# **Faverdale Technology Centre Ltd**

TECHNOLOGY C E N T R E

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Order number:	Document number:
310329	FTCR/96/0038
Client: Alpha Division of CS Sherborne Dorset DT9 3RB	S-Interglas Ltd

# **TEST REPORT**

REPORT ON THE FIRE TESTING OF AN ALPHA MARITEX CLOTH REF NO. 3200/2/SP 'FIRE SCREEN' TEST DATE: 5 MARCH 1996

Issue	Issued by	Date	Approved by	Date
Α	S Pallister		M R Gardner	
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## **Revision Sheet**

Pages Affected	Section	Date	Revision Summary	Revised By
None				-
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#### **SUMMARY**

A fire test to BS 476 Part 20 and 22 was carried out on Alpha Maritex Cloth Ref No. 3200/2/SP, at the Faverdale Technology Centre Site, Newton Aycliffe on 5 March 1996 and followed the Cellulosic time/temperature curve detailed in BS 476, Part 20.

The pass/fail criteria detailed in BS 476, Part 20, Section 10.3 was applied.

The Alpha Maritex cloth maintain the criteria for integrity for 75 minutes test duration when a gap greater than 6mm over a distance of 150mm appeared.

The specification and interpretation of fire test methods are the subject of ongoing development and refinement. Changes in associated legislation may also occur.

For these reasons it is recommended that the relevance of test reports over five years old should be considered by the user. The laboratory that issued the report will be able to offer, on behalf of the legal owner, a review of the procedures adopted for a particular test to ensure that they are consistent with current practices, and if required, may endorse the test report.

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APPENDIX B Graph of Mean Furnace Temperature against time

Fire Curve Accuracy Check Data

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# 1. INTRODUCTION

A fire test to BS 476 Part 20 and 22 was carried out on an Alpha Maritex cloth Ref No. 3200/2/SP, supplied by Alpha Division of CS-Interglas Ltd. The test followed the BS 476 Part 20 cellulosic curve.

The aim of the test was to see if the cloth could withstand a BS 476 Part 20 fire test with regards to integrity only.

The test was conducted on 5 March 1996 at the Faverdale Technology Centre site, Newton Aycliffe.

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# 2. TEST EQUIPMENT

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The furnace was the 3 metre square panel furnace manufactured by Furnace Construction Company Ltd and situated at the Faverdale Technology Centre site, Newton Aycliffe.

The furnace consisted essentially of a furnace-brick lined chamber measuring approximately 3m x 3m by 1m deep internally, the front face of which is formed by the test sample secured in a mounting frame. Heating of the furnace was achieved by 14 natural gas/air burners controlled by computer. Flue damper control is also computer controlled.

The 3m x 3m exposed area of the front face was reduced around two sides and the bottom edge by 350mm, 450mm and 400mm respectively using standard fire bricks. This left an exposed area of approximately 2600mm x 2200mm.

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# 3. SAMPLE DETAILS

The sample consisted of three 1270mm wide, lengths of Alpha Maritex cloth, ref 3200/2/SP. The construction of the cloth was as follows:

Glass fabric:

415 g/m<sup>2</sup>

Silver Polyurethane Coating:

20 g/m<sup>2</sup> per side

The lengths were sewn together, with approximately 75mm overlaps, using grade S-40-1 sewing thread (stainless steel reinforced). The sections of cloth were stitched together by the customer.

The edges of the cloth along the two sides and the bottom were secured to the unexposed side of the additional fire bricks using 50 x 50mm unistrut channel. The channel was bolted to the bricks using M6 x 55 through bolts at 250mm centres; the cloth being secured between the fire bricks and the channel. At the top the cloth end was secured to the detachable furnace frame fire bricks using 50 x 50mm unistrut channel which was bolted to the bricks using M12 rawl bolts, the cloth being secured between the channel and the bricks.

Joint configuration and further sample details are contained in Appendix A.

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## 4. INSTRUMENTATION

Nine thermocouples, 1.5mm diameter metal sheathed, type K protrude through the rear of the furnace, supported by ceramic tube insulators, and were arranged such that they were evenly distributed over the exposed face of the test sample and with their hot junctions  $100 \pm 10$ mm from its face at the start of the test.

An Orion Delta Multi-task data processing and logging device (0077 FAV) with an accuracy of 0.05°C was connected in parallel with the resident computer in the furnace control facility. The thermocouple results were processed and printed to paper at the following intervals:

Test Duration (mins)	Scan Interval (mins)
0 - 10	1
10 - 30	2
30 on	5

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#### PASS/FAIL CRITERIA 5.

The pass/fail criteria detailed in BS 476 Part 20, Section 10.3 was applied.

Any gaps, holes or fissures than opened up in the panel during the test would be assessed for failure of integrity using 6mm and 25mm gap gauges and/or cotton pad.

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## 6. TEST PROCEDURE

The cloth sample was secured to the brick wall built into the framework which forms the front vertical face of the furnace, and the framework located to the front of the furnace.

After the thermocouples were checked for correct functioning, the furnace was ignited and controlled by software of the resident computer, such that the mean furnace temperature followed the BS 476 Part 20 Cellulosic time/temperature curve and the pressure maintained at  $8.5 \, \text{Pa} \pm 2$ .

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#### 7. TEST RESULTS

- 7.1 The test was conducted on 5 March 1996.
- 7.2 Observations were made during the test on the general behaviour of the fire curtain and these are given in Section 8.
- 7.3 Furnace pressure readings are also given in Section 8.
- 7.4 The Alpha Maritex cloth maintained the criteria for integrity for 75 minutes test duration.
- 7.5 A graph of mean furnace temperature against time compared to the BS 476, Part 20, Cellulosic curve, together with fire curve accuracy check data, are given in Appendix B.
- 7.6 Complete data printouts are given in Appendix C.
- 7.7 A photographic record is contained in Appendix D.

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# 8. OBSERVATIONS

Time (minutes/seconds)	Comments
0 .	Immediate smoking from sample.
1	Sample discolouring in exposed area.
5	Cloth bowing inwards Negative furnace pressure
15	Cloth light to mid brown in colour on the unexposed side. Furnace pressure negative
30	Smoking ceased Furnace pressure -1 Pa
35	Furnace pressure 6.5 Pa
46	Left side of right section showing signs of splitting from centre section. Furnace pressure 10 Pa
55	Furnace pressure 9.5 Pa
60	Furnace pressure 9.5 Pa Cloth bowing outwards Furnace glow showing through cloth. Cloth showing further signs of splitting at the left side of right section - approximately 5-10mm from stitching, centre 1/3 of section.
70	Centre top of centre section of cloth is showing signs of splitting just below the unistrut channel.
.75	Gap has appeared along the top of the centre section of cloth just below the unistrut channel.  Gap was greater than 6mm over a distance of 150mm - integrity failure.
75	Test ended.

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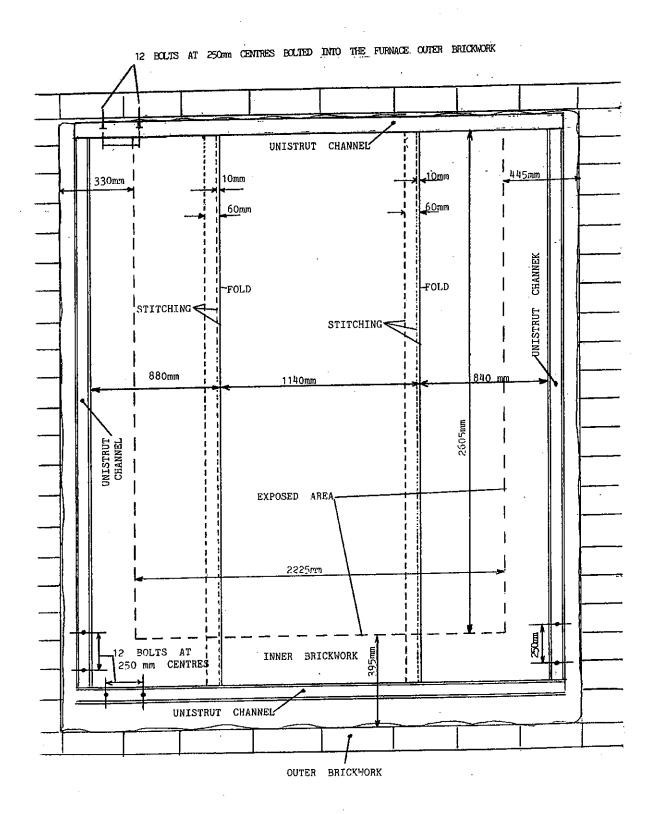
# APPENDIX A

1. Sample Details

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# APPENDIX B

- 1. Graph of mean furnace temperature against time compared to the BS 476 Part 20 Cellulosic time/temperature curve.
- 2. Fire curve accuracy check data.

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÷.	Simpson's F	Rule Numerio	al Integration	· 1	•
	TEST DA	TA	BS 476 Pt	20(1987)	
Time, min.	Temp.	Cum. *C-min.	Temp.	Cum. *C-min.	limits
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. 0	31		20		
1	421		349		
2	453		445	1	
3	455		502	,	
4	457		544	1	
5	539	Ì	576		
6	574		603		
7	590	1	626		
8	615	· 1	645		
9	637		663		454
10	664	5154	678	5346	i
12	691		705		614
14	718		728		
16	742	İ	748	}	
18	755		766		
20	774		781		
22	793		796	İ	
24	803		809		
26	812		820		
. 28	825		832		1875
30	839	20486	842	20840	
35	864		865		2292
40	876		885		00=~
45	903		902	00700	3657
50	912	38105	918	38503	4040
55	932	. [	932		4042
60	943		945		e 160
65	954	E0054	957	57392	5452
70 75	966 980	56951	968 979	51392	6026
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#### APPENDIX C

Complete data printouts of thermocouple results

Channel No. Location

1 - 9 Furnace

10 Ambient

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RUN 10:01:33 05-03

SCAN (MINS) 0

FURNACE

31.2012

AMBIENT

10.9598

S T 6 10:09:39.7 C 001 0035-2 deC C 002 0025.0 deC C 003 0031.2 deC C 004 0017.2 deC C 005 0034-1 d≘C C 006 0056.6 deC C 007 0042.2 deC 008 0026.6 deC C C 009 0018.7 deC C 010 0010.9 deC D T 6

SCAN (MINS) 1.00000

FURNACE

421-158

AMBIENT

10.8095

S T 6 10:10:40.2 C 001 0465.8 deC C 002 0473.5 deC C 003 0537-7 deC C 004 0461.6 deC C 005 0431.4 deC C 006 0348.3 deC C 007 0486.3 deC C 008 0429.8 deC C 009 0156.2 deC C 010 0010.8 daC D T 6

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SCAN (MINS) 2.00000	SCAN (MINS) 4.00000
FURNACE 453.052	FURNACE 456.947
AMBIENT 11.0134	AMBIENT 11.1286
S T 6 10:11:39.7 C 001 0553.8 deC C 002 0493.4 deC C 003 0620.7 deC C 004 0509.7 deC C 005 0448.3 deC C 006 0398.7 deC C 007 0465.2 deC C 008 0418.4 deC C 009 0169.2 deC C 010 0011.0 deC D T 6	S T 6 10:13:39.7 C 001 0527.7 deC C 002 0488:3 deC C 003 0627.5 deC C 004 0501.4 deC C 005 0457.0 deC C 006 0404.0 deC C 007 0473.9 deC C 008 0432.9 deC C 009 0206.1 deC C 010 0011.1 deC D T 6
SCAN (MINS) 3.00000	SCAN (MINS) 5.00000
FURNACE 454.869	FURNACE 538.610
AMBIENT 11.2945	AMBIENT 10.9837
S T 6 10:12:39.7 C 001 0551.1 deC C 002 0469.4 deC C 003 0816.6 deC C 004 0544.1 deC C 005 0447.4 deC C 006 0365.7 deC C 007 0487.5 deC C 008 0427.7 deC C 009 0180.5 deC C 010 0011.2 deC	S T 6 10:14:39.7 C 001 0641.4 deC C 002 0550.0 deC C 003 0601.0 deC C 004 0625.6 deC C 005 0536.9 deC C 006 0502.2 deC C 007 0565.5 deC C 008 0540.9 deC C 010 0010.9 deC

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SCAN (MINS) 6.00000	SCAN (MINS) 8.00000	SCAN (MINS) 10.0000
FURNACE 574.132	FURNACE 615.015	FURNACE 683-587
AMBIENT 11-0457	AMBIENT 11.0927	AMBIENT 11.2913
S T 6 10:15:40.2 C 001 00669 deC C 002 0555.7 deC C 003 0609.6 deC C 004 0644.7 deC C 005 0569.3 deC C 006 0586.5 deC C 007 0593.9 deC C 008 0602.2 deC C 008 0602.2 deC C 010 0011.0 deC D T 6	S T 6 10:17:39.7 C 001 00689 deC C 002 0581.4 deC C 003 0639.7 deC C 004 00671 deC C 005 0591.0 deC C 006 0639.3 deC C 007 0621.9 deC C 008 0638.2 deC C 009 0452.3 deC C 010 0011.0 deC D T 6	C 006 00683 d9C C 007 00659 d9C C 008 00692 d9C C 009 0551.6 d9C C 010 0011.2 d9C
SCAN (MINS) 7.00000	SCAN (MINS) 9-00000	SCAN (MINS) 12.0000
FURNACE 589.725	FURNACE 637.494	FURNACE 691-410
AMBIENT 11.0966	AMBIENT 10.9211	AMBIENT 11.1894
S T 6 10:16:39.7 C 001 00649 deC C 002 0574.9 deC C 003 0636.5 deC C 004 0646.1 deC C 005 0579.4 deC C 006 0610.2 deC C 007 0599.1 deC C 008 0617.9 deC C 009 0389.0 deC C 010 0011.0 deC	C 002 0602.7 deC C 003 00655 deC C 004 00685 deC C 005 0613.6 deC C 006 00671 deC C 007 0629.3 deC C 008 00675 deC C 009 0506.1 deC C 010 0010.9 deC	S T 7 10:21:39.7 C 001 00738 deC C 002 00664 deC C 003 00691 deC C 004 00734 deC C 005 0644.9 deC C 006 00712 deC C 007 00696 deC C 008 00726 deC C 009 0613.5 deC C 010 0011.1 deC

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SCAN (MINS) 14.0000	SCAN (MINS)	18.0000	SCAN (MINS)	22.0000
FURNACE 717.933	FURNACE	755-288	FURNACE	792.876
AMBIENT 11.8011	AMBIENT	12.0175	AMBIENT	12-6479
S T 7 10:23:39.7 C 001 00753 deC C 002 00703 deC C 003 00731 deC C 004 00747 deC C 005 00678 deC C 006 00725 deC C 007 00711 deC C 008 00741 deC C 009 00669 deC C 010 0011.6 deC D T 7	S T 7 10:27: C 001 00789 C 002 00754 C 003 00777 C 004 00765 C 005 00720 C 006 00739 C 007 00759 C 008 00767 C 009 00720 C 010 0012.6	0eb 0eb 0eb 0eb 0eb 0eb 0eb	S T 7 10:31 C 001 00829 C 002 00799 C 003 00801 C 005 00764 C 006 00772 C 007 00794 C 008 00805 C 009 00777 C 010 0012.6 D T 7	Jeb Jeb Jeb Jeb Jeb Jeb Jeb
SCAN (MINS) 16.0000	SCAN (MINS)	20.0000	SCAN (MINS)	24.0000
FURNACE 741.556	FURNACE	773-693	FURNACE	803-225
AMBIENT 11.8824	AMBIENT	12.1446	AMBIENT	13.0321
S T 7 10:25:39.7 C 001 00779 deC C 002 00740 deC C 003 00757 deC C 004 00772 deC C 005 00694 deC C 006 00724 deC C 007 00746 deC C 008 00762 deC C 009 00692 deC C 010 0011.8 deC	S T 7 10:29: C 001 00800 C 002 00775 C 003 00777 C 004 00787 C 005 00743 C 006 00752 C 007 00782 C 009 00756 C 010 0012.1	39.7 deC deC deC deC deC deC deC deC	S T 7 10:33:3 C 001 00826 C 002 00802 C 003 00820 C 004 00820 C 005 00799 C 006 00804 C 008 00817 C 009 00774 C 010 0013.0	39.7 deC deC deC deC deC deC deC

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SCAN (MINS)	26.0000	SCAN (MINS)	30.0000	SCAN (MINS)	40.0000
FURNACE	812.255	FURNACE	838.984	FURNACE	876.297
AMBIENT	13.1745	AMBIENT	14.3020	AMBIENT	15-8761
S T 7 10:35: C 001 00837 C 002 00816 C 003 00811 C 004 00823 C 005 00774 C 006 00774 C 007 00827 C 008 00827 C 009 00800 C 010 0013.1 D T 7	deC deC deC deC deC deC deC deC	S T 8 10:39 C 001 00834 C 002 00864 C 003 00824 C 005 00849 C 006 00817 C 007 00846 C 008 00863 C 009 00822 C 010 0014.3	deb Jeb Jeb Jeb Jeb Jeb Jeb Jeb	S T 8 10:49: C 001 00878 C 002 00902 C 003 00869 C 004 00894 C 005 00909 C 006 00857 C 007 00863 C 008 00898 C 009 00810 C 010 0015.8	098 098 098 098 098 098 098
SCAN (MINS)	28.0000	SCAN (MINS)	35.0000	SCAN (MINS)	45.0000
FURNACE	824.646	FURNACE	863.574	FURNACE	902.944
AMBIENT	13.7783	AMBIENT	14.1743	AMBIENT	18-06 <del>4</del> 2
S T 7 10:37: C 001 00827 C 002 00841 C 003 00820 C 004 00828 C 005 00807 C 006 00834 C 007 00834 C 009 00811 C 010 0013.7 D T 7	Jeb Jeb Jeb Jeb Jeb Jeb Jeb	S T 8 10:44: C 001 00882 C 002 00895 C 003 00848 C 004 00870 C 005 00870 C 006 00839 C 007 00878 C 009 00816 C 010 0014.1	Oeb Oeb Oeb Oeb Oeb Oeb	S T 8 10:54: C 001 00904 C 002 00930 C 003 00889 C 004 00912 C 005 00956 C 006 00884 C 007 00879 C 009 00843 C 010 0018.0	Oeb Oeb Oeb Oeb Oeb Oeb

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SCAN (MINS) 50	1.9999	SCAN (MINS)	60.0000
FURNACE 9i	1.853	FURNACE	943.261
AMBIENT 18	9698	AMBIENT	20.1284
S T 8 10:59:39 C 001 00923 C 002 00937 C 003 00915 C 004 00912 C 005 00927 C 006 00888 C 007 00913 C 008 00935 C 009 00858 C 010 0018.9 D T 8 *************	deC deC deC deC deC deC deC deC deC	S T 8 11:09 C 001 00963 C 002 00965 C 003 00934 C 005 00948 C 006 00915 C 007 00974 C 008 00935 C 009 00892 C 010 0020. D T 8	Oeb Oeb Oeb Oeb Oeb Oeb Oeb
SCAN (MINS) 55	5.0000	SCAN (MINS)	65.0000
FURNACE 93	)i.951	FURNACE	954.433
AMBIENT 18	). <u>+2</u> +2	AMBIENT	20.7299
S T 8 11:04:39 C 001 00929 C 002 00963 C 003 00923 C 004 00935 C 005 00967 C 006 00929 C 007 00905 C 008 00940 C 009 00890 C 010 0018.4	Jeb Jeb Jeb deC Jeb Jeb Jeb	S T 8 11:14 C 001 00972 C 002 00982 C 003 00961 C 004 00978 C 005 00978 C 006 00932 C 007 00947 C 008 00968 C 009 00911 C 010 0020	0eb 0eb 0eb 0eb 0eb 0eb

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SCAN (MINS) 70.0000 965.868 FURNACE 21.7362 **AMBIENT** T 8 11:19:39.7 001 00997 deC 002 00998 d∋C C deC 003 00959 С deC 004 00974 C deC 005 00972 C 008 00942 deC deC 007 00978 Ċ d9C 00960 998 C 009 00922 deC deC 010 0021.7 D T 8 \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\* SCAN (MINS) 75.0009 979.551 FURNACE ABSTRACT No: 31032 22.1871 AMBIENT AIGNAME: PROPOSITION **EST SPECIFICATION** S T 8 11:24:39.7 001 01001 deC 002 01009 deC 003 00974 deC C 004 00998 d∋C: C 005 00977 deC C d∋C 996 00946 deC: 007 01007 008 00971 deC) C 009 00918 deC C 010 0022.1 deC D T 8 11:27:37 05-03 HALT

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## APPENDIX D

# Photographic Record

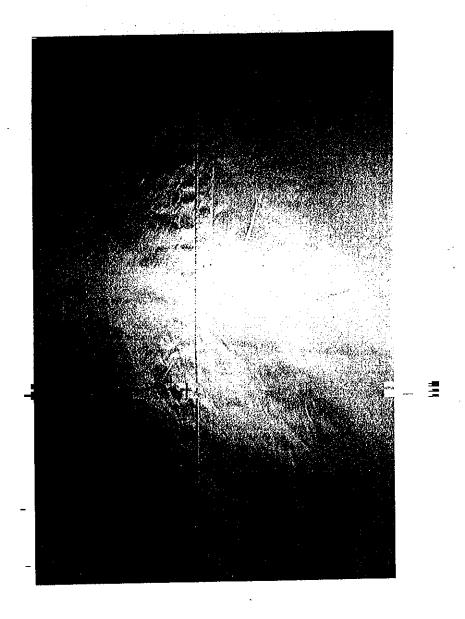
Frame 1	Unexposed face showing stitching arrangement
Frame 2	Unexposed face at the start of the test
Frame 3	Unexposed face after 14 minutes test duration
Frame 4	Unexposed face after 30 minutes test duration
Frame 5	Unexposed face after 60 minutes test duration
Frame 6	Unexposed face after 60 minutes test duration showing close up of right joint
Frame 7	Unexposed face after 75 minutes test duration
Frame 8	Close up of the area of failure at centre top edge

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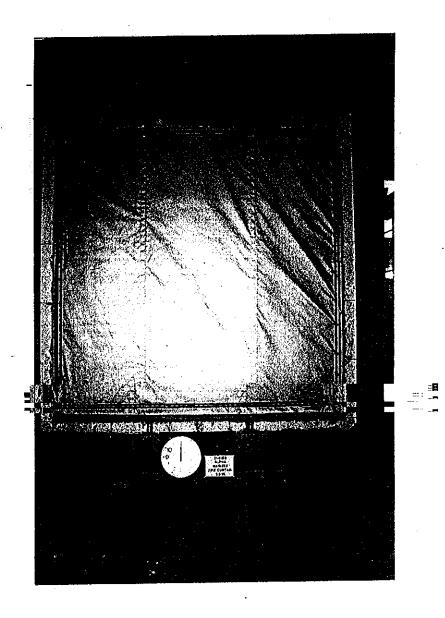


Frame 1 Unexposed face showing stitching arrangement

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Frame 2 Unexposed face at the start of the test

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Frame 3 Unexposed face after 14 minutes test duration

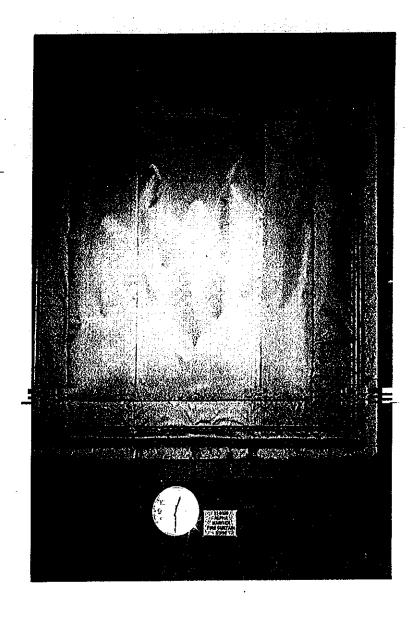
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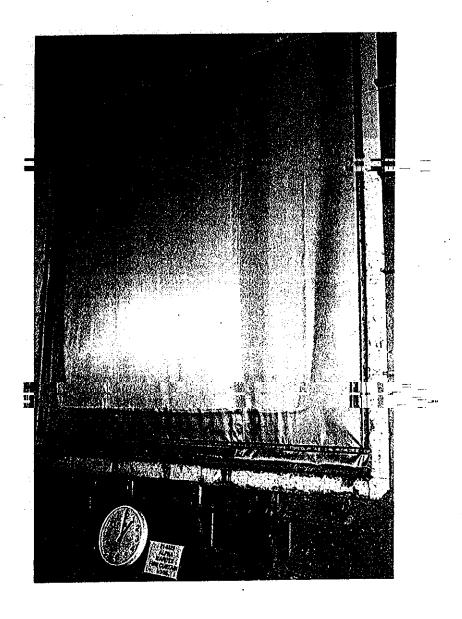
Frame 4 Unexposed face after 30 minutes test duration

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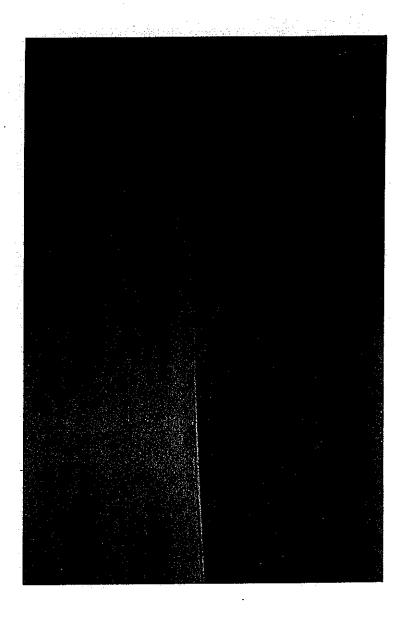
Frame 5 Unexposed face after 60 minutes test duration

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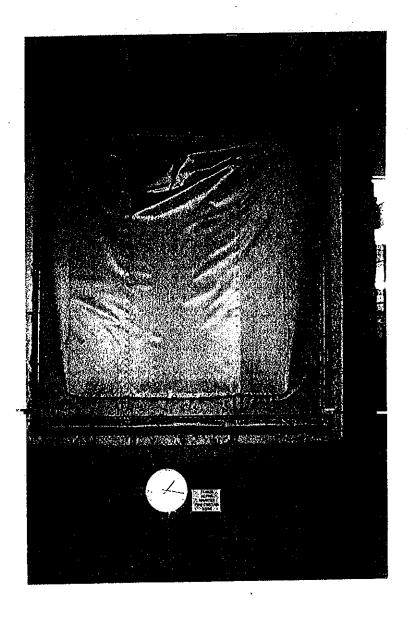
Frame 6 Unexposed face after 60 minutes test duration showing close up of right joint

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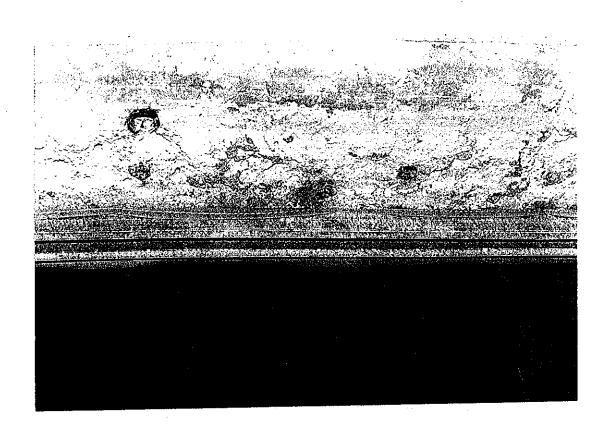
Frame 7 Unexposed face after 75 minutes test duration

TEST DATE: 5 MARCH 1996

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Frame 8 Close up of the area of failure at centre top edge