
British Standard

Fire tests for furniture

Part 2. Methods of test for the ignitability of upholstered composites for seating by flaming sources

Essais de comportement au feu de l'ameublement

Partie 2. Méthode d'essai d'inflammabilité des sièges à capitonnage composite au contact de sources de flammes

Prüfungen des Brennverhaltens an Möbeln

Teil 2. Verfahren zur Prüfung der Zündempfindlichkeit von Polsterbestandteilen von Sitzflächen gegenüber Zündquellen

Confirmed December 2011

Contents

	Page		Page
Foreword		Inside front cover	
Cooperating organizations		Back cover	
Methods		Tables	
0. Introduction	1	1. Parameters of ignition sources 2 and 3	5
1. Scope	1	2. Parameters of crib ignition sources 4 and 5	6
2. Definitions	1	3. Parameters of crib ignition sources 6 and 7	6
3. Principle	1	4. Suggested gradings on mass/unit length basis	14
4. Criteria of failure	1	Figures	
5. Health and safety of operators	2	1. Test rig detail	3
6. Apparatus	2	2. Test rig assembly	4
7. Atmosphere for conditioning and testing	7	3. Crib 4	7
8. Test pieces	7	4. Crib 5	7
9. Test procedure	10	5. Crib 6	8
10. Test results	12	6. Crib 7	9
11. Test report	12	7. Details of cut-outs for fabric covers and interliners	11
Appendices			
A. Guidance notes for designers and specifiers	13		
B. Guidance notes for operators	13		

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

Foreword

This British Standard has been prepared under the direction of the Furniture Standards Committee in consultation with the Textile Products Standards Committee and is a development of that part of DD 58 not covered by Part 1 of this standard. DD 58 is now withdrawn.

BS 5852 : Part 1 specifies methods of test for assessing the ignitability of upholstered assemblies when subjected to either a smouldering cigarette or a lighted match.

This Part specifies a range of methods of test for examining the ignitability of upholstered assemblies when subjected to flaming ignition sources of thermal output ranging from greater than that of a burning match up to that approximating to four double sheets of full size newspaper.

Suggestions for modifications that may be made to examine more specific furniture design features are described in appendix A.

The methods of test are based on the principles of DD 58 but incorporate many improvements. In particular, the crib ignition sources have been modified substantially following research to give more reproducible ignition and burning;

the method uses replicate testing; the test rig has been reduced in size to be more economical with materials; also there is an option that the tests with the smaller (butane) sources can be carried out with the rig specified in Part 1.

Important note. The results of these laboratory tests relate to the behaviour of the test specimens as supplied under the particular conditions of test and do not take into consideration the effects of ageing, washing, soiling, etc. that may be encountered during the life of the product. It has to be recognized that these tests cannot give a full assessment of fire properties in all situations.

Measures taken to reduce the ignitability of an assembly may adversely affect other fire properties such as smoke and toxic gas evolution and this aspect requires consideration when materials and construction techniques are being evaluated.

Appendix B gives guidance notes for users of this standard. It is important that the details given in the appendix are studied before testing is carried out.

British Standard

Fire tests for furniture

Part 2. Methods of test for the ignitability of upholstered composites for seating by flaming sources

0. Introduction

After an assessment of the results of various research projects that have been carried out to investigate the fire properties of furniture, it was clear that tests carried out on component materials in isolation could not give a true indication of their behaviour when combined with other component materials in a piece of furniture. Therefore, to evaluate the ignitability of an item of seating, having due regard to the effects of interactions between materials and of design, it is necessary to test the complete finished item of furniture. However, there is a very wide range of designs and materials employed, so tests have been developed to test upholstery materials combined together to give information regarding the ignitability properties of assemblies that might be used in a number of different circumstances.

The position at which accidentally dropped flaming material is most likely to cause ignition is at the angle between vertical and horizontal surfaces. In designing these tests for evaluating assemblies of materials, this situation has been modelled, even though in practice an assembly might only be used on a single surface. The results, therefore, provide a measure of the ignitability of a combination of cover and filling which is equally valid for the different designs of furniture or the different applications in that furniture in which the combination might be used.

Six sources are specified (two butane flames and four burning wooden cribs) which together with the butane flame source of BS 5852 : Part 1, form a sequence of increasing thermal output from that approximating to a match to the burning of four sheets of full size newspaper. It has to be emphasized that the cribs are not intended to reproduce burning newspapers in all respects and the thermal output comparisons are given for guidance only. The cribs have been designed to give an additional weight loading (greater than that obtained with newspaper) on the upholstery composite. This is important to cover the situations that may occur in practice and to ensure that the test method errs on the side of safety with combinations prone to failure under load. Examples of these situations might be high localized cover tension induced by deep-buttoned upholstery, or the presence of heavy books close to the ignition source.

The test method measures the ignitability of the *overall* composite of materials (i.e. cover(s), infill material, etc.) as constructed on the test rig. The results have not to be stated as being applicable to the general behaviour of any individual component.

In the test method, the ignitability of an assembly may be determined by applying the sources in the order source 2 to

source 7, but for many specification purposes a test(s) involving one, or a limited number of selected sources may be required.

1. Scope

This Part of BS 5852 describes methods of test for assessing the ignitability of upholstered composites for seating, e.g. covers and filling, when subjected to flaming sources of thermal output ranging from that just greater than from a burning match up to that approximating to four double sheets of full size newspaper, as might be applied accidentally in the use of upholstered seats. It does not necessarily cover ignition caused by deliberate acts of vandalism.

Possible ways in which the standard can be used to indicate the potential ignitability of components in conjunction with other specified materials or where more specific information is required about design features are given in appendix A.

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

2. Definitions

For the purposes of this Part of BS 5852 the following definitions apply.

2.1 progressive smouldering. An exothermic oxidation, not accompanied by flaming, that is self-propagating, i.e. independent of the ignition source. It may or may not be accompanied by incandescence.

2.2 flaming. Undergoing combustion in the gaseous phase with the emission of light.

3. Principle

The principle is to subject an assembly of upholstered composites, arranged to represent, in stylized form, a junction between a seat and back (or seat and arm) such as is typical in chairs, to six flaming sources (two butane flames and four burning wooden cribs) selected to cover the intensities of actual sources that might be encountered in various end use environments.

4. Criteria of failure

4.1 Progressive smouldering failure. For the purposes of this standard, all the following types of behaviour are considered to be progressive smouldering failures:

- (a) for sources 2 or 3: any composite that produces externally detectable amounts of smoke, heat or glowing 30 min after the removal of the burner tube;
- (b) for sources 4, 5, 6 or 7: any composite that produces externally detectable amounts of smoke, heat or glowing 60 min after ignition of the crib;

- (c) any composite that displays escalating combustion behaviour so that it is unsafe to continue the test and requires forcible extinction;
- (d) any composite that smoulders until it is essentially consumed within the test duration relevant to the source;
- (e) any composite that smoulders to the extremities of the specimen viz upper or lower margins, either side or to its full thickness, within the duration of the test;
- (f) any composite that, on final examination, shows evidence of charring other than discolouration, more than 100 mm in any direction apart from upwards from the nearest part of the original position of the source.

NOTE. In practice it has been found that there is usually a clear distinction between materials that char under the influence of the ignition source but that do not propagate further (non-progressive) and those where smouldering develops in extent and spreads (progressive).

4.2 Flaming failure. For the purposes of this standard, all the following types of behaviour are considered as to be flaming failures:

- (a) for sources 2 or 3: any composite that continues to flame for more than 120 s after the removal of the burner tube;
- (b) for sources 4 or 5: any composite that continues to flame for more than 10 minutes after the ignition of the crib;
- (c) for sources 6 or 7: any composite that continues to flame for more than 13 minutes after the ignition of the crib;
- (d) any composite that displays escalating combustion behaviour so that it is unsafe to continue the test and forcible extinction is required;
- (e) any composite that burns until it is essentially consumed within the test duration relevant to the source;
- (f) any composite on which any flame front reaches the lower margin, either side or passes through the full thickness of the specimen within the duration of the test (but see 6.1.2).

5. Health and safety of operators

5.1 General. There is a considerable hazard with these tests and precautions have to be taken.

5.2 Enclosure. For safety, the tests should be conducted in a suitable fume cupboard. If such a cupboard is not available, an enclosure should be constructed so that the operator is not exposed to the fumes (see clause 9 and 6.1.1).

5.3 Extinguishers. Adequate means of extinguishing the assembly should be provided, bearing in mind that some combinations may produce severe flaming during the test. A hand and/or a fixed water spray which can be directed over the burning area can be advantageous. Other means such as fire extinguishers (water and halogenated hydrocarbons), fire blankets and a bucket of water will assist.

In some cases smouldering may be difficult to extinguish completely and complete immersion in water may be necessary.

6. Apparatus

6.1 Test rig

6.1.1 Test rig for all ignition sources. A suitable test rig is illustrated in figures 1 and 2. It consists of two rectangular frames hinged together and capable of being locked at right angles to each other.

The frames are made from nominal 25 mm x 3 mm steel flat bar and securely hold expanded steel platforms set 6 ± 1 mm below the top edge of the frames.

NOTE. The size of the mesh of the expanded steel is not critical, but a mesh size across the diagonals of approximately 28 mm x 6 mm has been found to be suitable. The expanded metal may bow slightly during test, but this has not been found to affect the result.

The internal width and height of the back frame is 450 ± 2 mm, and the internal width and depth of the base frame is 450 ± 2 mm x 300 ± 2 mm. A standard edging section may be used around the expanded steel to give protection and greater rigidity.

The sides of the frames extend beyond the back of each frame to provide for the hinge holes and to form the back legs. The hinge rod is of nominal 10 mm diameter steel, continuous across the back of the rig, and its axis 22.5 ± 0.5 mm beyond the back member of each frame.

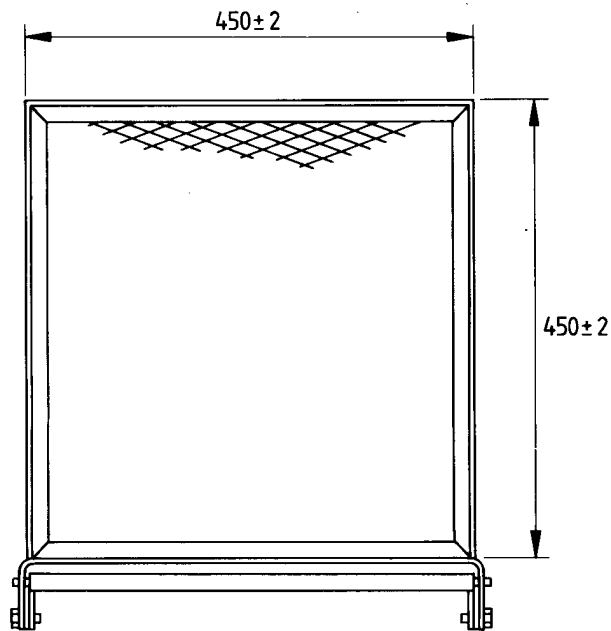
The frames are lockable at right angles by a bolt or pin through each of the pairs of members forming the back legs. The front legs may be welded across the front corners of the base frame. The height of the legs shall be such as to leave a gap not less than 50 mm high between the base frame and the supporting surface.

For the tests, the rig is sited within the enclosure (see 5.2) and the testing is performed in a substantially draught-free environment permitting an adequate supply of air and removal of smoke from the area of the apparatus.

6.1.2 Alternative test rig for ignition sources 2 and 3. The smaller test rig specified in 6.1 of BS 5852 : Part 1 : 1979 is equally as suitable for use as that described in 6.1.1 when testing with ignition sources 2 and 3. However, if the flame reaches the top of the rig with sources 2 or 3 on the small rig, without failing by any other criteria, the test is repeated using the large rig.

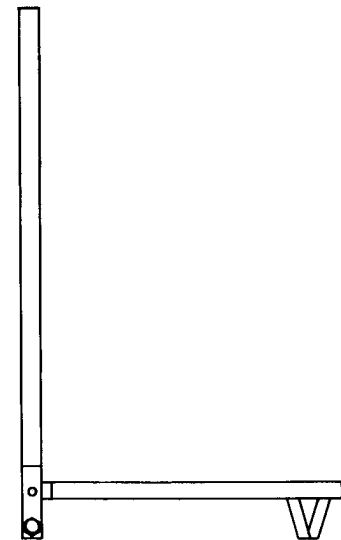
6.2 Test enclosure. Either, a room with a volume greater than 20 m³ (which contains adequate oxygen for testing), or a smaller enclosure with a through flow of air is used. Inlet and extraction systems providing air flow rates of 0.02 m/s to 0.2 m/s in the locality of the rig provide adequate oxygen without disturbing the burning behaviour.

6.3 Clock. A clock accurate to at least 1 s and capable of measuring at least 1 h is required.

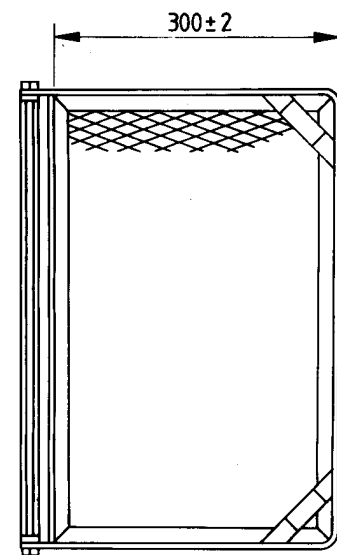


Front view
Scale 1 : 10

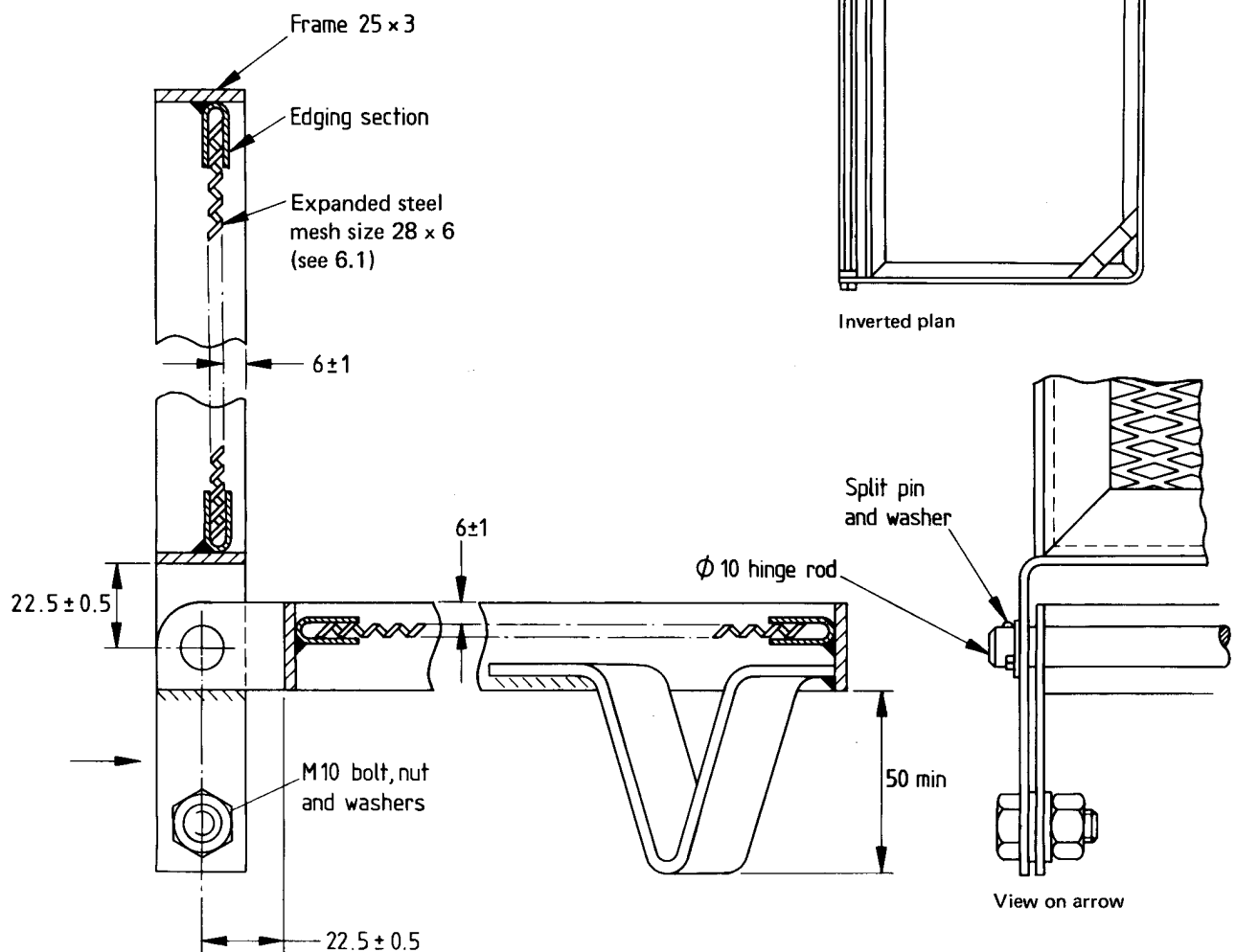
Unless otherwise shown the dimensions
have a tolerance of 2.5 %



Side view



Inverted plan



Side section
Scale 1 : 2

All dimensions are in millimetres. All parts are of steel

Figure 1. Test rig detail

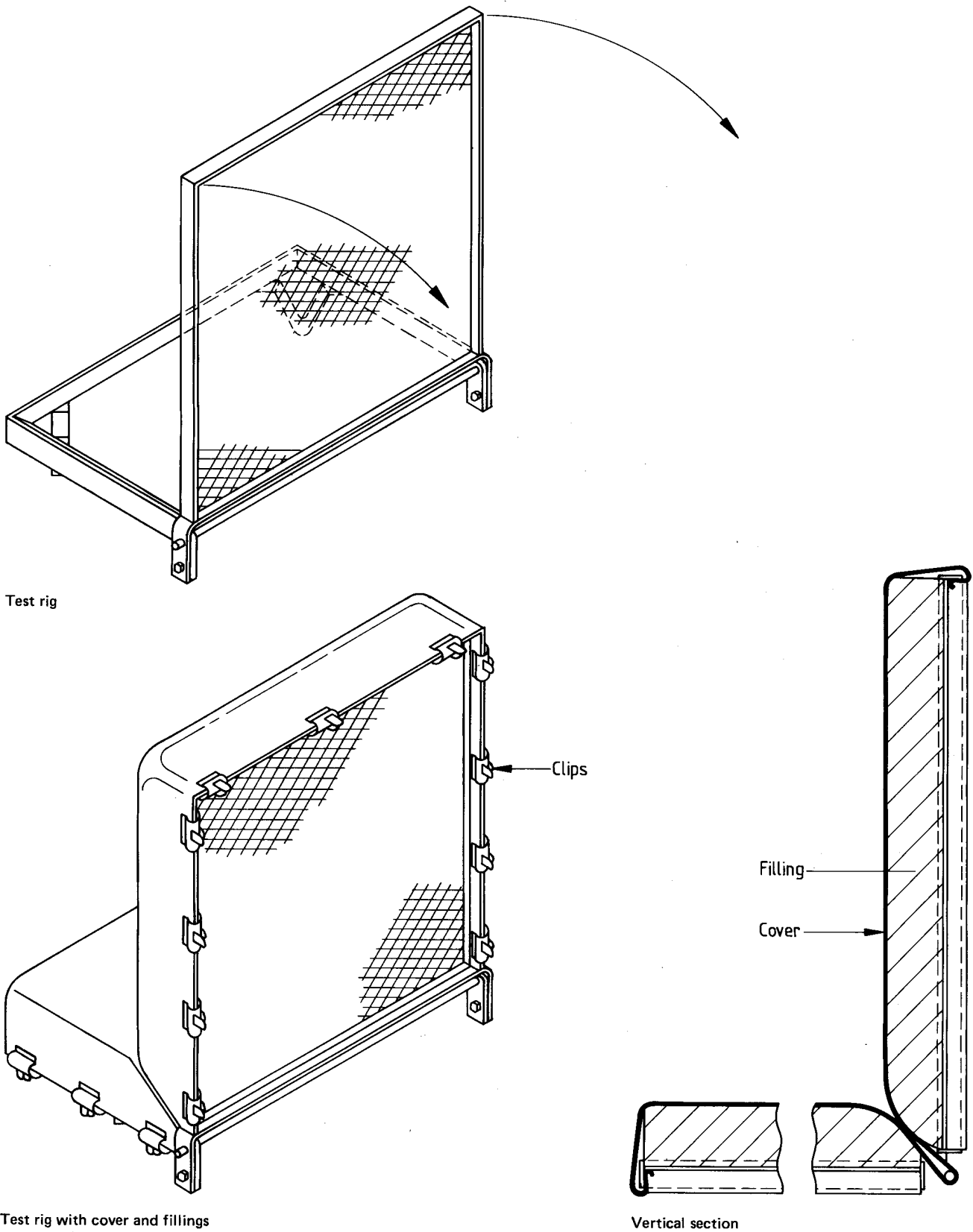


Figure 2. Test rig assembly