



**FIRE TEST REPORT FOR
MARLON LONGLIFE
10mm Twinwall Polycarbonate**

Manufactured by Brett Martin Limited

**Classification: Class 1
Report: WARRES No. 48082**



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CONFIDENTIAL REPORT

WARRES No. 48082

BS 476: PART 7: 1987

METHOD OF CLASSIFICATION OF THE SURFACE SPREAD OF FLAME FOR PRODUCTS

sponsored by

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PURPOSE OF TEST

To determine the performance of specimens of a product when they are subjected to the conditions of the test specified in British Standard 476: Part 7: 1987, Fire tests on building materials and structures, method for classification of the surface spread of flame of products.

SCOPE OF TEST

BS 476: Part 7: 1987 specifies a method of test for measuring the lateral spread of flame along the surface of a specimen of a product orientated in the vertical position, and a classification system based on the rate and extent of flame spread. It provides data suitable for comparing the performances of essentially flat materials, composites or assemblies, which are used primarily as the exposed surfaces of walls or ceilings.

DESCRIPTION OF TEST SPECIMENS

The description of the specimens given below has been prepared from information provided by the sponsor of the test. All values quoted are nominal, unless tolerances are given.

The product was 10 mm thick "Marlon Longlife", a clear twin skinned sheet having a weight of from 1.7 kg/m² to 2.0 kg/m², manufactured from polycarbonate. The skins were separated by inner ribs to form rectangular cavities along the length of the sheet. The specimens were tested with the cavities running in the horizontal orientation. One skin was co-extruded coated on the exposed face with a U-V protective layer to provide a weather resistant surface.

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Further details of the product have been provided and are held on our confidential file relating to this investigation.

CONDITIONING OF SPECIMENS

Prior to test the specimens were conditioned to constant mass at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $55 \pm 10\%$.

DATE OF TEST

The test was performed on 20th July 1989.

TEST PROCEDURE

The test was performed in accordance with the procedure specified in BS 476: Part 7: 1987, as amended in April 1989, and this report should be read in conjunction with that British Standard.

FORM IN WHICH THE SPECIMENS WERE TESTED

The specimens were tested in the form of a composite but in the product shape described above. The definitions for a material, composite and assembly have been assumed to be those given in BS 476: Part 6: 1989.

EXPOSED FACE

The "Inner skin" face of the specimens was exposed to the radiant heat of the test when the specimens were mounted in the test position.

TEST RESULTS

The test results relate only to the behaviour of the specimens of the product under the particular conditions of test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

The test results relate only to the specimens of the product in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test results. Care should be taken to ensure that any product which is supplied or used is fully represented by the specimens which were tested.

The test results for the individual specimens, together with observations made during the test and comments on any difficulties encountered during the test are given in Table 1.

In accordance with the class definitions given in BS 476: Part 7: 1987 the specimens tested are classified as class 1Y.

Note: If the prefix 'D' or suffix 'R' or 'Y' is included in the classification, this indicates that the results should be treated with caution. An explanation of the reason for the prefix and suffixes is given in Appendix 1, together with the irradiance along the horizontal reference line of the specimen position during the test and the classification limits specified in the Standard.

INTERPRETATION OF TEST RESULTS

Attention is drawn to Appendix 2 entitled "Effect of thermal characteristics on the performance of assemblies".

Responsible Officer

P.E. Lythgoe

P.E. LYTHGOE
Senior Technical Officer -
Fire Performance of
Materials and Components

Approved

R.J. Shaw

R.J. SHAW
Director

Date: 5th October 1989

LD4489

TABLE 1

SPECIMEN NO.	1	2	3	4	5	6
Maximum distance travelled at 1.5 minutes (mm)	165	90	150	80	75	140
Distance (mm)	Time to travel to indicated distance (minutes, seconds)					
75	0.50	0.52	0.45	0.55	0.55	1.00
165	1.20				5.20	
190						
215						
240						
265						
290						
375						
455						
500						
525						
600						
675						
710						
750						
785						
825						
900						
Time to reach maximum distance travelled (minutes, seconds)	1.20	1.00	1.15	1.02	5.20	1.20
Maximum distance travelled in 10 minutes (mm)	165	90	150	80	165	140

Note: Six specimens only are usually tested. If the test on any specimen is deemed to be invalid, as defined in the Standard, it is permissible for up to a maximum of nine specimens to be tested in order to obtain the six valid test results.

Observations made during test and comments on any difficulties encountered during the test:

The specimens started to soften and sag during the first minute of the tests progressively melting away from the test position as the tests continued up to a maximum distance of approximately 500 mm. The molten residue collected at the bottom of the specimen holder where it continued to burn throughout the tests. Flaming droplets were produced from all the specimens during the fourth minute of the tests. All flaming droplets extinguished before reaching the floor.

APPENDIX 1

Irradiance along the horizontal reference line of the specimen position during the test.

Distance along reference line from the hotter end of the specimen position (in mm)	75	225	375	525	675	825
Irradiance at points specified above (kW/m ²)	32.5	21.0	14.5	10.0	7.0	5.0

Note: a tolerance of ± 0.5 kW/m² is specified on the irradiance measurement.

Classification of spread of flame

Classification	Spread of flame at 1.5 min		Final spread of flame	
	Limit	Limit for one specimen in sample	Limit	Limit for one specimen in sample
	mm	mm	mm	mm
class 1	165	165 + 25	165	165 + 25
class 2	215	215 + 25	455	455 + 45
class 3	265	265 + 25	710	710 + 75
class 4	exceeding the limits for class 3			

Explanation of prefix and suffixes which may be added to the classification

1. A suffix R is added to the classification if more than six specimens are required in order to obtain six valid test results (e.g. class 2R).
2. A prefix D is added to the classification of any product which does not comply with the surface characteristics specified in the Standard and has therefore been tested in a modified form (e.g. class D3).
3. A suffix Y is added to the classification if any softening and/or other behaviour that may affect the flame spread occurs (e.g. class 3Y).

For example, a classification of D3RY could be achieved indicating (a) a modified surface has been used; (b) a class 3 result has been obtained; (c) additional specimens have been used to obtain 6 valid results and; (d) softening and/or other behaviour has occurred which is considered to have affected the test result.

APPENDIX 2

The result of a test in accordance with BS 476: Part 7: 1987 is applicable only to the specimens in the form in which they were tested. Small differences in the composition or thickness of the product may significantly affect the performance during the test and may therefore invalidate the test result. It is important that the specimens which are tested fully represent the product which is supplied and the manner in which it will be used. This may require a product to be tested in a number of different ways to determine the classification which will be achieved in its different methods of use.

A surface coating, for example, may be applied to a selected substrate using a particular method and application rate. The test classification which is achieved for that set of specimens will be applicable only to that situation. If the substrate or method and rate of application in a particular practical situation are different from that which was tested, then it will be necessary to determine the classification which will be achieved. Similarly, specimens incorporating a wallcovering must be fully representative of the situation which occurs in practice and will normally consist of the wallcovering bonded to a chosen substrate with a chosen adhesive; the test result will apply only to that composite system. The same principle applies to any composite or assembly which is being investigated.

It is sometimes possible to assume a 'worst-case' situation which will enable a chosen set, or sets, of specimens to be constructed and tested to provide a foundation for the assessment of the probable performance of variations within the system. Similarly, it is sometimes possible to formulate a series of exploratory tests to investigate the effect of variations within a product or system, usually culminating in a series of formal tests to provide the basis for a composite assessment of pre-determined variables. In such cases, however, it is essential that careful planning of the programmes are undertaken by suitably qualified fire safety practitioners.

The following is re-produced from Appendix B of BS 476: Part 7: 1987;

With thin materials or composites, particularly those with a high thermal conductivity, the presence of an air gap and the nature of any underlying construction may significantly affect the ignition performance of the exposed surface. Increasing the thermal capacity of the underlying construction increases the 'heat sink' effect and may delay ignition of the exposed surface. Any backing provided to the test specimen and in intimate contact with it, such as the non-combustible spacers, may alter this 'heat sink' effect and may be fundamental to the test result itself. The influence of the underlying layers on the performance of the assembly should be understood and care should be taken to ensure that the result obtained on any assembly is relevant to its use in practice.

The following advice is offered on the construction and preparation of test specimens;

- (a) Where the thermal properties of the product are such that no significant heat loss to the underlying layers can occur, e.g. a material/composite greater than approximately 6 mm thick of high thermal capacity and/or low thermal conductivity, then the product should be tested backed only by the backing board.

- (b) Where the product is normally used as a free-standing sheet and the characteristics noted in (a) do not apply, then an air space should be provided at the back of the product by testing over spacers of non-combustible insulation board 20 mm wide and 25 ± 1 mm thick.
- (c) Where the product is to be used over a low density non-combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.
- (d) Where the product is to be used over a combustible substrate and the characteristics noted in (a) do not apply, then the product should be tested in conjunction with that substrate.