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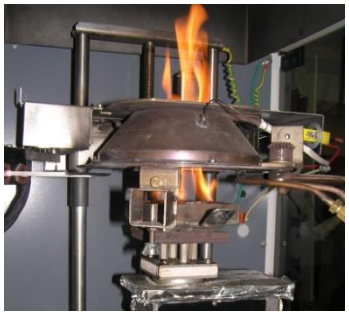

BRANZ Type Test

FH5551-TT-2

CONE CALORIMETER TEST AND NZBC VERIFICATION METHOD C/VM2 APPENDIX A PERFORMANCE OF KAPO BOARD

CLIENT
Enviro Square Ltd
80 Prince Regent Drive
Half Moon Bay
Auckland 2012
New Zealand

ilac-MRA IANZ ACCREDITED LABORATORY

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

TEST SUMMARY

Objective

To conduct cone calorimeter testing and reduce the data in accordance with ISO 5660 on client supplied specimens for the purposes of determination of the Group Classifications in accordance with;

- New Zealand Building Code (NZBC) Verification Method C/VM2 Appendix A

Test sponsor

Enviro Square Ltd
80 Prince Regent Drive
Half Moon Bay
Auckland 2012
New Zealand

Description of test specimen

The product as described by the client as Kapo Board, a calcium silicate panel.

Date of test

11 June 2014
Revalidation: 10 September 2019

Test results

For the purposes of compliance with the relevant building code documents, the following classification is considered applicable to the tested sample as described in Section 1.

Building Code Document	Group Number Classification
NZBC Verification Method C/VM2 Appendix A	1-S

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.

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SIGNATORIES

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Fire Test Engineer

Reviewer

P. C. R. Collier
Senior Fire Engineer
IANZ Approved Signatory

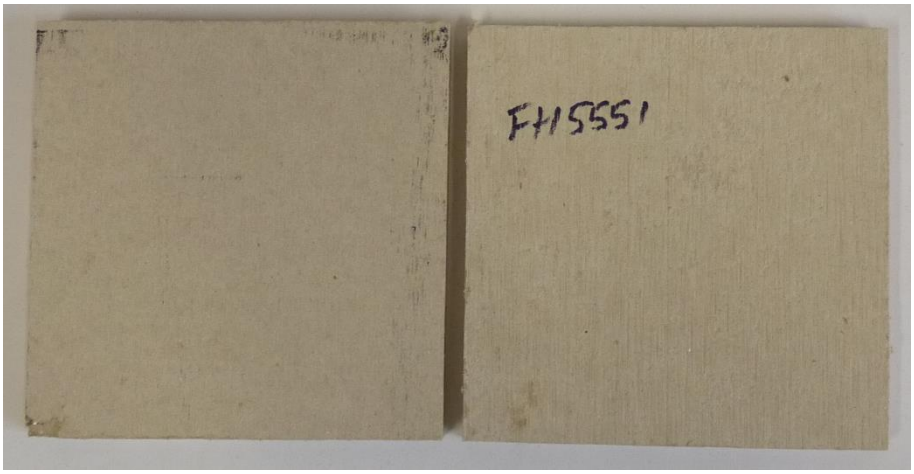
DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	EXPIRY DATE	DESCRIPTION
1	10 July 2014	10 July 2019	Initial Issue
2	11 October 2019	11 October 2024	Addition of Section 6: Revalidation of Performance
			Additional specimen tested

1. GENERAL

The product submitted by the client for testing was identified by the client as Kapo Board, a calcium silicate panel. Figure 1 illustrates a representative specimen of that tested.

Figure 1: Representative specimen (front face on left, back 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/m³)	Date of Test
	Mass (g)	Mean thickness (mm)		
FH5551-1-50-1	103.3	9.1	1135	11/06/14
FH5551-1-50-2	105.3	9.1	1157	11/06/14
FH5551-1-50-3	106.2	9.1	1167	11/06/14
FH11997-1-50-1	110.3	9.1	1212	10/09/19

2. EXPERIMENTAL PROCEDURE

2.1 Test standard

The tests were carried out and data reduced according to the test procedures described in ISO 5660: (2002), Reaction-to-fire tests – Heat release, smoke production and mass loss – Part 1: Heat release rate, and Part 2: Smoke production rate. The sample preparation and test procedure are as described in 2.4 and 2.5.

2.2 Test date

The tests were conducted on the 11 June 2014 by Mr Lukas Hersche at BRANZ Limited laboratories, Judgeford, New Zealand.

2.3 Specimen conditioning

All specimens were conditioned to moisture equilibrium (constant weight), at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5% immediately prior to testing.

2.4 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.

2.5 Test programme

The test program consisted of three replicate specimens as identified in the above table, tested at an irradiance level of 50 kW/m^2. All tests were carried out with the specimen horizontal, and with a nominal duct flow rate of 0.024 m^3/s.

A single indicative specimen was tested for the purposes of revalidation on the 10th September 2019 by Mr Lukas Hersche as described in 2.4 and 2.5. Details of the performance are provided in Section 6.

2.6 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 – NZBC C/VM2

Table 2: Test results and reduced data – NZBC C/VM2

Material		Test specimens as described in Section 1 (in accordance with ISO 5660)			Mean
Specimen test number		FH5551-1-50-1	FH5551-1-50-2	FH5551-1-50-3	
Test Date		11/06/2014	11/06/2014	11/06/2014	
Time to sustained flaming	s	No Ignition	No Ignition	No Ignition	
Observations[a]		-	-	-	
Test duration[b]	s	1800**	1208*	1800**	1603
Mass remaining, m_f	g	89.0	92.5	89.6	90.4
Mass pyrolyzed	%	13.9%	12.1%	15.6%	13.9%
Specimen mass loss[c]	kg/m^2	1.6	1.4	1.9	1.6
Specimen mass loss rate[c]	g/m^2 .s	0.9	0.8	1.0	0.9
Heat release rate					
peak, $\dot{q}''_{max}$	kW/m^2	10.6	13.1	8.5	10.7
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	0.1	0.4	0.3	0.3
Over 180 s from ignition	kW/m^2	1.8	2.0	1.9	1.9
Over 300 s from ignition	kW/m^2	3.2	2.7	2.9	2.9
Total heat released	MJ/m^2	4.3	2.6	4.4	3.8
Average Specific Extinction Area	m^2/kg	7.4	NR	NR	7.4
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	2.7	1.8	2.3	2.3

Notes :

[a] no significant observations were recorded

[b] determined by * X_{O2} returning to the pretest value within 100 ppm of oxygen concentration for 10 minutes
** 30 minutes after time to sustained flaming

[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 requires 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
FH5551-1-50-1	1.8	1.9	-4.2%
FH5551-1-50-2	2.0		4.6%
FH5551-1-50-3	1.9		-0.4%

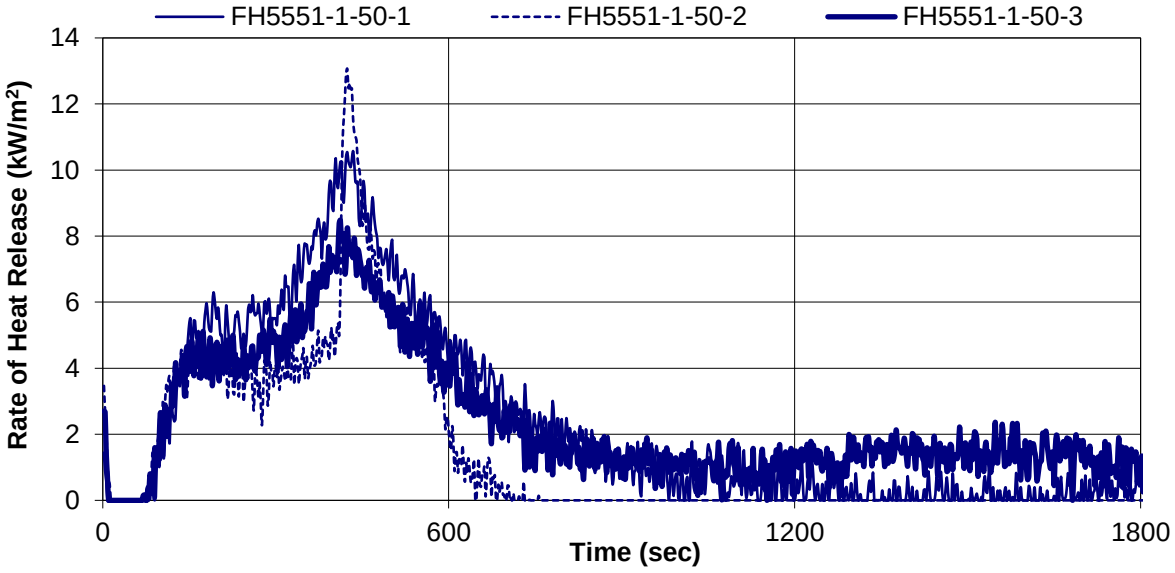
Table 33 identifies that the specimens exposed to 50 kW/m² irradiance meet the acceptance criteria.

The report summary for the specimens as described in Section 1, exposed to an irradiance of 50 kW/m² is given in table below with rates of heat release illustrated in Figure 2.

Table 4: Report summary

Mean Specimen thickness (mm)	Irradiance (kW/m²)	Mean Time to Ignition (s)	Mean Peak Heat Release Rate (kW/m²)	Average Specific Extinction Area (m²/kg)
9.1	50	No Ignition	10.7	7.4

Figure 2: Rate of heat release versus time



5. CLASSIFICATION IN ACCORDANCE WITH NZBC VERIFICATION METHOD C/VM2 APPENDIX A

The following classification has been assessed in accordance with the New Zealand Building Code Verification Method C/VM2 Appendix A: Establishing Group Numbers for lining materials. Calculations were carried out according to section A1.3 for predicting a material's group number for each specimen tested. It states that "If a different classification group is obtained for different specimens tested, then the highest (worst) classification for any specimen must be taken as the final classification for that material." The classification for the specimens as described in Section 1 is as follows:

Table 5: NZBC Group classification and smoke extinction area

	Sample 1	Sample 2	Sample 3	Classification
Group number Classification	1	1	1	1-S
Average Specific Extinction Area (m^2/kg)	7.4	NR	NR	

The tested samples recorded an average specific extinction area less than 250 m^2/kg. In accordance with Verification Method C/VM2 Appendix A, samples achieving either a Group number classification 1 or 2, and with an average specific extinction area less than 250 m^2/kg are identified with "S" post-script to the Group number.

6. REVALIDATION OF PERFORMANCE

A single indicative test was undertaken on client supplied sample FH11997-1-50-1 for the purpose of revalidation of performance. The sample was tested to the conditions of Section 2 on 10 September 2019. The indicative test results are provided in Table 6 below.

Table 6: Revalidation parameters and test results

Specimen test number		FH11997-1-50-1	FH5551-1-50-1*
Test Date		10/09/19	11/06/2014
Time to sustained flaming	s	No Ignition	No Ignition
Observations			-
Test duration	s	1800	1800
Mass remaining, m_f	g	97.3	89.0
Mass pyrolyzed	%	11.7%	13.9%
Specimen mass loss	kg/m2	1.5	1.6
Specimen mass loss rate	g/m2 .s	1.3	0.9
Heat release rate			
peak, $\dot{q}''_{max}$	kW/m2	8.5	10.6
average, $\dot{q}''_{avg}$			
Over 60 s from ignition	kW/m^2	1.2	0.1
Over 180 s from ignition	kW/m^2	2.7	1.8
Over 300 s from ignition	kW/m^2	3.7	3.2
Total heat released	MJ/m^2	6.1	4.3
Average Specific Extinction Area	m^2/kg	58	7.4
Effective heat of combustion, $\Delta h_{c,eff}$	MJ/kg	4.1	2.7

Note: * Sample 1 of 3 replicate test specimens

No significant variations were detected in the revalidation test of sample FH11997-1-50-1. The same Group 1 Classification was determined for the indicative sample. Further testing would not be expected to lead to an alteration of the classification.

7. NZBC CONCLUSION

The cone calorimeter testing was carried out on the specimens as described in Section 1. For the purposes of compliance with the NZBC Verification Method C/VM2 Appendix A, the following classification is considered applicable to the material as described in Section 1.

Group Number Classification	**1-S**

BRANZ Type Test Summary

This is to certify that the specimen described below has been tested by BRANZ Ltd on behalf of

Enviro Square Ltd
80 Prince Regent Drive
Half Moon Bay
Auckland 2012
New Zealand

Test standard: ISO 5660 Parts 1 and 2.

Specimen name: Kapo Board.

Specimen description: Calcium silicate panel.

Orientation: From the direction tested.

A full description of the test specimen and the test results are given in BRANZ Test Report:

Fire Test FH5551-TT-2 – Test date 10 September 2019

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

The test results were the basis for the following:

Building Code Document	Group Number Classification
NZBC Verification Method C/VM2 Appendix A	1-S

Issue Date:
11 October 2019

Expiry Date:
11 October 2024

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