

Strength and stability of furniture —

Part 7: Methods for determination of strength of storage furniture

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- British Rubber Manufacturers' Association
- Business Equipment Trade Association
- Consumer Standards Advisory Committee of BSI
- Consumers' Association
- Department of Education and Science
- Design Council
- Furniture Industry Research Association
- Greater London Council
- Local Authorities Management Services and Computer Committee
- Mail Order Traders' Association of Great Britain
- National Bedding Federation

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Foreword

This Part of BS 4875 has been prepared under the direction of the Furniture and Household Equipment Standards Committee, and forms a revision of part of BS 4875-3:1977. Together with Part 8 it supersedes BS 4875-3:1977 which is withdrawn.

The major changes introduced by this revision are that the realism of the tests has been improved. The opportunity has been taken to align the standard with an international standard in course of preparation¹⁾ in ISO/TC 136/SC 1 “Furniture — Test methods”.

The tests described in this Part of BS 4875 reproduce normal use and common types of mis-use to which storage furniture may be subjected. The tests are designed to be applied to an article that is fully assembled and ready for use and are only intended to determine strength of the structure. Five test levels are given for the tests to cover the variations in severity of end-use that arise from the use of delicate styles, short life furniture, robust serviceable styles, etc. While the tests reproduce normal use and common types of mis-use they do not reproduce any abuse to which the article may be subjected.

Appendix A gives an explanation of the furniture test levels used in this standard.

Other Parts of BS 4875 are as follows:

- *Part 1: Methods for determination of strength of chairs and stools;*
- *Part 2: Methods for determination of stability of chairs and stools;*
- *Part 3: Methods for determination of strength of settees;*
- *Part 4: Methods for determination of stability of settees;*
- *Part 5: Methods for determination of strength of tables and trolleys;*
- *Part 6: Methods for determination of stability of tables and trolleys;*
- *Part 8: Methods for determination of stability of storage furniture.*

Attention is drawn to BS 6250 which specifies performance requirements for domestic and contract furniture using this standard as the method of test, and to BS 5459 and BS 5873 which specify performance requirements for office and educational furniture using methods that are very similar to those in this standard.

A standard for storage furniture for use in schools is being developed.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 16, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ Currently at Draft Proposal stage, ISO/DP 7170.

1 Scope

This Part of BS 4875 describes methods for determination of the strength of storage furniture. The tests do not apply to built-in kitchen furniture which is covered by BS 1195 and BS 6222, nor to office furniture which is covered by BS 5459-3.

NOTE 1 Tests carried out according to the requirements of this standard are intended to demonstrate the ability of the item to give satisfactory service in its intended environment. It should be understood that such tests do not ensure that structural failure will not eventually occur as a result of habitual mis-use or after an excessively long period of service.

NOTE 2 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Principle

2.1 General

The principle is to determine the strength of the structure of an article of furniture by applying to various parts loads or forces simulating normal functional use, as well as acceptable mis-use, according to a graded scale of severity (see Appendix A).

A summary of the tests is given in Table 1.

The sequence as a whole determines the following:

- a) static strength and initial damage;
- b) fatigue strength and damage propagation;
- c) ability to withstand acceptable mis-use and demonstration of sufficient residual strength.

The severity of loading is graded by varying the number of applications or the magnitude of forces applied.

2.2 Static tests

The principle of static tests is to assess the static strength of the article under the high levels of loading that only occasionally occur.

2.3 Wear and fatigue tests

The principle of wear and fatigue tests is to assess the strength and durability of the component parts of the article under the repeated operations, movement, or applications of loads occurring during daily use.

2.4 Impact tests

The principle of impact tests is to assess the impact strength of the article under the rapid rates of loading that only occasionally occur.

3 General requirements for tests

3.1 Test loading

All loads and forces shall be measured to an accuracy of $\pm 5\%$.

NOTE The tests may in certain cases be carried out by means of loads or forces. For practical purposes, a force of 10 N may be taken to be equal to the downward force due to a mass of 1 kg.

3.2 Moisture content and conditioning

Before the tests are commenced the article shall be sufficiently old to ensure that all component materials have developed their full strength. At least four weeks in normal conditions shall elapse from manufacture in the case of glued joints in timber, plastics moulded parts, etc.

Parts made of timber products shall be checked with an electric moisture meter to ensure that the moisture content is between 8 % and 12 %. If the moisture content is above 12 % the article shall be allowed to dry out in a warm ventilated room until the moisture content is between 8 % and 12 %.

If a standard atmosphere is required for conditioning or testing, that atmosphere shall be a temperature of $23 \pm 3^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$.

3.3 Loading system

The loads specified in Table 2 shall be applied to all parts intended for storage purposes, whilst one part is subjected to test.

The loads specified in Table 3 shall be applied to a part undergoing test.

NOTE The loads specified in Table 2 represent the average load that is applied during normal use. The loads specified in Table 3 represent the maximum load that is applied during normal use.

Table 1 — Summary of test procedures (see also Table 3)

Title	Description	Test level (see Appendix A)				
		1	2	3	4	5
Strength of top and bottom surfaces test	force (in N)					
Top surface						
Height above floor:						
less than 1 050 mm		—	600	750	1 000	1 250
1 050 mm and above		—	125	250	350	450
Bottom surface						
Wall units		—	600	750	1 000	1 250
floor units, unrestricted headroom		—	600	750	1 000	1 250
floor units, head room less than 1 050 mm		—	250	350	450	700
Wear and fatigue of pivoted doors test	cycles	10 000	20 000	40 000	80 000	160 000
Strength of pivoted doors test	mass (in kg)	15	25	30	45	60
Slam open/shut of pivoted doors	force (in N $^{+0}_{-0.5}$)	5	10	15	20	30
Wear and fatigue of sliding doors test	cycles	10 000	20 000	40 000	80 000	160 000
Slam open/shut of sliding doors test	mass (in kg)	2.0	2.0	3.0	4.0	6.0
Wear and fatigue of flaps test	cycles	5 000	10 000	20 000	40 000	80 000
Strength of flaps test	force (in N)	50	100	200	300	500
Wear and fatigue of roll fronts test	cycles	2 500	5 000	10 000	20 000	40 000
Slam open/shut of roll fronts test	cycles	10	20	30	40	50
Wear and fatigue of drawers and runners test	cycles	10 000	20 000	40 000	80 000	160 000
Displacement of bottom surface and drawers test	force (in N)	30	40	60	70	80
Slam open and slam shut of drawers tests	velocities, m/s, at calibration points					
	slam open 5 kg and	1.25	1.45	1.65	1.85	2.05
	slam shut 35 kg	0.80	0.95	1.10	1.25	1.40
Strength of runners test	force (in N)	150	250	300	450	600
Strength of carcass and underframe test	force (in N)	150	250	300	450	600

NOTE The absence of a value for certain tests at some test levels indicates that the test is not appropriate at that level.

3.4 Setting up of furniture

The articles shall be tested as delivered. Self-assembly furniture shall be assembled according to instructions supplied with the article. If the article can be combined in different ways the most adverse combination shall be used for each test. This requirement shall also apply to furniture that can be combined with other articles. Articles intended for wall attachment shall be mounted on a wall so that secure attachment is achieved through the mounting positions specified by the

manufacturer.

3.5 Rate of carrying out tests

The forces shall be applied at a sufficiently slow rate to ensure that negligible dynamic load is applied and also to ensure that kinetic heating does not occur.

NOTE It is recommended that the tests are carried out at a maximum rate of six cycles per minute.

Table 2 — Average loads applied to parts other than the part being tested

Part	Load	Test level				
		1	2	3	4	5
Horizontal surfaces, shelves and door baskets	kg/10 000 mm ²	1.0	1.0	1.0	1.0	1.25
Drawers and extension elements	kg/dm ³ internal volume	0.25	0.25	0.25	0.3	0.4
Suspended pocket file fittings	kg/100 mm length	1.25	1.25	1.25	1.25	1.25
Clothes rails	kg/100 mm length	2.0	2.0	2.0	2.0	2.0

Table 3 — Maximum loads applied to parts undergoing test

Part	Load	Test level				
		1	2	3	4	5
Horizontal surfaces, shelves and door baskets	kg/10 000 mm ²	1.0	1.0	1.5	2.0	2.5
Drawers and extension elements	kg/dm ³ internal volume	0.25	0.25	0.33	0.65	0.8
Suspended pocket file fittings	kg/100 mm length	2.5	2.5	2.5	2.5	2.5
Clothes rails	kg/100 mm length	4.0	4.0	4.0	4.0	4.0

3.6 Emergency tests

When there is not time for furniture to be aged or to reach equilibrium the moisture content shall be measured where applicable at the beginning and at the end of the testing sequence, and these measurements shall be included in the test report if they are outside the limits specified, together with the age of the article when testing commenced.

3.7 Combinations of tests

Components of the article shall be subjected to the relevant tests described in clause 6. Components that have a dual function shall be subjected to the relevant tests for each component, e.g. a shelf that can be pulled out on runners shall be subjected to the tests for shelves and additionally to the wear and fatigue tests for drawers and runners.

The strength tests shall be carried out on the same article of furniture, but to reduce testing time, the wear and fatigue tests can be carried out on different articles.

3.8 Tests on doors, flaps and drawers

For an article fitted with a number of flaps, drawers or doors that are identical in every respect (apart from the direction of opening and closing), it is necessary to test only one of the relevant flaps, doors or drawers. Other flaps, drawers or doors fitted to the article shall each be tested separately.

4 Inspection before and after testing

Immediately before testing, each article shall be thoroughly inspected. Any defects in the members, joints or attachments of such components as flaps and extensions shall be noted so that they are not attributed to the effect of the tests when the tests have been completed.

Immediately after completion of the tests, the article shall again be thoroughly inspected. Any apparent defects shall be noted and a determination made of any changes that have taken place since the initial inspection.

Fittings in self-assembly furniture shall be tightened before testing, and after each test level if testing is carried out at more than one test level.

Each article shall be subjected to each of the tests at the same test level and the occurrence of any of the following shall be recorded as defects affecting the strength of the article:

- any fracture of any member, joint or component;
- any loosening, shown to be permanent by hand pressure applied to suitable members, of joints intended to be rigid;
- any deformation or wear of any component that will essentially affect its function;
- any loosening of any means of fixing components to the article;
- any movable parts that do not open or close freely, or catches that do not operate smoothly.