



A simulated bushfire test report

Test standard: [Clauses 14 and 21 of AS 1530.8.1:2018](#)

Test sponsor: [Wood Modification Technologies Limited](#)

Product: [FLAMEfixx dFx® decking system](#)

Bushfire attack level (BAL) exposure: [40 kW/m²](#) Crib class: [AA](#)




Job number: [FRT210169](#)

Test date: [25 August 2021](#) Revision: [R1.0](#)

Warringtonfire: accredited for compliance with ISO/IEC 17025 – Testing



Quality management

Revision	Date	Information about the report			
R1.0	31 August 2021	Description	Initial issue		
		Name Signature	Prepared by	Reviewed by	Authorised by
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Executive summary

This report documents the findings of a simulated bushfire attack – radiant heat and small flaming sources test on elements of construction for buildings undertaken on 25 August 2021 in accordance with clauses 14 and 21 of AS 1530.8.1:2018.

Warringtonfire performed the test at the request of Wood Modification Technologies Limited.

Table 1 provides details of the test assembly, and Table 2 provides a summary of the test specimen. A summary of the results is provided in Table 3.

Table 1 Test assembly

Item	Detail	
Wall system	Width	3000 mm
	Height	3000 mm
	Thickness	109 mm
Deck system	Width	1800 mm
	Height	450 mm
	Depth	750 mm
Recess	The unenclosed deck was set within 1800 mm wide x 250 mm deep recess of the wall system.	

Table 2 Test specimen

Item	Detail
Test specimen	<ul style="list-style-type: none"> Two 90 x 45 FLAMEfixx dFx® timber bearers were cut to a length of 1800 mm long. Five 90 x 45 FLAMEfixx dFx® timber joists were spaced at 450 mm centres and secured to the top of the timber bearers using 75 mm long framing nails. The nails were shot at an angle through the sides of the joist into the bearers with a nail located either side of each joist. The 20 mm thick x 90 mm wide FLAMEfixx dFx® decking boards were installed over the top of the joist and laid perpendicular to the joists. The deck boards were secured to the joists using 10g x 65 mm long bugle head Type 17 decking screws. There was a nominal 2 mm gap between each deck board.

Table 3 Test results

Performance criteria		Time to failure (min.)	Position of failure
Formation of through-gaps greater than 3 mm		No failure	-
Sustained flaming for 10 s on the non-fire side		No failure	-
Extent of flaming exceeding 500 mm limits on decking boards		No failure	-
Flaming on the fire-exposed side at the end of the 60 minute test period		No failure	-
Radiant heat flux 365 mm from the non-fire side exceeding 15 kW/m ²		Not applicable	-
Mean and maximum temperature rises greater than 140 K and 180 K		No failure	-
Radiant heat flux 250 mm from the specimen, greater than 3 kW/m ² between 20 min and 60 min		No failure	-
Mean and maximum temperature of internal faces exceeding 250 °C and 300 °C respectively between 20 min and 60 min after commencement of test		No failure	-
Crib class	Type AA	Peak heat flux	40 kW/m ²
Test result		BAL— AA40	

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1. Introduction

This report documents the findings of a simulated bushfire attack – radiant heat and small flaming sources test on elements of construction for buildings undertaken on 25 August 2021 in accordance with clauses 14 and 21 of AS 1530.8.1:2018.

Warringtonfire performed the test at the request of the test sponsor listed in Table 4.

Table 4 Test sponsor details

Test sponsor	Address
Wood Modification Technologies Limited	19 Melanesia Road Kohimarama Auckland 1071 New Zealand

2. Test specimen

2.1 Schedule of components

Table 5 describes the test specimen and lists the schedule of components. These were provided by the test sponsor and surveyed by Warringtonfire.

All measurements were done by Warringtonfire – unless indicated otherwise.

Detailed drawings of the test specimen are provided in Appendix A.

Table 5 Schedule of components

Item	Description	
Deck		
1.	Item name	FLAMEfixx dFx® deck boards
	Material	H3 Treated Radiata Pine
	Size	20 mm thick x 90 mm wide x 1800 mm long
	Density	500 kg/m ³
	Moisture content	13.6%
	Fixings	10g x 65 mm long bugle head Type 17 decking screws.
Sub-floor		
2.	Item name	FLAMEfixx dFx® subfloor system
	Material	H3 Treated Radiata Pine
	Size	90 mm high x 45 mm deep x 1800 mm wide bearers 90 mm high x 45 mm wide x 750 mm deep joists
	Density	500 kg/m ³
	Moisture content	Bearers: 13.9% Joists: 13.9%
	Fixings	3.06 x 75 mm long bright smooth shank framing nails.
Deck system (unenclosed)	Overall size	1800 mm wide x 450 mm high x 750 mm deep
	Installation	<ul style="list-style-type: none"> Two 90 x 45 FLAMEfixx dFx® timber bearers (item 2) were cut to a length of 1800 mm long. Five 90 x 45 FLAMEfixx dFx® timber joists (item 2) were spaced at 450 mm centres and secured to the top of the timber bearers using 75 mm long framing nails. The nails were shot at an angle through the sides of the joist into the bearers with a nail located either side of each joist. The 20 mm thick x 90 mm wide FLAMEfixx dFx® decking boards (item 1) were installed over the top of the joist and laid perpendicular

Item	Description	
		to the joists. The deck boards were secured to the joists using 10g x 65 mm long bugle head Type 17 decking screws. There was a nominal 2 mm gap between each deck board.
Wall system		
3.	Item name	Framing
	Product name	90 x 45 MGP10 Radiata pine
	Density	489 kg/m ³ (measured)
	Location	Located around the perimeter of the specimen and the wall system. Noggings were located at nominal 1000 mm centres to the sides of the specimen. Jack studs were located at nominal 300 mm centres above and below the specimen.
	Fixings	Assembled using 3.06 x 75 mm long bright smooth shank framing nails.
4.	Item name	Unexposed cladding
	Product name	10 mm thick standard plasterboard
	Density	566 kg/m ³ (measured)
	Location	Fixed directly to the timber framing on the unexposed face of the specimen.
	Fixings	6g x 32 mm bugle head plasterboard screws at approximately 300 mm centres through the timber framing.
5.	Item name	Exposed cladding
	Product name	9 mm thick CSR Cemintel® fibre cement board
	Density	1625 kg/m ³ (nominal)
	Location	Fixed directly to the timber framing on the exposed face of the specimen.
	fixings	6g x 32 mm bugle head plasterboard screws at approximately 200 mm centres through the timber framing.
6.	Item name	Eaves sheet lining
	Product name	6 mm thick CSR Cemintel® fibre cement board
	Density	1625 kg/m ³ (nominal)
	Location	Fixed directly to the timber framing along the eaves on the exposed side.
	fixings	6g x 32 mm bugle head plasterboard screws at approximately 200 mm centres through the timber framing.
Wall system	Overall size	3000 mm wide x 3000 mm high x 109 mm thick
	Installation	<ul style="list-style-type: none"> Two 90 x 45 timber stud frames (item 3) with the central frame offset 250 mm back. The timber framing was assembled using 3.06 x 75 mm long bright smooth shank framing nails. The exposed side of the timber framing (item 3) was clad using 9 mm thick fibre cement board (item 5) and incorporated a 250 mm high eave detail lined with 6 mm thick fibre cement (item 6). The unexposed side of the timber framing was lined with 10 mm thick regular plasterboard (item 4).

2.2 Installation details

Table 6 lists the installation details for the test specimen.

Table 6 Installation details

Item	Detail
Start date for construction of separating element	16 August 2021
Deck assembled on	23 August 2021
Separating element constructed by	Representatives of Warringtonfire
Deck assembled by	Representatives of Warringtonfire.
Deck installed into the separating element by	Representatives of Warringtonfire
Symmetry	<p>Asymmetrical due to:</p> <ul style="list-style-type: none"> The exposed side of the wall being clad with 9 mm thick fibre cement and the unexposed side lined with 10 mm thick regular plasterboard. The external face with the deck assembly exposed to the radiant heat source. The front face of the deck was exposed to a radiant panel at an initial irradiance level of 40 kW/m² <p>It was confirmed that the system was exposed to heat from the side that would normally face the outside of the building.</p>

3. Test procedure

Table 7 details the test procedure for this simulated bushfire test.

Table 7 Test procedure

Item	Detail						
Statement of compliance	The test was performed in accordance with the requirements of clauses 14 and 21 of AS 1530.8.1:2018 for an external construction.						
Variations	None						
Pre-test conditioning	The construction and installation of the test specimen was completed on 24 August 2021. The test specimen was subjected to normal laboratory temperatures and conditions between the completion of construction of the test specimen and the start of the test.						
Sampling / specimen selection	<p>The laboratory was not involved in sampling or selecting the test specimen for the simulated bushfire test.</p> <p>The results obtained during the test only apply to the test samples as received and tested by Warringtonfire.</p>						
Ambient laboratory temperature	<table border="1"> <tr> <td>Start of the test</td> <td>18 °C</td> </tr> <tr> <td>Minimum temperature</td> <td>18 °C</td> </tr> <tr> <td>Maximum temperature</td> <td>23 °C</td> </tr> </table>	Start of the test	18 °C	Minimum temperature	18 °C	Maximum temperature	23 °C
Start of the test	18 °C						
Minimum temperature	18 °C						
Maximum temperature	23 °C						
Test duration	The test was stopped after 60 minutes in accordance with the procedures in AS 1530.8.1:2018.						
Instrumentation and equipment	<p>The instrumentation was provided in accordance with AS 1530.8.1:2018 as follows:</p> <ul style="list-style-type: none"> The unexposed side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5 mm soldered to 12 mm diameter x 0.2 mm thick copper discs covered by 30 mm x 30 mm x 2.0 mm thick inorganic insulating pads. 						

Item	Detail
	<ul style="list-style-type: none"> • The internal temperatures of the specimen were measured by Type K thermocouples with wire diameters less than 0.5 mm soldered to 12 mm diameter x 0.2 mm thick copper discs covered by 30 mm x 30 mm x 2.0 mm thick inorganic insulating pads. • The thermocouple positions are shown in Table 10 and in Figure 5 in Appendix D. • A Ø3 mm gap gauge was available during the test to assess the performance of the specimen under the criteria of integrity. • A pilot ignition source was available to assess any areas of the specimen producing significant quantities of volatiles. • The crib was conditioned for at least 24 hours in a conditioning oven and removed 1 hour before the start of the test. • The crib was weighed to confirm that it was within the 0.152 ± 0.03 kg mass required by the standard. The crib was lit over a 2 minute period – 20 seconds on the upper 0.10 m x 0.10 m face. 20 seconds on each of the 0.54 m x 0.10 m faces, and a further 20 seconds on the upper 0.10 m x 0.10 m face – using an oxyacetylene torch with Type 551 size 8 x 10 heating tip. • Radiant heat flux measurements to determine the irradiance received and transmitted from the exposed face of the specimen were taken using heat flux gauges. • A second heat flux meter was placed in the centre of the wall to provide additional information. • During the test, a third heat flux gauge was centrally located next to the deck system at a distance of 250 mm from the exposed side of the specimen during the 20 to 60 minutes periods of the test. • The heat flux gauge positions are shown in Figure 4 in Appendix E.

4. Test measurements and results

Table 8 summarises the results the specimen achieved against the performance criteria listed in clauses 14 and 21 of AS 1530.8.1:2018.

Appendix E includes details of the measurements taken during the test.

Table 9 in Appendix B includes observations of any significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.8.1:2018.

Photographs of the specimen are included in Appendix F.

Table 8 Test results

Performance criteria	Time to failure (min.)	Position of failure
Formation of through-gaps greater than 3 mm	No failure	-
Sustained flaming for 10 s on the non-fire side	No failure	-
Extent of flaming exceeding 500 mm limits on decking boards	No failure	-
Flaming on the fire-exposed side at the end of the 60 minute test period	No failure	-
Radiant heat flux 365 mm from the non-fire side exceeding 15 kW/m ²	Not applicable	-
Mean and maximum temperature rises greater than 140 K and 180 K	No failure	-
Radiant heat flux 250 mm from the specimen, greater than 3 kW/m ² between 20 min and 60 min	No failure	-
Mean and maximum temperature of internal faces exceeding 250 °C and 300 °C respectively between 20 min and 60 min after commencement of test	No failure	-
Crib class	Type AA	Peak heat flux
		40 kW/m ²
Test result	BAL— AA40	

5. Application of test results

5.1 Test limitations

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

These results only relate to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, and they do not necessarily reflect the actual behaviour in fires.

5.2 Variations from the tested specimen

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described here was tested following the procedure outlined in AS 1530.8.1:2018. Any significant variation with respect to size, construction details, loads, stresses, edge or end conditions, other than that allowed under the field of direct application in the relevant test method, is not covered by this report.

It is recommended that any proposed variation to the tested configuration – other than as permitted under the field of direct application specified in Appendix C – should be referred to the test sponsor.

They should then obtain appropriate documentary evidence of compliance from Warringtonfire or another accredited testing authority.

5.3 Uncertainty of measurements

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy for the result.

Appendix A Drawings of test assembly

The leaders in the drawings represent the items listed in section 2.1.

All measurements are in millimetres – unless otherwise indicated.

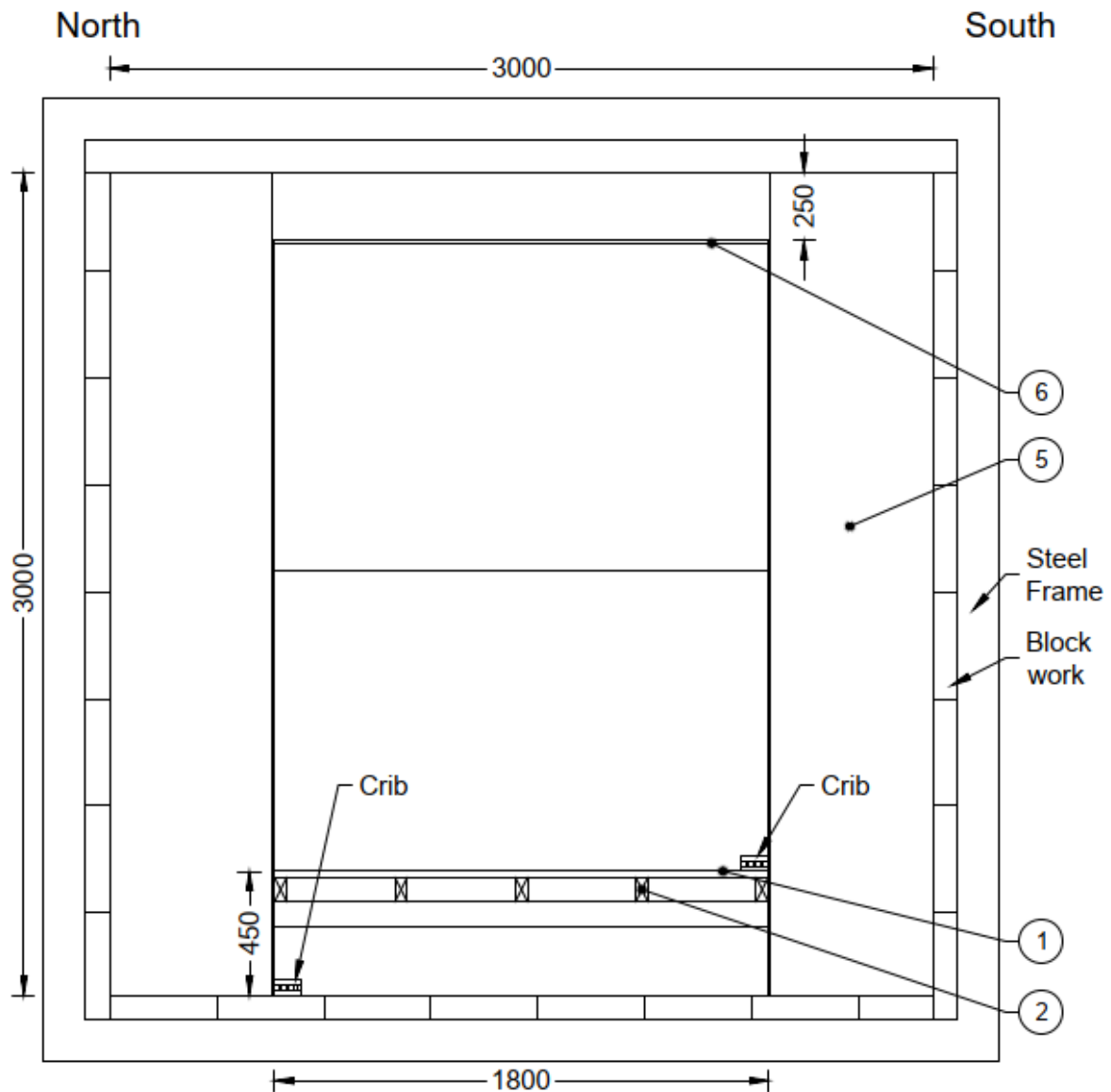


Figure 1 Elevation of the specimen

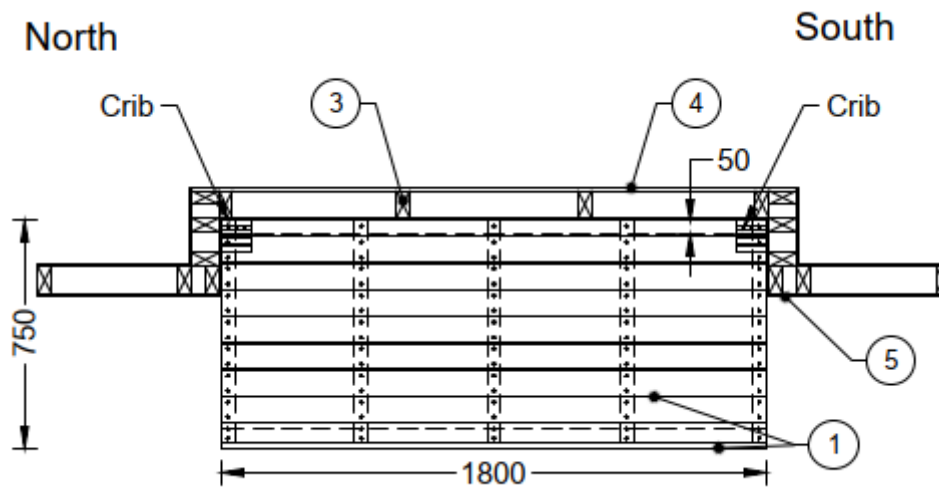


Figure 2 Horizontal cross-section

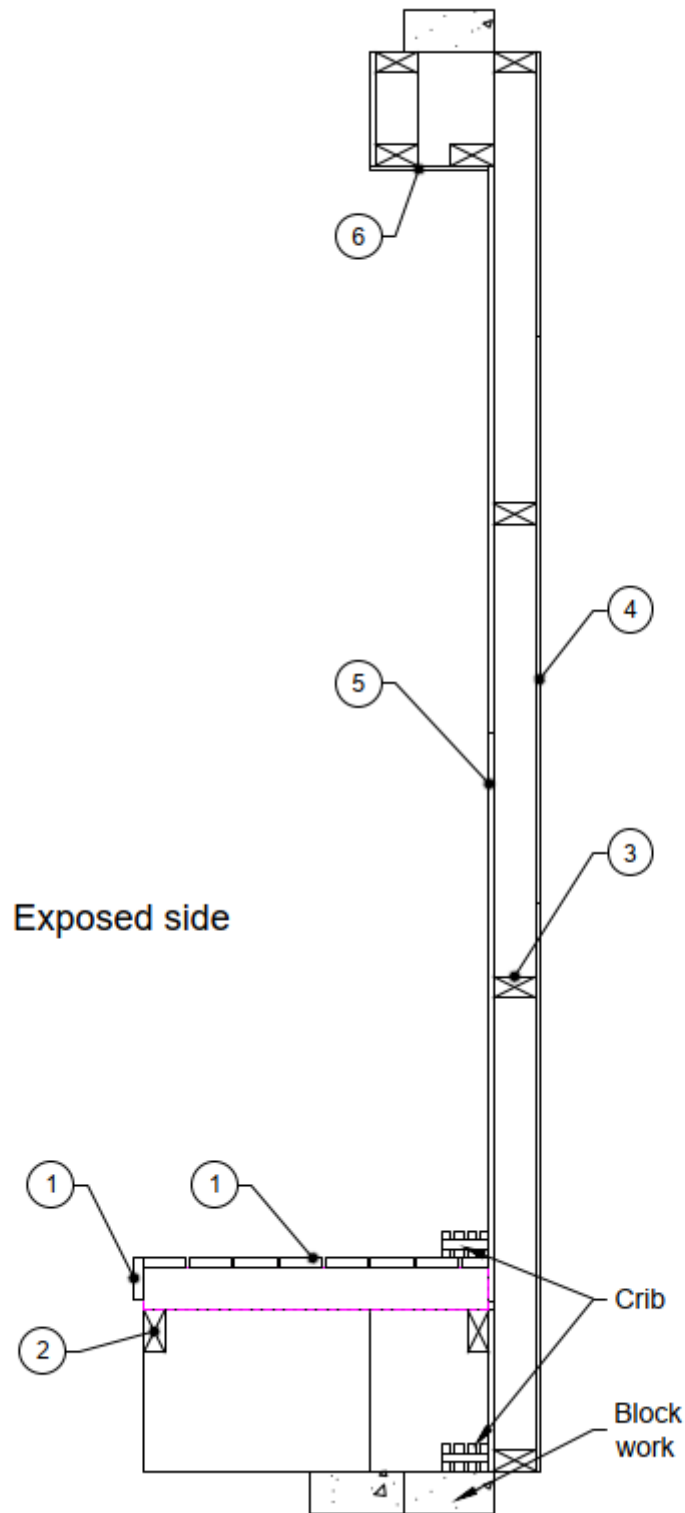


Figure 3 Vertical cross-section

Appendix B Test observations

Table 9 shows the observations of any significant behaviour of the specimen during the test.

Table 9 Test observations

Time		Observation
Min	Sec	
00	00	The simulated bushfire radiant heat test started. Two flaming cribs (class AA) were placed against the test specimen. The ambient temperature of the laboratory was 18°C.
00	04	The screen shielding the specimen from the radiant heat panel was removed and the test specimen was exposed to the radiant heat profile for BAL 40, as specified in AS 1530.8.1:2018.
00	50	Smoke was emitting from the fascia of the deck.
03	14	Smoke had stopped emitting from the fascia of the deck.
10	00	The screen was re-positioned in front of the furnace and exposure to the radiant heat profile of BAL 40 was stopped. Monitoring of the test specimen against the performance criteria outlined in AS 1530.8.1:2018 continued.
60	00	There were no further changes to the specimen. The test was stopped in accordance with the procedures outlined in AS 1530.8.1:2018.

Appendix C Direct field of application

Note: The text, figures and tables in this appendix have been taken from AS 1530.8.1:2018.

The results of the fire test contained in this test report are directly applicable, without reference to the testing authority for a technical opinion, to similar constructions where one or more of the following changes have been made provided no individual component is removed or reduced:

- Increase in thickness of solid decking material.
- Increase in cross-section of bearers and joists.
- Increase in the size of the deck.

Appendix D Instrumentation locations



Note:

- Southern crib located above the deck
- Northern crib located below
- White dots show heat flux gauge locations.
- Orange dots show crib locations.

Figure 4 Instrumentation locations (exposed side shown)

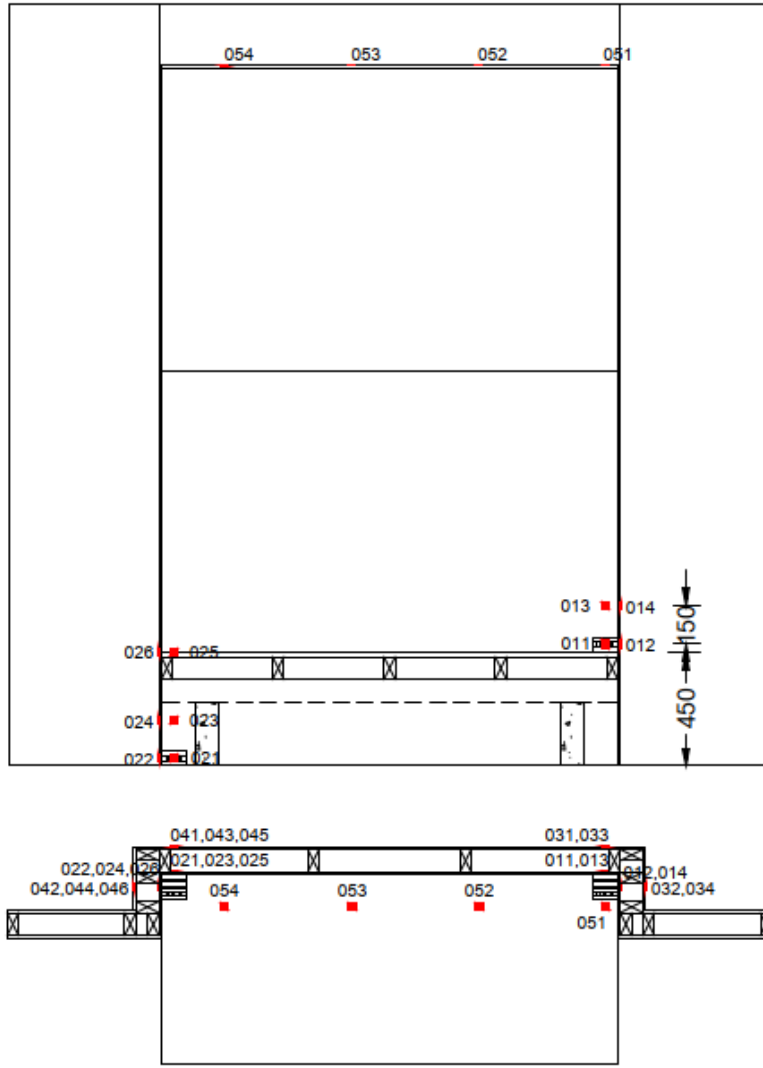


Figure 5 Thermocouple locations

The instrumentation was positioned in accordance with the requirements of clause 14 and 21 of AS 1530.8.1:2018 – as summarised in Table 10 and Table 11.

Table 10 Thermocouple locations

Location	T/C #	Description
Internal (top crib)	011	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the east side.
	012	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the south side.
	013	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 011 on the east side.
	014	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 013 on the south side.
Internal (bottom crib)	021	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the east side.
	022	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the north side.
	023	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 021 on the east side.
	024	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 023 on the north side.
	025	On the unexposed side of the external lining sheet, directly behind the top face of the deck on the east side
	026	On the unexposed side of the external lining sheet, directly behind the top face of the deck on the north side
Unexposed (top crib)	031	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the east side.
	032	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the south side.
	033	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 011 on the east side.
	034	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 013 on the south side.
Unexposed (bottom crib)	041	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the east side.
	042	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the north side.
	043	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 021 on the east side.
	044	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 023 on the north side.
	045	On the unexposed side of the plasterboard, directly behind the top face of the deck on the east side
	046	On the unexposed side of the plasterboard, directly behind the top face of the deck on the north side
Eave	051	Eave above the south crib.
	052	At the south quarter point of the eave.
	053	At the centre of the eave.
	054	At the north quarter point of the eave.

Table 11 Heat flux gauge locations

Location	Ref	Description
Deck	HFG1	Located centrally across the deck, nominal 90 mm below the bottom of the deck.
Wall	HFG2	Located centrally on the wall, on the exposed face.
	HFG3	Located at the mid-height of the wall at a distance of 250 mm from the exposed face of the wall.

Appendix E Test data

E.1 Measure of heat flux received

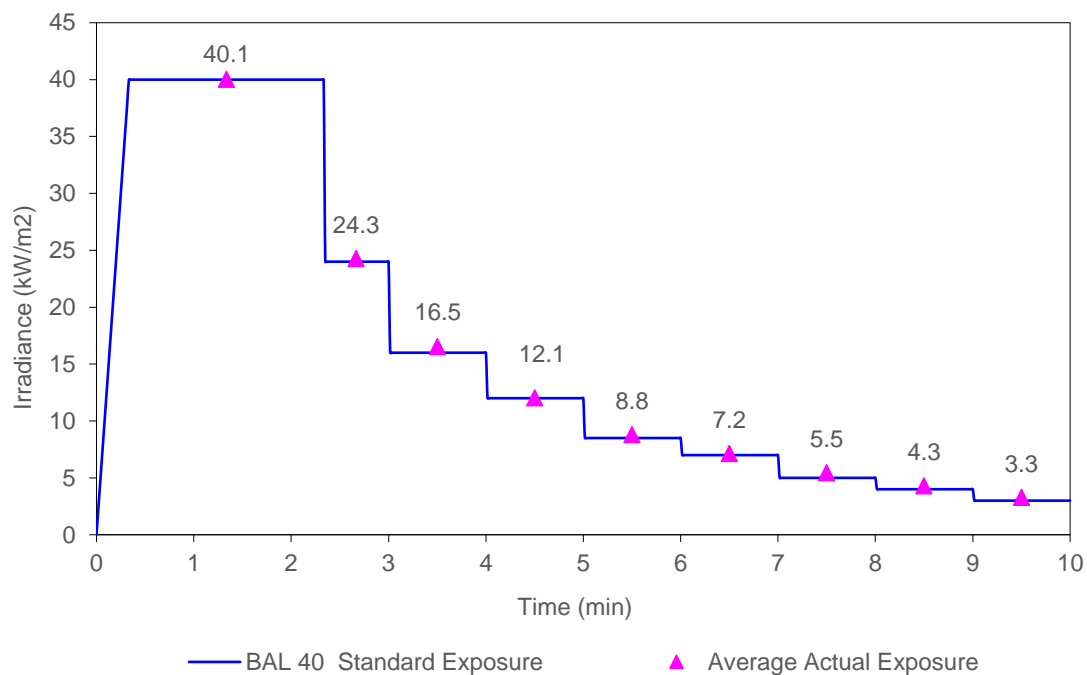


Figure 6 Averaged irradiance levels during the test to the deck system

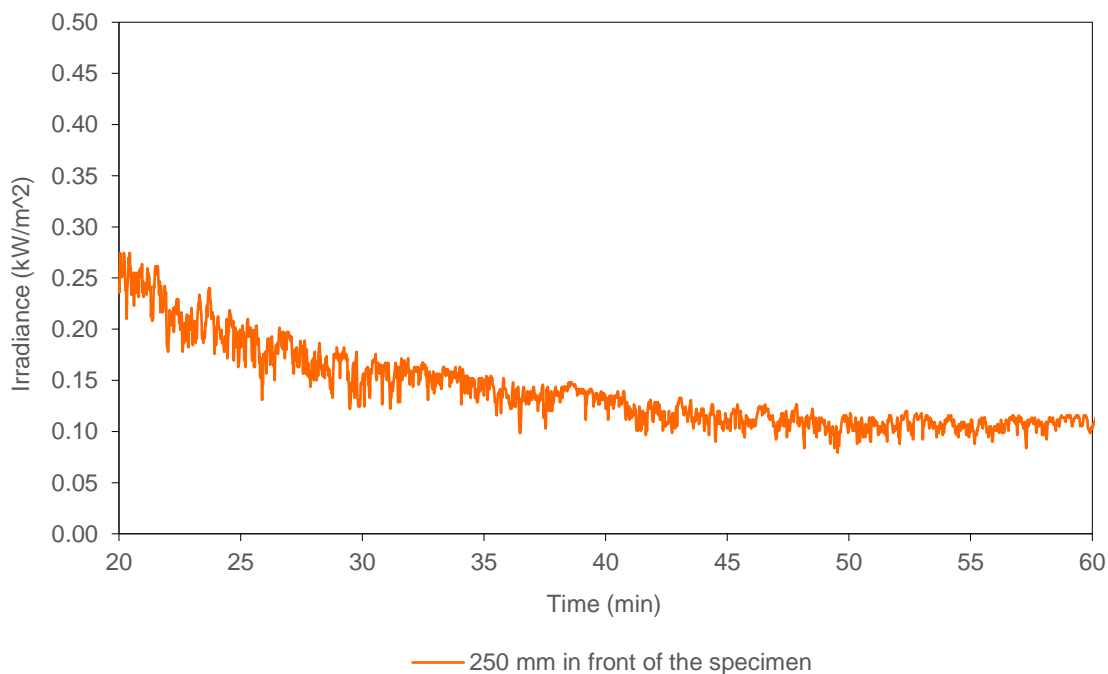


Figure 7 Radiant heat flux received 250 mm in front of the specimen

Less than 0.27 kW/m² heat flux radiation was received by the heat flux gauge positioned centrally to the front of the specimen and 250 mm from the wall during the time period of 20 to 60 minutes of the test period.

E.2 Specimen temperatures

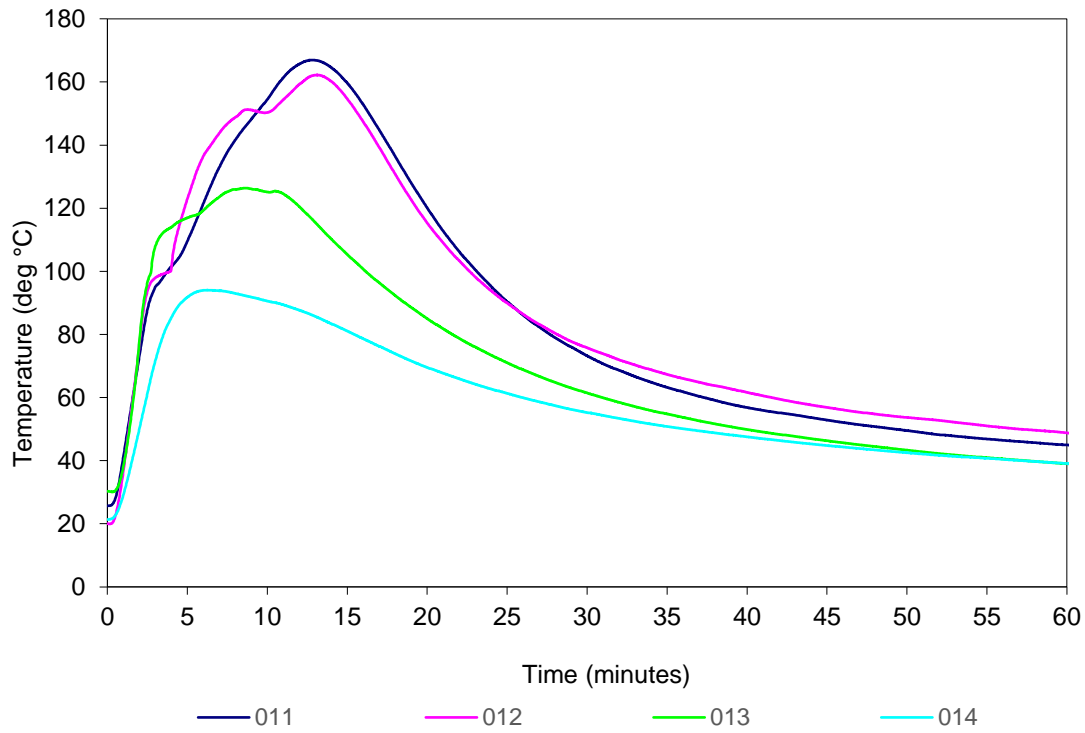


Figure 8 Top crib internal temperatures – temperature vs time

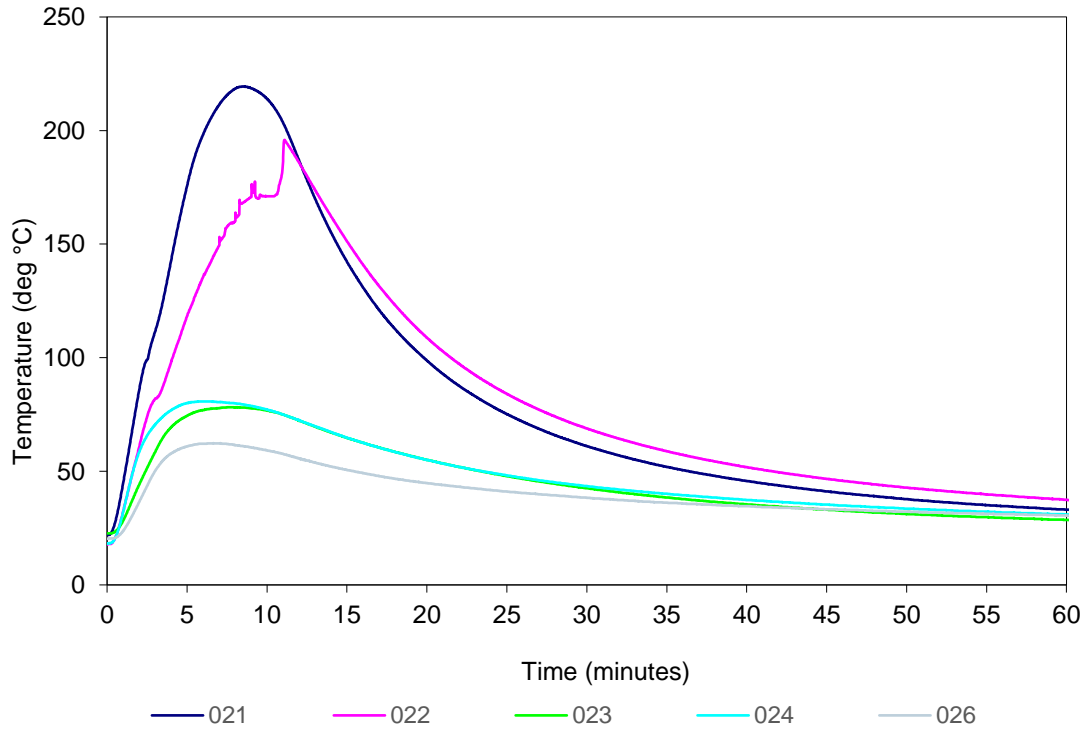


Figure 9 Lower crib internal temperatures – temperature vs time

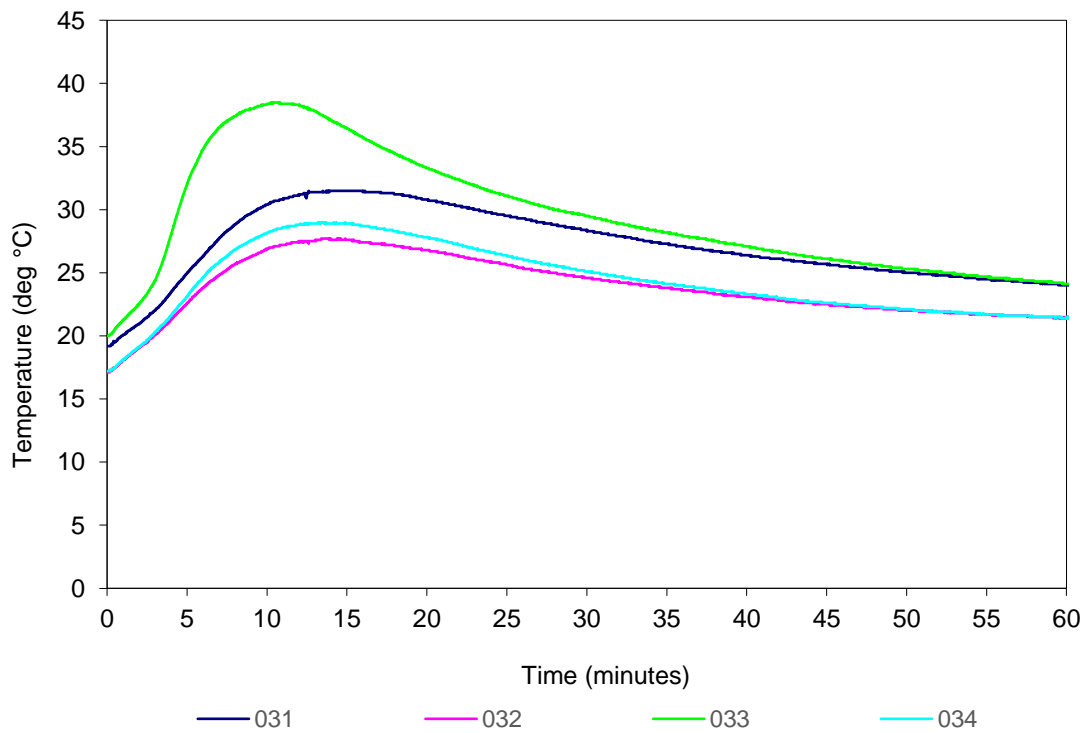


Figure 10 Top crib unexposed side temperatures – temperature vs time

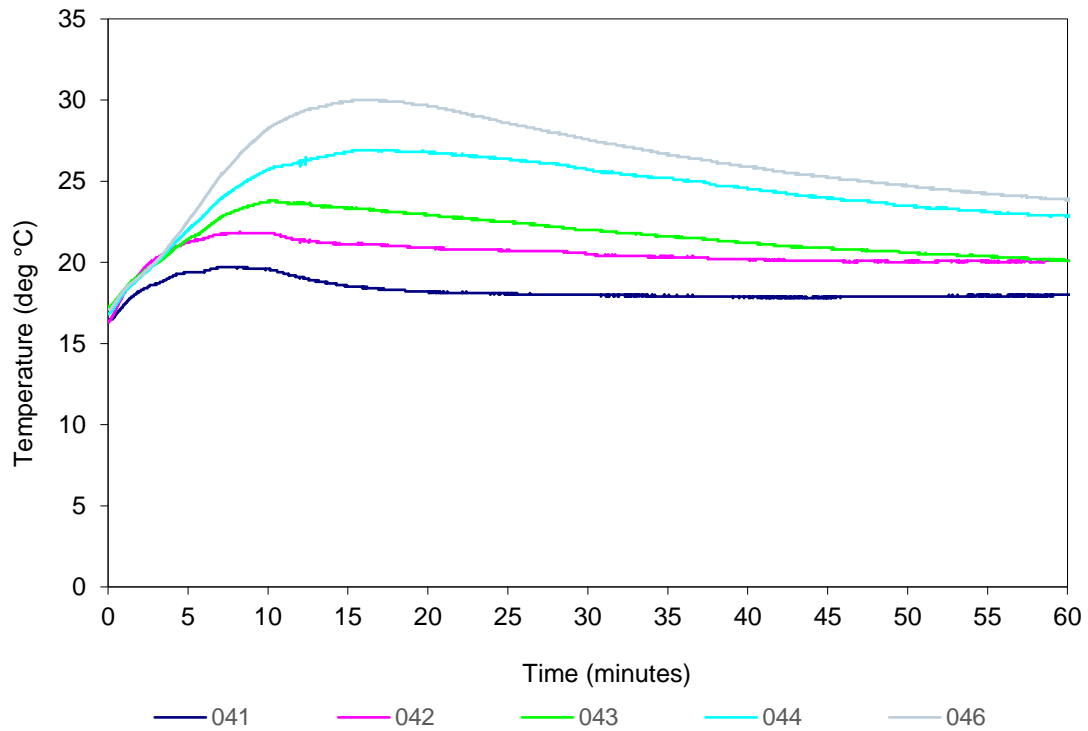


Figure 11 Lower crib unexposed side temperatures – temperature vs time

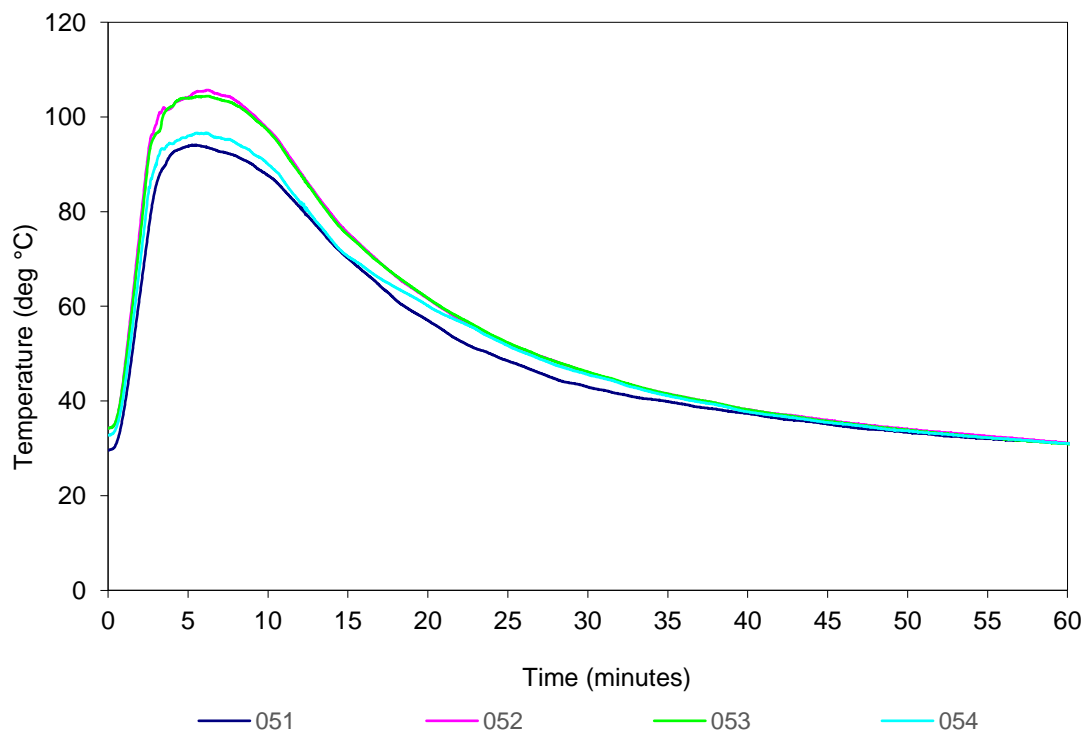


Figure 12 Eave temperatures – temperature vs time

Table 12 Test specimen temperatures

Location	T/C #	Description ¹	Temp (°C) at t (minutes)					Limit ² (minutes)
			t=0	t=10	t=20	t=30	t=60	
Internal (top crib)	011	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the east side.	26	155	120	73	45	-
	012	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the south side.	20	150	115	76	49	-
	013	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 011 on the east side.	30	125	85	61	39	-
	014	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 013 on the south side.	21	91	70	55	39	-
Internal (bottom crib)	021	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the east side.	22	214	99	61	33	-
	022	On the unexposed side of the external lining sheet, behind the crib 27 mm above the top of the deck on the north side.	18	171	109	69	38	-
	023	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 021 on the east side.	23	77	55	43	29	-
	024	On the unexposed side of the external lining sheet, behind the crib 150 mm above TC 023 on the north side.	18	77	55	44	31	-
	025	On the unexposed side of the external lining sheet, directly behind the top face of the deck on the east side	25	91	56	43	30	-
	026	On the unexposed side of the external lining sheet, directly behind the top face of the deck on the north side	20	59	45	38	31	-
Unexposed (top crib)	031	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the east side.	19	30	31	28	24	-
	032	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the south side.	17	27	27	25	22	-
	033	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 011 on the east side.	20	38	33	30	24	-
	034	On the unexposed side of the plasterboard, behind the crib	17	28	28	25	22	-

Location	T/C #	Description ¹	Temp (°C) at t (minutes)					Limit ² (minutes)
			t=0	t=10	t=20	t=30	t=60	
		150 mm above TC 013 on the south side.						
Unexposed (bottom crib)	041	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the east side.	17	20	18	18	18	-
	042	On the unexposed side of the plasterboard, behind the crib 27 mm above the top of the deck on the north side.	16	22	21	21	20	-
	043	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 021 on the east side.	17	24	23	22	20	-
	044	On the unexposed side of the plasterboard, behind the crib 150 mm above TC 023 on the north side.	17	26	27	26	23	-
	045	On the unexposed side of the plasterboard, directly behind the top face of the deck on the east side	18	27	25	24	21	-
	046	On the unexposed side of the plasterboard, directly behind the top face of the deck on the north side	17	28	30	28	24	-
Eave	051	Eave above the south crib.	30	88	57	43	31	-
	052	At the south quarter point of the eave.	34	97	62	46	31	-
	053	At the centre of the eave.	34	97	62	46	31	-
	054	At the north quarter point of the eave.	33	90	60	46	31	-

- Note:**
- ¹ Refer to Table 10 for locations of thermocouples as only a generic description is included in the table.
 - ² Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by any surface thermocouple does not rise by more than 180K above the initial temperature, or the average of the external quarter point thermocouple measured temperatures does not rise by more than 140 K above the initial temperature.
 - ³ Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by any internal thermocouple does not reach 300 °C, or the average of the internal quarter point thermocouple measured temperatures do not reach 250 °C
 - ⁴ Under Limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

Appendix F Photographs



Figure 13 Exposed face of the specimen before the start of the test



Figure 14 Exposed face of the specimen at the end of the test

warringtonfire

Proud to be part of  element



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