

TEST REPORT FOR FIRE PROPAGATION CHARACTERISTICS OF EXTERIOR NON-LOADBEARING WALL ASSEMBLIES

Test Sponsor:

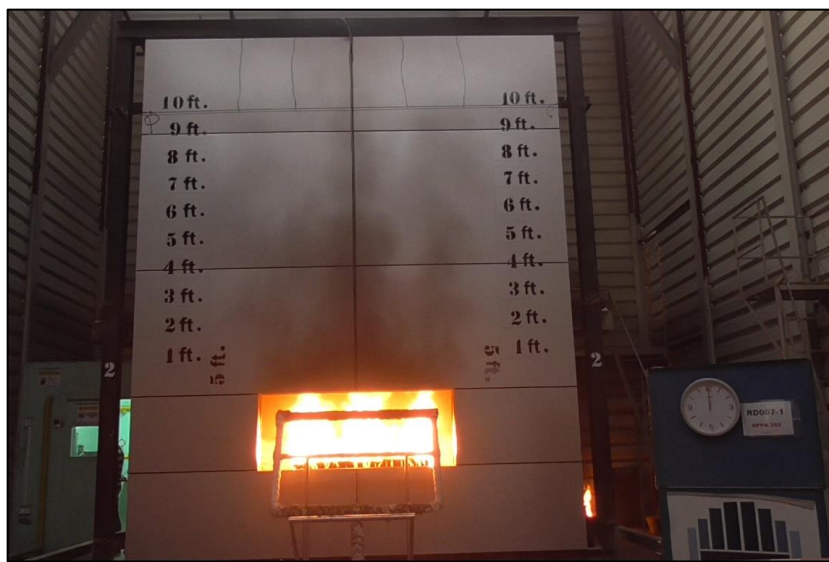
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Test Assembly:

Non-loadbearing 4mm thick Alpolic™ FR Aluminium Composite Panel Assembly.

Test Standard:

NFPA 285; Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Loadbearing Wall Assemblies Containing Combustible Components, 2012 Edition



**THOMAS BELL-WRIGHT
INTERNATIONAL CONSULTANTS**

Test Date: 18th July 2017
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DUBAI

ABU DHABI

DOHA



Accreditation

Testing

ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories *with*

International Accreditation Service (IAS) - Testing Laboratory: **TL-626**
www.iasonline.org



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The work which is the subject of this report falls wholly or partly under the accreditation of **ISO 17025 IAS**



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1. INTRODUCTION

Determination of the fire propagation characteristics of a non-loadbearing 4mm thick AlpoliTM FR Aluminium Composite Panel assembly according to:

NFPA 285; Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Loadbearing Wall Assemblies Containing Combustible Components, 2012 Edition.

2. SPONSOR

Name: Mitsubishi Chemical Corporation
Address: 1-1, Marunouchi 1-chrome, Chiyoda-ku,
Tokyo 100-8251, Japan
T: +81 268 38 9560
Website: www.mitsubishichem-hd.co.jp

3. TESTING LABORATORY

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4. DATE OF TEST

Installation Date: 10-Jul-17 to 13-Jul-17

Fire Test Date: 18-Jul-17

The test has been was witnessed by:

Name	Company	Contact Number
Mr. Moritaka Sakurai	Mitsubishi Chemical Asia Pacific Pte Ltd. (MCAP)	+65 9150 7483
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5. TEST SAMPLES

5.1. Sample and Assembly Description

The 5500 x 4550mm (h x w) intermediate scale multi-story assembly (ISMA) test wall was constructed of a base wall onto which Aluminium support brackets were fixed, anchored into the studs of the base wall. Vertical and horizontal Aluminium runners were fixed to the support brackets, and Aluminium panel hooks were fixed to the vertical runners.



5.1.1. BASE WALL

The base wall was composed of a layer of 15.9mm thick Type-X gypsum boards fixed on either side of a galvanized steel framing system consisting of vertical studs and horizontal tracks. The boards were fixed with steel drywall screws, and the meeting edges of all gypsum boards were covered with fiber jointing tape and gypsum jointing compounds.

5.1.2. ALUMINIUM WALL BRACKETS

A single length of wall bracket were used on the specimen. They were fixed to the exterior face of the base wall, anchored in the galvanized steel framing system of the base wall using stainless steel self-drilling screws.

5.1.3. ALUMINIUM CONNECTORS

The connectors were fixed at the junction of the horizontal and vertical runners using stainless steel screws to join them together.

5.1.4. ALUMINIUM RUNNER SYSTEM

The runner system consisted of extruded Aluminium tubes fixed vertically and horizontally to the Wall Brackets using stainless steel hex. Head bolt and nut. Horizontal and vertical runners were joined together using Aluminium Connectors, which were fixed using stainless steel screws.

5.1.5. ALUMINIUM L-ANGLE RUNNERS – VERTICAL EDGES OF THE SPECIMEN

L-shaped angles were fixed along the height of the base wall at the vertical edges to the exterior face of the base wall, anchored in the galvanized steel framing system of the base wall using stainless steel self-drilling screws.

5.1.6. EXTERIOR INSULATION & CAVITY FIRE BARRIER

Mineral wool (Rockwool) insulation was fixed to the exterior face of the base wall using insulation supports. It covered the entire exterior face of the base wall, except for in the location of the cavity fire barriers. The cavity fire barriers consisted of strips of mineral fiber insulation, fixed to the exterior of the base wall horizontally at the location of the window perimeter and along the first and second storey floor slabs. It was fixed using galvanized steel insulation supports.

5.1.7. ALPOLIC™ FR 4MM THICK ALUMINIUM COMPOSITE PANELS

The Aluminium Composite Panels (ACP) were made using 4mm thick Alpoli[™] FR ACP material folded into tray profiles. The panels were fixed to the vertical and horizontal runner profiles via extruded aluminum panel cleats, which were riveted within the bend of the tray profile. Similar extruded Aluminium profiles and ACP trimmings were used in the corners of the tray profiles to reinforce and support the bends, and were also fixed using rivets.

5.1.8. PANEL GAP INSULATION

Vedafeu Cordon-12 Firestop Rope which was friction fitted into the horizontal and vertical gaps (10mm) between adjacent panels. Once put in place, it was covered with Dow Corning Firestop 700 fire rated Silicone, extruded smoothly and made flush with the exterior face of the specimen.



5.1.9. WINDOW AND PERIMETER DETAIL

Aluminium Composite Panels at the window aperture and at the perimeter of the specimen had a larger bend enough to cover the depth of the specimen up to the base wall.

Along the interior top edge of the window opening, an Aluminium L-angle was fixed over the ACP corner using stainless steel self-drilling screws.

5.2. Supporting Construction

The test assembly was installed on a moveable test frame constructed of 150 x 150mm steel I-beams with 3 Nos. of 100 x 100mm steel angles welded horizontally at locations specified by the standard.

The assembly was secured onto the laboratory's intermediate scale multi-story test apparatus (ISMA) and the gaps were filled with ceramic fiber blanket with a density of 128 kg/m³.

6. SPECIMEN VERIFICATION

6.1. Specimen Definition

The laboratory has not been involved in the selection of the specimen.

The choice and the definition of the specimen have been made by the Mitsubishi Chemical Corporation.

6.2. Specimen Installation

Installation of the specimen: United Colour Film L.L.C.

Frame and base wall preparation: TBWIC

7. METHOD OF TEST

7.1. Verification of the Test Specimen

The construction has been verified by TBWIC based on a detailed survey and with the technical information provided by Mitsubishi Chemical Corporation.

The Alpolic™ FR 4mm thick Aluminium Composite Panels were marked and signed by Mr. Azel Joquino from TBWIC Certification (Certification Body) on 30-May-17 as part of the product certification process.

7.2. Conditioning and Moisture

The specimen was delivered on 10-Jul-17 and installed from 10-Jul-17 to 13-Jul-17. The specimen was covered with tarpaulin after installation and stored in ambient conditions at temperatures ranging between 35°C and 45°C and 14% to 59% humidity.

7.3. Instrumentation

The interior thermocouples fixed within the specimen were placed at mid-depth of the air cavity, nominally 195mm from the interior face of the base wall, as per figure 6.1(b), Detail H in the NFPA 285 standard, shown in Appendix 1, Figure 4 of this report.



8. CALIBRATION

The calibration for the test rig was performed on November 17, 2016 and followed the procedure and practices outlined for calibration in NFPA 285:2012, Chapter 7.

Table 1 shows the average heat flux and table 2 shows the average temperature obtained during the calibration test. The values are within the allowable ranges as specified in table 7.1.11 ($\pm 10\%$ allowable tolerance).

Time Interval (min)	Average Heat Flux 2FT (W/cm ²)	Average Heat Flux 3FT (W/cm ²)	Average Heat Flux 4FT (W/cm ²)
0:00-5:00	0.76	0.81	0.62
5:00-10:00	1.55	2.10	1.38
10:00-15:00	2.99	2.58	1.94
15:00-20:00	3.10	2.97	2.00
20:00-25:00	4.10	3.29	2.58
25:00-30:00	4.54	3.85	2.73

Table 1: Average heat flux values for the time period indicated.

Time Interval (min)	Avg. Burn Room Temp (°F)	Avg. Int. Wall Temp (°F)	Avg. 1 FT Temp (°F)	Avg. 2 FT Temp (°F)	Avg. 3 FT Temp (°F)	Avg. 4 FT Temp (°F)	Avg. 5 FT Temp (°F)	Avg. 6 FT Temp (°F)
0:00-5:00	1154	1110	675*	691	653	601	532	477
5:00-10:00	1353	1332	1038*	1039	1025	943	841	749
10:00-15:00	1447	1441	1113*	1118	1097	1047	957	865
15:00-20:00	1522	1532	1161*	1165	1132	1069	970	888
20:00-25:00	1592	1636	1190*	1236	1217	1147	1029	937
25:00-30:00	1641	1729	1215*	1253	1260	1203	1071	969

*Some values obtained during the calibration were slightly above the limit. These values represent a more severe test scenario.

Table 2: Average temperature values for the time period indicated.

9. FIRE TEST

9.1. Conditions and Test Situation

The fire test was carried out according to NFPA 285; 2012 Edition

9.2. Measurements (for graphs and data, refer to Appendix 5 & 6)

The specimen was fitted with 54 Type-K thermocouples which were distributed as per the diagram in Appendix 1.

A 100 channel Agilent 34970A data logger was used to record the output of the thermocouples on 15 second intervals.

The window burner was centered on the vertical centerline of the window, 9 inches below the top of the opening, and with the longitudinal centerline of the burner at 3.5 inches from the plane of the exterior wall, consistent with the standard and the calibration of the test apparatus.



The assembly was tested based on the values obtained during the calibration as per the NFPA 285 standard.

The burn room thermocouples were placed at 6 inches below the first story test room ceiling and distributed according to NFPA 285; Fig. 6.1(d)

The ambient temperature at the commencement of the test was recorded as 93.92 °F and the relative humidity was recorded as 39%. The airflow, measured with an anemometer placed at a right angle and within 1 meter of the test face, at the beginning at test was recorded at less than 0.1 m/s. Video recording digital photographs, visual observations and data collection were performed prior, during, and after testing was completed.

Note: The starting ambient temperature for the test was higher than the allowable 90°F specified in the NFPA 285 standard. However, the test was completed at the lowest available temperature over a 24 hour period.

9.3.Pre-Test Observations

The specimen was found satisfactory and fit to be tested.

9.4.Fire Test Observations

Time (min:sec)	Observations From In Front of the Specimen (Exterior Face)
0:00	The test was started.
3:00	Coating over the panel back bends along the window aperture began to peel off.
4:30	Panels along the window aperture began to bulge out along the window head.
5:00	The window burner was ignited.
5:10	Coating over the panels up to 3 feet above the window head began to peel off.
8:05	Flaming was observed on the sealant along the center joint of the panels 3 feet above the window head.
10:00	The specimen was stable.
10:43	Flaming was observed on the sealant along the center joint of the panels 4 feet above the window head.
11:00	Panels along the window aperture began to sag along the window head.
15:00	The specimen was stable.
15:37	The core material from the panels along the window head began to fall.
16:00	The core material from the panels above the window aperture began to fall off and were observed to have melted through up to 4 feet above the window head.
17:00	Flaming was observed on the sealant along the center joint of the panels 6 feet above the window head.
18:00	Flaming was observed at the top corners of the window aperture.
19:00	The core material was observed to be falling off continuously. Inner skin of the panels were also observed to be melted and dripping down exposing the external insulation up to 4 feet above the window head.
20:00	The specimen was stable.
21:00	The core material that fell onto the floor and window sill were observed to be burning.
25:00	The specimen was stable.



30:00	The specimen was stable, the test was stopped and gas shut off, as per the NFPA 285 Standard, and the 10 minute observation period began.
30:01	The core material along the window vertical edges and sill was observed to be burning.
32:00	The flaming along the vertical edges of the window sill referenced at 30:01 had ceased.
35:00	The flaming referenced at 30:01, except the flaming along the sill had ceased.
40:00	The observation period was ended as per the NFPA 285 standard and the NFPA 285 test was completed. Flaming of the core material along the sill continued beyond the observation period and had ceased after 9 minutes from the end of the observation period.

9.5. Second Floor Test Room Observations

Time (min:sec)	Observations From The 2 nd Floor Room (Interior Face)
0:00	The test was started
10:00	The 2 nd floor room was stable, no flaming was observed.
15:00	The 2 nd floor room was stable, no flaming was observed.
20:00	The 2 nd floor room was stable, no flaming was observed.
25:00	The 2 nd floor room was stable, no flaming was observed.
30:00	The 2nd floor room was stable, no flaming was observed, the test was stopped and gas shut off, as per the NFPA 285 Standard, and the 10 minute observation period began.
35:00	The 2 nd floor room was stable, no flaming was observed.
40:00	The observation period was ended as per the NFPA 285 standard and the NFPA 285 test was completed.

10. EXTENT OF DAMAGE

10.1. Exterior Face Observations

1. The panels 4 feet right above the window head had melted through, exposing the external insulation.
2. The panels above and to either sides of the burned areas were observed to be delaminated.
3. The panels above the window head up to the top end of the specimen extending beyond the 5 feet mark horizontally from the window centerline and had slightly delaminated.

10.2. Interior Face Observations

The 2nd storey room was stable and intact.

10.3. Dismantling Observations

The Aluminium foil scrim of the exterior insulation up to 6 ½ feet had melted and burned away.



11. FIRE PROPOGATION ANALYSIS

Test Performance Evaluation Summary Table		
Test Requirement	Test Observation	Pass/Fail
Flames emitting from the surface of the exterior face of the test specimen shall not reach a height of 10ft or greater above the top of the window opening.	Flames did not reach 10 feet above the window opening.	Pass
Flames emitting from the surface of the exterior face of the test specimen shall not reach a horizontal distance of 5ft or greater from the vertical centerline of the window opening.	Flames did not reach a lateral distance of 5ft from the vertical centerline.	Pass
Flames shall not occur in the second-story test room.	There was no visible flaming in the second story test room.	Pass
Temperatures shall not exceed 1000°F as measured by thermocouples Tc-11 and Tc-14 through Tc-17.	Tc-11 and Tc-14 through Tc-17 did not exceed the 1000°F limit.	Pass
Temperatures in the wall cavity air space shall not exceed 1000°F as measured by thermocouples Tc-18 and Tc-19.	Tc-18 and Tc-19 did not exceed the 1000°F limit.	Pass
Temperatures in the wall cavity air space shall not exceed 1000°F as measured by thermocouples Tc28 and Tc-31 through 40.	Tc-28 and Tc-31 through Tc-40 did not exceed the 1000°C limit.	Pass
Temperatures measured 1 in. (25mm) from the interior surface of the test specimen within the second story test room shall not exceed 500 °F above ambient air temperature of test facility at the start of fire test as measured by Tc-49 through Tc-54.	Tc-49 through Tc-54 did not exceed the maximum temperature of 593.92°F. (500°F + Initial Ambient Temperature = 500°F + 93.92°F = 593.92°F)	Pass

12. SUMMARY OF RESULTS

The 4mm thick Alpolic™ FR Aluminium Composite Panel cladding assembly has been evaluated in accordance with NFPA 285; Standard Test Method for Evaluation of Fire Propagation Characteristic of Exterior Non load-bearing Wall Assemblies Containing Combustible Components, 2012 Edition.

The results of the fire performance evaluation conducted on the wall assembly described herein indicate that the assembly met the acceptance criteria stated in the standard.



13. LIMITATION

The results are only applicable to the type and orientation of the installation which relate to what has been tested. No uncertainty factors have been considered or covered in this test report for the test assembly stated herein given a large scale fire.

14. RECOMMENDATION

Thomas Bell-Wright International Consultants recommend that the relevance of test reports should be considered after a period of five years.

This test report is respectfully submitted by: Thomas Bell-Wright International Consultants

Prepared By:

Fawaz Hashim, AIFireE
Lead Fire Testing Engineer

Reviewed By:

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15. APPENDIX 1 – ORIENTATION OF THERMOCOUPLES

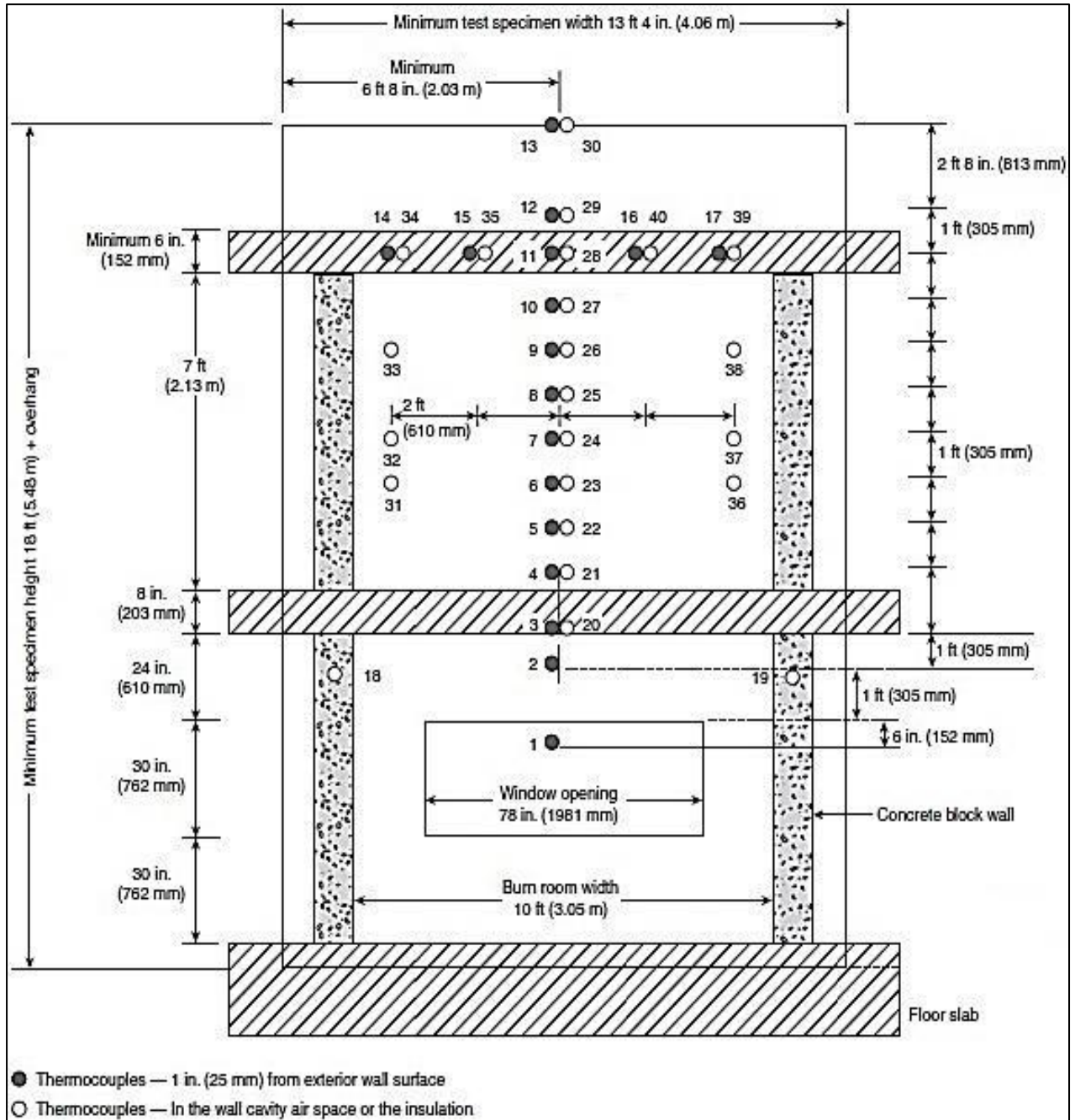


Figure 1: Overall instrumentation on the exterior wall surface and air cavity.

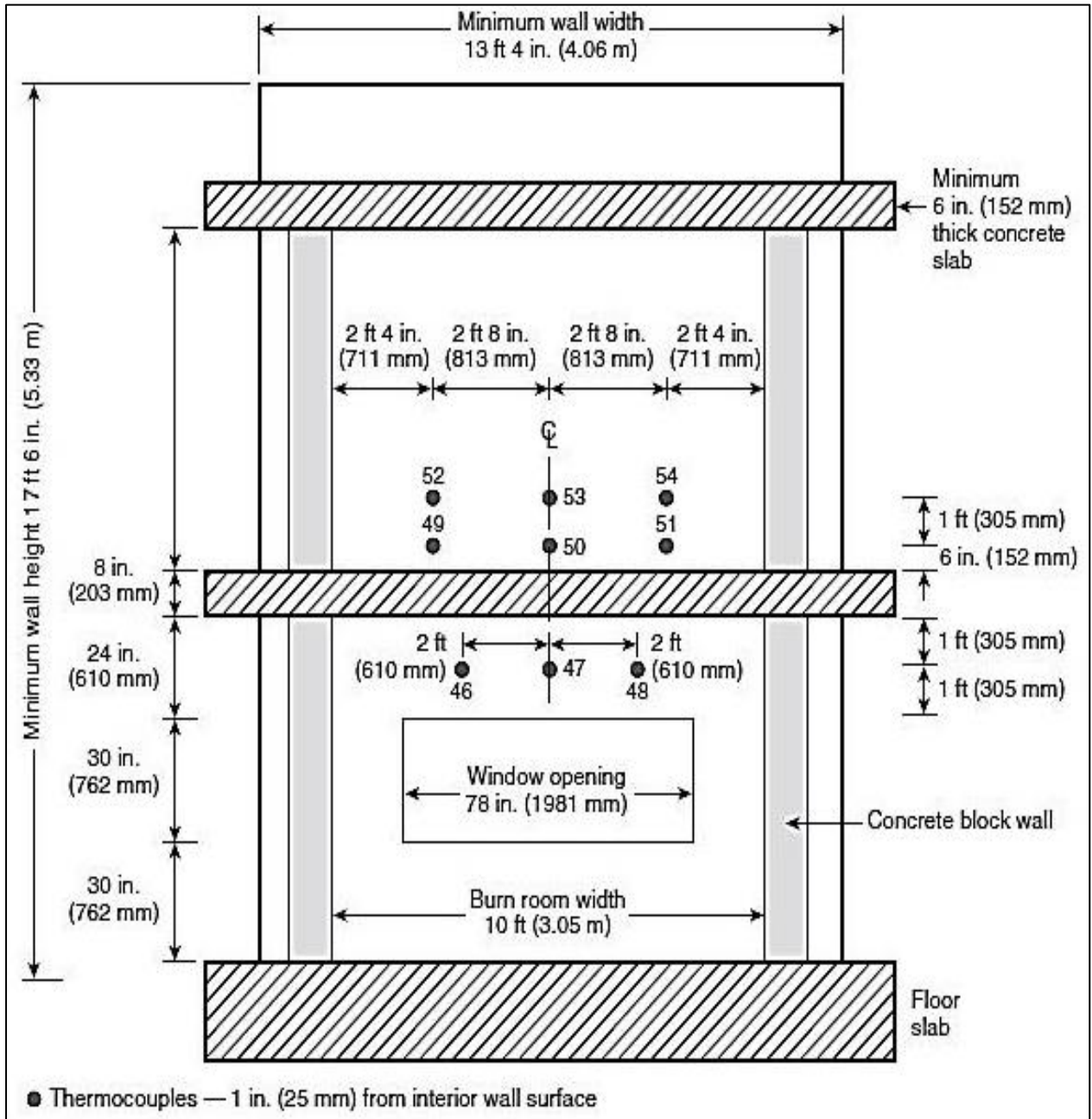


Figure 2: Overall instrumentation on the interior wall surface.

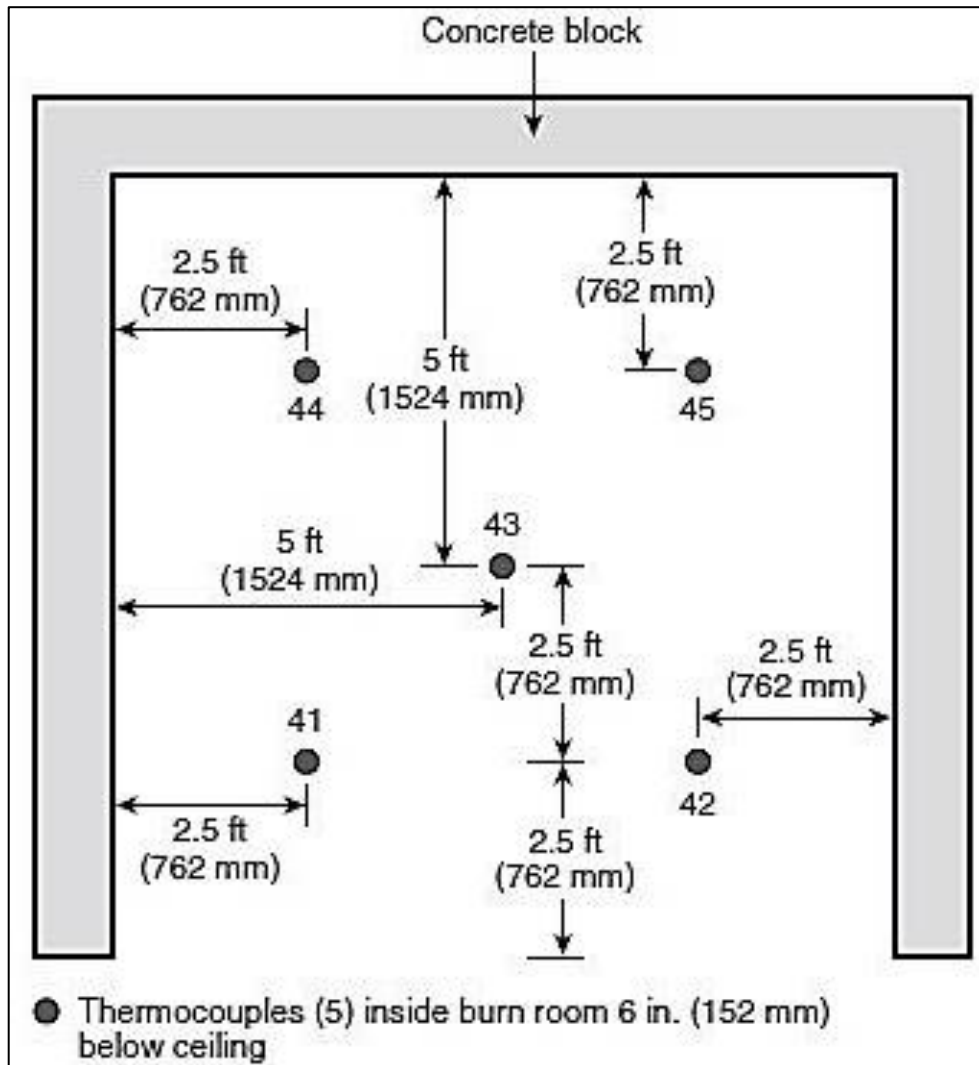


Figure 3: Overall instrumentation inside of the 1st story burn room (Top View)

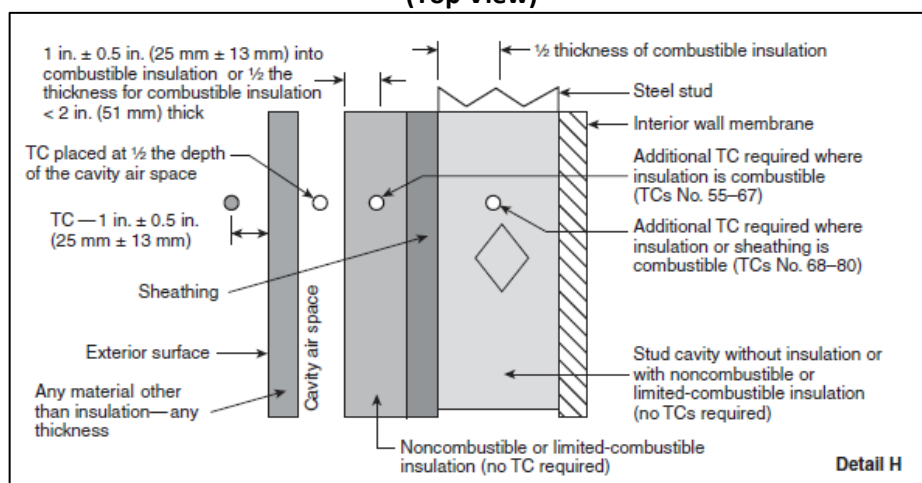


Figure 4: Figure 6.1(b) Detail H of the NFPA 285 standard, showing the thermocouple depth specifications of the specimen.



16. APPENDIX 2 – BURNER GAS FLOW DATA

Time	During Fire Test		During Calibration	
	Room Burner	Window Burner	Room Burner	Window Burner
0 – 5 mins	47.7 SCFM	0 SCFM	47.7 SCFM	0 SCFM
5 – 10 mins	50.9 SCFM	8.6 SCFM	50.9 SCFM	8.6 SCFM
10 – 15 mins	54.0 SCFM	12.1 SCFM	54.0 SCFM	12.1 SCFM
15 – 20 mins	57.2 SCFM	12.4 SCFM	57.2 SCFM	12.4 SCFM
20 – 25 mins	60.4 SCFM	14.5 SCFM	60.4 SCFM	14.5 SCFM
25 – 30 mins	63.6 SCFM	15.5 SCFM	63.6 SCFM	15.5 SCFM

*SCFM: Standard Cubic Feet per Minute



17. APPENDIX 3 – COMPONENTS DESCRIPTION

A. Base Wall:

Studs	
Material	Galvanized Steel
Manufacturer	JB Mechanical Services
Dimension	93 x 32 x 34 x 9 x 1.2 mm [web x flange (1) x flange (2) x return lip x thickness]
Fixing method & Application	Studs were fixed at edge of the wall span and nominally spaced to match the distribution of the Aluminium wall brackets (see drawings in Appendix 4). The top and bottom edges were welded within tracks at the head and sill of the base wall. The studs were also welded onto the horizontal angle bars of the test frame at every intersection.
Evidence of survey	Information provided by TBWIC.

Tracks	
Material	Galvanized Steel
Manufacturer	JB Mechanical Services
Dimension	95 x 32 x 1.2 mm (web x flange x thickness)
Fixing method & Application	The tracks were welded directly onto the test frame along the bottom edge (sill) and also onto the studs at the intervals provided by the sponsor for the spacing of the Aluminium wall brackets. The tracks were placed along the top and bottom of the framing system. Tracks were used along the window opening, too.
Evidence of survey	Information provided by TBWIC.

Interior/Exterior Wall Lining	
Material	Gypsum Board
Manufacturer	Knauf LLC
Reference	15.9mm Type X (GW-TX)
Dimension	1220 x 2400 x 15.9 mm (w x h x t)
Fixing method & Application	The boards were fixed with Knauf self-tapping screws TB 3.5 x 35mm self-tapping screws, screwed at nominal distance of 300mm C/C vertically on each stud.
Evidence of survey	Information provided by TBWIC.

Jointing Tape	
Manufacturer	Knauf LLC
Reference	Knauf Joint Tape
Dimensions	50 mm wide
Fixing method & Application	Applied along the meeting edges between the gypsum boards and was embedded into the jointing compound on both the interior and exterior faces of the base wall.
Evidence of survey	Information provided by TBWIC.



Jointing Compound	
Manufacturer	Knauf LLC
Reference	Knauf Readygips (Gypsum based filler)
Fixing Method & Application	First coat of Knauf Readygips (gypsum based filler) was applied along the joints between the boards. Knauf Joint Tape was embedded into the joint filler and then two more passes of joint filler were applied along the 15.9mm thk. boards after allowing for appropriate drying times. Three separate coats of joint filler were applied over each screw head. The tape and jointing compound were also applied to the inside of the exterior face of specimen at the request of the test sponsor.
Evidence of survey	Information provided by TBWIC.

B. Framing System:

Aluminium Wall Bracket	
Material	Extruded Aluminium T6-6063
Fabricator	United Colour Film L.L.C.
Reference	Aluminium Wall Bracket
Thickness	3mm
Fixing Method & Application	The wall brackets were fixed to the base wall using 3 Nos. of $\varnothing 4.8 \times 38$ mm long stainless steel pan head self-drilling screws, anchored into the galvanized steel framing system of the base wall. They were fixed both horizontally and vertically, and supported the Aluminium Runner Profiles via a single M8x80mm stainless steel hex head bolt, nut and washers.
Evidence of survey	Information provided by Sponsor and verified by TBWIC.



Aluminium Runner System	
Material	Extruded Aluminium Tube T6-6063
Fabricator	United Colour Film L.L.C.
Reference	Aluminium Runner Profile
Thickness	3mm I Cut to required length.
Fixing Method & Application	The Aluminium runner profiles were oriented both vertically and horizontally, and were fixed to the Aluminium wall brackets via a single M8x80mm stainless steel hex head bolt, nut and washers. They were also fixed horizontally via the same set of Aluminium Brackets and hex head bolts along the entire width of the base wall at the top and bottom edge. The Aluminum Panel Cleats on the ACPs were fixed to runners using $\varnothing 4.8 \times 25$ mm stainless steel pan head self-drilling screws and ultimately supported the panels on the framing system.
Evidence of survey	Information provided by Sponsor and verified by TBWIC.

Aluminium Runner Connector	
Material	Extruded Aluminium Tube T6-6063
Fabricator	United Colour Film L.L.C.
Reference	Aluminium Runner Profile
Thickness	Length – 40mm
Fixing Method & Application	The Aluminium connectors were used to join the vertical and horizontal runners together at their junctions. The connectors were fixed onto the runners using $\varnothing 4.8 \times 25$ mm long stainless steel pan head self-drilling screws
Evidence of survey	Information provided by Sponsor and verified by TBWIC.



Aluminium L-angles – Vertical edges of the base wall	
Material	Extruded Aluminium T6-6063
Manufacturer	United Colour Film L.L.C.
Thickness	3mm Cut to required length.
Fixing Method & Application	The Aluminium L-angles were oriented vertically along the vertical edges of the specimen using $\varnothing 4.8 \times 48$ mm long stainless steel pan head self-drilling screws, anchored into the galvanized steel framing system of the base wall. The aluminum panel cleats were fixed to L-angles using $\varnothing 4.8 \times 25$ mm stainless steel pan head self-drilling screws.
Evidence of survey	Information provided by Sponsor and verified by TBWIC.

C. Cavity Fire Barrier and Exterior Insulation:

Cavity Fire Barrier		
	Vertical	Horizontal
Material	Mineral Fiber	Mineral Fiber
Manufacturer	Siderise Insulation Ltd. – UK	
Reference	Siderise CH-CB (Constructed partially from Siderise CW-FS120)	
Dimensions	85 x 120mm (depth x h)	85 x 120mm (depth x h)
Density	Nominally 75 kg/m ³ (Stated)	Nominally 75 kg/m ³ (Stated)
Fixing Method & Application	Fixed vertically along the full height of the specimen at each vertical edge of the window opening using B65/110 galvanized steel brackets at 600mm C/C, as per Manufacturer guidelines.	Fixed horizontally at the sill and head of the window opening, as well as at the first and second storey floor slabs, using B65/110 galvanized steel brackets at 600mm C/C, as per Manufacturer guidelines.
Evidence of survey	Information provided by the sponsor and verified by TBWIC.	



Cavity Fire Barrier Fixings	
Material	Galvanized Steel
Manufacturer	Siderise Insulation Ltd. – UK
Reference	B65/110 galvanized steel brackets
Dimension	50 x 65 x 25 x 1mm (depth x h x w x thk.)
Fixing Method & Application	The insulation support brackets were pre-bent pieces of galvanized steel that were nominally 65mm high and extended 50mm from the exterior of the base wall and impaled the mineral fiber cavity fire barrier. They were fixed to the base wall using No. 8x1.5” steel pan head screws and were spaced nominally at 600mm C/C.
Evidence of survey	Information provided by the sponsor and verified by TBWIC.

Exterior Insulation & Fixings		
	Mineral Fiber	Insulation Fixing
Manufacturer	Fujairah Rockwool Factory	RAWL PLUG
Reference	S2XX	MBA-08090
Material	Mineral fiber slabs with foil scrim Kraft (FSK) on one side.	Galvanized Steel Pins
Density	80 kg/m ³ (Stated) 80.9 kg/m ³ (Measured)	N/A
Dimensions	Max: 1200x600x50 mm (l x w x thk.)	M8 x 90mm long
Fixing Method & Application	The 50mm thick slabs were fixed directly to the base wall using insulation fixings which were anchored directly into the base wall. The fixings had no particular spacing but were evenly distributed over each full size slab. Typically 5 fixings were used for each slab.	
Evidence of survey	Information provided by sponsor and verified by TBWIC.	



D. Cladding:

Exterior Cladding	
Material	4 mm thick Aluminium Composite Panel
Manufacturer	Mitsubishi Chemical Corporation
Reference	Alpolic™ FR Aluminium Composite Panel
Description	The “Tray Profile” Aluminum Composite Panels were made of 3mm thick mineral filled core, with one 0.5 mm thick sheet of Aluminium on either side. The panel corners were reinforced with an Aluminium strip of size 20 x 40 2mm (w x l x thk.) at 45° corners and with an ACP trimmings at 90° corners; both were fixed onto the panels using Ø3.8 mm Steel SRC blind rivets.
Dimension	PANEL-01 : L x W = 2270mm x 1113mm PANEL-02 : L x W = 2270mm x 1113mm PANEL-03 : L x W = 2270mm x 1500mm PANEL-04 : L x W = 2270mm x 1500mm PANEL-05 : L x W = 2270mm x 1300mm PANEL-06 : L x W = 2270mm x 1300mm PANEL-07 : L x W = 1278mm x 755mm PANEL-08 : L x W = 1278mm x 755mm PANEL-09 : L x W = 1278mm x 842mm PANEL-10 : L x W = 1278mm x 842mm
Fixing Method & Application	Aluminum panel support cleats of dimensions 20x20x40x2 mm (w x h x l x thk.) were fixed in the tray profiles of the ACP panels using Ø3.8 mm Steel SRC blind rivets at regular intervals. The panel support cleats were fixed to the vertical & horizontal Aluminum runner profiles using Ø4.8x25mm stainless steel self-drilling pan head screws. The horizontal and vertical gaps between adjacent panels were filled with Vedafeu-C firestop backer rope to hold the Dow Corning Firestop 700 fire rated Silicone Sealant over it. The sealant was extruded smoothly and made flush with the exterior face of the panels.
Evidence of survey	Information provided by Sponsor and verified by TBWIC.

Panel Corner Support		
Type of joint	45° Joint	90° Joint
Material	Aluminium strip	ACP Trimmings (L-Shaped)
Dimensions	40 x 20 x 1mm (l x w x thk.)	50 x 50 x 20 x 4mm (leg x leg x width x thk.)
Fixing Method & Application	Fixed using two Nos. of Ø3.8 steel SRC blind rivets.	Fixed using four Nos. of Ø3.8 steel SRC blind rivets.
Evidence of survey	Information provided by sponsor and verified by TBWIC.	



Aluminium Panel Cleat	
Material	Extruded Aluminium AA6063 T6
Manufacturer	United Colour Film L.L.C.
Reference	Aluminium Panel Cleat
Dimension	As shown Thickness – 2mm Length – 40mm
Fixing Method & Application	The panel cleats were riveted inside the tray profiles using two Nos. of Ø3.8mm steel SRC blind rivets per cleat, and nominally 450mm C/C. On the vertical panel edges, panel cleats were fixed directly to the Aluminium runner profiles using single Ø4.8x25mm long stainless steel pan head screws.
Evidence of survey	Information provided by Sponsor and verified by TBWIC.

Panel Gap Insulation	
Manufacturer	VEDA France
Reference	Vedafeu Cordon-12 Firestop Rope
Material	Core of fireproof and rot proof mineral fibers bound by an outer braiding of fiber glass thread.
Diameter	12mm
Fixing Method & Application	The Vedafeu Cordon-12 Firestop Rope was friction fitted into the horizontal and vertical gaps (10mm) between adjacent panels. Once put in place, it was covered with Dow Corning Firestop 700 fire rated Silicone, extruded smoothly and made flush with the exterior face of the specimen.
Evidence of survey	Information provided by sponsor and verified by TBWIC.

Sealant	
Manufacturer	Dow Chemical Company
Reference	Dow Corning Firestop 700
Description	Gray, silicone sealant
Fixing Method & Application	The Silicone sealant was used to fill gaps between adjacent panels, to cap the Vedafeu-C firestop rope. It was extruded smoothly and made flush with the exterior face of the specimen. It was also used on the edges of the window detailing around the perimeter of the window opening.
Evidence of survey	Information provided by sponsor and verified by TBWIC.

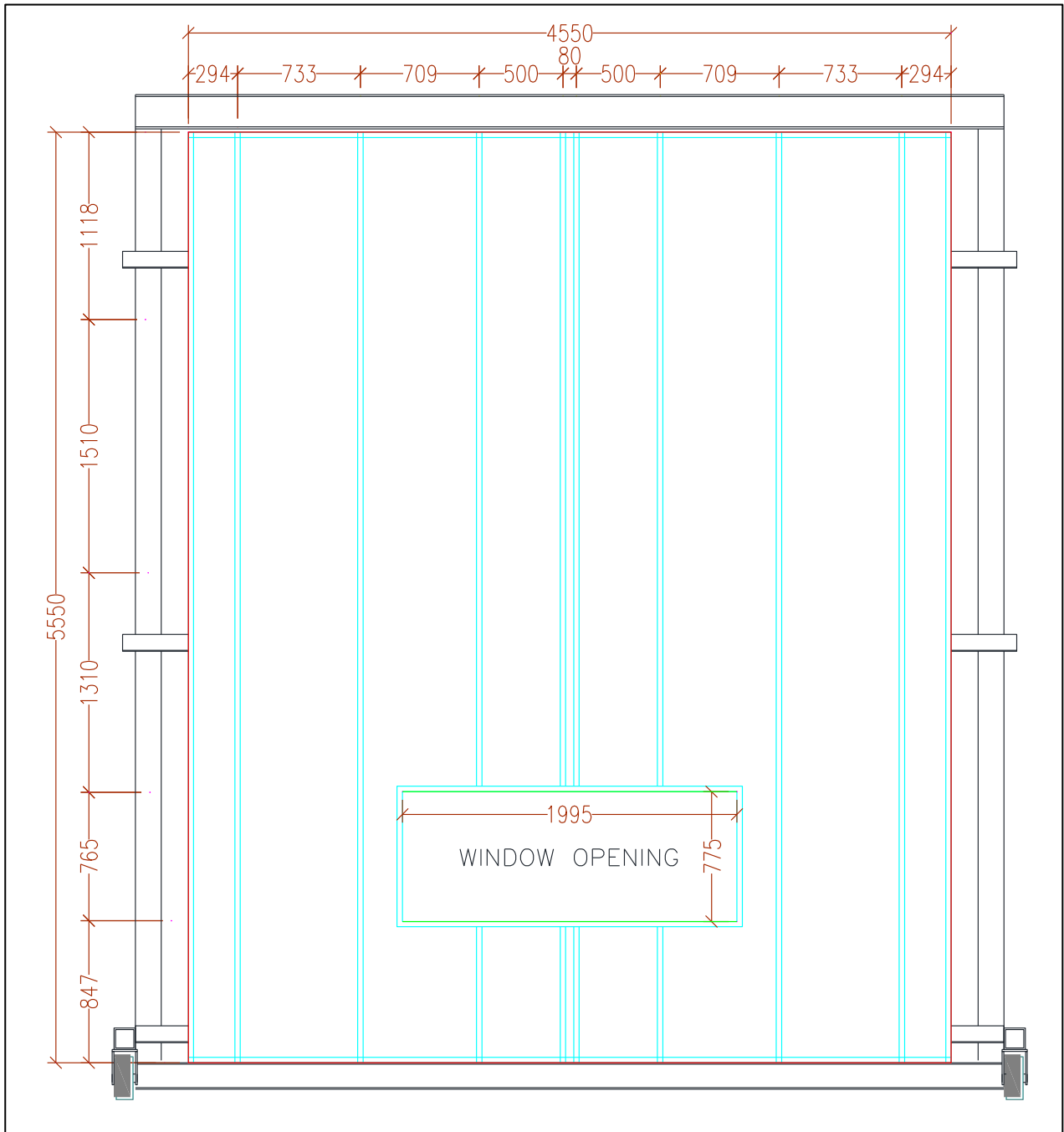


E. Window Detail:

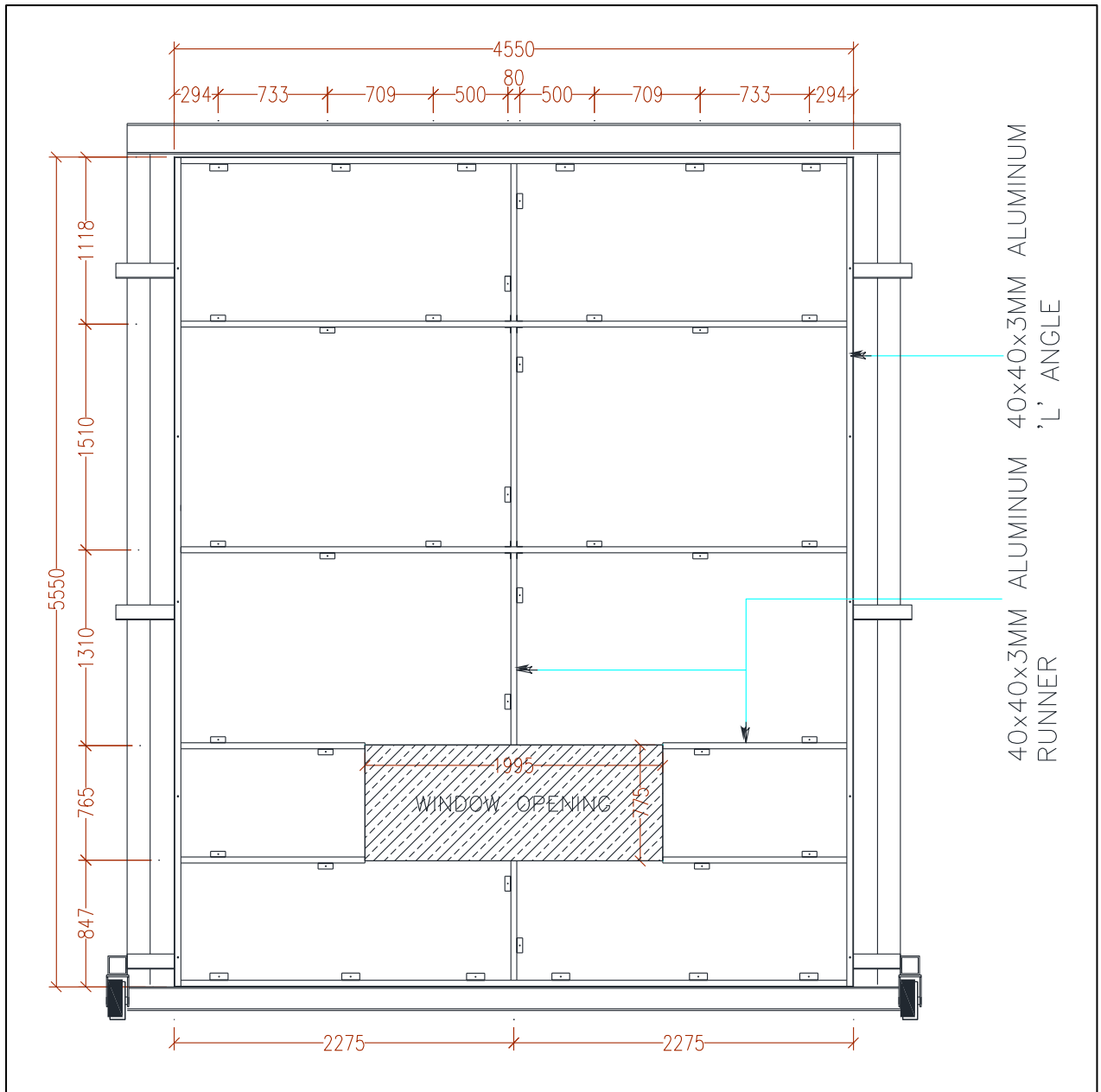
Aluminium L-angles – Inner perimeter edge	
<p>INSIDE GYPSUM TRACK (BY TBWIC) EXISTING GYPSUM BASE WALL (BY TBWIC) ALUMINUM 'L' ANGLE (25x25x2MM) 4MM THICK FR ACM CLADDING WINDOW OPENING</p> <p>Burn Room Side</p>	
Material	Extruded Aluminium T6-6063
Fabricator	United Colour Film L.L.C.
Thickness	2mm I Cut to required length.
Fixing Method & Application	The Aluminium L-angles were fixed along the interior edges of the perimeter of the window using #10x1 inch self drilling screws spaced at 600mm c/c and 50mm from the edges.
Evidence of survey	Information provided by Sponsor and verified by TBWIC.



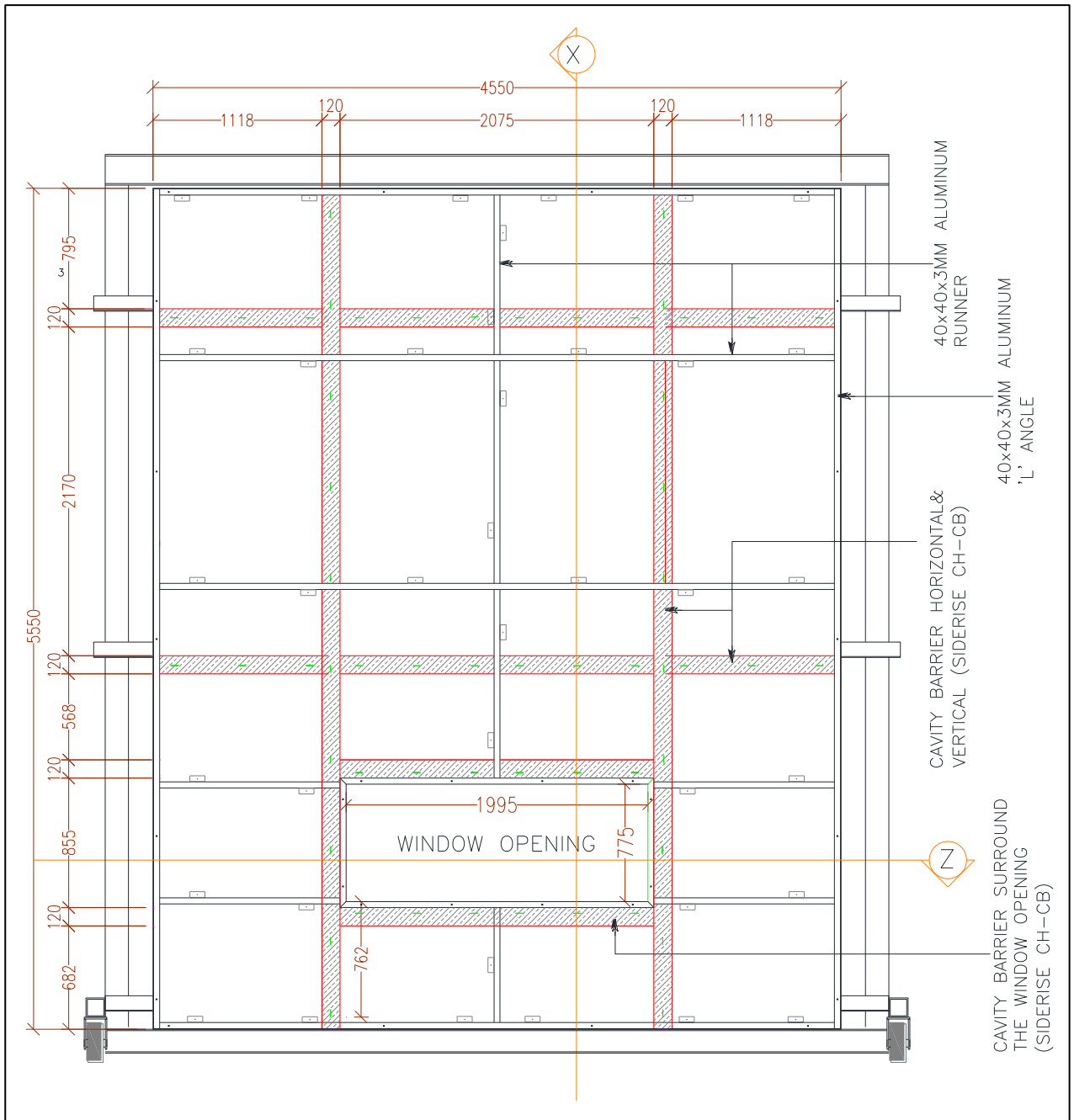
18. APPENDIX 4 – ASSEMBLY DRAWINGS



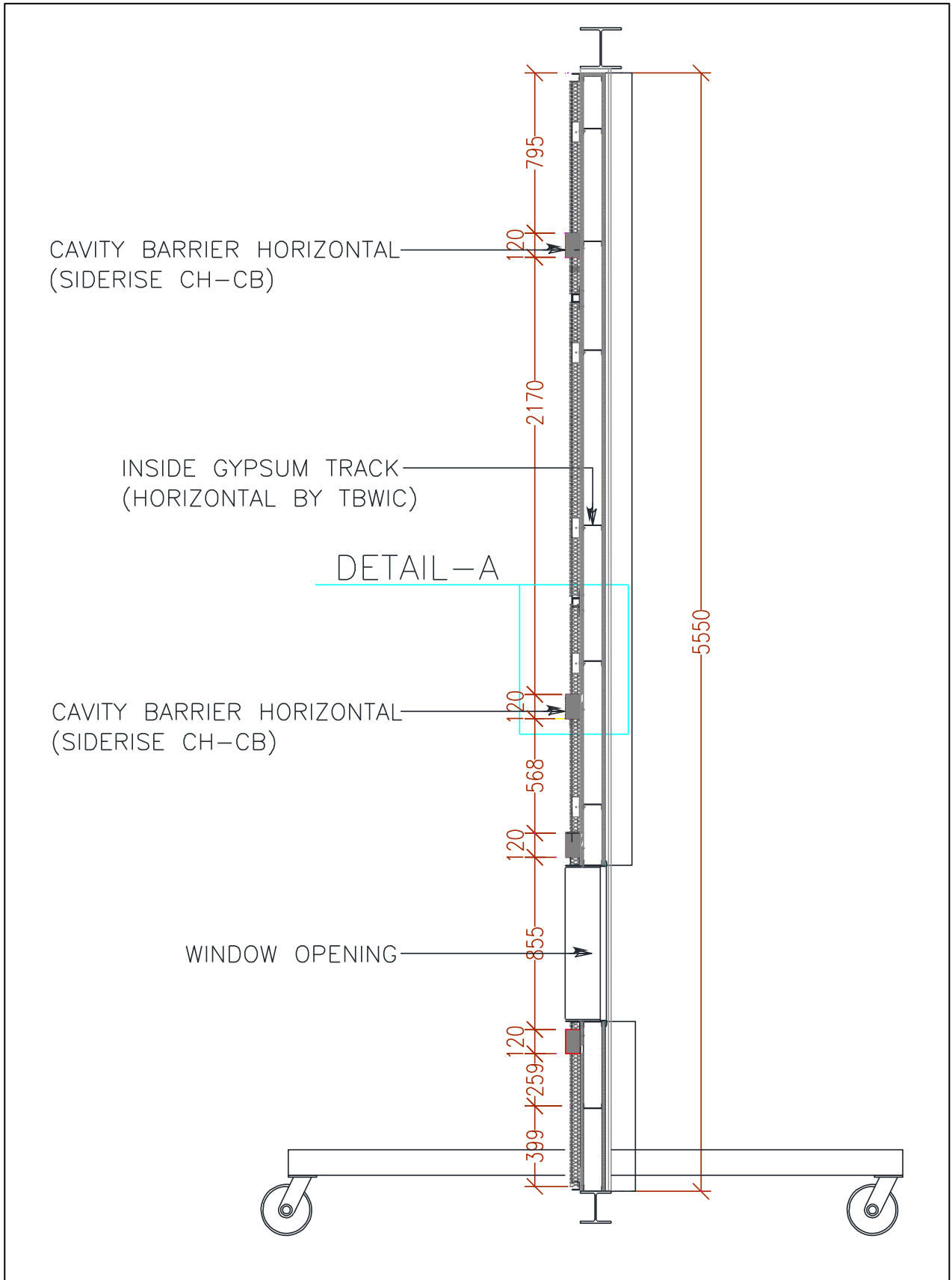
Drawing 1: Base wall framing system of the specimen.



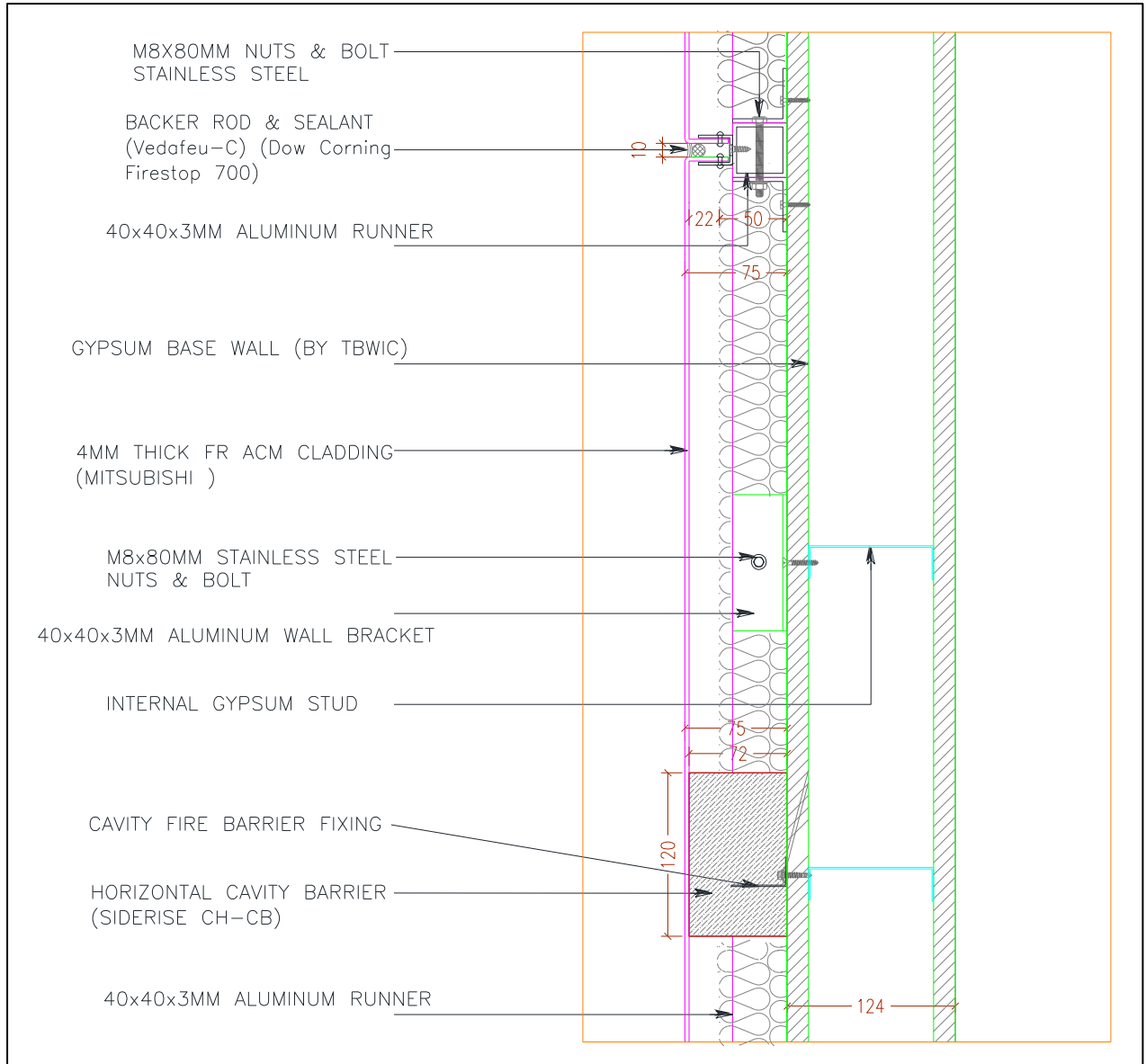
Drawing 2: Framing system for the cladding structure.
(Drawing provided by the sponsor and verified by TBWIC)



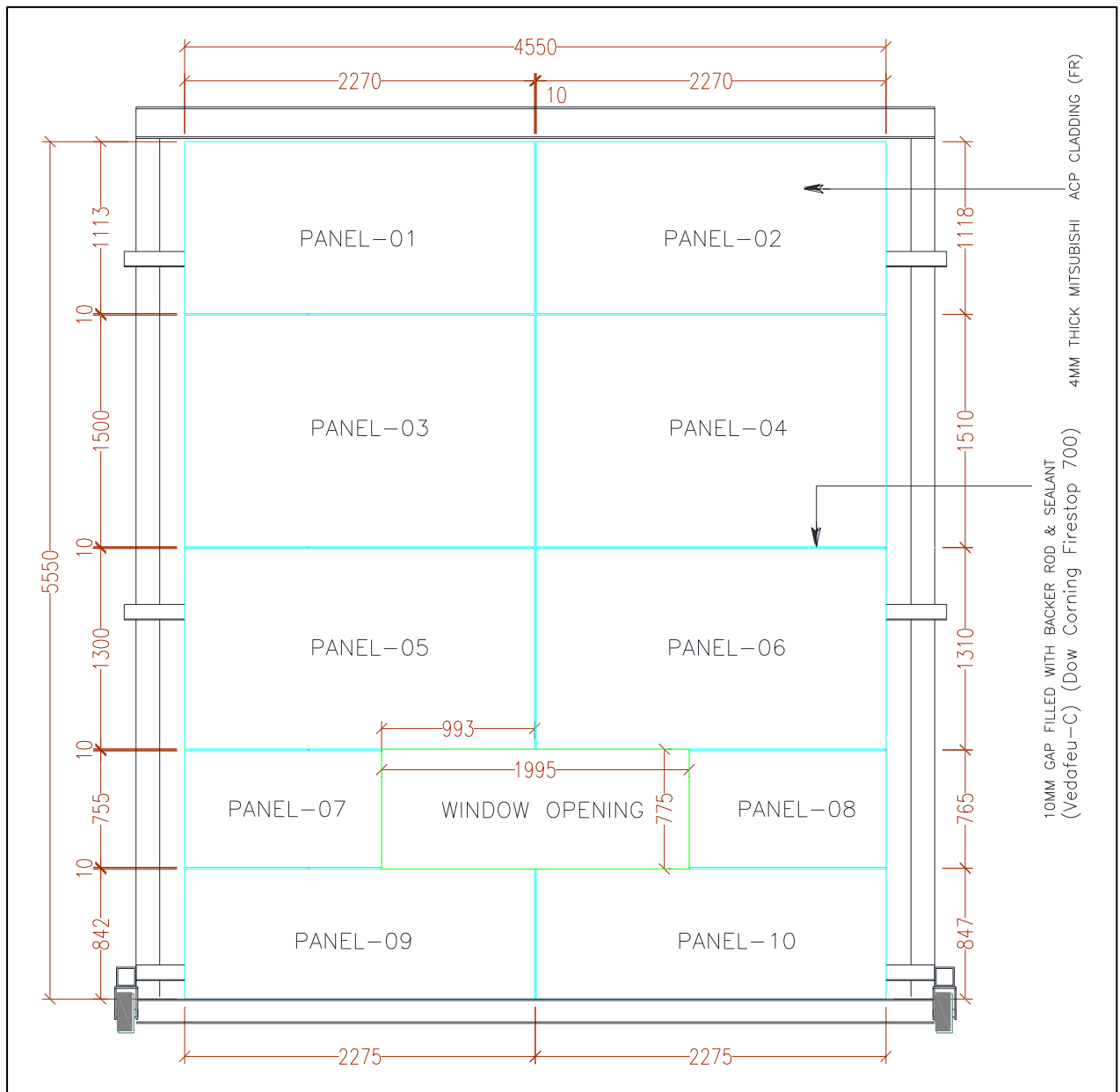
Drawing 3: Elevation showing the arrangement of the horizontal and vertical cavity barrier.
(Drawing provided by the sponsor and verified by TBWIC)



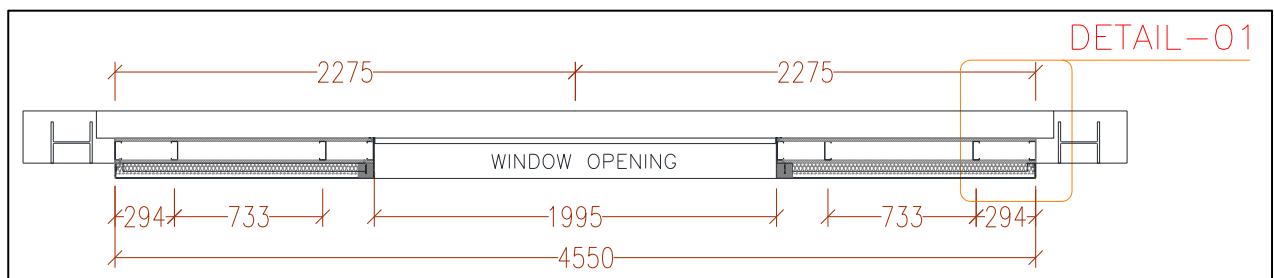
Drawing 4: Vertical section X of the Drawing 3.
(Drawing provided by the sponsor and verified by TBWIC)



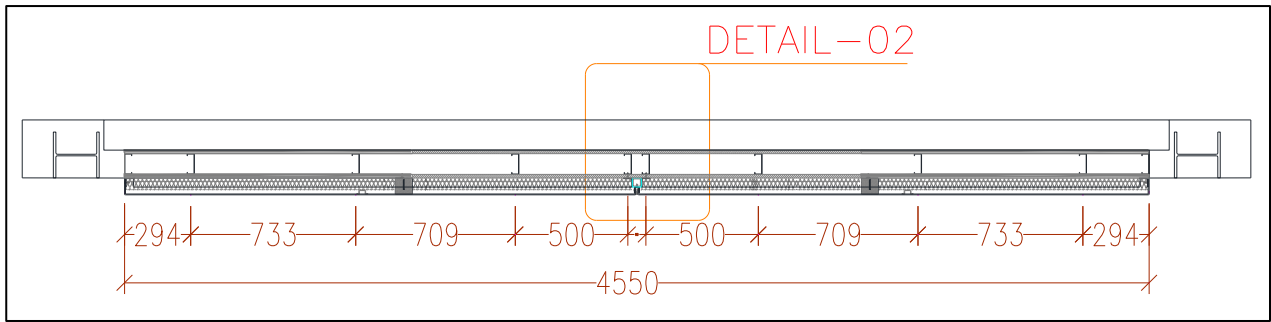
Drawing 5: Detail A of the specimen.
(Drawing provided by the sponsor and verified by TBWIC)



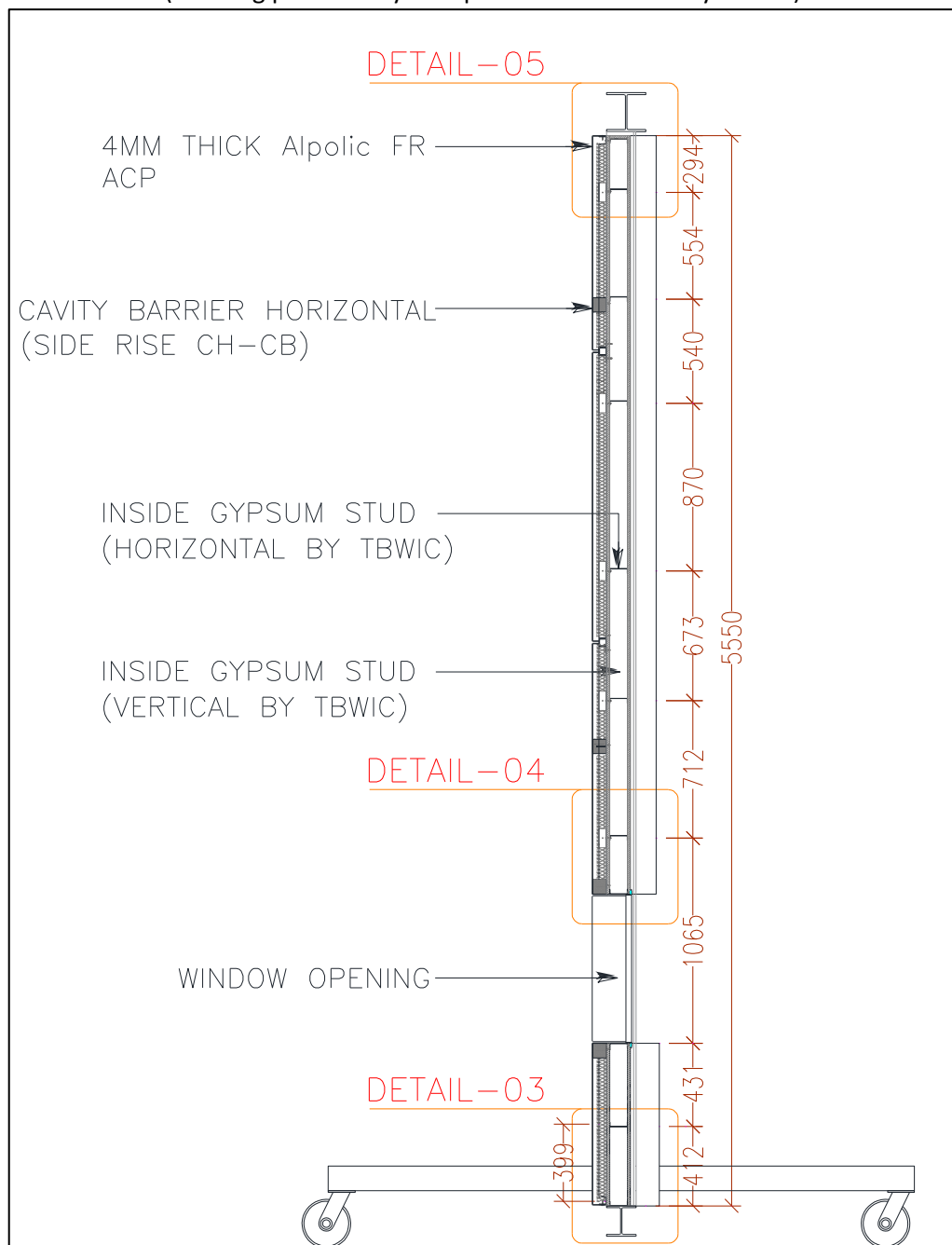
Drawing 6: Elevation showing the ACP arrangement.
(Drawing provided by the sponsor and verified by TBWIC)



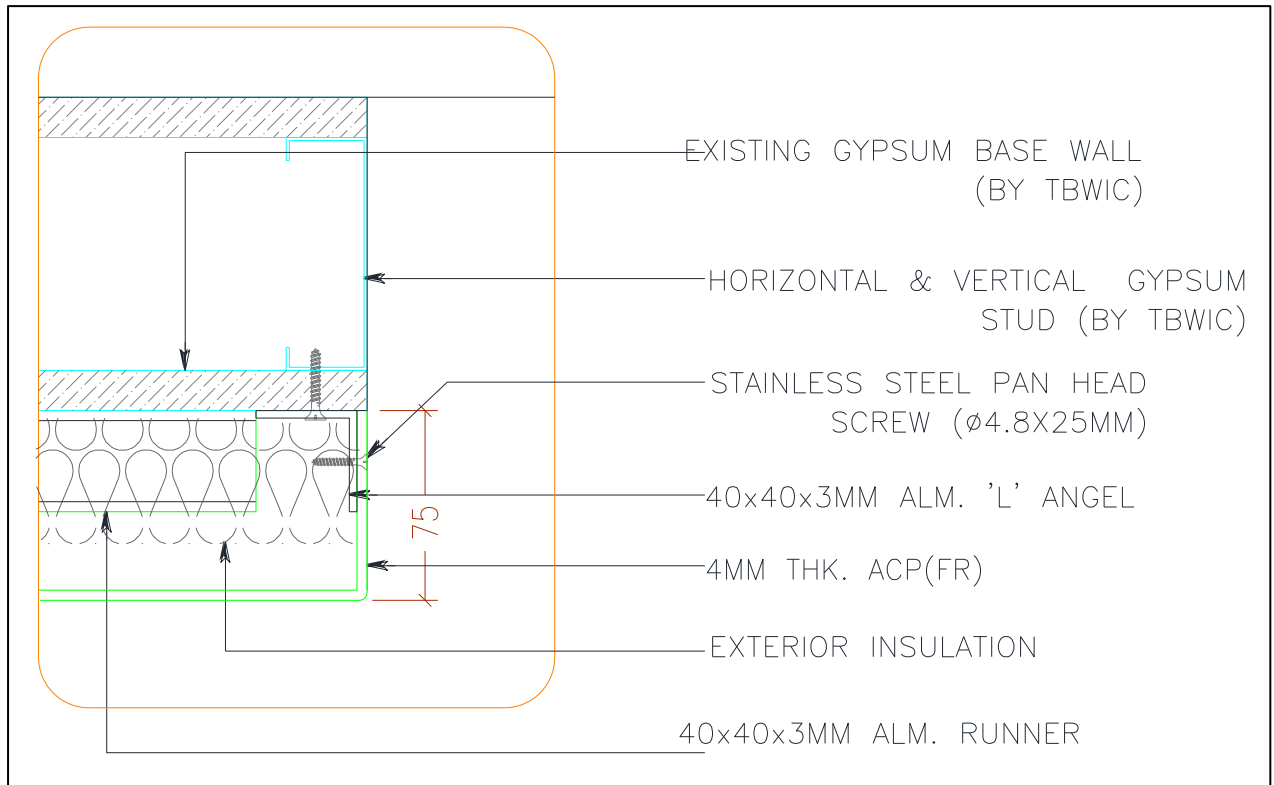
Drawing 7: Horizontal section of the specimen along the window opening.
(Drawing provided by the sponsor and verified by TBWIC)



Drawing 8: Horizontal section of the specimen along the mid-height of the specimen.
(Drawing provided by the sponsor and verified by TBWIC)

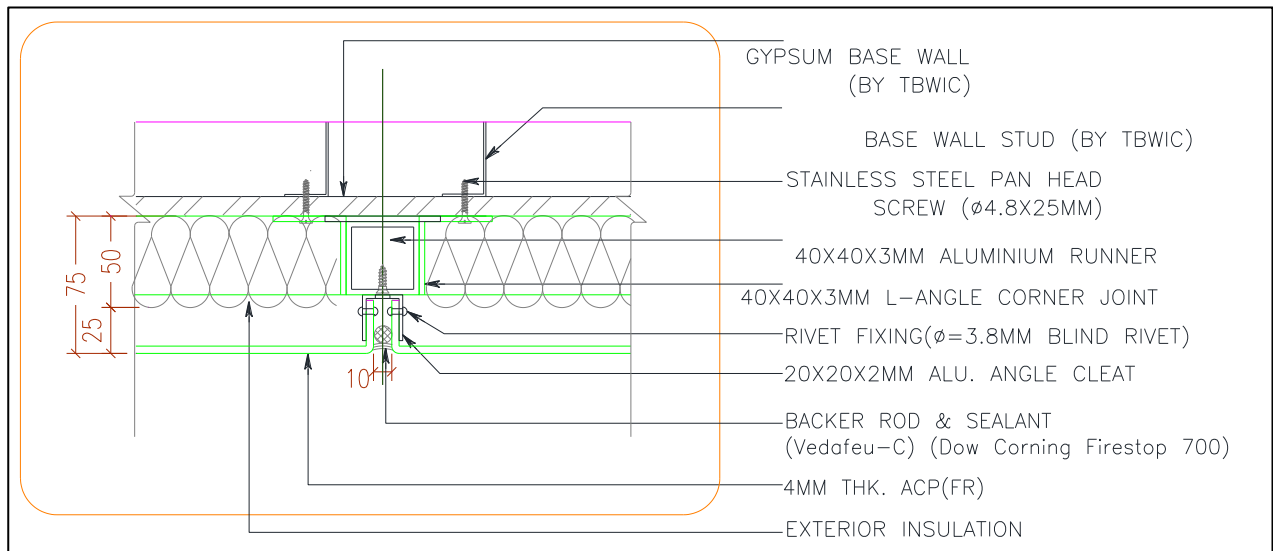


Drawing 9: Vertical section of the specimen along the mid-width of the specimen.
(Drawing provided by the sponsor and verified by TBWIC)



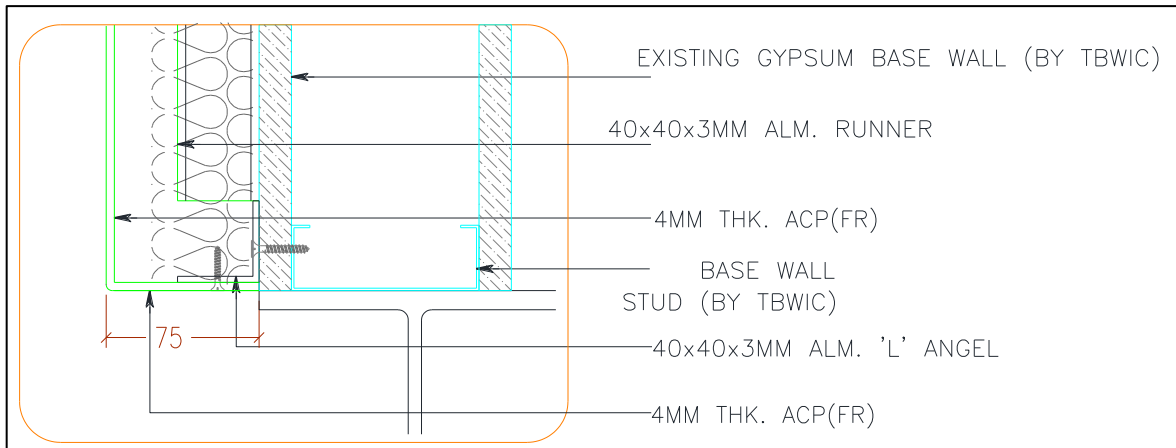
Drawing 10: Detail 1 of the specimen.

(Drawing provided by the sponsor and verified by TBWIC)



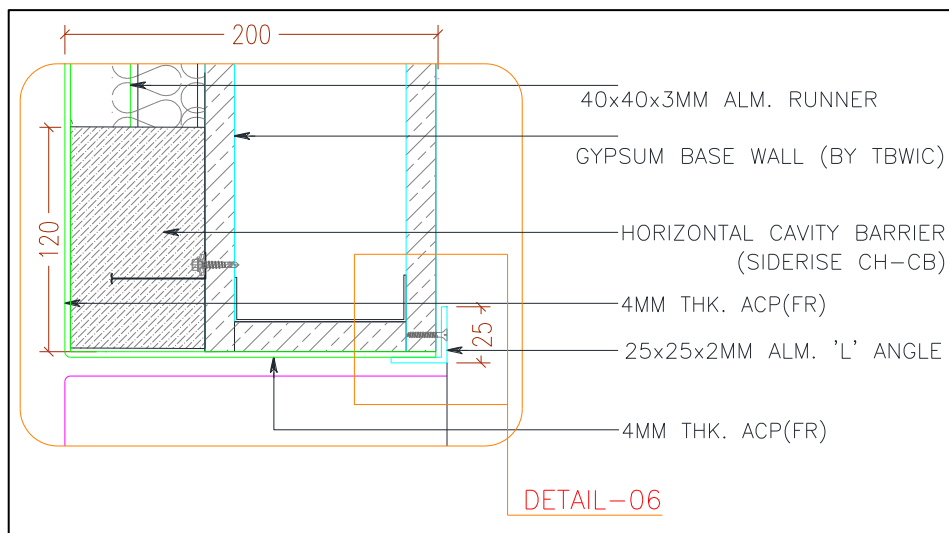
Drawing 11: Detail 2 of the specimen.

(Drawing provided by the sponsor and verified by TBWIC)



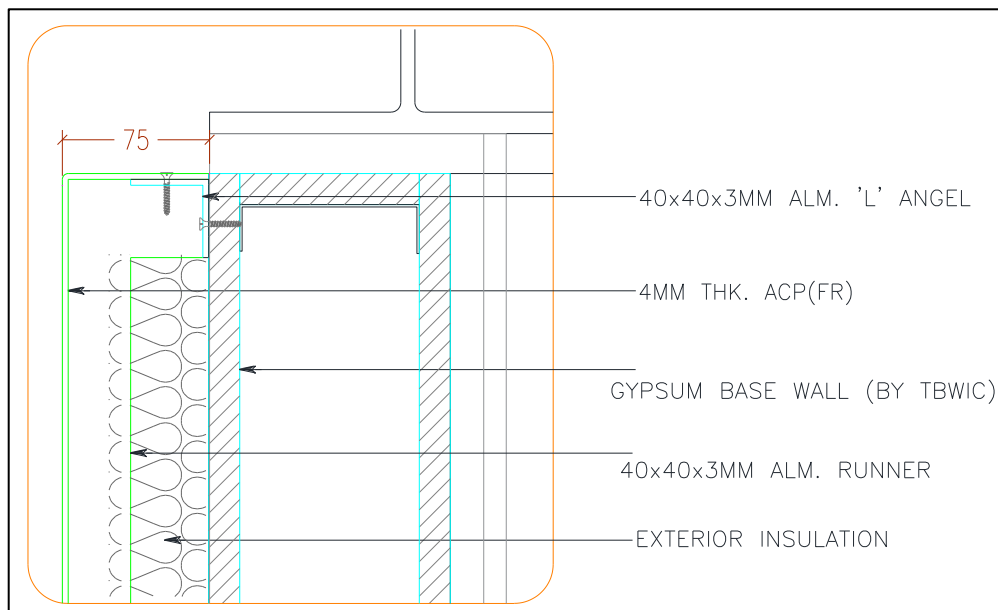
Drawing 12: Detail 3 of the specimen.

(Drawing provided by the sponsor and verified by TBWIC)



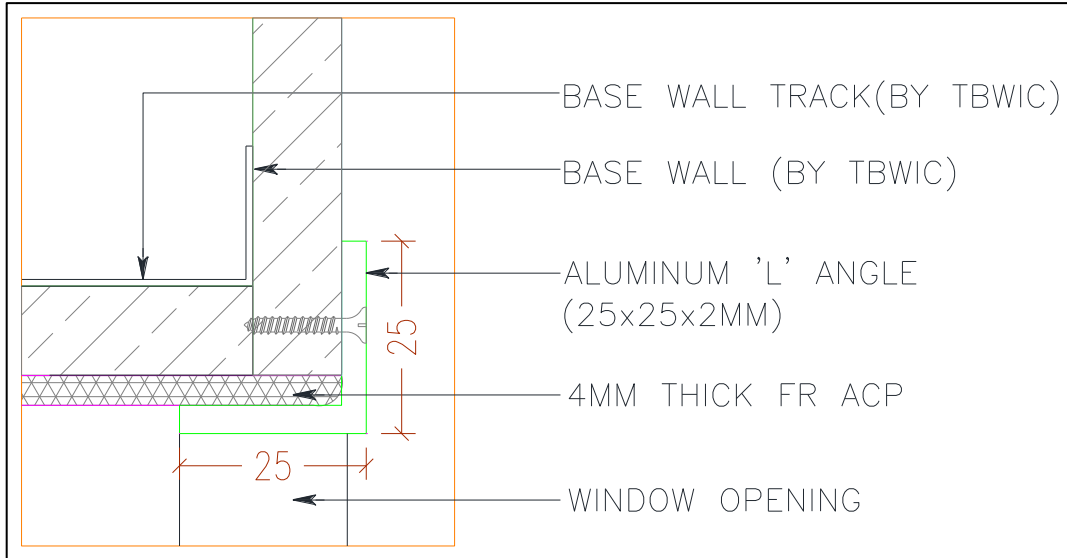
Drawing 13: Detail 4 of the specimen.

(Drawing provided by the sponsor and verified by TBWIC)



Drawing 14: Detail 5 of the specimen.

(Drawing provided by the sponsor and verified by TBWIC)



Drawing 15: Detail 6 of the specimen.
(Drawing provided by the sponsor and verified by TBWIC)



19. APPENDIX 5 – THERMOCOUPLE DATA

Time (min:sec)	Tc 1 (°F)	Tc 2 (°F)	Tc 3 (°F)	Tc 4 (°F)	Tc 5 (°F)	Tc 6 (°F)	Tc 7 (°F)	Tc 8 (°F)	Tc 9 (°F)
0:00	150	118	107	104	105	99	94	94	94
0:15	624	474	389	315	386	341	133	225	161
0:30	740	559	536	361	471	395	170	268	192
0:45	791	636	572	403	517	444	216	302	219
1:00	797	636	605	409	529	466	253	330	243
1:15	819	646	625	449	568	502	291	342	262
1:30	869	711	671	487	614	549	324	381	288
1:45	875	683	665	477	590	530	350	387	305
2:00	886	687	666	478	601	541	370	400	318
2:15	921	676	672	483	631	574	388	443	335
2:30	925	696	682	504	617	556	405	453	347
2:45	954	702	697	527	631	575	417	461	356
3:00	951	706	692	535	636	579	427	460	362
3:15	950	734	689	536	626	577	435	467	375
3:30	969	724	692	548	653	599	442	469	378
3:45	964	744	709	544	649	595	448	474	386
4:00	985	752	712	557	669	619	458	481	394
4:15	972	767	722	570	676	624	467	489	402
4:30	987	795	727	572	656	598	470	480	401
4:45	1008	801	743	571	677	620	473	490	409
5:00	1005	810	750	585	691	635	483	511	423
5:15	1065	906	826	669	823	750	506	570	460
5:30	1118	1034	919	762	936	854	562	622	512
5:45	1117	1049	921	727	903	845	593	637	525
6:00	1123	1054	927	726	882	844	624	677	555
6:15	1118	1078	957	731	889	861	651	707	566
6:30	1137	1106	981	745	920	869	670	721	570
6:45	1139	1124	1002	773	934	878	683	720	568
7:00	1126	1133	1015	777	928	865	698	735	578
7:15	1130	1144	1042	795	950	872	706	743	586
7:30	1127	1174	1087	840	992	888	716	748	589
7:45	1110	1175	1134	869	1012	916	735	801	616
8:00	1120	1144	1126	843	991	902	749	784	620
8:15	1107	1170	1166	895	1020	896	755	763	614
8:30	1130	1153	1120	850	998	889	754	762	611
8:45	1107	1152	1106	835	990	890	755	760	608
9:00	1128	1145	1097	813	975	883	760	753	609
9:15	1130	1146	1081	795	964	874	758	745	603
9:30	1084	1141	1083	804	975	877	757	745	600
9:45	1094	1146	1092	812	992	877	753	745	602



Time (min:sec)	Tc 1 (°F)	Tc 2 (°F)	Tc 3 (°F)	Tc 4 (°F)	Tc 5 (°F)	Tc 6 (°F)	Tc 7 (°F)	Tc 8 (°F)	Tc 9 (°F)
10:00	1090	1157	1096	808	994	883	754	784	619
10:15	1086	1207	1178	915	1066	921	775	800	634
10:30	1145	1234	1244	968	1140	969	803	860	668
10:45	1132	1253	1283	987	1190	999	833	823	663
11:00	1127	1262	1306	965	1135	958	828	771	647
11:15	1121	1282	1338	978	1162	983	834	802	660
11:30	1139	1288	1356	989	1184	1004	844	825	674
11:45	1153	1284	1356	985	1178	1002	850	831	689
12:00	1156	1291	1351	985	1178	1020	858	836	730
12:15	1098	1290	1364	994	1188	1013	859	818	700
12:30	1116	1297	1352	995	1177	1004	858	793	681
12:45	1119	1291	1350	993	1174	1004	850	804	682
13:00	1142	1305	1369	1022	1216	1046	872	849	711
13:15	1109	1303	1372	1017	1214	1038	874	845	703
13:30	1120	1305	1373	1015	1214	1042	879	842	705
13:45	1132	1302	1369	1012	1189	1000	866	806	685
14:00	1126	1297	1381	1018	1221	1039	877	862	714
14:15	1096	1290	1394	1034	1231	1050	890	853	717
14:30	1107	1272	1378	1017	1199	1050	894	857	723
14:45	1087	1293	1380	1032	1215	1075	911	895	745
15:00	1100	1299	1373	1034	1198	1076	918	878	736
15:15	1178	1308	1380	1045	1247	1094	939	905	762
15:30	1208	1319	1390	1044	1254	1084	943	889	752
15:45	1179	1311	1396	1031	1237	1088	942	869	741
16:00	1200	1369	1408	1047	1264	1107	955	924	765
16:15	1236	1425	1405	1052	1265	1125	982	983	784
16:30	1225	1492	1392	1059	1257	1124	992	973	772
16:45	1238	1381	1408	1058	1270	1148	1020	1025	803
17:00	1269	1354	1406	1058	1280	1170	1062	1095	852
17:15	1202	1416	1405	1061	1303	1189	1095	1083	877
17:30	1152	1447	1429	1065	1317	1220	1131	1072	879
17:45	1339	1442	1429	1053	1308	1236	1160	1158	928
18:00	1299	1489	1429	1053	1329	1243	1157	1096	909
18:15	1323	1478	1405	1045	1335	1227	1137	1007	869
18:30	1408	1454	1398	1036	1337	1166	1086	957	832
18:45	1421	1492	1449	1062	1350	1146	1067	972	828
19:00	1363	1567	1456	1054	1317	1116	1037	944	815
19:15	1401	1460	1441	1038	1300	1075	1003	946	811
19:30	1286	1465	1404	1009	1244	1030	977	879	781
19:45	1335	1467	1394	1015	1211	987	950	869	767



Time (min:sec)	Tc 1 (°F)	Tc 2 (°F)	Tc 3 (°F)	Tc 4 (°F)	Tc 5 (°F)	Tc 6 (°F)	Tc 7 (°F)	Tc 8 (°F)	Tc 9 (°F)
20:00	1355	1507	1393	1004	1177	960	914	839	741
20:15	1287	1508	1422	1040	1224	982	912	907	783
20:30	1400	1482	1416	1036	1207	976	908	899	775
20:45	1423	1478	1441	1039	1232	981	910	906	783
21:00	1435	1449	1425	1021	1200	964	899	884	771
21:15	1447	1471	1448	1046	1214	964	904	891	763
21:30	1443	1410	1427	1030	1221	989	907	947	798
21:45	1403	1409	1426	1032	1210	973	910	908	780
22:00	1490	1414	1438	1038	1239	1003	921	961	812
22:15	1414	1389	1433	1014	1218	986	919	902	781
22:30	1387	1399	1448	1033	1233	995	924	903	779
22:45	1386	1377	1455	1033	1243	1010	931	948	810
23:00	1394	1395	1449	1031	1240	997	933	912	790
23:15	1439	1385	1442	1020	1222	986	926	898	787
23:30	1376	1362	1430	1015	1218	987	924	911	796
23:45	1390	1355	1442	1025	1233	990	922	924	794
24:00	1378	1353	1421	1015	1227	984	924	922	791
24:15	1401	1360	1407	1000	1224	991	923	938	800
24:30	1354	1322	1401	1005	1221	986	922	930	804
24:45	1380	1318	1395	1006	1231	993	924	938	810
25:00	1362	1311	1392	1011	1241	1002	930	967	838
25:15	1332	1354	1404	1017	1247	1007	937	944	823
25:30	1354	1364	1423	1018	1246	1015	940	944	828
25:45	1446	1361	1405	1007	1233	1013	935	918	796
26:00	1396	1365	1430	1038	1261	1013	944	961	830
26:15	1413	1406	1448	1062	1285	1021	945	954	847
26:30	1444	1401	1450	1041	1242	1021	950	949	836
26:45	1517	1424	1458	1046	1234	1017	954	929	825
27:00	1468	1400	1455	1053	1250	1028	954	948	846
27:15	1421	1380	1436	1049	1246	1018	952	946	845
27:30	1433	1378	1427	1032	1227	1011	945	933	829
27:45	1392	1423	1434	1049	1243	1016	941	943	836
28:00	1416	1419	1436	1062	1250	1015	944	934	836
28:15	1455	1401	1429	1064	1254	1021	951	963	856
28:30	1425	1401	1422	1038	1224	998	938	912	815
28:45	1393	1392	1419	1059	1252	1003	935	955	857
29:00	1421	1415	1428	1062	1250	1010	939	965	859
29:15	1394	1393	1427	1041	1245	1016	937	950	851
29:30	1403	1391	1431	1065	1263	1021	941	942	843
29:45	1420	1394	1427	1062	1259	1022	945	963	867
30:00	1470	1397	1427	1045	1242	1005	942	920	830



Time (min:sec)	Tc 10 (°F)	Tc 11 (°F)	Tc 12 (°F)	Tc 13 (°F)	Tc 14 (°F)	Tc 15 (°F)	Tc 16 (°F)	Tc 17 (°F)	Tc 18 (°F)
0:00	93	94	94	93	93	95	95	94	95
0:15	165	252	239	206	122	149	192	121	94
0:30	198	278	270	235	146	163	212	125	95
0:45	222	283	269	243	150	176	220	136	94
1:00	245	313	293	265	144	172	223	136	95
1:15	263	313	289	256	149	174	226	135	95
1:30	289	337	313	278	147	177	246	136	95
1:45	299	332	315	287	139	180	241	136	96
2:00	310	347	325	289	139	175	240	139	95
2:15	325	347	325	299	142	175	232	134	96
2:30	334	356	333	305	136	180	235	133	96
2:45	341	351	329	299	138	170	231	139	96
3:00	350	356	334	296	138	176	251	148	96
3:15	360	367	343	320	130	170	233	147	96
3:30	363	356	337	313	137	174	235	144	96
3:45	369	363	342	316	147	189	230	147	96
4:00	375	366	341	313	154	193	258	153	95
4:15	383	377	354	329	154	193	240	148	95
4:30	388	373	349	328	151	189	221	142	96
4:45	391	371	352	325	147	194	256	152	95
5:00	398	390	369	332	146	194	251	156	95
5:15	432	457	427	384	148	224	310	171	96
5:30	468	511	488	445	154	230	323	175	95
5:45	482	490	464	415	158	246	342	177	95
6:00	504	518	485	427	152	236	325	169	96
6:15	523	529	502	444	142	233	352	186	91
6:30	534	515	478	429	144	237	337	185	90
6:45	535	517	482	422	142	236	324	196	90
7:00	539	518	474	425	140	229	327	204	90
7:15	545	522	488	438	143	242	337	197	90
7:30	547	520	482	432	169	248	326	200	91
7:45	564	550	509	448	165	248	334	197	92
8:00	571	555	511	452	169	249	338	202	93
8:15	566	528	479	420	184	268	339	209	94
8:30	562	529	484	431	182	255	363	214	94
8:45	564	528	489	432	184	253	346	213	95
9:00	561	531	488	433	178	252	370	215	95
9:15	555	517	478	423	198	249	378	211	95
9:30	554	517	476	436	190	265	345	211	96
9:45	560	531	494	462	178	265	334	203	98



Time (min:sec)	Tc 10 (°F)	Tc 11 (°F)	Tc 12 (°F)	Tc 13 (°F)	Tc 14 (°F)	Tc 15 (°F)	Tc 16 (°F)	Tc 17 (°F)	Tc 18 (°F)
10:00	575	567	516	469	172	256	357	177	108
10:15	585	568	516	471	179	282	363	199	101
10:30	612	635	572	509	171	258	374	194	110
10:45	606	596	544	473	187	264	430	204	112
11:00	598	551	503	448	204	278	380	219	113
11:15	605	570	517	467	195	263	385	211	116
11:30	616	601	548	483	170	257	384	207	116
11:45	620	593	548	482	178	259	427	233	118
12:00	632	614	567	499	195	276	390	217	120
12:15	631	594	537	486	195	263	399	221	122
12:30	622	562	513	463	206	296	419	228	125
12:45	622	597	535	477	199	238	462	186	149
13:00	641	638	573	509	207	290	413	229	124
13:15	639	607	549	499	207	300	409	234	129
13:30	641	605	545	485	195	292	394	239	152
13:45	627	580	521	459	201	298	463	238	131
14:00	639	619	562	504	192	304	423	233	133
14:15	639	601	533	465	202	291	477	244	133
14:30	651	617	555	498	215	271	388	191	161
14:45	664	648	594	532	212	299	392	232	136
15:00	659	618	552	494	211	238	433	173	131
15:15	676	649	596	519	179	168	411	123	143
15:30	673	641	581	489	204	162	357	118	92
15:45	670	606	532	475	220	241	377	164	99
16:00	690	666	588	524	205	215	351	134	95
16:15	703	699	617	534	209	291	415	202	109
16:30	700	664	594	520	207	355	420	267	121
16:45	726	720	634	565	206	363	444	272	119
17:00	772	801	717	597	202	384	455	297	119
17:15	797	763	683	590	198	337	433	269	115
17:30	801	772	711	552	222	376	548	312	125
17:45	831	841	772	611	229	379	495	277	151
18:00	820	754	699	567	241	352	493	282	152
18:15	791	679	625	505	216	334	551	295	152
18:30	768	648	603	509	216	352	541	281	152
18:45	758	691	639	529	249	335	486	244	154
19:00	743	650	595	504	234	339	476	285	156
19:15	739	673	636	535	207	346	472	294	156
19:30	720	635	590	496	216	331	489	273	156
19:45	708	653	607	495	218	329	460	265	156



Time (min:sec)	Tc 10 (°F)	Tc 11 (°F)	Tc 12 (°F)	Tc 13 (°F)	Tc 14 (°F)	Tc 15 (°F)	Tc 16 (°F)	Tc 17 (°F)	Tc 18 (°F)
20:00	683	610	574	482	203	321	484	288	155
20:15	704	678	640	555	209	340	435	279	155
20:30	696	661	624	542	223	336	451	277	155
20:45	702	660	613	522	242	363	424	277	156
21:00	698	626	594	512	223	338	443	290	156
21:15	688	635	589	494	224	333	483	291	157
21:30	709	667	633	540	233	352	466	286	159
21:45	697	664	621	514	222	321	478	269	157
22:00	722	676	631	545	238	341	454	271	161
22:15	702	638	590	509	230	356	459	281	160
22:30	698	633	585	509	222	348	479	286	159
22:45	723	708	671	563	218	344	492	282	159
23:00	712	675	624	515	212	336	494	288	159
23:15	708	650	599	507	229	342	466	286	159
23:30	714	668	617	533	217	350	447	275	160
23:45	716	656	606	519	228	362	472	305	160
24:00	713	650	605	529	231	358	474	298	160
24:15	714	675	625	544	214	333	472	293	160
24:30	719	674	634	540	223	342	449	267	161
24:45	723	671	629	540	205	336	467	294	161
25:00	750	719	679	600	222	340	431	289	161
25:15	745	688	641	545	209	347	452	285	163
25:30	749	693	647	561	191	359	474	269	164
25:45	726	628	589	527	244	399	429	295	165
26:00	744	684	640	560	230	371	456	287	165
26:15	768	736	700	623	225	372	409	278	166
26:30	756	694	646	564	228	391	430	290	168
26:45	747	678	623	540	232	391	479	304	168
27:00	759	719	663	590	218	383	439	305	168
27:15	756	696	649	562	212	362	449	318	168
27:30	748	672	619	554	229	405	458	321	169
27:45	755	673	628	572	232	416	418	302	170
28:00	753	667	616	549	244	383	478	302	171
28:15	769	719	674	595	236	375	438	302	172
28:30	746	669	623	545	266	385	445	318	173
28:45	779	740	700	634	214	370	425	306	173
29:00	778	717	675	591	213	381	448	311	173
29:15	776	698	652	601	209	414	452	312	175
29:30	771	685	636	569	228	395	456	302	175
29:45	788	738	685	604	226	395	434	316	176
30:00	764	670	617	535	226	362	498	301	175



Time (min:sec)	Tc 19(°F)	Tc 20(°F)	Tc 21(°F)	Tc 22(°F)	Tc 23(°F)	Tc 24(°F)	Tc 25(°F)	Tc 26(°F)	Tc 27(°F)
0:00	95	95	99	97	96	97	95	97	97
0:15	95	96	108	98	97	106	96	101	97
0:30	95	100	110	98	99	107	98	102	98
0:45	94	105	114	99	103	112	101	104	98
1:00	95	113	114	99	107	112	105	104	98
1:15	95	121	116	100	111	113	110	104	98
1:30	95	129	118	101	115	114	115	105	98
1:45	96	140	118	102	120	114	120	105	99
2:00	95	149	119	103	123	115	124	105	99
2:15	96	159	120	105	127	114	129	105	99
2:30	96	169	125	107	132	116	133	105	99
2:45	96	180	123	108	135	115	138	105	99
3:00	96	192	127	110	139	117	143	106	99
3:15	96	206	127	112	143	117	148	106	100
3:30	96	217	128	115	146	118	152	106	100
3:45	96	231	134	117	150	122	156	108	100
4:00	95	243	138	120	153	124	160	109	101
4:15	95	253	138	123	156	125	164	109	101
4:30	96	264	137	125	160	124	168	109	102
4:45	95	272	140	129	164	127	172	110	102
5:00	96	280	141	132	164	127	174	110	102
5:15	97	295	147	137	162	132	176	112	102
5:30	97	322	151	142	169	135	177	113	103
5:45	97	332	153	149	179	138	181	114	105
6:00	97	345	153	156	189	138	188	114	106
6:15	92	326	163	168	198	144	196	120	106
6:30	91	319	168	178	204	153	202	122	108
6:45	92	323	170	199	199	154	211	122	107
7:00	91	326	171	210	204	156	221	121	107
7:15	92	329	171	222	209	159	228	123	109
7:30	92	332	176	232	216	162	237	120	109
7:45	93	338	176	243	226	164	245	114	109
8:00	94	343	179	257	231	167	253	105	109
8:15	95	346	181	269	234	170	260	105	109
8:30	95	350	182	279	244	173	267	105	109
8:45	95	361	183	288	252	174	273	108	111
9:00	96	369	183	293	266	175	279	108	110
9:15	96	382	183	297	286	178	284	107	110
9:30	96	407	191	302	336	182	293	111	113
9:45	98	417	195	303	341	186	308	111	113



Time (min:sec)	Tc 19(°F)	Tc 20(°F)	Tc 21(°F)	Tc 22(°F)	Tc 23(°F)	Tc 24(°F)	Tc 25(°F)	Tc 26(°F)	Tc 27(°F)
10:00	108	521	177	305	322	170	306	111	113
10:15	102	447	196	313	340	190	321	114	115
10:30	111	569	178	320	319	171	331	117	116
10:45	113	597	181	325	317	175	332	120	120
11:00	114	631	183	328	321	178	336	118	116
11:15	115	662	184	335	319	177	339	120	116
11:30	116	683	186	335	322	179	336	122	119
11:45	118	707	192	347	327	183	340	122	118
12:00	120	729	191	346	331	185	344	125	124
12:15	121	750	186	364	330	179	348	126	122
12:30	125	768	194	363	342	181	357	127	123
12:45	152	1055	122	371	274	126	351	125	121
13:00	126	773	210	416	359	137	371	131	128
13:15	134	828	205	428	345	139	372	132	129
13:30	167	1196	131	437	271	133	368	133	127
13:45	136	833	216	476	366	143	379	136	133
14:00	138	842	214	501	370	145	383	137	132
14:15	139	858	204	515	370	146	367	139	130
14:30	167	1147	158	521	361	146	340	141	131
14:45	140	858	210	574	372	152	347	143	133
15:00	140	974	73	870	270	153	202	144	134
15:15	154	1249	19	1221	219	166	228	143	131
15:30	97	559	61	1615	240	184	211	142	128
15:45	106	601	117	1234	295	177	259	150	136
16:00	103	565	85	1401	267	181	229	151	137
16:15	114	647	181	1066	370	177	319	150	136
16:30	124	691	248	755	448	173	394	153	138
16:45	123	736	240	827	447	176	385	156	141
17:00	123	777	271	767	493	178	418	158	141
17:15	120	763	236	970	474	182	408	158	141
17:30	127	810	289	792	531	181	451	160	142
17:45	153	1213	235	817	481	176	402	161	145
18:00	156	1450	235	794	490	177	439	163	144
18:15	156	1457	258	783	509	178	442	165	146
18:30	155	1438	244	789	500	180	486	168	150
18:45	155	1521	234	861	495	184	564	171	154
19:00	156	1517	266	905	536	184	443	174	157
19:15	157	1467	271	929	536	187	443	176	160
19:30	158	1444	268	940	537	189	442	178	161
19:45	158	1449	279	940	531	192	442	180	161



Time (min:sec)	Tc 19(°F)	Tc 20(°F)	Tc 21(°F)	Tc 22(°F)	Tc 23(°F)	Tc 24(°F)	Tc 25(°F)	Tc 26(°F)	Tc 27(°F)
20:00	158	1511	280	933	525	194	441	181	163
20:15	158	1490	279	928	524	195	441	182	163
20:30	158	1470	291	929	527	196	444	183	164
20:45	158	1481	292	931	533	199	449	183	165
21:00	158	1479	300	943	533	201	450	184	164
21:15	157	1489	319	943	535	208	456	183	165
21:30	158	1460	320	968	542	207	462	186	172
21:45	153	1465	313	982	619	212	446	187	175
22:00	156	1477	333	1015	616	211	455	188	180
22:15	156	1491	361	1066	622	215	467	189	184
22:30	160	1530	353	1094	624	215	474	190	189
22:45	160	1509	350	1113	625	216	479	193	198
23:00	162	1502	358	1129	624	216	484	191	193
23:15	161	1484	363	1135	622	218	488	193	196
23:30	162	1466	361	1147	615	223	485	195	202
23:45	164	1483	377	1153	612	222	491	194	197
24:00	170	1467	376	1159	612	221	494	197	204
24:15	170	1444	362	1165	598	223	494	197	205
24:30	167	1460	364	1164	599	221	493	197	201
24:45	166	1446	361	1173	601	223	493	198	205
25:00	168	1429	363	1179	602	227	493	196	198
25:15	169	1456	365	1190	609	230	503	196	195
25:30	170	1496	367	1187	614	232	506	198	202
25:45	171	1447	378	1186	609	235	513	197	198
26:00	169	1477	379	1193	609	237	514	197	197
26:15	169	1482	381	1204	615	240	516	197	197
26:30	170	1481	393	1197	622	246	524	196	193
26:45	169	1514	417	1186	629	246	527	198	193
27:00	169	1488	426	1185	623	249	526	199	199
27:15	168	1480	437	1177	626	252	528	199	197
27:30	169	1471	442	1173	627	257	537	200	202
27:45	171	1465	451	1180	627	259	535	201	201
28:00	171	1484	447	1180	628	263	535	201	202
28:15	171	1459	452	1174	633	269	538	203	205
28:30	172	1470	460	1160	645	273	543	204	203
28:45	173	1455	459	1164	650	275	542	205	205
29:00	173	1488	472	1149	656	280	546	205	209
29:15	175	1477	487	1158	661	285	556	206	207
29:30	175	1469	491	1155	669	288	556	206	207
29:45	176	1471	467	1159	670	292	571	208	210
30:00	174	1484	483	1152	685	298	645	211	211



Time (min:sec)	Tc 28(°F)	Tc 29(°F)	Tc 30(°F)	Tc 31(°F)	Tc 32(°F)	Tc 33(°F)	Tc 34(°F)	Tc 35(°F)	Tc 36(°F)
0:00	95	94	93	94	94	94	94	94	94
0:15	96	94	94	93	93	93	93	93	94
0:30	96	95	99	93	93	93	92	93	95
0:45	96	97	102	93	93	93	92	92	94
1:00	96	98	99	94	94	93	92	92	95
1:15	96	100	103	94	94	94	92	93	96
1:30	96	102	105	95	95	95	93	93	96
1:45	96	104	108	95	95	95	93	93	97
2:00	96	107	108	95	96	96	93	94	97
2:15	96	109	109	96	96	96	93	94	98
2:30	96	112	112	96	96	97	94	95	98
2:45	96	115	114	96	97	97	94	96	98
3:00	96	117	116	96	97	98	95	96	99
3:15	96	120	117	97	98	98	95	97	99
3:30	97	122	118	97	98	98	95	98	100
3:45	97	125	123	97	98	99	95	98	100
4:00	97	127	126	98	98	99	96	99	100
4:15	97	130	128	98	99	100	96	100	100
4:30	97	132	129	98	99	100	97	101	101
4:45	97	135	130	99	100	101	97	102	101
5:00	98	137	133	99	100	101	97	103	101
5:15	98	139	136	98	100	101	97	103	102
5:30	98	142	138	99	100	101	98	104	102
5:45	98	146	141	99	100	101	98	104	102
6:00	99	149	142	100	100	102	98	106	103
6:15	100	153	155	101	101	103	99	108	97
6:30	100	156	157	101	101	103	100	109	98
6:45	100	159	159	102	101	103	100	110	98
7:00	100	162	162	103	102	104	101	112	98
7:15	101	166	164	103	102	104	101	113	99
7:30	101	171	168	103	103	105	102	114	100
7:45	101	174	171	104	103	105	102	116	102
8:00	102	177	174	105	104	106	103	117	103
8:15	102	182	177	105	104	106	103	118	104
8:30	103	185	180	105	104	107	104	119	104
8:45	104	188	180	105	105	108	105	121	105
9:00	104	190	183	106	105	109	105	122	106
9:15	105	193	187	107	106	110	106	124	105
9:30	106	195	190	107	107	110	106	125	106
9:45	108	199	196	108	108	112	107	126	108



Time (min:sec)	Tc 28(°F)	Tc 29(°F)	Tc 30(°F)	Tc 31(°F)	Tc 32(°F)	Tc 33(°F)	Tc 34(°F)	Tc 35(°F)	Tc 36(°F)
10:00	108	200	184	108	108	112	107	127	119
10:15	110	204	206	108	108	113	108	129	111
10:30	111	207	197	108	108	113	108	130	120
10:45	113	211	210	108	109	114	109	131	121
11:00	115	215	202	109	109	115	109	133	121
11:15	116	219	216	110	110	116	110	135	121
11:30	118	222	216	111	111	118	111	136	121
11:45	119	225	210	112	112	119	112	138	122
12:00	122	229	221	112	112	119	112	139	123
12:15	124	234	224	113	113	121	113	141	123
12:30	127	239	221	113	114	123	114	142	126
12:45	127	240	146	113	113	122	114	141	167
13:00	134	247	229	115	116	129	116	146	125
13:15	138	251	234	116	117	132	116	145	149
13:30	141	253	213	114	115	130	114	145	163
13:45	143	255	234	118	120	136	119	150	132
14:00	144	259	236	119	121	138	122	152	133
14:15	146	261	251	120	120	140	122	153	138
14:30	147	265	255	120	122	143	126	154	142
14:45	148	267	258	122	125	146	122	156	135
15:00	148	271	260	117	119	139	113	148	206
15:15	147	269	170	118	120	142	118	149	194
15:30	144	271	123	121	125	149	141	157	93
15:45	151	281	270	121	125	149	145	160	96
16:00	152	285	274	122	126	152	146	161	97
16:15	150	286	248	125	130	155	160	165	113
16:30	153	292	278	127	132	158	153	168	117
16:45	154	294	283	126	132	160	151	169	117
17:00	155	300	293	129	134	164	164	172	115
17:15	156	305	285	128	134	169	162	173	110
17:30	158	308	294	132	133	173	164	177	114
17:45	161	311	297	131	134	177	160	176	138
18:00	162	311	287	132	136	182	163	178	141
18:15	165	312	304	133	138	185	164	182	142
18:30	166	314	303	133	138	189	168	183	142
18:45	168	319	310	133	139	190	155	185	142
19:00	169	320	313	135	141	196	156	188	146
19:15	170	322	315	136	142	196	158	189	147
19:30	171	325	317	137	144	200	158	191	150
19:45	172	334	318	138	145	202	159	193	151



Time (min:sec)	Tc 28(°F)	Tc 29(°F)	Tc 30(°F)	Tc 31(°F)	Tc 32(°F)	Tc 33(°F)	Tc 34(°F)	Tc 35(°F)	Tc 36(°F)
20:00	173	337	319	139	152	202	160	196	152
20:15	173	339	320	139	152	204	161	197	153
20:30	173	340	323	139	147	208	161	199	155
20:45	173	345	326	139	147	211	163	201	156
21:00	172	346	327	140	147	212	164	203	157
21:15	173	348	329	141	148	214	165	205	158
21:30	173	350	331	141	150	214	167	206	159
21:45	173	352	332	142	150	215	168	208	157
22:00	173	354	335	142	150	215	169	209	161
22:15	174	355	337	142	152	215	170	210	162
22:30	175	356	339	143	152	216	171	212	162
22:45	177	356	340	144	152	217	173	213	164
23:00	179	356	342	144	151	219	174	215	165
23:15	181	358	345	145	151	220	175	217	166
23:30	182	360	347	146	152	221	177	218	168
23:45	184	362	348	147	152	222	178	219	169
24:00	185	364	351	147	152	223	179	221	170
24:15	186	365	351	148	154	225	180	223	171
24:30	187	366	354	149	154	225	181	224	173
24:45	189	367	352	150	155	224	178	225	173
25:00	190	368	356	150	155	224	176	226	174
25:15	191	369	357	150	154	218	163	227	176
25:30	192	370	359	151	155	217	163	227	177
25:45	194	372	365	150	154	215	163	228	178
26:00	196	373	366	151	154	214	163	229	179
26:15	197	374	366	152	155	215	164	231	180
26:30	199	375	369	152	156	215	165	231	181
26:45	201	377	372	153	156	212	166	233	182
27:00	203	378	375	154	157	213	166	235	184
27:15	204	380	377	155	158	214	168	236	184
27:30	207	381	378	155	158	214	168	237	186
27:45	209	382	377	155	158	215	168	238	188
28:00	211	384	380	156	159	216	169	240	190
28:15	213	385	380	157	160	218	170	241	192
28:30	215	386	376	158	160	219	170	243	193
28:45	217	388	385	159	161	220	171	244	194
29:00	219	389	389	160	161	221	172	245	195
29:15	221	390	387	160	162	222	172	246	197
29:30	223	392	396	161	162	224	172	247	198
29:45	225	394	406	162	163	225	173	248	201
30:00	226	394	385	163	163	226	173	249	199



Time (min:sec)	Tc 37(°F)	Tc 38(°F)	Tc 39(°F)	Tc 40(°F)	Tc 41(°F)	Tc 42(°F)	Tc 43(°F)	Tc 44(°F)	Tc 45(°F)
0:00	94	94	94	94	216	222	353	336	329
0:15	94	94	93	94	660	757	989	1017	1016
0:30	95	99	94	95	863	916	1187	1203	1196
0:45	94	94	94	95	960	965	1185	1223	1220
1:00	95	99	95	96	1013	992	1188	1210	1236
1:15	96	101	95	97	1017	1013	1184	1245	1227
1:30	96	96	95	97	1021	1036	1188	1270	1243
1:45	97	107	96	100	1035	1042	1220	1251	1253
2:00	98	105	96	100	1033	1066	1219	1266	1272
2:15	98	107	97	102	1046	1069	1206	1298	1252
2:30	99	107	97	103	1051	1086	1215	1293	1276
2:45	98	104	97	104	1060	1086	1213	1309	1289
3:00	99	110	98	105	1065	1103	1228	1334	1287
3:15	100	110	98	106	1078	1115	1253	1310	1289
3:30	101	111	99	108	1083	1111	1235	1340	1300
3:45	101	106	99	108	1098	1120	1272	1313	1361
4:00	100	98	99	109	1114	1128	1276	1338	1334
4:15	101	100	99	111	1120	1131	1277	1393	1324
4:30	102	104	100	112	1121	1147	1311	1384	1348
4:45	102	100	100	113	1144	1152	1302	1400	1366
5:00	102	100	101	114	1139	1155	1280	1397	1346
5:15	103	104	101	115	1153	1176	1315	1415	1369
5:30	102	101	101	116	1176	1191	1345	1446	1396
5:45	103	104	102	117	1188	1201	1355	1437	1438
6:00	103	103	103	119	1208	1223	1379	1466	1415
6:15	97	97	97	115	1215	1244	1389	1407	1419
6:30	98	99	98	117	1225	1254	1400	1483	1431
6:45	98	99	99	118	1215	1262	1385	1431	1470
7:00	98	104	99	119	1230	1271	1400	1411	1449
7:15	99	100	100	121	1216	1258	1387	1450	1460
7:30	100	101	101	123	1219	1259	1380	1470	1458
7:45	102	102	102	125	1224	1256	1377	1456	1464
8:00	103	104	104	127	1226	1257	1382	1467	1449
8:15	104	105	105	129	1228	1247	1373	1526	1482
8:30	103	105	105	130	1231	1264	1382	1432	1460
8:45	105	106	106	132	1232	1274	1388	1480	1465
9:00	107	112	107	133	1241	1280	1401	1519	1472
9:15	106	106	107	133	1246	1269	1394	1538	1523
9:30	107	114	108	135	1252	1268	1386	1493	1496
9:45	108	112	110	138	1256	1264	1377	1560	1472



Time (min:sec)	Tc 37(°F)	Tc 38(°F)	Tc 39(°F)	Tc 40(°F)	Tc 41(°F)	Tc 42(°F)	Tc 43(°F)	Tc 44(°F)	Tc 45(°F)
10:00	119	131	120	149	1255	1258	1388	1541	1504
10:15	111	134	113	143	1283	1287	1423	1601	1527
10:30	120	131	122	153	1278	1293	1434	1515	1581
10:45	121	136	123	154	1292	1316	1433	1570	1560
11:00	121	136	123	156	1307	1309	1454	1564	1582
11:15	121	134	124	157	1302	1306	1439	1599	1583
11:30	121	128	124	158	1301	1318	1457	1533	1632
11:45	122	135	125	160	1296	1328	1445	1517	1586
12:00	122	136	126	162	1305	1328	1458	1593	1623
12:15	122	139	127	164	1312	1324	1447	1565	1604
12:30	126	149	130	168	1317	1323	1443	1570	1583
12:45	169	174	166	203	1319	1333	1468	1558	1600
13:00	125	131	128	168	1325	1327	1453	1636	1622
13:15	148	153	151	192	1323	1329	1451	1602	1588
13:30	163	148	131	172	1329	1326	1464	1630	1656
13:45	132	146	136	178	1327	1332	1454	1600	1603
14:00	132	141	137	179	1334	1328	1458	1643	1610
14:15	136	146	140	184	1329	1340	1453	1573	1612
14:30	142	154	149	194	1326	1346	1461	1575	1585
14:45	135	157	141	187	1339	1332	1462	1584	1622
15:00	205	157	216	266	1343	1347	1484	1599	1608
15:15	207	155	212	214	1354	1391	1544	1556	1588
15:30	93	113	108	159	1362	1381	1508	1590	1677
15:45	96	117	107	158	1366	1396	1529	1606	1659
16:00	96	117	105	159	1373	1368	1483	1667	1673
16:15	112	141	121	176	1377	1393	1508	1657	1645
16:30	116	140	126	181	1376	1405	1514	1661	1706
16:45	115	142	125	182	1388	1417	1534	1717	1774
17:00	114	141	124	182	1435	1409	1543	1680	1751
17:15	110	138	121	181	1436	1427	1557	1735	1774
17:30	115	145	126	186	1478	1445	1592	1789	1802
17:45	139	171	150	212	1460	1458	1579	1768	1773
18:00	140	173	151	215	1488	1472	1603	1783	1822
18:15	142	175	152	218	1478	1486	1595	1770	1849
18:30	143	177	153	221	1491	1476	1598	1764	1840
18:45	141	175	151	222	1471	1488	1608	1717	1804
19:00	147	191	157	228	1462	1477	1595	1714	1853
19:15	148	183	157	230	1464	1460	1601	1749	1714
19:30	150	186	159	234	1482	1466	1579	1780	1805
19:45	152	187	161	237	1458	1463	1573	1744	1826



Time (min:sec)	Tc 37(°F)	Tc 38(°F)	Tc 39(°F)	Tc 40(°F)	Tc 41(°F)	Tc 42(°F)	Tc 43(°F)	Tc 44(°F)	Tc 45(°F)
20:00	152	189	161	239	1467	1449	1567	1726	1721
20:15	154	191	163	243	1473	1454	1611	1753	1781
20:30	156	192	165	246	1471	1468	1604	1819	1877
20:45	156	194	166	249	1459	1471	1592	1666	1834
21:00	158	195	167	252	1466	1466	1585	1803	1826
21:15	160	197	168	254	1461	1460	1591	1804	1826
21:30	158	201	167	254	1463	1460	1583	1742	1833
21:45	159	196	167	256	1456	1460	1596	1753	1797
22:00	162	202	171	260	1452	1443	1555	1776	1838
22:15	163	201	172	262	1463	1457	1586	1782	1789
22:30	164	202	173	264	1464	1456	1588	1718	1746
22:45	165	206	174	266	1473	1453	1579	1768	1777
23:00	166	205	174	268	1451	1453	1585	1708	1793
23:15	167	206	176	270	1459	1446	1569	1743	1816
23:30	169	208	177	272	1457	1456	1589	1695	1822
23:45	171	209	178	274	1452	1453	1591	1718	1797
24:00	171	209	178	275	1445	1457	1581	1656	1805
24:15	173	210	179	277	1474	1455	1603	1782	1825
24:30	174	212	181	279	1472	1467	1592	1748	1842
24:45	175	212	181	280	1461	1464	1598	1697	1827
25:00	175	213	182	282	1463	1462	1583	1691	1828
25:15	177	215	184	284	1473	1482	1615	1741	1849
25:30	178	216	185	286	1495	1472	1599	1818	1793
25:45	179	217	186	288	1491	1468	1616	1791	1779
26:00	180	218	187	290	1493	1478	1605	1767	1820
26:15	181	219	188	292	1485	1483	1614	1702	1842
26:30	182	221	189	293	1474	1482	1592	1683	1819
26:45	182	221	189	294	1485	1482	1612	1742	1841
27:00	183	222	190	295	1494	1477	1613	1751	1839
27:15	183	222	190	296	1488	1481	1611	1728	1805
27:30	184	223	191	297	1475	1481	1583	1690	1853
27:45	186	225	192	299	1485	1484	1607	1736	1836
28:00	187	225	193	300	1496	1484	1604	1777	1785
28:15	188	226	194	301	1495	1487	1614	1778	1824
28:30	188	227	194	302	1503	1484	1608	1784	1784
28:45	189	228	195	303	1500	1488	1620	1755	1852
29:00	190	229	195	304	1496	1467	1595	1804	1755
29:15	191	231	197	305	1504	1477	1622	1792	1800
29:30	192	233	197	306	1518	1474	1603	1801	1730
29:45	193	236	199	308	1495	1476	1599	1721	1786
30:00	191	234	196	305	1500	1483	1620	1749	1792



Time (min:sec)	Tc 46(°F)	Tc 47(°F)	Tc 48(°F)	Tc 49(°F)	Tc 50(°F)	Tc 51(°F)	Tc 52(°F)	Tc 53(°F)	Tc 54(°F)
0:00	295	284	262	97	98	98	98	98	97
0:15	806	842	754	97	98	98	98	98	97
0:30	958	1060	985	97	98	98	98	98	97
0:45	1037	1092	1097	97	98	98	98	98	97
1:00	1073	1128	1116	97	98	98	98	98	97
1:15	1108	1148	1126	97	98	98	98	98	97
1:30	1167	1167	1158	97	98	98	98	98	97
1:45	1186	1182	1166	97	98	98	98	98	97
2:00	1147	1193	1178	97	98	98	98	98	97
2:15	1159	1222	1195	97	98	98	98	98	97
2:30	1169	1239	1218	97	98	98	98	98	98
2:45	1188	1250	1227	98	98	98	98	98	98
3:00	1201	1254	1236	98	98	98	99	98	98
3:15	1208	1278	1247	98	98	98	99	98	98
3:30	1212	1293	1261	98	98	99	99	98	98
3:45	1251	1319	1281	99	98	99	99	98	99
4:00	1257	1332	1278	99	98	99	99	98	99
4:15	1280	1352	1300	99	98	99	99	98	99
4:30	1285	1352	1291	99	99	100	100	98	100
4:45	1286	1348	1304	99	99	100	100	98	100
5:00	1285	1370	1316	100	99	101	100	98	100
5:15	1293	1388	1321	100	99	102	101	98	101
5:30	1358	1424	1352	100	99	102	101	99	102
5:45	1366	1444	1380	101	99	103	102	99	102
6:00	1383	1445	1373	101	99	104	103	99	103
6:15	1386	1476	1395	101	99	105	104	99	104
6:30	1378	1453	1398	102	99	106	105	99	104
6:45	1392	1453	1400	102	99	107	105	99	105
7:00	1418	1471	1396	102	100	108	106	100	106
7:15	1396	1496	1402	103	100	109	107	100	106
7:30	1413	1458	1408	103	100	110	108	100	107
7:45	1425	1493	1414	104	100	111	109	100	108
8:00	1411	1456	1398	104	100	112	110	100	108
8:15	1420	1446	1386	104	100	113	111	100	110
8:30	1459	1487	1404	105	100	114	112	100	110
8:45	1444	1489	1428	105	100	115	112	101	110
9:00	1444	1461	1405	106	101	116	113	101	111
9:15	1430	1469	1410	106	101	116	114	101	112
9:30	1446	1506	1428	106	101	117	115	101	113
9:45	1439	1453	1402	107	101	118	115	101	113



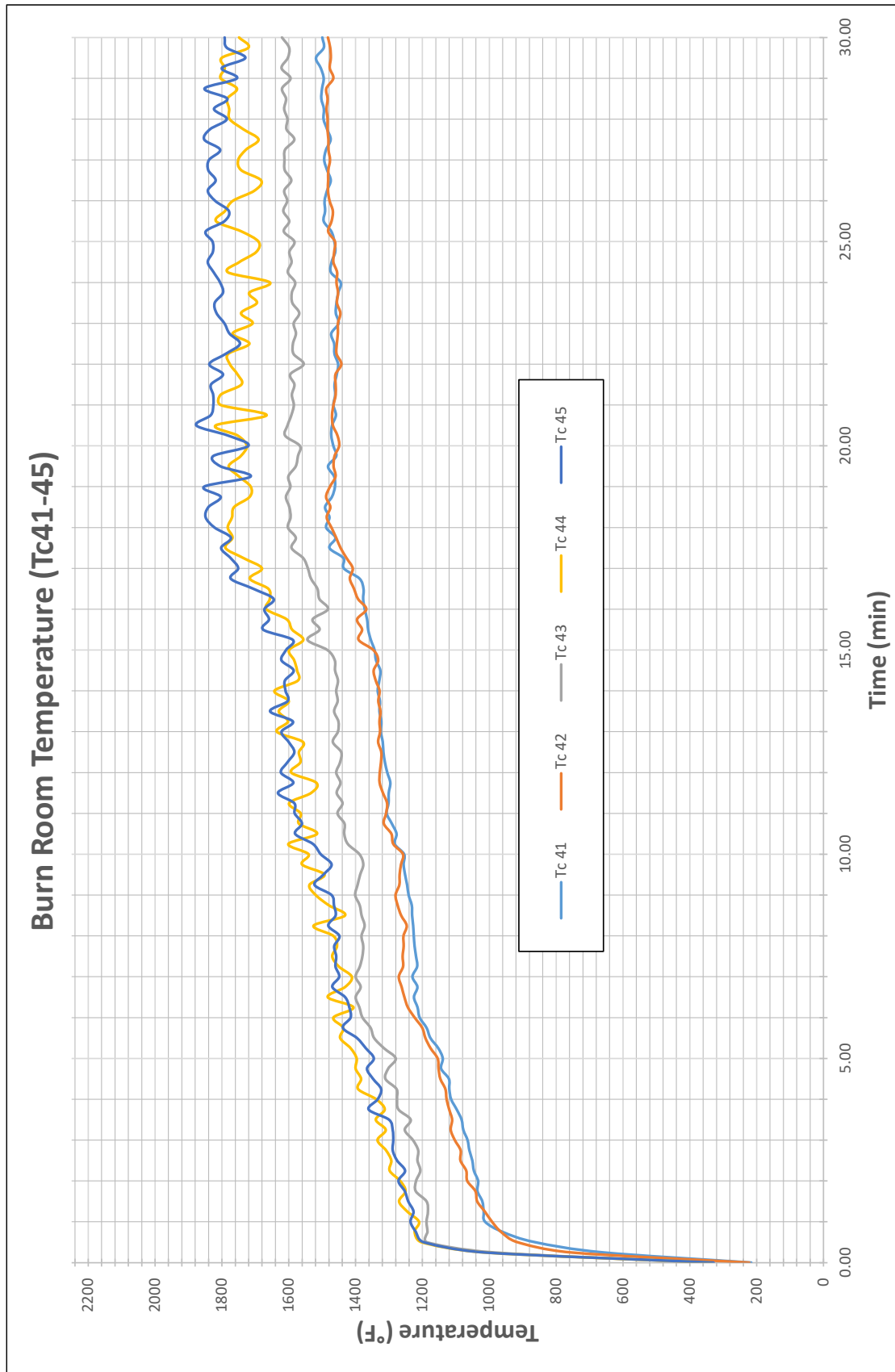
Time (min:sec)	Tc 46(°F)	Tc 47(°F)	Tc 48(°F)	Tc 49(°F)	Tc 50(°F)	Tc 51(°F)	Tc 52(°F)	Tc 53(°F)	Tc 54(°F)
10:00	1429	1458	1400	107	101	119	116	101	114
10:15	1451	1534	1449	107	101	120	117	101	114
10:30	1505	1562	1466	107	102	120	117	102	114
10:45	1501	1523	1466	108	102	121	118	102	114
11:00	1516	1576	1507	108	102	122	119	102	114
11:15	1533	1549	1479	109	102	123	119	102	115
11:30	1515	1598	1525	109	102	123	120	102	116
11:45	1541	1572	1503	109	103	123	121	103	116
12:00	1526	1577	1505	109	103	124	121	103	117
12:15	1528	1571	1492	109	103	125	122	103	117
12:30	1533	1540	1474	110	103	125	122	103	117
12:45	1558	1574	1502	110	104	126	123	103	118
13:00	1552	1592	1509	111	104	127	124	104	118
13:15	1575	1550	1486	111	104	127	124	104	119
13:30	1536	1530	1485	111	104	127	125	104	119
13:45	1558	1560	1492	111	105	128	125	104	120
14:00	1529	1553	1494	112	105	129	126	105	120
14:15	1589	1578	1504	112	105	129	126	105	121
14:30	1556	1599	1514	112	106	130	126	105	121
14:45	1578	1606	1530	113	106	131	127	106	122
15:00	1583	1639	1560	113	107	130	128	106	122
15:15	1610	1685	1574	113	107	131	128	106	122
15:30	1610	1636	1565	114	107	132	128	107	122
15:45	1605	1642	1580	114	108	132	129	107	123
16:00	1616	1603	1568	114	108	133	130	108	123
16:15	1595	1635	1564	114	108	133	130	108	124
16:30	1613	1634	1606	115	109	134	131	109	124
16:45	1670	1654	1643	115	109	135	131	109	125
17:00	1720	1688	1658	115	109	135	132	110	126
17:15	1692	1691	1685	115	110	136	133	111	126
17:30	1744	1703	1707	115	110	137	132	111	127
17:45	1741	1743	1716	116	111	138	133	112	128
18:00	1724	1753	1753	116	111	138	133	112	128
18:15	1754	1734	1757	116	112	139	133	113	128
18:30	1755	1721	1727	117	112	139	133	114	129
18:45	1745	1817	1774	116	113	141	133	114	129
19:00	1796	1759	1727	116	113	142	134	115	129
19:15	1823	1766	1716	117	114	143	134	116	130
19:30	1719	1742	1755	117	115	144	134	117	131
19:45	1766	1777	1738	117	115	145	135	117	131



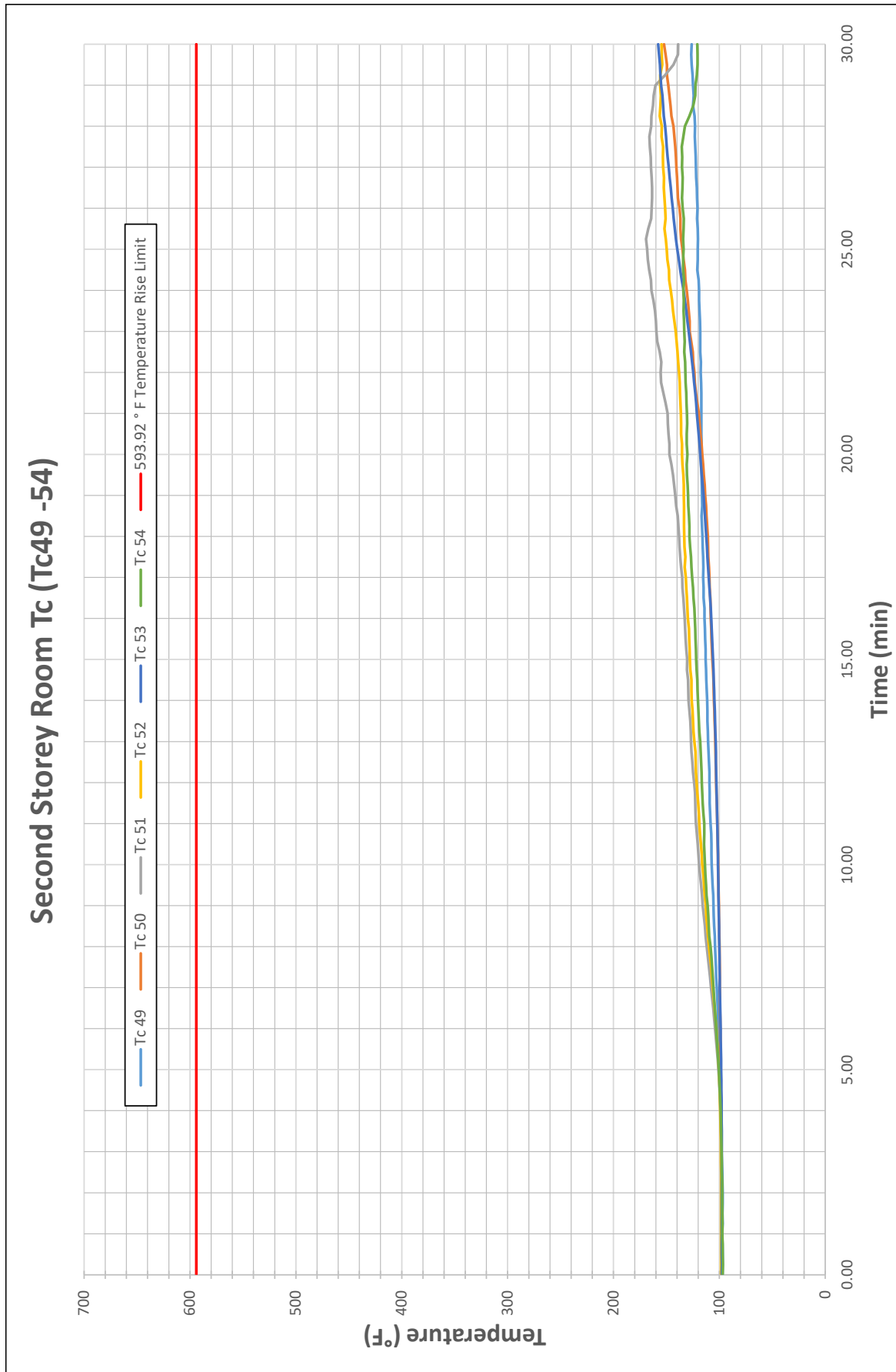
Time (min:sec)	Tc 46(°F)	Tc 47(°F)	Tc 48(°F)	Tc 49(°F)	Tc 50(°F)	Tc 51(°F)	Tc 52(°F)	Tc 53(°F)	Tc 54(°F)
20:00	1729	1771	1738	117	116	147	135	118	130
20:15	1741	1805	1754	117	117	147	135	119	131
20:30	1734	1744	1747	117	118	148	136	120	131
20:45	1806	1826	1762	117	119	149	136	120	131
21:00	1767	1780	1773	117	119	149	136	121	131
21:15	1749	1765	1776	117	121	151	137	122	131
21:30	1776	1792	1763	117	122	153	137	123	131
21:45	1773	1792	1770	117	123	155	138	124	132
22:00	1750	1758	1775	118	124	155	138	125	132
22:15	1767	1760	1756	118	125	155	139	126	132
22:30	1741	1777	1761	118	125	156	140	127	133
22:45	1795	1795	1773	118	127	159	140	128	133
23:00	1799	1809	1762	118	128	160	141	129	133
23:15	1746	1774	1741	118	128	160	142	130	133
23:30	1792	1785	1749	119	129	161	144	131	134
23:45	1772	1780	1767	119	130	162	145	133	134
24:00	1766	1842	1759	119	131	164	146	134	134
24:15	1775	1786	1749	120	132	165	147	135	133
24:30	1811	1814	1761	121	133	166	148	137	134
24:45	1810	1895	1794	120	134	168	149	138	134
25:00	1816	1814	1738	120	135	168	150	140	134
25:15	1811	1888	1816	120	136	169	151	141	134
25:30	1808	1832	1807	120	137	167	152	142	134
25:45	1839	1824	1782	121	137	164	151	143	134
26:00	1868	1858	1802	121	138	164	151	144	135
26:15	1852	1920	1821	121	139	164	152	145	135
26:30	1858	1958	1824	121	140	163	153	146	135
26:45	1838	1868	1779	122	140	164	152	147	135
27:00	1799	1818	1798	122	141	165	153	148	135
27:15	1840	1881	1807	122	141	165	153	149	135
27:30	1826	1809	1781	123	142	166	153	150	135
27:45	1851	1883	1798	123	142	166	155	150	134
28:00	1821	1841	1801	123	143	164	154	151	133
28:15	1820	1834	1797	123	145	164	156	152	128
28:30	1829	1844	1776	125	146	163	156	153	125
28:45	1861	1883	1777	124	147	162	155	154	123
29:00	1812	1835	1781	125	148	160	156	155	123
29:15	1833	1791	1769	125	150	151	156	156	121
29:30	1799	1878	1821	126	149	143	154	156	121
29:45	1844	1866	1800	127	151	139	154	157	121
30:00	1788	1888	1850	126	152	139	155	158	121



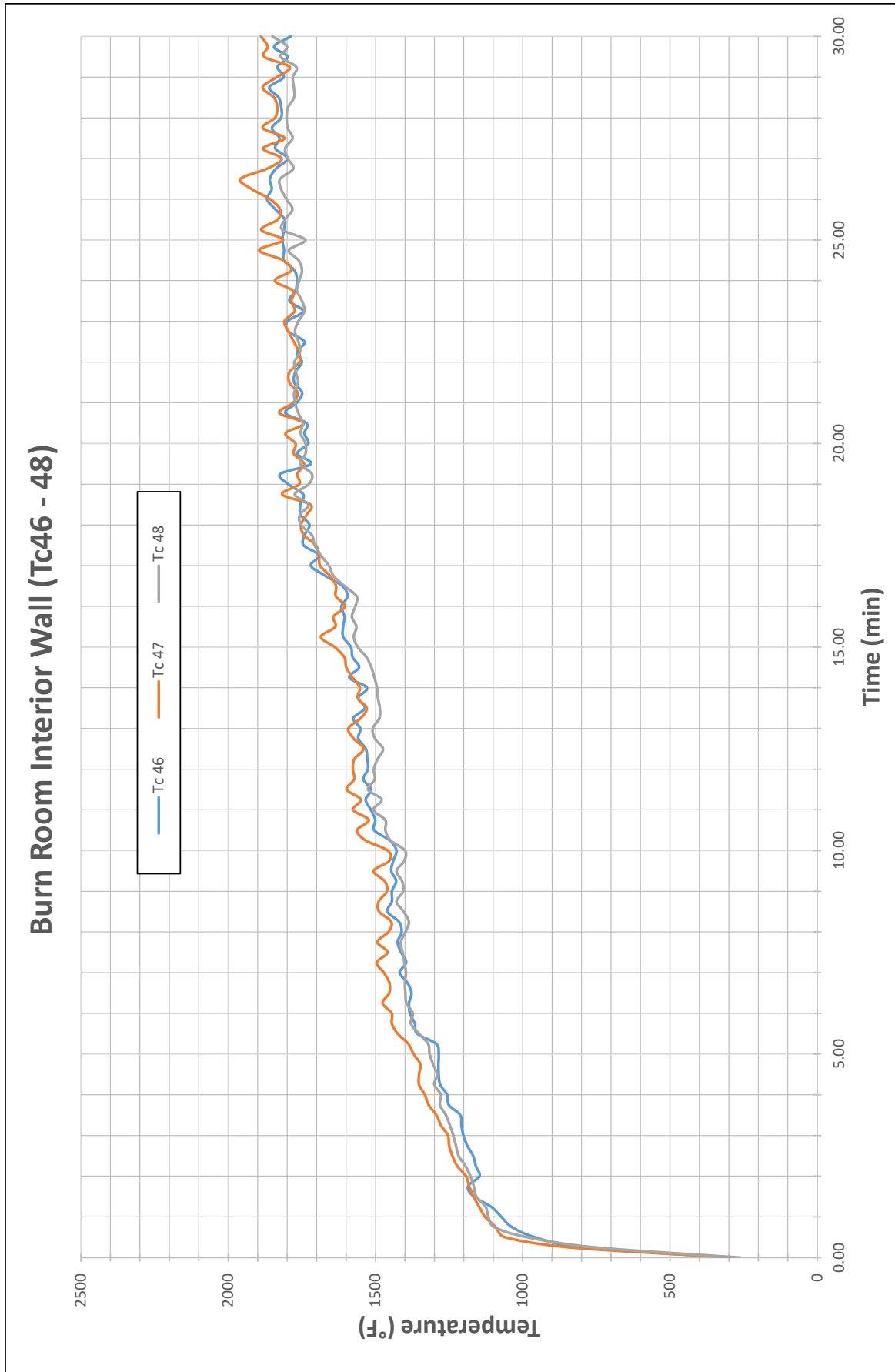
20. APPENDIX 6 – GRAPHS



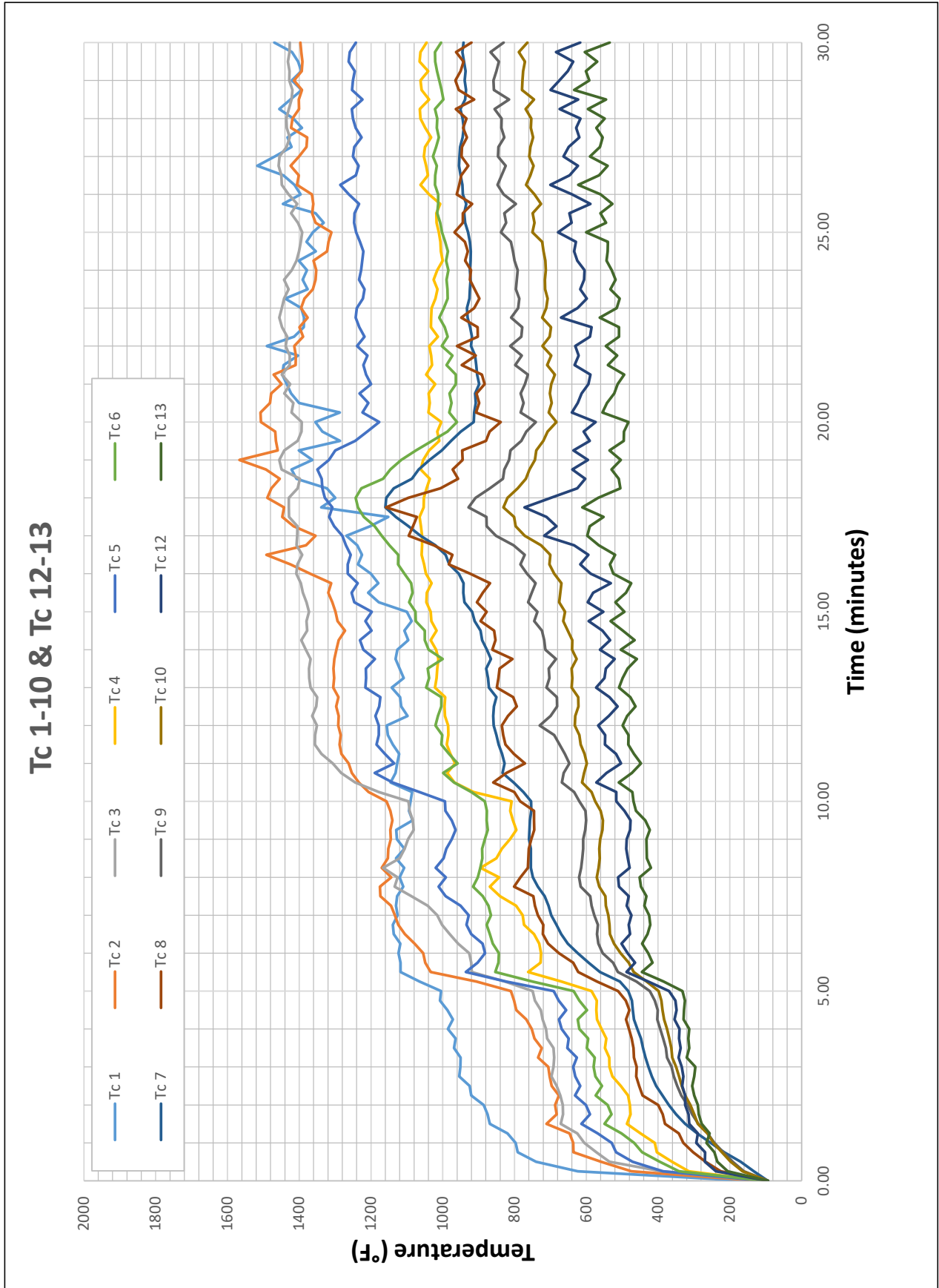
Graph 1: Burn room thermocouple temperature (Tc41 – Tc45)



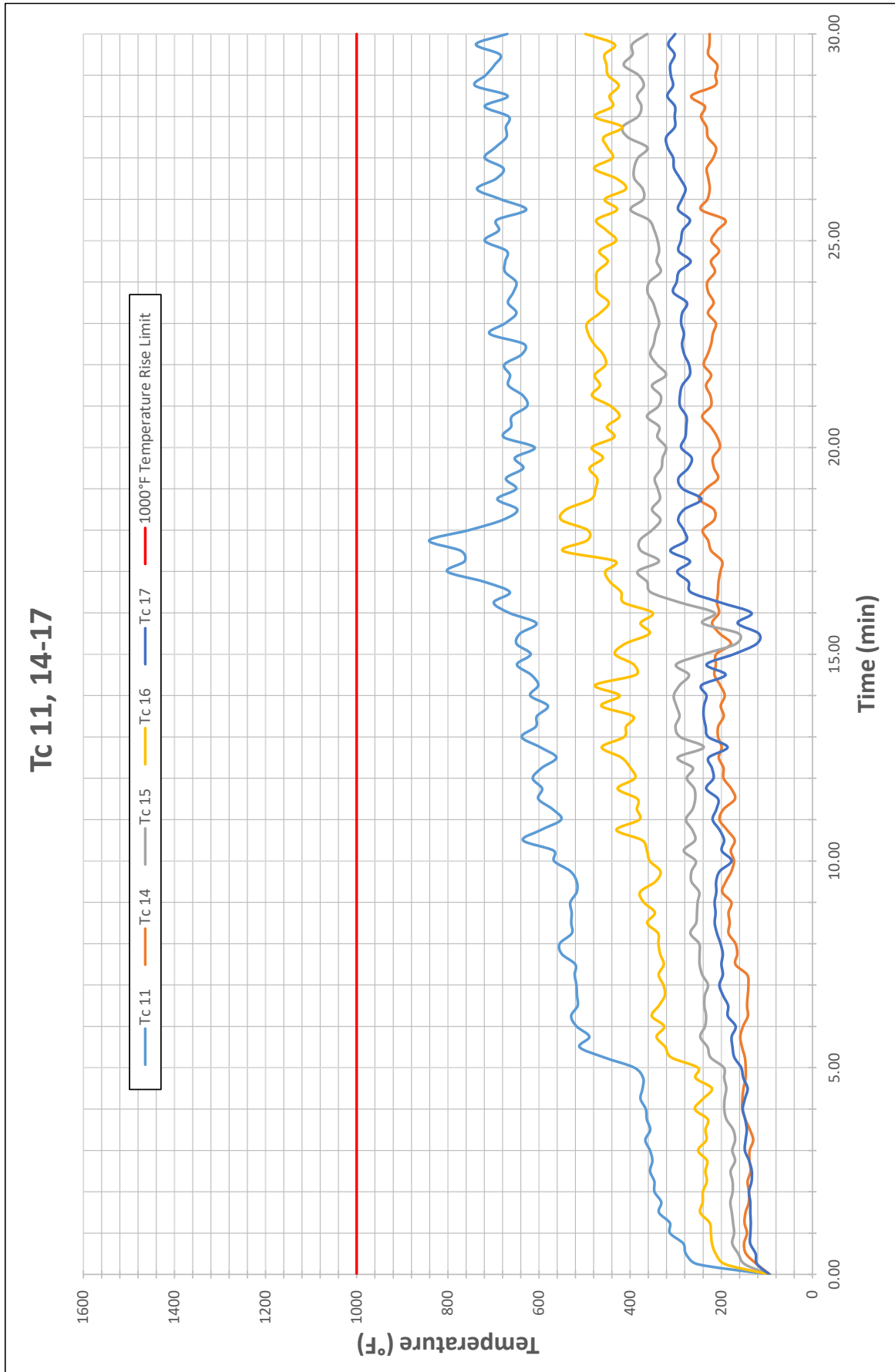
Graph 2: Second storey room thermocouple temperatures (Tc49-Tc54)



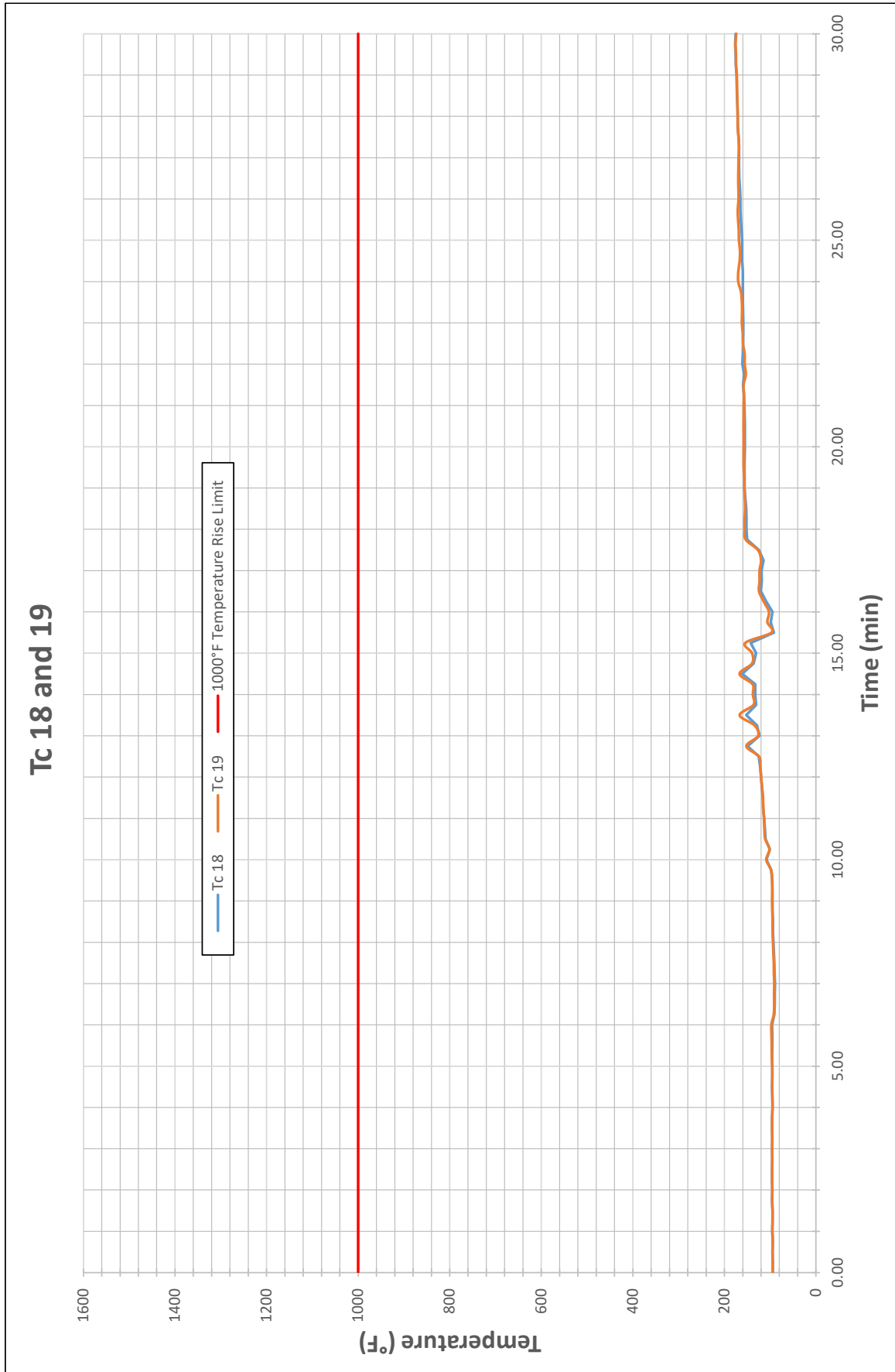
Graph 3: Burn room interior wall temperature (Tc46 – Tc48)



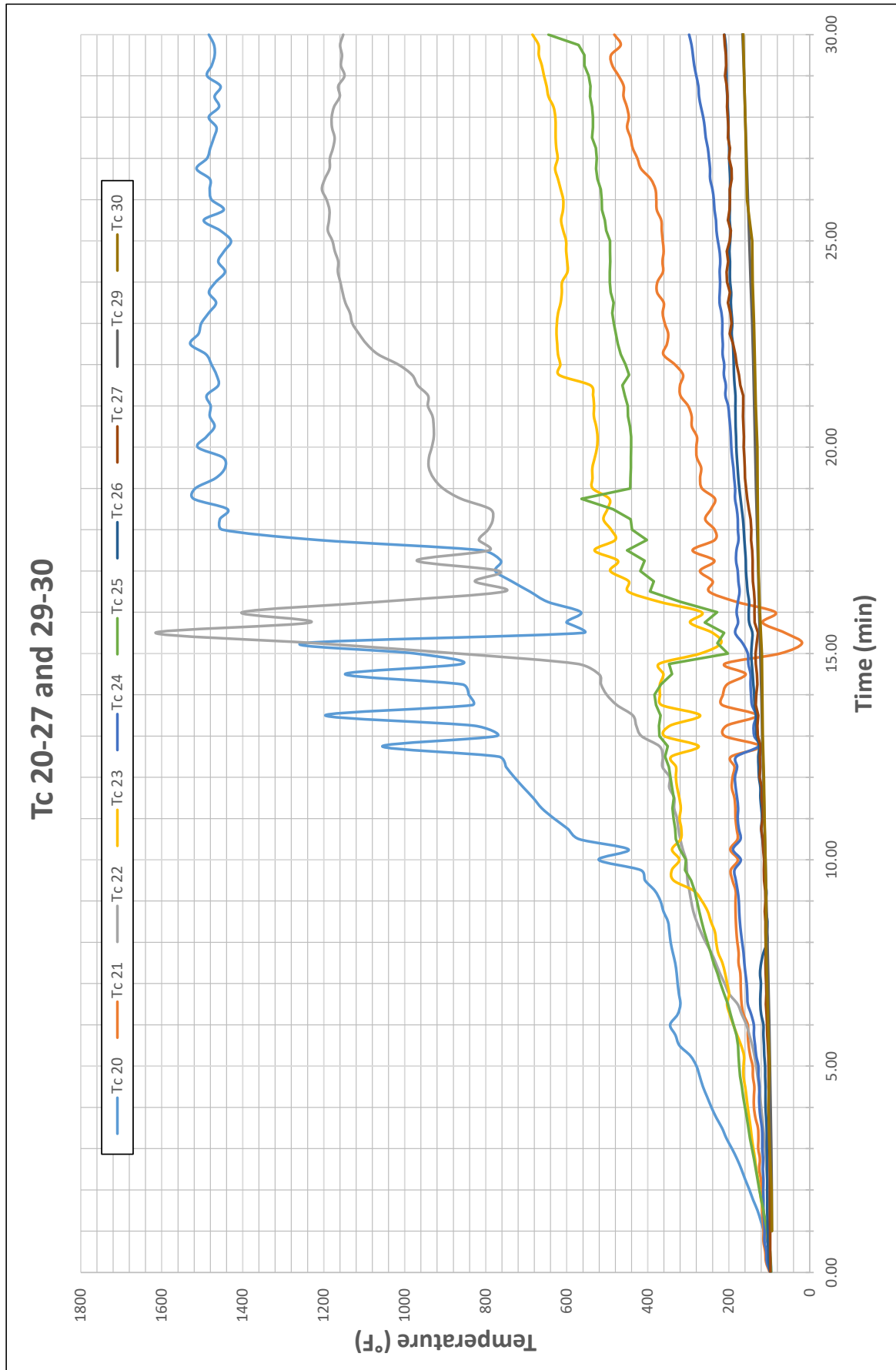
Graph 4: Thermocouple temperatures for Tc1 -Tc10 and Tc12 – Tc23.



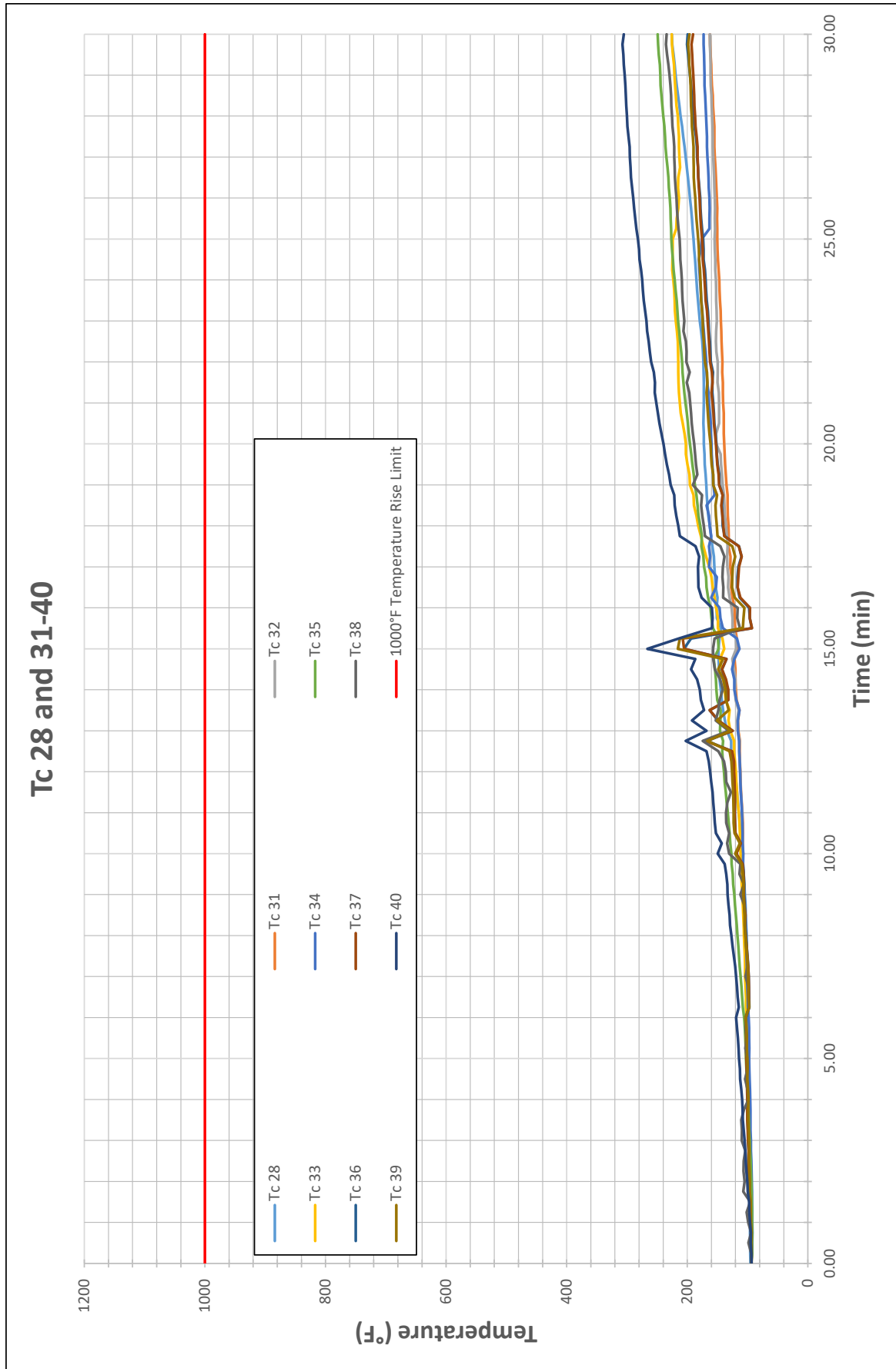
Graph 5: Thermocouple temperatures for Tc11 and Tc14 – Tc17.



Graph 6: Thermocouple temperatures for Tc18 and Tc19.



Graph 7: Thermocouple temperatures for Tc20 – Tc27 and Tc29 – Tc30.



Graph 8: Thermocouple temperatures for Tc28 and Tc31 – Tc40.



21. APPENDIX 7 – CONSTRUCTION PHOTOGRAPHS



Picture 1: Wall bracket and horizontal runner fixing assembly.



Picture 2: Aluminium L-angle along the vertical edge of the specimen.



Picture 3: Cavity fire barrier along the window aperture.



Picture 4: External insulation and cavity fire barrier fixed over the base wall.



Picture 5: External insulation slab fixing anchor.



Picture 6: Aluminium strip at 45° corner joint of ACP's.



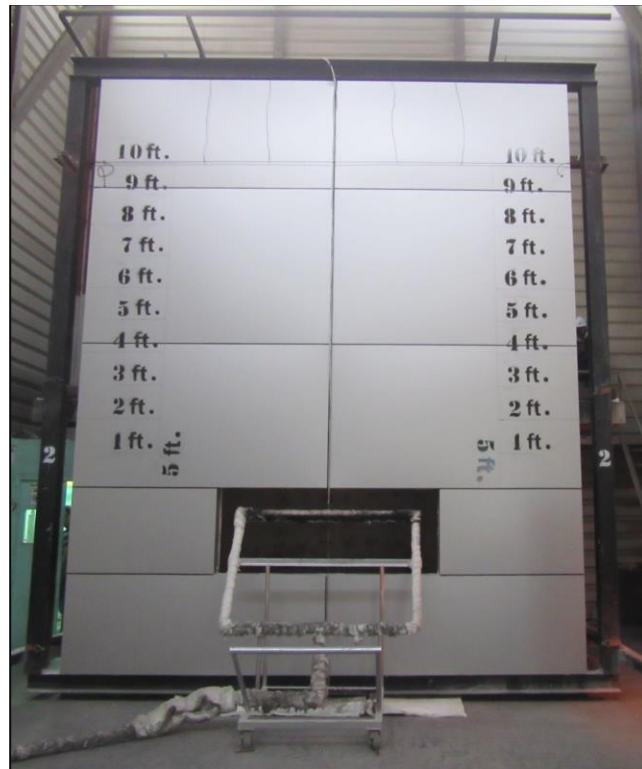
Picture 7: 90° corner joints of ACP's.



Picture 8: Alpollic FR ACP's fixed onto the framing system.



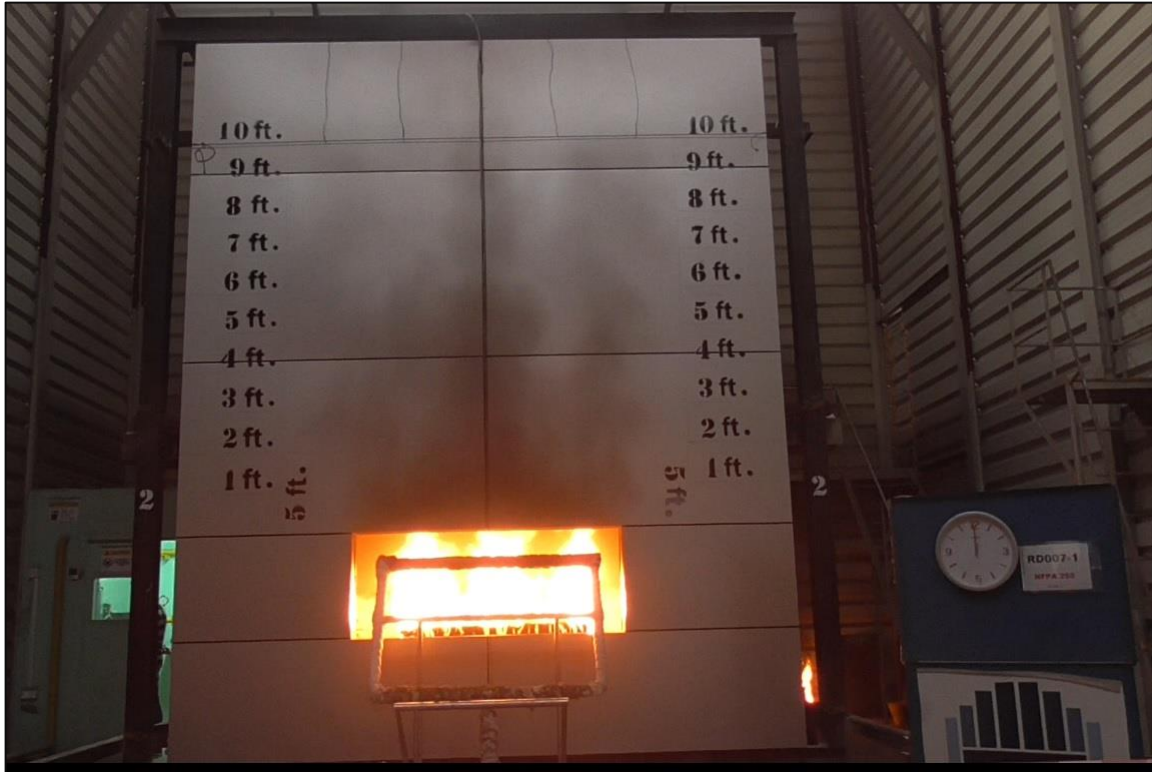
Picture 9: Firestop rope backer rod fitted into the gap between the panels.



Picture 10: Elevation of the completed specimen.



22. APPENDIX 8 – TEST PHOTOGRAPHS



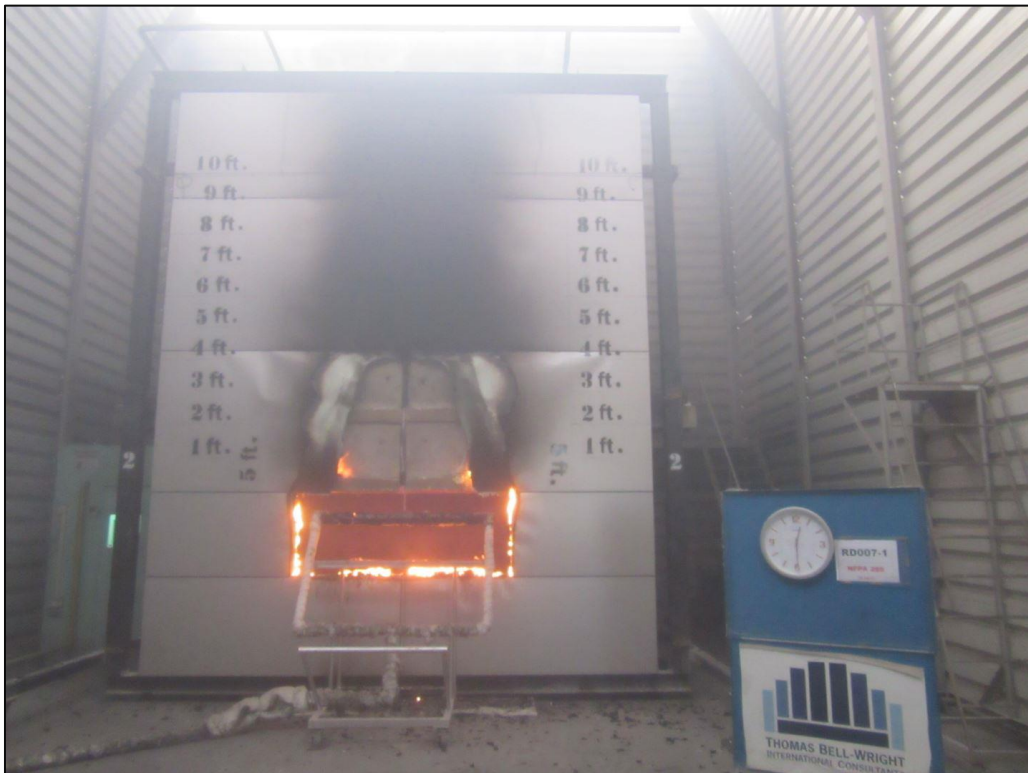
Picture 11: The specimen at the beginning of the test.



Picture 12: The interior of the base wall in the second floor test room at the beginning of the test.



Picture 13: The specimen at 5:00 minutes and when the window burner was ignited.



Picture 14: The specimen immediately after the gas was shut off, starting the observation period.



Picture 15: The interior of the base wall in the second floor test room at the end of the test.



Picture 16: The specimen at the end of the observation period and end of the NFPA 285 test.

----- End of Test Report -----