

BRANZ Fire Test Report

FH12484-001

CONE CALORIMETER TESTING ON TIMBER DEFENCE/PAINT FR BUSHFIRE SYSTEM, FOLLOWING ASTM D 2898 METHOD B ACCELERATED WEATHERING AND CLASSIFICATION IN ACCORDANCE WITH AS 3959

CLIENT

Fire Defender
13 Burwood Terrace
Clontarf, QLD 4019
Australia



All tests and procedures reported herein, unless indicated, have been performed in accordance with the laboratory's scope of accreditation



REPORT NUMBER:

FH12484-001

ISSUE DATE:

28 September 2020

PAGE:

1 of 12

TEST SUMMARY

Objective

The cone calorimeter test reported herein was carried out in accordance with AS/NZS 3837 as specified in AS 3959–2018 for the evaluation of fire-retardant-treated timber. The test results are reported and included is the classification of the test results in accordance with AS 3959 for construction in bushfire-prone areas acceptable to withstand exposure up to a BAL—29 condition.

Test sponsor

Fire Defender
13 Burwood Terrace
Clontarf, QLD 4019
Australia

Description of test specimen

The product as described by the client as Timber Defence/Paint FR Bushfire System, comprising of a Natural/Raw Pine timber with 2 applied coats of Timber Defence, and 3 further coats of Sikkens Cetol, with 80 ml of Paint FR added to each 1000 ml of Sikkens Cetol before the coatings.

Date of tests

25th June, 7th July and 11th August 2020

LIMITATION

The results reported here relate only to the item/s tested.

TERMS AND CONDITIONS

This report is issued in accordance with the Terms and Conditions as detailed and agreed in the BRANZ Services Agreement for this work.



TO WHOM IT MAY CONCERN

Both NATA (National Association of Testing Authorities, Australia) and IANZ (International Accreditation New Zealand) are signatories to the ILAC Mutual Recognition Arrangement. Under the terms of this arrangement, each signatory:

- (i) recognises within its scope of recognition of this Arrangement the accreditation of an organisation by other signatories as being equivalent to an accreditation by its own organisation,
- (ii) accepts, for its own purposes, endorsed* certificates or reports issued by organisations accredited by other signatories on the same basis as it accepts endorsed* certificates or reports issued by its own accredited organisations,
- (iii) recommends and promotes the acceptance by users in its economy of endorsed* certificates and reports,

* The word "endorsed" means a certificate or report bearing an Arrangement signatory's accreditation symbol (or mark) preferably combined with the ILAC-MRA Mark.

Signed:

A handwritten signature in blue ink, appearing to read "Jennifer Evans".

Jennifer Evans
NATA CEO

Date: 24 March 2014

A handwritten signature in blue ink, appearing to read "Dr Llewellyn Richards".

Dr Llewellyn Richards
IANZ CEO

Date: 24th March 2014

CONTENTS

SIGNATORIES	5
DOCUMENT REVISION STATUS	5
1. GENERAL	6
1.1 Sample measurements	6
1.2 AS 3959–2018.....	7
2. EXPERIMENTAL PROCEDURE	8
2.1 Test standard	8
2.2 Test date	8
2.3 Accelerated weathering	8
2.4 Specimen conditioning	8
2.5 Specimen wrapping and preparation.....	8
2.6 Test programme.....	8
2.7 Specimen selection	8
3. TEST RESULTS AND REDUCED DATA.....	9
3.1 Test results and reduced data – AS/NZS 3837	9
4. SUMMARY	10
5. CLASSIFICATION IN ACCORDANCE WITH AS 3959–2018 FOR CONSTRUCTION IN BUSHFIRE-PRONE AREAS.....	12
5.1 Results	12
5.2 Conclusion	12

FIGURES

Figure 1: Representative specimen (front face on left, back face on right).....	6
Figure 2: Rate of heat release versus time	11

TABLES

Table 1: Physical parameters	6
Table 2: Test results and reduced data – AS/NZS 3837.....	9
Table 3: Heat release rate.....	10
Table 4: Report summary for six specimens.....	10
Table 5: Results summary	12

SIGNATORIES



Author

J. R. Stallinger
Associate Fire Testing Engineer
BRANZ



Reviewer

E. Soja
Senior Fire Safety Engineer
IANZ Approved Signatory

DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
1	28/09/2020	Initial Issue

1. GENERAL

The product submitted by the client for testing was identified by the client as Timber Defence/Paint FR Bushfire System, comprising of a Natural/Raw Pine timber with 2 applied coats of Timber Defence, and 3 further coats of Sikkens Cetol, with 80 ml of Paint FR added to each 1000 ml of Sikkens Cetol before the coatings. Figure 1 illustrates a representative specimen of that tested.

Figure 1: Representative specimen (front face on left, back face on right)



1.1 Sample measurements

The following physical parameters were measured for each specimen prior to testing.

Table 1: Physical parameters

Specimen ID	Initial properties		Overall apparent density (kg/m ³)	Colour
	Mass (g)	Mean thickness (mm)		
FH12484-G-50-1	175.9	41.0	429	Brown
FH12484-G-25-2	179.9	41.9	429	Brown
FH12484-G-25-3	183.5	40.6	452	Brown
FH12484-G-25-4	177.1	41.0	432	Brown
FH12484-G-25-5	180.1	41.5	434	Brown
FH12484-G-25-6	180.1	40.2	448	Brown

1.2 AS 3959–2018

The Australian Standard for construction of buildings in bushfire-prone areas AS 3959 to withstand exposure up to a BAL—29 condition states that:

(a) To satisfy the requirements for bushfire-resisting timber, timber shall be tested in accordance with AS/NZS 3837 and shall meet the following criteria:

(i) The maximum heat release rate shall be not greater than 100 kW/m².

(ii) The average heat release rate for 10 min following ignition shall be not greater than 60 kW/m² when the material is exposed to an irradiance level of 25 kW/m².

(b) Where the timber has been altered by chemicals, the test samples shall be subjected to the regime of accelerated weathering before testing to AS/NZS 3837, external fire-retardant-coated substrates shall be subjected to the ASTM D2898 Method B weathering regime, with the water flow rate modified to be the same as that within ASTM D2898 Method A.”

Prior to being submitted for the cone calorimeter testing reported herein, the samples, as supplied by the client, had been subjected to accelerated weathering in accordance with ASTM D 2898 Method B as required by AS 3959.

2. EXPERIMENTAL PROCEDURE

2.1 Test standard

The tests were carried out and data reduced according to the test procedures described in AS/NZS 3837:1998 'Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter'; (the test standard). The sample preparation and test procedure were as described in 2.4 and 2.6.

2.2 Test date

The tests were conducted on 25th June, 7th July and 11th August 2020 by Mr James Stallinger and Mr James Quilter at BRANZ Limited laboratories, Judgeford, New Zealand.

2.3 Accelerated weathering

In accordance with AS 3959–2018, where timber has been altered by chemicals it shall be subjected to the ASTM D2898 Method B accelerated weathering regime with water flow rate modified to be the same as that within ASTM D2898 Method A prior to testing to AS/NZS 3837. The tested samples as described in Section 1 were altered by chemical impregnation and were therefore subjected to the accelerated weathering requirements of AS 3959 for 1000 hrs prior to conditioning.

2.4 Specimen conditioning

All specimens were conditioned to moisture equilibrium (constant weight), at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 5\%$ immediately prior to testing.

2.5 Specimen wrapping and preparation

All tests were conducted and the specimens prepared in accordance with the test standard. The spark igniter and the stainless-steel retainer frame were used. All specimens were wrapped in a single layer of aluminium foil, covering the unexposed surfaces.

2.6 Test programme

The test program consisted of six replicate specimens tested at an irradiance level of 25 kW/m^2 . All tests were carried out with the specimen horizontal, and with a nominal duct flow rate of $0.024 \text{ m}^3/\text{s}$.

2.7 Specimen selection

BRANZ was not involved in the selection of the materials submitted for testing. The test materials used were supplied to the laboratory by the client.

3. TEST RESULTS AND REDUCED DATA

3.1 Test results and reduced data – AS/NZS 3837

Table 2: Test results and reduced data – AS/NZS 3837

Material	Test specimens as described in Section 1						Mean
Specimen test number	FH12484-G-50-1	FH12484-G-25-2	FH12484-G-25-3	FH12484-G-25-4	FH12484-G-25-5	FH12484-G-25-6	
Test Date	25/06/2020	7/07/2020	7/07/2020	11/08/2020	11/08/2020	11/08/2020	
Time to sustained flaming s	770	0	0	0	0	0	128
Observations ^a	-	-	-	-	-	-	
Test duration ^b s	3600*	3600*	3600*	3600*	3600*	3600*	3600
Mass remaining, m_f g	78.4	81.7	72.2	65.8	79.3	76.8	75.7
Mass pyrolyzed %	55.4%	54.6%	60.7%	62.9%	55.9%	57.4%	57.8%
Specimen mass loss ^c kg/m ²	9.0	11.2	12.7	12.7	11.4	11.7	11.4
Specimen mass loss rate ^c g/m ² .s	3.2	3.0	3.4	3.4	3.1	3.1	3.2
Heat release rate							
peak, \dot{q}_{max}'' kW/m ²	27.9	15.7	70.1	70.1	30.1	72.3	47.7
average, \dot{q}_{avg}''							
Over 60 s from ignition kW/m ²	8.7	2.9	1.9	1.9	0.9	-0.1	2.7
Over 180 s from ignition kW/m ²	12.7	2.4	3.4	3.4	2.2	1.3	4.2
Over 300 s from ignition kW/m ²	13.9	2.0	3.1	3.1	2.5	1.8	4.4
Over 600 s from ignition kW/m ²	14.3	1.5	2.3	2.2	2.7	2.2	4.2
Total heat released MJ/m ²	56.7	21.0	63.7	63.7	35.2	31.7	45.3
Average Specific Extinction Area m ² /kg	78.4	148.6	79.7	79.7	96.3	116.1	99.8
Effective heat of combustion ^d , $\Delta h_{c,eff}$ MJ/kg	5.3	1.9	5.1	5.1	3.1	2.7	3.9

Notes: ^a no significant observations were recorded

^b determined by * 60 mins elapsed

^c from ignition to end of test

^d from the start of the test

+ value calculated using data beyond the official end of test time according to the test standard.

NR not recorded

4. SUMMARY

The test standards require that the mean heat release rate (HRR) readings over the first 180 s from ignition for the three specimens should differ by no more than 10% of the arithmetic mean of the three readings. In the event of this criterion not being met, a further three specimens are required to be tested.

Table 3: Heat release rate

Specimen ID	Average HRR over 180 s from ignition	Arithmetic mean	% difference from the arithmetic mean
FH12484-G-50-1	12.7	6.2	106.8%
FH12484-G-25-2	2.4		-61.6%
FH12484-G-25-3	3.4		-45.2%

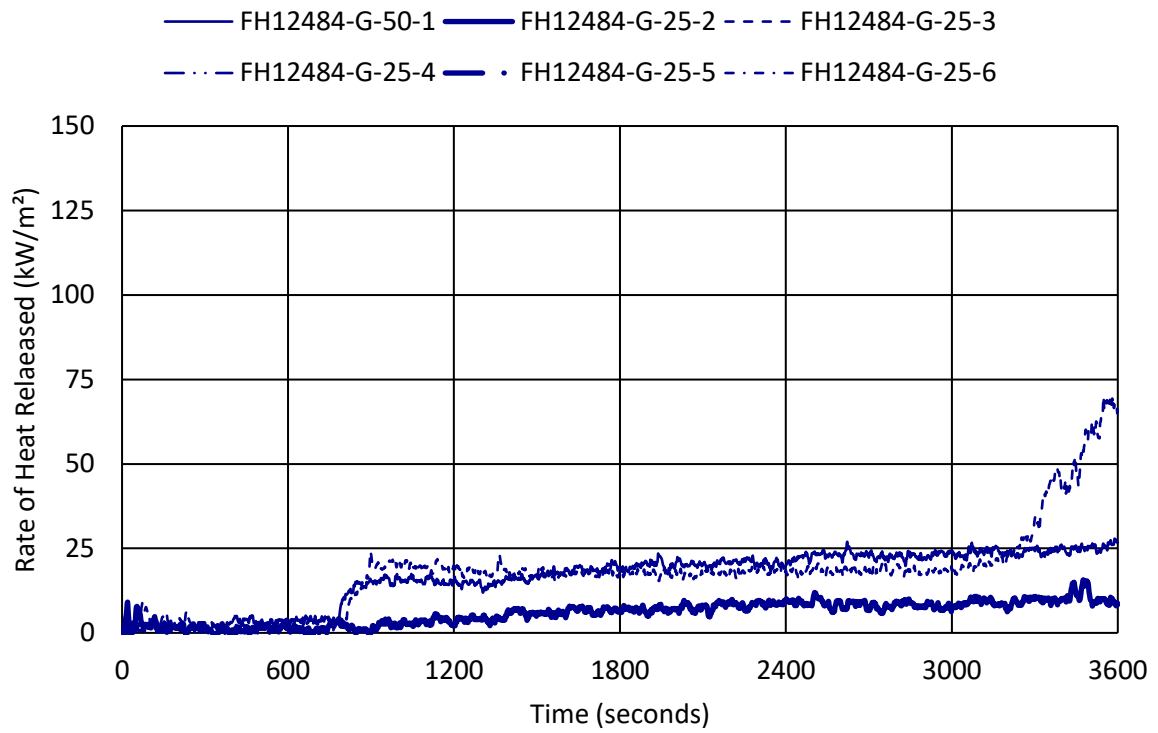
Table 3 identifies that all of the specimens exposed to 25 kW/m² irradiance exceeded the acceptance criteria. A further three specimens were tested as required by the test standard.

The report summary for the six replicate specimens, as described in Section 1, exposed to an irradiance of 25 kW/m² is given in Table 4 below with rates of heat release illustrated in Figure 2.

Table 4: Report summary for six specimens

Mean Specimen thickness (mm)	Irradiance (kW/m ²)	Mean Time to Ignition (s)	Mean Peak Heat Release Rate (kW/m ²)	Average Specific Extinction Area (m ² /kg)
41.0	25	128	47.7	99.8

Figure 2: Rate of heat release versus time



5. CLASSIFICATION IN ACCORDANCE WITH AS 3959–2018 FOR CONSTRUCTION IN BUSHFIRE-PRONE AREAS

5.1 Results

Fire testing was carried out as required by AS 3959 in accordance with AS/NZS 3837. Analysis of the results is summarised as follows:

Table 5: Results summary

Specimen: Timber Defence/Paint FR Bushfire System			
Irradiance (kW/m ²)	AS 3959 Criteria	Test result summary	Performance assessment
25	Maximum HRR ≤ 100 kW/m ²	47.7	Pass
	Average HRR for 10 mins. following ignition ≤ 60 kW/m ²	4.2	Pass

5.2 Conclusion

For the purposes of compliance with the performance requirements of AS 3959-2018, Appendix F Bushfire-resisting timber, the Timber Defence/Paint FR Bushfire System specimens prepared as described in Section 2, meet the necessary performance criteria and are deemed to be acceptable to withstand exposure up to a BAL–29 condition.

FH12484-002

GROUP NUMBER CLASSIFICATION



The specimens described below were tested by BRANZ in accordance with AS/NZS 3837 for determination of AS 3959–2018 assessed performance.

Test Sponsor

Fire Defender
13 Burwood Terrace
Clontarf, QLD 4019
Australia

Date of tests

25th June, 7th July and 11th August 2020

Reference BRANZ Test Report

FH12484-001 – issued 28/09/2020

Test specimens as described by the client

Timber Defence/Paint FR Bushfire System, comprising of a Natural/Raw Pine timber with 2 applied coats of Timber Defence, and 3 further coats of Sikkens Cetol, with 80 ml of Paint FR added to each 1000 ml of Sikkens Cetol before the coatings.

Specimens reference	Mean values		
	Mass (g)	Thickness (mm)	Apparent density (kg/m ³)
FH12484-G-50-1,2,3,4,5,6	179.4	41.0	437.4

Testing in accordance with AS 3959–2018

The specimens were subjected to the ASTM D2898 Method B accelerated weathering regime with water flow rate modified to be the same as that within ASTM D2898 Method A prior to testing in accordance with AS/NZS 3837.

The test results to withstand exposure up to BAL–29 conditions were as follows:

Specimen: Timber Defence/Paint FR Bushfire System			
Irradiance (kW/m ²)	AS 3959 Criteria	Test result summary	Performance assessment
25	Maximum HRR ≤ 100 kW/m ²	47.7	Pass
	Average HRR for 10 mins. following ignition ≤ 60 kW/m ²	4.2	Pass

Issued by

J. R. Stallinger
Associate Fire Testing
Engineer
BRANZ

Reviewed by

E. Soja
Senior Fire Safety Engineer
IANZ Approved Signatory

Regulatory authorities are advised to examine test reports before approving any product.



All tests and procedures reported herein, unless indicated, have been performed in accordance with the laboratory's scope of accreditation

Issue Date
28 September 2020