

**Test on aluminium foil-faced glass-fibre pre-formed pipe
section insulation at 50-kW/m² irradiance in accordance
with ISO 5660 Part 1 and Part 2**

Report number FNKI 10865

CSIRO job number NKI6989

Date of Issue: 17 September 2013

Client

Forman Building Systems Limited

Commercial-in-confidence



CSIRO – Materials Science and Engineering

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Table of Contents

SUMMARY	4
Sample Identification:	4
Sponsor:	4
Manufacturer:	4
Job Number:	4
Test Date:	4
Description of Sample:	4
Documentation:	4
Conditioning of Specimens:	4
Test Method:	5
Duration of Test:	5
Observations:	5
Specimen 1	5
Specimen 2	5
Specimen 3	5
Results:	6
APPENDICES:	6
 TABLES	
Table 1- ISO 5660-1:2002(E) test results	7
Table 2- ISO 5660-2:2002(E) test results	7
 FIGURES	
Figure 1- Heat Release Rate	8
Figure 2 - Effective Heat of Combustion	9
Figure 3 – Rate of smoke production per unit area	10
 CERTIFICATES	
Certificate of Assessment 1-1850	11

SUMMARY

SPONSORED INVESTIGATION REPORT No. FNKI 10865

TEST ON REINFORCED ALUMINIUM FOIL-FACED GLASS-FIBRE
PRE-FORMED PIPE SECTION INSULATION AT 50-kW/m² IRRADIANCE
IN ACCORDANCE WITH ISO 5660 PART 1 AND PART 2

Sample Identification:

Fibreglass Pipe Section Foil-faced

Sponsor:

Forman Building Systems Limited
20 Vestey Drive
Mt. Wellington
AUCKLAND
NEW ZEALAND

Manufacturer:

Owens Corning (Guangzhou) Fiberglass Co. Ltd.
Dong Ji Industrial Zone
Guangzhou Economic Technological
GUANGZHOU
CHINA

Job Number:

NKI6989

Test Date:

24 July 2013

Description of Sample:

The sponsor described the tested specimen as glass-fibre pre-formed pipe section with aluminium foil facing. The foil facing was adhered onto the glass-fibre using polyvinyl acetate (PVA) adhesive at an application rate of 1 m²/L.

Nominal thickness of foil facing:	215-µm
Nominal thickness of glass-fibre:	50-mm
Nominal total thickness:	50-mm
Nominal density of glass-fibre:	80 kg/m ³
Nominal mass of foil facing:	220 g/m ²
Colour:	silver (foil); pink (glass-fibre)

Documentation:

The following documents were supplied by the sponsor as a full and complete description of the sample:

Test Agreement and form FTAF33 dated 13 June 2013.

Conditioning of Specimens:

Prior to the test, the specimens were conditioned to constant mass at a temperature of 23 ± 2°C and a relative humidity of 50 ± 10%.

Test Method:

Tests were performed in accordance with International Standard ISO 5660-1:2002 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method) and Part 2: Smoke production rate (dynamic measurement). All test specimens were exposed in the horizontal orientation with the standard pilot operating.

As a requirement of the New Zealand Building Code, Appendix CM2, Appendix A (Normative): Establishing Group Numbers for lining materials, Clause A1.1 (b), substrates of foil-faced materials must be deemed non-combustible to be appropriate for Group Number prediction using data obtained in accordance with ISO 5660.

The substrate for this material, Owens Corning glasswool insulation, had been tested to AS/NZS 1530.1:1994 Combustibility test for materials (CSIRO Report No. FNC10854, 26 Sept. 2013) and deemed non-combustible.

Nominally 100 x 100 mm specimens were tested as supplied. Specimens were tested with the use of an edge frame. The edge frame reduces the test surface area to 0.0088 m². The specimens were restrained with a wire grid which further reduced the test surface area to 0.0081 m², and this is the area used in calculations.

For the test, specimens were wrapped in aluminium foil so that the four edges and the bottom of the specimen were covered. The foil formed a shallow tray that retained any molten material during testing.

Three specimens were tested at an irradiance level of 50-kW/m².

The nominal exhaust system flow rate for all tests was 0.024-m³/s.

A measured quantity of ethanol was burnt to obtain a C factor to be used in the Heat Release calculations.

Duration of Test:

The test is terminated when any one of the following is applicable:

1. 32 minutes after time to sustained flaming;
2. The specimen fails to ignite after a 30 minute exposure;
3. O₂ concentration returns to pretest value for at least 10 minutes; or
4. The mass of the specimen becomes zero.

Observations:**Specimen 1**

The specimen began to smoke at 20 seconds after exposure to the test. The specimen ignited during the test. The test was terminated when 32 minutes have elapsed.

Specimen 2

The specimen began to smoke at 35 seconds after exposure to the test. The specimen ignited during the test. The test was terminated when 32 minutes have elapsed.

Specimen 3

The specimen began to smoke at 39 seconds after exposure to the test. The specimen ignited during the test. The test was terminated when 32 minutes have elapsed.

Results:

The results of tests as specified in the Standard are summarised in Table 1.

Table 1- ISO 5660-1:2002(E) test results	7
Table 2- ISO 5660-2:2002(E) test results	7

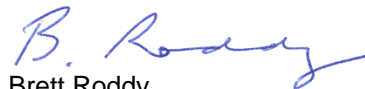
APPENDICES:

Appendix1	
Figure 1- Heat Release Rate.....	8
Figure 2 - Effective Heat of Combustion	9
Figure 3 – Rate of smoke production per unit area.....	10

Appendix 2	
Certificate of Assessment 1-1850	11

TESTED BY:

Heherson Alarde
Testing Officer



Brett Roddy
Team Leader, Fire Testing and Assessments

17 September 2013

Test Details:

Date of test: 24/07/13

Test Report Date: 17/09/13

Ethanol burn ('C' factors): 0.04169

	Irradiance (kW/m ²)	exhaust system flow rate (m ³ /s)	Time to sustained burning (s)	Test duration (s)	Thickness (mm)	Specimen mass (g)	Specimen mass at sustained flaming (g)	Mass remaining (g)	Mass loss (g/m ²)	Average rate of mass loss (g/m ² .s)	Specimen mass loss $m_{A,10-90}$ (g/m ² .s)	Peak HRR (kW/m ²)	Average HRR (first 180s after ign)	Average HRR (first 300s after ign)	Total heat released (MJ/m ²)
Sample 1	50	0.024	90	1920	50	55.7	54.9	53.00	333	2.47	2.47	32.9	10.1	8.5	8.69
Sample 2	50	0.024	109	1920	50	51.4	50.5	48.8	321	2.48	2.48	30.1	9.3	7.2	7.34
Sample 3	50	0.024	104	1920	50	52	51.3	50.3	210	2.47	2.47	20.7	10.0	6.8	3.06
Mean			101.0	1920.0			52.2	50.7	288.1	2.47	2.5	27.9	9.8	7.5	6.36
SD			9.8	0.0			2.3	2.1	68.0	0.0	0.0	6.4	0.5	0.9	2.9

Table 1- ISO 5660-1:2002(E) test results

	Exposed surface area (m ²)	Average Specific Extinction Area (m ² /kg)	Average SEA over flaming phase (m ² /kg)	Smoke production: non-flaming period (m ² /m ²)	Smoke production: flaming period (m ² /m ²)	Total smoke production (m ² /m ²)
Sample 1	0.0081	399.3	201.9	15.3	9.5	24.8
Sample 2	0.0081	318.0	147.9	13.3	6.2	19.5
Sample 3	0.0081	262.5	89.3	8.6	2.2	10.8
Mean		326.6	146.4	12.4	6.0	18.4
SD		68.8	56.3	3.5	3.6	7.1

Table 2- ISO 5660-2:2002(E) test results

Figure 1- Heat Release Rate

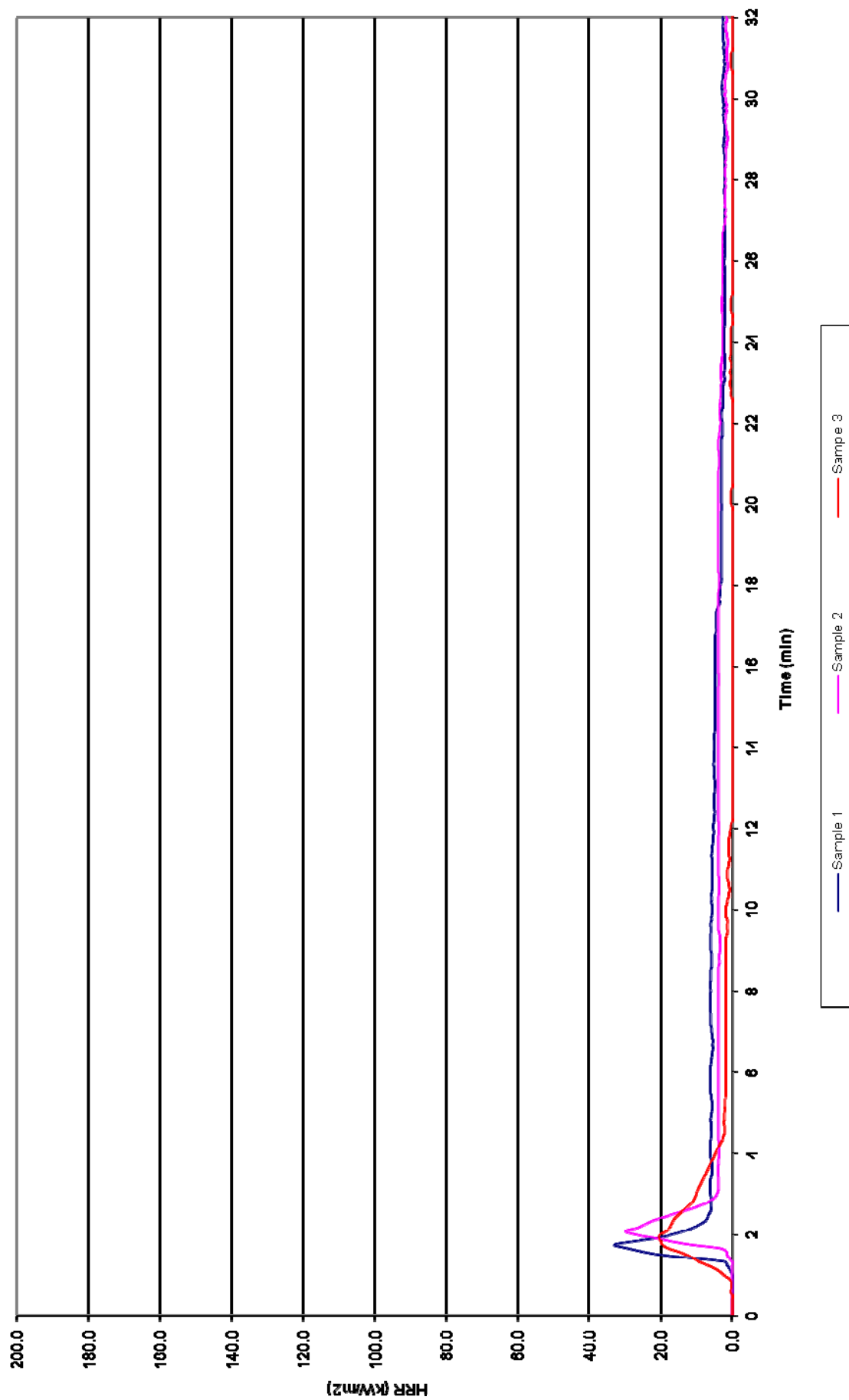


Figure 2 - Effective Heat of Combustion

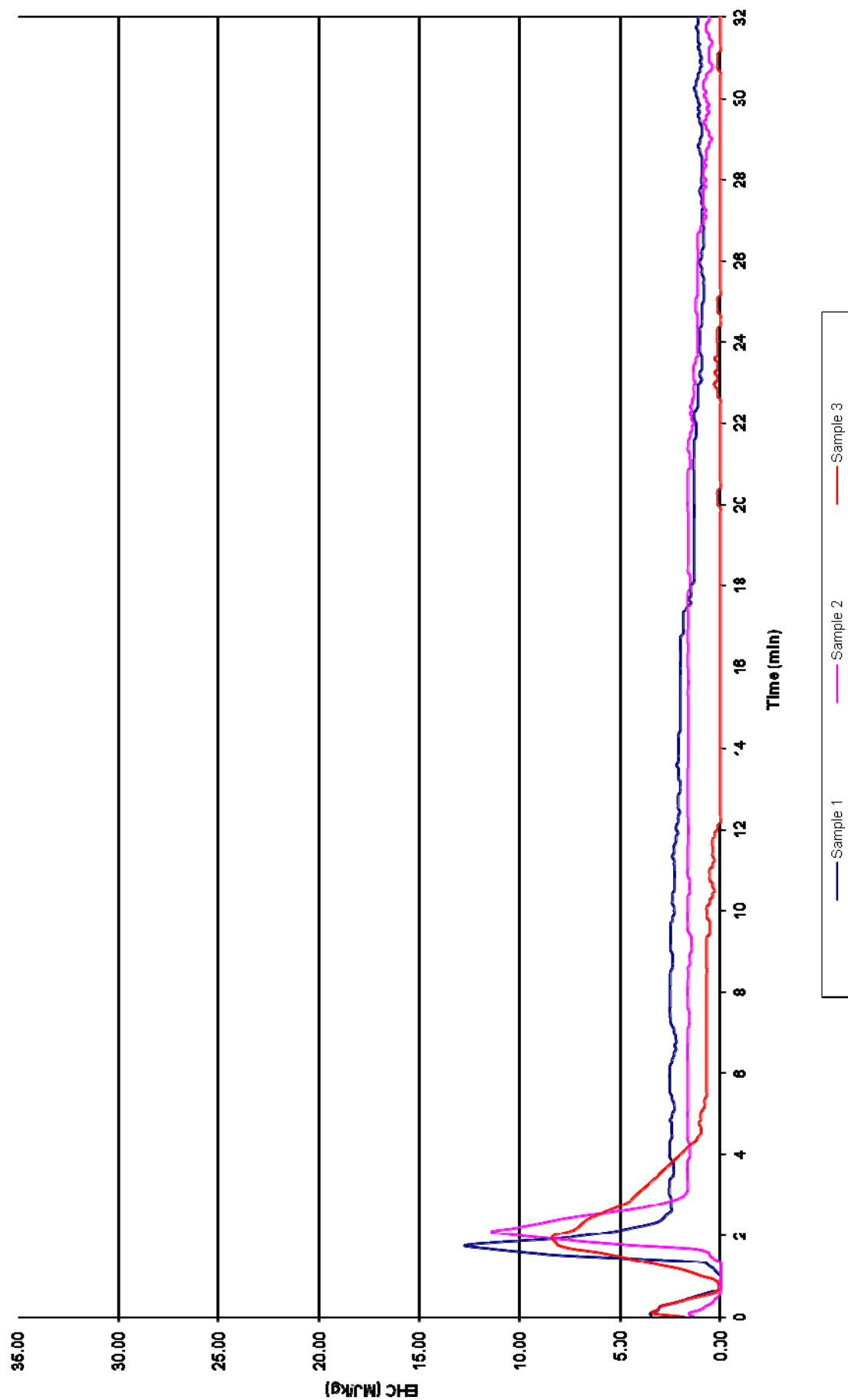
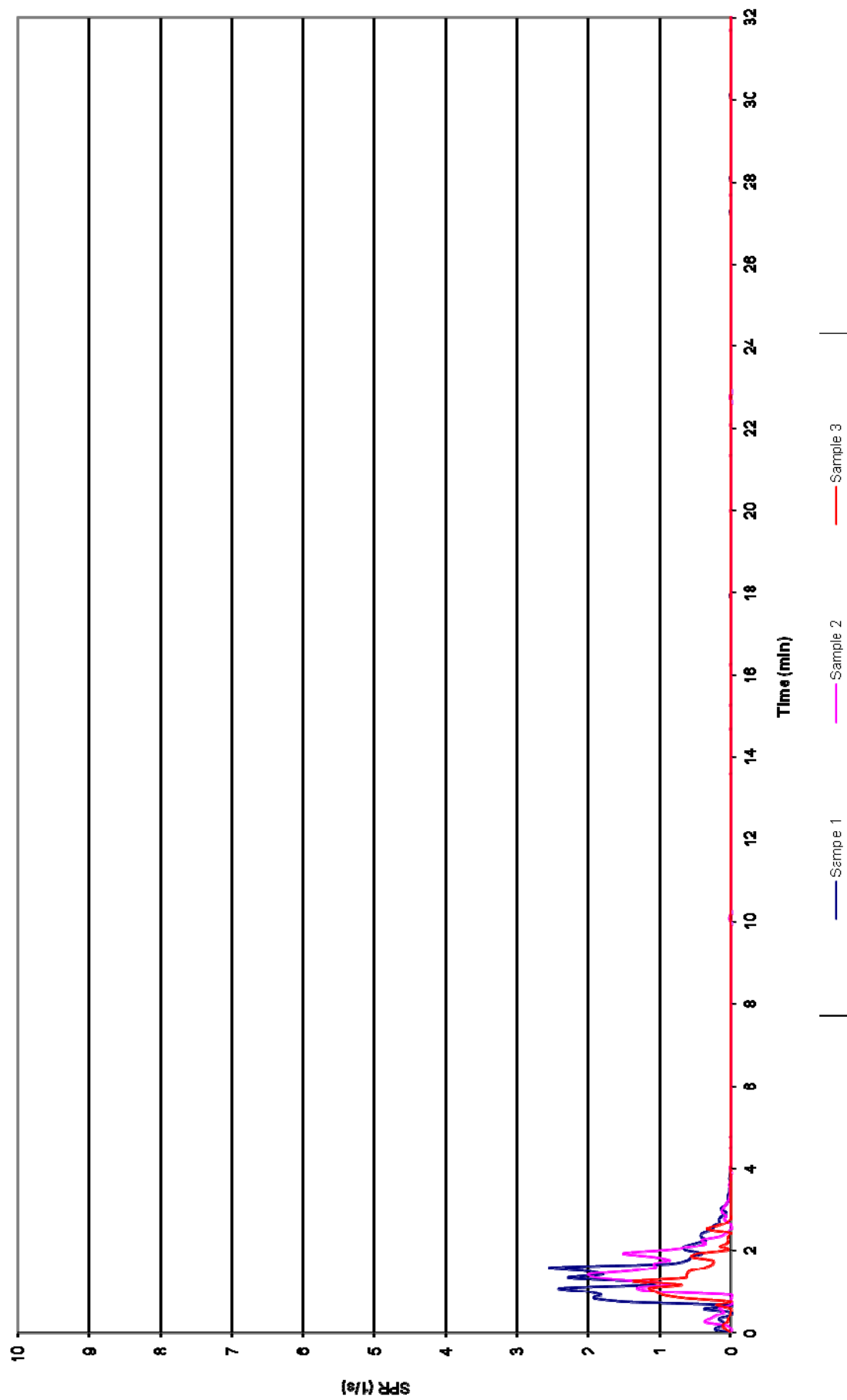
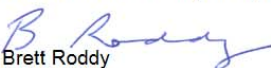



Figure 3 – Rate of smoke production per unit area



Certificate of Assessment 1-1850

<i>Certificate of Assessment</i>	
NKI6989	No. 1850
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<p>This is to certify that the specimen described below was tested by the CSIRO Division of Materials Science and Engineering in accordance with International Standard ISO 5660-1:2002 Reaction-to-fire tests – Heat release, smoke production and mass loss rate – Part 1: Heat release rate (cone calorimeter method) and Part 2: Smoke production rate (dynamic measurement), at 50 kW/m², on behalf of:</p>	
	Forman Building Systems Limited 20 Vestey Drive Mt. Wellington AUCKLAND NEW ZEALAND
<p>A full description of the test specimen and the complete test results are detailed in the Division's sponsored investigation report numbered FNKI 10865.</p>	
<p>SAMPLE IDENTIFICATION: Fibreglass Pipe Section Foil-faced</p>	
<p>DESCRIPTION OF SAMPLE:</p>	
	<p>The sponsor described the tested specimen as glass-fibre pre-formed pipe section with aluminium foil facing. The foil facing was adhered onto the glass-fibre using polyvinyl acetate (PVA) adhesive at an application rate of 1 m²/L.</p>
	<p>Nominal thickness of foil facing: 215-µm Nominal thickness of glass-fibre: 50-mm Nominal total thickness: 50-mm Nominal density of glass-fibre: 80 kg/m³ Nominal mass of foil facing: 220 g/m² Colour: silver (foil); pink (glass-fibre)</p>
<p>SAMPLE CLASSIFICATION:</p>	
	<p>Group Number: Group 1 (In accordance with Verification Method C/VM2 Appendix A Paragraph A1.2 and Paragraph A1.3 of the New Zealand Building Code.)</p>
	<p>Average specific extinction area: 326.6 m²/kg (In accordance with Verification Method C/VM2 Appendix A Paragraph A1.2 of the New Zealand Building Code.)</p>
<p>As a requirement of the New Zealand Building Code, Appendix CM2, Appendix A (Normative): Establishing Group Numbers for lining materials, Clause A1.1 (b), substrates of foil-faced materials must be deemed non-combustible to be appropriate for Group Number prediction using data obtained in accordance with ISO 5660.</p>	
<p>The substrate for this material, Owens Corning glasswool insulation, had been tested to AS/NZS 1530.1:1994 Combustibility test for materials (CSIRO Report No. FNC10854, 26 Sept. 2013) and deemed non-combustible.</p>	
Testing Officer:	Heherson Alarde
Date of Test:	24 July 2013
Issued on the 17 th day of September 2013 without alterations or additions.	
 Brett Roddy Team Leader, Fire Testing and Assessments	
	
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