



Reaction to fire test report

Test standard: Ad hoc ISO 13785-1:2002 Part 1 – Intermediate-scale

Test sponsor: Cladding Safety Victoria (CSV)

System: Cassetted aluminium composite panel (ACP) – with a 45% PE core – wall system

Job number: RTF240032

Test date: 20 June 2024 Revision: RR1.0

Quality management

Revision	Date	Information about the report			
RR1.0	3 December 2025	Description	Initial issue		
		Name	Prepared by	Reviewed by	Authorised by
			Signature		

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1. Introduction

This report documents the findings of an ad-hoc reaction to fire test for a Cassetted aluminium composite panel (ACP) – with a 45% PE core – wall system performed on 20 June 2024. The test was based off some general requirements of ISO 13785-1:2002 with an additional wind component.

Warringtonfire performed the test at the request of the test sponsor listed in Table 1.

Table 1 Test sponsor details

Test sponsor	Address
Cladding Safety Victoria (CSV)	717 Bourke Street Docklands VIC 3808 Australia

2. Test specimen

2.1 Schedule of components

Table 2 describes the test specimen and lists the schedule of components. These were provided by the representatives of the test sponsor and surveyed by Warringtonfire. All measurements were done by Warringtonfire – unless indicated otherwise.

Table 2 Schedule of components

Item	Description				
Cladding					
1.	Item name	FR aluminium composite panel (ACP)			
	Product name				
	Manufacturer/Supplier				
	Batch no.	09/09/2016			
	Material	The material was nominated as panels consisting of two layers of aluminium sheets sandwiching a layer (core) with 45% polyethylene (PE) and inorganic filler. Analysis conducted by the analytical centre of UNSW showed that the core consisted of polyethylene-vinyl acetate (PEVA) - found to be 43.9 % w/w - whilst the remainder of the material was found to be 45.3 % magnesium hydroxide, 6.1 % calcium carbonate and 4.8 % other inert material.			
	Size	Total panel thickness – 4.0 mm Core thickness –2.9 mm Skin thickness – 0.5 mm (both) Refer to Appendix A for individual panel sizing details.			
	Areal density	Full panel – 7.6 kg/m ² as nominated			
	Colour	<table border="1"> <tr> <td>Skins</td> <td>Front skin – Dark brown oak pattern Back skin – Matte white</td> </tr> <tr> <td>Core</td> <td>Light grey</td> </tr> </table>	Skins	Front skin – Dark brown oak pattern Back skin – Matte white	Core
Skins	Front skin – Dark brown oak pattern Back skin – Matte white				
Core	Light grey				
2.	Item name	FR Plasterboard			
	Product name				
	Batch no.	14/05/2024			
	Size	1200 mm wide × 3600 mm long × 16 mm thickness			

Item	Description	
Framing		
3.	Item name	Test rig frame - 90 × 90 SHS and 200 × 90 PFC frame
	Material	Steel
	Manufacturer	██████████
	Size	90 mm × 90 mm × 5 mm thick and 200 mm × 90 mm × 10 mm thick – refer to Figure 4.
4.	Item name	Top track/base track
	Material	Steel
	Size	92 mm × 3600 mm × 40 mm, 1.15 mm B.M.T.
5.	Item name	Steel stud
	Size	92 mm × 3600 mm × 40 mm, 1.15 mm B.M.T.
	Installation	Studs at every 600 mm
6.	Item name	Steel nogging
	Size	92 mm × 580 mm × 40 mm, 1.15 mm B.M.T.
	Installation	Running horizontally at about 1800 mm height
7.	Item name	Aluminium cassette angles
	Size	20 mm × 20 mm × 3600 mm, 1.6 mm thick
	Installation	Used to secure the plasterboard within the ACPs. The angle was screw fixed to both ACPs and the plasterboard using screws (item 10 and 11).
8.	Item name	Curtain wall bracket
	Size	140 mm deep (13 mm thick) × 137 tall (13 mm thick) × 76 mm wide, 100 mm deep (9 mm thick) × 100 tall (9 mm thick) × 200 mm wide
	Installation	Used to secure the studs to the test rig using tek screws (item 11).
Sealant/Adhesive		
9.	Item name	Weathering sealant – silicone sealant
	Product name	██████████
	Manufacturer/Supplier	██████████████████
	Usage	Placed at ACP edges
Fixings		
10.	Item name	Wafer head screws
	Size	10g × 30 mm long
	Manufacturer	██████████
	Installation	Used to fix FR aluminium composite panel to the aluminium cassette angles
11.	Item name	Tek screws
	Size	10 - 16g × 50 mm long
	Manufacturer	██████████
	Installation	Used to fix plasterboard to the studs and aluminium cassette angles
12.	Item name	Aluminium rivets
	Size	Ø4 mm
	Usage	To fix the studs to the noggings.

Item	Description
Installation method	
Test rig	The test rig frame was the main support for the test specimen. The test specimen, interconnected through studs and noggings, was fixed to the test ring using curtain wall brackets (item 8) and fixings (item 10) – see Figure 1, 2 and 4.
Cassette wall	The cassetted wall was composed of plasterboard (item 2), top/base tracks (item 4), studs (item 5), noggings (item 6) and the diagonal supports, which were screw fix together using aluminium rivets (item 12). The FR plasterboard (item 2) were fixed to the studs using tek screws (item 11). The aluminium cassette angles (item 7) were fixed to the FR plasterboard (item 2) using tek screws (item 11).
Cladding	The exposed face of the specimen was clad with cassetted ACPs (item 1) that were fixed to aluminium cassette angles (item 7) using wafer head screws (item 10) at about 325 mm centres.

3. Test procedure

Table 3 details the test procedure for this reaction to fire test.

Table 3 Test procedure

Detail	
Statement of compliance	The ad-hoc test which was based off ISO 13785-1:2002 – was performed to determine the reaction to fire performance of an external wall cladding when exposed to heat from a simulated external fire with flames impinging directly upon the facade with an added wind component. The test utilises a burner used in ISO 13785-1:2002.
Sampling / specimen selection	The laboratory was not involved in sampling or selecting the test specimen for the reaction to fire test. The results obtained during the test only apply to the test samples as received and tested by Warringtonfire.
Test duration	60 minutes
Instrumentation and equipment	<ul style="list-style-type: none"> • 21 mineral insulated metal sheathed (MIMS) Type K thermocouples with an overall diameter of 1.5 mm with the measuring junction insulated from the sheath were positioned 60 mm in front of the face of the test specimen. Refer to Figure 1 and Figure 2 for details on positioning. • 8 mineral insulated metal sheathed (MIMS) Type K thermocouples with an overall diameter of 1.5 mm inserted through the plasterboard from the unexposed side to the mid-depth of the ACP cassette cavity. Refer to Figure 2 for details on positioning. • Temperatures above and below the cladding were measured by seven 100 mm × 100 mm × 0.7 mm plate thermocouples with mineral insulated metal sheathed (MIMS) Type K thermocouples with an overall diameter of 1 mm with the measuring junction electrically insulated from the sheath. The thermocouple hot junction was fixed to the geometric centre of the plate by a small steel strip made from the same material as the plate. The plate thermocouples included 97 mm × 97 mm × 10 mm inorganic insulation pads. Before the first use of the plate thermocouples, they were aged by being exposed to heat in a fire-resistance test furnace for 90 min under the standard temperature / time curve. Refer to Figure 1 and Figure 2 for details of the positioning. • The fire source was a propane (95% purity) gas burner 1.2 m long × 0.1 m deep × 0.15 m tall. The burner was placed on the floor next to the specimen. • Airflow across the front of the specimen was provided by a square array of 4-off pedestal fans. 3 blades with a fan diameter of 750 mm. The centre of the fans was located at the approximate heights of 1.5 m and 2.3 m from the floor and 0.5 m and 1.3 m from the guide wall. The fans were at the settings that provided the airflow listed in Table 4. • A guide wall – 2.8 m tall × 3.0 m wide was butted up to the specimen and cassetted wall was placed at a 45° angle in relation to the specimen. • The horizontal wind speed was measured using a hot wire anemometer.
Test procedure	<ul style="list-style-type: none"> • At least two minutes of baseline data was collected prior to burner ignition. Temperature data was collected at 5 s intervals. • The burner was ignited and the heat output from the burner was held at 300 kW. • 10 minutes after the burner ignition, the artificial wind source was turned on. • The burner was turned off 30 minutes after burner ignition. • 35 minutes after burner ignition, the artificial wind source was turned off. • Data was collected for the duration of the test – i.e. 60 minutes after burner ignition.

4. Test measurement and results

The results from the tests are summarized below. Photographs of the specimen are included in Appendix B.

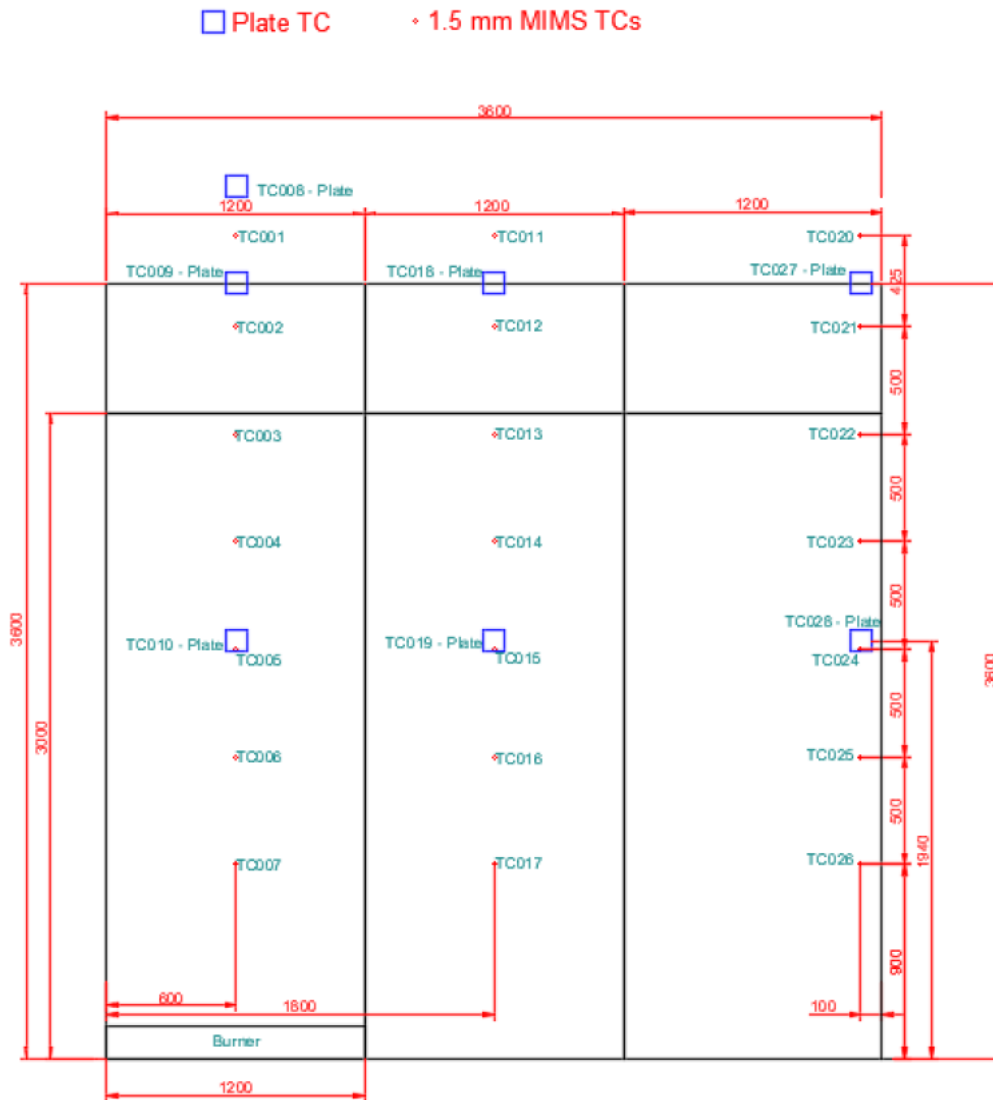


Figure 1 Instrumentation locations – front elevation

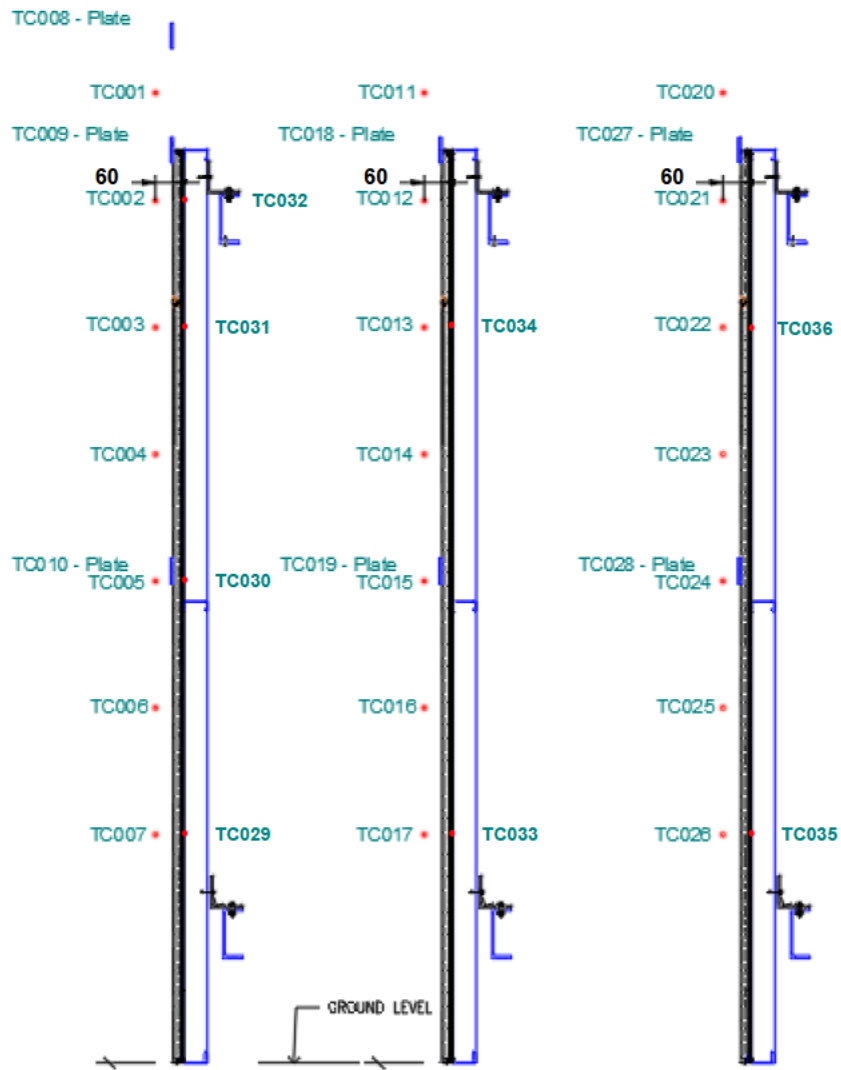


Figure 2 Instrumentation locations - sections

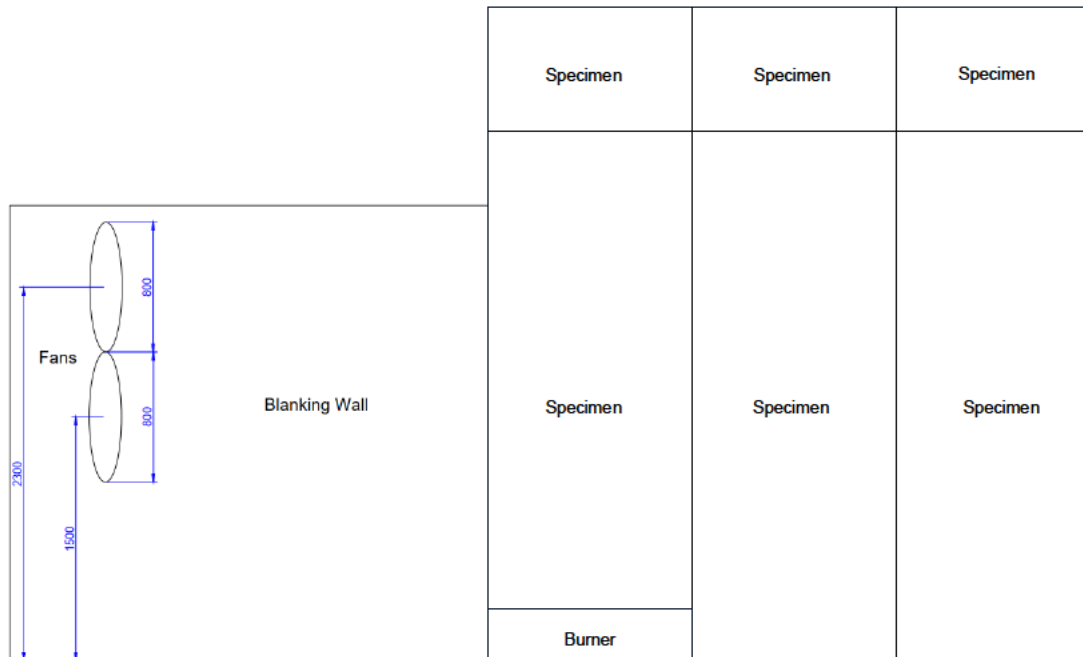


Figure 3 Instrumentation locations - Elevation

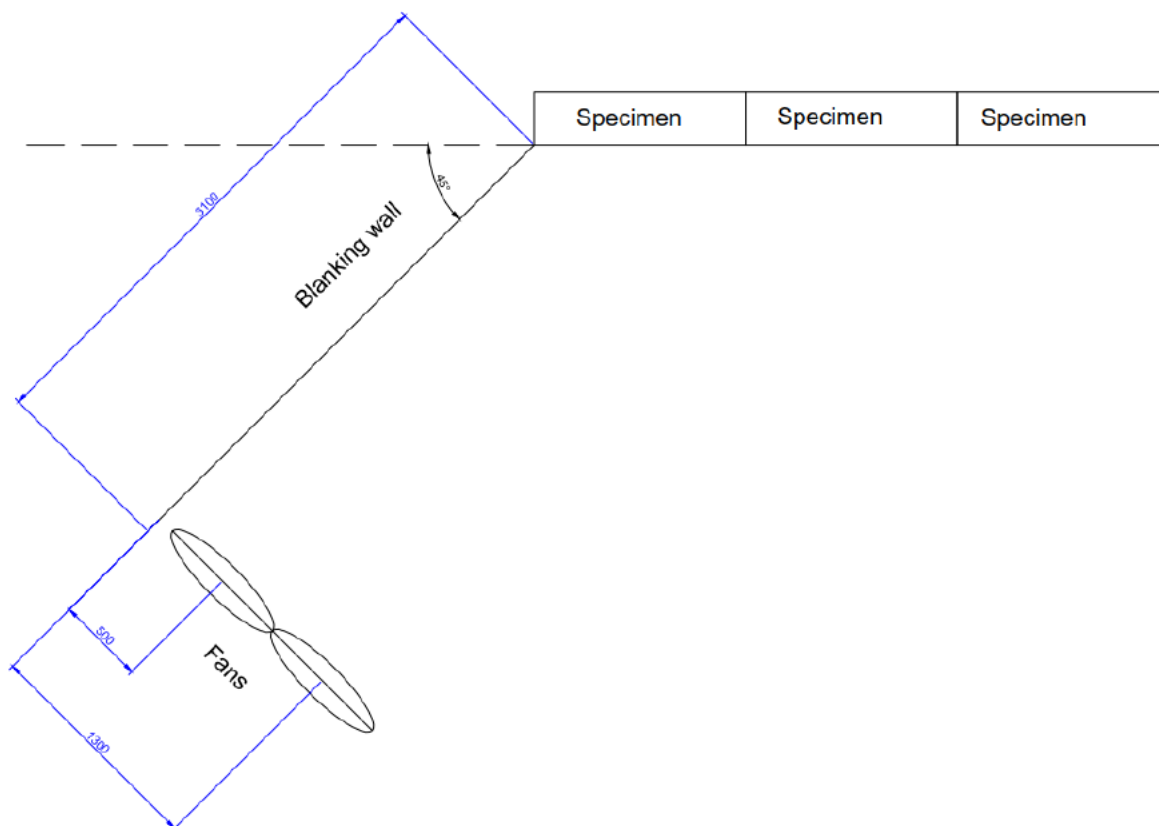


Figure 4 Instrumentation locations – Plan view

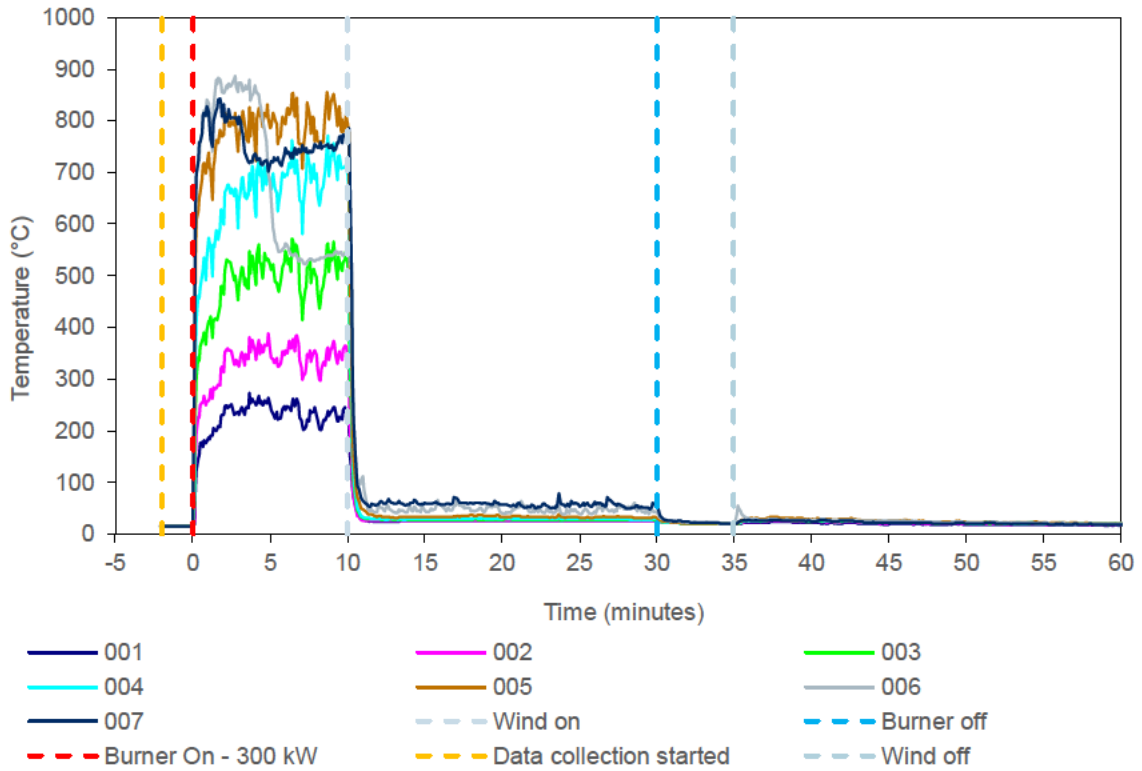


Figure 5 External temperature data collected by thermocouples placed 60 mm from the front face of the specimen – in-line with the burner

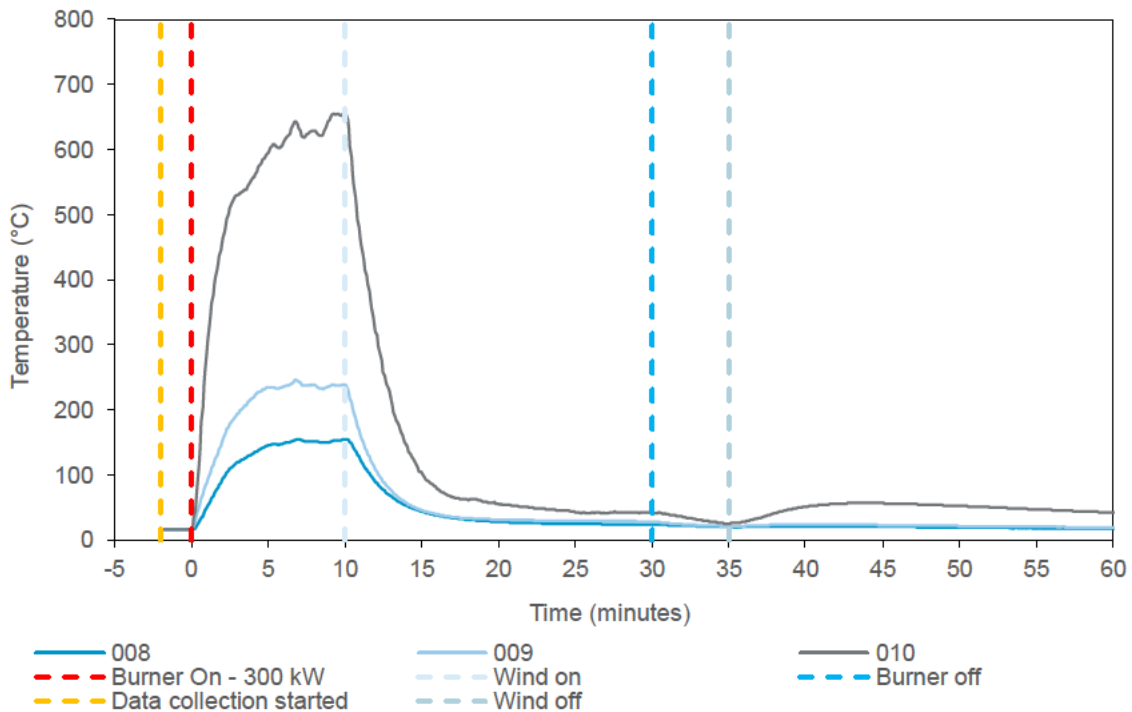


Figure 6 External temperature data collected by plate thermocouples in-line with ACP – in-line with the burner

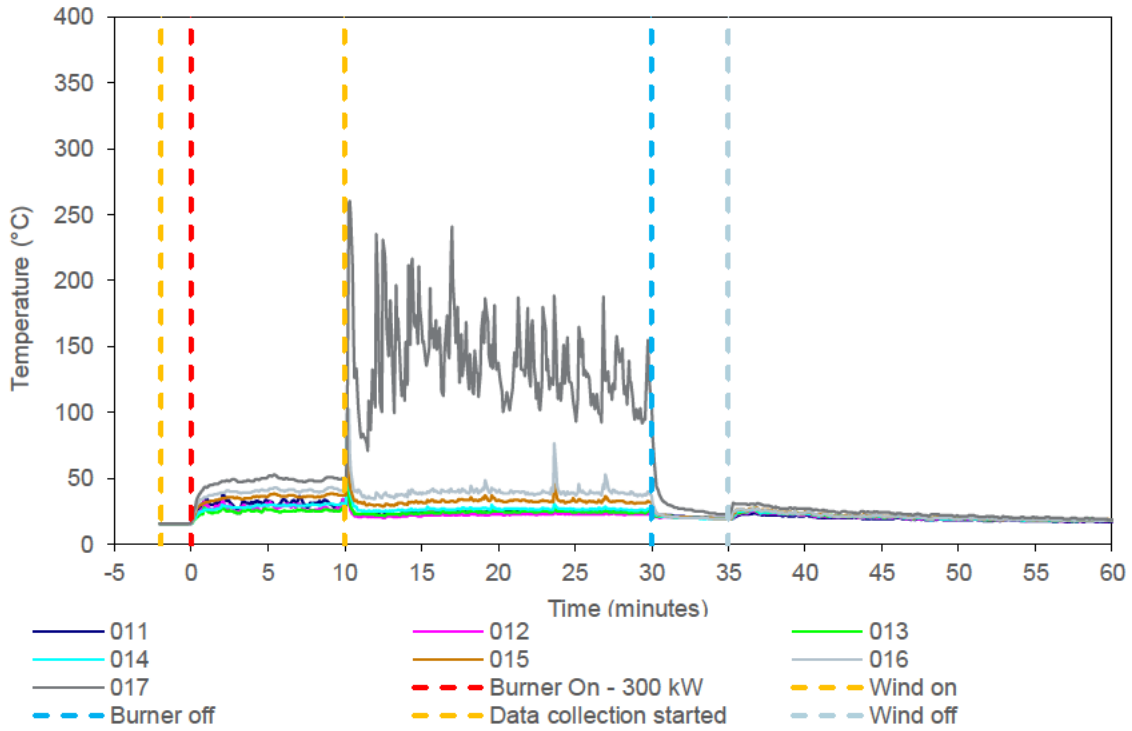


Figure 7 External temperature data collected by thermocouples placed 60 mm from the front face of the specimen – central module

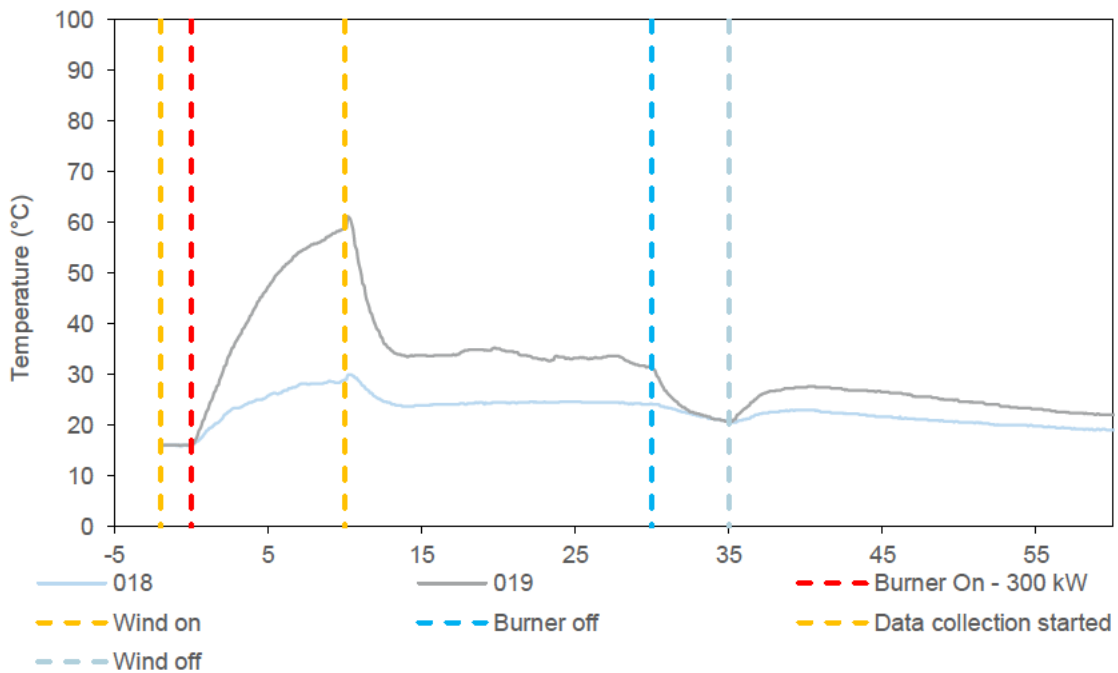


Figure 8 External temperature data collected by plate thermocouples in-line with ACP – central module

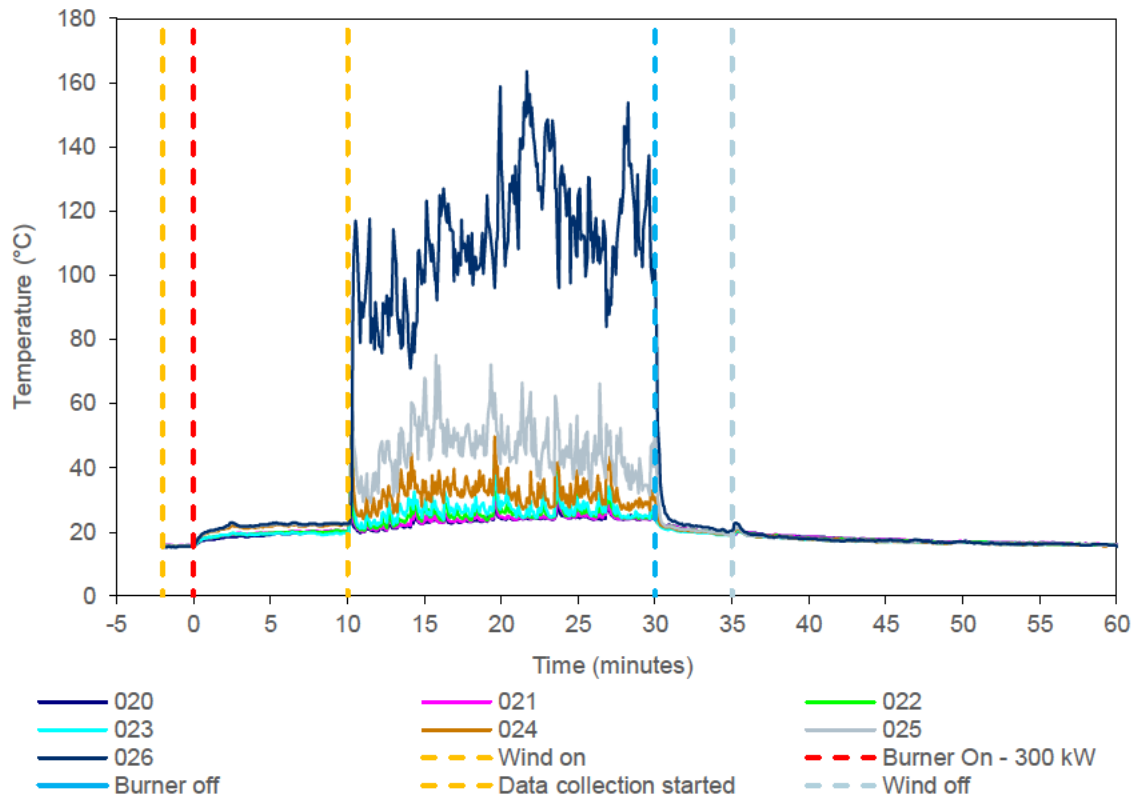


Figure 9 External temperature data collected by thermocouples placed 60 mm from the front face of the specimen – away from the burner

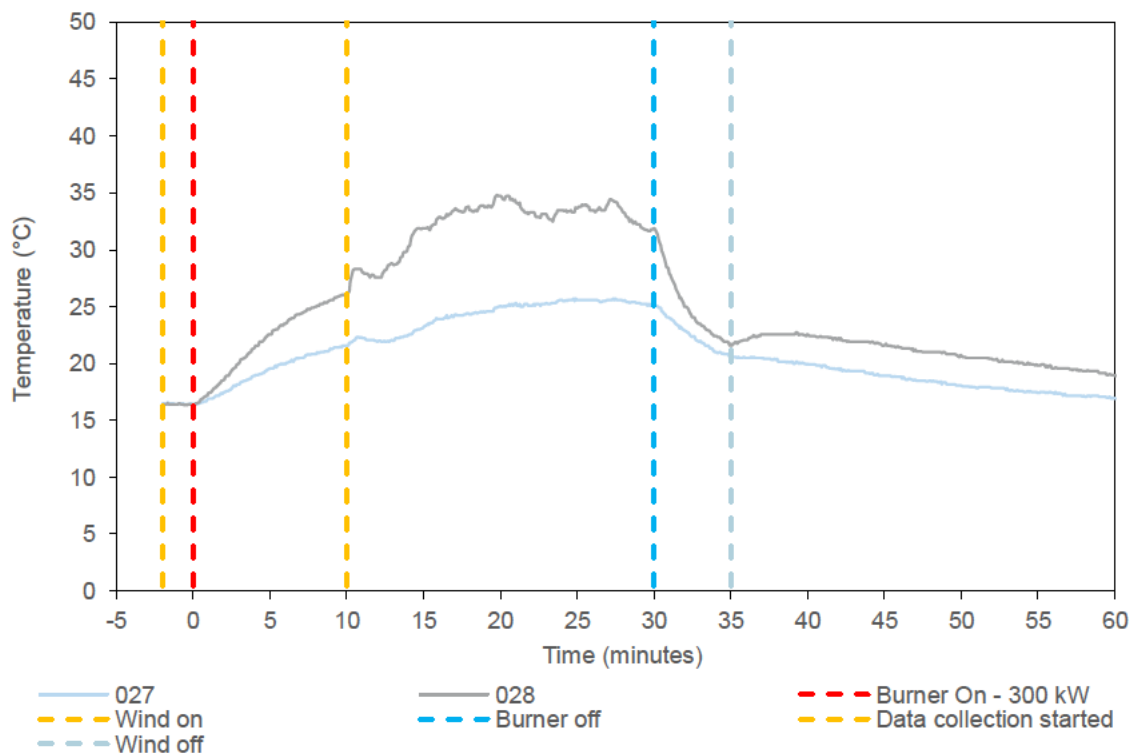


Figure 10 External temperature data collected by plate thermocouples in-line with ACP – away from the burner

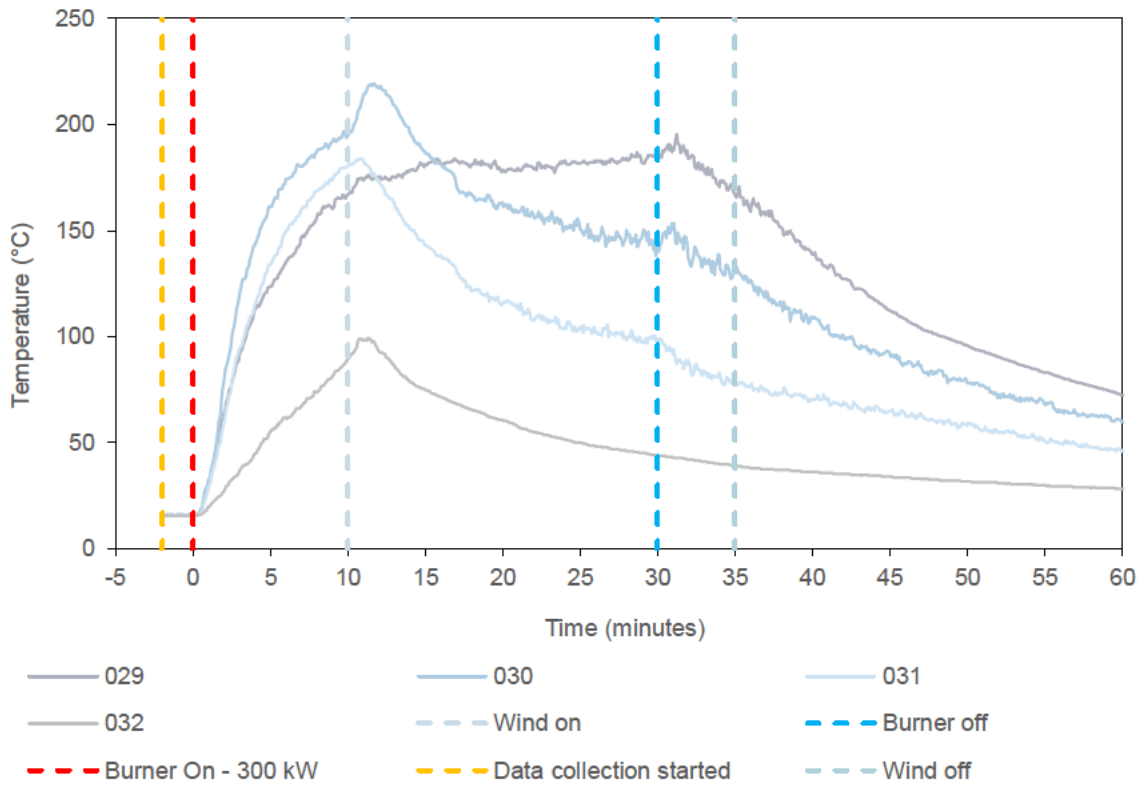


Figure 11 Internal temperature data collected by cavity thermocouples – in-line with the burner

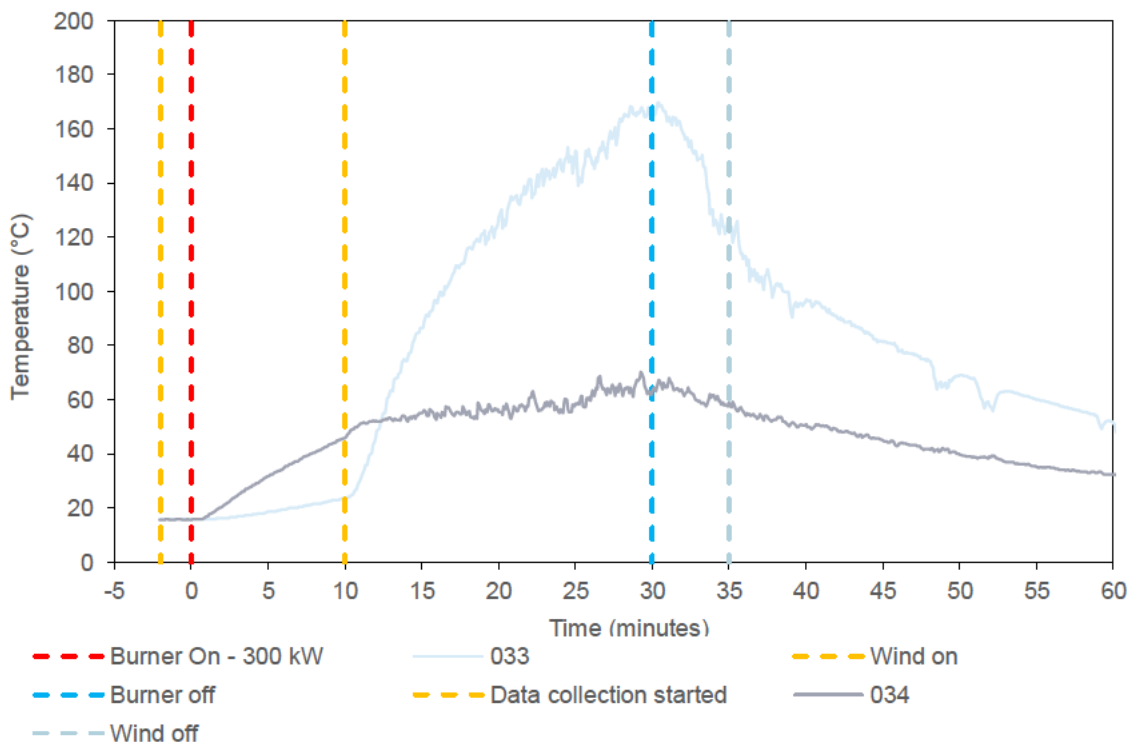


Figure 12 Internal temperature data collected by cavity thermocouples – central module

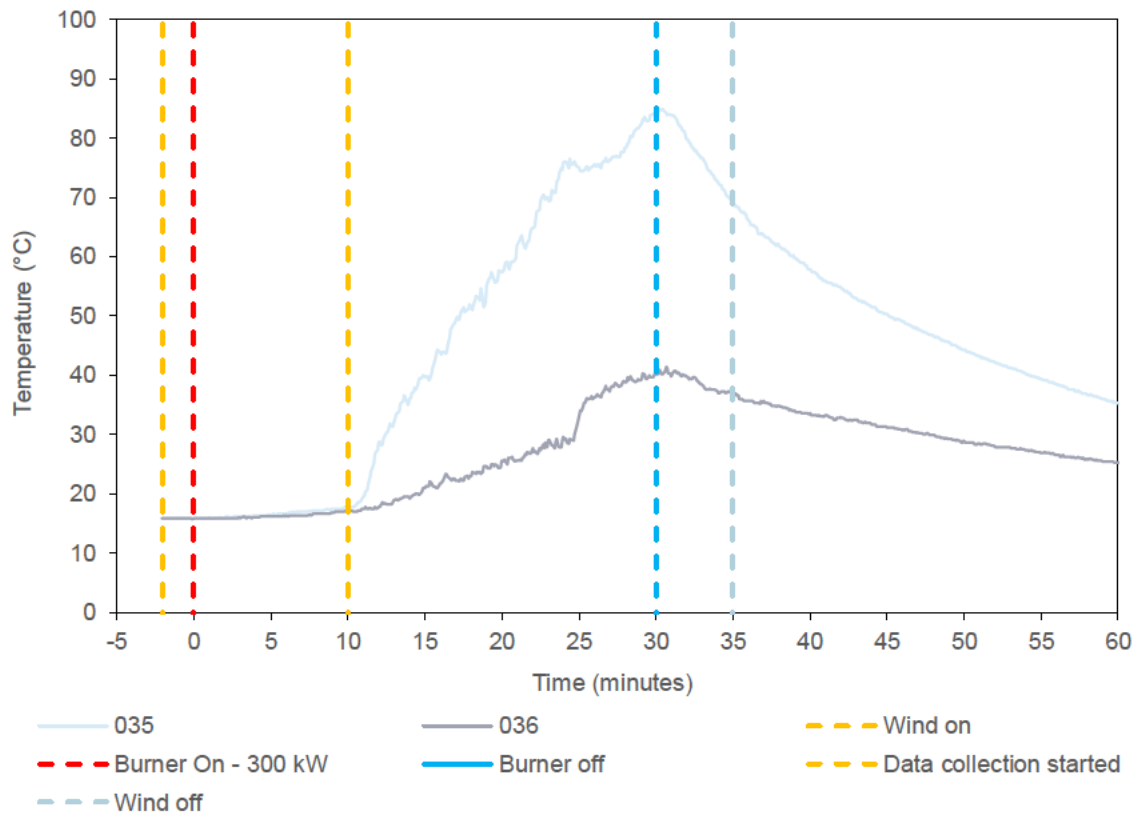


Figure 13 Internal temperature data collected by cavity thermocouples – away from the burner



Figure 14 Designation of section for the test observation

Table 4 shows the observations of any significant behaviour of the specimen during the test. Figure 14 shows the panel designations sighted in the observations.

Video recordings were also taken of the test. A copy of the video recording is available upon request by contacting Cladding Safety Victoria. The video of the test should be viewed in conjunction with the contents of this report.

Table 4 Test observations

Time		Des.	Observation
Min	Sec		
Pre-test			Within an hour period prior to the test period and data collection the wind was turned on and wind measurements and steady state conditions were recorded.
		A1	The wind speed just below TC005 was 0.8 – 1.9 m/s.
		A2	The wind speed just below TC015 was 0.9 – 2.3 m/s.
		A3	The wind speed just below TC024 was 1.9 – 2.4 m/s.
-2	00	All	Data logger started. Fan is turned off.
0	00	All	Burner on 300 kW. Stopwatch was started 2 sec before burner is on.
1	26	A1	Paint at the lower part was burned off.
2	29	A1	More paint burned off mid part
3	27	A4	Smoke observed from the back.

Time		Des.	Observation
Min	Sec		
5	39	A4	The middle part of A4 appeared to deform.
9	39	A1	Panel appeared to open up at area below TC6.
10	00	All	Fans turned on.
10	37	A1/A2	Flaming observed at the lower joint between A1 and A2.
11	25	A2	The lower part paint was burned off.
13	46	A2	The lower part appeared to open up.
14	37	A1	Smoke emission observed from A1 between TC7 and TC5.
17	49	A2/A3	Flaming observed at the lower joint between A2 and A3.
18	41	A2	The opened up area reached to the lower right edge of A2.
19	56	A3	The area close to the lower left edge deformed and part of the paint was burned off.
22	14	A1	The lower right corner opened up.
30	00	All	Burner was turned off.
30	30	A2/A3	Flaming observed at the joint between A2 and A3 at the lower part.
32	41	All	No flaming observed.
35	00	All	Fans turned off.
60	00	All	Test ended.

5. Application of test results

5.1 Test limitations

The results of these fire tests may be used to directly assess fire hazard, but it should be recognised that a single test method will not provide a full assessment of fire hazard under all fire conditions.

These results only relate to the behaviour of the specimen of the element of construction under the particular conditions of the test. They are not intended to be the sole criteria for assessing the potential fire performance of the element in use, and they do not necessarily reflect the actual behaviour in fires.

5.2 Variations from the tested specimen

This report details methods of construction, the test conditions and the results obtained when the specific element of construction described here was tested following the procedure outlined in Table 3. Any significant variation with respect to size, construction details, loads, stresses, edge or end conditions, other than that allowed under the field of direct application in the relevant test method, is not covered by this report.

It is recommended that any proposed variation to the tested configuration should be referred to the test sponsor. They should then obtain appropriate documentary evidence of compliance from Warringtonfire for another accredited testing authority.

5.3 Uncertainty of measurements

Because of the nature of reaction to fire testing and the consequent difficulty in quantifying the uncertainty of measurements obtained from a reaction to fire test, it is not possible to provide a stated degree of accuracy for the result.

Appendix A Drawings of test assembly

The drawings of the test assembly in Figure 15 to Figure 18 were provided by the representatives of Warringtonfire. Dimensions, unless specified, are in mm. The Figure 17 was modified by Warringtonfire, where the locations of the Fixing Bracket and FR plasterboard were modified.

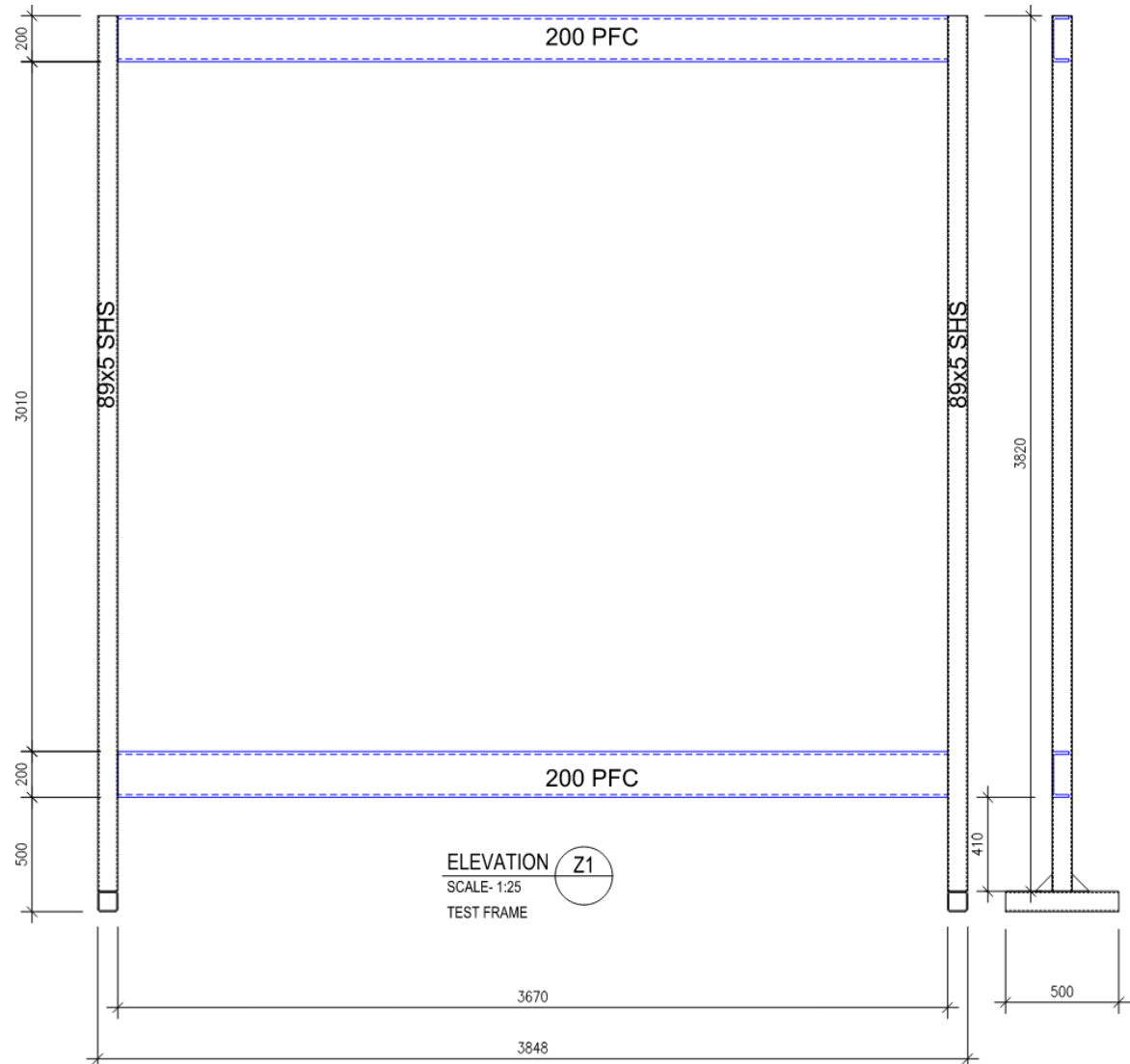
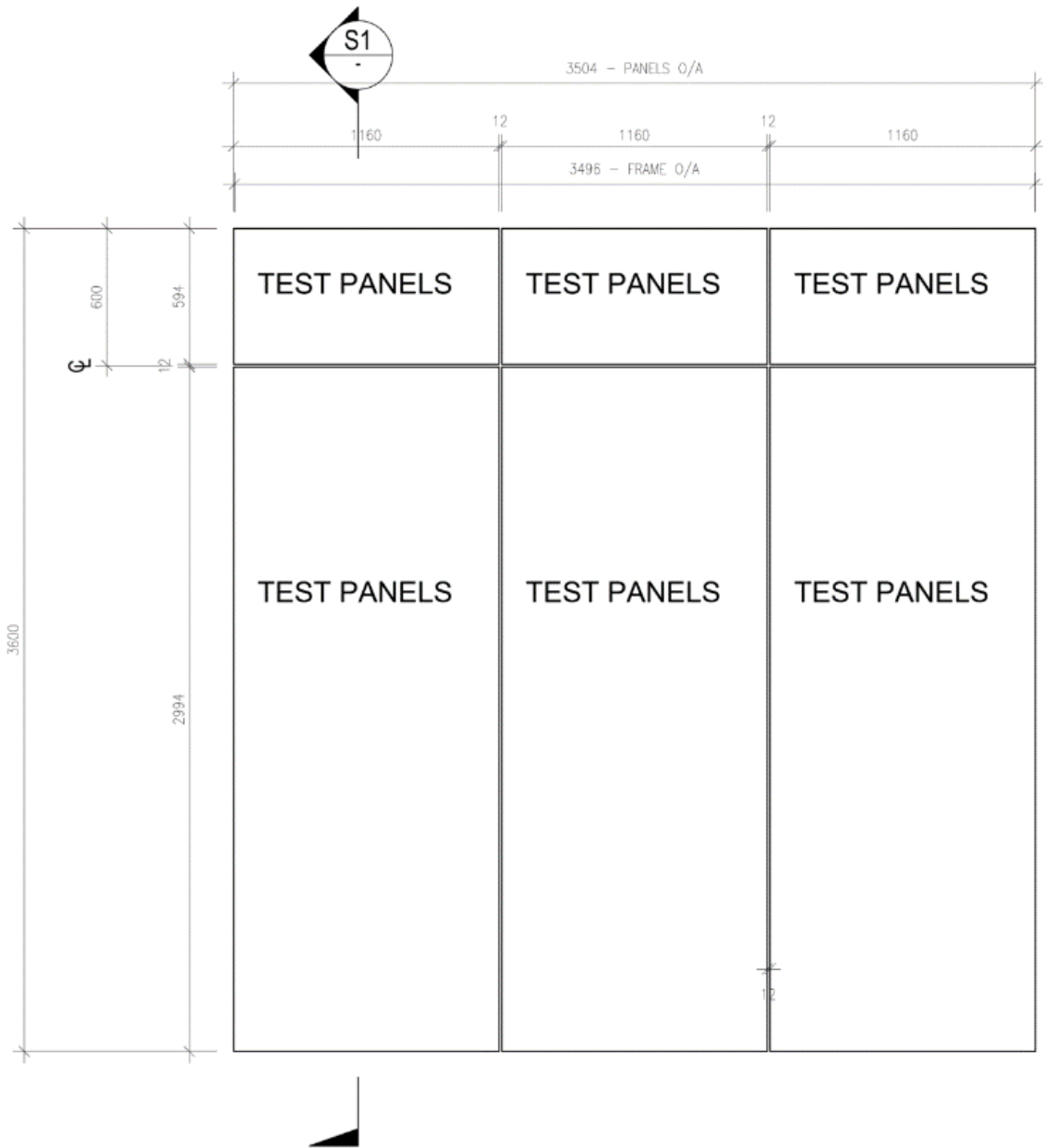


Figure 15 Elevation of rig support



ELEVATION X1
 SCALE- 1:25
 BLANK WALL PANELS TESTING

Figure 16 System assembly – Front view

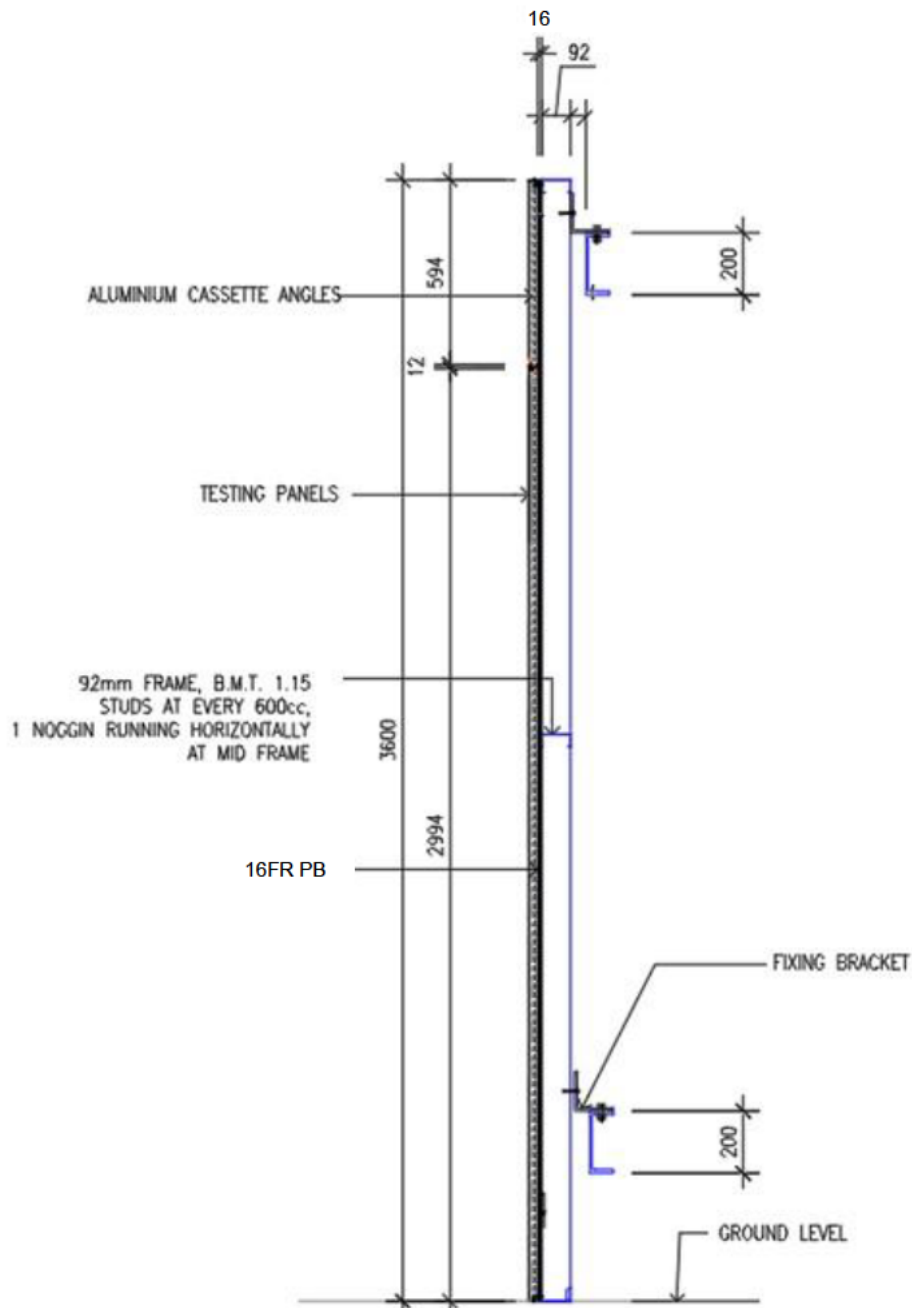


Figure 17 System assembly – vertical cross-sectional view

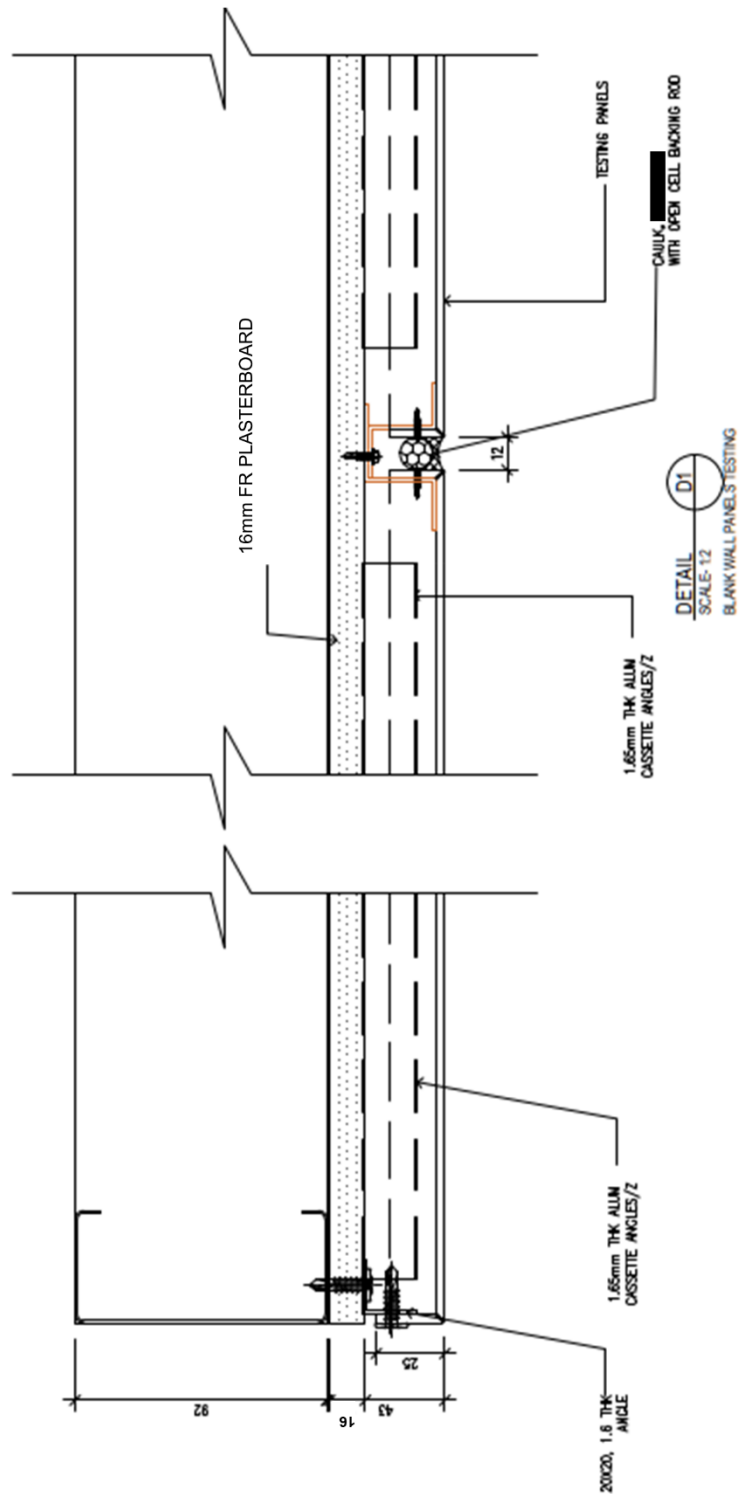


Figure 18 System assembly – vertical cross-sectional view

Appendix B Photographs



Figure 19 The specimen before the reaction to fire test – exposed side



Figure 20 The specimen before the reaction to fire test - unexposed side



Figure 21 The specimen 2 minutes 56 seconds into the test (burner output at 300 kW)



Figure 22 The specimen 5 minutes 48 seconds into the test (burner output at 300 kW)



Figure 23 The specimen 10 minutes 6 seconds in the test (burner output at 300 kW)

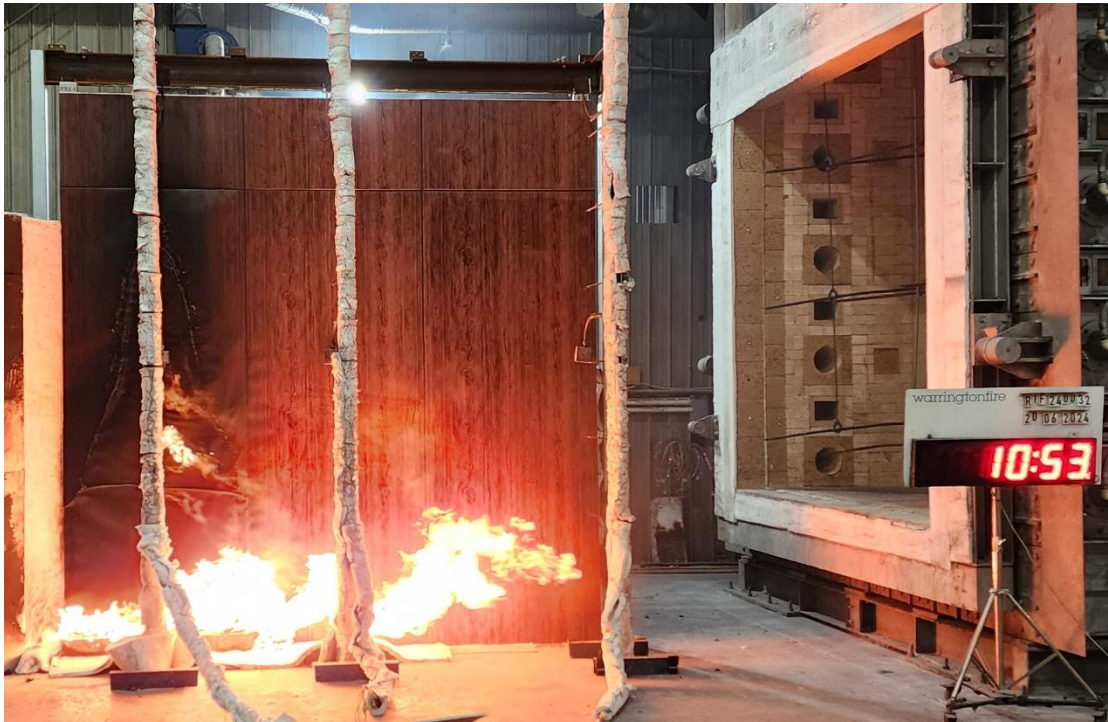


Figure 24 The specimen 10 minutes 53 seconds into the test (burner output at 300 kW)



Figure 25 The specimen 20 minutes into the test (burner output at 300 kW)



Figure 26 The specimen 29 minutes 25 seconds into the test (burner output at 300 kW)



Figure 27 The specimen 30 minutes 11 seconds into the test (11 seconds after burner off)



Figure 28 The specimen 31 minutes 49 seconds into the test (1 minutes 49 seconds after burner off)



Figure 29 The specimen 60 minutes into the test (30 minutes after burner off)

Appendix C Chemical analysis results



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Test Report

Prepared by:

ANALYSIS OF CLADDING SAMPLES

REF: UB8388

For

Company: Warrington Fire
Contact: [REDACTED]
Date: 17 October 2023

Project No: 23197

Prepared by: [REDACTED]

Approved by: [REDACTED]

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Analysis of Cladding Samples

REF: UB8388

1. SAMPLES

One plastic sachet containing two ACP cores was received for analysis. The samples were identified as follows:

CCL sample coding	Client sample coding
23197-1	Oak
23197-2	Silver

CCL has been asked to identify the polymer and the filler (s) in the samples by FT/IR, quantitate and identify the mineral filler in the samples and classify them in accordance with the ICA cladding scheme.

2. METHODOLOGY AND RESULTS

The aluminium metal was removed from the ACPs cladding polymer, and the flat surface of the polymer samples was abraded to remove any surface adhesive. The surface of each sample was analysed directly by FTIR. The FT-IR spectrum is presented in Figures 1-2.

The core of each sample was then ashed to determine its percentage mineral content (Table 1). If sufficient (>0.5 g) ash had been produced it was analysed for elemental composition by X ray fluorescence spectroscopy. Results are presented in Table 2.

Table 1 Ash content of samples.

Sample coding	Ash content (w/w%)
23197-1	39.5
23197-2	21.6

Table 2 Elemental composition of 23197-1

Element Oxide wt. %	23197-1
Na ₂ O	0.45
MgO	79.26
Al ₂ O ₃	0.39
SiO ₂	4.87
P ₂ O ₅	0.12
SO ₃	0.26
K ₂ O	0.04
CaO	8.66
TiO ₂	2.24
V ₂ O ₅	0.01
Cr ₂ O ₃	<0.01
Mn ₃ O ₄	0.04
Fe ₂ O ₃	0.55
NiO	<0.01
CuO	<0.01
ZnO	0.01
SrO	<0.01
ZrO ₂	<0.01
BaO	0.09
HfO ₂	<0.01
PbO	<0.01
L.O.I.	ND

NOTE: (i) L.O.I.= loss on ignition at 1,050 °C.
(ii) ND = not determined



3. CONCLUSIONS

The cladding sample #1 consisted of consisted of 45.3% magnesium hydroxide, 6.1% calcium carbonate, 4.8% other inert material and approximately 43.9% polyethylene/EVA copolymer.

The cladding sample #1, is classified as ICA category A.


The cladding sample#2 consisted of consisted of 21.6% inert material and approximately 78.4% polyethylene/EVA copolymer.

The cladding sample #2, is classified as ICA category A.

The ICA Classification assigned is correct as per the September 2020 revision of the ICA Guidelines.

The calculation for magnesium hydroxide content assumes that all magnesium found is present as the hydroxide. The calculation for calcium carbonate content assumes that all calcium found is present as calcium carbonate.

The reader is reminded that we can only analyse and classify the content of samples actually presented to us. We can offer no guarantee that this composition or classification is valid for cladding as a whole, because some types of cladding can be inhomogeneous, and a sample may not be representative of the cladding as a whole. Anyone using our results should consider these sampling issues and uncertainties before they generalise the results we present to anybody of cladding as a whole.


Technical Officer
Chemical Consulting Laboratory
Mark Wainwright Analytical Centre, UNSW
17 October 2023



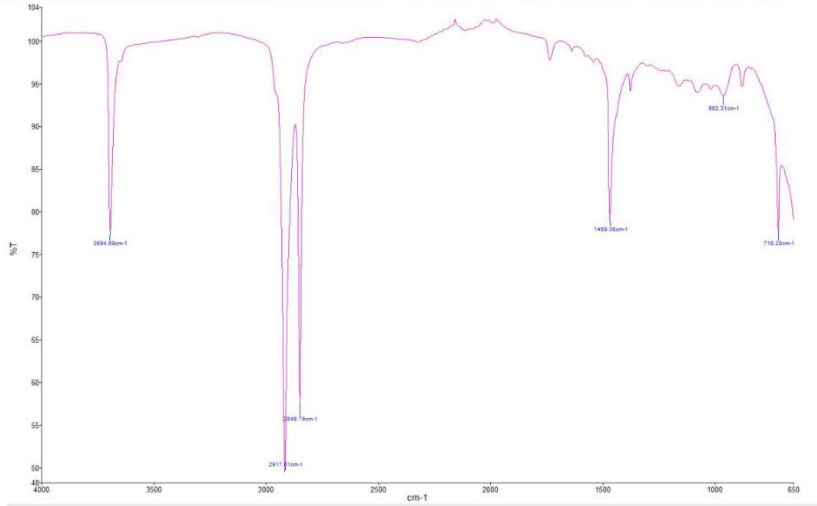


Figure 1. FT-IR spectrum of Sample #1

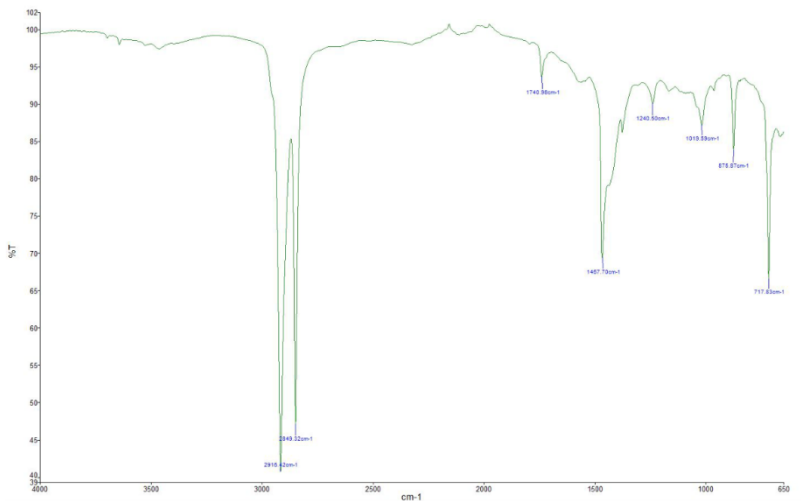


Figure 2. FT-IR spectrum of sample #2





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