

**CONFIDENTIAL REPORT**

**FIRE-RESISTANCE TEST ON  
FIRESOUND GREY TRIAL ACRYLIC SEALANT  
PROTECTING FOUR (4-OFF) JOINTS  
IN A PLASTERBOARD PARTITION  
IN ACCORDANCE WITH AS1530.4-1997,  
SECTIONS 2, 4 AND 10 AND AS4072.1-1992  
AS APPROPRIATE**

Report for

HB Fuller Australia Company Pty Ltd,  
16-20 Red Gum Drive  
Dandenong South  
VIC 3175

Report	Name	Signature/* Authorisation	Date
Prepared by:	A.F. Rayner	<i>A.F. Rayner</i>	5/9/02
Reviewed by:	G.G. Catania	<i>G.G. Catania</i>	5/9/02

\* For and on behalf of Warrington Fire Research Group.

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**FIRE-RESISTANCE TEST ON FIRESOUND GREY TRIAL ACRYLIC SEALANT  
PROTECTING FOUR (4-OFF) JOINTS IN A PLASTERBOARD PARTITION IN  
ACCORDANCE WITH AS1530.4-1997, SECTIONS 2, 4 AND 10 AND AS4072.1-1992  
AS APPROPRIATE**

Report Sponsor	HB Fuller Australia Company Pty Ltd, 16-20 Red Gum Drive, Dandenong South, VIC 3175.
Test Laboratory	Warrington Fire Research (Aust) Pty Ltd, Unit 2, 409-411 Hammond Road, Dandenong South, Victoria, 3175.
Test Date	2 <sup>nd</sup> July 2002.
Test standards prescribed	Sections 2 and 4 of AS1530.4-1997, and AS4072.1-1992 as appropriate.
General description of tested specimens	The test assembly comprised a nominal 2 hour fire rated plasterboard partition 1200mm high x 1200mm wide x 128mm thick with masonry block along the bottom and one vertical edge. The test assembly was provided with the following joints/junctions, designated as Joints 1, 2, 3 and 4 for the purpose of this report. Joint #1 a horizontally oriented junction along the top edge of the partition (nominally 16mm wide), Joint #2 a vertically oriented junction along the meeting edge of the partition and the masonry side (nominally 16mm wide), Joint #3 a horizontally oriented junction along the meeting edge of the partition and the masonry bottom (nominally 6mm high) and Joint #4 a vertically oriented control joint in the middle of the partition (nominally 15mm wide). The joints/junctions were protected by FireSound Grey Trial acrylic sealant material. A detailed description of the test construction is contained within Appendix 1.
Separating Element	The separating element comprised a nominal 2 hour fire rated plasterboard partition 1200mm high x 1200mm wide x 128mm thick.
Penetrating Services	The four (4-off) joints/junctions were protected by FireSound Grey Trial acrylic sealant material. Further details of the joints/junctions are presented in Table 2.
Instrumentation	Instrumentation was provided in accordance with AS1530.4-1997 and AS4072.1-1992 as appropriate. The position of the thermocouples are summarised in Table A2.1 and shown on Drawing 40922-TS-03.
Test Procedures	The test procedures were as specified in AS1530.4-1997 and AS4072.1-1992 as appropriate. Control of furnace temperature was maintained within the prescribed limits of variance from the time/temperature curve that is specified in Clause 2.9.2 of AS1530.4-1997 for the duration of the fire test. The furnace pressure was measured at a position approximately 100mm below the top edge of the panel, and was maintained at approximately 20 Pa above the laboratory atmosphere after the first 5 minutes and then for the duration of the fire test. The fire-resistance test was terminated after 181 minutes at the request of the test sponsor.
Test Duration	181 minutes.

<b>Test Results</b>	
Ambient Air Temperature	Approximately 15°C at the start of the test with no significant variations during the test period.
Temperatures Measured versus Time	Refer to tables and graphs in Appendix 2.
Observations	Refer to Table A2.2 in Appendix 2.
Performance Against the Criteria Specified in AS1530.4-1997	Refer to Table 1 for the results judged against each of the performance criteria specified in AS1530.4-1997.
FRL designation	For the purposes of the Building Code of Australia in Australia the specimen may be regarded as having achieved the fire resistance levels (FRL's) as shown in Table 2.

**Table 1:** Summary of the Performance of the Test Specimens based on the Criteria Specified in AS1530.4-1997

<b>Control Joint Ref.</b>	<b>Structural Adequacy</b>	<b>Integrity (minutes)</b>	<b>Insulation (minutes)</b>
1	Not Applicable	No failure at 181	148*
2	Not Applicable	No failure at 181	171
3	Not Applicable	No failure at 181	No failure at 181
4	Not Applicable	No failure at 181	No failure at 181

\* Recorded on sealant material using roving thermocouple which was affixed to the test specimen at 133 minutes test duration.

**Table 2:** Summary of Fire Resistance Levels Ascertained for the Purpose of the Building Code of Australia for the Tested Specimen

<b>Control Joint Ref.</b>	<b>Description of fire protection system*</b>	<b>FRL</b>
1	A horizontal junction along the meeting edge of the partition and the plasterboard infill top (nominally 20mm wide x 16mm deep)	-/180/120
2	A vertical junction along the meeting edge of the partition and the masonry side (nominally 16mm wide x 16mm deep)	-/180/120
3	A horizontal junction along the meeting edge of the partition and the masonry bottom (nominally 6mm wide x 16mm deep)	-/180/180
4	A vertical control joint in the middle of the partition (nominally 15mm wide x 20mm thick either side of partition) with a RONDO P35 control joint cover strip over the join	-/180/180

\* Note: Description refers to depth of FireSound applied to both fire exposed and non-fire exposed sides of test specimen

### **LIMIT OF APPLICATION**

The results of this fire test may be used to directly assess fire hazard, but it should be recognised that a single test method does not provide a full assessment of fire hazard under all fire conditions.

The results of this fire test apply to the configuration as tested. Any variations to the test configuration may achieve different results. It is therefore recommended that any proposed variation to the tested configuration should be referred to Warrington Fire Research (Aust) Pty Ltd in the first instance.

### **WFRA**

## **APPENDIX 1**

### **DESCRIPTION OF THE SPECIMEN**

#### **A1.1 GENERAL DESCRIPTION**

- A1.1.1 A nominal 1200mm high x 1200mm wide opening was provided within a steel restraint frame. Masonry block surrounds were provided along the bottom edge and along one vertical edge with the other vertical and top edge lined with fire rated plasterboard. A steel stud plasterboard partition was installed within the opening. The partition was provided with the following joints/junctions, designated as Joints 1, 2, 3 and 4 for the purpose of this report. Joint #1 a horizontally oriented junction along the top edge of the partition (nominally 16mm wide), Joint #2 a vertically orientated junction along the meeting edge of the partition and the masonry side (nominally 16mm wide), Joint #3 a horizontally orientated junction along the meeting edge of the partition and the masonry side on the bottom (nominally 6mm wide) and Joint #4 a vertically orientated control joint in the middle of the partition (nominally 15mm wide).
- A1.1.2 A polyurethane foam backing rod of nominal dimension 30mm wide x 25mm deep was pushed into the control joint to a depth of approximately 35mm from the face of the plasterboard on either side of the plasterboard partition as shown in Section D-D on Drawing No. 40922-TS-02.
- A1.1.3 The sealant material used to protect the joint/junctions, designated by the test sponsor as "FireSound Grey Trial – Batch No. 6111170530", was then applied within the joint/junctions as detailed on WFRA Drg No. 40922-TS-02. The sealant material was provided by the test sponsor in a 20 litre bucket.
- A1.1.4 Details of the test construction are shown schematically on Drawing No's 40922-TS-01, 40922-TS-02 and 40911-TS-03.
- A1.1.5 After sealant was applied the test specimen was left to cure for a period of approximately 8 weeks.
- A1.1.6 The joint sealing systems were supplied and installed by the test sponsor, with staff of WFRA constructing the plasterboard partition (with joints provided) within the steel restraint frame. WFRA staff observed the joint sealing installation.

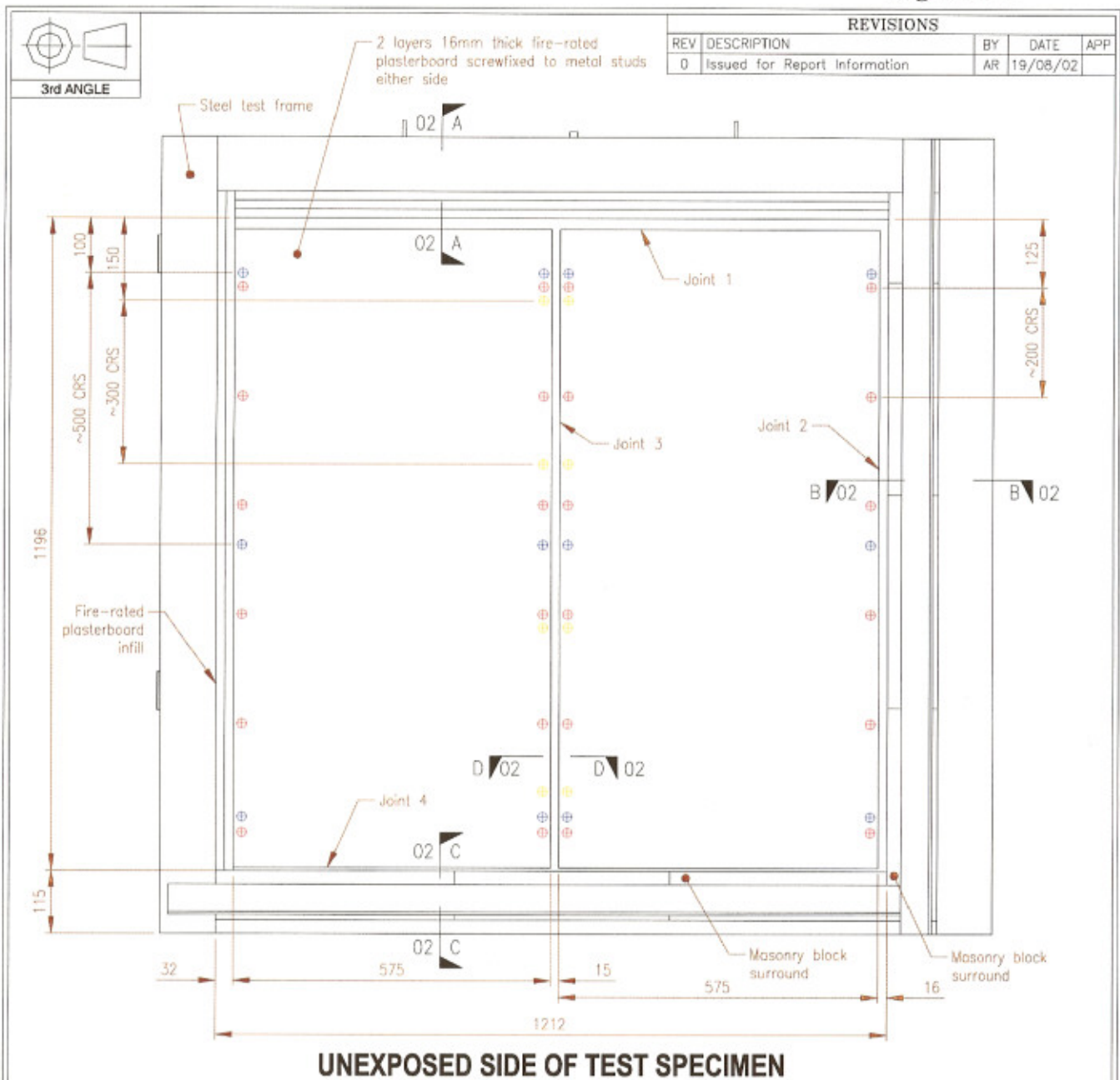
#### **A1.2 SEPARATING ELEMENT**

- A1.2.1 The separating element comprised a nominal 2 hour fire rated steel stud plasterboard partition 1200mm high x 1200mm wide x 128mm thick.
- A1.2.2 The plasterboard partition was constructed with two layers of 16mm thick fire-rated plasterboard screwfixed to either side of steel studs and tracks. Details of

the partition construction are shown schematically in Drawing No's 40922-TS-01 and 40922-TS-02.

### **A1.3 DRAWINGS OF SPECIMEN**

<b>Drawing Designation</b>	<b>Description</b>
40922-TS-01	Construction Details
40922-TS-02	Construction Details
40922-TS-03	Thermocouple locations

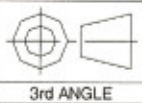
**LEGEND:**

- ⊕ Screws for first layer of plasterboard
- ⊕ Screws for second layer of plasterboard
- ⊕ Screws for Rondo strip control joint

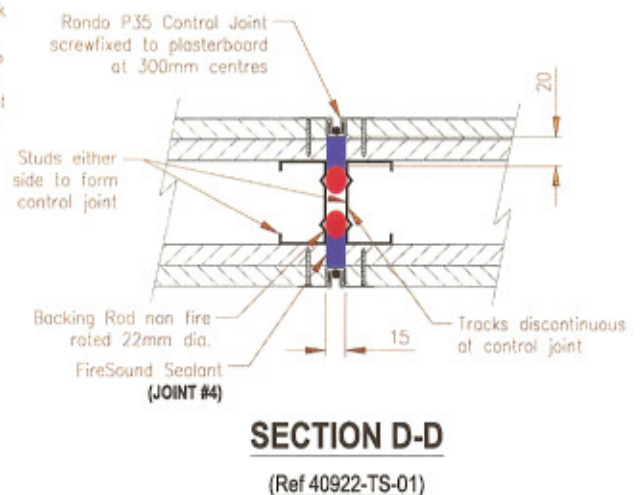
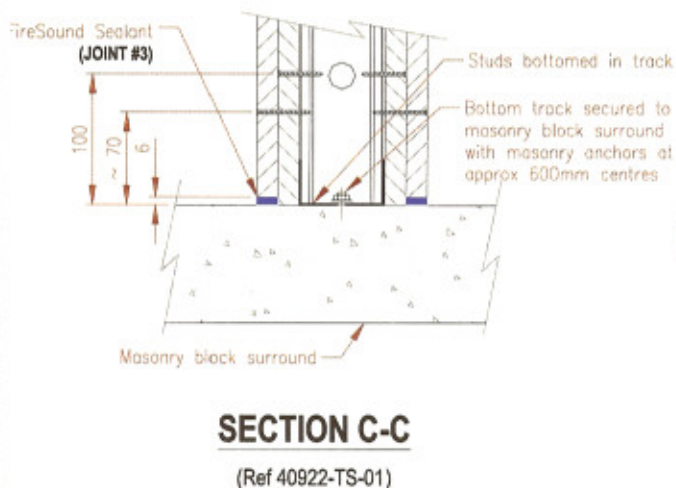
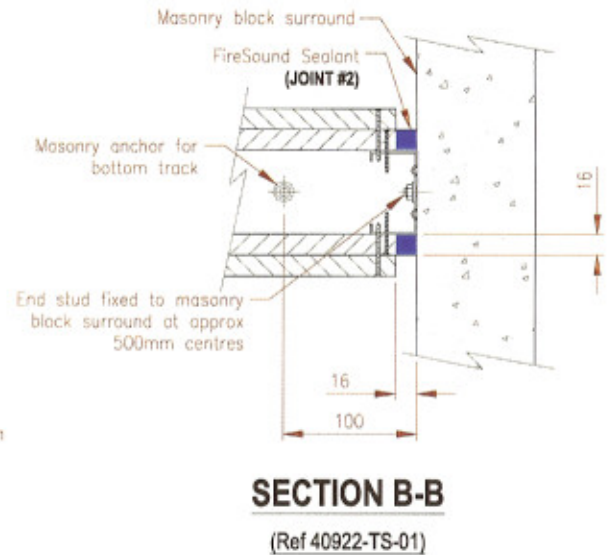
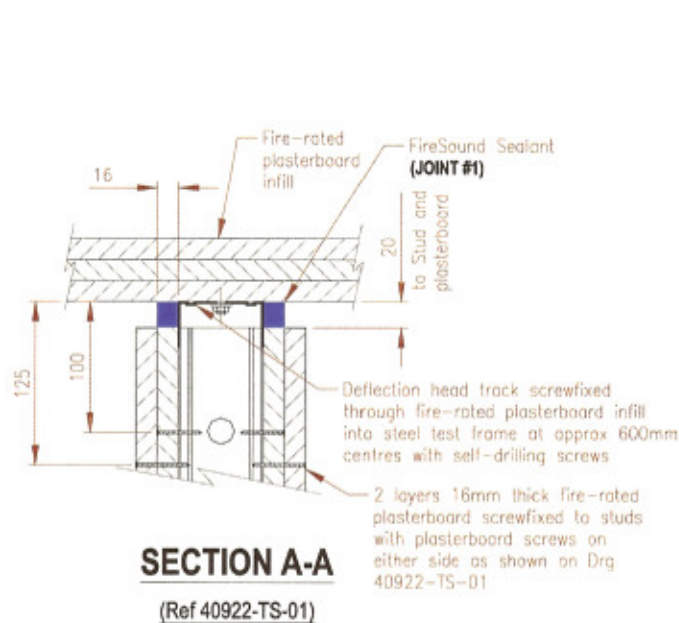
Approx. Scale 0 100 200 300 400 500 mm

NOTE: ALL DIMENSIONS ARE IN MM AND NOMINAL

<b>Warrington</b> <b>FIRE</b> <b>research</b>	P.O. Box 4282 Dandenong South Victoria 3164 Australia. Tel: +613 9793 0088 Fax: +613 9793 0111 or +613 9701 7222 Email: testing@wfra.com.au A.B.N. 81 050 241 524		<b>SIGNATURES</b>		<b>Scales</b> 1:10	<b>Project</b> 40922	<b>Title</b> HB Fuller Company Australia P/L Plasterboard Wall Construction Details
	DRAWN		SIGNED A. Royner	DATE 19/08/02	<b>DRG No.</b> 40922-TS-01		
					<b>CAD Ref.</b> 40922-PENTEST-00		



REVISIONS				
REV	DESCRIPTION	BY	DATE	APP
0	Issued for Report Information	AR	19/08/02	



Approx. Scale 0 50 100 150 200 250 mm

**NOTE: Steel test frame removed for clarity**

NOTE: ALL DIMENSIONS ARE IN MM AND NOMINAL

**Warrington**  
**FIRE**  
**research**

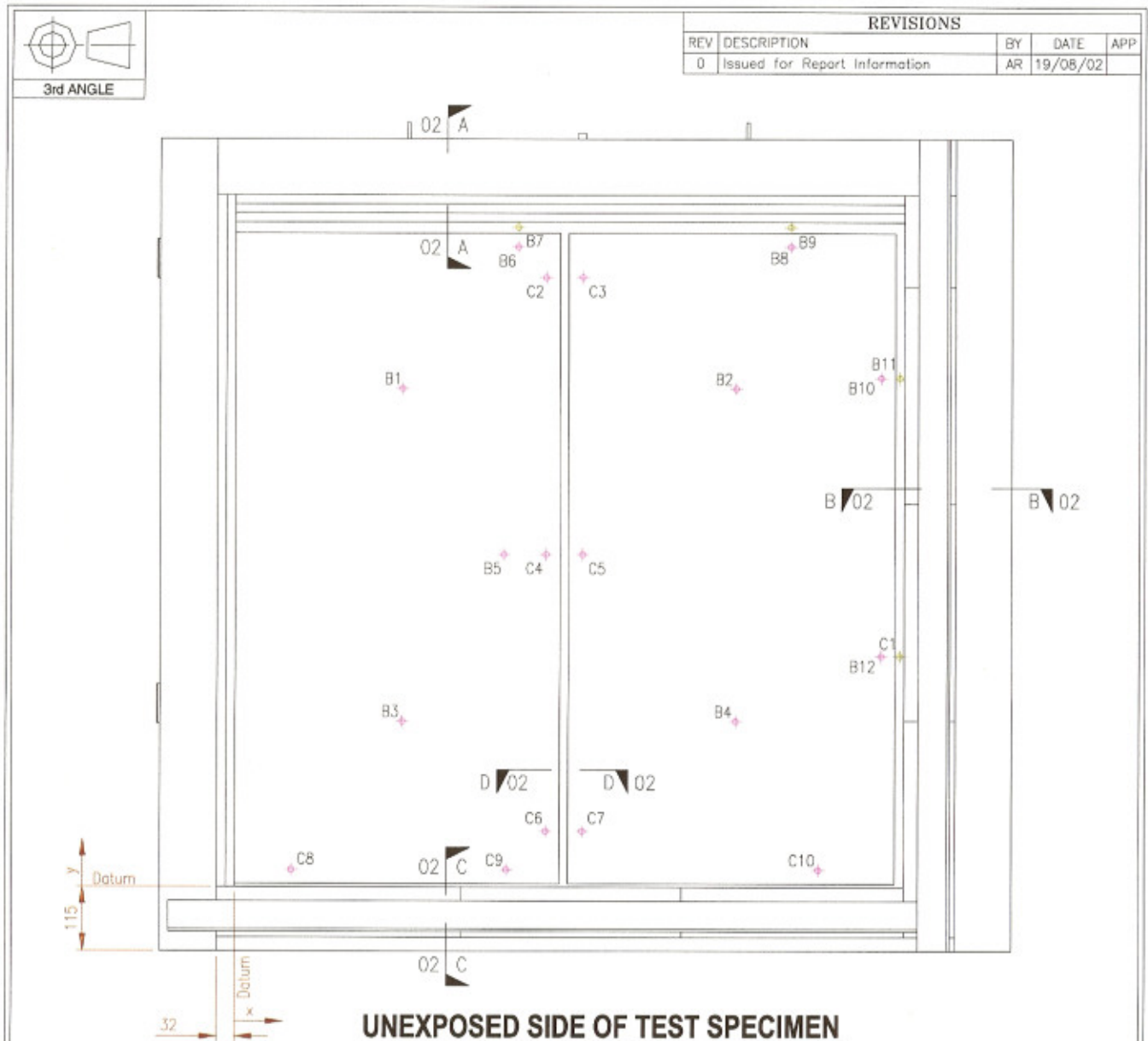
P.O. Box 4282  
Dandenong South  
Victoria 3184  
Australia

Tel: +613 9793 0088  
Fax: +613 9793 0111  
or +613 9701 7222  
Email: testing@wfra.com.au  
A.B.N. 61 050 241 524

SIGNATURES	
SIGNED	DATE
DRAWN A. Royner	19/08/02

Scale 1:5	Project 40922
DRG No. 40922-TS-02	
CAD Ref. 40922-PENTEST-00	

Title  
HB Fuller Company Australia P/L  
Plasterboard Wall  
Construction Details



Thermocouple Positions


Thermocouple	Position		Thermocouple	Position	
	x	y		x	y
B1	295	897	B12	1139	416
B2	885	897	C1	1172	416
B3	295	299	C2	550	1096
B4	885	299	C3	615	1096
B5	475	598	C4	550	598
B6	500	1151	C5	615	598
B7	500	1186	C6	550	100
B8	980	1151	C7	615	100
B9	980	1186	C8	100	31
B10	1139	916	C9	480	31
B11	1172	916	C10	1030	31

**LEGEND:**

- x Thermocouple on plasterboard  
y Thermocouple on sealant

Approx. Scale 0 100 200 300 400 500 mm

NOTE: ALL DIMENSIONS ARE IN MM AND NOMINAL

	P.O. Box 4282 Dandenong South Victoria 3164 Australia.  Tel: +613 9793 0088 Fax: +613 9793 0111 or +613 9701 7222 Email: testing@wfra.com.au A.B.N. 81 050 241 524	SIGNATURES			Scale	Project	Title HB Fuller Company Australia P/L Plasterboard Wall Thermocouple locations
			SIGNED	DATE	1:10	40922	
		DRAWN	A. Royner	19/08/02	DRG No.	40922-TS-03	
					CAD Ref.	40922-PENTEST-00	

## APPENDIX 2

### TEST DATA AND OBSERVATIONS

Table A2.1: Specimen Temperatures

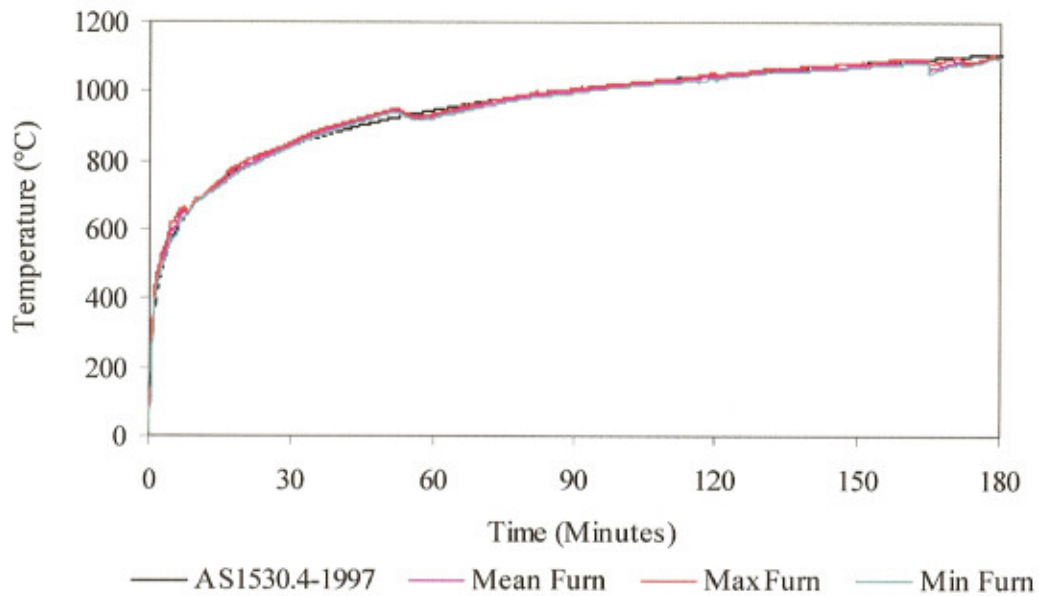
Joint	T/C No.	Surface	Position <sup>1</sup>	Temp (°C) at t (minutes)					Limit <sup>2</sup> (minutes)
				t=0	t=30	t=60	t=120	t=180	
1	B7	Sealant	x=500, y-1186	13	48	70	109	229	172
	B9	Sealant	x=980, y-1186	13	46	69	99	211	175
	B6	Plasterboard	x=500, y-1151	14	27	53	67	88	-
	B8	Plasterboard	x=980, y-1151	14	30	55	67	92	-
2	B11	Sealant	x=1172, y-916	13	31	71	96	161	-
	C1	Sealant	x=1172, y-416	12	42	81	104	252	171
	B10	Plasterboard	x=1139, y-916	13	29	57	68	98	-
	B12	Plasterboard	x=1139, y-416	13	27	54	65	88	-
3	C8	Plasterboard	x=100, y-31	14	22	50	65	76	-
	C9	Plasterboard	x=480, y-31	13	24	49	69	77	-
	C10	Plasterboard	x=1030, y-31	13	43	51	64	83	-
4	C2	Plasterboard	x=550, y-1096	14	29	56	78	118	-
	C3	Plasterboard	x=615, y-1096	14	28	54	77	112	-
	C4	Plasterboard	x=550, y-598	14	25	50	75	93	-
	C5	Plasterboard	x=615, y-598	14	25	51	76	99	-
	C6	Plasterboard	x=550, y-100	15	#	48	73	93	-
	C7	Plasterboard	x=615, y-100	14	25	48	70	94	-
Partition ¼ Points	B1	Plasterboard	x=295, y-897	14	28	56	66	86	-
	B2	Plasterboard	x=885, y-897	14	30	58	66	94	-
	B3	Plasterboard	x=295, y-299	14	26	55	68	83	-
	B4	Plasterboard	x=885, y-299	14	23	50	66	76	-
	B5	Plasterboard	x=475, y-598	14	26	56	66	90	-

Notes: <sup>1</sup> Positions are all shown in millimetres and are measured from the bottom western corner of the partition (See Drawing 40922-TS-03).

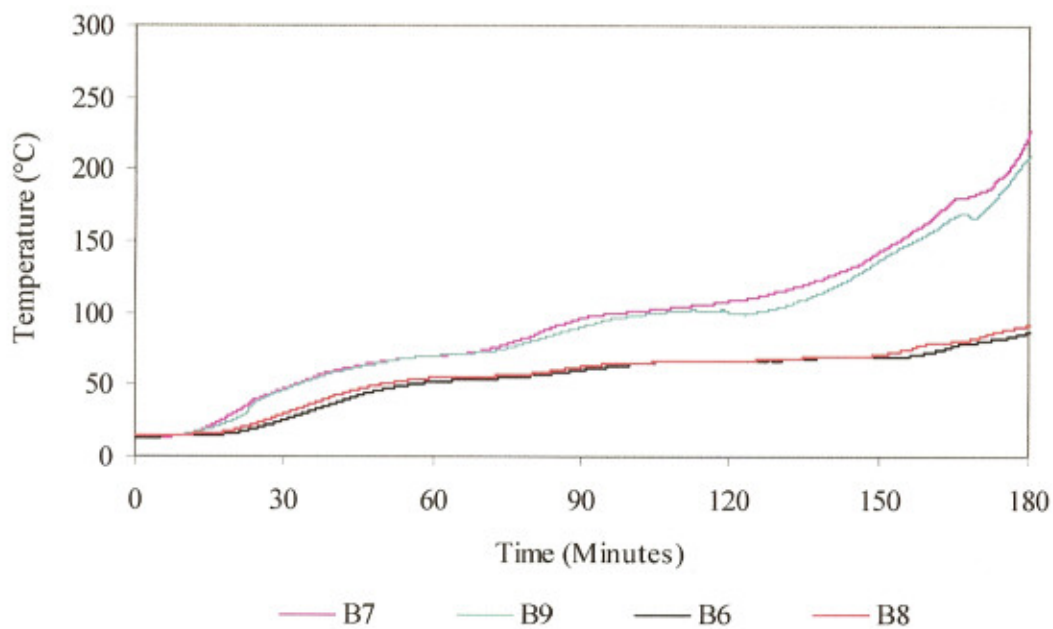
<sup>2</sup> Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180 K above the initial temperature.

'-' indicates the temperature limit was not exceeded during the test period.

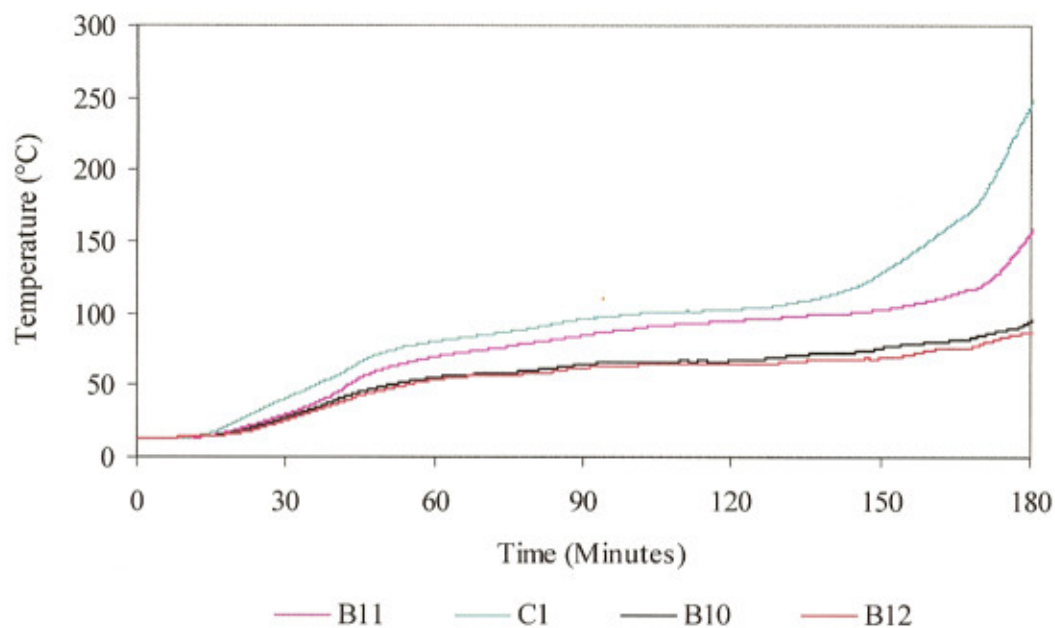
# indicates a thermocouple fault or possible over range conditions.



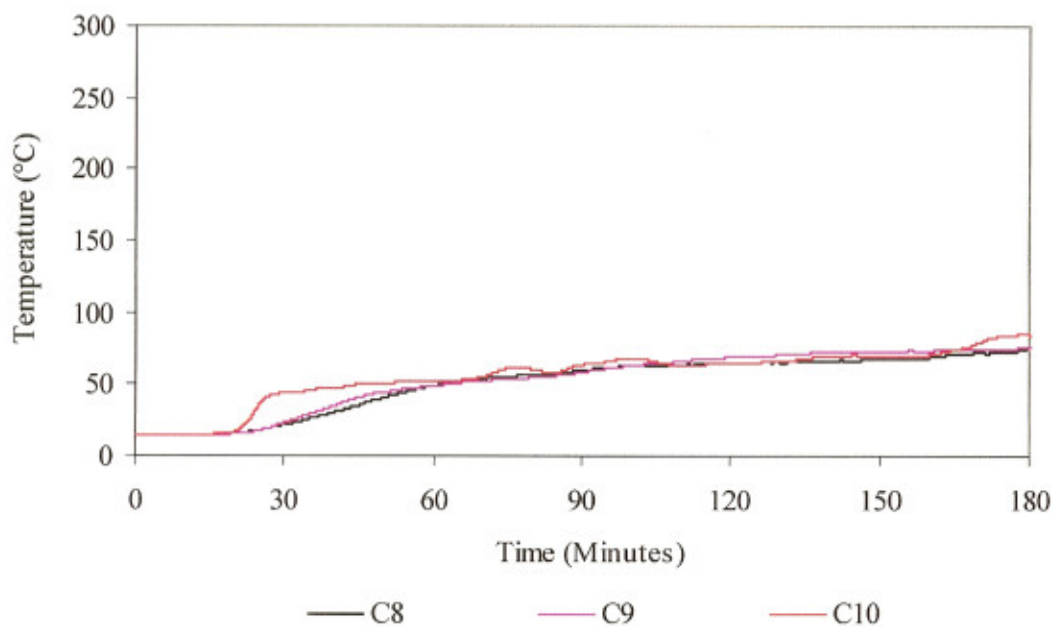
**Figure A2.1: Furnace Temperatures versus Time**



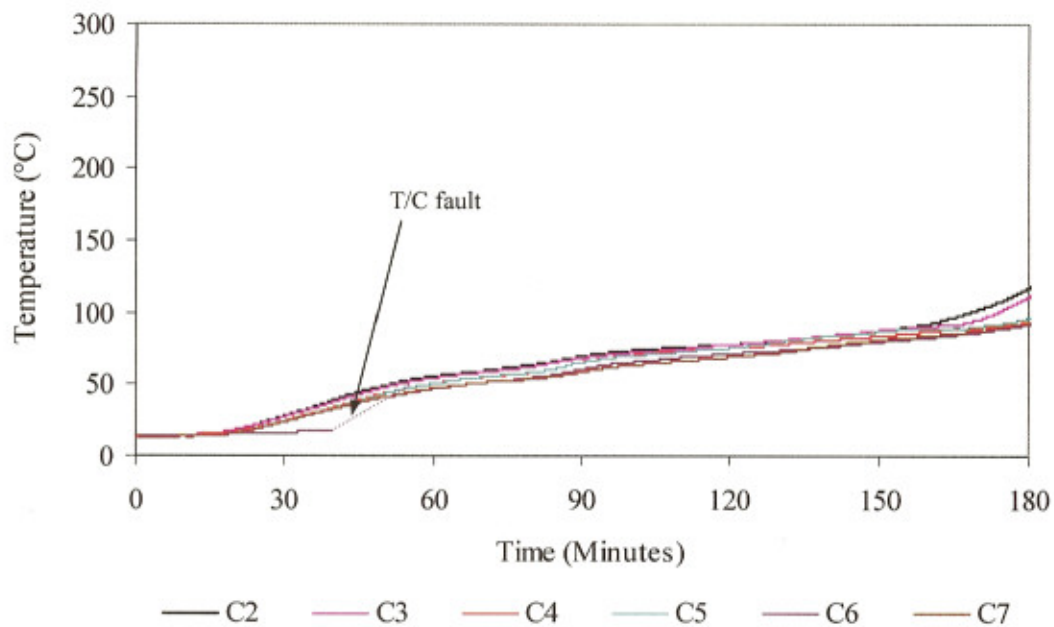
**Figure A2.2: Joint #1 Temperatures versus Time**



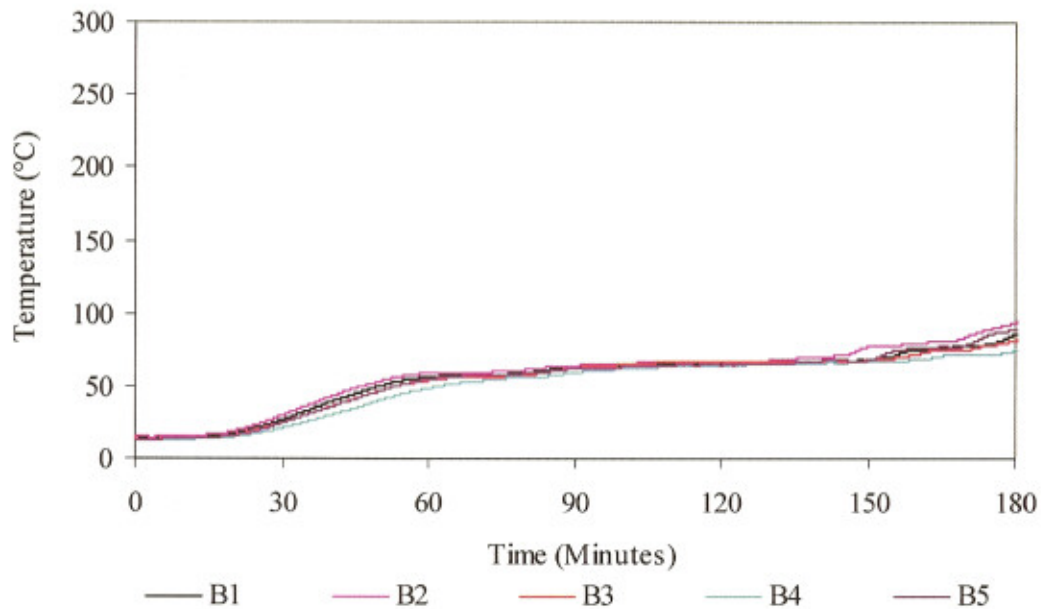
**Figure A2.3: Joint #2 Temperatures versus Time**



**Figure A2.4: Joint #3 Temperatures versus Time**



*Figure A2.5: Control Joint #4 Temperatures versus Time*



*Figure A2.6: Plasterboard partition 1/4 point Temperatures versus Time*

Table A2.2: Test Observations

Time		Face	Test Observations 40922
Min	Sec		
0	00	U	Fire-Resistance Test commenced.
4	00	U	Slight amount of blue smoke was emitted from the top western corner of the specimen.
4	40	U	Smoke was emitted from the bottom furnace seal.
4	40	E	Paper was burnt from the exposed face of the partition.
5	00	U	There was a reduction in the amount of smoke that was emitted from the bottom furnace seal.
6	00	U	There was a further reduction in the amount of smoke that was emitted from the bottom furnace seal.
10	00	U	There was only a slight amount of smoke emitted from the bottom furnace seal.
10	00	E	Majority of the paper on the exposed face had burnt away and there was evidence of cracking of the stopping compound particularly in the lower region of the exposed face.
15	00	U	No further changes had occurred other than emission of moisture and steam from the masonry block surround on the eastern side of the specimen support frame.
19	00	E	Further cracking of the stopping compound render had occurred with several sections up to 150mm in length fallen away and exposed the control joint (Joint #4) flange.
31	00	U	No further changes had occurred. Test specimen continued to maintain integrity in accordance with AS1530.4-1997 and AS4072.1-1992.
45	00	U	Surface thermocouple C6 developed a fault and was replaced. No further changes had occurred.
60	00	E	Several transverse cracks were evident in half section of the exposed face but no vertical cracking was evident. The control Joint (Joint #4) appeared to be intact with no evidence of any local degradation. There appeared to be little or no inwards deflection of the panel. F
61	00	U	The unexposed face appeared to be plumb both horizontally and vertically. Test specimen continued to maintain integrity in accordance with AS1530.4-1997 and AS4072.1-1992.
75	00	E	There was an increase in the amount of transverse cracks that had occurred on the exposed face but no vertical cracks were evident and each of joints on the exposed face appeared to be intact.
75	00	U	The unexposed face of the specimen appeared to be plumb both horizontally and vertically with no evidence that differential movement had occurred at the control joint (Joint #4).
91	00	U	No further changes had occurred. Test specimen continued to maintain integrity in accordance with AS1530.4-1997 and AS4072.1-1992.
100	00	U	Local bubbling of the sealant had occurred in Joints #1 and #2. This was more evident in Joint #2. A section, nominally 25mm long at the top left corner of Joint #1 had blackened in colour.
105	00	U	There was a increase in the size of the bubbling that had occurred as mentioned at 100 minutes with Joint #1 (top joint) being uniform in shape and Joint #2 (east side) with the appearance of several tear drop shapes due to gravity affecting the softened material.
110	00	E	The width of the transverse cracking on the exposed face had increased and a singular vertical crack of approximately 200mm in length had appeared in the eastern half section at approximately the middle of the panel commencing at the bottom edge.

Please Note: U - Observations from Unexposed side of specimen  
E - Observations from Exposed side of specimen

Table A2.2: Test Observations (continued...)

Time		Face	Test Observations 40922
Min	Sec		
115	00	E	The top eastern corner on the exposed face of the control joint (Joint #4) had begun to curl inwards towards furnace in a triangular shape.
116	00	E	A section of the outer layer of the plasterboard had fallen away from the exposed face at the top section of the eastern side. The section was full width by approximately 300mm high.
119	00	E	A further section of the outer layer of the plasterboard had fallen away from the exposed face on the upper eastern side. The section was full width by approximately 600mm high.
120	00	E	A crazed cracking pattern was evident on the inner layer of plasterboard now exposed on the eastern side of the test specimen.
121	00	U	The unexposed face appeared to be plumb but with a slight amount of inwards deflection on the eastern side of the specimen. There appeared to be no differential movement between the edges of the control joint (Joint #4). No gaps or fissures were evident in Joints #1, #2, #3 and #4 on the unexposed side of the test specimen. The test specimen continued to maintain integrity in accordance with AS1530.4-1997 and AS4072.1-1992.
133	00	U	A roving thermocouple was positioned on a black spot on the top joint (Joint #1) at the western corner and was fixed in this position.
135	00	E	A triangular section of the plasterboard outer layer of approximately 150mm deep had fallen away from the top western corner of the specimen on the exposed face. The area where the control joint flange had been exposed to the furnace had been completely burnt away but the control joint appeared fully sealed on the exposed face.
140	00	E	The crazed cracking on the exposed face on the eastern side of the specimen had increased considerably.
140	00	U	There was an increase in the size of the bubbling that had occurred in Joints #1 (top joint) and Joint #2 (east side).
149	00	U	The roving thermocouple reading was 195.3°C on the position stated at 133 minutes. This equated to an 180°C rise of Joint #1. <b>Insulation failure of Joint #1 in accordance with AS1530.4-1997.</b>
154	00	E	An additional triangular section of the plasterboard outer layer of approximately 150mm deep had fallen away from the top western corner of the specimen on the exposed face.
167	00	E	The control joint on the exposed face had opened up with a gap of about 25mm and the eastern side inner layer of the plasterboard on the exposed face had fallen away. The control joint sealant had been consumed from the top to about 400mm downwards and the stud sections were exposed in these regions.
167	00	U	The unexposed face of the test specimen was basically plumb in both directions.
170	00	E	Further sections of the plasterboard on the western side exposed face had fallen away (approximately 40% of the western side in total).
172	00	E	A triangular section of the inner layer of plasterboard on the western top corner of the exposed face had fallen away.
181	00	U	No further changes had occurred. No gaps or fissures evident in Joints #1, #2, #3 and #4 on the unexposed side of the test specimen. Test specimen continued to maintain integrity in accordance with AS1530.4-1997 and AS4072.1-1992.
181	00	U	The furnace was shut down and the fire-resistance test was terminated at the request of the test sponsor.

Please Note: U - Observations from Unexposed side of specimen  
E - Observations from Exposed side of specimen

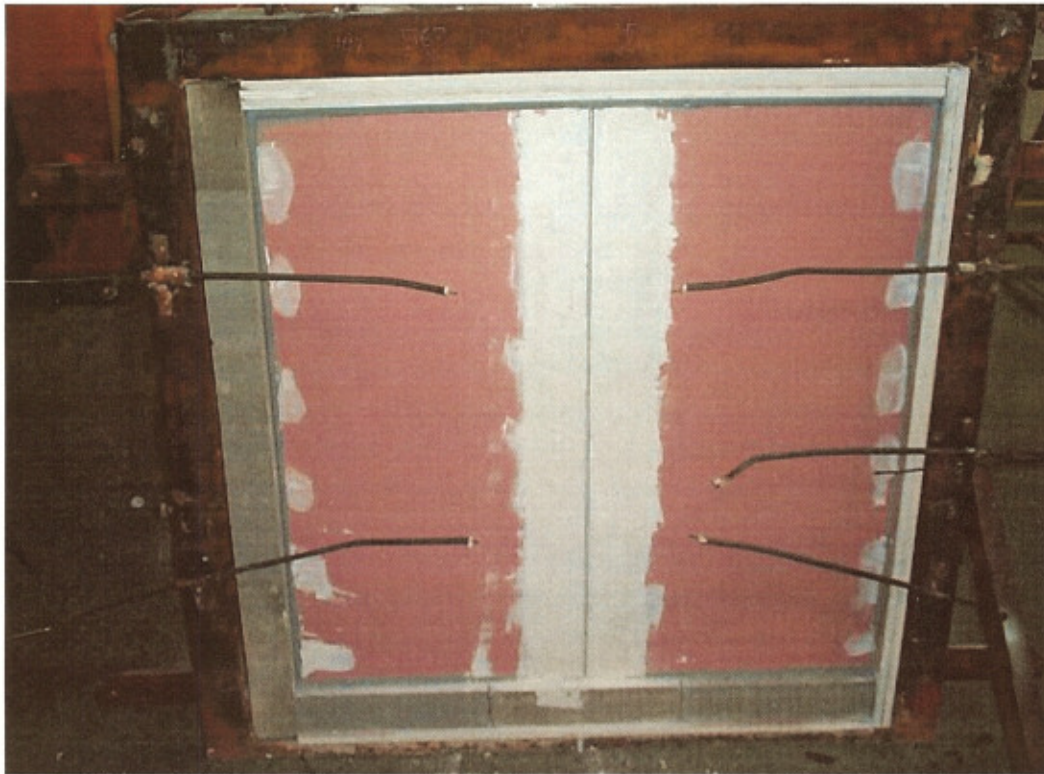
### **A2.3 POST-TEST OBSERVATIONS**

- A2.3.1 After the termination of the fire test the specimen was immediately removed from the furnace and the following observations were noted regarding the condition of the exposed and unexposed faces of the test specimen.
- (i) Both control joint (Joint #4) studs were bowed outwards, with a gap of approximately 25mm wide, buckling was evident at several localized positions along the eastern stud.
  - (ii) The control joint (Joint #4) material was intact on the exposed face for about 250mm above the bottom of the joint.
  - (iii) The control joint (Joint #4) material was intact for the unexposed control joint however, where the stud had bowed outwards there was a gap of approximately 5mm.

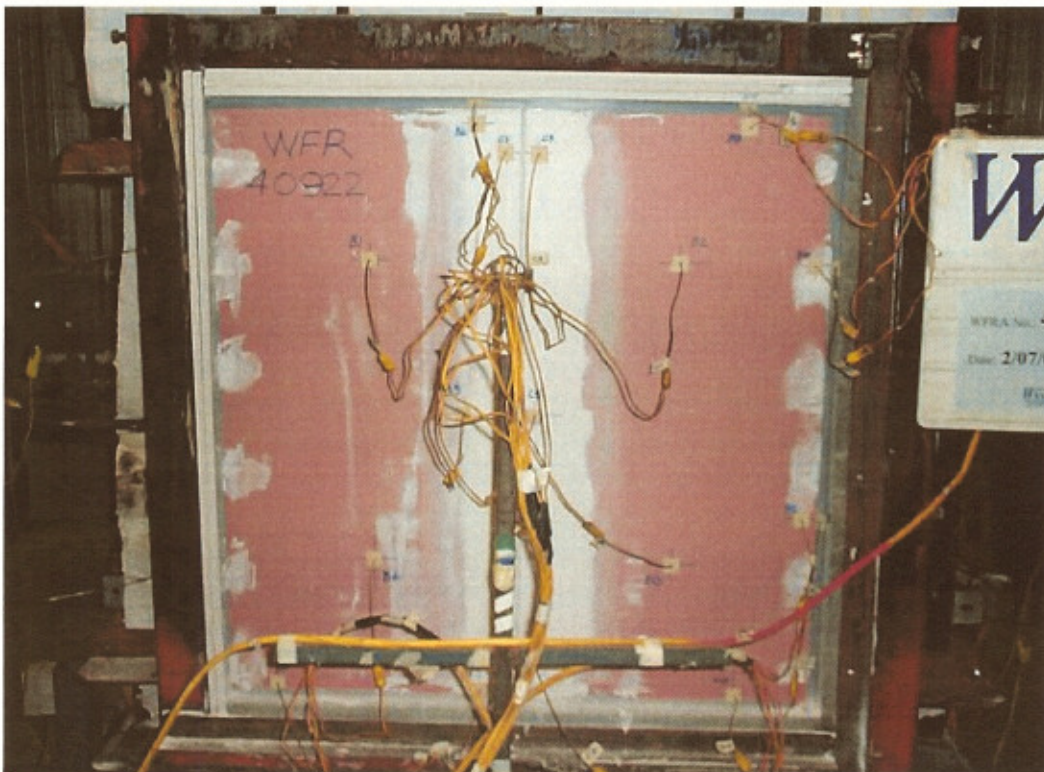
**APPENDIX 3**

**PHOTOGRAPHS**

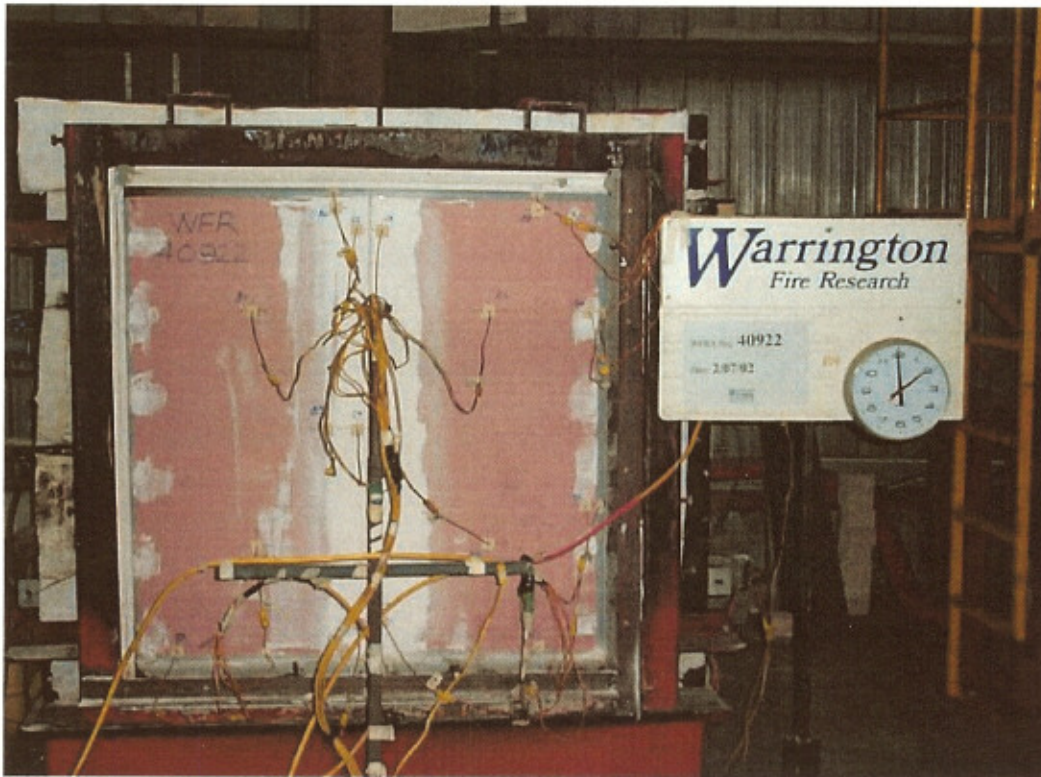
- PLATE 1: Exposed face of the test specimen before commencement of the fire-resistance test.
- PLATE 2: Unexposed face of the test specimen before commencement of the fire-resistance test.
- PLATE 3: Unexposed face of test specimen after approximately 120 minutes test duration.
- PLATE 4: Exposed face of the test specimen after completion of the fire-resistance test.



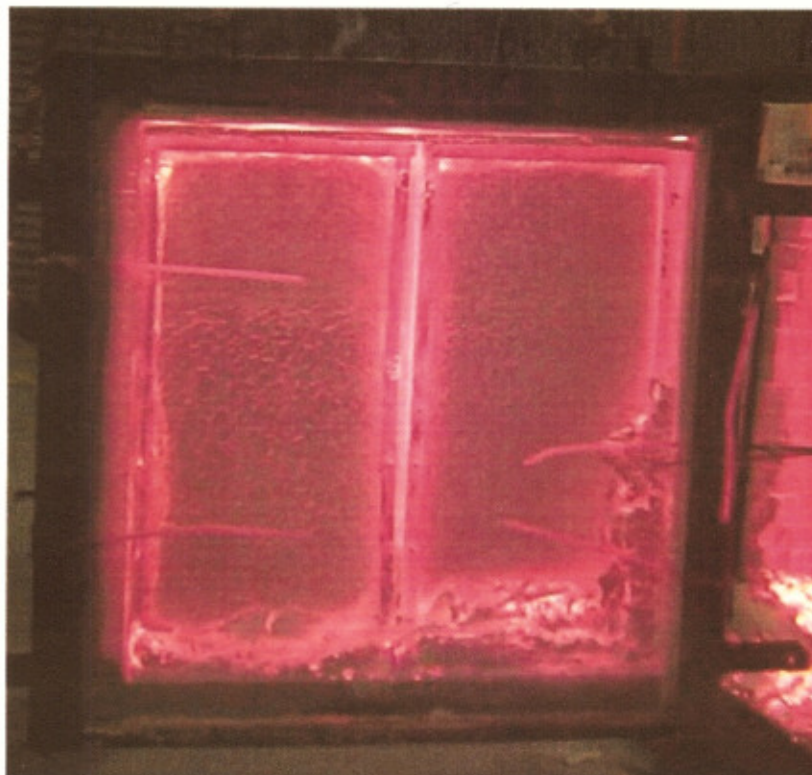
*Plate 1: Exposed face of test specimen before commencement of the fire-resistance test*



*Plate 2: Unexposed face of test specimen before commencement of the fire-resistance test*



*Plate 3: Unexposed face of the test specimen after approximately 120 minutes test duration*



*Plate 4: Exposed face of the test specimen after completion of the fire-resistance test*