

FIRE TYPE TEST REPORT

FR12976-001

FIRE RESISTANCE TEST OF A LOADBEARING 36 MM THICK METRA PANEL WALL SYSTEM IN ACCORDANCE WITH AS 1530.4:2014

CLIENT
Metra Panel Systems Limited
15 Tregowerth Lane
Huntly
New Zealand

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

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TEST SUMMARY

Objective

To determine the fire resistance of a loadbearing wall when tested in accordance with AS 1530.4:2014 *"Methods for fire tests on building materials, components and structures, Part 4: Fire–resistance test of elements of construction."*

Test Sponsor

Metra Panel Systems Limited
15 Tregowerth Lane
Huntly
New Zealand

Description of Test Specimen

The test specimen consisted of two separate 36 mm Metra Panel walls nominally 3,000 mm high x 3,000 mm wide to simulate an intertenancy wall. Each wall was constructed from four nominally 1,500 mm x 1,500 mm x 36 mm Metra Panel panels. At the vertical and horizontal panel joint positions, 400 mm wide x 36 mm thick Metra Panel 'splice plates' were attached to the internal faces of the panels of both walls and were glued and fixed on both sides of the joints. Additionally, vertically orientated 45 mm x 45 mm SG8 H1.2 timber battens were attached to the walls at nominally 600 mm centres, the battens were offset by 300 mm between walls. The voids between the battens of the unexposed face wall were filled with a layer of 75 mm thick Pink Batts Silencer insulation.

Date of Test

28 July 2020

Test Results

The test results in accordance with AS 1530.4:2014, *"Methods for fire tests on building materials, components and structures – Part 4: Fire – resistance test of elements of construction"* are as follows:

Structural Adequacy	69 minutes	
Integrity	70 minutes	No failure
Insulation	70 minutes	No failure

The tested specimen is deemed to have achieved an FRL of 60/60/60.

The test standard requires the following statements to be included:

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

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

"Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result."

LIMITATIONS

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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DOCUMENT REVISION STATUS

ISSUE NO.	DATE ISSUED	EXPIRY/REVIEW DATE	DESCRIPTION
01	8 September 2020	8 September 2025	Initial Issue

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1. TEST PROCEDURE

The test was conducted in accordance with AS 1530.4:2014 *"Methods for fire tests on building materials, components and structures, Part 4 Fire-resistance tests of elements of construction, Section 3"*, for which the fire resistance of the specimen is the time, expressed in minutes, to failure under one or more of the following criteria:

1.1 Structural Adequacy Failure Criteria

Failure in relation to structural adequacy shall be deemed to have occurred when collapse occurs, or when the following criteria for axially loaded elements has been exceeded:

Limiting axial contraction, $C = \frac{h}{100}$ mm; and

Limiting rate of axial contraction, $\frac{dC}{dt} = \frac{3h}{1{,}000}$ mm/min

where

h = initial height.

For the test specimen the limiting axial contraction was 30 mm and the limiting rate of axial contraction was 9.0 mm per minute.

1.2 Integrity Failure Criteria

Failure shall be deemed to occur when;

a) A cotton pad in its frame applied against the surface of the test specimen over any crack, fissure or flaming under examination, until ignition of the cotton pad (defined as glowing or flaming) or a maximum of 30 seconds.; or

b) a 6 mm gap gauge can be passed through an unobstructed gap in the specimen and project into the furnace and move a distance of 150 mm along the gap; or

c) a 25 mm gap gauge can be passed through an unobstructed gap in the specimen and project into the furnace; or

d) Sustained flaming on the surface of the unexposed face for 10 seconds or longer.

1.3 Insulation Failure Criteria

Failure in relation to insulation shall be deemed to have occurred if;

a) The average temperature on the unexposed face of the wall exceeds the initial temperature by 140 K: or

b) The maximum temperature at any point on the unexposed face of the wall exceeds the initial temperature by 180 K.

2. DESCRIPTION OF TEST SPECIMEN

2.1 General

The test specimen consisted of two separate 36 mm Metra Panel walls nominally 3,000 mm high x 3,000 mm wide to simulate an intertenancy wall. Each wall was constructed from four nominally 1,500 mm x 1,500 mm x 36 mm Metra Panel panels. At the vertical and horizontal joint positions, 400 mm wide x 36 mm thick Metra Panel 'splice plates' were attached to the internal faces of the panels of both walls and were glued and fixed on both sides of the joints. Additionally, vertically orientated 45 mm x 45 mm SG8 H1.2 timber battens were attached to the walls at nominally 600 mm centres, the battens were offset by 300 mm between walls. The voids between the battens of the wall installed on the unexposed side were filled with a layer of 75 mm thick Pink Batts Silencer insulation. A nominal 10 mm gap was provided between the timber battens at the vertical edges of the walls, there was no connection between the two walls.

All dimensions are nominal unless otherwise stated.

2.1.1 Conditioning

The walls were constructed on 27 July 2020.The wall was left under ambient laboratory conditions until testing on 28 July 2020.

2.1.2 Specimen Selection

BRANZ was not involved with the selection of materials or for the construction of the specimen.

2.2 Plans and Specification

Details of the construction of the various components are included in this report as Figure 1. Further details of the tested specimens are held on file by BRANZ.

Where discrepancies between the dimensions in the report text and those shown in the attached drawings exist, the text takes precedence.

2.3 Specimen Construction

2.3.1 Metra Panel Construction

Each wall comprised four nominally 1,500 mm x 1,500 mm x 36 mm Metra Panel panels which were butt jointed together. On the internal faces of the walls, 400 mm wide x 36 mm thick Metra Panel 'splice plates' were fitted over the joints, the vertical 'splice plate' was nominally 3,000 mm high, the horizontal 'splice plates' were nominally 1,300 mm long. The 'splice plates' were attached to the panels using a thin bead of H.B. Fuller Sturdi Bond heavy duty adhesive and were mechanically fixed using 65 mm long x 8g screws. The screws were spaced at nominally 200 mm centres at four positions nominally 50 mm and 150 mm from both edges of the 'splice plate'. A thin bead of Hilti Firestop Acrylic sealant was applied into gaps between the butt joints of the horizontal and vertical 'splice plates'.

Both walls were provided with vertically orientated 45 mm x 45 mm SG8 H1.2 timber battens which were positioned above and below the horizontal 'splice plates' at both vertical perimeter edges and at 600 mm centres between the edge battens.

The timber battens, excluding those at the vertical edges, were offset between the walls by nominally 300 mm. The timber battens were nailed to the Metra Panel panels at nominally 300 mm centres, two additional nails were used at the bottom of the lower battens and the top of the upper battens.

The Metra Panel panels had the following measured properties:

Measured thickness	35.4 mm
Measure weight per unit area	24.13 kg/m²
Measured density	681.8 kg/m³
Measured moisture content by weight	8.83 %

2.3.2 Insulation

75 mm thick Pink Batts Silencer insulation was installed between the timber battens of the unexposed face wall.

The measured properties of the Pink Batts Silencer insulation were as follows:

Measured thickness	75 mm
Measure weight per unit area	0.86 kg/m²
Measured density	11.43 kg/m³
Measured moisture content by weight	1.63 %

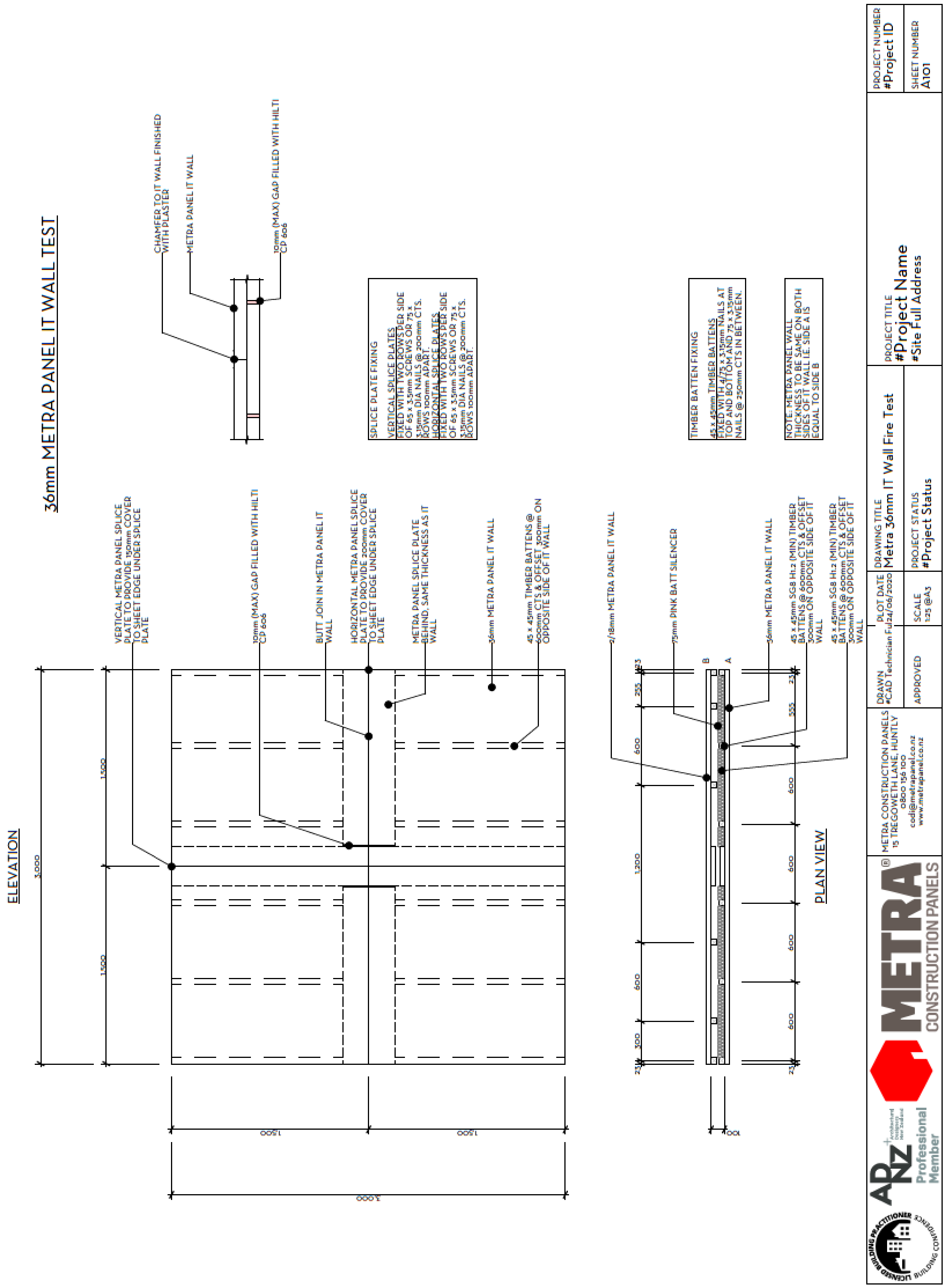
2.3.3 Installation of the Walls

The unexposed face wall was fixed to the concrete lined test frame using 35 mm x 35 mm x 1.2 mm thick steel angles fitted at the top and bottom edges of the test frame. The angles were fixed to the concrete faces of the test frame with 50 mm long masonry screws at nominally 400 mm centres. The Metra Panel panels were fixed to the steel angles with 25 mm long x 8g screws at nominally 100 mm centres. The exposed face wall was then fitted into the test frame, a nominally 10 mm gap was provided between the edge battens of the walls and there was no direct connection between the walls. The exposed face wall was fixed to the test frame as previously described.

The vertical edges of the walls were unrestrained, the gap between the concrete faces of the test frame and the edges of walls were filled with Superwool insulation blanket.

An elevation and section view of the walls is shown in Figure 1.

Figure 1: Client Supplied Drawing – Elevation and Section View



3. TEST CONDITIONS AND RESULTS

3.1 General

The specimen was tested on 28 July 2020, at the BRANZ laboratories at Judgeford, New Zealand in the presence of the client.

The ambient temperature at the beginning of the test was 10°C.

The frame containing the test specimen was placed in front of the vertical furnace, and the temperature and pressure conditions were controlled as specified in AS 1530.4:2014.

The test was terminated after the specimen had been exposed to the standard fire resistance conditions for 70 minutes.

3.2 Furnace Conditions

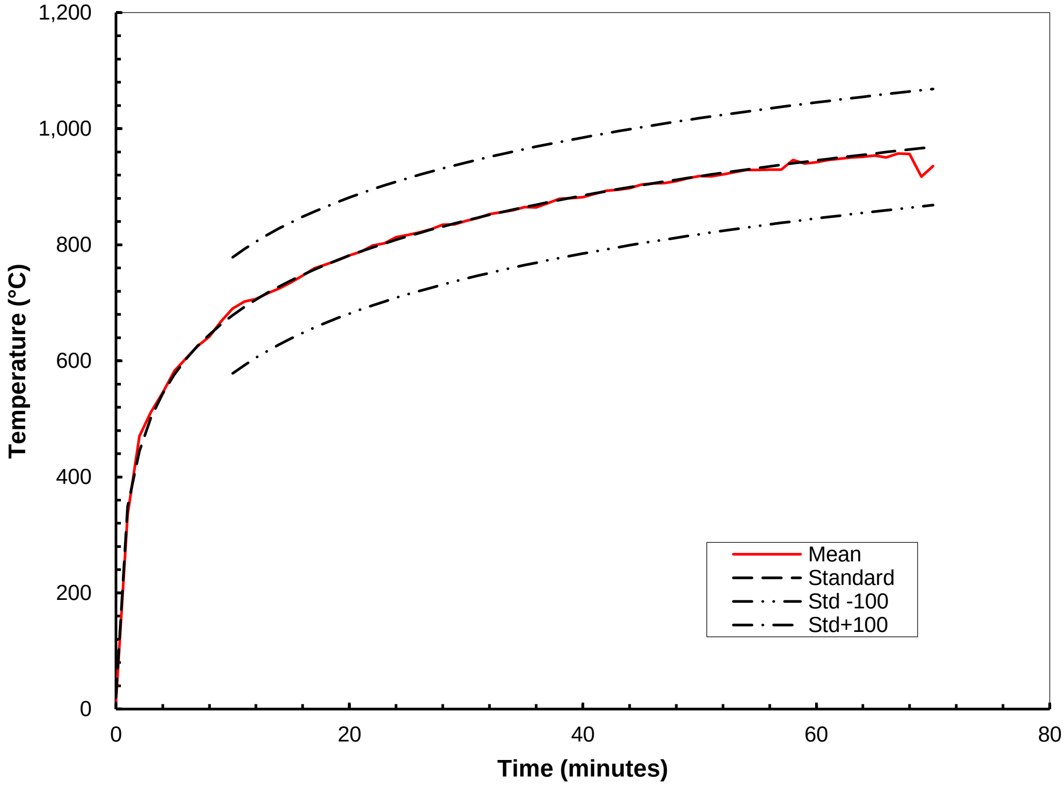
3.2.1 Furnace Temperature Measurement

Temperature measurement within the furnace was made using twelve mineral insulated metal sheathed (MIMS) chromel-alumel thermocouples uniformly distributed in a vertical plane approximately 100 mm from the exposed face of the specimen.

The furnace thermocouples were connected to a computer controlled data logging system which recorded the temperatures at 15 second intervals.

Figure 2 shows the mean furnace temperature curve and the permitted upper and lower limits in accordance with AS 1530.4:2014.

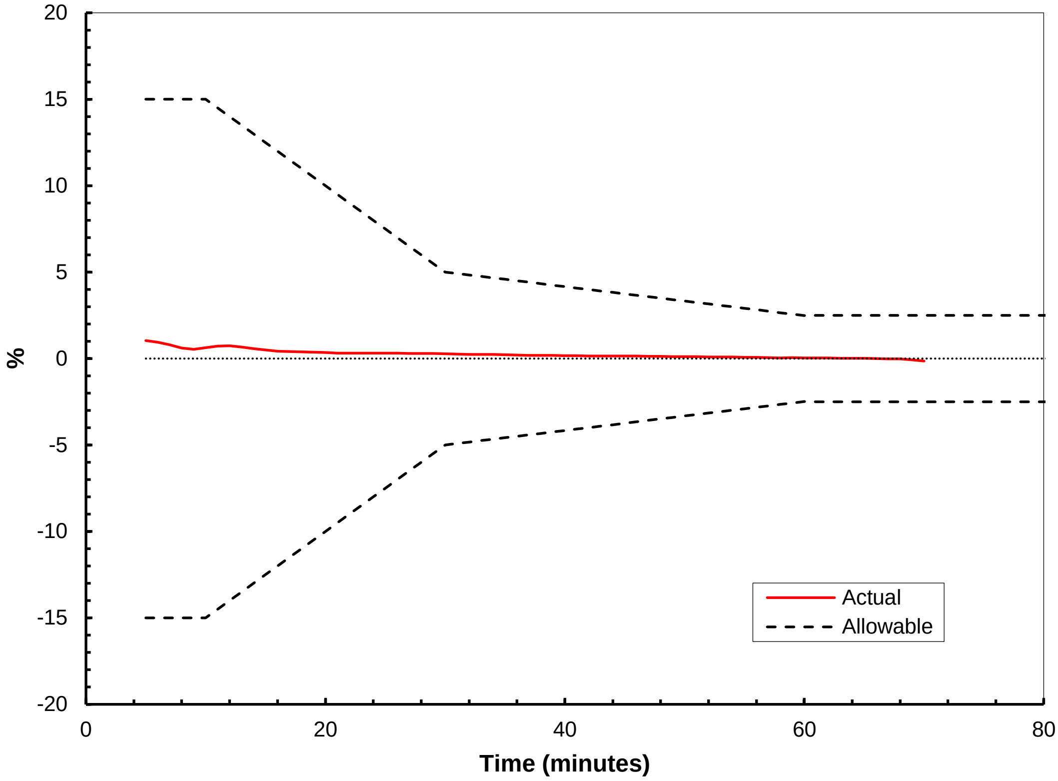
Figure 2: Furnace Temperature



3.2.2 Furnace Control

The percentage deviation of the area under the curve of the furnace mean temperature from the standard time temperature curve is shown in Figure 3.

Figure 3: Percentage Deviation of the Furnace Drive



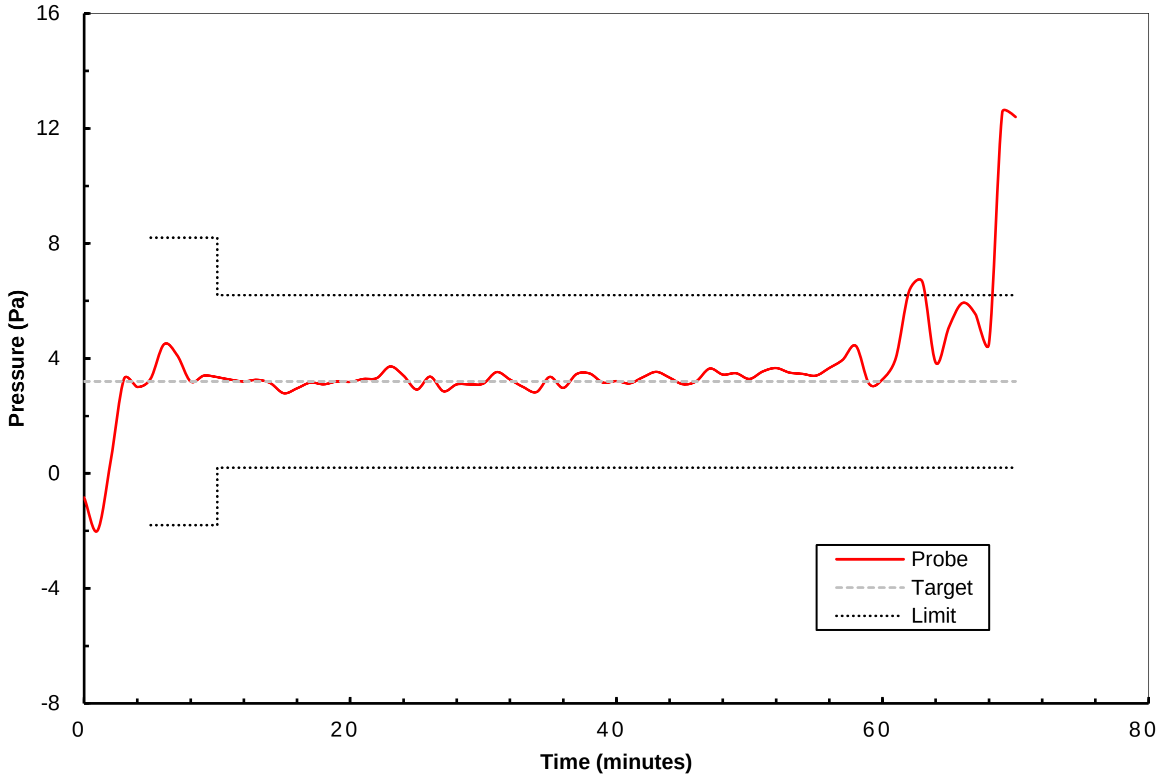
3.2.3 Pressure Measurements

The differential pressure of the furnace above the laboratory atmosphere was controlled to be 0 Pa at 500 mm above the notional floor level which corresponds to 3.2 Pa at the pressure probe in the furnace. The differential pressure was monitored using a micromanometer connected to a computer controlled data logging system which recorded the pressure at 15 second intervals.

The furnace pressure was monitored and controlled during the test so that by 5 minutes after the commencement of the test the furnace pressure was within ± 5 Pa of the target pressure at the pressure sensor and after 10 minutes was within ± 3 Pa of the target pressure. The pressure sensor was located 900 mm above notional floor level.

Figure 4 shows the furnace pressure variation with time.

Figure 4: Furnace Pressure



In summary, the furnace conditions met the requirements of the standard for the majority of the 70 minute test duration except for two instances where the recorded furnace pressure exceeded the upper tolerances. It is considered the pressure variation outside the standard would not have influenced the tested results.

3.3 Specimen Temperature Measurement

The temperature on the unexposed face of the test specimen was measured using chromel-alumel thermocouples mounted on copper discs and covered with insulating pads, in accordance with clause 2.2.3 of the test standard. The thermocouples were placed on the wall as shown in Figure 5.

Additional thermocouples were included on the test specimen for information purposes.

All the thermocouples described above were connected to a computer controlled data logging system which recorded the temperatures at 15 second intervals.

A roving thermocouple was available for measuring temperatures elsewhere on the specimen.

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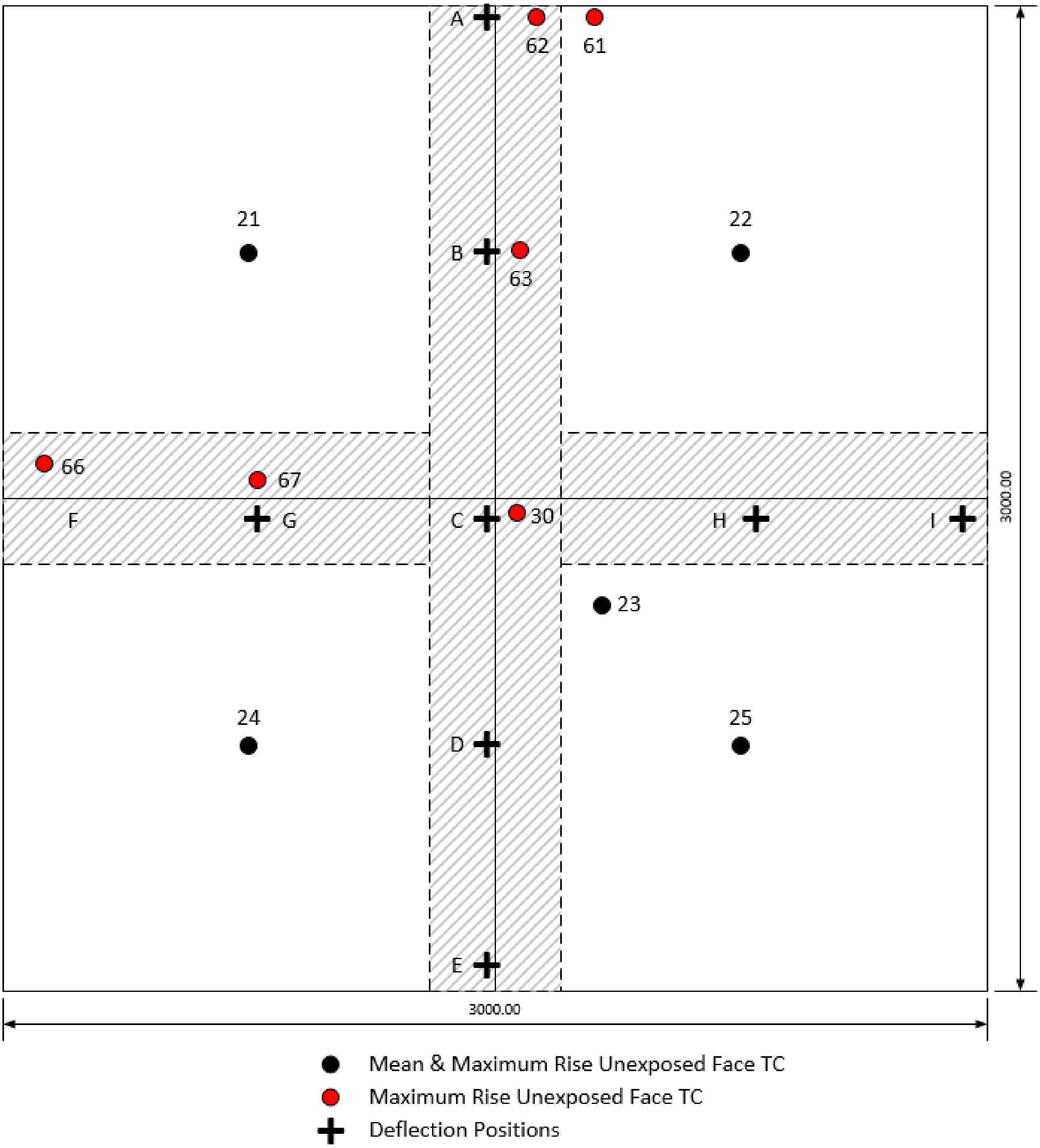
Figure 5: Thermocouple Locations and Deflection Points



3.4 Loading

At the request of the client a load of 5.6 kN per lineal meter was applied as a uniformly distributed axial load to the wall. This equated to a total load of 16.6 kN and was monitored using a load cell, placed between each of the two jacks and the moveable platen of the test frame, and connected to a computer controlled data logging system which recorded the load at 1 second intervals. The load was applied to the specimen at least 15 minutes before the commencement of the test.

3.5 Structural Adequacy

The wall was subjected to the test load for a duration of 69 minutes at which time collapse of the right hand edge occurred and the load was removed. Over the course of the test, the wall experienced a net contraction. The maximum measured axial deflection of the wall was 1.66 mm and occurred at 70 minutes into the test. The wall did not exceed the limiting axial deflection of 30 mm for the duration of the test. Figure 8 shows the axial deflections over the duration of the test.

The maximum measured rate of axial deflection was 1.18 mm/min and occurred at 70 minutes at the LVDT on the right-hand measuring spot. The wall did not exceed the 9 mm per minute maximum allowable rate of axial deflection for the duration of the test. Figure 9 shows the rate of axial deflection over the duration of the test.

3.6 Integrity

The wall did not fail the integrity criteria for the 70 minute test duration.

3.7 Insulation

The average temperature rise measured on the unexposed face of the wall did not exceed the 140 K average temperature rise criteria for the 70 minute duration of the test. The highest average temperature rise was 17 K at 70 minutes.

The temperature measured on the unexposed face of the wall did not exceed the 180 K maximum criteria for the 70 minute duration of the test. The maximum temperature rise on the unexposed face was 43 K at 70 minutes, recorded by thermocouple no. 22.

Graphs of the mean and maximum temperature rise of the wall are shown in Figure 6 and Figure 7.

3.8 Deflection Measurements

3.8.1 Axial Deflections

The axial deflection of the wall was measured using two linear variable differential transducers (LVDT's) connected to a computer controlled data acquisition system which recorded the deflections at 15 second intervals.

3.8.2 Lateral Deflections

The lateral deflections on the unexposed face at the positions shown in Figure 5 were measured using a theodolite and rule. The maximum measured deflection was 9 mm towards the furnace at the head and 2/3 height at mid width of the wall (deflection points A & B). The results are summarised in Table 1.

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Figure 6: Unexposed Average and Maximum Temperature Rise – Key Thermocouples

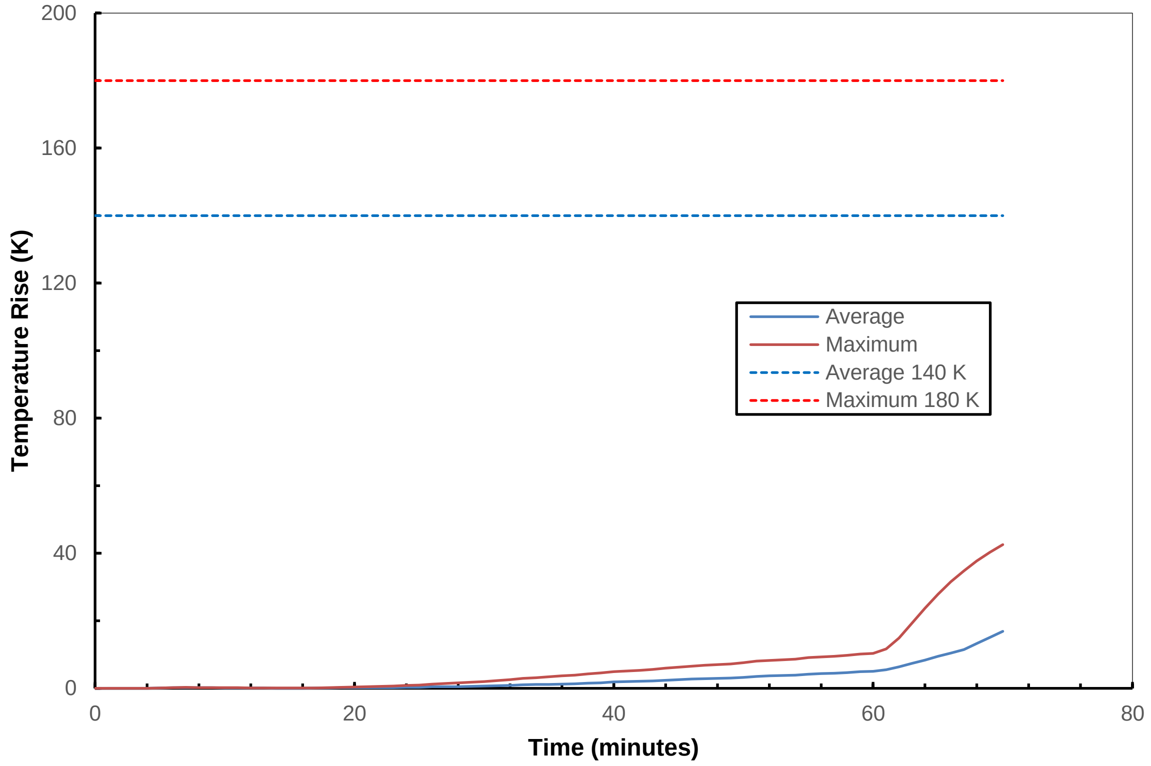

Figure 7: Unexposed Maximum Temperature Rise – Additional Thermocouples

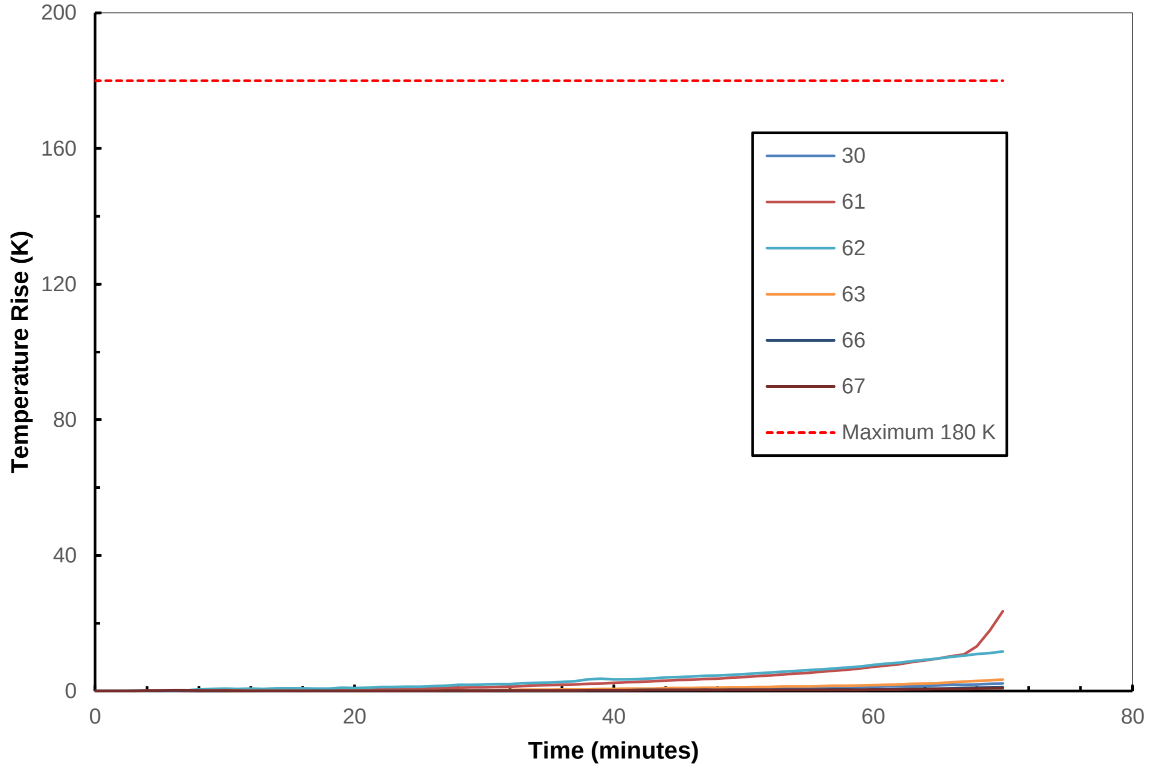

Figure 8: Axial Deflection of the Wall

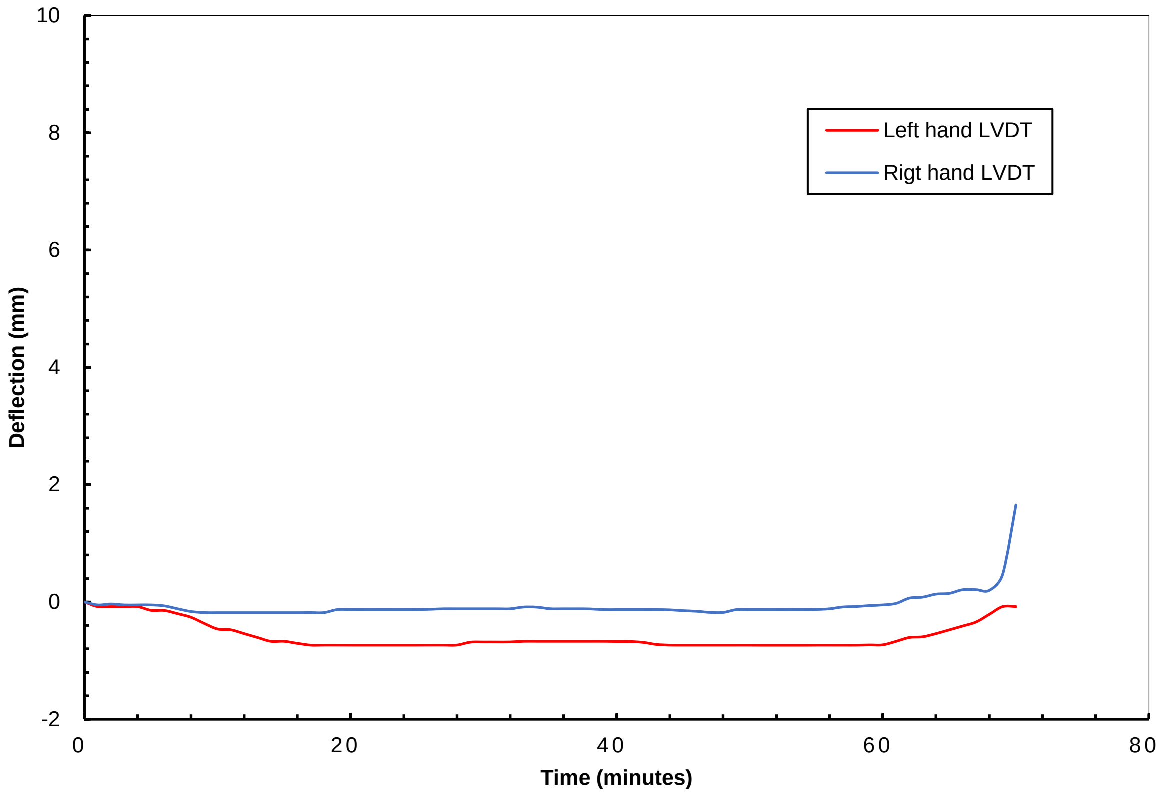

Figure 9: Rate of Axial Deflection of the Wall

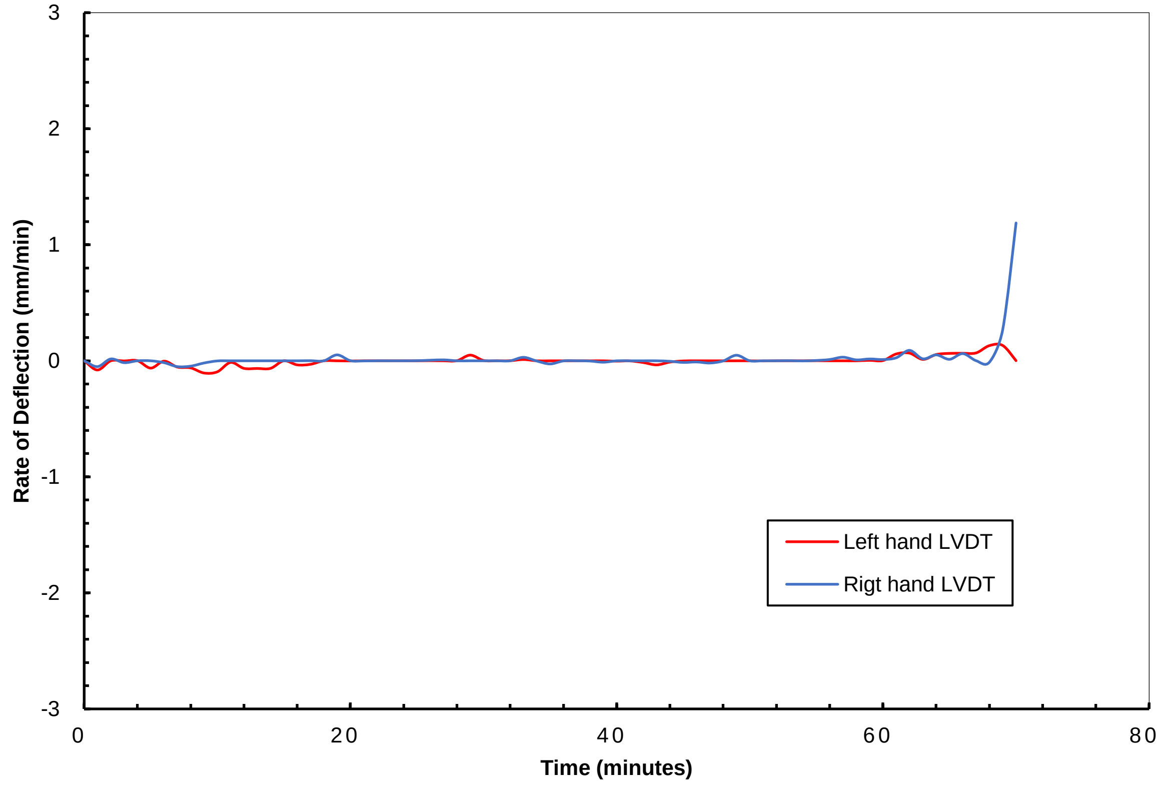

Table 1: Lateral Deflection Measurements of the Wall

Location	Time (minutes) Deflection (mm)			
	15	30	45	60
A	-4	-6	-7	-9
B	-3	-6	-9	-8
C	0	-2	-5	-6
D	0	-2	-4	-5
E	0	0	0	0
F	1	1	1	1
G	0	-2	-4	-4
H	-1	-4	-7	-5
I	1	1	0	0

Negative readings indicate movement towards the furnace.

3.9 Test Observations

Observations related to the performance of the specimen were at the times stated in minutes and seconds are shown in Table 2.

U = Observations from the unexposed face.
E = Observations from the exposed face.

Table 2: Test Observations

Time (Min:Sec)	Test Face	Observations
00:00	-	Test commences.
05:00	U	Smoke issue commences at the head of the wall.
08:00	E	The exposed face of the wall has ignited and there is a large amount of flaming within the furnace chamber.
18:00	E	The horizontal panel joint gap has increased in width to approximately 5 mm. The vertical joint is not visible.
28:00	U	Smoke issue commences at the head of the wall.
30:00	-	The specimen continues to maintain Structural Adequacy, Integrity and Insulation.
35:00	E	The horizontal panel joint gap continues to increase in width, it is now approximately 10 mm.
50:00	E	The volume of flaming within the furnace chamber has increased significantly.
60:00	-	The specimen continues to maintain Structural Adequacy, Integrity and Insulation.
69:55	U	The right hand edge of the wall appears to be collapsing, flaming is visible at mid height of the unrestrained edge where the edge is folding. **Structural Adequacy failure is deemed to have occurred.** Load removed.
70:47		The test is discontinued.

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4. SUMMARY

The test results in accordance with AS 1530.4:2014, "Methods for fire tests on building materials, components and structures – Part 4: Fire – resistance test of elements of construction are as follows:

Structural Adequacy	69 minutes	
Integrity	70 minutes	No failure
Insulation	70 minutes	No failure

The tested specimen is deemed to have achieved an FRL of 60/60/60.

The test standard requires the following statements to be included:

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

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

"Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result."

5. PERMITTED VARIATION

5.1 General

The results of the fire test contained in the test report are directly applicable, without reference to the testing authority, to similar constructions where one or more of the following changes have been made, provided no individual component is removed or reduced:

(a) Increase in the length of a wall of identical construction if the specimen was tested with one vertical edge unrestrained.
(b) Increase in thickness of the wall.
(c) For framed walls –
   i. Increase in timber density;
   ii. Increase in cross-sectional dimensions of the framing element(s);
   iii. Decrease in sheet or panel sizes;
   iv. Decrease in stud spacing; or
   v. Decrease in fixing centres of wall sheet materials.

PHOTOS

Photo 1: The Unexposed Face of the Specimen Prior to Testing

Photo 2: The Unexposed Face of the Specimen After a Duration of 30 Minutes

Photo 3: The Unexposed Face of the Specimen After a Duration of 60 Minutes

Photo 4: The Exposed Face of the Specimen Immediately After Testing

FR12976-001
Type Test Summary

BRANZ

This is to certify that the specimen described below has been tested by BRANZ on behalf of the sponsor.

Sponsor: Metra Panel Systems Limited
15 Tregowerth Lane
Huntly
New Zealand

Referenced Standard: AS 1530.4:2014

Specimen Name: 36 mm Metra Panel (IT) Intertenancy Wall – 1 Hour

Specimen Description: The test specimen consisted of two separate 36 mm Metra Panel walls nominally 3,000 mm high x 3,000 mm wide to simulate an intertenancy wall. Each wall was constructed from four nominally 1,500 mm x 1,500 mm x 36 mm Metra Panel panels. At the vertical and horizontal joint positions, 400 mm wide x 36 mm thick Metra Panel 'splice plates' were attached to the internal faces of the panels of both walls and were mechanically fixed on both sides of the joints. Additionally, vertically orientated 45 mm x 45 mm SG8 H1.2 timber battens were attached to the walls at nominally 600 mm centres, the battens were offset by 300 mm between walls. The voids between the battens of the wall installed on the unexposed side were filled with a layer of 75 mm thick Pink Batts Silencer insulation. A nominal 10 mm gap was provided between the timber battens at the vertical edges of the walls, there was no direct connection between the two walls.

At the request of the client, a uniformly distributed axial load of 5.6 kN per lineal metre was applied to the specimen and was maintained for a duration of 69 minutes.

A full description of the test specimen and the test results are given in BRANZ Type Test report: FR12976-001

Orientation: Exposure from either side.

The assessed results were as follows:

FRL (FRR) = 60/60/60

Issued by	Reviewed by	
Stephen Whatham Fire Testing Engineer IANZ Approved Signatory	Merv Godkin Senior Fire Testing Engineer BRANZ	*Regulatory authorities are advised to examine test reports before approving any product.*
Issue Date 8 September 2020	**Expiry Date** 8 September 2025	