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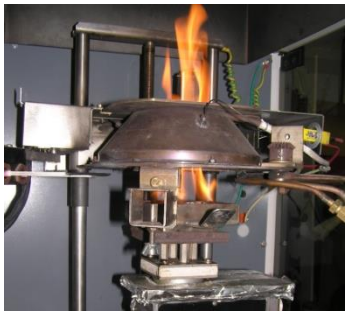

FIRE TEST REPORT

FH 5638

CONE CALORIMETER TEST AND NZBC ACCEPTABLE SOLUTIONS SECTION 5.8.1 PERFORMANCE OF GRAPHEX INSULATED FAÇADE SYSTEM WITH X200

CLIENT
Rockcote Resene Ltd
P.O. Box 39108
Harewood,
Christchurch, 8545
New Zealand

IANZ ACCREDITED LABORATORY ACCREDITATION №: 37

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 as specified in New Zealand Building Code (NZBC) Acceptable Solutions Appendix C 7.1, on client supplied specimens for the purposes of determination of the Exterior Surface Finishes performance in accordance with;

- NZBC Acceptable Solutions Section 5.8.1. a) and b).

Test sponsor

Rockcote Resene Ltd
P.O. Box 39108
Harewood,
Christchurch, 8545
New Zealand

Description of test specimen

The product as described by the client as Graphex Insulated Façade System with X200.

Date of test

24 November, 4 December and 10 December 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		Performance
NZBC Acceptable Solutions Section 5.8.1	a)	Not Satisfied
	b)	Satisfied

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

TABLES

SIGNATORIES

Author

Matthew Van Atta
Fire Engineer

Reviewer

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

DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	DESCRIPTION
1	9 December 2014	Initial Issue

1. GENERAL

The product submitted by the client for testing was identified by the client as Graphex Insulated Façade System. The samples were prepared by the client using a Neopor® EPS substrate, a plaster coating system with 3-4 mm of fibreglass mesh reinforced, polymer-modified, cement-based plaster (Coarse mesh render), which is finished with a cement-based finishing plaster (Ezytex or Tasman) and painted with Resene Limelock and X200. 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)	
FH5638-1-50-1	213.2	46.2	461
FH5638-1-50-2	213.1	46.2	461
FH5638-1-50-3	213.0	46.1	462
FH5638-1-50-4	213.2	46.5	458
FH5638-1-50-5	213.8	46.3	462
FH5638-1-50-6	215.6	46.3	466

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 24 November and 4 December 2014 by Mr Matthew Van Atta and on 10 December 2014 by Lucas 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 Special weathering

According to Acceptable Solutions Appendix C 7.1.3, timber claddings which have a fire retardant treatment incorporated in or applied to them are required to be subjected to the regime of accelerated weathering described in ASTM D 2898 Method B with the water flow rate from Method A before testing. The tested specimens were not timber claddings and therefore were not subjected to the accelerated weathering.

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 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.

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

Table 2: Test results and reduced data to NZBC Acceptable Solutions Appendix C 7.1

Material		**Test specimens as described in Section 1 (in accordance with AS/NZS 3837)**			**Mean (3 samples)**
Specimen test number		FH5638-1-50-1	FH5638-1-50-2	FH5638-1-50-3	
Test Date		24/11/2014	4/12/2014	4/12/2014	
Time to sustained flaming	s	60	59	57	59
Observations[a]		-	-	-	
Test duration[b]	s	900++	900++	900++	900
Mass remaining, m_f	g	204.2	203.0	201.9	203.0
Mass pyrolyzed	%	4.2%	4.7%	5.2%	4.7%
Specimen mass loss[c]	kg/m^2	1.0	1.0	1.1	1.0
Specimen mass loss rate[c]	g/m^2 .s	1.1	1.0	1.2	1.1
Heat release rate					
peak, $\dot{q}''_{max}$	kW/m^2	115.2	123.6	114.5	117.8
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	61.4	64.4	56.5	60.8
Over 180 s from ignition	kW/m^2	26.8	27.1	22.7	25.5
Over 300 s from ignition	kW/m^2	18.5	18.1	14.8	17.2
Total heat released	MJ/m^2	8.9	8.1	6.1	7.7
Average Specific Extinction Area	m^2/kg	25.4	22.6	21.6	23.2
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	8.7	7.1	4.8	6.9

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
[++] test duration of 15 minutes as specified in NZBC Acceptable Solutions Appendix C 7.1.2

[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

Table 3: Test results continued

Material		Test specimens as described in Section 1 (in accordance with AS/NZS 3837)			Mean (3 samples)
Specimen test number		FH5638-1-50-4	FH5638-1-50-5	FH5638-1-50-6	
Test Date		10/12/2014	10/12/2014	10/12/2014	
Time to sustained flaming	s	60	57	59	59
Observations[a]		-	-	-	
Test duration[b]	s	900++	900++	900++	900
Mass remaining, m_f	g	203.6	203.7	205.2	204.2
Mass pyrolyzed	%	4.5%	4.7%	4.8%	4.7%
Specimen mass loss[c]	kg/m^2	1.0	1.1	1.1	1.0
Specimen mass loss rate[c]	g/m^2 .s	0.9	0.6	1.1	0.9
Heat release rate					
peak, $\dot{q}''_{max}$	kW/m^2	105.1	111.3	117.7	111.4
average, $\dot{q}''_{avg}$					
Over 60 s from ignition	kW/m^2	51.9	56.5	62.5	56.9
Over 180 s from ignition	kW/m^2	18.8	24.6	26.0	23.2
Over 300 s from ignition	kW/m^2	11.4	17.1	17.3	15.3
Total heat released	MJ/m^2	3.5	8.0	7.3	6.2
Average Specific Extinction Area	m^2/kg	25.3	13.7	10.4	16.5
Effective heat of combustion[d], $\Delta h_{c,eff}$	MJ/kg	3.2	7.0	6.2	5.5

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
[++] test duration of 15 minutes as specified in NZBC Acceptable Solutions Appendix C 7.1.2

[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 ISO 5660 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.

Table 4: Heat release rate

Specimen ID	Average HRR over 180 s from ignition	Arithmetic mean	% difference from the arithmetic mean
FH5638-1-50-1	26.8	25.5	4.9%
FH5638-1-50-2	27.1		6.1%
FH5638-1-50-3	22.7		-11.0%

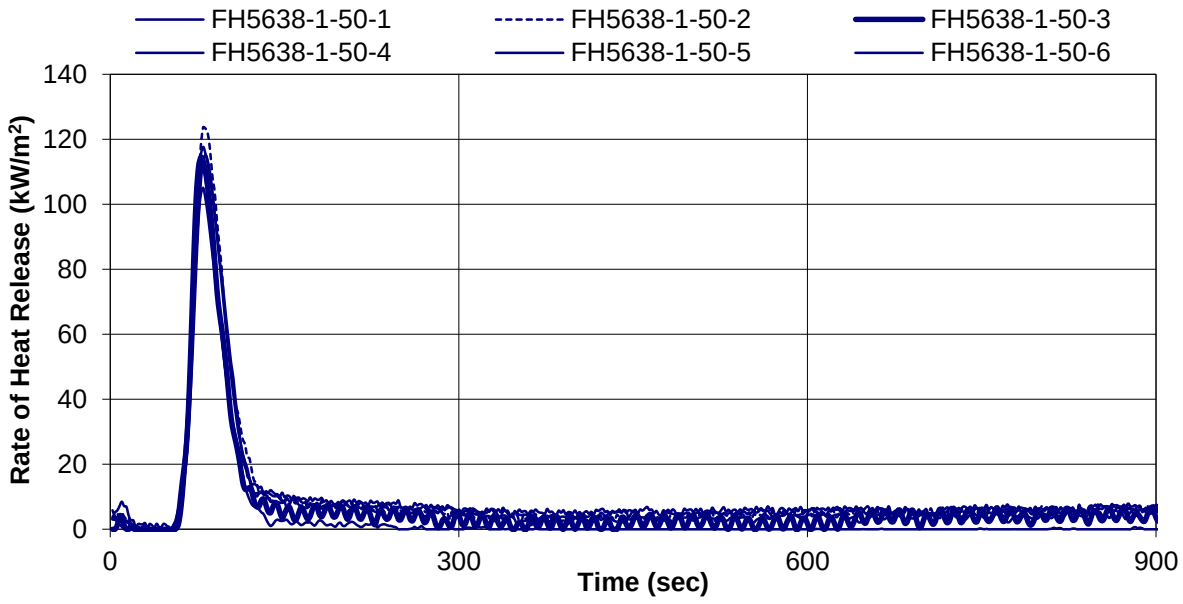
Table 4 identifies that the specimens exposed to 50 kW/m² irradiance did not meet the acceptance criteria. Three more specimens were tested.

The report summary for the six specimens as described in Section 1, exposed to an irradiance of 50 kW/m² is given in Table 5 with rates of heat release illustrated in Figure 2.

Table 5: 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)
46.3	50	59	114.6	19.8

Figure 2: Rate of heat release versus time



5. RESULTS FOR NZBC ACCEPTABLE SOLUTIONS SECTION 5.8.1

In accordance with NZBC Acceptable Solutions Section 5.8.1 a) and b) for external walls the mean test results must not exceed the Peak Heat Release rate and Total Heat Release shown in Table 6.

Table 6: NZBC Acceptable Solutions Section 5.8.1 a) and b) requirements

	NZBC Acceptable Solutions Section 5.8.1 Requirement – values shall not exceed	
	(a)	(b)
Peak Heat Release rate (kW/m²)	100	150
Total Heat Release (MJ/m²)	25	50

The samples as described in Section 1 had the following results when reduced over the 15 minute (900 s) period as specified in Appendix C 7.1.2.

Table 7: NZBC Group classification and smoke extinction area

	Specimen						**Performance**
	1	**2**	**3**	**4**	**5**	**6**	
Peak Heat Release rate (kW/m²)	115.2	123.6	114.5	105.1	111.3	117.7	Meets b)
Total Heat Release (MJ/m²)	8.9	8.1	6.1	3.5	8.0	7.3	Meets a) and b)

The tested samples recorded a mean Peak Heat Release of 114.6 KW/m^2 and a mean Total Heat Release of 7.0 MJ/m^2 and it is therefore considered to satisfy the requirements of NZBC Acceptable Solutions Section 5.8.1 b) only.

6. CONCLUSION

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		**Performance**
NZBC Acceptable Solutions Section 5.8.1	a)	Not Satisfied
	b)	Satisfied