

Strength and stability of furniture —

Part 1: Methods for determination of strength of chairs and stools

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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 4875-1:1972. Together with Parts 2, 3 and 4 it supersedes BS 4875-1:1972 which is withdrawn.

The major changes introduced by this revision are that the realism of the tests has been improved by specifying the use of more realistic apparatus, and a template is specified to determine the loading points. 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 seating may be subjected. As a result the methods are applicable to nearly all seating. The only exception arises with all-foam furniture for which an additional test is given. 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. Whilst 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. 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; they do not assess durability of filling materials, upholstery fabrics or foam cushions. The tests also do not reproduce the effects caused by degradation of structural materials by sunlight or chemical attack.

IMPORTANT SAFETY NOTE. In the case of chairs fitted with a gas spring seat height adjustment mechanism, it should be understood that, although the tests are representative of all the loads which can reasonably be expected, there is still some uncertainty as to the nature and cause of the side entry gas spring service failures understood to have occurred in West Germany but about which details have not been released.

Some types of side entry gas spring have failed catastrophically and it should be understood that the current British Standards do not yet contain a range of tests suitable for determining the safety of such components. Consequently any conclusions drawn after testing that the chair will be suitable for a particular end use should not be taken to imply that the gas spring will not eventually fail in a dangerous manner.

Other Parts of BS 4875 are as follows:

- *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 7: Methods for determination of strength of storage furniture;*
- *Part 8: Methods for determination of stability of storage furniture.*

¹⁾ Currently at Draft Proposal stage, ISO/DP 7173

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 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 to iv, 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 Scope

This Part of BS 4875 describes methods for determination of the strength of the structure of chairs and stools.

NOTE 1 Pouffes are considered to be stools.

NOTE 2 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 3 The tests are not suitable for demonstrating the structural strength of reclining and tilting chairs when in the reclined or tilted position.

NOTE 4 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).

The interrelation of the tests is shown in Table 1 and a summary is given in Table 2.

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 Fatigue tests

The principle of fatigue tests is to assess the strength 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.

Table 1 — Test data (purpose of each test)

Sequence	Number	Title	Primary purpose	Secondary purpose	Type
1	1a	Seat static load test	Basic strength	Damage initiation	Functional
	1b	Back static load test			
2	2	Arm and wing sideways static load test			
3	3	Arm downwards static load test	Service durability	Damage propagation	
4	4a	Seat fatigue test			
	4b	Back fatigue test			
5	5a	Leg forwards and sideways test	Handling strength	Residual strength	Acceptable mis-use
	5b	Static load test			
	5c	Diagonal base test			
6	6	Seat impact test	Impact strength		
7	7a	Back impact test			
	7b	Arm impact test			
8	8	Drop test			
9	9	Chair swivelling wear test	Service wear	No secondary purpose	Functional
10	10	Seat height adjustment wear test			

Table 2 — Summary of test procedures

Number	Title	Description	Test level (see appendix A)				
			1	2	3	4	5
1a	Seat static load test	Seat force (in N)	—	1 100	1 300	1 600	2 000
1b	Back static load test	Back force (in N) at each pad	—	410	560	760	760
		Balancing seat force (in N)	—	1 100	1 300	1 600	2 000
2	Arm sideways static load test	Force applied (in N)	—	300	400	600	900
	Wing sideways static load test	Force applied (in N)	—	200	300	400	500
3	Arm downwards static load test	Force applied (in N)	—	700	800	900	1 000
4a	Seat fatigue test	Number of cycles: 950 N seat force	12 500	25 000	50 000	100 000	200 000
4b	Back fatigue test	Number of cycles: 330 N back force	12 500	25 000	50 000	100 000	200 000
5a	Leg forwards static load test	Maximum forward force (in N)	300	375	500	620	760
5b	Leg sideways static load test	Maximum sideways force (in N)	250	300	390	490	760
		Balancing seat force (in N)	760	780	1 000	1 250	1 800
5c	Diagonal base force test	Force applied (in N)	125	250	375	500	620
6	Seat impact test	Drop height (in mm)	—	140	180	240	300
7a	Back impact test and	Drop height (in mm)	—	120	210	330	620
7b	Arm impact test	Angle (in degrees)	—	28	38	48	68
7a	Wing impact test	Drop height (in mm)	—	120	210	330	620
		Angle (in degrees)	—	28	38	48	68
8	Drop test	Drop height (in mm)					
		(a) Stacking chairs and stools with legs or pedestals longer than 200 mm,	150	300	450	600	900
		(b) Non-stacking chairs with legs or pedestals longer than 200 mm,	—	150	200	300	450
		(c) Chairs and stools with legs or pedestals shorter than 200 mm	—	75	100	150	250
9	Chair swivelling wear test	Number of cycles	—	25 000	50 000	100 000	200 000
10	Seat height adjustment wear test	Number of cycles	—	—	10 000	15 000	25 000
NOTE The absence of a value for certain tests at some test levels indicates that the test is not appropriate at that level.							