



BRANZ Type Test

FH14268-01-1

CONE CALORIMETER TEST AND NZBC ACCEPTABLE SOLUTION C/AS1 EXTERIOR SURFACE FINISH PERFORMANCE OF EPS SUBSTRATE

CLIENT

Rockcote Resene Ltd
T/A Resene Construction Systems
5 Venture Place, Middleton,
Christchurch, 8024
New Zealand



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



REPORT NUMBER:

FH14268-01-1

ISSUE DATE:

15 June 2022

REVIEW/EXPIRY DATE

15 June 2027

PAGE:

1 of 9

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TEST SUMMARY

Objective

To conduct cone calorimeter testing and reduce the data in accordance with ISO 5660 (2002) as specified in New Zealand Building Code (NZBC) Acceptable Solutions C/AS1 Appendix C C7.1 on client supplied specimens for the purposes of determination of performance in accordance with:

- NZBC Acceptable Solutions C/AS1 Section 5.4 Exterior Surface Finishes

Test sponsor

Rockcote Resene
5 Venture Place, Middleton,
Christchurch, 8024
New Zealand

Description of test specimens

The product as described by the client as EPS Substrate with Resene Lumbersider or Resene X200 painted finish.

Date of tests

12 November 2021 and 22 March 2022

Test results

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

Building Code Document	Criteria	Result	Performance
NZBC Acceptable Solution C/AS1	Peak Heat Release rate (kW/m ²)	92.3	≤100 kW/m ²
	Total Heat Release (MJ/m ²)	30	≤ 50 MJ/m ²

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.

	REPORT NUMBER: FH14268-01-1	ISSUE DATE: 15 June 2022	REVIEW/EXPIRY DATE 15 June 2027	PAGE: 2 of 9
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CONTENTS

SIGNATORIES	4
DOCUMENT REVISION STATUS	4
1. GENERAL	5
1.1 Sample measurements	5
2. EXPERIMENTAL PROCEDURE	6
2.1 Test standard	6
2.2 Test date	6
2.3 Specimen conditioning	6
2.4 Special weathering	6
2.5 Specimen wrapping and preparation	6
2.6 Test programme	6
2.7 Specimen selection	6
3. TEST RESULTS AND REDUCED DATA	7
3.1 Test results and reduced data in accordance with NZBC Acceptable Solution C/AS1 Appendix C7.1	7
4. SUMMARY	8
5. RESULTS FOR NZBC ACCEPTABLE SOLUTION C/AS1 EXTERIOR SURFACE FINISHES	9
6. NZBC CONCLUSION	9

FIGURES

Figure 1: Representative specimens (EPS with X200 left, and Lumbersider right)	5
Figure 2: Rate of heat release versus time	8

TABLES

Table 1: Physical parameters	5
Table 2: Test results and reduced data for EPS Substrate with X200	7
Table 3: Heat release rate	8
Table 4: Report summary	8
Table 5: NZBC Acceptable Solution C/AS1 Table 5.1	9
Table 6: NZBC Classification of external wall claddings	9



REPORT NUMBER:

FH14268-01-1

ISSUE DATE:

15 June 2022

REVIEW/EXPIRY DATE

15 June 2027

PAGE:

3 of 9

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DOCUMENT REVISION STATUS

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REPORT NUMBER:

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ISSUE DATE:

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15 June 2027

PAGE:

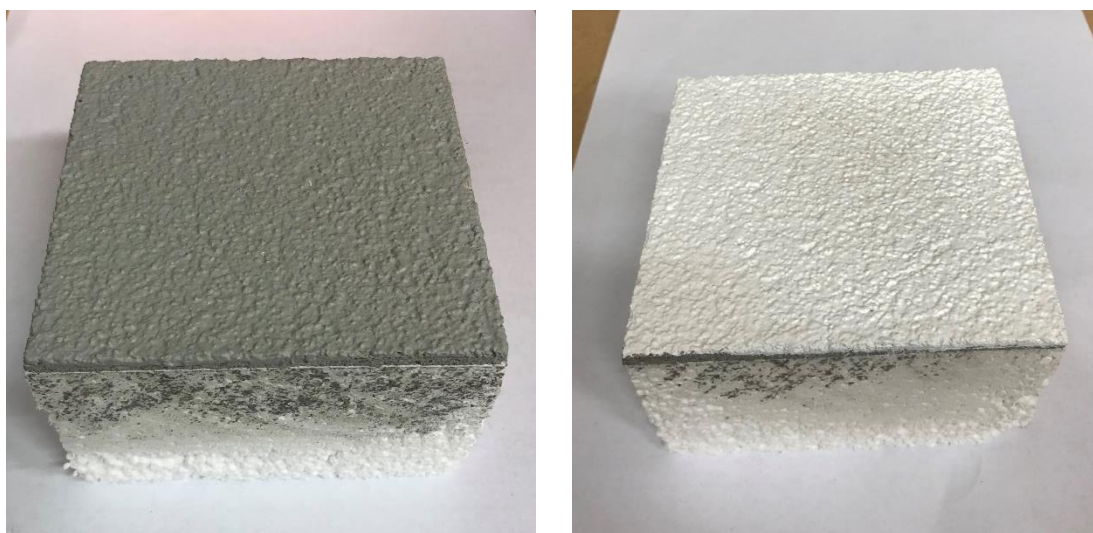
4 of 9

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1. GENERAL

The product submitted by the client for testing was identified by the client as EPS Substrate in Resene Lumbersider or Resene X200 painted finish. The nominally 50 mm thick panel system is comprised of an expanded polystyrene foam (EPS) substrate with multi-layered render finish of mineral base coat, mineral texture, Resene Limelock, and Resene Lumbersider or X200 painted finish. Figure 1 illustrates representative specimens of that tested.

Figure 1: Representative specimens (EPS with X200 left, and Lumbersider 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/m ³)	Colour
	Mass (g)	Mean thickness* (mm)		
FH12468-2-50-1	86.9	40.0	217	Grey
FH14268-2-50-2	77.0	39.5	195	Grey
FH14268-2-50-3	84.2	40.2	209	Grey
FH14268-1-50-1	80.6	40.0	202	White

Shaded rows – indicative test specimen only

* Thickness reduced by cutting away the unexposed face

	REPORT NUMBER:	ISSUE DATE:	REVIEW/EXPIRY DATE	PAGE:
	FH14268-01-1	15 June 2022	15 June 2027	5 of 9

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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. 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 12 November 2021 and 22 March 2022 by Mr James Quilter and Mr James Stallinger respectively, at BRANZ Limited laboratories, Judgeford, New Zealand.

2.3 Specimen conditioning

All specimens were conditioned to moisture equilibrium (constant weight), at a temperature of $23 \pm 2^{\circ}\text{C}$ and a relative humidity of $50 \pm 5\%$ immediately prior to testing.

2.4 Special weathering

According to Acceptable Solutions Appendix C C7.1.3, 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 during testing. All specimens were wrapped in a single layer of aluminium foil, covering the unexposed surfaces.

Samples as supplied by the client were greater than 50 mm thick. In accordance with the standard, the requisite specimens were obtained by cutting away the unexposed face to reduce the thickness.

2.6 Test programme

The test programme consisted of three replicate specimens and one indicative specimens, as identified in the Table 1, 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 $0.024 \text{ m}^3/\text{s}$.

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.



REPORT NUMBER:

FH14268-01-1

ISSUE DATE:

15 June 2022

REVIEW/EXPIRY DATE

15 June 2027

PAGE:

6 of 9

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3. TEST RESULTS AND REDUCED DATA

3.1 Test results and reduced data in accordance with NZBC Acceptable Solution C/AS1 Appendix C7.1

Table 2: Test results and reduced data for EPS Substrate with X200

Material	Test specimens as described in Section 1			Mean
Specimen test number	FH12468-2-50-1	FH14268-2-50-2	FH14268-2-50-3	
Test Date	12/11/2021	22/03/2022	22/03/2022	
Time to sustained flaming s	54	47	50	50
Observations ^a	-	-	-	
Test duration ^b s	900	900	900	900
Mass remaining, m _f g	76.0	62.3	72.1	70.1
Mass pyrolyzed %	12.6%	19.1%	14.4%	15.3%
Specimen mass loss ^c kg/m ²	1.1	1.6	1.3	1.3
Specimen mass loss rate ^c g/m ² .s	1.3	1.9	1.5	1.6
Heat release rate				
peak, \dot{q}_{\max}'' kW/m ²	73.4	119.0	84.4	92.3
average, \dot{q}_{avg}''				
Over 60 s from ignition kW/m ²	36.6	48.8	47.7	44.4
Over 180 s from ignition kW/m ²	35.7	41.4	28.9	35.3
Over 300 s from ignition kW/m ²	38.1	67.1	27.1	44.1
Total heat released MJ/m ²	23.8	37.7	28.4	30.0
Average Specific Extinction Area m ² /kg	169.4	526.1	223.3	306.3
Effective heat of combustion ^d , $\Delta h_{c,\text{eff}}$ MJ/kg	19.2	22.7	20.7	20.9

Notes:

^a no significant observations were recorded

^b determined by test duration of 15 minutes (900 sec) as specified in NZBC Acceptable Solutions C/AS1 Appendix C C7.1.2

^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



REPORT NUMBER:

FH14268-01-1

ISSUE DATE:

15 June 2022

REVIEW/EXPIRY DATE

15 June 2027

PAGE:

7 of 9

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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.

Table 3: Heat release rate

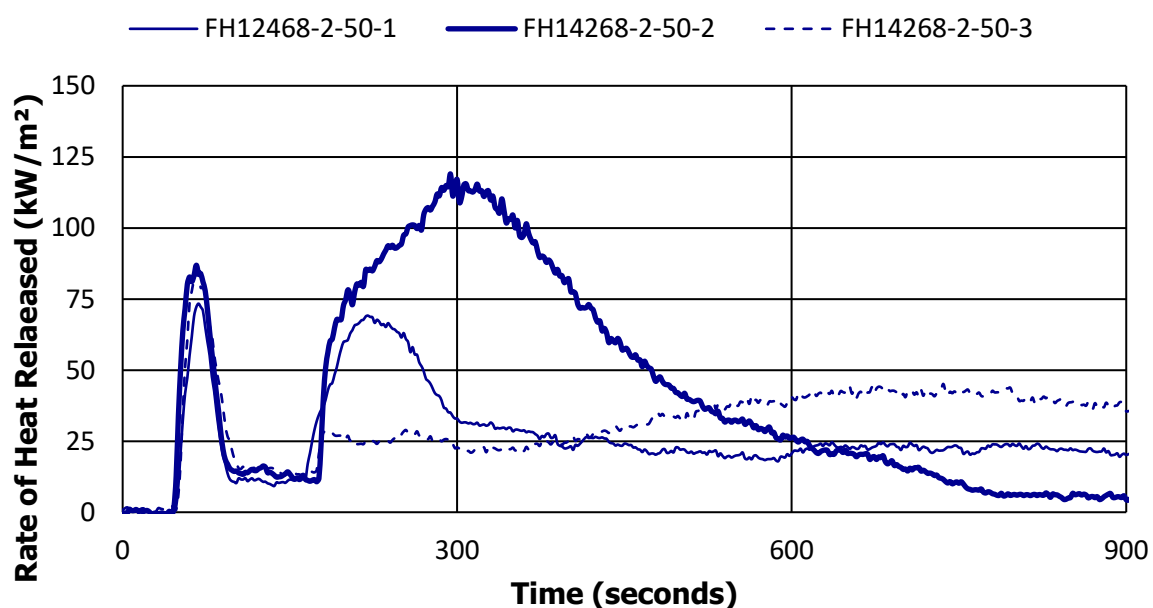
Specimen ID	Average HRR over 180 s from ignition	Arithmetic mean	% difference from the arithmetic mean
FH12468-2-50-1	35.7	35.3	0.9%
FH12468-2-50-2	41.4		17.2%
FH12468-2-50-3	28.9		-18.1%


Table 3 identifies two specimens exposed to 50 kW/m² irradiance exceeded the acceptance criteria. Although outside of the variability criteria of the test standard, 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.

Table 4: Report summary

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)
39.9	50	50	92.3	30.0

Figure 2: Rate of heat release versus time



	REPORT NUMBER: FH14268-01-1	ISSUE DATE: 15 June 2022	REVIEW/EXPIRY DATE: 15 June 2027	PAGE: 8 of 9
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5. RESULTS FOR NZBC ACCEPTABLE SOLUTION C/AS1 EXTERIOR SURFACE FINISHES

In accordance with NZBC Acceptable Solution C/AS1 Table 5.1 for external wall claddings the mean test results must not exceed the Peak Heat Release rate and Total Heat Release shown in Table 5.

Table 5: NZBC Acceptable Solution C/AS1 Table 5.1

	NZBC Acceptable Solution Requirement	
	Column B	Column D
Peak Heat Release rate (kW/m ²)	≤100	≤ 150
Total Heat Release (MJ/m ²)	≤ 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 C7.1.2 as shown in Table 6.

Table 6: NZBC Classification of external wall claddings

	Sample 1	Sample 2	Sample 3	Mean
Peak Heat Release rate (kW/m ²)	73.4	119.0	84.4	92.3
Total Heat Release (MJ/m ²)	23.8	37.7	28.4	30.0

The tested samples recorded a mean Peak Heat Release of 92.3 KW/m² and a mean Total Heat Release of 30.0 MJ/m² and it is therefore considered to satisfy the requirements of NZBC Acceptable Solutions C/AS1 Table 5.1 Requirements for external wall claddings, Column D.

6. NZBC CONCLUSION

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

Building Code Document	Criteria	Performance
NZBC Acceptable Solution C/AS1	Peak Heat Release rate (kW/m ²)	≤100 kW/m ²
	Total Heat Release (MJ/m ²)	≤ 50 MJ/m ²



REPORT NUMBER:

FH14268-01-1

ISSUE DATE:

15 June 2022

REVIEW/EXPIRY DATE

15 June 2027

PAGE:

9 of 9

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FH14268-01-1-C1

NZBC CLASSIFICATION



This is to certify that the specimen described below was tested by BRANZ in accordance with ISO 5660-1:2002

Test Sponsor

Rockcote Resene
5 Venture Place, Middleton,
Christchurch, 8024
New Zealand

Date of tests

12 November 2021 and 22 March 2022

Reference BRANZ Test Report

FH14268-01-1 – issued 15 June 2022

Test specimens as described by the client

EPS Substrate in Resene Lumbersider or Resene X200 painted finish.

A nominally 50 mm thick façade system comprised of an expanded polystyrene foam (EPS) substrate with multi-layered render finish of mineral base coat, mineral texture, Resene Limelock, and Resene Lumbersider or X200 painted finish.

Specimen name/ID	Mean values			Colour
	Mass (g)	Thickness (mm)	Apparent Density (kg/m ³)	
FH14268-1-50-1	80.6	40.0*	202	White
FH14268-2-50-1/2/3	82.7	39.9*	207	Grey

* Specimen thickness reduced prior to test

Classification in accordance with the New Zealand Building Code

Calculations were carried out according to NZBC Acceptable Solutions C/AS1 Appendix C7.1.
The performance for the sample as described above is given in the table below.

Building Code Document	Criteria	Performance
NZBC Acceptable Solution C/AS1	Peak Heat Release rate (kW/m ²)	≤100 kW/m ²
	Total Heat Release (MJ/m ²)	≤ 50 MJ/m ²

Issued by


L. F. Hersche
Fire Testing Engineer
IANZ Approved Signatory

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Reviewed by


E. Soja
Senior Fire Safety Engineer
IANZ Approved Signatory

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