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A simulated bushfire test report

An enclosed deck tested in accordance with AS 1530.8.1:2018

Test sponsor: Modinex Group

Product: Urbanline Architectural Tractio Edge Board

Bushfire attack level (BAL) exposure: 19 kW/m^2 Crib class: AA

Job number: FRT190063

Test date: 20 March 2019 Revision: R1.0

Amendment schedule

Version	Date	Information relating to report			
R1.0	01/04/2019	Description	Initial issue		
			Prepared by	Reviewed by	Authorised by
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		Signature			

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General conditions of use

Executive summary

This report documents the findings of a simulated bushfire attack – radiant heat and small flaming sources test of elements of construction for buildings undertaken on 20/03/2019 in accordance with clause 14 and 21 of AS 1530.8.1:2018.

The test specimen consisted of Urbanline Architectural Tractio Edge decking boards that were nominal 140mm wide × 22mm thick. A summary of the results achieved by the test specimen is provided in Table 1.

Table 1 Test results

Performance criteria		Time to failure (min.)	Position of failure
Formation of through-gaps greater than 3mm		No Failure	-
Sustained flaming for 10s on the non-fire side		No Failure	-
Extent of flaming exceeding 500mm limits on decking boards		15 minutes and 12 seconds	The upper deck boards extending from the crib corner towards the west edge
Flaming on the fire-exposed side at the end of the 60 minute test period		Specimen flaming was extinguished at 27 minutes and 35 seconds due to safety reasons	The upper deck boards extending from the crib corner towards the west edge
Radiant heat flux 365mm from the non-fire side exceeding 15kW/m^2		Not Applicable	N/A
Mean and maximum temperature rises greater than 140K and 180K		Not Applicable	N/A
Radiant heat flux 250mm from the specimen, greater than 3kW/m^2 between 20 min and 60 min		Not Applicable	N/A
Mean and maximum temperature of internal faces exceeding 250°C and 300°C respectively between 20 min and 60 min after commencement of test		20 minutes	Peak temperature recorded by TC 012 of 412°C
Crib class	AA	**Peak heat flux**	19kW/m^2
Test result		**BAL— NIL**	

Contents

1. Introduction

This report documents the findings of a simulated bushfire attack – radiant heat and small flaming sources test of elements of construction for buildings undertaken on 20/03/2019 in accordance with clause 14 and 21 of AS 1530.8.1:2018.

Warringtonfire Australia did the test at the request of Modinex Group.

Table 2 Test sponsor details

Test sponsor	Address
Modinex Group	150 Toongarra Road Ipswich 4305 QLD Australia

2. Construction details

Table 3 provides details of the test assembly. Table 4 provides a summary of the test specimen. A full description of the specimen is provided in Appendix A and Section 3.

Table 5 shows the installation method and orientation of the test specimen.

Table 3 Test assembly

Item	Detail	
Deck	Urbanline Architectural Tractio Edge Decking Board	
Wall system size	Width (w): Height (h):	3000mm 3000mm
Nominal deck size	Width (w): Height (h): Depth (d):	1800mm 202mm 750mm
Recess	The deck was set within 1800mm wide × 250mm deep recess of the wall system and installed at a height of 450mm above the bottom of the wall.	

Table 4 Test specimen

Item	Detail
Test specimen	The deck consisted of Urbanline Architectural Tractio Edge decking boards that were nominal 140mm wide × 22mm thick, that were installed parallel to the wall system with nominal 5.5mm spacing between each board. The boards were secured to joists and spaced using the Deckorators® Stowaway™ hidden fastening system incorporating 8g × 55mm long countersunk Type 17 screws. The front fascia of the specimen consisted of a single decking board horizontally installed. The wall system comprised an AS 3959:2018 DtS BAL 19 wall system, incorporating a timber frame of 90 × 45mm studs clad with 6mm thick square edge fibre-cement board to the exposed side and 10mm standard plasterboard to the unexposed side.

Table 5 Installation method and orientation

Item	Detail
Wall system constructed on	15 March 2019
Deck was delivered on	18 March 2019
Deck assembled on	19 March 2019

Item	Detail
Wall system constructed by	Representatives of Warringtonfire Melbourne.
Deck assembled by	Representatives of Warringtonfire Melbourne.
Deck installed into the wall system by	Representatives of Warringtonfire Melbourne.
Orientation	Asymmetrical, due to 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 19kW/m^2. It was confirmed that the system was exposed to heat from the side that would normally face the outside of the building.

3. Schedule of components

Table 6 lists the schedule of components for the test specimen which were provided by the test sponsor and surveyed by Warringtonfire Australia

Table 6 Schedule of components

Item	Description	
Deck		
1.	Product name	Urbanline Architectural Tractio Edge decking boards
	Size	140mm wide × 22mm thick (nominal)
	Density	787 kg/m^3
	Installation	Positioned on the top side of the joists parallel to the wall system. There was a nominal gap of 5.5mm between boards. A single full width board was also fixed to the front face of the deck, positioned such that the top of the board was in line with the top of the boards on the deck.
	Fixing	The decking boards were securing using screws (item 9) and the hidden fastening system (item 8)
Sub-floor		
2.	Item name	Sub-floor of deck
	Material	F17 KD Hardwood
	Size	90mm × 45mm
	Density	675 kg/m^3 (measured)
	Moisture content	Average of 9% for the joists Average of 9% for the bearers
	Fixings	Two Ø3mm × 75mm long nails on each joist to bearer
	Installation	5-off 750mm long lengths to form the joists that were located perpendicular to the wall, at nominal 450mm centres.
		2-off 1800mm lengths to form the bearers were located parallel to the wall; the bearers were located at the front and back edge of the specimen.
3.	Item name	Fibreglass mesh
	Material	Woven fibreglass fabric
	Thickness	0.2mm thick
	Installation	The mesh was stapled to the bearer and front fascia, to ensure no gaps greater than 3mm in diameter to the subfloor area.
Cladding		
4.	Product name	CSR Cemintel fibre-cement board
	Material	6mm thick cement sheet
	Density	1468 kg/m^3 (measured)
	Location	Fixed to the exposed side of the wall directly to the wall framing (item 7) at nominal 200mm centres with 6g × 40mm long needle point screws.
5.	Product name	10mm Gyprock plasterboard
	Size	1200mm wide × 3000mm long × 10mm thick (cut to size)
	Density	691 kg/m^3 (measured)
	Installation	Fixed to the unexposed side of the wall directly to the wall framing (item 7) at nominal 400mm centres with 6g × 32mm long needle point screws.

Item	Description	
6.	Item name	Eaves sheet lining
	Material	4.5mm thick cement sheet
	Density	1468 kg/m^3 (measured)
	Location	A nominal 250mm wide cement sheet was located into the top of the recess formed in the wall system approximately 1800mm long and secured to the eaves framing with two screws at each support location.
Wall framing		
7.	Product name	90×45 MGP10 Radiata pine
	Density	489 kg/m^3 (measured)
	Installation	Assembled using 3-inch gun nails.
Fixings		
8.	Item name	Deckorators® Stowaway™ Hidden Fastener
	Size	21mm wide × 32mm long × 13.12mm high × 3.63mm thick (measured)
	Installation	Inserted into the groove of the decking boards (item 1) and secured to each joist using screws (item 9).
9.	Item name	Decking Screws
	Size	8g × 55mm long Type 17 countersunk square drive head
	Installation	A single screw used in conjunction with the hidden fastener (item 8) to secure the deck boards to each joist. Further used to secure the single fascia board directly to the subfloor.

4. 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 clause 14 and 21 of AS 1530.8.1:2018 as appropriate for decks.	
Variations	None	
Pre -test conditioning	The construction of the test specimen was completed on 20 March 2019 and tested on 20 March 2019. The test specimen was subjected to normal laboratory temperatures and conditions of the specimen between the completion of the construction and the start of the test.	
Sampling / specimen selection	The laboratory was not involved in sampling or selecting the test specimen for the simulated bushfire test.	
Ambient laboratory temperature	Start of the test Minimum temperature Maximum temperature	30°C 30°C 34°C
Test duration	The test was stopped after 27 minutes and 35 seconds due to safety reasons ensued by excessive flaming of the deck boards.	
Instrumentation and equipment	The instrumentation was provided in accordance with AS 1530.8.1:2018 as detailed below:	

	• The internal specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0mm inorganic insulating pads. The thermocouple positions are shown in Table 10 and Figure 4 in Appendix D. • Radiant heat flux measurements to determine the irradiance transmitted from the exposed face of the specimen were taken using Medtherm heat flux gauges. • A second heat flux meter was placed in the centre of the wall to provide additional information. • The heat flux gauge positions are shown in Figure 4 in Appendix E. • A 3mm gap gauge was available during the test to assess the performance of the test specimen under the criteria of integrity. • A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples. • A pilot ignition source was available to assess any areas of the specimen producing significant quantities of volatiles. (delete if not used) • 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 ± 0.03kg mass required by the standard. The crib was lit over a 2 minute period – 20 seconds on the upper 0.10m × 0.10m face – 20 seconds on each of the 0.54m × 0.10m faces and a further 20 seconds on the upper 0.10m × 0.10m face using an oxy/acetylene torch with Type 551 size 8 × 10 heating tip. (Type AA crib).

5. Test measurements and results

The radiation and temperature measurements taken from the specimen are included in Appendix E. 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 shows the results the specimen achieved against the performance criteria listed in clause 14 & 21 of AS 1530.8.1:2018 subject to the variations listed in Section 4.

The test was terminated at 27 minutes and 35 seconds due to excessive flaming on the exposed face of the specimen

Table 8 Test results

Performance criteria		Time to failure (min.)	Position of failure
Formation of through-gaps greater than 3mm		No Failure	-
Sustained flaming for 10s on the non-fire side		No Failure	-
Extent of flaming exceeding 500mm limits on decking boards		15 minutes and 12 seconds	The upper deck boards extending from the crib corner towards the west edge
Flaming on the fire-exposed side at the end of the 60 minute test period		Specimen flaming was extinguished at 27 minutes and 35 seconds due to safety reasons	The upper deck boards extending from the crib corner towards the west edge
Radiant heat flux 365mm from the non-fire side exceeding 15kW/m^2		Not Applicable	N/A
Mean and maximum temperature rises greater than 140K and 180K		Not Applicable	N/A
Radiant heat flux 250mm from the specimen, greater than 3kW/m^2 between 20 min and 60 min		Not Applicable	N/A
Mean and maximum temperature of internal faces exceeding 250°C and 300°C respectively between 20 min and 60 min after commencement of test		20 minutes	Peak temperature recorded by TC 012 of 412°C
Crib class	AA	**Peak heat flux**	19kW/m^2
Test result		**BAL— NIL**	

6. Application of test results

6.1 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 the 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.

6.2 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 herein was tested in accordance with test method 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 Australia Pty Ltd or another registered testing authority.

6.3 Uncertainty of measurements

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

Appendix A Drawings of test assembly

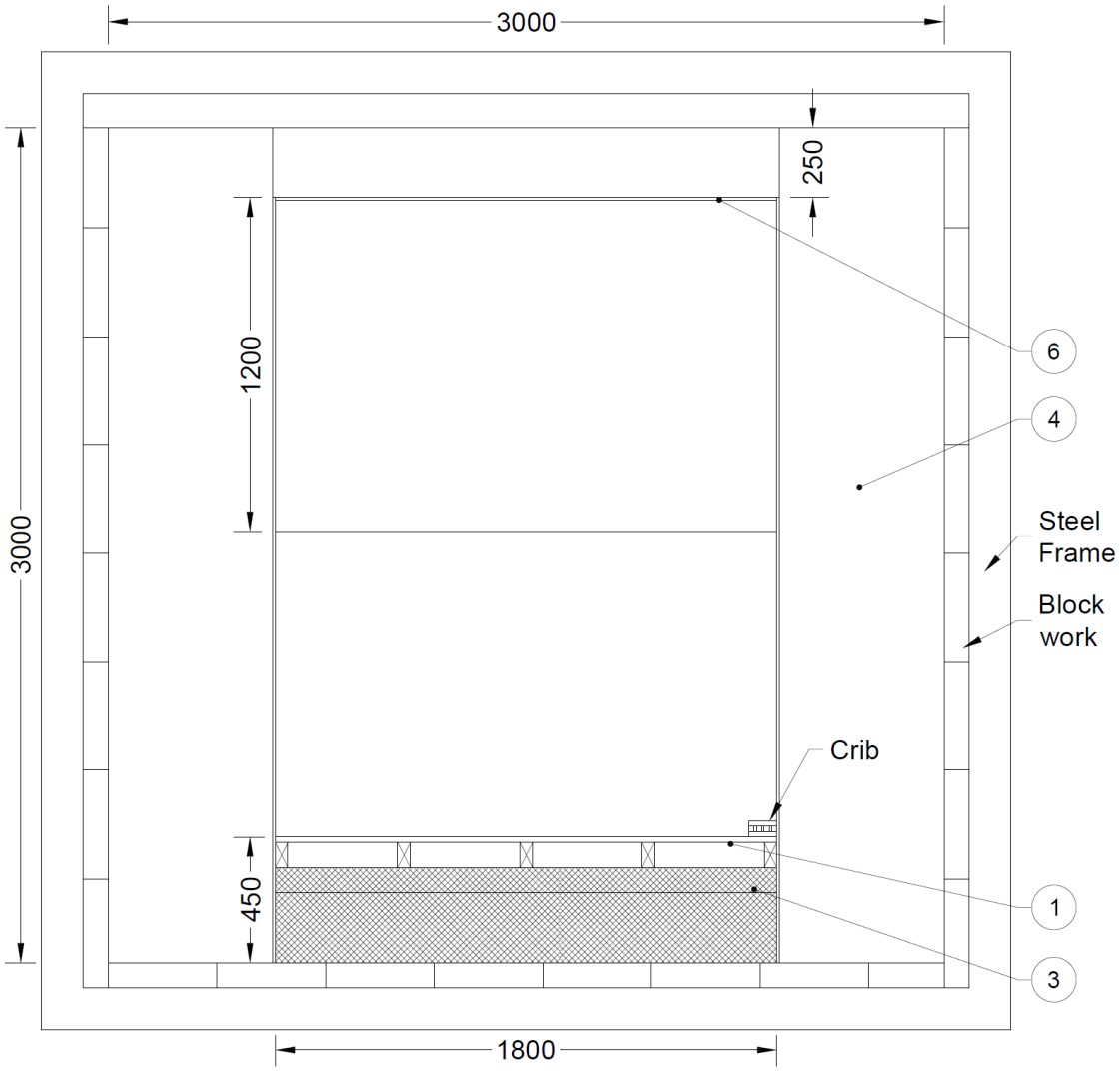

Figure 1 Elevation of front frame

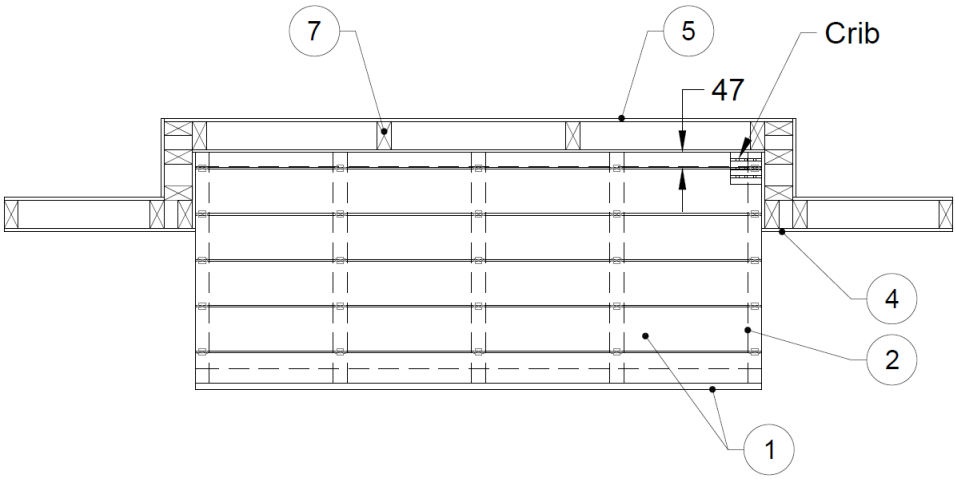

Figure 2 Cross-section through the specimen

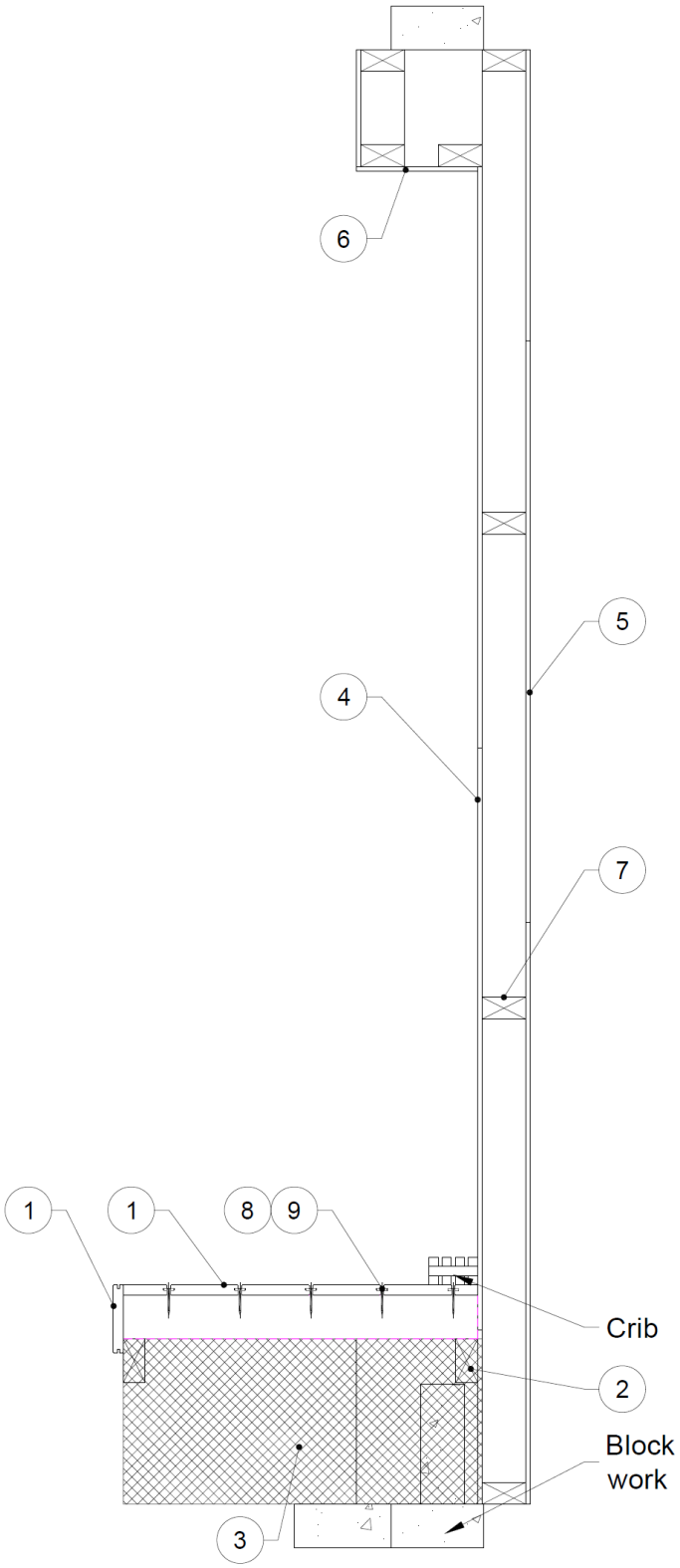

Figure 3 Vertical section through the specimen

Appendix B Test observations

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

Table 9 Test observations

Time		Observation
Min	Sec	
0	00	Bushfire test commenced; two flaming cribs (Class AA) were placed against the specimen.
0	03	The screen was removed and the specimen was exposed to the radiant heat profile for BAL-19 as specified in AS 1530.8.1:2018.
00	54	The walls adjacent to the crib had discoloured.
01	16	Smoke had emitted from the fascia.
01	33	The level of smoke emitted from the fascia and upper deck boards and increased significantly.
01	55	The deck boards directly below the crib had begun to fame.
03	14	The fascia board had discoloured.
04	00	Molten and flaming deck boards had begun to drip onto the floor.
05	40	Flaming of the deck boards adjacent to the crib had increased and bun to spread.
08	53	Flaming of the deck boards adjacent to the crib continued to spread.
10	00	Screen was positioned in front of the furnace and exposure to the radiant heat profile for BAL-19 ceased. Monitoring of the specimen to the criteria specified in AS 1530.8.1:2018.
10	12	Flaming of the upper deck boards continued.
15	**12**	**Flame spread had exceeded the 500mm limits on the decking boards.** **Failure in accordance with AS 1530.8.1:2018 clause 21.5, where flaming of the deck assembly had extended by more than 500mm in any direction from the rear and side walls.**
20	**00**	**TC 012 located on the unexposed side of the fibre cement cladding at the mid-height and adjacent to the crib recorded a temperature of 412°C.** **Failure in accordance with AS 1530.8.1:2018 clause 14.4 (e), where the maximum temperature of the internal faces of construction including cavities exceeded 300°C between 20 minutes and 60 minutes after the commencement of the test.**
27	35	Flaming of the upper deck board had extended to the west edge of the decking and up to mid-width of the deck. Specimen flaming was extinguished due to safety reasons.
27	35	The test was terminated due to safety reasons.

Appendix C Direct field of application

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 positions

Figure 4 **Indicative heat flux gauge locations (exposed face)**

Note: HFG 1 centrally located across the deck, nominal 50mm below the bottom of the deck.

HFG 2 located at the centre of the wall

The crib was located at the south-east corner of the deck

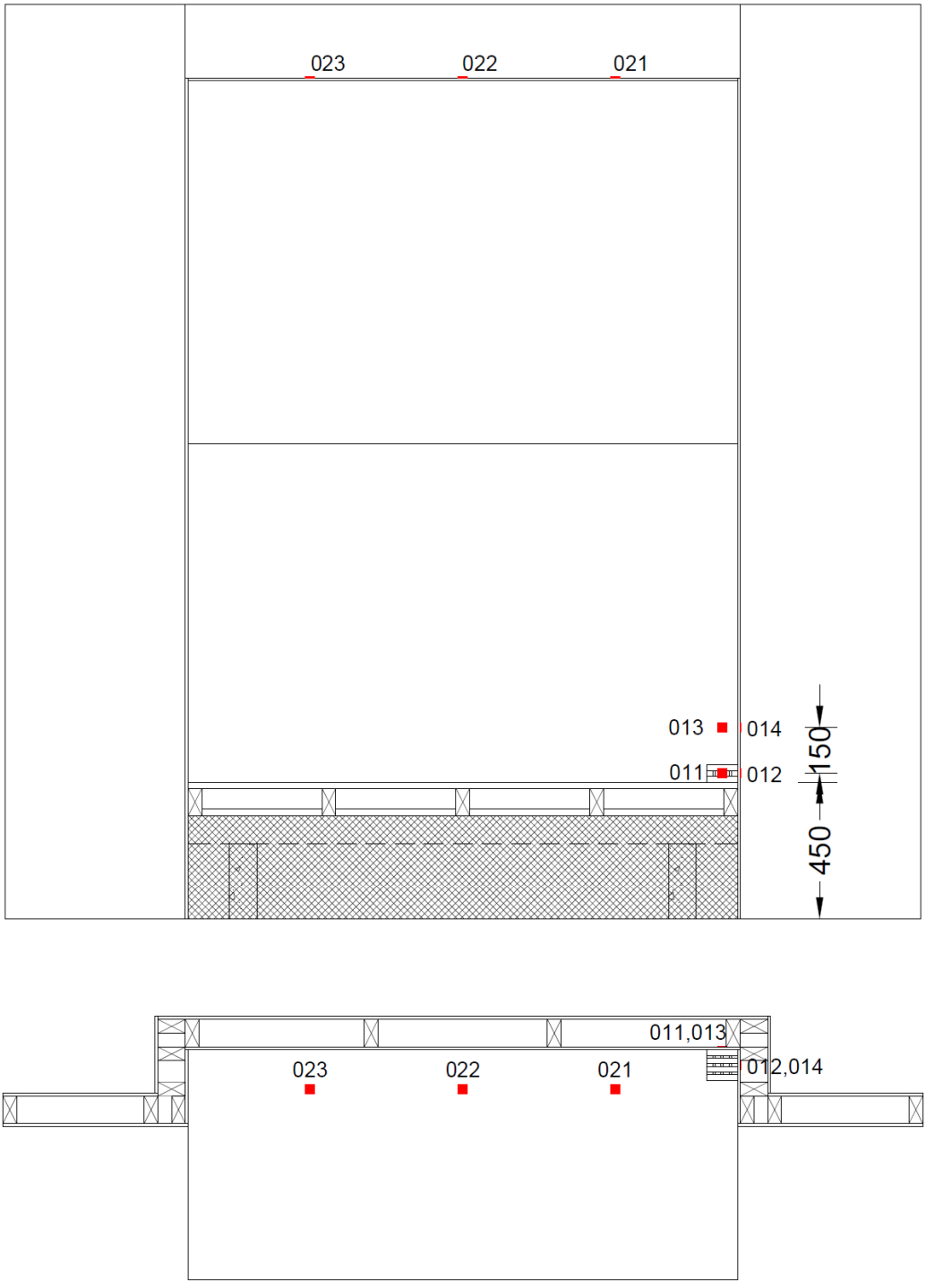

Figure 5 Thermocouple locations

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

- Heat flux gauge (HFG 1) was located centrally across the deck, a nominal 50mm below the bottom of the deck.
- Heat flux gauge (HFG 2) was located centrally to the wall, on the exposed face.

Table 10 Thermocouple location

Location	T/C No.	Description
Internal crib	011	On the unexposed side of the external lining sheet, behind the crib 27mm above the top of the deck on the east side
	012	On the unexposed side of the external lining sheet, behind the crib 27mm above the top of the deck on the south side
	013	On the unexposed side of the external lining sheet, behind the crib 150mm up from TC 011 at the east side
	014	On the unexposed side of the external lining sheet, behind the crib 150mm up from TC 012 at the south side
Eave	021	Eave above the crib.
	022	Eave at the middle of the specimen.
	023	Eave above the north door reveal.

Appendix E Test data

E.1 Measure of heat flux received

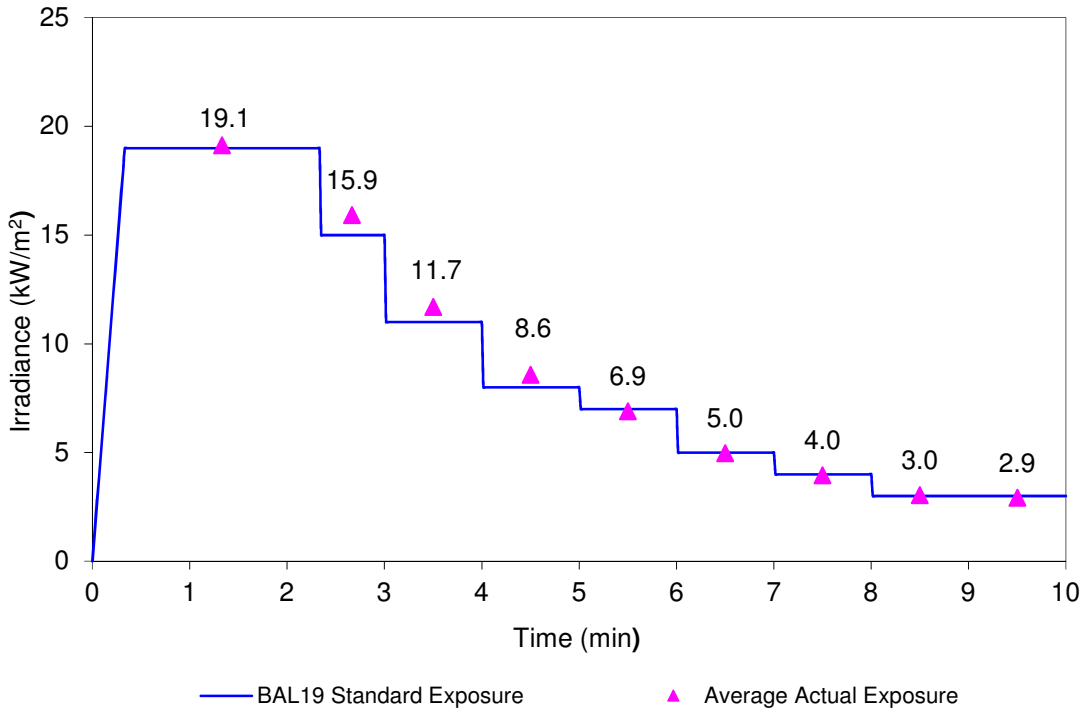

Figure 6 Averaged irradiance levels during the test to the front of the deck

E.2 Specimen temperatures

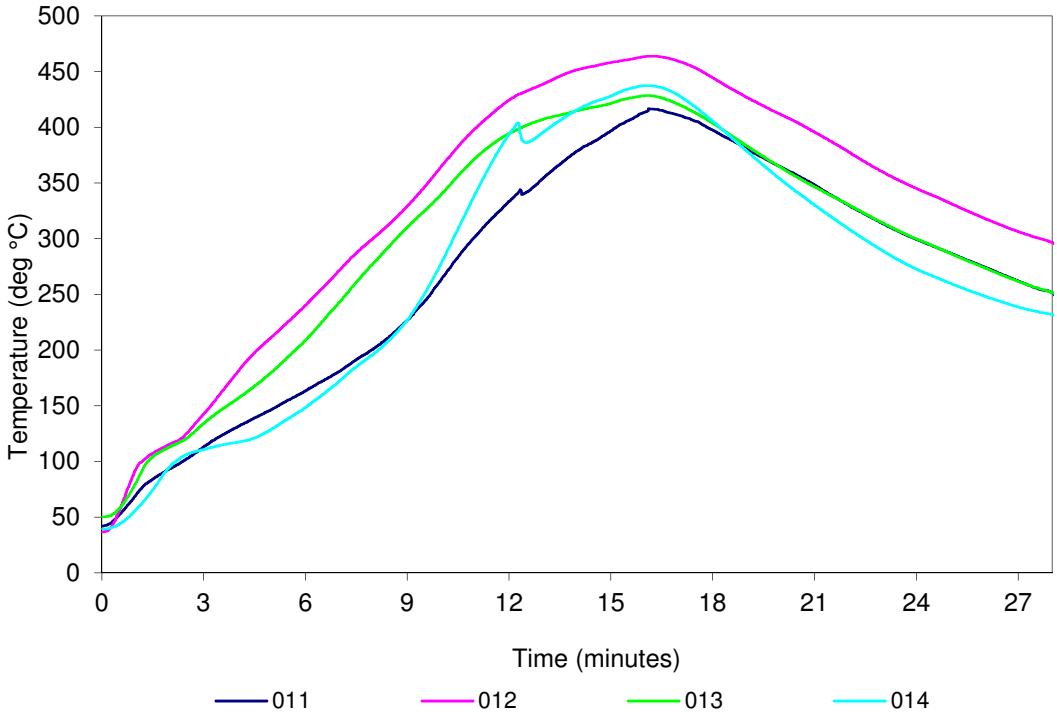

Figure 7 **Internal crib temperatures – temperature vs time**

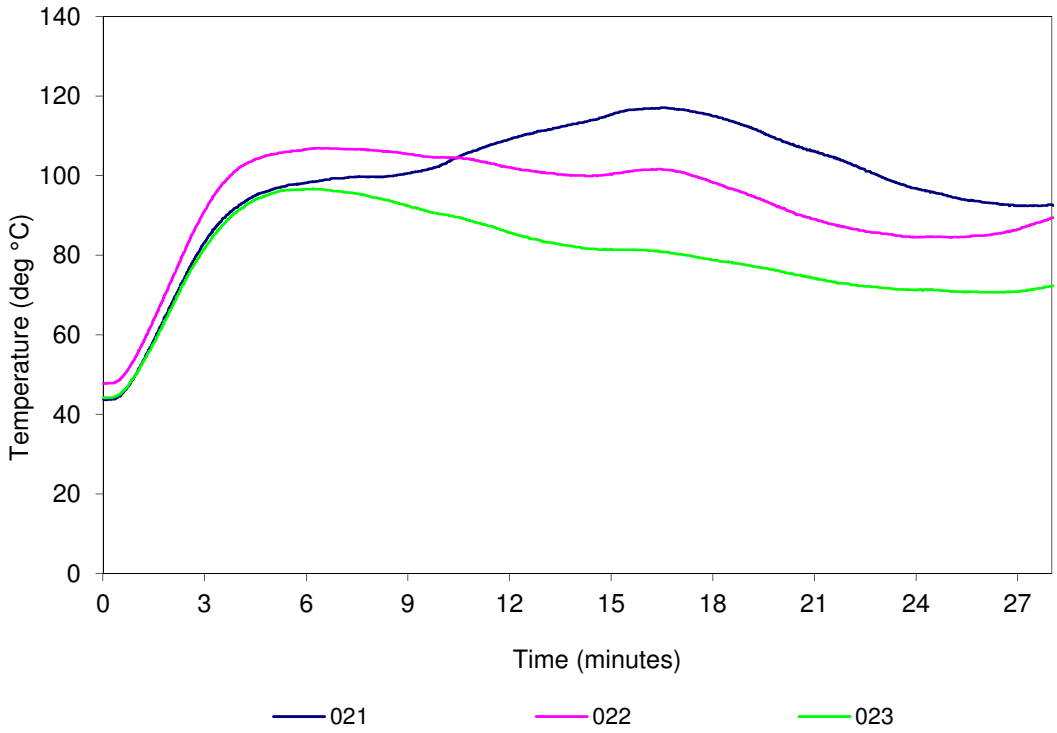

Figure 8 **Eaves – temperature vs time**

Table 11 Test specimen temperatures

Location	T/C no.	Description[2]	Temp (°C) at t (minutes)				Limit[1] (minutes)
			t=0	t=15	t=20	t=27	
Internal crib	011	On the unexposed side of the external lining sheet, behind the crib 27mm above the top of the deck on the east side	42	396	365	262	20
	012	On the unexposed side of the external lining sheet, behind the crib 27mm above the top of the deck on the south side	37	458	412	307	20
	013	On the unexposed side of the external lining sheet, behind the crib 150mm up from TC 011 at the east side	50	421	364	262	20
	014	On the unexposed side of the external lining sheet, behind the crib 150mm up from TC 012 at the south side	39	428	354	239	20
	011	On the unexposed side of the external lining sheet, behind the crib 27mm above the top of the deck on the east side	42	396	365	262	20
Eaves	021	Eave above the crib.	44	115	109	93	-
	022	Eave at the middle of the specimen.	48	100	92	87	-
	023	Eave above the north door reveal.	44	82	76	71	-

Notes

1 Refer to Appendix D 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 internal thermocouple doe not reach 300°C, or the average of the internal quarter point thermocouple measured temperatures does not reach 250°C

Thermocouple failure.

'–' 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

North

South

Figure 9 Exposed face of the specimen before the start of the bush fire test

North

South

Figure 10 Exposed face of specimen at the end of the bush fire test