BRITISH STANDARD

BS 5459-3: 1983

Specification for

Performance requirements and tests for office furniture —

Part 3: Storage furniture

UDC 651.2:684.45:684.462

Committees responsible for this British Standard

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British Furniture Manufacturers' Federated Associations
British Stationery and Office Products Federation
Business Equipment Trade Association
Civil Service Department
Committee of London Clearing Bankers on behalf of the Committee of Scottish Clearing Bankers, Co-operative Bank, Central Trustee Savings Bank and Yorkshire Bank
Department of the Environment (PSA)
Design Council
Drawing Office Material Manufacturers' and Dealers' Association
Electricity Supply Industry in England and Wales
Envelope Makers' and Manufacturing Stationers' Association
Furniture Industry Research Association
Her Majesty's Stationery Office
Institute of Administrative Management
Institute of Chartered Secretaries and Administrators
Local Authorities Management Services and Computer Committee
Office Machines and Equipment Federation
Royal Institute of British Architects
Society of Industrial Artists and Designers

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Foreword

This Part of this British Standard has been prepared under the direction of the Furniture and Household Equipment Standards Committee in recognition of the need for performance standards for office furniture; it is intended to provide assurance that office furniture made in compliance with it is sound and reasonably durable, factors that are difficult to assess by inspection at the time of purchase.

The requirements are based on performance tests that are intended to ensure a satisfactory article whatever materials or manufacturing methods are used. The tests have been devised to take into account the conditions and hazards to which office furniture is subjected during everyday use, and in using them the Technical Committee wishes to acknowledge the considerable assistance given to it by the Furniture Industry Research Association (FIRA), Whose research work has been utilized whenever possible. At the request of the Business Equipment Trade Association, FIRA has completed a special programme of testing during which several typical items of office furniture were subjected to the strength and stability tests and due account of this work has been taken in the performance figures given in this standard. Subsequent to the completion of the testing programme, the opportunity was taken to align the test methods with those in international work in progress within ISO/TC 136/SC 1 "*Furniture — test methods*". An additional loading test for flaps, and a test for displacement of the bottom surface of drawers was also included using the tests proposed in ISO Draft Proposal DP 7170 "*Furniture — storage units — determination of strength and durability*". The performance tests specified in this standard are similar to those given in BS 4875-3 for domestic and contract furniture and do not assess ageing and wear. The tests are designed to be applied to an article of furniture that is fully assembled and ready for use.

At present, no requirements are specified in this standard for surface finishes. It is intended to introduce requirements for surface finishes at a later date in an amendment to this standard.

This standard forms Part 3 of a specification for office furniture of which the other Parts are Part 1 "*Desks and tables*" and Part 2 "*Adjustable chairs*".

Attention is drawn to BS 4438 which specifies dimensional and performance requirements for filing cabinets and suspended filing pockets.

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 10, 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 5459 specifies performance requirements and describes applicable tests for office storage furniture. The test methods give three levels of severity of testing, i.e. furniture intended for general use (test level G), heavy use (test level H) and severe use (test level S).

The requirements do not apply to office desks, mechanical filing and retrieval systems, rotary filing systems, drawing office storage furniture and furniture for archival storage.

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

2 Definition

For the purposes of this Part of BS 5459 the following definition applies.

2.1
office storage

shelves and open or closed cupboards and cabinets

NOTE This definition includes free-standing, fixable and mobile items, e.g. shelf systems.

3 Description of performance tests

3.1 Functional tests

3.1.1 *Principle.* The functional tests simulate the loads imposed on an article of furniture during the performance of its primary function.

The following tests (**3.1.2** to **3.1.4**) fall within the functional test category.

3.1.2 *Sustained load test.* The sustained load test simulates the levels of continuous application that occur most frequently.

3.1.3 *Operational test.* The operational test simulates the repetition of operations occurring during daily use.

3.1.4 *Fatigue loading test.* The fatigue loading test simulates that level of repeated loading that is likely to occur most frequently.

3.2 Non-functional tests

3.2.1 *Principle.* The non-functional tests simulate the loads imposed on an article of furniture as a result of the use to which it may reasonably be put outside the performance of its primary function. As such the test levels set in the non-functional tests represent the dividing line between reasonable misuse and abuse.

The following tests (**3.2.2** to **3.2.5**) fall within the non-functional test category.

3.2.2 *Static load test.* The static load test consists in the steady and gradual application, up to the maximum that the article may be required to withstand occasionally, of a test load repeated a sufficient number of times to check the static strength of the article.

3.2.3 *Impact test.* The impact test simulates impact or repetition of sudden operations that occur only occasionally.

3.2.4 *Slam open and slam shut tests.* The slam open and slam shut tests simulate sudden operations that occur only occasionally.

3.2.5 *Carcase rigidity test.* The carcase rigidity test simulates the forces employed when moving a loaded carcase.

4 Performance requirements

4.1 When tested in accordance with clauses **5** and **6**, the article shall meet the requirements of **4.2** and **4.3** and, where appropriate, the requirements of **4.4** and **4.5** at the same test level in all tests.

4.2 There shall be no overbalancing during the tests.

4.3 The article shall not develop any of the following as a consequence of the tests:

a) any fracture of any member, component or joint;

b) any deformation or wear of any part or component that will essentially affect its function;

c) any loosening of any means of fixing components to the article;

d) any loosening, shown to be permanent by hand racking the article, of any joint intended to be rigid.

4.4 The maximum deflection of each shelf or clothes hanging rail when tested in accordance with **6.1.1** shall not exceed the span divided by 100 for metals and the span divided by 200 for all other materials.

NOTE The requirements for metals are different from those for other materials owing to their different time dependent properties.

4.5 When tested in accordance with **6.5.1** to **6.5.4**, the force required to move the loaded drawer from rest shall not exceed 70 N and the force required to maintain constant movement shall not exceed 40 N. The drawer shall operate smoothly.

NOTE Guidance on the scale of sampling is given in BS 6001.

5 General requirements for tests

5.1 Sequence of tests. The article of furniture shall be submitted in turn to each of the appropriate tests given in clause **6**. The tests on each component, e.g. doors, shall be carried out in the specified sequence, but it is not necessary to test the components of the article in any set sequence.

Unless otherwise specified in the particular test method, during each test free-standing articles shall be supported on a true and level base; articles for wall attachment shall be mounted on a flat vertical surface in the manner intended by the manufacturer.

NOTE 1 Test loads should be applied at a realistic rate and care should be taken to avoid kinetic heating since the functions represented do not occur continuously in practice. It is recommended that in the tests the rate of operation or loading of components does not exceed 15 cycles per minute including a 2 s delay in each cycle.

NOTE 2 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.

5.2 Test loads. Unless otherwise specified in the particular test method, the test loads shall be as given in Table 1.

Table 1 — Test loads (1)[a]

Component	Unit of load	Load for test level:		
		G	H	S
Top surface, shelves and bottom surface	kg/100 mm^2	0.7	1.25	1.5
Clothes hanging rails	kg per 100 mm length	4.0	4.0	4.0
Drawers	kg per litre internal volume	0.5	0.5	0.5

[a] The test loads represent the average loads that are applied to an article of furniture.

5.3 Moisture content. Before any article containing structural members made of timber or of other materials whose properties depend on moisture content is subjected to the strength tests, it shall be checked with an electric moisture meter to ensure that the moisture content is not higher than 12 %. If the moisture content is too high, the article shall be allowed to dry out gently in a warm, ventilated room until the moisture content is below 12 %. The moisture content during testing shall be recorded if outside the range 8 % to 12 %.

NOTE The moisture content during testing should be reasonably constant but it is recognized that there are many different conditions of end use which alter the moisture content. The low relative humidity possible in centrally heated premises can reduce moisture content to considerably less than 12 %, whilst other conditions can allow it to rise above 12 %.

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

5.5 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 their direction of opening and closing), it is necessary to test only one of the relevant flaps, drawers or doors. Other flaps, drawers or doors fitted to the article shall each be tested separately.

6 Test methods

NOTE For information on the availability of test apparatus for carrying out the various test procedures apply to Central Enquiries Section, BSI, 2 Park Street, London W1A 2BS, enclosing a stamped addressed envelope for reply.

6.1 Tests on shelves, horizontal surfaces and clothes hanging rails

6.1.1 *Sustained load test.* Load each component of the article given in Table 2 uniformly and simultaneously with the appropriate load given in Table 2 (see Figure 1). Maintain the load for 7 days. Record the maximum deflection.

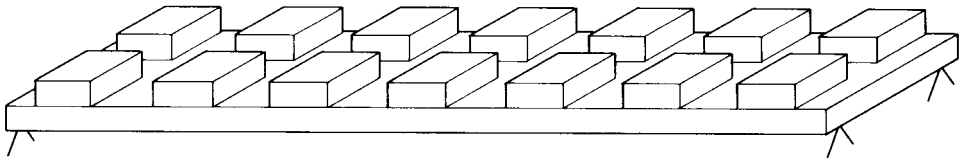


Figure 1 — Sustained load test

For articles for which the number of shelves that can be fitted is variable, carry out this test with shelves fitted at a distance of 200 mm apart, except for the distance between the lowest shelf and the bottom surface or the floor which shall be between 100 mm and 300 mm.

Table 2 — Test loads (2)[a]

Component	Unit of load	Load for test level:		
		G	H	S
Top surface, shelves and bottom surface	kg/100 mm^2	1.5	2.5	3.0
Clothes hanging rails	kg per 100 mm length	4.0	4.0	4.0
Drawers	kg per liter internal volume	0.5	0.5	0.5

[a] The test loads represent the maximum loads that can be applied to an article of furniture.

For wall or screen hung articles, i.e. articles not directly supported by the floor, the following additional test shall be carried out. Load the horizontal surfaces of the article with four times the load given in Table 1 for the appropriate test level. Maintain the load for **7** days.

6.1.2 *Impact test.* Carry out the following test in turn on each shelf and horizontal surface serving as a shelf on the article (e.g. the top and bottom surfaces of a wall unit). Load the surface with the appropriate load given in Table 1. Allow a steel cylinder[1)] to fall with its axis vertical on to the surface through the distance given in Table 3 for the appropriate test level. The point of impact shall be as close as possible to a point of support of the surface. Repeat at each of the other points of support of the surface in turn.

NOTE Scratches on the surface finish can be ignored when examining the article for compliance with clause **4**.

6.1.3 *Static load test.* Load the components of the article given in Table 1 with the appropriate loads given in Table 1. Subject in turn each shelf, the top and bottom surfaces and, if appropriate, each clothes hanging rail to 10 repeated applications of the appropriate load given in Table 4, applied downwards through a loading pad 100 mm × 100 mm, except where the load is to be applied to a centre of a rail, when a hook or other means of applying the load may be used (see Figure 2).

Table 3 — Impact test on horizontal surfaces

Test level	G	H	S
Impact test distance, mm	120	180	240

Apply the load to the top and bottom surfaces in any position likely to cause failure. If there are several such positions, apply the load 10 times to each position (up to a maximum of three positions).

Test the shelves and clothes hanging rails at the centre of each span and adjacent to each of the end supports. Apply the load 10 times to each position.

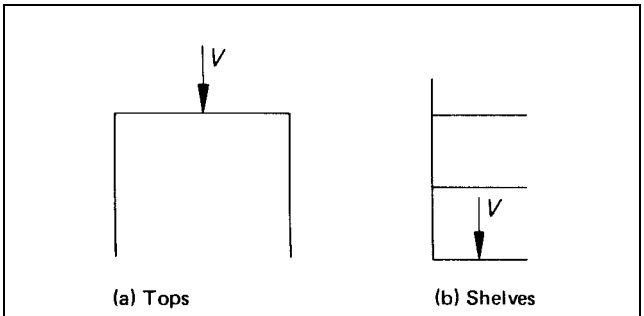


Figure 2 — Static load test

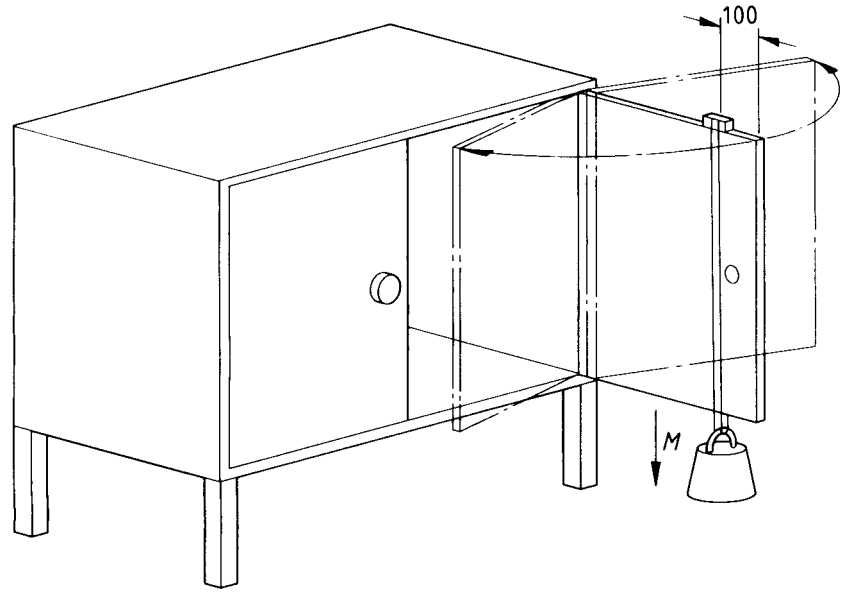
6.2 Tests on pivoted doors

6.2.1 *Static load test.* Attach to the door the appropriate load given in Table 5. Position the load in such a way that its mass is equally distributed on both sides of the door, and so that the centre of gravity acts 100 mm from the edge of the door. Swing the door 10 times back and forth from a position 10° from fully closed to a position 10° from fully open. Remove the load and check the appearance and function of the door when it is fully closed and when it is opened through an angle of 90° (see Figure 3).

Table 4 — Loads required for static load test

Component	Static load for test level:		
	G	H	S
Top surface	kg	kg	kg
Height above floor less than 1 050 mm	100	125	2 × 90
Height above floor 1 050 mm and above	35	45	70
Shelves, clothes hanging rails and bottom surface	35	45	70

[1)] Steel cylinder 75 mm in diameter and about 77 mm long with its ends radiused to 15 mm



Dimension in millimetres.

Figure 3 — Static load test for doors

Table 5 — Static load test for doors

Test level	G	H	S
Static load, kg	20	35	70

Table 6 — Slam open test for pivoted doors

Test level	G	H	S
Mass, kg	2.0	3.0	3.0

6.2.2 *Operational test.* Position and support the article as it is intended to be used. Load the shelves and bottom surface with the appropriate loads given in Table 1. Open the door to an angle of 120° from the fully closed position, or as far as possible for a door with concealed hinges, and then fully close it without impact but operating any catches that are fitted. Repeat 80 000 times (see Figure 4).

6.2.3 *Siam open test.* Open the door 10 times towards the fully open position by means of the appropriate mass given in Table 6 attached to a string and pulley arrangement as shown in Figure 5. Attach the string 50 mm from the outer edge of the door at the same height as the upper part of the handle and at right angles to the door when fully open. If the door does not have a handle, attach the string to the middle of the outer edge of the door.

The movement shall start 30° from the fully open position (measured before the test) for each of the 10 operations. Support the mass by the string throughout the test.

Check the appearance and function of the door after the test when the door is fully closed, when it is opened through an angle of 90° and when it is fully open.

6.3 Tests on flaps

6.3.1 *Friction stays.* For testing purposes, articles fitted with adjustable friction stays shall have the friction mechanism disconnected or the friction reduced to a minimum during the test. The stays shall otherwise remain connected.

6.3.2 *Operational test.* Position and support the article as it is intended to be used. Open the flap through an angle of 90° from the fully closed position, operating, without impact, any catches fitted. If concealed hinges are fitted, open the flap through the maximum angle possible. Close the flap and repeat the number of times given in Table 7.

Note the appearance of the flap, hinges, etc. when the flap is fully closed and when it is fully open.

6.3.3 *Slam shut test.* Position and support the article as it is intended to be used. Open the flap through an angle of at least 30° and allow to close freely under the influence of the appropriate force given in Table 7 applied to the middle of the edge opposite the hinges at right angles to the plane of the front of the carcase. Repeat 10 000 times.

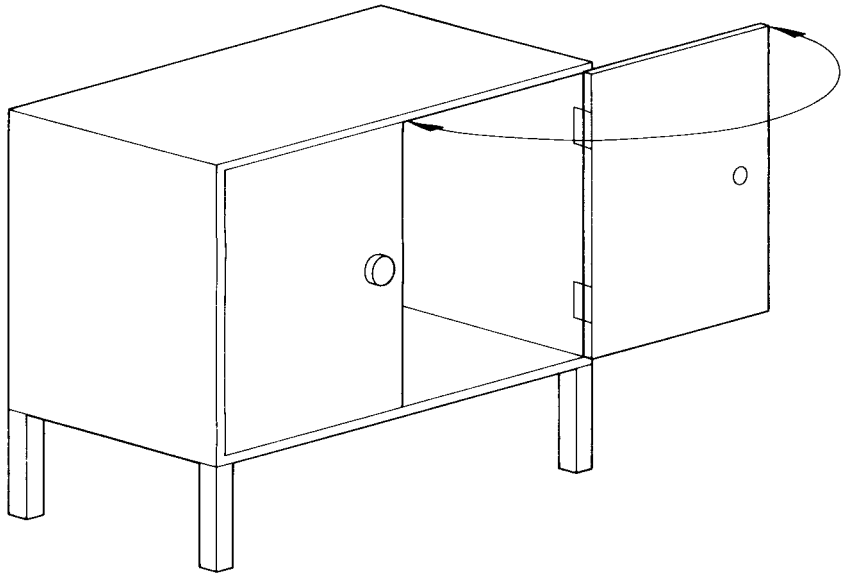


Figure 4 — Operational test for doors

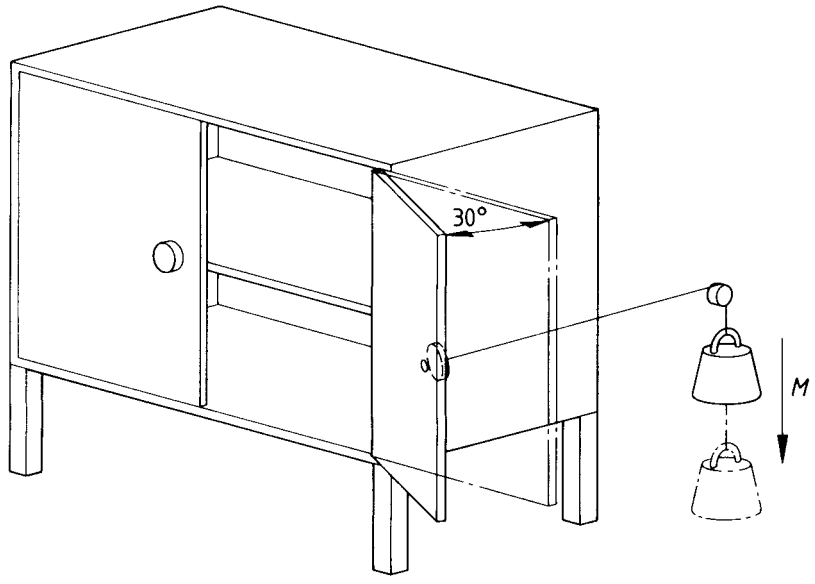


Figure 5 — Slam open test for pivoted doors

6.3.4 *Slam open test.* Position and support the article as it is intended to be used. If the flap is fitted with a non-automatic stop, set the stop in the open position. Fully open the flap and move it towards the closed position through an angle of 30°. Allow the flap to open freely under the influence of the appropriate force given in Table 7 applied to the middle of the edge opposite the hinges at right angles to the plane of the fully open flap. Open and close the flap in the manner described a total of 10 times.

6.3.5 *Loading test.* Load the components of the article given in Table 1 with the appropriate loads given in Table 1. Position the flap in its fully open/extended position and subject to 10 applications of the appropriate force given in Table 7, applied 50 mm from the weakest corner (see Figure 6). Check the appearance and function of the flap, hinges, etc. when the flap is fully closed and when it is fully open.

Table 7 — Tests for flaps

Test level	G	H	S
Applied force, N			
Slam shut test	25	30	40
Slam open test	25	30	40
Operational test, number of cycles	100 000	200 000	200 000
Loading test, force, N	300	300	500

6.4 Tests on sliding doors (including tambour closures)

6.4.1 *Operational test.* Position and support the article as it is intended to be used. Open and close the door through a distance equal to 300 mm or total travel of door (whichever is the smaller). Close the door without impact, operating any catch fitted. Repeat the appropriate number of times given in Table 8 (see Figure 7).

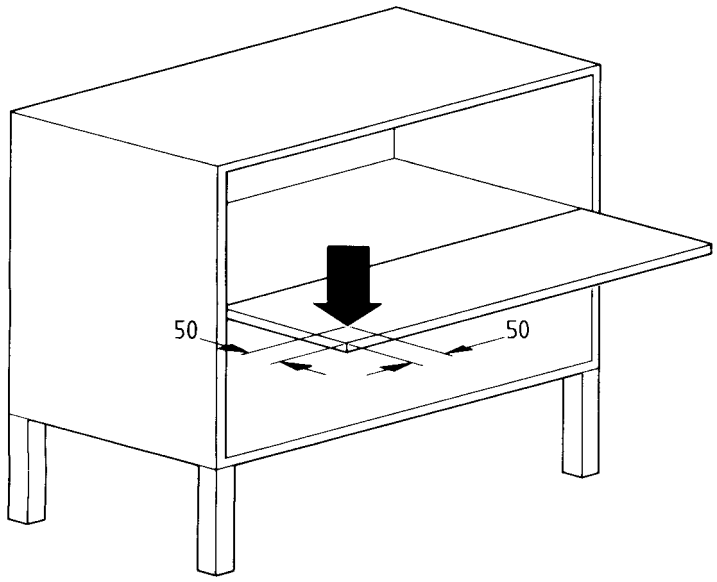
Table 8 — Operational test for sliding doors

Test level	G	H	S
Number of cycles of opening and closing	25 000	25 000	50 000

6.4.2 *Slam shut test for sliding doors.* Position and support the article as it is intended to be used. Open the door through a distance equal to 300 mm or the total travel of the door (whichever is the smaller), and allow it to close freely under the influence of the appropriate force given in Table 9 applied to the handles of the door. Repeat 10 times (see Figure 8).

Table 9 — Slam shut test for sliding doors

Test level	G	H	S
Closing force, N	40	60	80



Dimensions are in millimetres.

Figure 6 — Loading test

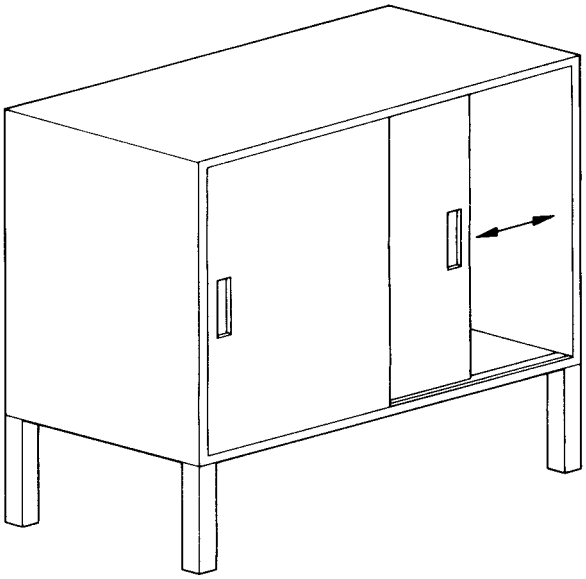


Figure 7 — Operational test for sliding doors

6.5 Tests on drawers

6.5.1 *Operational test.* Load the drawer with the appropriate load given in Table 1. Open and close the drawer to the full extent or to the stops (without impact) by means of an actuating mechanism (attached to the handle or hand-hold of the drawer) the appropriate number of times given in Table 10 (see Figure 9).

Table 10 — Operational test for drawers

Test level	G	H	S
Number of cycles of opening and closing	25 000	50 000	75 000

6.5.2 ***Slam open and slam shut tests***

6.5.2.1 Place the drawer in its normal position and load it with the appropriate load given in Table 1. Carry out the slam shut test (see **6.5.2.2**) and, in addition, if the drawer is fitted with stops, the slam open test (see **6.5.2.3**) using an apparatus capable of producing the velocities given in Table 11 to an accuracy of ± 5 %.

Table 11 — Closing velocities

Test	Velocity for test level:		
	G	H	S
	m/s	m/s	m/s
Slam open	1.64	1.64	1.81
Slam shut	1.70	1.70	2.04

6.5.2.2 Open the drawer 300 mm from the closed position, or to the point at which one-third of the inside length (depth) of the drawer or at least 100 mm remains in the carcase. Slam the drawer shut at the appropriate velocity given in Table 11. Carry out this procedure a total of 10 times.

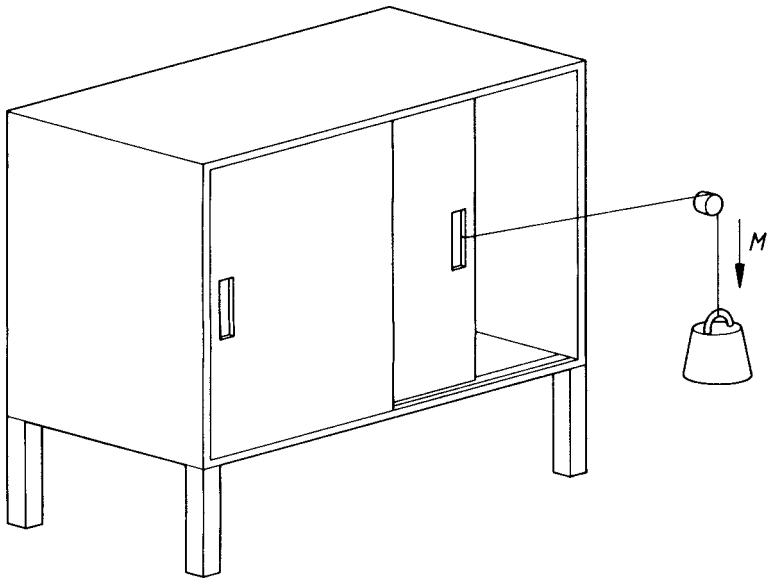


Figure 8 — Slam shut test for sliding doors

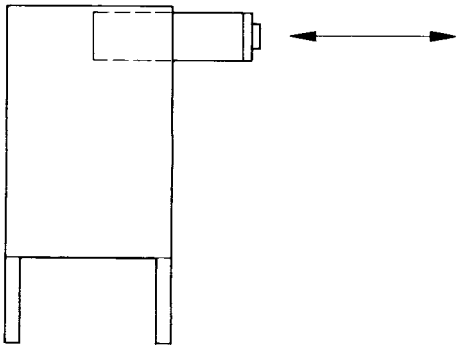


Figure 9 — Operational test for drawers

6.5.2.3 Close the drawer to a position 300 mm from the fully open position (or fully close the drawer if the total drawer travel is less than 300 mm). Slam the drawer open at the appropriate velocity given in Table 11. Carry out this procedure a total of 10 times.

6.5.3 *Drawer downward static load test.* With the carcase restrained to prevent overturning and the drawer, if fitted with stops, withdrawn to its limit, or, if not fitted with stops, withdrawn two-thirds way out, apply a static force of 350 N to the centre of the top edge of the front of the drawer. Repeat the loading on one front corner of the drawer. Apply the force to each position a total of 10 times.

Table 12 — Displacement of bottom surface of drawer

Test level	G	H	S
Force, N	60	70	80

6.5.4 *Displacement of bottom surface of drawer.* Place the drawer on its runners and load it with the appropriate load given in Table 1. Apply two forces of the appropriate magnitude given in Table 12 to points midway across the inside front and back surfaces of the drawer approximately 25 mm above the bottom surface. Apply the forces a total of 10 times.

6.5.5 *Stability.* Load the components of the article given in Table 1 with the appropriate loads given in Table 1, and withdraw one drawer to the limit of its travel.

NOTE See BS 4438 for design requirements of filing cabinets.

6.6 *Carcase rigidity test.* This test shall not be applied to wall mounted units.

Load the components of the article given in Table 1 that can be used for storage purposes with the appropriate load given in Table 1. Close the drawers and flaps and open the doors through an angle of 90°. Block the base at floor level at one end to prevent sliding.

Apply the appropriate force given in Table 13, at right angles to the plane of the surface, at the centre of the shortest side of the article at a height not greater than 1 600 mm from the floor and not less than 50 mm from the top. Remove the force. Apply the force to the centre of the opposite short edge. Remove the force. Apply the force to each position a total of 10 times.

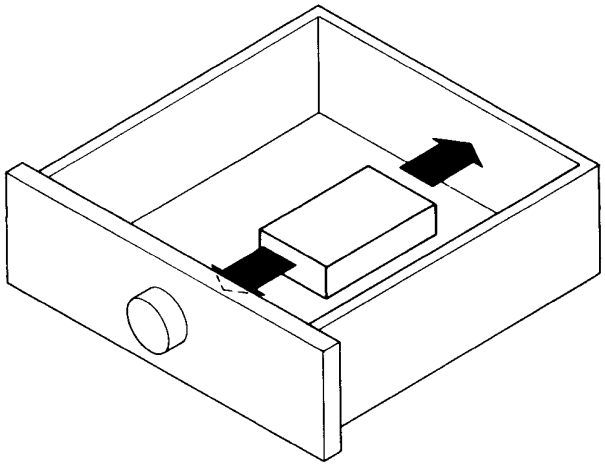


Figure 10 — Displacement of bottom surface of drawer

Repeat the above procedure with the force applied to the centre of the other side of the carcase (see Figure 11), without altering the position of the stops.

If, on application of the force given in Table 13, the article tends to overturn, reduce the magnitude of the force sufficiently to just prevent overturning.

Table 13 — Forces for carcase rigidity test

Test level	G	H	S
Force, N	450	600	800

7 Marking

Each article of furniture shall be clearly and indelibly marked, or shall have an indelible label permanently attached, to show the following information:

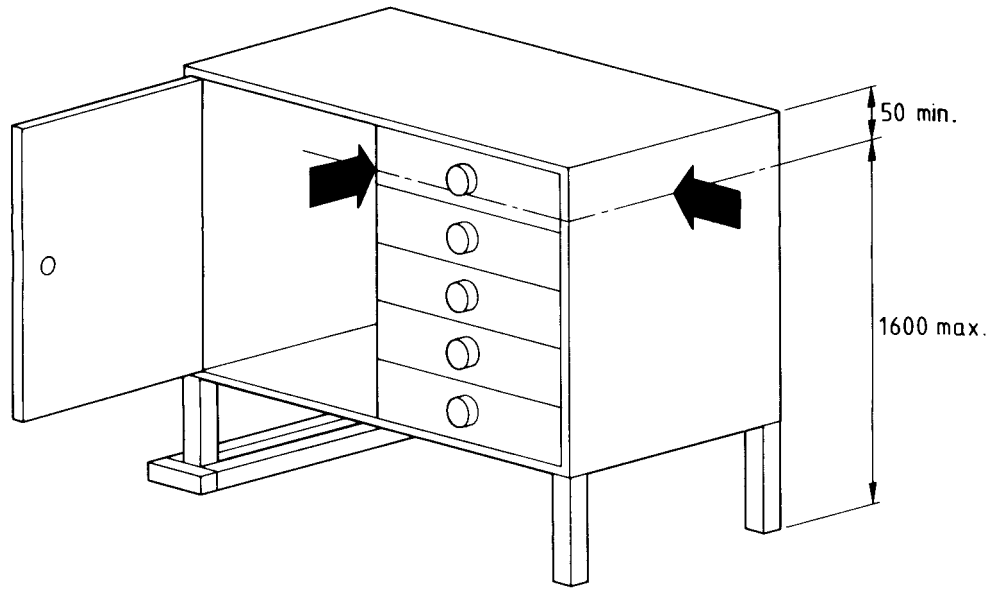
a) the name, registered trade name, or other means of identification of the manufacturer;

b) the number of this British Standard, i.e. BS 5459-3[2)];

c) the test level, i.e. G, H or S (see **4.1**);

and, if appropriate,

d) that the article is intended for wall attachment.



Dimensions are in millimetres.

Figure 11 — Carcase rigidity test

[2)] Marking BS 5459-3 on or in relation to a product is a claim by the manufacturer that the product has been manufactured to the requirements of the standard. The accuracy of such a claim is therefore solely the manufacturer's responsibility. Enquiries as to the availability of third party certification to support such claims should be addressed to the Director, Quality Assurance Division, BSI, Maylands Avenue, Hemel Hempstead, Herts HP2 4SQ for certification marks administered by BSI or to the appropriate authority for other certification marks.

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Publications referred to

BS 4438, *Filing cabinets and suspended filing pockets.*

BS 4875, *Strength and stability of domestic and contract furniture*[3)].

BS 4875-3, *Cabinet furniture.*

BS 5459, *Specification for performance requirements and tests for office furniture*[3)].

BS 5459-1, *Desks and tables.*

BS 5459-2, *Adjustable chairs.*

BS 6001, *Sampling procedures and tables for inspection by attributes.*

[3)] Referred to in the foreword only.

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