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TEST REPORT

FIRE RESISTANCE TEST UTILISING THE HEATING CONDITIONS AND GENERAL PRINCIPLES OF BS 476: PART 20: 1987, ON A WALL MOUNTED AIR TRANSFER GRILLE

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FIRE SAFETY

Warrington FIRE research
CONSULTANCY • TESTING

TEST REPORT

TEST SPONSOR : **LORIENT POLYPRODUCTS LIMITED**, Fairfax Road, Heathfield Industrial Estate, Newton Abbot, Devon, TQ12 6UD.

SUMMARY : A specimen of a wall mounted air transfer grille has been subjected to a fire resistance test utilising the heating conditions and general principles of BS 476: Part 20: 1987.

The specimen had overall nominal dimensions of 600 mm high by 600 mm wide by 40 mm thick and was installed within an aperture located in a section of aerated concrete wall.

If the performance of the specimen was to be assessed against the integrity performance criteria specified in BS 476: Part 20: 1987, the results could be expressed as follows:

Integrity : 66 minutes

The test was discontinued after a period of 68 minutes.

DATE OF TEST : 10th January 1997

REPORT ISSUED : 21st February 1997

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CONTENTS

1. PURPOSE OF THE TEST

1.1 To provide an indication of the performance of a wall mounted air transfer grille when subjected to the heating conditions and assessed using the performance criteria for integrity specified within BS 476: Part 20: 1987.

2. INTRODUCTION

2.1 There are at present no published British Standards applicable to the fire resistance testing of air transfer grilles intended to restrict the spread of fire. Wall constructions which are required to provide fire resistance are tested using procedures detailed within BS 476: Part 20: 1987 'Methods for determination of the fire resistance of elements of construction (general principles)'. Consequently it would seem appropriate to utilise that standard as a basis for this test.

2.2 The air transfer grille was symmetrical and was fitted into an aperture within a section of an aerated concrete wall.

2.3 The specimen was assessed against the integrity performance criteria specified within BS 476: Part 20: 1987.

2.4 Certain aspects of some fire test specifications are open to different interpretations. The Fire Test Study Group has identified a number of such areas and has agreed Resolutions which define common agreement of interpretations between fire test laboratories which are members of the Group. Where such Resolutions are applicable to this test they have been followed.

2.5 The test was conducted on the 10th January 1997, at the request of Lorient Polyproducts Limited, the sponsor of the test.

2.6 The test was witnessed by Mr D Boulton and Mr G Newcombe, representatives of the test sponsor.

3. TEST SPECIMEN CONSTRUCTION

3.1 A comprehensive description of the test construction is given in Annex A. The description is based on a detailed survey of the specimen and information supplied by the sponsor of the test.

3.2 The air transfer grille was supplied by the sponsor on the 9th January 1997. Warrington Fire Research Centre was not involved in any sampling or selection procedure of the components.

3.3 The specimen was installed into prepared aperture within a 150 mm thick aerated concrete blockwork wall by representatives of the sponsor on the 10th January 1997.

4. INSTRUMENTATION AND MEASURING EQUIPMENT

4.1 The instrumentation was provided in accordance with BS 476: Part 20: 1987, where appropriate.

4.2 Four thermocouples distributed over a plane 100 mm from the surface of the specimen, were provided to monitor the temperature of the furnace atmosphere.

4.3 Pressure sensors were provided within the furnace to monitor the furnace atmospheric pressure.

4.4 A roving thermocouple was available to measure temperatures on the unexposed surface of the specimen at any position. Thermocouples could not be fixed to the unexposed face of the specimen due to the nature of the construction in the early stages of the test.

4.5 Cotton pads and gap gauges were available to evaluate the impermeability of the specimen to hot gases.

5. TEST PROCEDURE

5.1 The test was conducted utilising the heating conditions and general principles specified in BS 476: Part 20: 1987.

5.2 The furnace was controlled so that its mean temperature complied with the requirements of BS 476: Part 20: 1987, Clause 3.1.

5.3 After the first five minutes of testing and for the remainder of the test, the furnace pressure was controlled so that it complied with the requirements of BS 476: Part 20: 1987, Clause 3.2.2. The pressure differential relative to the laboratory atmosphere at mid height of the specimen was 5 ± 2 Pa.

5.4 Throughout the test the temperatures indicated by the thermocouples provided to monitor the furnace were continuously monitored and were recorded at one minute intervals.

5.5 The thermocouples referred to in 4.2 were used to determine the mean furnace temperature.

5.6 The cotton pads and gap gauges were used if considered appropriate, to determine compliance with the integrity criterion of the Standard. The occurrence of any sustained flaming on the unexposed surface of the specimen was also monitored to determine compliance with this criterion.

6. TEST DATA AND INFORMATION

6.1 The following data, which was recorded during the test, is given in Annex B:

6.1.1 Mean furnace temperature, together with a comparison with the temperature/time relationship specified in the Standard.

6.2 A summary of the observations made on the general behaviour of the specimen is given in Annex C.

6.3 The ambient air temperature in the vicinity of the test construction was 13°C at the start of the test with a maximum variation of +1°C during the test.

6.4 The test was discontinued after a period of 68 minutes at the request of the sponsor.

7. EVALUATION AGAINST THE PERFORMANCE CRITERIA

7.1 The performance of the specimen was judged against the following criteria of BS 476: Part 20: 1987:

7.1.1 **Integrity** - It is required that there is no collapse of the specimen, no sustained flaming on the unexposed surface and no loss of impermeability. The specimen satisfied these requirements for 66 minutes after which time a through gap in excess of 150 mm by 6 mm was evident.

8. CONCLUSIONS

8.1 A specimen of an air transfer grille has been subjected to a fire test utilising the heating conditions and general principles of BS 476: Part 20: 1987.

8.2 If the performance of the specimen was to be assessed against the integrity criteria specified in BS 476: Part 20: 1987, the results could be expressed as follows:

Integrity : 66 minutes

The test was discontinued after a period of 68 minutes.

9. LIMITATIONS

9.1 The results relate only to the behaviour of the specimen of the element of construction under the particular conditions of test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use, nor do they reflect the actual behaviour in fires.

9.2 The test results relate only to the specimen tested. Appendix A of BS 476: Part 20: 1987 provides guidance information on the application of fire resistance tests and the interpretation of test data. Application of the results to grilles of different dimensions or supported other than by an aerated concrete wall as tested or incorporating different components should be the subject of a design appraisal.

10. REVIEW

10.1 This report covers a test which was conducted to a procedure which is not the subject of any British Standard specification but the test utilised the heating conditions and general principles of fire resistance testing given in BS 476: Part 20: 1987. Since fire tests are the subject of a continuing Standardisation process, and because existing standards are the subject of review and possible amendment and new interpretations, it is recommended that the report be referred back to the test laboratory after a period of two years to ensure that the methodology adopted and the results obtained remain valid in the light of the situation prevailing at that time.

Responsible Officer

S. Hankey.

S HANKEY
Technical Officer
Structural Fire Protection

Approved by

M THOMPSON
Senior Technical Officer
For and on behalf of
WARRINGTON FIRE RESEARCH CENTRE

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ANNEX A

SCHEDULE OF COMPONENTS
(Refer to Figures 1 and 2)
(All values are nominal unless stated otherwise)
(All references are as stated by the sponsor)

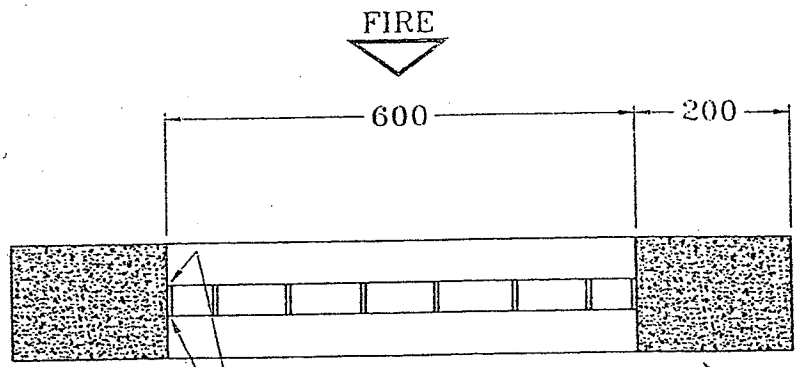
SPONSORS REFERENCE : LORIENT LV40 INTUMESCENT AIR TRANSFER GRILLE

Item	Description		
1.	**Perimeter Sections**		
	Manufacturer	:	Lorient Polyproducts Limited
	Material	:	Polyvinyl Chloride (PVC) casing containing 1 No. layer of Palusol and 1 No. layer of perforated steel mesh.
	Section size		
	i) PVC casing	:	40 mm wide x 6 mm thick
	ii) Palusol layer	:	37.5 mm wide x 2 mm thick
	iii) Mesh layer	:	37.5 mm wide x 1 mm thick
	Fixing	:	Each vertical perimeter member fixed to masonry aperture using 2 No. 4.2 mm diameter by 45 mm long self tapping steel screws. All perimeter members contained slots to accept the vertical and horizontal slats (items 2 and 3)
2.	**Vertical Slats**		
	Manufacturer	:	Lorient Polyproducts Limited
	Material	:	PVC casing containing 1 No. layer of Palusol and 1 No. layer of perforated steel mesh.
	Section size		
	i) PVC casing	:	40 mm wide x 6 mm thick
	ii) Palusol layer	:	37.5 mm wide x 2 mm thick
	iii) Mesh layer	:	37.5 mm wide x 1 mm thick
	Fixing	:	Ends of each slat located into slots in the top and bottom perimeter members (item 1).

ANNEX A (continued)

3. **Horizontal Slats**

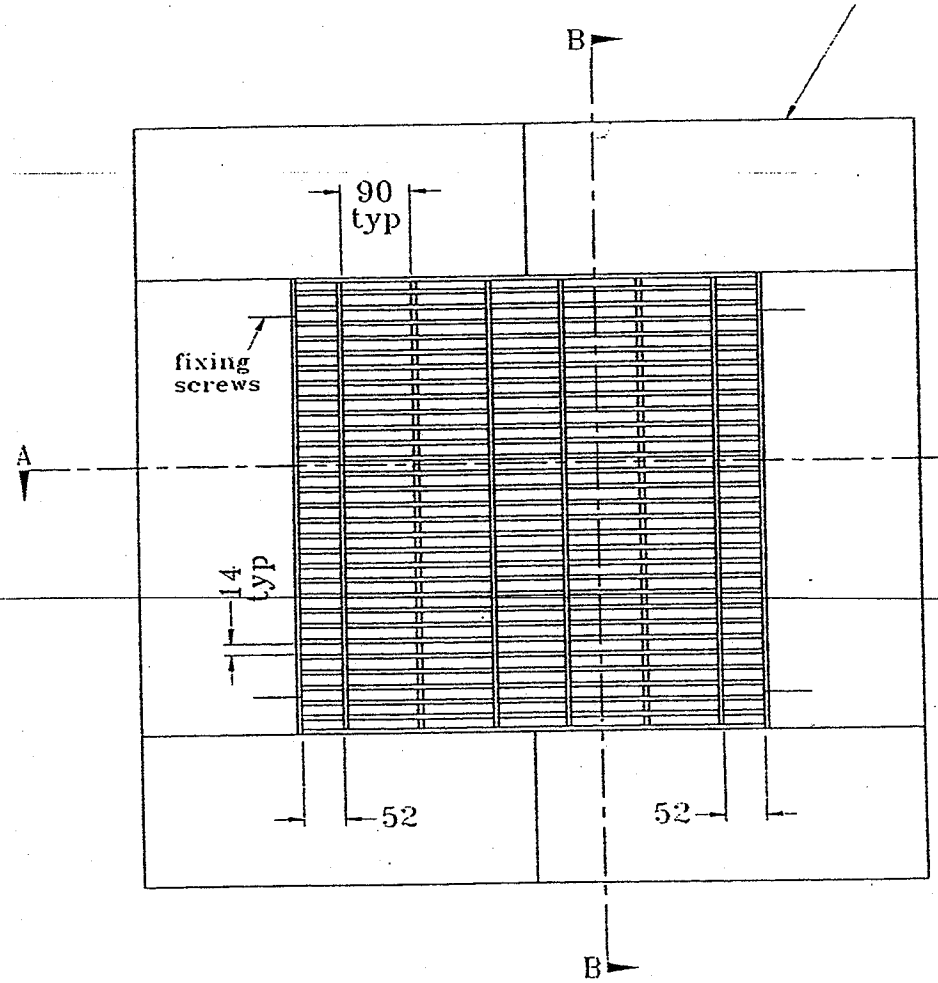
Manufacturer	:	Lorient Polyproducts Limited
Material	:	PVC casing containing 2 No. layers of Palusol
Section size		
i) PVC casing	:	40 mm wide x 6 mm thick
ii) each Palusol layer	:	37.5 mm wide x 2 mm thick
Fixing	:	Ends of each slat located into slots in the vertical perimeter members (item D)



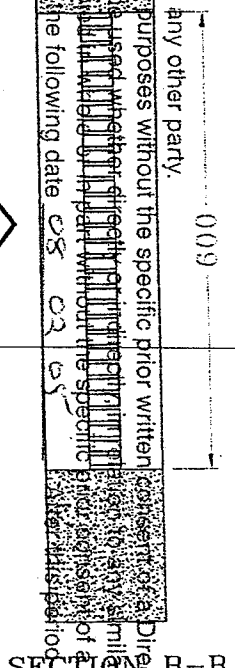
SECTION A–A

perimeter sealed with mastic

150 thick aerated concrete blocks



GENERAL ELEVATION OF GRILLE



SECTION B–B

All dimensions are in mm.
Do not scale

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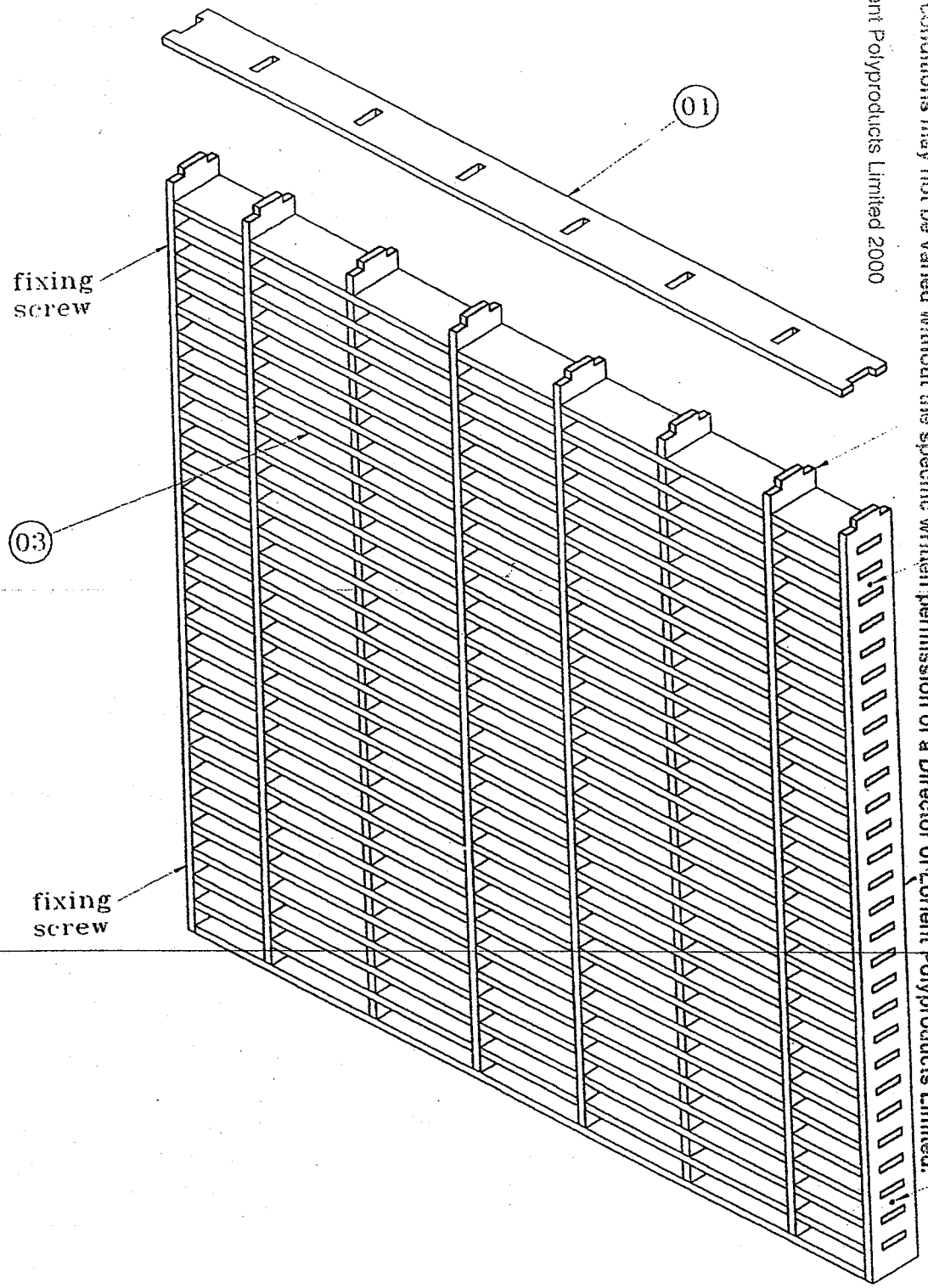
FIGURE 1



ISOMETRIC VIEW OF
INTUMESCENT AIR TRANSFER GRILLE
REFERENCE LV40

l dimensions are in mm.
ɔe Annex A for schedule.
ɔ not scale

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FIGURE 2

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ANNEX B

DATA RECORDED DURING THE TEST

TABLE 1

RECORDED AND SPECIFIED FURNACE TEMPERATURES AND PERCENTAGE TOLERANCES

Time Mins	STANDARD FURNACE TEMP. Deg C	ACTUAL FURNACE TEMP. Deg C	AREA UNDER STANDARD CURVE Deg C.min	AREA UNDER ACTUAL CURVE Deg C.min	PERCENT DIFF.	PERCENT TOLERANCE + or -
0	20	28				
1	349	366				
2	445	432				
3	502	511				
4	544	550				
5	576	559				
6	603	587				
7	626	637				
8	645	645				
9	663	662				
10	678	678	5302	5302	0	15
12	705	705				
14	728	727				
16	748	747				
18	766	767				
20	781	781				
22	796	795				
24	809	806				
26	820	820				
28	831	828				
30	842	842	15493	15462	0	10
35	865	862				
40	885	881				
45	902	900				
50	918	919				
55	932	932				
60	945	953				
65	957	958				
68	964	963	34624	34636	.036	5

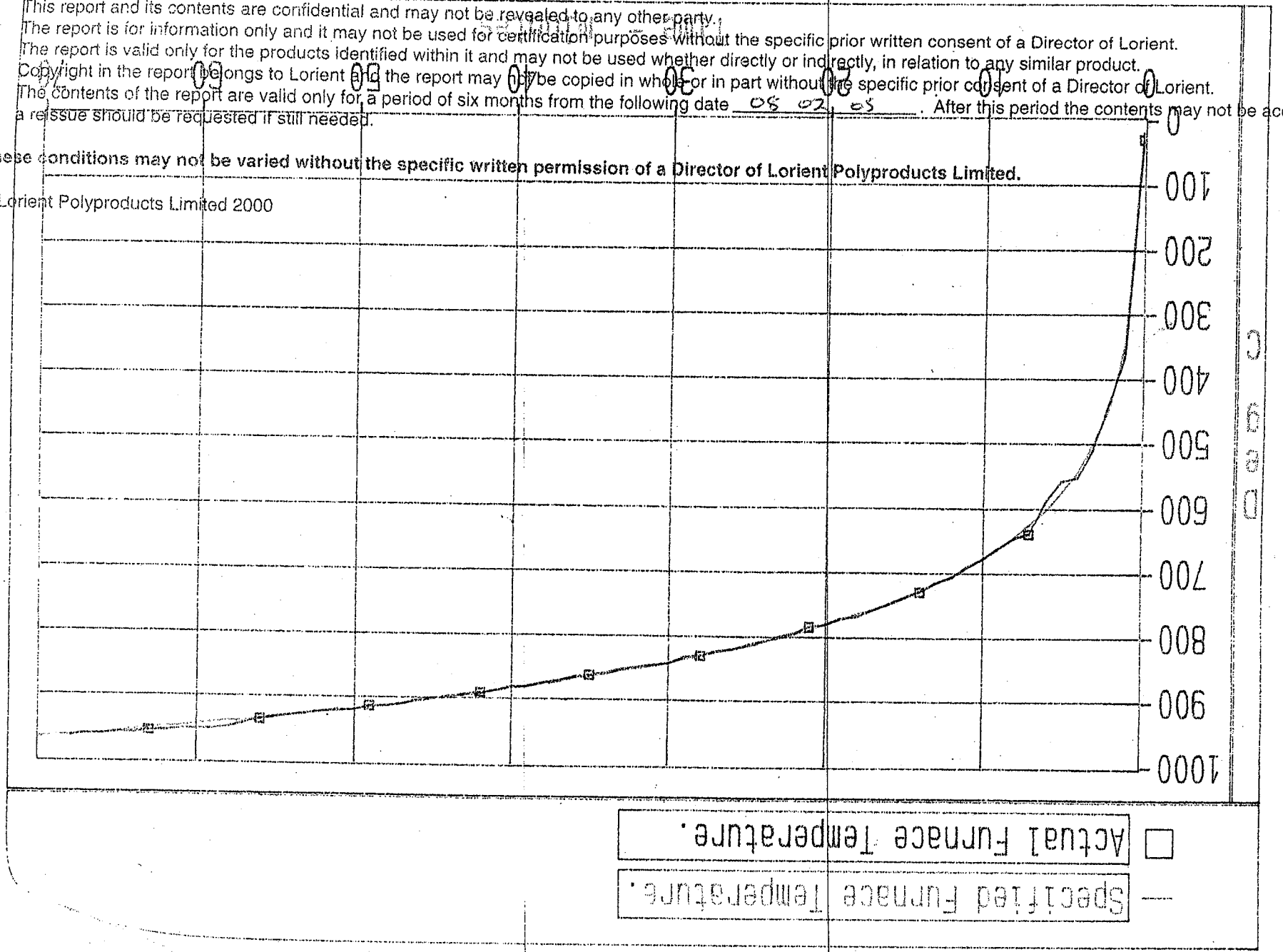

FIGURE 3

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ANNEX C

OBSERVATIONS MADE BY THE TESTING OFFICER

E - Observations from exposed side
U - Observations from unexposed side

Time			
mins	**secs**		
00	00		**The test commences.**
00	50	U	The PVC is starting to soften at the top half mm of the specimen as the intumescent begins to react
02	40	U	Approximately 50% of the total area has reacted.
04	00	U	Approximately 75% of the total area has reacted.
09	00	U	The specimen has completely intumesced to leave no through gaps to the furnace.
23	20	U	No further significant visible changes.
30	00	U	Integrity remains intact.
38	30	U	There is a slight through gap of approximate size 4 mm wide x 50 mm long along the right hand side of the specimen.
45	45	U	The top half of the specimen is deflecting to the left causing a through gap at the top right vertical joint with the wall, approximately 75 mm long by 6 mm wide.
51	00	U	There is a slight area of glowing at mid-height on the left hand of the grille to blockwork joint.
53	50	U	Small areas of glowing are visible along the top edge of the grille.
54	26	U	The area of glowing mentioned at 51 minutes has developed into a through gap approximately 4 mm wide by 50 mm long.

Annex C (Continued)

Time			
mins	secs		
60	00	U	Integrity of the specimen remains intact.
60	05	U	The through gap mentioned at 45 minutes 45 seconds is now approximately 10 mm wide by 100 mm long.
62	00	U	A through gap is visible on the left hand side approximately 75 mm long by 6 mm wide.
66	00	U	The through gap mentioned at 62 minutes is now greater than 150 mm long by 6 mm wide. **Integrity failure is deemed to occur.**
68	20	U	**The test is discontinued at the request of the sponsor.**

Mr D Ferris
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Review of Test Report Referenced WFRC No. C70339

1 Introduction

The report referenced WARRES No. 70339 relates to a fire resistance test conducted utilising the general principles of BS 476: Part 20: 1987, on an air transfer grille.

The test incorporated an air transfer grille installed within a section of aerated concrete wall.

The test demonstrated the ability of the specimen to provide an integrity performance of 66 minutes.

2 Confirmation of Specification

It has been confirmed by Lorient Polyproducts Limited that there have been no changes to the specification or the construction considered in the original report, referenced WARRES No. 70339, other than those which may have been addressed in relevant WFRC assessment reports.

3 Conclusions

At present there are no additional resolutions adopted by the Fire Test Study Group since the original test was performed which would affect the manner in which the test would be conducted or the interpretation of the test results.

The procedures adopted for the original test have also been re-examined and are similar to those currently in use.

Therefore, with respect to the fire resistance test report referenced WARRES No. 70339, the contents should remain valid until the 1st April 2007.

4 Validity

This review is based on information used to formulate the original test report. No other information or data has been provided by Lorient Polyproducts Limited which could affect this review.

This review should not be used in isolation but should be read in conjunction with the above referenced reports.

Performed by:

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