

Test on rigid PVC-based rib-reinforced plastic material for concrete formwork at 50-kW/m² irradiance in accordance with AS/NZS 3837:1998

Fire Testing Report

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Report Number: FNK 11034

Job Number: NK7079

Date: 4 February 2014

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Client: Permaform Australia Pty Ltd

Commercial-in-confidence

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Test Report Details

Document: Fire Testing Report Test Standard: AS/NZS 3837:1998 at 50-kW/m² irradiance
Client: Permaform Australia Pty Ltd Proposal number: NK7079

Test Report Status and Revision History

VERSION	STATUS	DATE	DISTRIBUTION	COMMENT	FORMAT
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Revision B	Final for issue	4 February 2014	CSIRO; Permaform Australia Pty Ltd		PDF

Test Report Authorisation

AUTHOR	REVIEWED BY	AUTHORISED BY
Alarde, Heherson  4 February 2014	Collins, Russell  4 February 2014	Roddy, Brett  4 February 2014

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1 Summary

Sponsored Investigation Report Number FNK 11034

Test on rigid PVC-based rib-reinforced plastic material for concrete formwork at 50-kW/m² irradiance in accordance with AS/NZS 3837:1998

2 Test Details

2.1 Sample Identification

Permaform

2.2 Sponsor

Permaform Australia Pty Ltd
6A Barrow Pl
QUEANBEYAN NSW 2620
AUSTRALIA

2.3 Manufacturer

Permaform Australia Pty Ltd
6A Barrow Pl
QUEANBEYAN NSW 2620
AUSTRALIA

2.4 Job Number

NK7079

2.5 Test Date

21 January 2014

2.6 Description of Sample

The sponsor described the tested specimen as rigid PVC-based, hollow-type rib-reinforced plastic material comprising of two PVC panel facings with internal reinforced PVC ribs, used as permanent formwork for concrete walls. The rigid PVC profile formed the exposed face of the tested specimen. The specimen contained flame-retardant additives.

Nominal thickness of PVC:	2.50 mm
Nominal thickness of concrete block:	47 mm
Nominal total thickness:	50 mm
Nominal density of PVC:	1300 kg/m ³
Nominal total mass:	97.13 kg/m ²
Colour:	beige (PVC)

2.7 Documentation

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

- Test Agreement and form FTAF33 dated 30 October 2013.

3 Method

3.1 Conditioning of Specimens

Prior to the test, the specimens were conditioned to constant mass at a temperature of $23 \pm 2^\circ\text{C}$ and a relative humidity of $50 \pm 10\%$.

3.2 Test Method

Tests were performed in accordance with Australian/New Zealand Standard 3837:1998 Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter. All test specimens were exposed in the horizontal orientation with the standard pilot operating.

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-m^2 . The specimens were restrained with a wire grid which further reduced the test surface area to 0.0081 m^2 , 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.

Six specimens were tested at an irradiance level of 50-kW/m^2 .

The nominal exhaust system flow rate for all tests was $0.024\text{-m}^3/\text{s}$.

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

3.3 Departure from Standard

In performing heat release rate calibration to determine the orifice constant, C , an alternative procedure was employed as specified in Clause 10.2.4 of ISO 5660-1:2002(E) by burning a measured quantity of absolute ethanol.

3.4 Duration of Test

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

1. 2 minutes have passed since all flaming from the specimen ceased; and
2. the average mass loss over a 1-minute period has dropped below 150-g/m^2 ;
3. 60 minutes have elapsed; or
4. the specimen fails to ignite after a 10-minute exposure.

Note: The mass loss test end criterion was not used for this test.

4 Results and Observations

Observations

4.1.1 SPECIMEN 1

The specimen began to smoke after 10 seconds exposure to the test. The specimen ignited during the test. The test was terminated when two minutes had passed since all flaming from the specimen ceased.

4.1.2 SPECIMEN 2

The specimen began to smoke after 10 seconds exposure to the test. The specimen ignited during the test. The test was terminated when two minutes had passed since all flaming from the specimen ceased.

4.1.3 SPECIMEN 3

The specimen began to smoke after 10 seconds exposure to the test. The specimen ignited during the test. The test was terminated when two minutes had passed since all flaming from the specimen ceased.

4.1.4 SPECIMEN 4

The specimen began to smoke after 10 seconds exposure to the test. The specimen ignited during the test. The test was terminated when two minutes had passed since all flaming from the specimen ceased.

4.1.5 SPECIMEN 5

The specimen began to smoke after 10 seconds exposure to the test. The specimen ignited during the test. The test was terminated when two minutes had passed since all flaming from the specimen ceased.

4.1.6 SPECIMEN 6

The specimen began to smoke after 11 seconds exposure to the test. The specimen ignited during the test. The test was terminated when two minutes had passed since all flaming from the specimen ceased.

4.2 Results of Tests

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

Test Details:

Date of test: 21/01/14
 Test Report Date: 04/02/14
 Ethanol burn ('C' factors): 0.038418

Table 1 Results of test

	IRRADIANCE (kW/m ²)	TIME TO SUSTAINED BURNING (s)	TEST DURATION (s)	THICKNESS (mm)	SPECIMEN MASS (g)	MASS REMAINING (g)	MASS LOSS (g)	PERCENT OF MASS PYROLYSED (%)	AVERAGE RATE OF MASS LOSS (g/m ² ·s)	PEAK HRR (kW/m ²)	AVERAGE HRR (FIRST 60s AFTER IGN)	AVERAGE HRR (FIRST 180s AFTER IGN)	AVERAGE HRR (FIRST 300s AFTER IGN)	TOTAL HEAT RELEASED (MJ/m ²)	AVERAGE EHC (MJ/kg)	AVERAGE SPECIFIC EXTINCTION AREA (m ² /kg)
Sample 1	50	146	475	48.22	48.32	25.72	22.60	46.77	6.62	67.5	44.5	49.8	38.3	12.28	4.40	256.7
Sample 2	50	146	460	48.37	48.47	15.87	32.60	67.26	7.05	77.9	53.7	58.4	40.8	12.73	3.16	212.5
Sample 3	50	144	470	49.95	50.05	27.65	22.40	44.76	6.43	66.3	36.3	47.8	37.5	11.85	4.29	248.6
Sample 4	50	129	455	48.47	947.35	915.4	32.00	3.38	6.03	67.9	35.6	49.3	36.0	11.32	2.86	174.9
Sample 5	50	162	485	49.17	949.47	927.1	22.40	2.36	7.37	61.4	38.3	40.9	31.8	10.34	3.74	256.5
Sample 6	50	140	470	48.1	973.19	950.1	23.10	2.37	7.43	67.0	37.1	47.6	33.8	10.65	3.73	271.5
Mean		144.5	469.2		502.8	477.0	25.9	27.8	6.8	68.0	40.9	49.0	36.4	11.5	3.7	236.8
SD		10.7	10.7		497.3	497.3	5.0	28.6	0.6	5.4	7.0	5.6	3.3	0.9	0.6	36.2

Figure 1 Heat Release Rate (HRR)

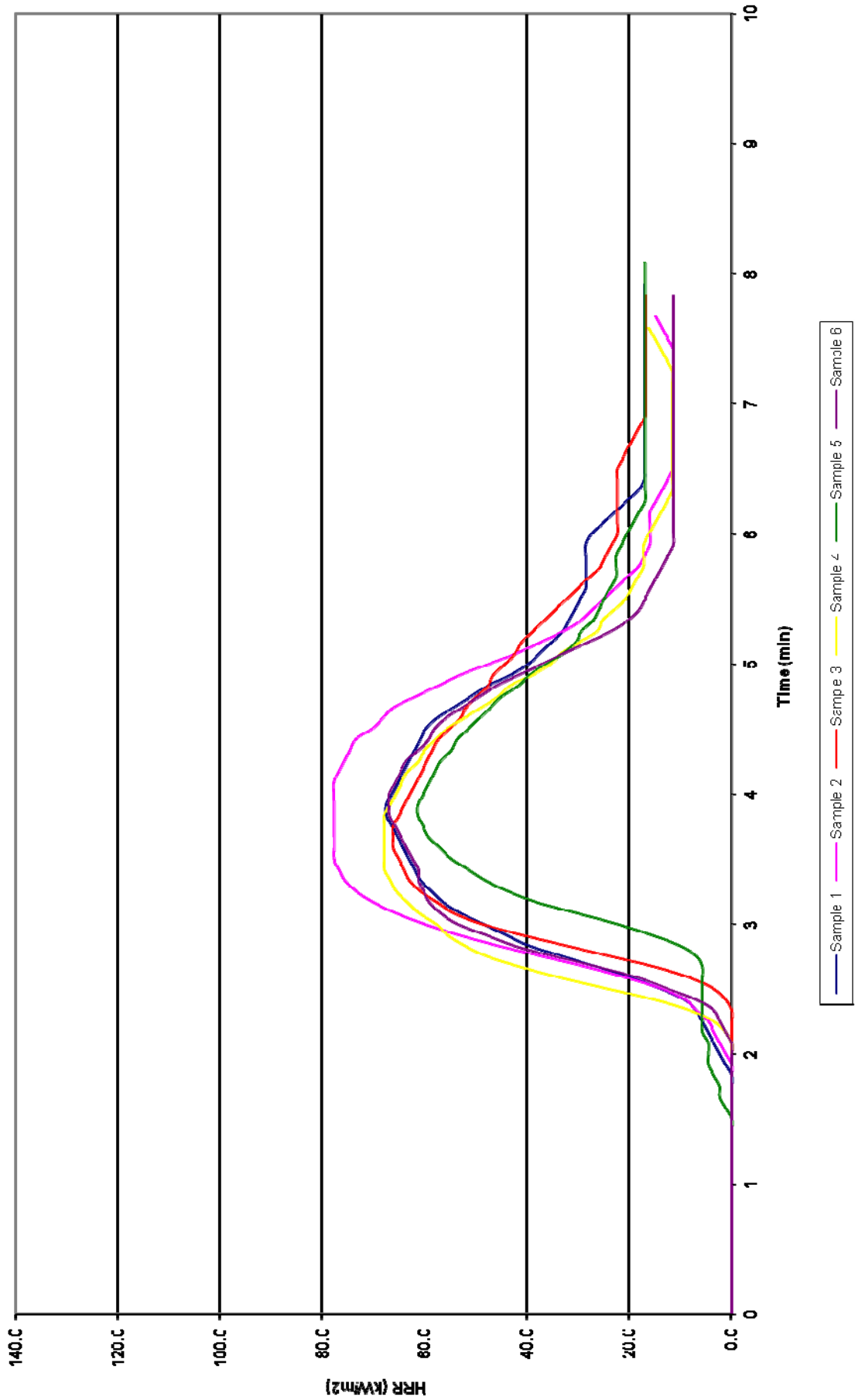
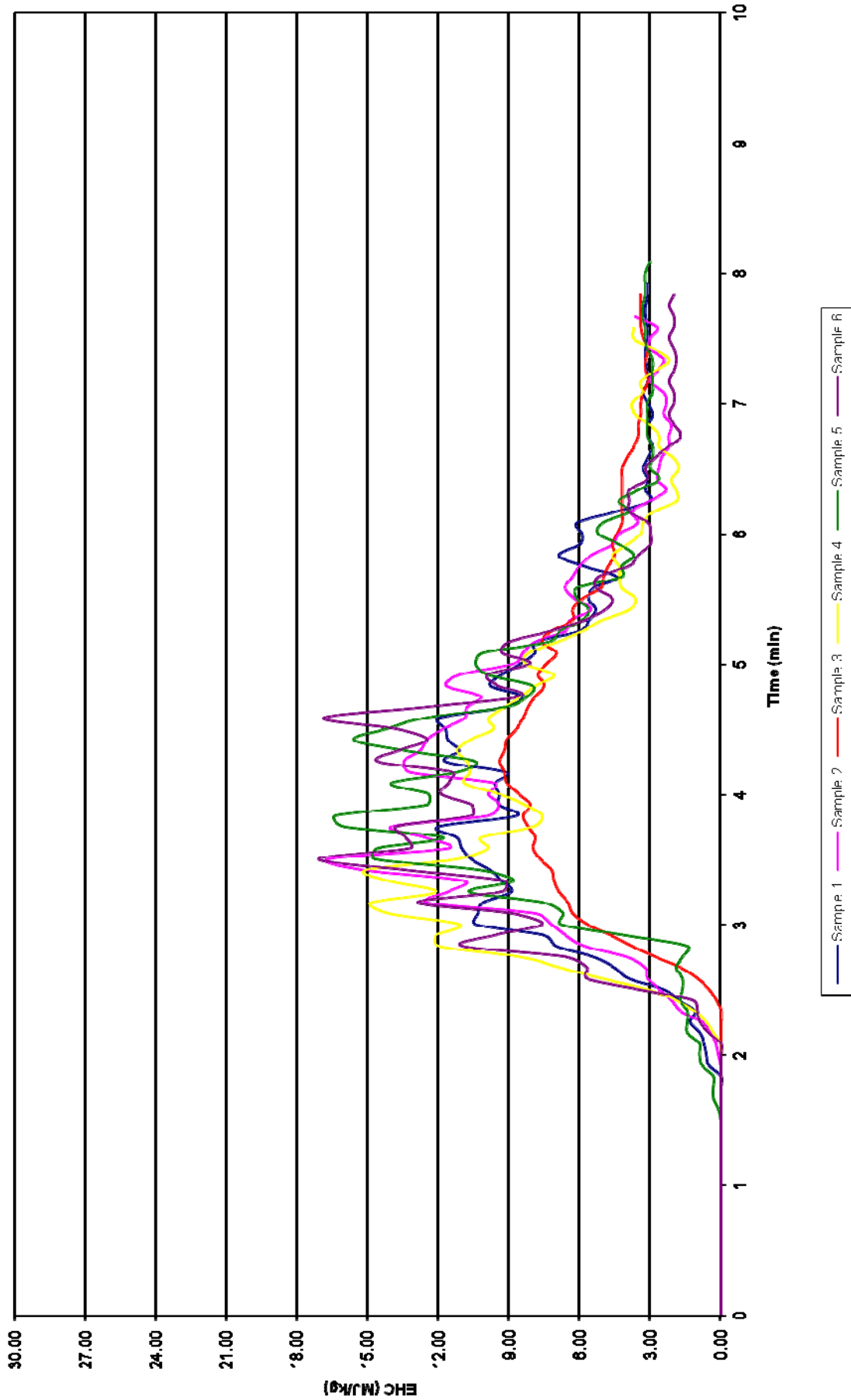


Figure 2 Effective Heat of Combustion (EHC)



5 Assessment Certificate

Figure 3 Certificate of Assessment 1950

Certificate of Assessment

Quote No.: NK7079

No. 1950
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This is to certify that the specimen described below was tested by the CSIRO Division of Materials Science and Engineering in accordance with Australian/ New Zealand Standard 3837, Method of test for heat and smoke release rates for materials and products using an oxygen consumption calorimeter, 1998, at 50 kW/m², on behalf of:

Permaform Australia Pty Ltd
6A Barrow Pl
QUEANBEYAN NSW 2620
AUSTRALIA

A full description of the test specimen and the complete test results are detailed in the Division's sponsored investigation report numbered FNK 11034.

SAMPLE IDENTIFICATION: Permaform

DESCRIPTION OF SAMPLE: The sponsor described the tested specimen as a rigid PVC-based, hollow-type rib-reinforced plastic material comprising of two PVC panel facings with internal reinforced PVC ribs, used as permanent formwork for concrete walls. The rigid PVC profile formed the exposed face of the tested specimen. The specimen contained flame-retardant additives.


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Nominal total thickness:	50 mm
Nominal density of PVC:	1300 kg/m ³
Nominal total mass:	97.13 kg/m ²
Colour:	beige (PVC)

SAMPLE CLASSIFICATION: Group Number: Group 1
(In accordance with Specification A2.4 of the Building Code of Australia.)

Average specific extinction area: 236.8 m²/kg
(Refer to Specification C1.10 section 4(c) of the Building Code of Australia.)


Testing Officer: Heherson Alarde Date of Test: 21 January 2014

Issued on the 4th day of February 2014 without alterations or additions.


Brett Roddy
Team Leader, Fire Testing and Assessments

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