TEST REPORT

Fire resistance test of a partially loaded double stud wall system clad each side 35mm Benex panels tested in accordance with AS 1530.4 – 2005.

EWFA Report No:

26704300

Report Sponsor:

Benex Bathurst
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Testing. Advising. Assuring.

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GENERAL CONDITIONS OF USE

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1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 3000mm wide × 3000mm high × 218mm thick party wall system.

The fire side leaf of the wall system was loaded and restrained at the top and bottom only.

TEST SPECIMENS

The test specimen comprised of two wall skins of 64mm Rondo frame separated by a 20mm gap. The wall system was clad with 35mm thick Benex panels on both exposed and unexposed sides that were both rendered with Rockcote Multiblend Masonry Render and Rockcote fast Prep Keycote. Insulco Acousti-Therm Batts were installed into the cavity space of the wall frame.

The full description of the specimen is provided in Figures A1.1 to A1.5 and the 'Schedule of Components' in Section 2.

ASSEMBLY AND INSTALLATION METHODS

The wall system was constructed by representatives of Benex on the 16th and 17th of October 2013.

ORIENTATION

The wall system was symmetrical.

2 SCHEDULE OF COMPONENTS

Item	Description	
1	**Product Name**	Benex Panel
	Material	The panels were manufactured from a mixture consisting of predominantly Cement and polystyrene.
	Size	Nominal 1200mm long × 400mm wide × 35mm thick (measured)
	Density	928kg/m^3 (measured)
	Location	Positioned horizontally on the exposed and unexposed sides of the steel frame. The panels were fixed to the frame with 8 – 15 × 15mm needle point screws (item 5) and Bostik Fireban One polyurethane sealant. See Appendix 1 for details of location.
Wall frame		
Location		2-off framed wall skins located 20mm apart.
2	**Product Name**	Top and bottom track
	Product	Rondo 64mm track
	Size	3000mm long × 64mm Web × 29mm flange × 0.5mm thick
	Location	The top track was fixed to the top lintel with Ramset Ankascrew^{tm} AS08060W (item 6) at 600mm centres.
3	**Product name**	Stud
	Product	Rondo 64mm Stud
	Size	3000mm long × 64mm Web × 33.5mm flange × 0.5mm thick
	Location	Studs were spaced at 600mm centres and the first stud on the left hand side was 270mm offset from the edge stud.
4	**Product Name**	Timber nogging
	Product	MGP 10
	Size	64mm × 45mm
	Location	The nogging was located at nominal 1000mm and 2000mm from the bottom track and fixed to the stud with 8 – 15 × 15mm needle point screws on each edge.
5	**Product name**	Buildex 8 – 15 × 15mm needle point button head screw
	Size	8mm diameter × 15mm long
	Location	2-off joining each stud to the top and bottom plates and 2-off joining each stud to each nogging. 1-off joining each stud to the each Benex panel on both exposed and unexposed side.
6	**Product Name**	Fixing (top track to lintel)
	Product	Ramset Ankascrew^{tm} AS08060W
	Size	M6 × 50mm long
	Location	Used to fix top track to the lintel at nominal 500mm centres.
7	**Product Name**	Cavity Insulation
	Product	Prime 50 Polymax
	Size	50mm thick (Uncompressed)

Item	Description	
	Density	14kg/m^3
	Location	The insulation was installed in the cavity between the panels.
8	**Product Name**	Bostik FIREBAN ONE polyurethane sealant
	Location	Bostike FIREBAN ONE sealant was used: • On the vertical joint of the panel • On the horizontal joint of the panel • Between the wall framing and the Benex panel
Render		
	Moisture	1.9% on the day of the test.
	Total Thickness	3.5mm thick
9	**Product**	Base coating
	Product Name	Rockcote Fast Prep Keycote
	Thickness	2mm
	Location	Trowel applied over the Benex panel
10	**Product**	Top coating
	Product Name	Rockcote Multiblend Masonry Render
	Thickness	1.5mm
	Location	Trowel applied over the cured base coating

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS 1530.4-2005 Sections 2 & 3 subject to the variations listed below.

VARIATIONS TO TEST METHOD

Only one side of the wall was loaded, therefore the results of this test must be used with caution for assessment purposes and consideration given the location of applied loads.

PRE-TEST CONDITIONING

The construction of the wall was finished on the 17th of October 2013. Test specimen was subject to normal laboratory temperatures and conditions before test date.

SAMPLING / SPECIMEN SELECTION

The laboratory was not involved in the sampling or selection of the test specimen for the fire resistance test.

AMBIENT TEMPERATURE

The ambient temperature at the start of the test was approximately 20°C and did not vary significantly throughout the fire resistance test.

LOADING

The specimen was subjected to a total axial load of 36kN for the duration of the duration of the test. The load was applied at 6 single point load locations at 600mm centres to a RHS support channel. The support channel evenly distributed the load to the metal frame of the wall on the exposed side. The applied pressure at each hydraulic jack was 4kPa, which also allowed for the weight of the exposed side wall skin.

TEST DURATION

The test duration was 64 minutes.

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 1530.4-2005 and as detailed below:

The furnace temperature was measured by 9-off mineral insulated metal sheathed Type K thermocouples with wire diameters not greater than 1mm and overall diameter of 3mm with the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25mm from steel supporting tubes.

The non-fire side specimen temperatures as well as some internal specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm diameter soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0 mm inorganic insulating pads. The thermocouple positions are described in Table A4.1, and are shown on Figure A4.1 in Appendix 4.

A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples.

The furnace pressure was measured at approximately 500mm above the floor of the furnace.

Gap gauges were available during the test to assess the performance under the criteria for integrity.

The load was applied at nominal 600mm centres directly below each stud with hydraulic jacks, via 100mm × 100mm steel pads with pin support conditions. The loading equipment was capable of measuring the load applied within an accuracy of ± 2.5% of the test load.

Deflection measurements were taken from calibrated tapes fixed to the specimen using a Bosch Line laser level Model GLL 2-80P, at the positions shown on Figure A4.1 in Appendix 4

4 TEST MEASUREMENTS

FURNACE TEMPERATURE AND PRESSURE MEASUREMENTS

Furnace temperature and pressure data are provided in Figure A5.1 and Table A5.2 in Appendix 5.

SPECIMEN TEMPERATURES

Specimen temperature data is provided in A5.3 and Table A5.1 in Appendix 5.

OBSERVATIONS

A table that includes observations of the significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4-2005 is provided in Appendix 2. Photographs of the specimen are included in Appendix 6.

5 TEST RESULTS

The specimen tested achieved the following performance with respect to the performance criteria listed in AS 1530.4-2005, Section 2 & 3 and subject to the variations listed in section 3 of this report.

Criteria	Result
Structural Adequacy	No failure at 64 minutes
Integrity	Failure at 63 minutes
Insulation	Failure at 63 minutes

6 APPLICATION OF TEST RESULTS

TEST LIMITATIONS

The results of this fire test 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. The results only relate to the behaviour of the specimen of the element of the 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 nor do they necessarily reflect the actual behaviour in fires**.**

VARIATIONS FROM THE TESTED SPECIMENS

This report details the methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the procedure outlined in AS1530.4. Any significant variation 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 addressed by this report. It is recommended that any proposed variation to the tested configuration other than as permitted under the field of direct application specified in Appendix 3 should be referred to the test sponsor in the first instance to obtain appropriate documentary evidence of compliance from Exova Warringtonfire Aus Pty Ltd or another Registered Testing Authority.

UNCERTAINTY OF MEASUREMENT

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.

APPENDIX 1 DRAWINGS OF TEST ASSEMBLY

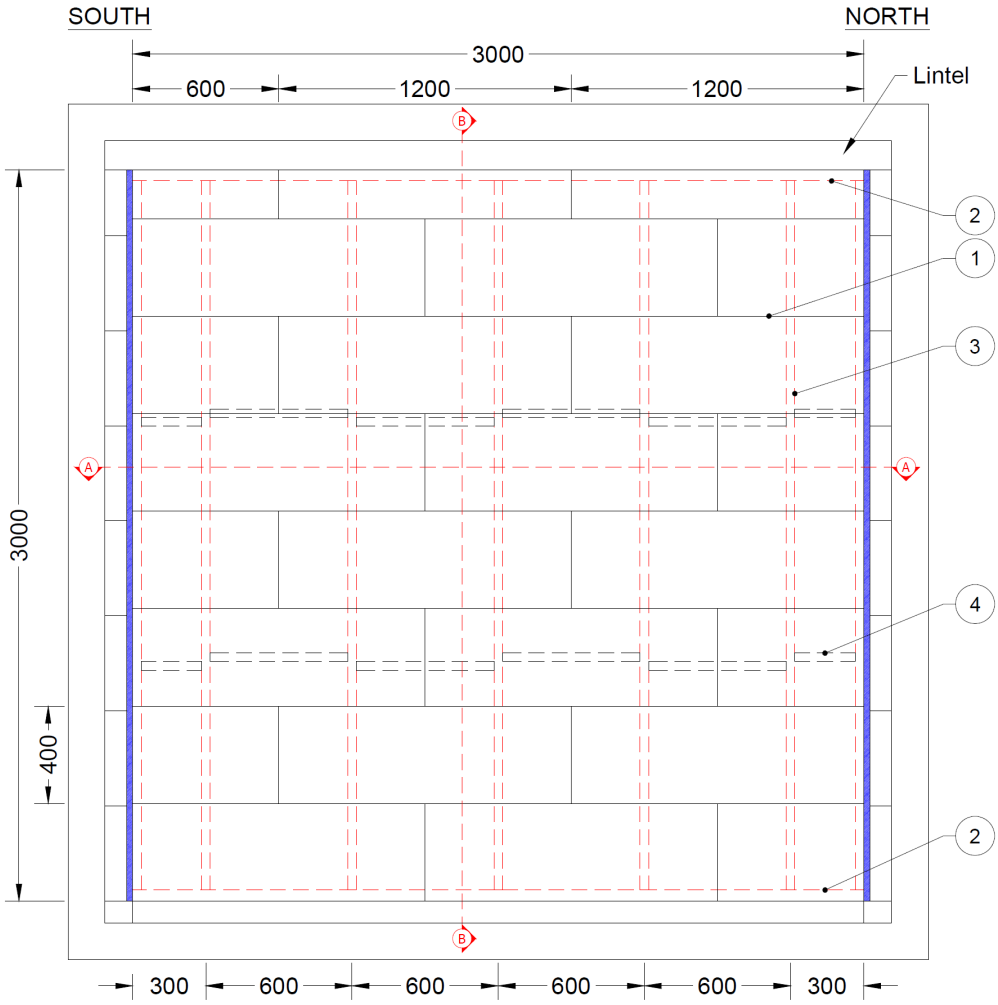

Figure A1.1: Elevation of Unexposed Cladding

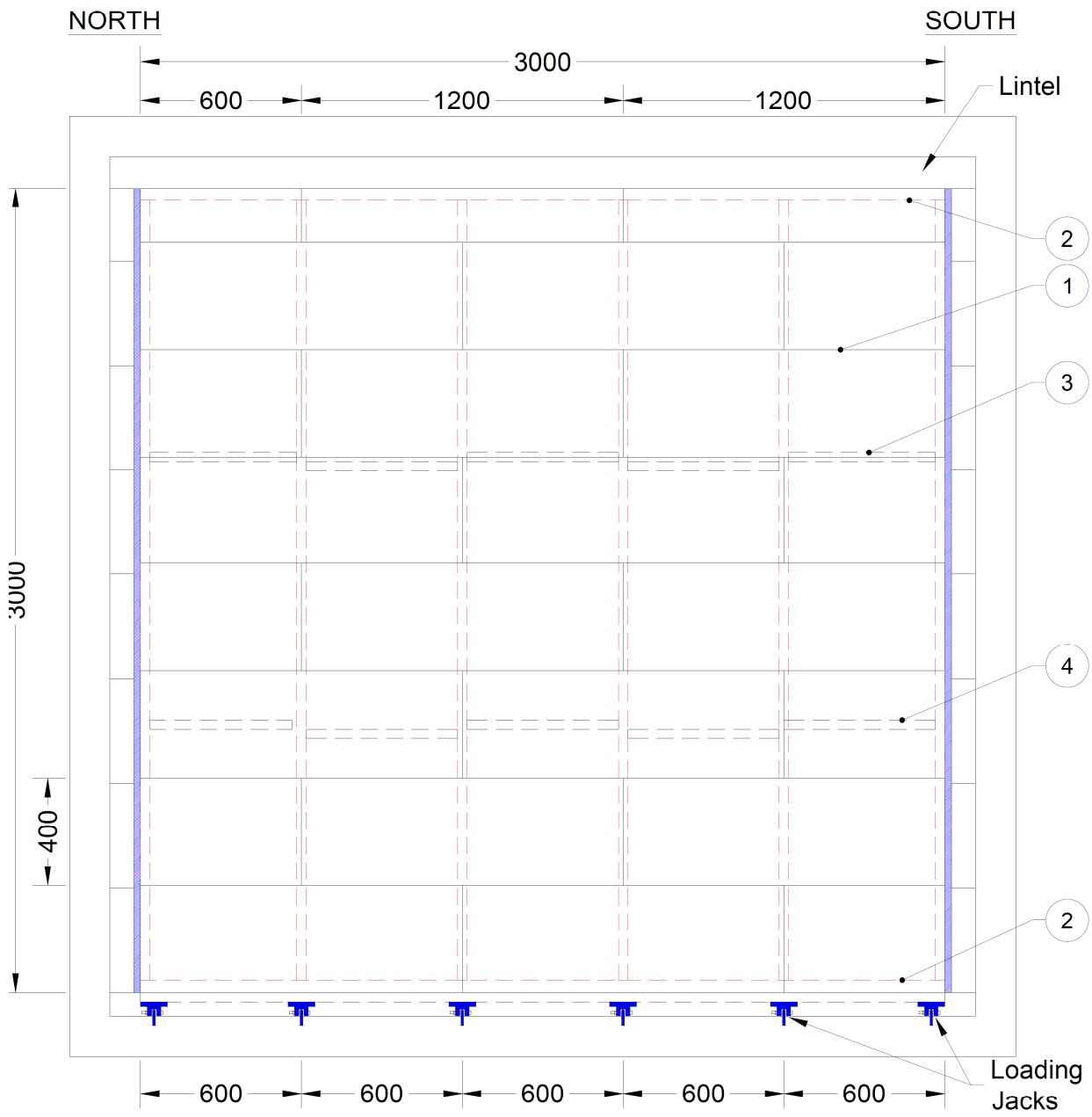

Figure A1.2: Elevation of Exposed Cladding

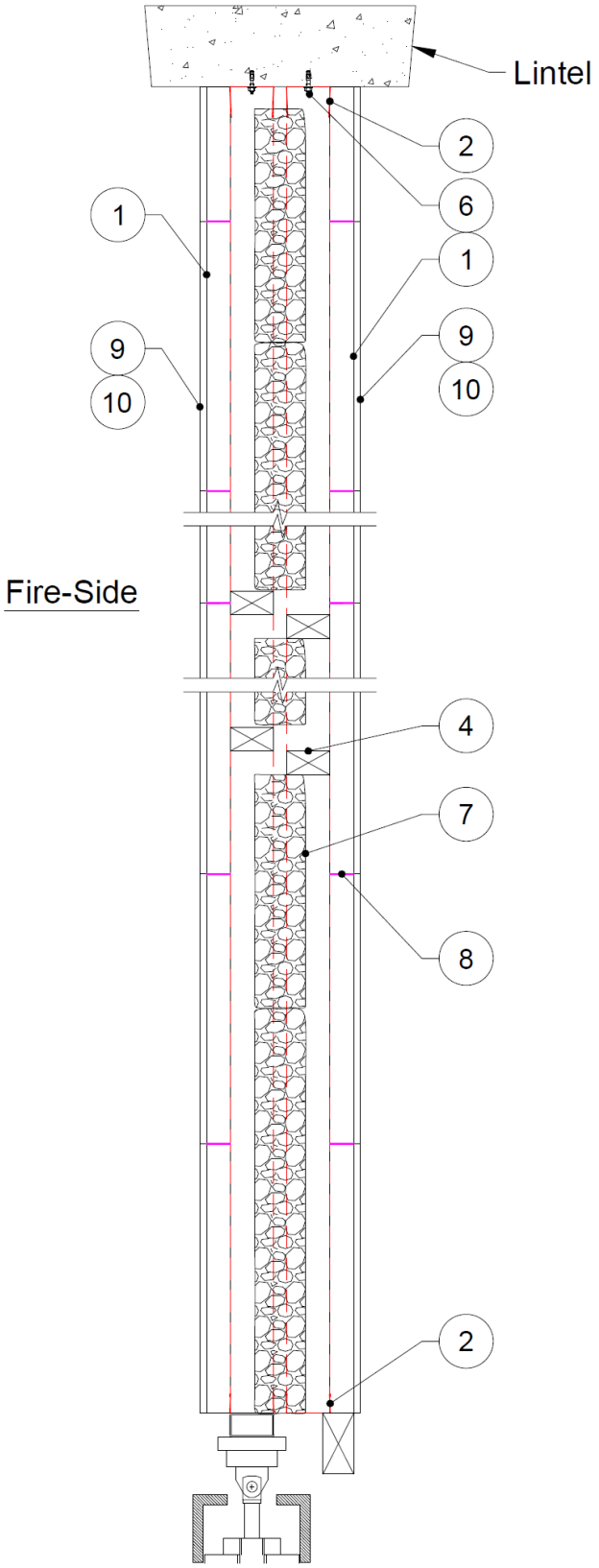

Figure A1.3: Vertical cross-Section

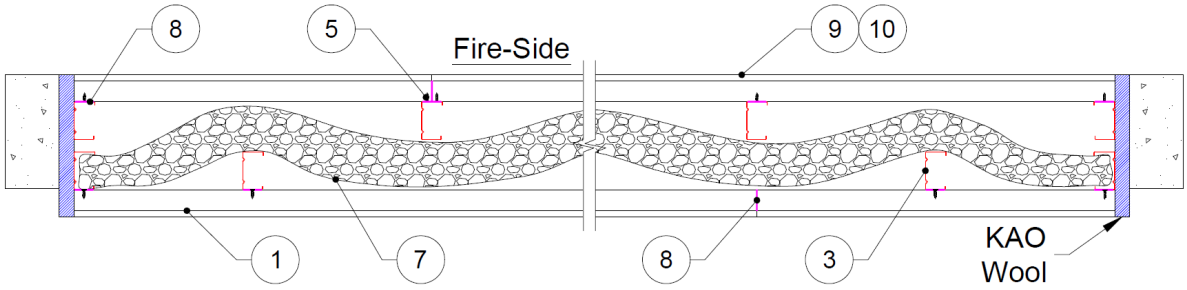

Figure A1.4: Horizontal cross-Section

APPENDIX 2 TEST OBSERVATIONS

The following include observations of the significant behaviour of the specimen.

Observations are from the unexposed face unless otherwise specified.

Time		Observation
Min	Sec	
-15	0	Test load was applied to the exposed side timber frame.
0	00	Fire resistance test commenced and the ambient temperature was approximately 20°C.
10	00	It had become evident that part of the render on the exposed side had spalled and detached from the specimen
26	00	It had become evident that flaming had appeared from the joint of the panel on the exposed side.
		It had become evident that the joints of the panel were visible on the exposed side.
		It had become evident that small gaps had opened up on the render on the exposed side
30	00	The specimen had continued to maintain structural adequacy, integrity and insulation in accordance with AS 1530.4-2005
36	00	Smoke emission had become evident on the top north corner of the specimen
		It had become evident that moisture patch appeared on the top north corner of the specimen
39	20	It had become evident that moisture patch appeared on the top south corner and middle top along the edge of the specimen
41	00	It had become evident that cracks appeared on render at the horizontal and vertical joint of the panel on the exposed side
46	44	Increase in volume of smoke emission from the top north edge had become evident
		Smoke emission had become evident on the top south edge of the specimen
47	10	It had become evident that loud metal cracking sound could be heard from the furnace.
50	00	Increase in volume of smoke emission from the top north and top south corners had become evident
53	00	Smoke emission had become evident at the bottom edge of the specimen
		It had become evident that the area covered by the moisture patch had extended.
60	00	The specimen had continued to maintain structural adequacy, integrity and insulation in accordance with AS 1530.4-2005
60	00	Smoke emission had become evident from the crack between the top edge of the specimen and the concrete lintel
63	00	It had become evident that loud sound could be heard from the furnace.
63	**30**	**It had become evident that large gaps appeared on both top corners. Flaming had become evident from the top corners of the specimen for more than 10s. Failure on integrity in accordance with AS 1530.4-2005, clause 2.12.2.4, due to sustained flaming on the non-exposed side for greater than 10 seconds.**
64	00	Test stooped as the request of the sponsor.

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

AS 1530.4-2005 states that the results of a fire resistance test on a wall are directly applicable without reference to the testing authority, to similar constructions where one or more of the following changes are made provided no individual component is removed or reduced:

A 3.2 SEPARATING ELEMENTS

a) An increase in the length of a wall of identical construction is permitted.

b) An increase in thickness of the framing is permitted.

c) For framed walls-

(i) increase in cross-sectional dimensions of the framing element(s);

(ii) decrease in sheet or panel sizes;

(iii) decrease in stud spacing; or

(iv) decrease in fixing centres of wall sheet materials.

APPENDIX 4 INSTRUMENTATION POSITIONS

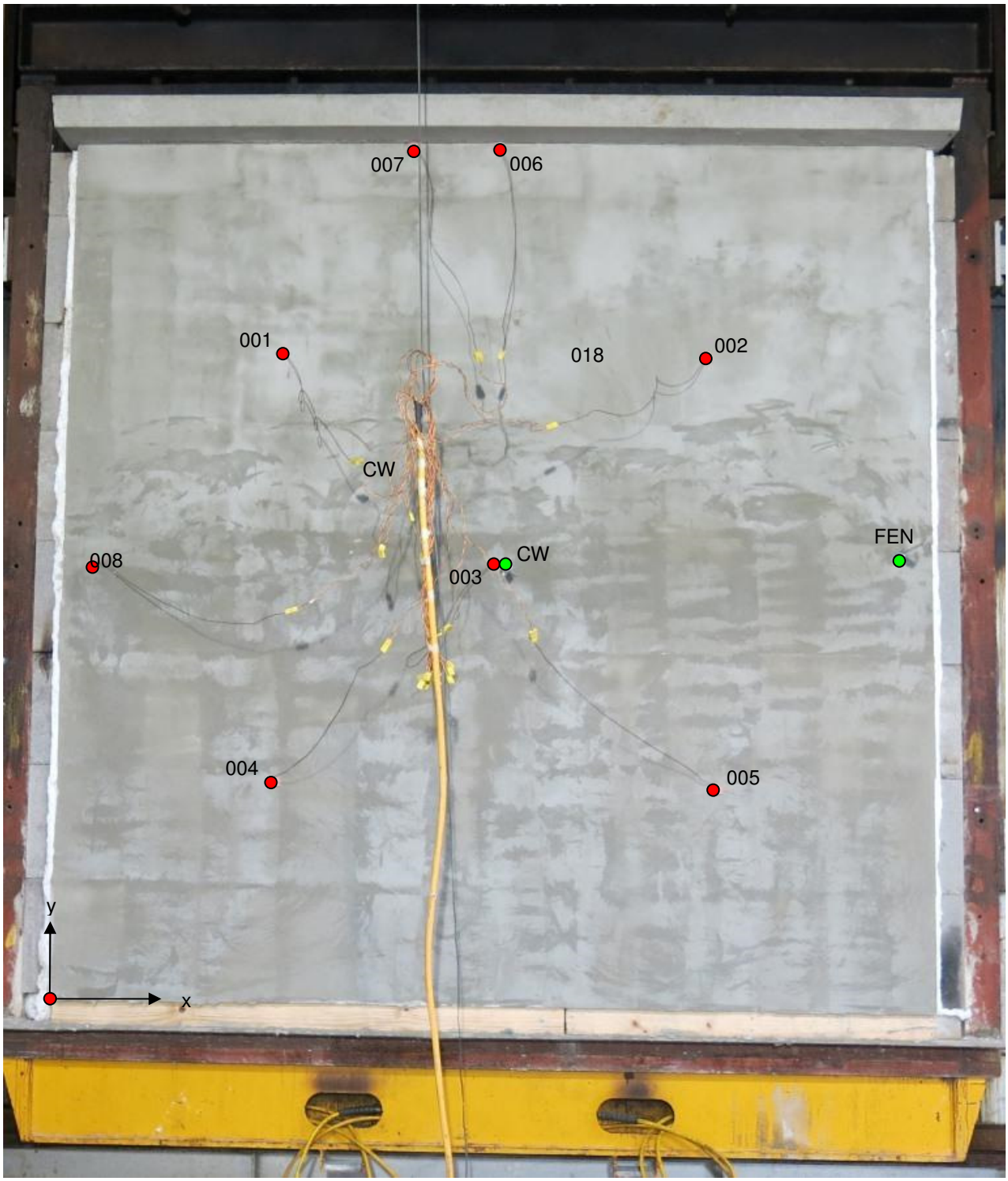

Figure A4.1: Unexposed surface thermocouple locations.
Note: The green dots indicate deflection locations.

Table A 4.1 Thermocouple Locations

Location	T/C No.	x	y	Description
Qtr points	001	750	2250	Upper west quarter point
	002	2250	2250	Upper east quarter point
	003	1500	1500	Centre of specimen
	004	750	750	Lower east quarter point
	005	2250	750	Lower west quarter point
Other Surface	006	1500	2985	At the head of the specimen at mid-width
	007	1800	2985	At the head of the specimen in line with a stud
	008	100	1500	Mid-height of the free edge, 100mm from the edge.

Table A 4.2 Deflection Locations

Part of specimen	Ref.	x	y	Description
Horizontal	CW	1500	1500	Centre point of the specimen
	FEN	2950	1500	Mid-height of the north free edge, 50mm from the edge.

APPENDIX 5 TEST DATA

A 5.1 FURNACE TEMPERATURE

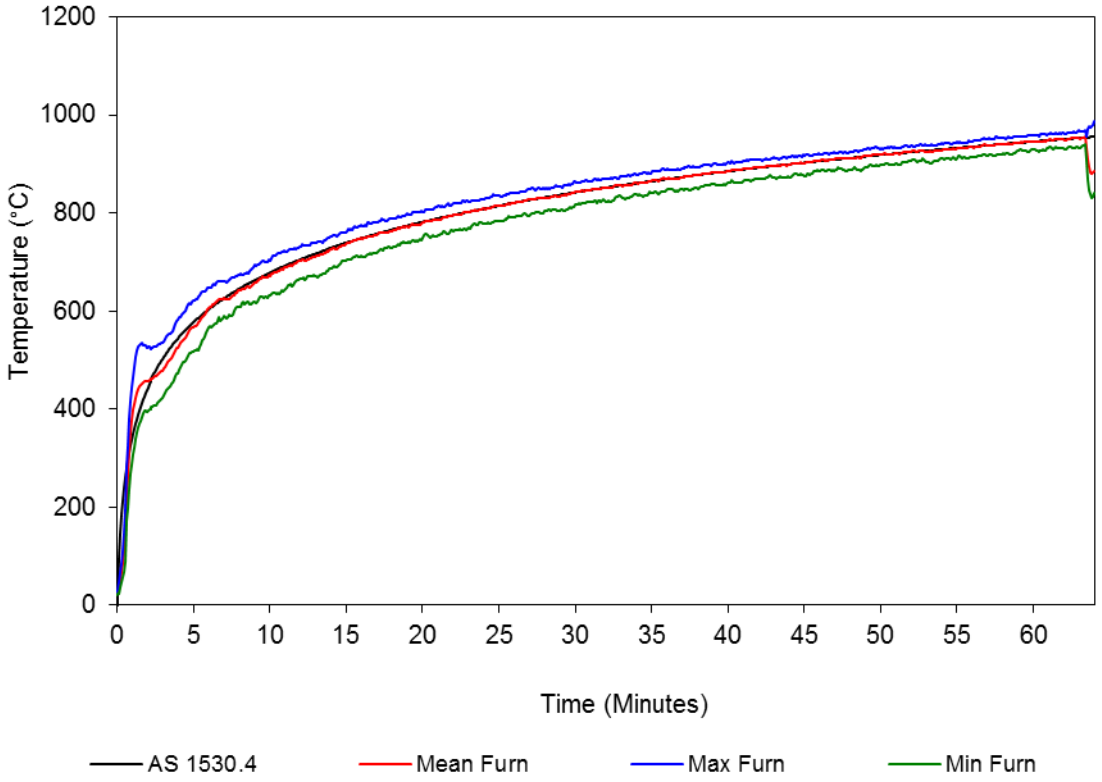

Figure A5.1: Furnace Temperatures vs. time

A 5.2 FURNACE PRESSURE

Time (minutes)	Pressure (Pa)	Time (minutes)	Pressure (Pa)
	Avg		**Avg**
5-10	**-1**	35-40	**0**
10-15	**-1**	40-45	**-2**
15-20	**0**	45-50	**-1**
20-25	**-1**	50-55	**-1**
25-30	**0**	55-60	**-1**
30-35	**0**	60-65	**0**

A 5.3 SPECIMEN TEMPERATURES

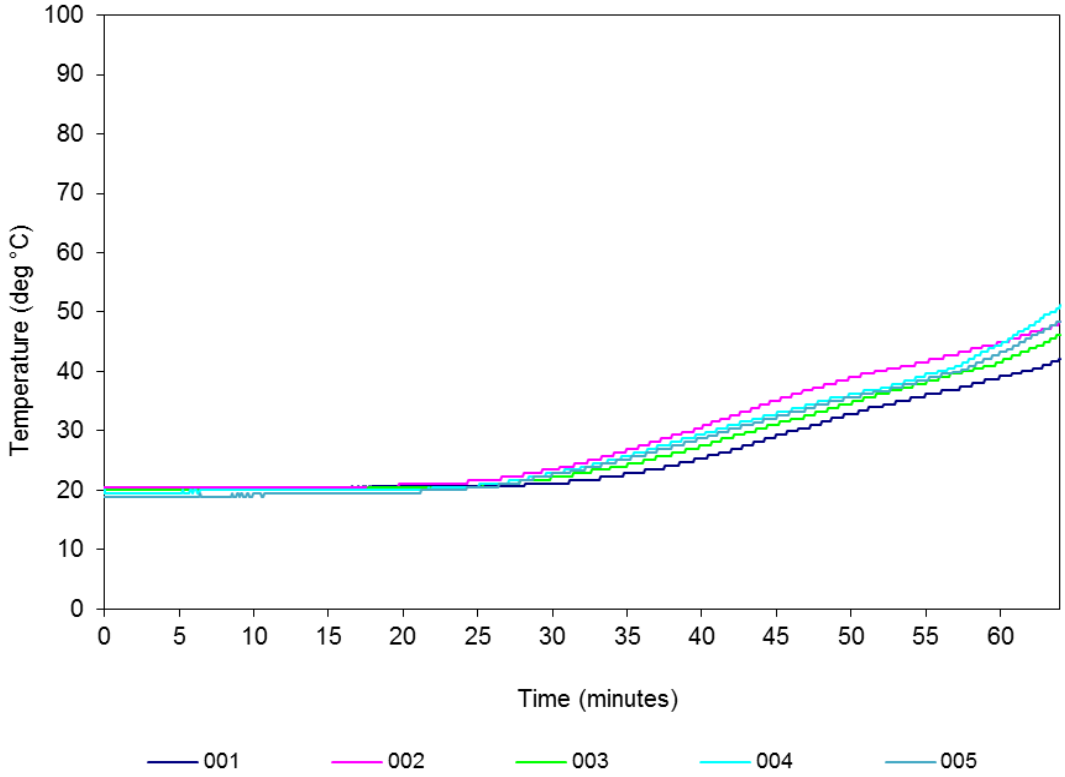

Figure A5.2: Quarter points and centre on unexposed face.
Temperatures vs. time

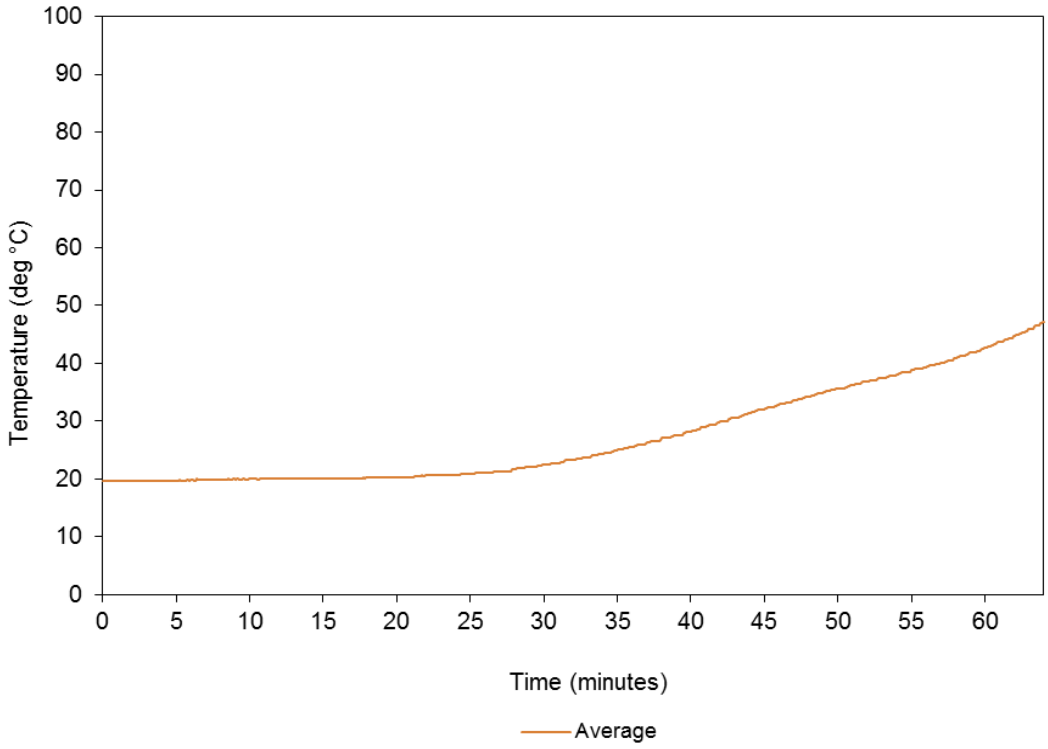

Figure A5.3: Average of Quarter point and centre on unexposed face.
Temperatures vs. Time

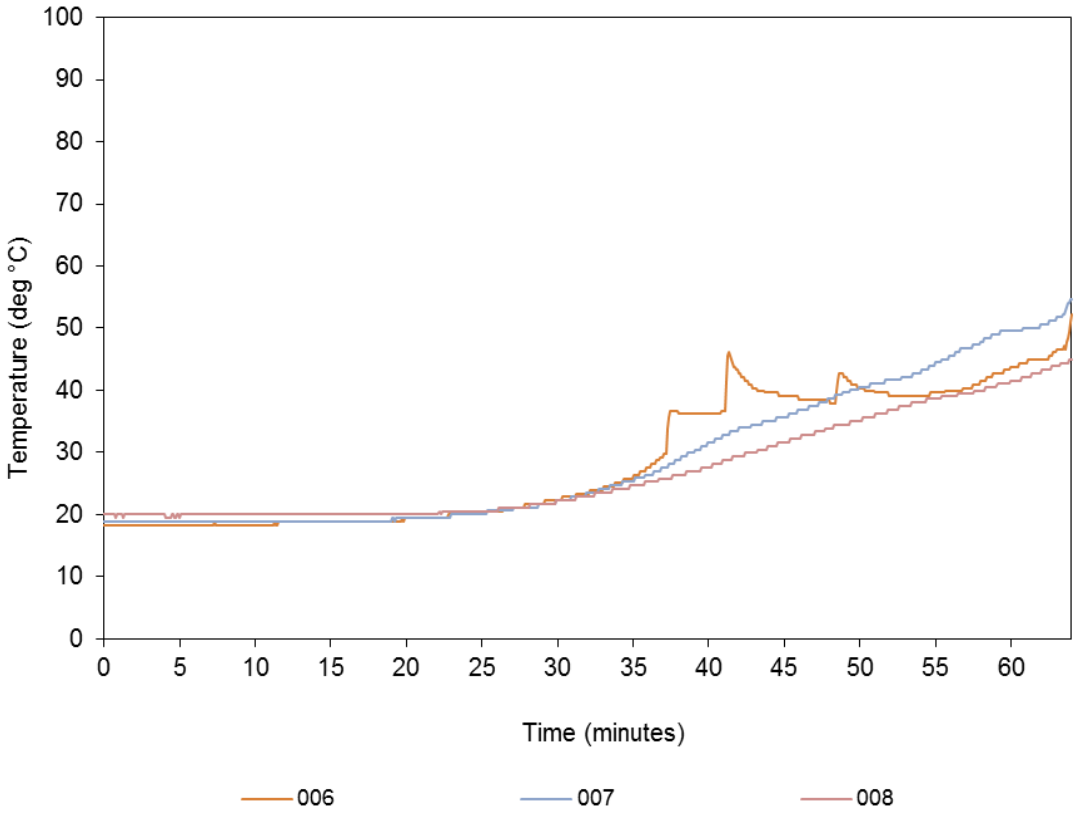

Figure A5.4: Other Surface - Head, Head at Stud and free edge.
Temperatures vs. time

Table A5.1: Test Specimen Temperatures

Location	T/C No.	Description[2]	Temp (°C) at t (minutes)						Limit (Mins)
			t=0	t=15	t=30	t=45	t=60	t=64	
Qtr points	001	Upper west quarter point	20	20	21	29	39	42	-
	002	Upper east quarter point	21	21	24	35	45	48	-
	003	Centre of specimen	20	20	22	31	42	46	-
	004	Lower east quarter point	19	20	23	33	44	51	-
	005	Lower west quarter point	19	19	23	32	43	48	-
Quarter point average			20	20	23	32	43	47	-
Other surface	006	At the head of the specimen at mid-width	18	19	22	39	44	52	-
	007	At the head of the specimen in line with a stud	19	19	22	36	50	55	-
	008	Mid-height of the free edge, 100mm from the edge.	20	20	22	32	42	45	-

Notes

[1] Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180K above the initial temperature.

[2] Refer to Appendix 4 for locations of thermocouples as only a generic description is included in the table.

[3] No insulation failure prior to thermocouple failure.

'-' Under Limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

A 5.4 DEFLECTIONS

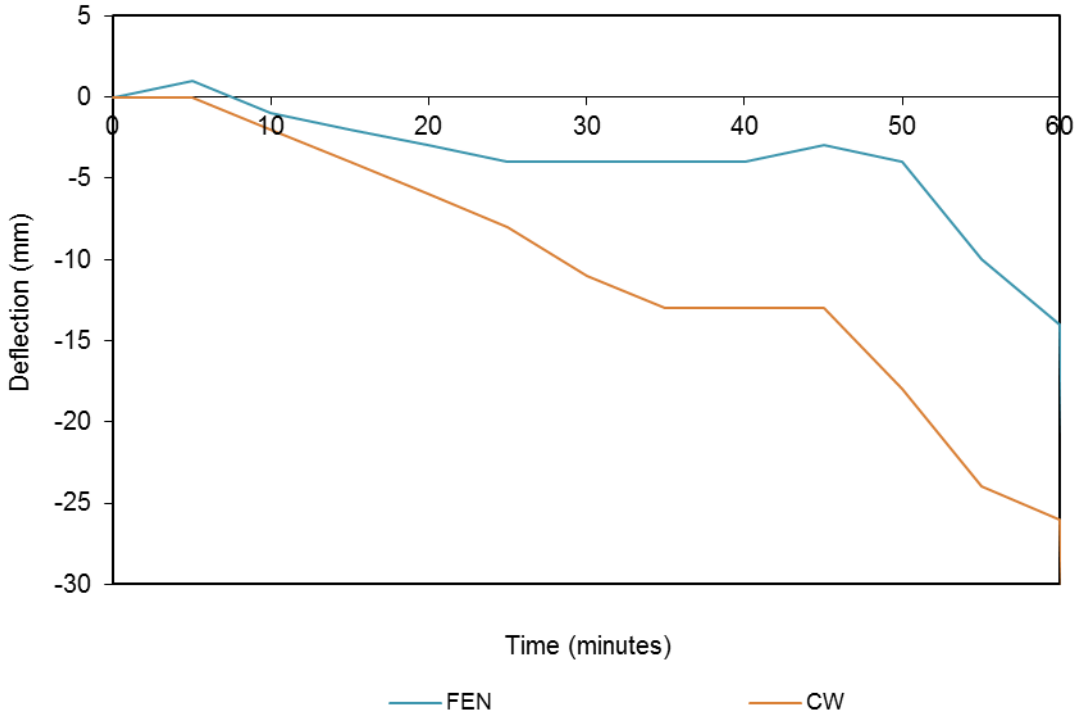

Figure A5.8: Specimen Deflection of the wall vs. Time (Horizontal Deflection)
Positive measurements show movement of the wall towards furnace, negative measurements show movement of wall away from furnace

APPENDIX 6 PHOTOGRAPHS

Figure A6.1. Unexposed face of specimen before commencement of the fire-resistance test

Figure A6.2. Exposed face of specimen before commencement of the fire-resistance test

Figure A6.3. Unexposed face of specimen at the end of the test

Figure A6.4 Exposed face of specimen at the end of the test