

Laboratory furniture and fittings —

Part 2: Specification for performance

Committees responsible for this British Standard

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- Association for Science Education
- Association of the British Pharmaceutical Industry
- British Furniture Manufacturers' Federation
- British Laboratory Ware Association
- British Occupational Hygiene Society
- British Woodworking Federation
- CLEAPSS
- Chartered Institution of Building Services Engineers
- Chartered Society of Designers
- Chemical Industries Association
- Department of Education and Science
- Department of Health
- Department of the Environment (Property Services Agency)
- Department of Trade and Industry (Laboratory of the Government Chemist)
- Furniture Industry Research Association
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Institute of Medical Laboratory Sciences
- Manufacturing, Science and Finance Union
- Medical Research Council
- National Association of Teachers in Further and Higher Education
- Royal Institute of British Architects
- Royal Society of Chemistry
- Universities Safety Association
- University Grants Committee

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Foreword

This part of BS 3202 has been prepared under the direction of the Laboratory Apparatus Standards Policy Committee. Together with BS 3202-1, -3 and -4, it supersedes BS 3202:1959, which is withdrawn. This part of BS 3202 is partially superseded by BS EN 13150:2001.

This part is one of a series, the other parts being as follows:

- *Part 1: Introduction;*
- *Part 3: Recommendations for design;*
- *Part 4: Recommendations for installation.*

This part covers requirements for the performance of laboratory furniture and fittings together with associated methods of test. Performance is described in terms of grades of severity in use related to the level of use and the degree of care it is likely to receive in service. Performance levels are designated for each test. The test methods are derived from existing British Standards but are modified in relation to testing of laboratory furniture.

This part should be read in conjunction with BS 3202-1. An index covering all parts of BS 3202 is included in BS 3202-1.

Product certification. Users of this British Standard are advised to consider the desirability of third party certification of product conformity with this British Standard based on testing and continuing surveillance, which may be coupled with assessment of a supplier's quality systems against the appropriate part of BS 5750.

Enquiries as to the availability of third party certification schemes will be forwarded by BSI to the Association of Certification Bodies. If a third party certification scheme does not already exist, users should consider approaching an appropriate body from the list of Association members.

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 44, an inside back cover and a back cover.

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1 Scope

This part of BS 3202 specifies strength and stability of laboratory furniture, and the performance of its exposed surface finishes. Additional requirements relating to work surfaces and surfaces likely to be exposed to wet conditions are also given.

Three grades of severity of use are described:

- G general use;
- H heavy use;
- S severe use.

These are related to the level of use and degree of care it is likely to receive in service. They are defined separately for strength and stability of the item of furniture and for the performance of its exposed surface finishes.

Tests for establishing compliance with this specification are given in Appendix A to Appendix S of this standard.

No tests are included for:

- a) the vibration characteristics of balance tables;
- b) the functional performance of fume cupboards (see BS 7258);
- c) the functional performance of display boards, e.g. notice boards, chalk boards, marker boards;
- d) the functional performance of ancillary equipment, e.g. emergency showers.

This part of BS 3202 does not apply to laboratory benching of the types covered in BS EN 13150:2001.

This standard does not specify the special requirements of furniture and fittings for:

- 1) ancillary laboratory spaces containing special equipment or support processes, e.g. cold rooms, environmental control rooms;
- 2) specialized laboratories with more stringent requirements relating to safety or the nature of the work, e.g. radio-isotope laboratories (see BS 4247); microbiological laboratories; industrial, medical and pharmaceutical controlled environment clean rooms; workstations and clean air devices (see BS 5295); animal house laboratories; explosives laboratories.

Recommended manufacturing tolerances on the dimensions of laboratory furniture are given in Appendix T.

NOTE 1 For microbiological laboratories, the Advisory Committee on Dangerous Pathogens has made recommendations in respect of some of the apparatus used and also furniture and fittings. In addition, if pathogens are to be manipulated, notification to the Health and Safety Executive is required in some cases before work can commence. See also the publications of the Advisory Committee on Genetic Manipulation.

NOTE 2 Consideration of safety matters is given in BS 3202-1.

NOTE 3 The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this British Standard, the definitions given in BS 3202-1 apply.

3 Performance grades

Laboratory furniture shall be graded according to the level of use it is intended to receive and the degree of care likely to be exercised by the users.

The three grades of performance shall be as given in Table 1.

Table 1 — Description of performance grades

Code	Grade	Description
G	General use	Appropriate to general laboratory use (with light loaded storage) and in use for approximately 8 h per day. Chairs for people up to 100 kg only
H	Heavy use	Appropriate to heavy laboratory use including up to 24 h use per day and some rough treatment and careless handling. Chairs for people up to 100 kg only
S	Severe use	Appropriate to severe laboratory use including heavy storage loads, up to 24 h use per day and subject to misuse. Chairs for people up to 120 kg

4 Performance

For an item of laboratory furniture to be designated as a particular grade for strength and stability, a sample shall meet the requirements for that grade in all the appropriate strength and stability tests (see clause 5).

For the exposed surfaces of an item of laboratory furniture to be designated as a particular grade, samples of all main exposed surface finishes shall meet the requirements for that grade in all the appropriate surface finish tests (see clause 6).

In addition, an item of furniture which includes a work surface shall be tested for ease of renovation and effect of impact by large diameter ball; certification shall be given to the purchaser.

For a system of laboratory furniture to be designated as a particular grade, all its components shall be of that grade. In addition, a sample assembly shall meet the support strength requirement (see Appendix A).

A stool shall meet the same requirements as a chair, except that loads specified as being applied to the chair back shall be applied horizontally to the stool seat.

NOTE Laboratory seating is considered to be no different in design or use from chairs used in other environments.

5 Strength and stability

5.1 Strength

According to its performance grade, a sample of laboratory furniture shall achieve the minimum performance ratings given in Table 2.

Applicable parts tests shall be carried out in the order listed in BS 4875-7. In order to reduce testing time when testing cabinets, the carcass strength tests shall, however, be carried out on the same unit. In addition, the durability tests on each component shall be accompanied by the relevant strength and impact tests specified for that component, in the order shown in Table 1 of BS 4875-7:1985.

Any sample which includes a separate support system, e.g. wall-mounted uprights and adjustable shelf brackets, shall meet the support strength requirement.

5.2 Stability

A sample of laboratory furniture shall comply with the appropriate requirements for normal stability furniture specified in BS 4875-8 for storage cabinets, BS 4875-6 for tables and trolleys, and BS 5459-2 for chairs and stools.

6 Surface finishes

6.1 Main exposed surfaces

According to its performance grade, samples of the main exposed surfaces, e.g. work surfaces, shelves, doors, cabinet sides, trolleys and seating, shall achieve the minimum performance ratings given in Table 3.

6.2 Work surfaces

In addition to the main exposed surfaces tests (see 6.1), samples of the work surfaces shall be tested for ease of renovation (Appendix R) and the effect of impact by large diameter ball (Appendix S).

The manufacturer shall state which of the work surfaces are intended to be soft and which are capable of reinstatement.

Samples of soft work surfaces shall be tested for surface penetration and, rather than meeting the level given in Table 3, the result shall be reported in order that an assessment may be made of the tool blunting propensity of the surface.

For the ease of renovation test, work surface replacement shall be adopted as the method of renovation unless the manufacturer specifies a method of surface reinstatement.

6.3 Minor surfaces

Tests shall not be applied to handles, knobs, decorative features, or tubes or rods making up the structural frame.

NOTE Such tests are deemed unnecessary.

7 Test samples

7.1 General

Testing shall be on specimen laboratory furniture which is fully representative of that to be supplied for use.

Unless stated otherwise for a specific test, test samples shall be aged in freely circulating air at a temperature not lower than 15 °C for not less than 28 days. All tests shall be carried out in the laboratory atmosphere. In all cases of dispute, tests shall be carried out at 23 ± 2 °C.

7.2 Strength and stability test samples

With the exception of conditioning (see 7.1), samples shall be tested in the state in which they are delivered.

Samples of self-assembly furniture shall be assembled in accordance with the manufacturer's instructions.

Where a sample includes a cantilevered work surface, this shall be tested as a flap, if hinged, and as an unloaded drawer, if sliding on runners.

Samples of system furniture shall be combined in the most adverse arrangement for each test. This requirement shall also apply to furniture that can be combined with other articles.

Samples intended for attachment to wall, partition or screen shall be securely fixed to a representative sample of such supporting structure through the fixing positions and using the fixing devices specified by the manufacturer.

Samples which are fitted with fixtures, e.g. fixed racks and hinged baskets, shall be tested with the fixture in the state or position which produces the most adverse loading conditions for each particular test. Strength tests shall be applied to the fixture itself as well as the item of furniture on which it is mounted.

Table 2 — Strength ratings

Items to be tested	Performance grade (see clause 3)	Test method	Minimum performance level
All laboratory furniture ^a	G H S	BS 4875-7	3 4 5
Tables and trolleys	G H S	BS 4875-5	3 4 5
Chairs and stools	G H S	BS 5459-2	G H S
Support system	G H S	Appendix A	G H S
^a For example, worktops, shelves, storage cabinets.			

Samples with fixtures which are designed to hold particular items shall have them loaded with the actual items, or a representation of them, in all strength and stability tests except the vertical static load test, the attachment security tests and the static overload test.

Samples having optional fixtures shall be tested with these fitted, unless in the opinion of the testing authority this is likely to increase the strength of the basic sample. In this case the fixture shall be tested separately.

Table 3 — Surface ratings

Test methods (appendix)	Property	Minimum performance ratings					
		Work surfaces			Other surfaces		
		G	H	S	G	H	S
Physical tests:							
B	Resistance to surface penetration (tool blunting propensity)	2 ^a	5 ^a	5 ^a	2	2	3
C	Impact	3 ^b	4 ^b	5 ^b	2	3	4
D	Wet heat						
	55 °C	4	5	5	—	—	—
	70 °C	3	4	5	—	—	—
	85 °C	3	4	5	—	—	—
	Dry heat						
	85 °C	—	—	—	3	3	4
	100 °C	—	—	—	2	2	3
	120 °C	3	5	5	—	—	—
	140 °C	2	4	4	—	—	—
	160 °C	2	3	4	—	—	—
Chemical tests:							
E	Resistance to cold liquids						
	Acetic acid	5	4	4	4	4	4
	Acetone	5	4	4	4	4	4
	Ammonium hydroxide	5	4	4	4	4	4
	Aqua regia	5	4	4	4	4	4
	Butyl acetate	5	4	4	4	4	4
	Dimethylformamide	5	4	4	4	4	4
	2-ethoxyethanol	5	4	4	4	4	4
	Gentian violet	4	3	3	3	3	3
	Hydrogen peroxide	5	4	4	4	4	4
	Nigrosine	4	3	3	3	3	3
	Potassium permanganate	4	3	3	3	3	3
	Silver nitrate	4	3	3	3	3	3
	Sodium hydroxide	5	4	4	4	4	4
	Sulphuric acid, concentrated	5	4	4	4	4	4
	Sulphuric acid, diluted	5	4	4	4	4	4
	Xylene	5	4	4	4	4	4
^a These levels apply to hard work surfaces only. Record results for assessment of tool blunting propensity (soft work surfaces only).							
^b These levels apply to hard work surfaces only.							

Table 3 — Surface ratings (*concluded*)

Test methods (appendix)	Property	Minimum performance ratings					
		Work surfaces			Other surfaces		
		G	H	S	G	H	S
Additional tests on applied finishes:							
F	Surface wear	150	300	300	150	300	300
G	Adhesion of paints and lacquers to substrates (cross cut test)	3	3	4	3	3	4
H	Surface heating	3 (all grades); no blistering					
J	Peel strength	1 300 N/m width minimum after ageing at room temperature and heat ageing.					
K	Shrinkage	0.25 mm maximum in both directions.					
L	Bond quality	No failure of the glue line to occur such that any area of either the surfacing material or substrate greater than 40 mm ² is free from adherent matter derived from substrate or surfacing material respectively					
M	Adhesion of edging material to substrate						
	40 °C	4 (all grades)					
	50 °C	3 (all grades)					
Additional tests on surfaces likely to be exposed to wet conditions, e.g. around sinks:							
N	Condensation	No visible deterioration; 0.8 mm maximum increase in panel thickness					
P	Water ingress	No visible deterioration; no blistering					
Q	Flooding	No visible deterioration; 0.8 mm maximum increase in panel thickness					
Additional tests on work surfaces:							
R	Ease of renovation	Record result					
S	Impact by large ball (accidental instrument damage)	Record result					

Table 4 — Test samples for a laboratory furniture range or system

Test	Test sample
BS 4875-7 Tests on shelves, horizontal surfaces and clothes hanging rails Tests on carcass and underframe	Largest free-standing item Largest supported item, e.g. wall mounted Longest unsupported span worktop Item with longest shelf, if not one of the above
BS 4875-7 Tests on pivoted doors	Item with pivoted door, the self-weight of which imposes the greatest bending moment on its hinge
BS 4875-7 Tests on sliding doors	Item with largest sliding door
BS 4875-7 Test on flaps	Item with largest cantilevered work surface
BS 4875-7 Test on roll fronts	Item with largest roll front
BS 4875-7 Tests on drawers	Item with largest drawer
BS 4875-8	Free standing item most likely to overturn and which includes: longest travel drawer; widest leaf pivoted door; greatest cantilevered work surface
BS 4875-5 and BS 4875-6 Tests on tables	Largest table of each type
BS 4875-5 and BS 4875-6 Tests on trolleys	Largest trolley of each type
BS 5459-2	Each type of chair Highest stool
All work surface finish tests	Cut from the test samples of laboratory furniture or manufactured to the same specification
All other exposed surface finish tests (see Table 3)	Cut from the test samples of laboratory furniture or manufactured to the same specification and to include all types of: shelf; door; cabinet side
NOTE Information on the scale of sampling to be employed can be obtained from BS 6001.	

7.3 Surface finish test samples

NOTE For surface finish tests, sample panels manufactured from the same materials and using similar application methods as those used during production of the furniture may be used.

Unless stated otherwise for a specific test, sample panels shall be at least 400 mm × 400 mm and shall be not less than 10 mm in thickness. Test methods having special requirements are:

Appendix F:	the sample shall be approximately 130 mm diameter;
Appendix J:	the sample shall be 300 mm × 50 mm size;
Appendix K:	the sample shall be 100 mm × 100 mm size;
Appendix L:	the sample shall have at least 300 mm of edging;
Appendix R:	the sample shall be a complete item with work surface.

7.4 Test samples from ranges of furniture

Samples for a test programme to cover a laboratory furniture range or system shall be in accordance with Table 4.

8 Test report

The test report shall include the following particulars:

- a) the number of this British Standard, i.e. BS 3202-2;
- b) the name, registered trade name, or other means of identification of the manufacturer;
- c) the detailed description of the samples tested;
- d) the strength grade for which the test sample has been tested;
- e) the surface finish grade for which the test sample has been tested;
- f) details of any defects observed before the tests;
- g) the individual test reports;
- h) the overall test result;
- i) the date.

NOTE All tests on services should be carried out on completion of the total laboratory installation.

9 Marking

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

- a) the name, registered trade name, or other means of identification of the manufacturer;
- b) the number of this British Standard, i.e. BS 3202-2:1991¹⁾;
- c) the strength/surface finish grades, e.g. G/G, H/S.

NOTE Laboratory furniture manufacturers and installers should provide printed recommendations for its operation and maintenance in the form of a printed manual.

The manual should include:

- 1) general information on the furniture elements and fittings;
- 2) the properties of the work surface material and its resistance to chemical attacks, etc., for the purchaser to ascertain that it is suitable for its intended purpose;
- 3) instructions on the care and maintenance of the various components and fittings;
- 4) information on decontamination procedures and the ease of decontamination of the surface material;
- 5) instructions for altering the layout of demountable and relocatable furniture and the associated services.

¹⁾ Marking BS 3202-2:1991 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

Appendix A

Method of test for the assessment of support system strength

A.1 Principle

This test is to establish the ability of the support system to sustain the loads from attached, fully-loaded furniture components and transmit these loads to anchorage points in the supporting construction, e.g. wall, floor, structural soffit.

A.2 Test specimen

The test specimen shall consist of two bays, i.e. three vertical supports, of the support system, a representative sample of the supporting construction for which the system is supplied and all necessary furniture components and fixing devices (see Figure 1).

The vertical members of the support system shall be placed at the maximum distance apart recommended for the system. Any joints the position of which is not predetermined by the system shall be located in the most adverse position in relation to the other support system components.

The support system specimen shall be attached to the supporting construction in accordance with the manufacturer's instructions and, where appropriate, using the fixing devices supplied. As far as possible, anchorages shall be made into good, sound construction, avoiding mortar joints, building block faults, etc.

The test assembly shall be fitted with work surface and storage components arranged to give the greatest recommended density of load supporting surfaces.

A.3 Procedure

Apply a loading of 4 kg/dm² to all support surfaces, e.g. work surfaces, shelves, cupboard tops and bottoms.

After 4 days under load, disengage every other fixing device (with the load removed if necessary for safety reasons) starting with the device judged to be the most highly stressed.

After a further 7 days remove the loading and record the condition of the sample and its fixing devices.

Failure occurs if at any time during the test a support system member, a furniture component attachment or a fixing device fractures or otherwise ceases to support the imposed loading.

NOTE Deformation of metal parts is not by itself deemed to be failure.

A.4 Test report

The test report shall include at least the following information:

- a) a reference to this appendix, i.e. Appendix A of BS 3202-2:1991;
- b) details of the samples tested, including furniture, fixing devices and supporting construction;
- c) the result of the test;
- d) the date of the test.

Appendix B

Method of test for surface penetration and the assessment of tool blunting propensity

B.1 Principle

A standard scraper blade is drawn over the test surface, across the grain where appropriate, at a constant speed under a gradually increasing force. The force acting on the blade at the point at which it first penetrates the test surface is measured and a numerical rating is given according to this force.

NOTE This test is based on the first part of the scrape test described in BS 3962-6.

B.2 Apparatus

B.2.1 Test machine (see Figure 2), which shall be capable of drawing a scraper blade, manufactured from tungsten carbide steel, and dimensioned as detailed in Figure 3, over the test surface under a force varying from less than 1.5 N to greater than 14 N over a distance of approximately 200 mm at a constant speed of 20 ± 5 mm/s.

The scraper blade shall be fixed in a blade holder (see Figure 4) so designed that the angle of the blade can be varied but locked at the required angle. At the same time, it shall be possible that the blade holder can be placed on, or removed from, the blade clamp body (see Figure 5) without disturbing the setting of the blade: this facility is necessary for calibration purposes.

The table shall be horizontal and its height shall be adjustable. A reference bar fixed parallel with the scraper head support arm shall be fitted.

B.2.2 *Viewing light*, consisting of a source of direct light.

NOTE A 60 W frosted lamp in an adjustable desk luminaire is suitable.

B.2.3 *Viewing lens*, which shall be a hand lens with a magnification of $\times 2$ to $\times 3$.

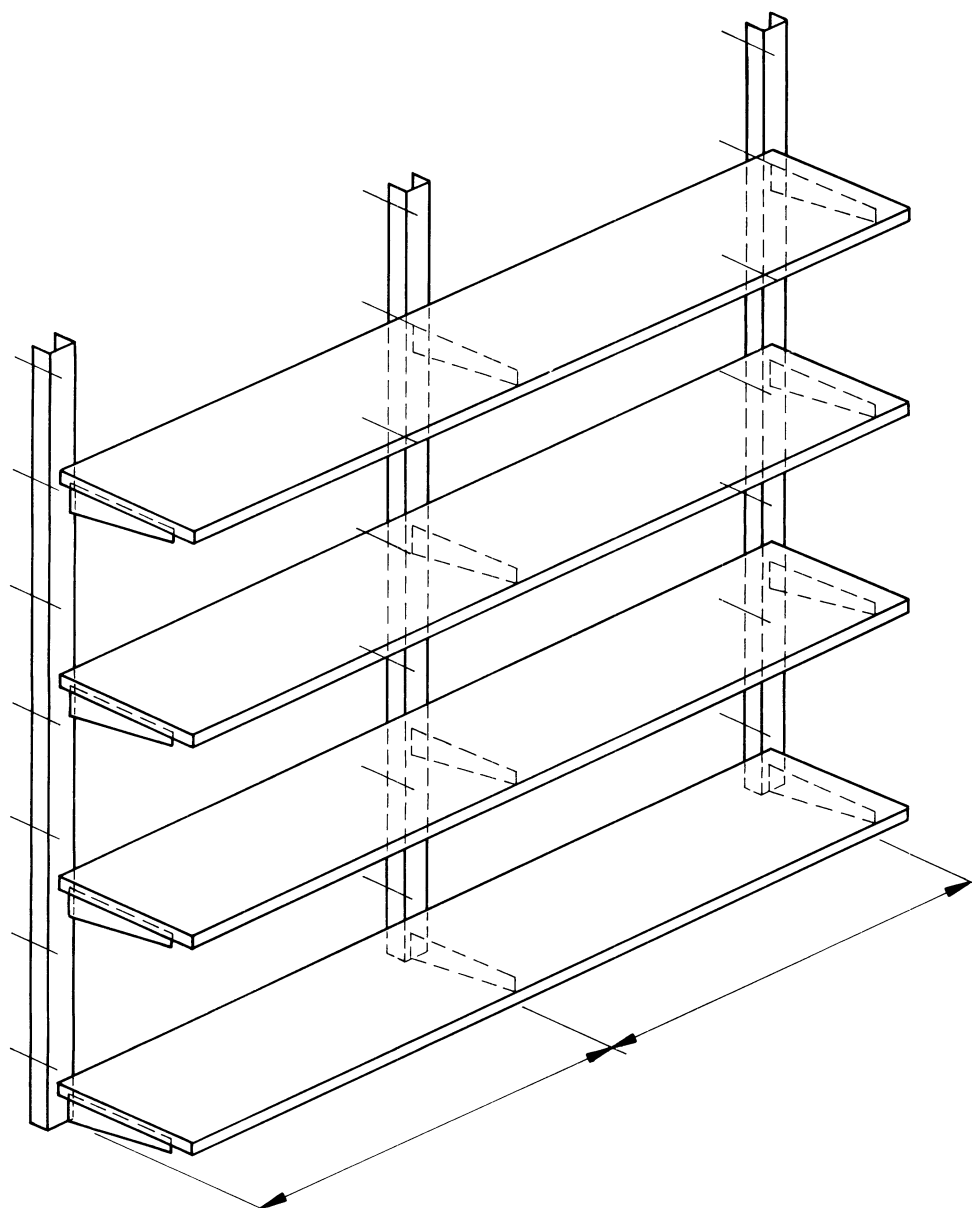


Figure 1 — Typical support system test assembly arrangement

B.3 Calibration of scraper blades

Each testing station requires a station standard blade calibrated against the master standard blade held by the Furniture Industry Research Association²⁾, and a working reference blade calibrated against the station blade. Each of these blades requires its own blade holder in which it is kept permanently. A third blade and holder, known as the “working blade”, shall be used for all testing.

NOTE References to a blade in the remainder of this appendix imply a blade in its holder.

Calibrate the working blade at regular intervals against the working reference blade to determine the required angle of the blade to the test surface. This angle will change slowly as the blade blunts with use.

Carry out the calibration by placing the relevant working reference blade on the machine and applying a scrape to any suitable finished wooden panel using the test procedure described. Replace the working reference blade by the working blade to be calibrated and scrape the panel again. Adjust the angle of the blade until the measured forces at failure agree with those obtained using the working reference blade. Clamp the working blade firmly in this position.

If the edge of the working blade becomes damaged, or worn to such a degree that the required angle is outside the range of the equipment, use the working reference blade as the working blade and use a new blade, calibrated against the station standard blade, as the working reference blade.

B.4 Procedure

Carry out the test at not less than two positions. Ensure that the test positions are as random as possible and, where relevant, that they do not lie on the same grain structure.

Place the test specimen on the machine table and, where the surface has a grain pattern, ensure that the direction of scrape is across the grain with the scraper blade resting on the surface. Adjust the height of the table until the reference arm is horizontal. The angle of the scraper blade to the test surface is now the required angle, and this angle should remain constant over the length of the scrape.

Draw the scraper blade over the test surface, commencing with the lowest force, after ensuring that the scraper blade and the surface are free from particles, or debris from previous tests, which could become lodged under the scraper blade to give a false result.

Carefully examine the scrape in good direct lighting (**B.2.2**), using the viewing lens (**B.2.3**), and note the position at which the blade first penetrates the surface of the finish and, when relevant, the position at which the blade first penetrates the substrate.

NOTE The surface will often be marked before the surface of the finish is penetrated.

Determine the force on the blade at these points, either by direct measurement or from a previously determined calibration.

Note any other observations, e.g. the nature of the failure could indicate poor intercoat or poor finish-to-substrate adhesion.

²⁾ The Furniture Industry Research Association (FIRA), Maxwell Road, Stevenage, Herts SG1 2EW.