4.4	Strength of top and bottom surfaces	Force (N)		
	Top surface less than 1 050 mm above floor		1 000	1 250
	Top surface 1 050 mm or greater above floor		400	500
	Bottom surface with headroom of less than 1 050 mm		550	700
	Bottom surface with unrestricted headroom		1 000	1 250
B.4.1	Strength of pivoted doors	Kilograms (kg)	30	37.5
B.4.2	Slam shut of pivoted doors	Force (N)	20	25
B.4.2	Slam shut of pivoted doors	Cycles	400	500
B.4.3	Slam open of pivoted doors	Force (N)	20	25
B.4.3	Slam open of pivoted doors	Cycles	400	500
B.4.4	Durability of pivoted doors	Cycles	80 000	100 000
C.4.1	Slam shut/open of sliding doors/roll fronts	Kilograms (kg)	4.0	5.0
C.4.1	Slam shut /open of sliding doors/roll fronts	Cycles	400	500
C.4.2	Durability of sliding doors/roll fronts	Cycles	80 000	100 000
D.4.1	Slam shut of vertical roll fronts	Cycles	400	500
D.4.2	Durability of vertical roll fronts	Cycles	40 000	50 000
E.3.2.1	Strength of bottom pivoted flaps	Force (N)	250	310
E.3.2.2	Slam open of bottom pivoted flaps	Cycles	400	500
E.3.2.3	Durability of bottom pivoted flaps	Cycles	40 000	50 000
E.4.2.1	Slam shut of top pivoted flaps	Cycles	400	500
E.4.2.2	Slam open of top pivoted flaps by powered devices	Cycles	400	500
E.4.2.3	Durability of top pivoted flaps	Cycles	40 000	50 000
F.4.1	Strength of drawers and runners (other than pencil drawers)	Force (N)	300	375
	Pencil drawers		100	125

Table 7.2(A) (continued)

Clause	Title of test	Test units	Test level	
			Normal	Severe
E.4.2	Slam shut of drawers	Cycles	400	500
E.4.3	Slam open of drawers	Cycles	400	500
E.4.4	Durability of drawers and runners	Cycles	80 000	100 000
G.5.1	Tote durability test	Cycles	20 000	25 000
G.5.3	Strength of tote — end supported	Force (N)	100	125
G.5.4	Tote drop test	Height (mm)	800	1 000
H.3.2	Racking strength of unit test	Force (N)	400	500
I.3.1	Strength of attachment points and rail dislodgement	Kilograms (kg)/metre (m)	50	62.5
I.3.2	Strength, deformation and dislodgement of rails	Kilograms (kg)/metre (m)	40	50
I.3.1	Strength of locks and manually actuated latches	Force (N)	240	300
I.3.2	Durability of key locking mechanisms	Cycles	8 000	10 000
K.3	Castor and wheel test	Cycles	3 000	4 000

Table 7.2(B) — Loads applied to components other than the component being tested

Component	Load unit	Test level	
		Normal	Severe
Horizontal surfaces, shelves and similar	kg/dm ²	1.0	1.25
Drawers, totes, extendible elements and door baskets	kg/dm ³ internal volume	0.3	0.375
Suspended pocket file fittings	kg/100 mm length	1.25	1.5

Table 7.2(C) — Loads applied to components being tested

Component	Load unit	Test level	
		Normal	Severe
Horizontal surfaces, shelves, extendible members and similar	kg/dm ²	2.0	2.5
Drawers, totes, and door baskets	kg/dm ³ internal volume	0.6	0.75
Suspended pocket file fittings	kg/100 mm length	2.5	3.1

Table 7.2(D) — Steel impact plates

Parameter	Unit	Test level	
		Normal	Severe
Mass	kg	1.7	2.1
Approximate depth	mm	109	135
Approximate thickness	mm	10	10
Height	mm	200	200
The impact surface shall be faced with 2 ± 0.25 mm thick rubber with a hardness of 85 ± 10 Shore A or IRHD in accordance with ISO 48-4 (Shore) or ISO 48-5 (IRHD).			

Appendix A (normative)

Tests for shelves and horizontal surfaces

A.1 Principle

The horizontal surfaces of units, including shelves and their supports, are subjected to static loads and impact forces and observed for failure.

NOTE [Clause 4.2](#) specifies the test specific failure criteria.

A.2 Apparatus

The following apparatus is required:

- (a) Means of applying forces as specified in [Table 7.2\(A\)](#).
- (b) Loads as specified in [Tables 7.2\(B\)](#) and [7.2\(C\)](#).

NOTE Loads for loading the unit during testing should be masses that do not reinforce the structure or redistribute the load. If metal bars are used, the front row of masses should be aligned with the front edge of the surfaces. If bags with lead shot or similar are used, the bags should be divided into small compartments to prevent the contents moving during testing.

- (c) Steel impact plate as specified in [Table 7.2\(D\)](#).
- (d) Loading pad, MDF or similar, 200 mm diameter, approximately 12 mm thick, flat and rigid.
- (e) Means of measuring in millimetres.

A.3 Preparation

Load all component parts intended for storage purposes, except the component part being tested, with the load specified in [Table 7.2\(B\)](#).

Where the top surface is horizontal it shall be determined as a storage component.

Where the unit is of singular purpose for storage of a dedicated product (e.g. paper) and it is not possible to load the unit fully with the specified medium and/or the specified weight, the procedure shall be as follows.

Where physically possible, as many of the components of the unit shall be loaded as specified. Where such loading is not possible load the remainder of the unit with the maximum quantity of the dedicated storage as is required to fill all the available components or load with an equivalent weight of any kind to fit the dedicated storage. The weight of the dedicated medium shall not exceed the load specified in [Table 7.2\(B\)](#).

Report any reduced loading used.

A.4 Procedures

A.4.1 Deflection of shelves

The procedure shall be as follows:

- (a) Before loading, measure and record the deflection at the front edge of the shelf at the point determined most likely to be adversely affected.
- (b) Uniformly load the shelf being tested with the applicable load specified in [Table 7.2\(C\)](#). Where this is not possible load according to the principle outlined for dedicated storage in [Clause A.3](#).
- (c) After 1 h for metal or 1 week (168 h) for all other materials, measure the maximum loaded deflection in millimetres at the front edge of the shelf. The loaded deflection shall include any original or self-weight deflection measured at Step (a).
- (d) After the weights have been removed for 15 min for metal or 24 h for all other materials, measure the permanent deformation at the same point as the greatest deflection.
- (e) Check for failure.

NOTE See [Figure A.4.1](#).

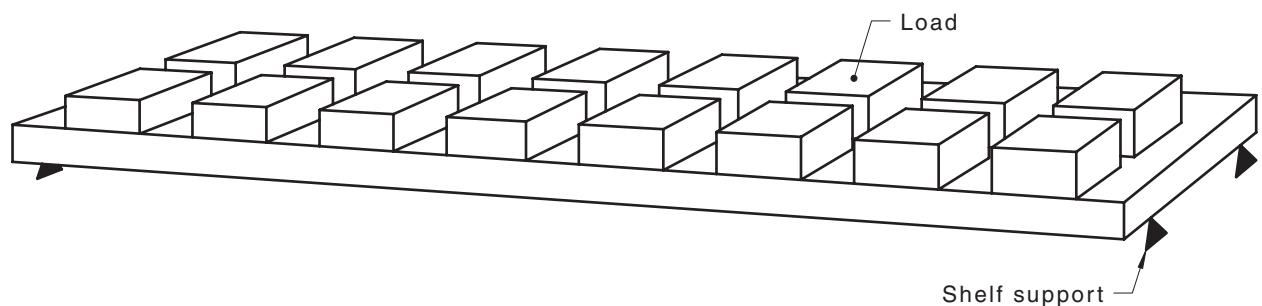


Figure A.4.1 — Example of deflection of shelves

Where the unit is fitted with different shelf sizes or different supports and the worst case is not evident each different shelf shall be tested.

A.4.2 Retention of shelves on shelf supports

The procedure shall be as follows:

- (a) Place the shelves on the shelf supports.
- (b) Apply the applicable horizontal and outward force as specified in [Table 7.2\(A\)](#) at the centre of the front edge of each shelf.
- (c) Check for failure.

A.4.3 Strength and displacement of shelves and shelf supports

The procedure shall be as follows:

- (a) Inspect the shelf and measure its position at each corner. Where shelf supports are used measure the shelf position at each of the supports.
- (b) Load the test shelf with half the applicable load specified in [Table 7.2\(C\)](#).

- (c) Distribute the loads uniformly except at approximately 220 mm from one support where a steel impact plate of the applicable mass specified in [Table 7.2\(D\)](#) is placed, standing upright on its end.

Where the depth of the shelf is greater than 300 mm the area to the side of the impact plate shall form part of the distributed load area.

- (d) For shelves that sit freely on shelf supports, tip over the impact plate five times as close as possible to the support.

- (e) Repeat the test for each support.

Where units have securely fixed shelves the impact plate shall be tipped over five times as close as possible to each corner.

Where the vertical spacing between fixed shelves does not allow the impact plate to stand upright the test shall be deemed to be not applicable.

Where the vertical spacing between shelves that sit freely on shelf supports can only be set at less than 205 mm the test shall be deemed to be not applicable.

- (f) Inspect and remeasure the shelf at each of the points taken in Step (a).

- (g) Check for failure.

Where the unit is fitted with shelves of different sizes or retained by different methods each variant shall be tested.

NOTE See [Figure A.4.3](#).

Dimensions in millimetres

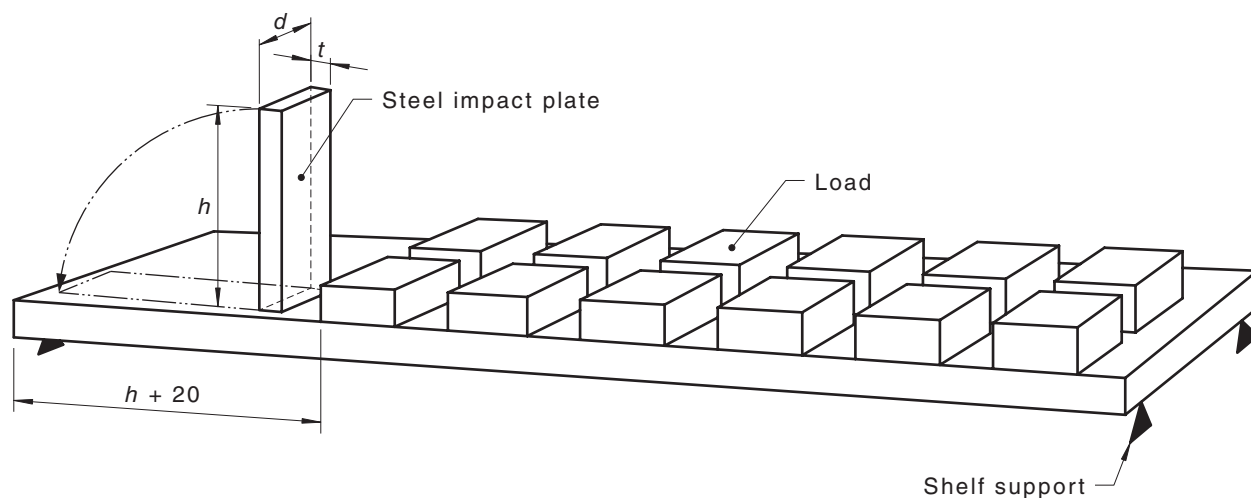


Figure A.4.3 — Example of strength and displacement of shelves and shelf supports

A.4.4 Strength of top and bottom surfaces

The procedure shall be as follows:

- Position the loading pad at the approximate geometric centre of the top surface.
- Apply the applicable vertical force as specified in [Table 7.2\(A\)](#) to the centre of the load pad.
- Hold for 10 s.
- Repeat for a total of 10 applications of the vertical force.