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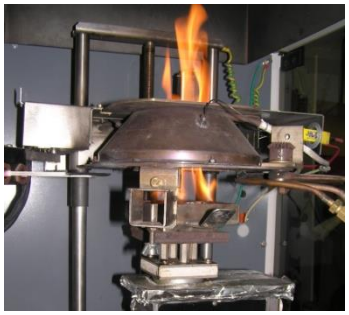

FIRE TEST REPORT

FH 5525

CONE CALORIMETER TEST AND NZBC VERIFICATION METHOD C/VM2 APPENDIX A AND NCC SPECIFICATION C1.10 PERFORMANCE OF CHEVALINE® COLOURGLAZE SYSTEM AND CHEVALINE® EPISTIXX RAPID SYSTEM

International Accreditation New Zealand (IANZ) has a Mutual Recognition Agreement (MRA) with the National Association of Testing Authorities, Australia (NATA). Users of test reports are recommended to accept test reports in the name of either accrediting body.

CLIENT
Equus Industries Ltd
7 Sheffield St
Riverlands
Marborough 7274
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 and reduce the data in accordance with ISO 5660 and AS/NZS 3837 on client supplied specimens for the purposes of determination of the Group Classifications in accordance with;

- National Construction Code (NCC) Volume One Specifications C1.10 and A 2.4 of the Building Code of Australia (BCA).
- New Zealand Building Code (NZBC) Verification Method C/VM2 Appendix A

Test sponsor

Equus Industries Ltd
7 Sheffield St
Riverlands
Marborough 7274
New Zealand

Description of test specimen

The product as described by the client as Chevaline® Colourglaze System and Chevaline® Epistixx Rapid System.

Date of test

17 and 22 April 2014

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	2–S
NCC Specifications C1.10 and A 2.4	2 The average specific extinction area was less than the 250 m^2/kg limit.

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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FIGURES

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SIGNATORIES

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DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
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1. GENERAL

The product submitted by the client for testing was identified by the client as Chevaline® Epistixx Rapid System on 10 mm standard paper-faced plasterboard. 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)
	Mass* (g)	Mean thickness* (mm)	
FH5525-1-50-1	81.4	10.4	783
FH5525-1-50-2	79.1	10.4	761
FH5525-1-50-3	82.0	10.4	789

*includes nominally 10 mm thick paper faced plasterboard substrate.

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, and 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 2.5.

2.2 Test date

The tests were conducted on 17th and 24th April 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/m². All tests were carried out with the specimen horizontal, and with a nominal duct flow rate of 0.024 m³/s.

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		FH5525-1-50-1	FH5525-1-50-2	FH5525-1-50-3	
Test Date		17/04/2014	17/04/2014	22/04/2014	
Time to sustained flaming	s	34	35	35	35
Observations[a]		-	-	-	
Test duration[b]	s	1834**	1810*	1835**	1826
Mass remaining, m_f	g	55.6	57.0	61.0	57.9
Mass pyrolyzed	%	31.7%	27.9%	25.6%	28.4%
Specimen mass loss[c]	kg/m^2	2.9	2.4	2.4	2.6
Specimen mass loss rate[c]	g/m^2 .s	1.6	1.4	1.3	1.4
Heat release rate					
peak, $\dot{q}''_{max}$	kW/m^2	398.3	382.8	378.0	386.4
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	113.7	109.2	105.1	109.3
Over 180 s from ignition	kW/m^2	48.0	46.3	42.7	45.7
Over 300 s from ignition	kW/m^2	32.2	30.5	27.1	29.9
Total heat released	MJ/m^2	17.1	14.6	11.1	14.3
Average Specific Extinction Area	m^2/kg	69.9	69.4	84.8	74.7
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	5.9	5.8	4.7	5.4

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

3.2 Test results and reduced data – NCC C1.10

Table 3: Test results and reduced data – NCC C1.10

Material		**Test specimens as described in Section 1 (in accordance with AS/NZS 3837)**			**Mean**
Specimen test number		FH5525-1-50-1	FH5525-1-50-2	FH5525-1-50-3	
Test Date		17/04/2014	17/04/2014	22/04/2014	
Time to sustained flaming	s	34	35	35	35
Observations[a]		-	-	-	
Test duration[b]	s	474*	434*	298*	402
Mass remaining, m_f	g	63.5	63.8	71.0	66.1
Mass pyrolyzed	%	22.0%	19.3%	13.4%	18.2%
Specimen mass loss[c]	kg/m^2	2.0	1.7	1.2	1.6
Specimen mass loss rate[c]	g/m^2 .s	13.4	11.3	8.4	11.1
Heat release rate					
peak, $\dot{q}''_{max}$	kW/m^2	398.3	382.8	378.0	386.4
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	113.7	109.2	105.1	109.3
Over 180 s from ignition	kW/m^2	48.0	46.3	42.7	45.7
Over 300 s from ignition	kW/m^2	32.2	30.5	27.1	29.9
Total heat released	MJ/m^2	10.7	9.7	8.1	9.5
Average Specific Extinction Area	m^2/kg	85.7	102.1	135.5	107.8
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	5.3	5.6	6.5	5.8

Notes :

[a] no significant observations were recorded

[b] determined by * average mass loss over 1 minute dropped below 150 g/m^2
** two minutes after flameout or other signs of combustion cease
*** 60 minutes have elapsed or 10 minutes without ignition

[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 4: Heat release rate

Specimen ID	Average HRR over 180 s from ignition	Arithmetic mean	% difference from the arithmetic mean
FH5525-1-50-1	48.0	45.7	5.1%
FH5525-1-50-2	46.3		1.3%
FH5525-1-50-3	42.7		-6.4%

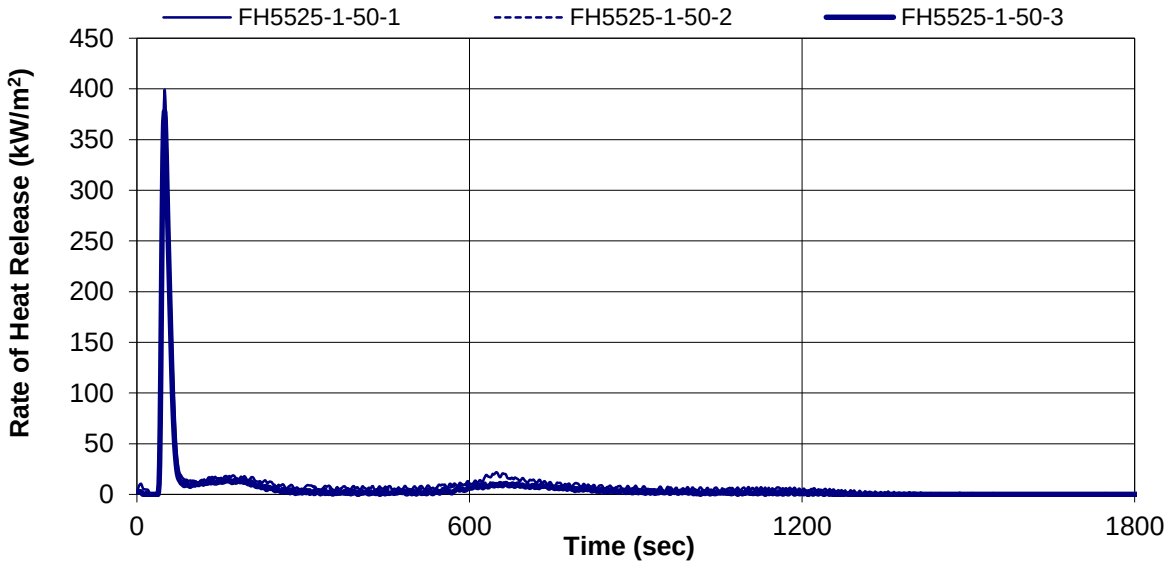
Table 4 identifies that the specimens exposed to 50 kW/m² irradiance meet the acceptance criteria.

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 5: Report summary

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)
10.4	50	35	386.4	74.7 (NZBC) 107.8 (NCC)

Figure 2: Rate of heat release versus time



5. DISCUSSION

A related system as described by the client as Chevaline® Colourglaze System was submitted for testing. Samples of each type were subjected to single indicative tests to identify any possible variations. The initial properties, including the paper-faced plasterboard, before testing are included in Table 6 and the test results are summarized in Table 7.

Table 6: Additional product for indicative testing

Ref. no	Designation	Weight (g)	Thickness (mm)	Density (kg/m^3)
FH5525-1-50-1	Chevaline® Epistixx Rapid System	81.4	10.4	783
FH5526-1-50-1	Chevaline® Colourglaze System	82.0	10.5	781

Shaded row – Sample 1 results for material tested in full herein.

Table 7: Indicative test results summary

Ref. no	Number of specimens tested	Time to Ignition (s)	Peak Heat Release Rate (kW/m^2)	Total Heat Released (MJ/m^2)	Average Specific Extinction Area (m^2/kg)	Indicated Group No.
FH5525-1-50-1	1	34	398	17.1	69.9	2
FH5526-1-50-1	1	20	322	14.4	25.2	2

Shaded row – Sample 1 results for material tested in full herein.

No significant variations were detected and each sample was designated a Group 2 classification. As the peak heat release rate and the total heat release results for the Chevaline® Colourglaze System are less than achieved by the Chevaline® Epistixx Rapid System, it is considered that the Chevaline® Colourglaze System surface will retain a Group 2 achieved by the Chevaline® Epistixx Rapid System as tested and reported herein.

6. 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 8: NZBC Group classification and smoke extinction area

	Sample 1	Sample 2	Sample 3	Classification
Group number Classification	2	2	2	2-S
Average Specific Extinction Area (m^2/kg)	69.9	69.4	84.8	

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.

7. CLASSIFICATION IN ACCORDANCE WITH NCC VOLUME ONE SPECIFICATION C1.10

Calculations were carried out according to Specification A2.4. The classification and for smoke extinction area for the sample as described in Section 1 is as follows:

Table 9: NCC Group classification and smoke extinction area

	Specimen 1	Specimen 2	Specimen 3	Classification
Group number Classification	2	2	2	2
Average Specific Extinction Area (m^2/kg)	85.7	102.1	135.5	

The average specific extinction area for the sample is less than the 250 m^2/kg limit and therefore it may be used in buildings with or without a sprinkler system complying with Specification E1.5 in accordance with Specification C1.10 Table 2.

8. 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 and discussed in Section 5.

Group Number Classification	**2-S**

9. NCC CONCLUSION

The cone calorimeter testing was carried out on the specimens as described in Section 1. For the purposes of compliance with the NCC Volume One Specification C1.10 for the Classification of Fire Performance of Wall and Ceiling Lining Materials, the following classification is considered applicable to the material as described in Section 1 and discussed in Section 5.

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