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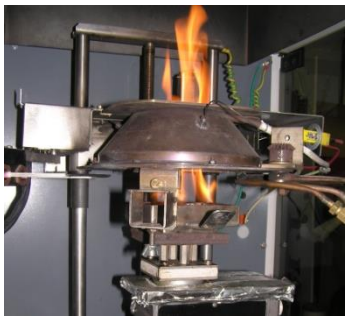

FIRE TEST REPORT

FH 5323

CONE CALORIMETER TEST AND NZBC VERIFICATION METHOD C/VM2 APPENDIX A PERFORMANCE OF A J BATES 'FENTA'

CLIENT
A J Bates Ltd
205 Station Road, Penrose
Auckland 1061
New Zealand

All tests reported herein have been performed in accordance with the laboratory's scope of accreditation.

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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 Classification in accordance with;

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

Test sponsor

A J Bates Ltd
205 Station Road, Penrose
Auckland 1061
New Zealand

Description of test specimen

The products submitted by the client for testing were identified by the client as A. J. Bates 'Fenta', nominally 6.0 mm thick and 'Fenta' Smooth nominally 4.5 mm thick prefinished fibre cement board.

Date of test

27th March 2013

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 Smoke less than 250 m²/kg

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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1. GENERAL

The product submitted by the client for testing was identified by the client as 'Fenta' comprising UV and Polyurethane 2K coatings on the exposed face of a 6.0 mm fibre cement board. Figure 1 illustrates a representative specimen of that tested.

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

1.1 Sample measurements

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

Specimen ID	Initial properties		Overall apparent density (kg/m³)
	Mass (g)	Mean thickness (mm)	
FH5173-50-1	91.5	6.6	1395
FH5173-50-2	90.1	6.6	1376
FH5173-50-3	91.0	6.5	1394

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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 test standard). The sample preparation and test procedure were as described in 2.4 and 2.5.

2.2 Test date

The tests were conducted on 27th March 2013 by Mr Peter Collier 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/m². All tests were carried out with the specimen horizontal, and with a nominal duct flow rate of 0.024 m³/s.

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3. TEST RESULTS AND REDUCED DATA

3.1 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		FH5173-50-1	FH5173-50-2	FH5173-50-3	
Time to sustained flaming	s	89	87	92	89.3
Observations[a]		-	-	-	
Test duration[b]	s	992*	1014*	1022*	1009
Mass remaining, mf	g	78.5	75.1	87.3	80.3
Mass pyrolyzed	%	14.2%	16.7%	4.1%	11.7%
Specimen mass loss[c]	kg/m^2	1.18	1.31	1.16	1.22
Specimen mass loss rate[c]	g/m^2 .s	15.8	16.5	6.9	13.1
Heat release rate					
peak, $\dot{q}''_{\max}$	kW/m^2	93.7	83.6	73.5	83.6
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	32.2	32.0	27.3	30.5
Over 180 s from ignition	kW/m^2	14.3	12.6	11.5	12.8
Over 300 s from ignition	kW/m^2	10.8	9.5	8.7	9.7
Total heat released	MJ/m^2	3.4	3.0	2.7	3.0
Average Specific Extinction Area	m^2/kg	32.7	42.1	180.7	85.2
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	2.3	2.0	7.3	3.9

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

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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.

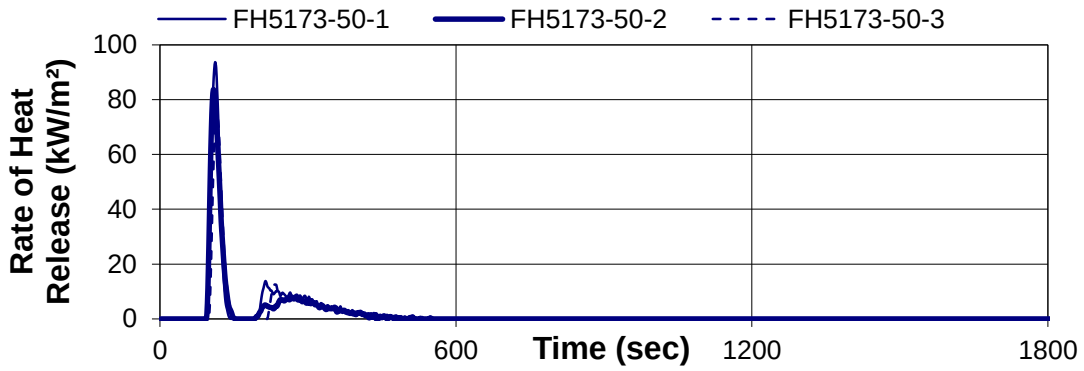
Specimen ID	Average HRR over 180s from ignition	Arithmetic mean	% difference from the arithmetic mean
FH5173-50-1	14.3	12.8	11.5
FH5173-50-2	12.6		-1.3
FH5173-50-3	11.5		-10.2

The above table identifies two of the specimens exposed to 50 kW/m² irradiance exceeded the acceptance criteria. Although one of the specimens was outside of the variability criteria of the test standard, the same NZBC Group Classification was determined for each specimen. A further set of three tests as required by the test standard was deemed not to be necessary and would not be expected to lead to an alteration of the classification.

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.

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)
6.5	50	89	83.6	85.2

Figure 2 Rate of heat release versus time



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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:

	Sample 1	Sample 2	Sample 3	Classification
Group number Classification	1	1	1	1

The tested sample recorded an average specific extinction area less than 250 m²/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 m²/kg are identified with "S" post-script to the Group number.

6. DISCUSSION

The specimen tested in full and reported herein was nominally 6 mm thick as described in full in Section 1.

A variation identified by the client as 'Fenta' Smooth and comprising UV and Polyurethane 2K coatings on the exposed face of a 4.5 mm fibre cement board substrate was prepared as described in Section 2 and subjected to a single indicative tests in accordance with the test standard. Representative specimens are illustrated in Figure 3.

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Figure 3 Representative specimen (back face on left, exposed on right)

The results were analysed in accordance with the Group Number Classification requirements, achieving a Group 1 classification.

The key results are summarised below.

Specimen ID	No. of tests	Time to Ignition (s)	Peak Heat Release Rate (kW/m^2)	Average Specific Extinction Area (m^2/kg)	Indicated Group No.
FH5174-50-1	1	79	87.3	57	1

It is therefore considered that the alternative specimen, if subjected to a full set of replicate tests in accordance with the standard, would not adversely affect the Group 1 classification achieved by the nominally 6 mm thick specimens as tested and reported herein.

7. 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**
The average specific extinction area was less than the 250 m^2/kg limit.	

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