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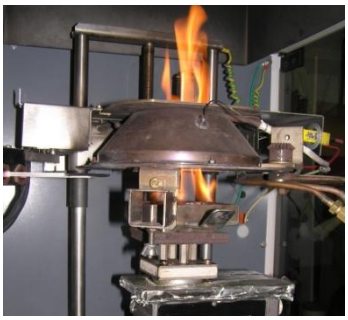


FIRE TEST REPORT

FH 4847

CONE CALORIMETER TEST AND NZBC VERIFICATION METHOD C/VM2 APPENDIX A PERFORMANCE OF ECOPLUS SYSTEMS VINYL TONE PLASTERBOARD CEILING TILE

CLIENT
Ecoplus Systems Limited
136 Customs Street West
Auckland City 1010
New Zealand

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

TEST SUMMARY

Objective

To conduct cone calorimeter testing 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

Ecoplus Systems Limited
136 Customs Street West
Auckland City 1010
New Zealand

Description of test specimen

The product submitted by the client for testing was identified by the client as Vinyl Tone Plasterboard Ceiling Tile.

Dates of tests

4 April 2012 and 15 June 2012

Test results

For the purposes of compliance with the respective 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 m^2/kg

LIMITATION

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

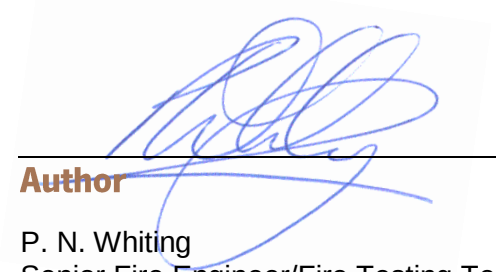
TERMS AND CONDITIONS

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

CONTENTS

FIGURES

SIGNATORIES



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DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
1	25 June 2012	Initial issue

1. GENERAL

The product submitted by the client for testing was identified by the client as Vinyl Tone Plasterboard Ceiling Tile, comprising a gypsum plasterboard core with a foil veneer to the back face and a white vinyl veneer to the front (fire exposed) face. 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/m^3)
	Mass (g)	Mean thickness (mm)	
FH4847-50-1	69.7	8.9	783
FH4847-50-2	69.2	8.8	785
FH4847-50-3	68.3	8.8	778

2. EXPERIMENTAL PROCEDURE

2.1 Test standard

The tests were carried out 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 4 April 2012 (FH4847-50-1) 15th June 2012 (FH4847-50-2 and FH4847-50-3) by Mr Paul Wong 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.

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		FH4847-50-1	FH4847-50-2	FH4847-50-3	
Time to sustained flaming	s	28	32	29	29.7
Observations[a]		-	-	-	
Test duration[b]	s	1242*	1458*	1458*	1386
Mass remaining, mf	g	54.5	54.3	51.4	53.4
Mass pyrolyzed	%	21.8%	21.5%	24.7%	22.7%
Specimen mass loss[c]	kg/m^2	1.66	1.61	1.84	1.70
Specimen mass loss rate[c]	g/m^2 .s	11.7	11.6	13.3	12.2
Heat release rate					
peak, $\dot{q}''_{max}$	kW/m^2	108.6	118.0	115.1	113.9
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	37.3	37.9	36.5	37.3
Over 180 s from ignition	kW/m^2	16.4	17.6	16.1	16.7
Over 300 s from ignition	kW/m^2	10.0	11.2	9.8	10.3
Total heat released	MJ/m^2	4.9	8.4	5.4	6.2
Average Specific Extinction Area	m^2/kg	34.6	55.0	68.1	52.6
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	2.9	5.0	2.8	3.6

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.

4. SUMMARY

The test standard 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.

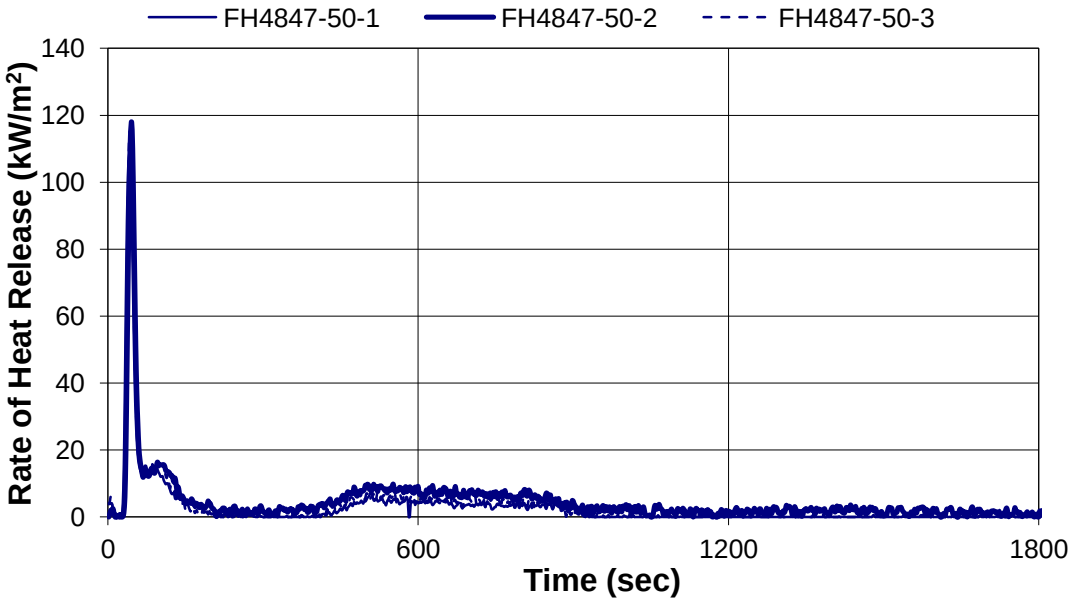
Specimen ID	Average HRR over 180s from ignition	Arithmetic mean	% difference from the arithmetic mean
FH4847-50-1	16.4	16.7	-1.9
FH4847-50-2	17.6		5.5
FH4847-50-3	16.1		-3.5

The above table identifies all three of the specimens exposed to 50 kW/m^2 irradiance were within the acceptance criteria.

The report summary for the specimens as described in Section 1, exposed to an irradiance of 50 kW/m² is:

Mean Specimen thickness (mm)	Irradiance (kW/m^2)	Mean Time to Ignition (s)	Mean Peak Heat Release Rate (kW/m^2)	Mean Total Heat Released (MJ/m^2)
8.8	50	29	113.9	6.2

Figure 2 Rate of heat release verses 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:

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

The tested sample recorded an average specific extinction area of 52.6 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. 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, and others in the same product range with the same fabrication, weight and thickness as the products tested.

Group Number Classification	**1 - S**
The average specific extinction area was less than the 250 m^2/kg limit.	

7. LIMITATION

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