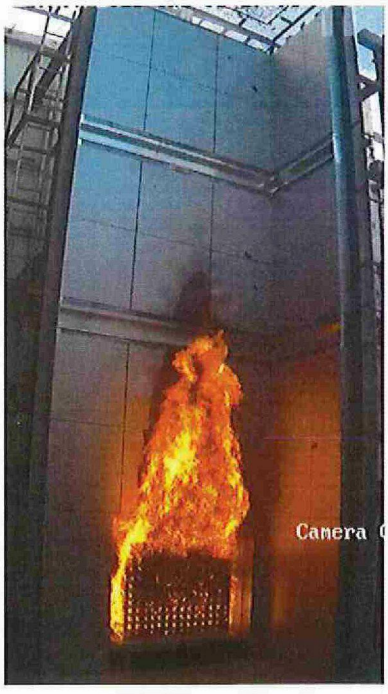
FAÇADE TESTING & ADVISORY SERVICES

Fire Performance Testing of an External Cladding System BS 8414-1:2015 + A1:2017

Test Report

Prepared for	:	**NDM (Metal Roofing & Cladding) Ltd**
Project	:	**Little Venice Towers, London, England**
Report No.	:	**DLR1537 Rev.0**
Sample	:	**Alucobond A2 Composite Panel on Fischer Aluminium Support Frame with 100mm Rockwool Duo Slab Insulation and Fischer Ventistop FFB-VS Cavity Barrier**



UKAS TESTING
4559

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Al-FuttaimExova
Facade Testing & Advisory Services Division

Contents

Table Index

Figure Index

Appendices

Photographs

Drawings

1. Introduction

This report describes the fire performance test carried out at Al Futtaim Exova (AFE) laboratory in Dubai at the request of:

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23A Little End Road,Eaton Socon,
St.Neots,Cambridgeshire,
PE19 8JH,England.

Contact email: [redacted]@ndmltd.com Contact number: [redacted]

AFE Job/Sample Number: PD 106863 / C2881

The test sample consisted of an external wall cladding system (Alucobond A2 Composite Panel on Fischer Aluminium Support Frame with 100mm Rockwool Duo Slab Insulation and Fischer Ventistop FFB-VS Cavity Barrier) installed by NDM (Metal Roofing & Cladding) Ltd.

1.1 Purpose of Testing

The test was carried out on 17th July 2018 and was to determine the fire performance of an aluminium composite cladding system fixed to the masonry face when exposed to external fire under controlled conditions. The test method was in accordance with AFE test method statement DMC2881/MSrev0, which was in accordance with the following standards:

- BS 8414-1: 2015 + A1:2017

This test report relates only to the actual sample as tested and described herein.

The tests were witnessed wholly or in part by:

[redacted]	-	NDM (Metal Roofing & Cladding) Ltd
[redacted]	-	NDM (Metal Roofing & Cladding) Ltd
S. Stevenson-Jones	-	CityWest Homes Limited
[redacted]	-	Wates Living Space

The test was supervised by [redacted] of Al Futtaim Exova.

1.2 Terms and Definitions

1.2.1 Level 1 Height

2500mm above the top of the combustion chamber opening on the test apparatus.

Refer to section 4 for details.

1.2.2 Level 2 Height

5000mm above the top of the combustion chamber opening on the test apparatus.

Refer to section 4 for details.

1.2.3 Start Temperature, T_s

Mean temperature of the thermocouples at Level 1, five minutes prior to ignition of the heat source.

1.2.4 Start Time, t_s

Time when the temperature recorded by any external thermocouple at Level 1 equals or exceeds 200°C above T_s and remains above this value for at least 30 seconds.

2. Test Summary

The cladding system was tested in accordance with BS 8414-1:2015 + A1:2017.

During the test, it was observed that the flame spread reached above the test sample which required early termination of the test. However, the sample was allowed to burn for the full duration to later evaluate the video footage to confirm the flame spread above the sample and its timing. Upon evaluation of the video, it was confirmed that the flame spread reached above the sample within 20 minutes of the ignition.

Table 1 Observations

Parameters	Temperature data / observations
T_s, start temperature	29°C
t_s, start time	111 seconds after ignition of the crib (thermocouple 2 & 3)
Peak temperature & time at Level 2 (External)	774°C at 1098 seconds from t_s (thermocouple 11)
Peak temperature & time at Level 2 (Mid-depth of cavity)	937°C at 1032 seconds from t_s (thermocouple 19)
Peak temperature & time at Level 2 (Mid-depth of 100mm Rockwool Duo Slab insulation)	312°C at 1347 seconds from t_s (thermocouple 27)

For full details refer to Section 6.

The above results are valid only for the conditions under which the tests were conducted.

3. Description of the Test Sample

The test specimen mainly comprised of:

- Alucobond A2 Composite Panel by 3A composites
- 100mm Rockwool Duo Slab insulation
- Fischer VentiStop FFB-VS Horizontal intumescent cavity barrier
- Fischer FCFcl 100 vertical cavity barrier
- Aluminium decorative 'I' beam feature
- Fischer Helping Hand bracket
- Fischer horizontal 'C' profile and vertical 'T' profile

Main wall - 3050mm wide x 9070mm high.
Wing wall - 1447mm wide x 9070mm high.

The top termination of the cladding system was left open. The main wall and wing wall sides closed with aluminium cladding panel folded inward. The interface between the cladding system and the combustion chamber was covered with 3mm thick aluminium sheet. The distance of the finished face of the wing wall to the side opening of the combustion chamber was 200mm.

Photo DLP C2881/2117 shows an external view of the sample.

Figure 1 Photo DLP C2881/2117 External View of the Test Sample

The system components are mentioned in Table 2. Refer to the drawings in Appendix B for sample construction details and dimensions.

Material information described in Table 2 below is as supplied by NDM (Metal Roofing & Cladding) Ltd

Table 2 System Details

Component	Description	Installation Details
Bracket	Fischer - 140x150x3mm thick aluminium bracket with Fischer thermo pad. Fischer - 140x80x3mm thick aluminium bracket with Fischer thermo pad. See photos DLP C2881/1919 in Appendix A.	The brackets were fixed to the masonry with Fischer ultracut FBS II concrete screws and nylon wall plugs. Fischer thermo pad shims were placed between masonry wall and brackets.
Cavity barrier	**Horizontal intumescent cavity barrier:** 180mm thick Fischer VentiStop FFB-VS Horizontal intumescent cavity barrier. 80mm thick Fischer VentiStop FFB-VS Horizontal intumescent cavity barrier. See photos DLP C2881/1955 & DLP C2881/1957 in Appendix A.	The horizontal cavity barriers were fixed to the masonry with Fischer DHM 100 A2 stainless steel pins. 1 no. 180mm thick Fischer intumescent cavity barrier was fixed to the main wall and wing wall at 75mm above the combustion chamber opening. 2 nos. of 80mm thick Fischer intumescent cavity barrier was fixed (behind decorative 'I' beam) to the main wall and wing wall at 2190mm and 4690mm above the combustion chamber opening.
	Vertical cavity barrier: Fischer FcFcl 100 vertical cavity barrier. See photos DLP C2881/1955 & DLP C2881/1957 in Appendix A.	The vertical cavity barriers were fixed to the masonry with Fischer ultracut FBS II concrete screws and nylon wall plugs. 4 nos. of continuous vertical cavity barriers were fixed to the masonry, two on the main wall and two on the wing wall.
Insulation	100mm Rockwool Duo Slab insulation. See photos DLP C2881/1955 & DLP C2881/2023 in Appendix A.	Insulation was fixed to the masonry wall with Fischer DHM 100 A2 stainless steel pins and Fischer DHK 100 plastic pins.
Railing	Fischer horizontal 'C' profile section : 2mm thick aluminium Fischer vertical 'T' profile section : 2mm thick aluminium See photo DLP C2881/2023 in Appendix A.	Vertical 'T' railings were fixed to the Helping hand brackets with Ejot self-drilling JT4-4-4.8mm Tec screws. Horizontal 'C' railings were fixed to the vertical 'T' railings with 4x10mm stainless countersunk screws.

Component	Description	Installation Details
Panel	4mm thick Alucobond A2 panel by 3A composites. Top Skin – Aluminium Core – Mineral filled core Bottom Skin – Aluminium See photo DLP C2881/2114 in Appendix A.	Aluminium composite panels were fixed to the railings with 5.0x12x14mm flange AL/SS rivets.
Decorative feature and ventilation	Aluminum decorative 'I' beam feature 1mm perforated Zinc insect mesh See photo DLP C2881/2119 in Appendix A.	'I' beam features were fixed to the railings with 5.0x12x14mm flange AL/SS rivets.

AFE was not involved in the design, procurement, installation and specification of the materials or system.

Sample installation

AFE monitored the installation of the sample based on the drawings supplied by NDM (Metal Roofing & Cladding) Ltd, which are included in Appendix B of this report. Any deviation of the installation from these drawings were recorded and reported.

Date of installation: 9 to 15 July '18

Ambient temperature range: 27 - 39°C

4. Test Apparatus

4.1 Test Rig

The test specimen was installed on a purpose-built test rig constructed by AFE as per the BS 8414-1:2015 + A1:2017 standard.

The rig comprised of two mutually perpendicular walls (constructed from the masonry bricks of compressive strength: 7.3 N/mm^2, density: 730kg/m^3 and thermal conductivity: 0.18W/mK), one referred to as the main wall with a width of 3275mm and the other as the wing wall with a width of 2685mm.The total height of the test rig was 9180mm.

A combustion chamber with an opening of 1999mm x 2010mm was positioned at the base of the main vertical wall.

Refer to Figure 2 below for a schematic diagram of the test rig.

4.2 Heat Source

A timber crib, 1500mm x 1000mm in plane and 1000mm in height, was constructed using Pinus Silvestris softwood sticks as described in BS 8414-1:2015 + A1:2017 with a first layer consisting of 10 long sticks of 1500mm. The next layer consisted of 15 short sticks was evenly distributed to cover an area of 1500mm x 1000mm.

The process was repeated to give a total of 20 layers of sticks, giving a nominal height of 1000mm. The crib was constructed on a solid steel platform positioned 400mm above the floor of the combustion chamber and placed centrally and displaced 100mm from the back wall of the chamber.

The crib was ignited using 16 strips of low density fibreboard, soaked for 5 minutes in 5 litres of white spirit.

4.3 Thermocouples

All thermocouples used conformed to BS EN 60584-1:2013, Type K (Chromel / Alumel). The thermocouples were mineral insulated and had a nominal 1.5mm diameter with insulated junctions. Data acquisition was performed at 3 second intervals.

The locations of the thermocouples on the specimen were as shown in Figure 3.

4.3.1 External thermocouples at Levels 1 and 2

Thermocouples were positioned in front of the main wall on the centre line and at 500mm & 1000mm each side of the centre line of the combustion chamber (five locations). Thermocouples were also positioned in front of the wing wall, at 150mm, 600mm & 1050mm from the finished face of the main wall (three locations).

4.3.2 Internal thermocouple locations at Level 2

Thermocouples were positioned within each layer of the main test wall face greater than 10mm on the centre line and at 500 mm and 1000 mm each side of the centre line of the combustion chamber (five locations). Thermocouples were also positioned within each layer of the wing test wall face greater than 10mm at 150 mm, 600 mm and 1050 mm from the finished face of the main test wall face (three locations).

Figure 2 Schematic View of the Test Rig

Note: All dimensions are in mm, the drawing is not to scale

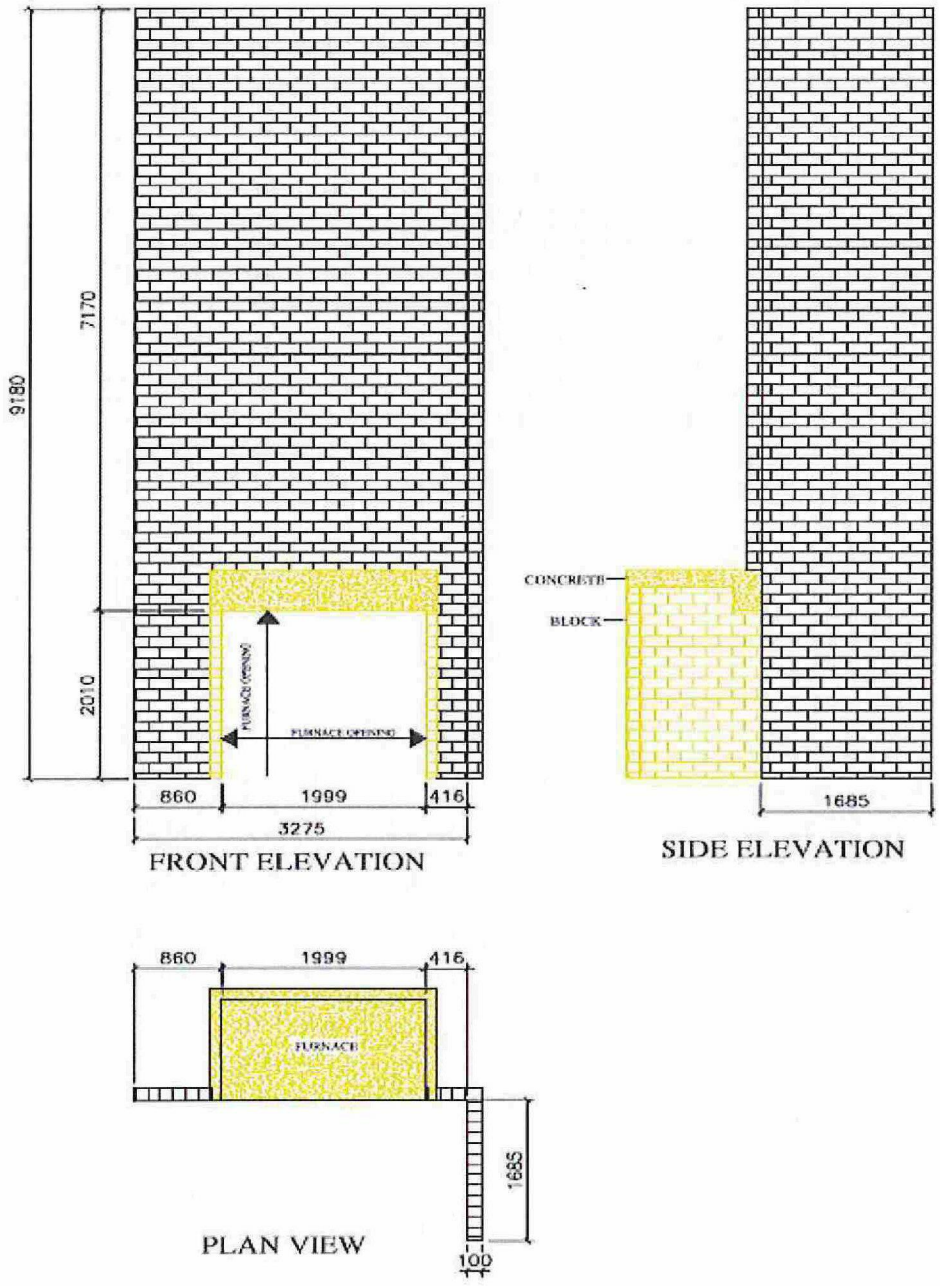


Figure 3 Thermocouple, Cavity Barrier Locations & Panel Numbering

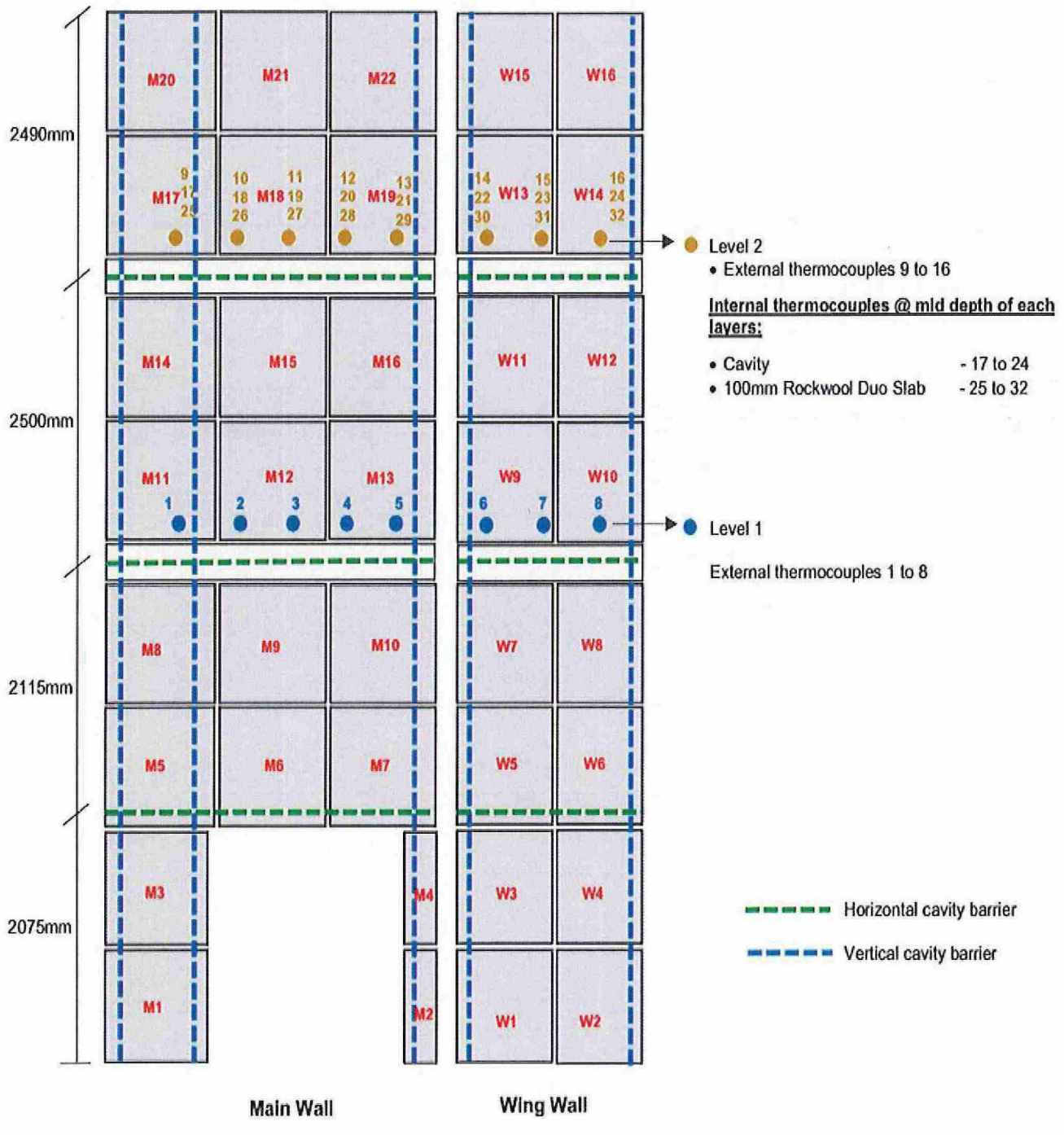
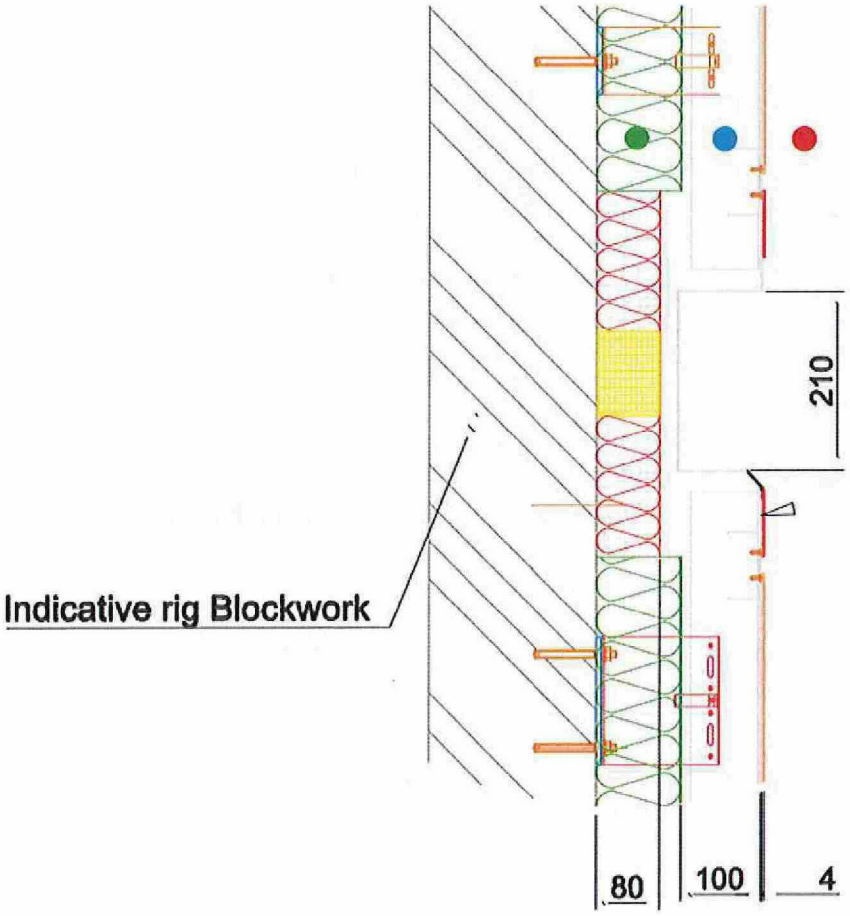


Figure 4 Level 2 Section Drawing Showing the Thermocouple Locations



- Level 2, External thermocouples 9 to 16
- Level 2, Internal thermocouples in cavity 17 to 24
- Level 2, Internal thermocouples in the insulation 25 to 32

5. Test Procedures

5.1 Testing

The environmental conditions were recorded.

The data acquisition and video recording was started 5 minutes prior to ignition of the fuel source. Then fuel source was ignited.

Significant events were recorded, including;

- changes in flaming conditions
- change in the mechanical behaviour of the cladding system
- the detachment of any part of the sample
- fire penetration through any fire stops in the cladding system

The heat source was extinguished 30 minutes after ignition. The data acquisition was continued to 60 minutes from ignition.

5.2 Post-test Examination

After the test was terminated, the sample was allowed to cool. The sample was then examined for damage, including the following.

- Spalling
- Melting
- Deformation
- Delamination
- The extent of flame spread over the surface of the cladding system
- The extent of flame spread and/or damage within intermediate layers
- An estimate of flame spread and/or damage within cavities
- The extent to which the external face of the cladding system has burnt away or become detached
- Details of any collapse or partial collapse

Smoke staining and discolouration were not considered damage in this context.

6. Test Data / Observations

Installation date: 9 to 15 July '18

Ambient temperature during installation: 27 - 39°C

Date of testing: 17 July '18.

Ambient temperature during testing: 29°C

Wind speed: 0.47 m/s

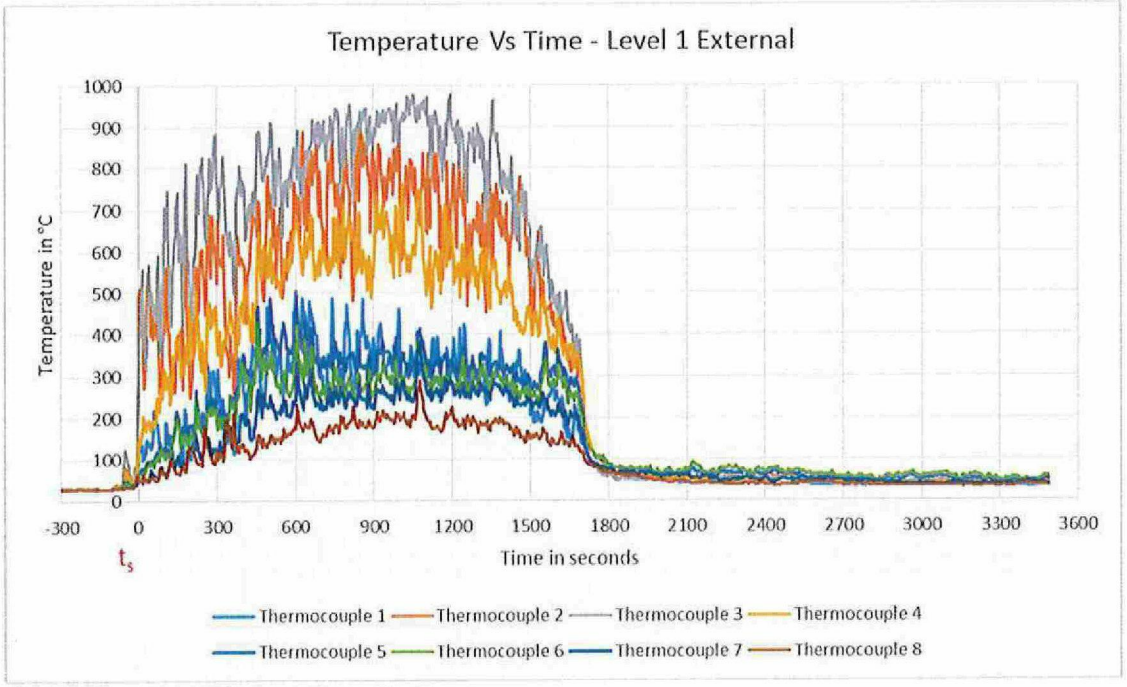
Table 3 below summarises the observations during the test.

Table 3 Visual Observations During the Test

Time	Seconds	Observation	Photo Reference
06:12:03	-	Ignition of crib	-
06:12:56	-	Flame tip reached above the combustion chamber.	-
06:13:54	00	Start time t_s, 342°C (≥T_s+200°C) at thermocouple 2, Level 1 (main wall).	-
06:14:30	36	Coating of panels M6 and M9 started to peel off.	-
06:14:48	54	Coating of panel M7 started to peel off.	-
06:14:59	65	Perforated zinc mesh located at 2m above the combustion chamber buckled.	DLP C2881/0001
06:15:28	94	Buckling observed on panel M10 and coating started to peel off.	-
06:15:34	100	Coating of panel M12 started to peel off.	-
06:16:30	156	Buckling observed on panel M13 and coating started to peel off.	-
06:18:03	249	Flaming debris fell off the main wall.	-
06:18:10	256	Self-sustained flames at 'I' beam and panel M12 horizontal joint.	DLP C2881/0002
06:18:59	305	Panels M6 and M9 partially melted and insulation exposed.	-
06:19:08	314	Flaming debris observed on the floor.	DLP C2881/0003
06:19:24	330	Panel M12 partially melted and insulation exposed.	DLP C2881/0004
06:20:30	396	Flame impinged on panel W5 and coating started to peel off.	-
06:20:49	415	Continuous falling of flaming debris from the main wall.	-
06:21:28	454	Flame on the coating of panel W7.	DLP C2881/0005

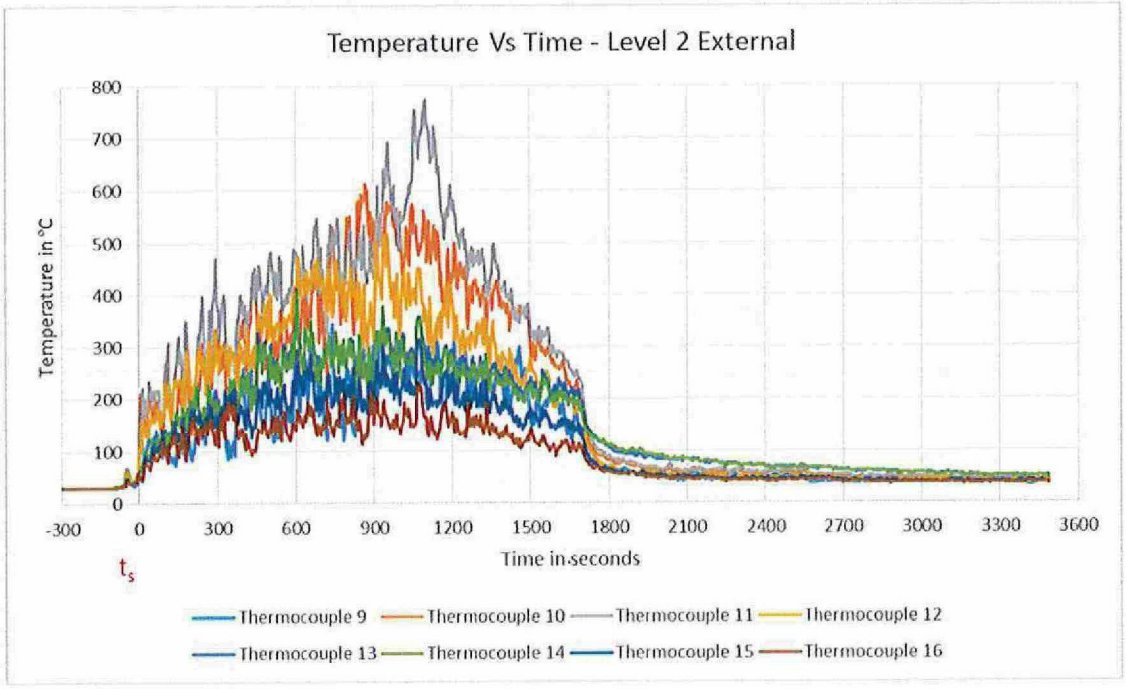
Time	Seconds	Observation	Photo Reference
06:21:48	474	Self-sustained flames at 'I' beam and panel M15 horizontal joint.	DLP C2881/0006
06:22:34	520	High intensity flaming debris on the floor.	DLP C2881/0007
06:23:20	566	Railings behind panels M6, M7, M8 and M9 melted.	-
06:25:18	684	Aluminium debris of panel M15 fell off.	DLP C2881/0008
06:26:04	730	'I' beam at level 1 partially melted.	-
06:27:14	800	Railings behind panels M12 and M15 melted.	DLP C2881/0009
06:28:05	851	Flame on the coating of panel M18.	-
06:29:56	962	Flame on the coating of panel M21.	
06:30:17	983	Self-sustained flames at 'I' beam and panel M18 horizontal joint.	DLP C2881/0010
06:32:20	1106	Flame reached above the test apparatus which required early termination.	DLP C2881/0011
06:42:03	1689	The heat source was extinguished.	-

Figure 5 Thermocouple Readings on Level 1 - External



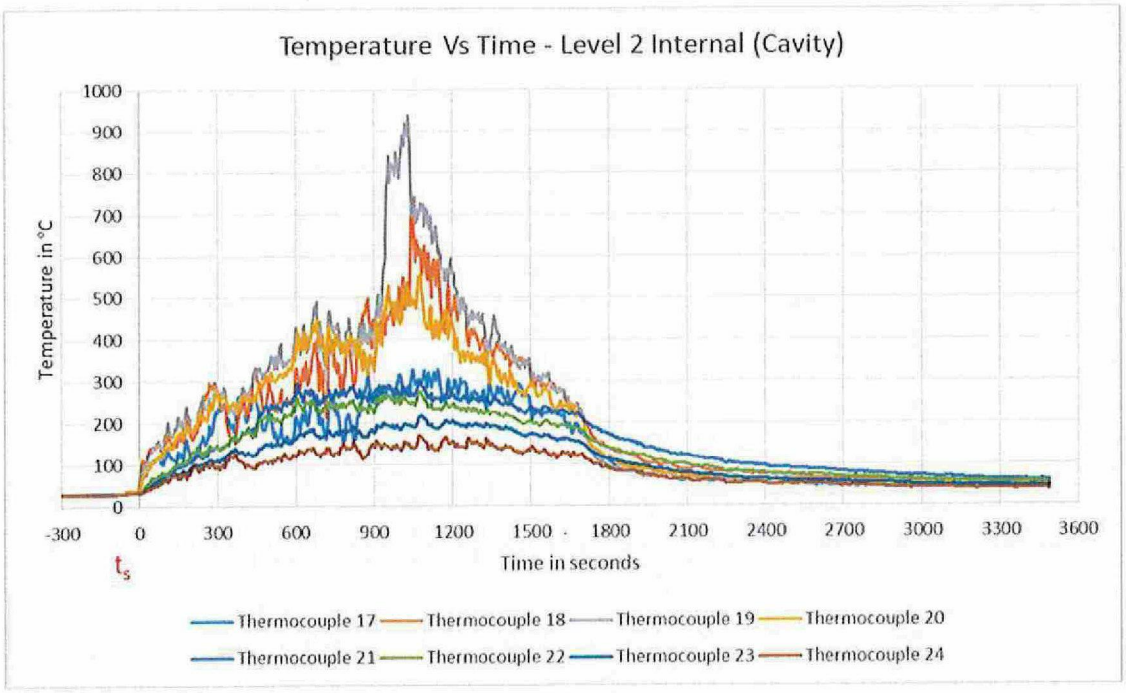
For thermocouple locations see Figure 3 & 4.

Figure 6 Thermocouple Readings on Level 2 – External



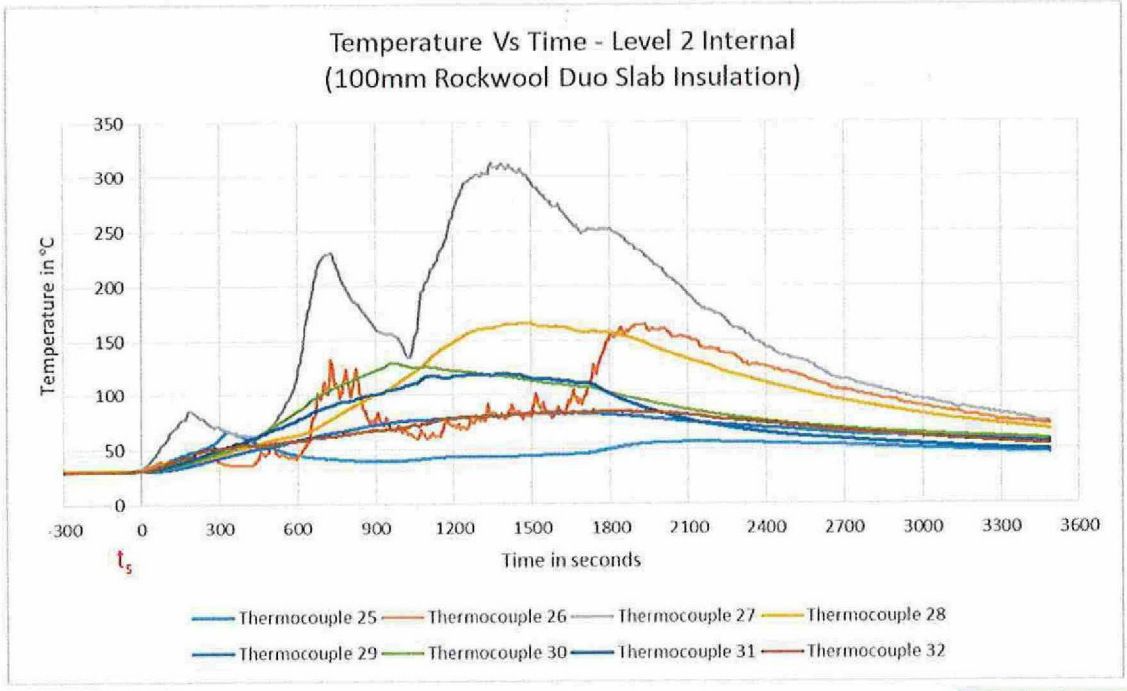
For thermocouple locations see Figure 3 & 4.

Figure 7 Thermocouple Readings on Level 2 – Internal (Cavity)



For thermocouple locations see Figure 3 & 4.

Figure 8 Thermocouple Readings on Level 2 – Internal (Mid-depth of 100mm Rockwool Duo Slab Insulation)



For thermocouple locations see Figure 3 & 4.

6.1 Post-test Examination

Table 5 below summarises the post-test observations.

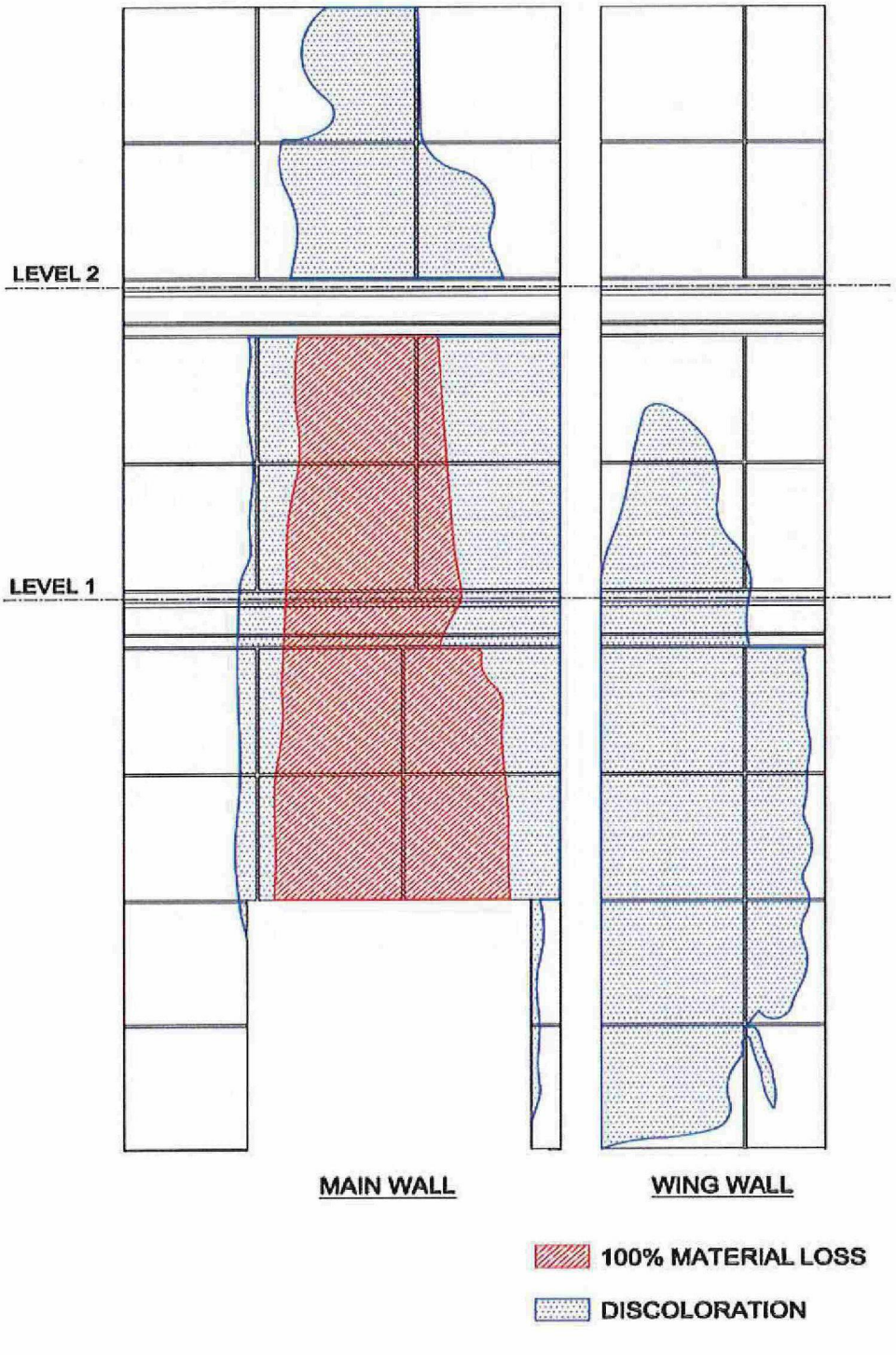
Table 4 Post-test Observations

Sl. No.	Components	Observation	Photo Reference
1	Aluminium composite panels	Panels M1, M17 & M20 – Minor buckling observed. Panels M2, M3, M4, M5, M8, M11, M14 & M22– Minor buckling and discoloration on the panels. Panels M6, M7, M9 & M10 - Approximately 85% of the panel was consumed and remaining area was discoloured and buckled. Panels M12, M13, M15 & M16 – Approximately 65% of the panel was consumed and remaining area was discoloured and buckled. Panel M18 – Approximately 80% of the panel was discoloured. Minor material loss on the panel. Panels M19 & M21 - Approximately 50% of the panel was discoloured. No material loss on the panels. Panels W1, W3 & W9 – Approximately 90% of the panel was discoloured. Minor material loss observed. Panels W2, W10 & W11 – Minor discoloration on the panels. Panels W5 & W7 – 100% discolouration on the panels. Material loss observed. Panels W4, W6 & W8 – Approximately 50% of the panel was discoloured. Panels W12, W13, W14, W15 & W16 – No significant changes to the panels	DLP C2881/0012. See Figure 9 in this section for the damaged areas.
2.	'I' Beam	Main wall: Approximately 50% of the 'I' beam at level 1 melted. Remaining area was buckled and discoloured. Buckling, minor material loss and discoloration on the 'I' beam at level 2. Wing wall: Minor buckling and discoloration on the 'I' beam at level 1 and level 2.	DLP C2881/0012 & DLP C2881/0015.

Sl. No.	Components	Observation	Photo Reference
3	Fischer cavity barriers	**Horizontal intumescent cavity barrier:** Main wall: The 1st horizontal cavity barrier at 75mm above the combustion chamber was activated except the cavity behind panel M5 (beyond the left side (viewing from outside) vertical fire barrier on the main wall). Intumescent layer was not present during the dismantling. Material loss and damage observed. The 2nd horizontal cavity barrier at 2190mm above the combustion chamber was activated except the cavity between panels M8 & M11 (beyond the left side (viewing from outside) vertical fire barrier on the main wall). Intumescent layer was partially present during the dismantling. No material loss observed. The 3rd horizontal cavity barrier at 4690mm above the combustion chamber was activated except the cavity between panels M14 & M17 (beyond the left side (viewing from outside) vertical fire barrier on the main wall). Intumescent layer was present during the dismantling. No material loss observed. Wing wall: The 1st horizontal cavity barrier at 2075mm above the ground level was activated. Intumescent layer was present during the dismantling. No material loss observed. The 2nd horizontal cavity barrier at 4190mm above the ground level was activated except the cavity between panels W8 & W10 (between the vertical fire barriers on wing wall). Intumescent layer was present during the dismantling. No material loss observed. The 3rd horizontal cavity barrier at 6690mm above the ground level was activated except the cavity between panels W12 & W14 (between the vertical fire barriers on wing wall). Intumescent layer was present during the dismantling. No material loss observed.	DLP C2881/0013, DLP C2881/0014, DLP C2881/0016 & DLP C2881/0017.
		Vertical cavity barrier: Discolouration and buckling to the vertical cavity barriers on the main wall and wing wall was observed.	

Sl. No.	Components	Observation	Photo Reference
4	100mm Rockwool Duo Slab insulation	Main wall: Discoloration and minor material loss on the insulations behind panels M6, M7, M9, M10, M12, M13, M15 & M16. Minor discoloration on the insulation behind panels M18, M19, M21 & M22. No changes on the remaining insulation on the main wall. Wing wall: Discolouration on the insulation behind panels W5, W7, W9 & W11. No changes on the remaining insulation on the wing wall.	DLP C2881/0013, DLP C2881/0016 & DLP C2881/0017.
5	Railing	Main wall: All railings behind panels M6, M7, M9, M10, M12, M13, M15 & M16 were melted. Railings behind panels M18, M19, M21 & M22 were discoloured and buckled. All other railings were in place and no damage was observed. Wing wall: All railings behind panels W5, W7, W9 & W11 were discoloured. All other railings were in place and no damage was observed.	DLP C2881/0013, DLP C2881/0016 & DLP C2881/0017.
6	Brackets	Approximately 20% of the brackets on the main wall were damaged. All brackets on the wing wall were in place and no damage was observed.	DLP C2881/0018.

Figure 9 Area Map Showing the Condition of the Sample After the Test



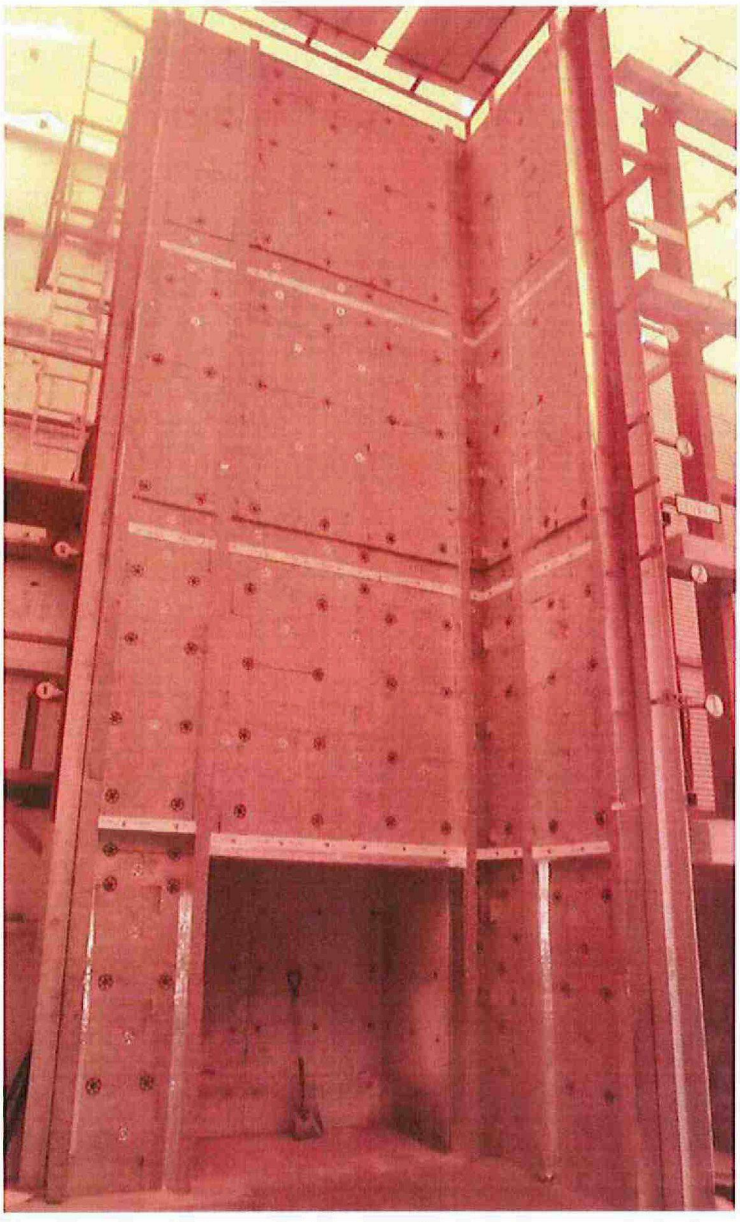
- Approximately 6m² of the total external visible area was completely consumed.
- Approximately 13m² of the total external visible area was discoloured.

Appendix A

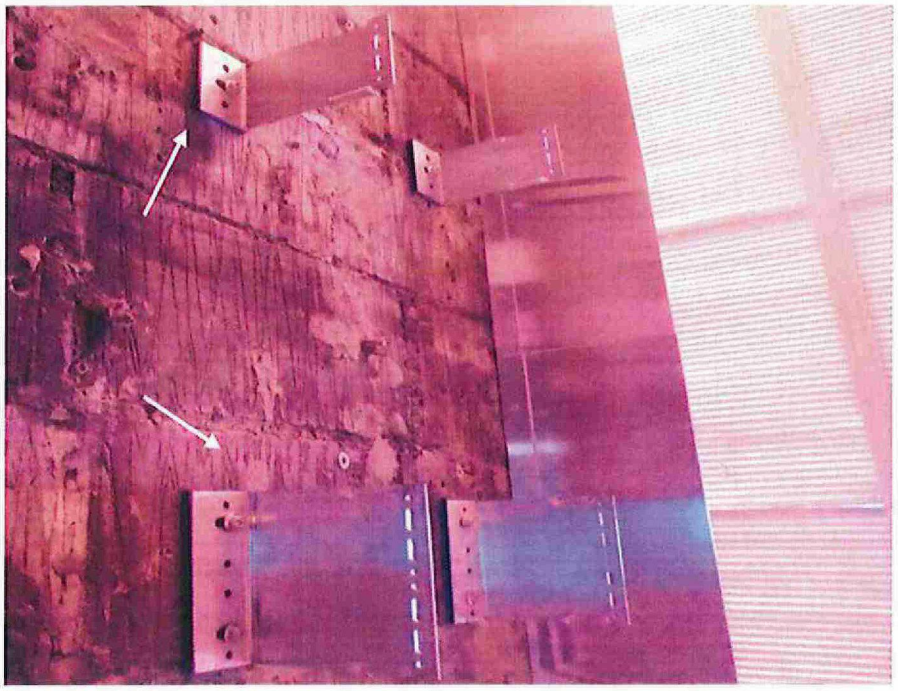
Photographs

Note: Any warp in the images is due to fish eye effect of the camera.

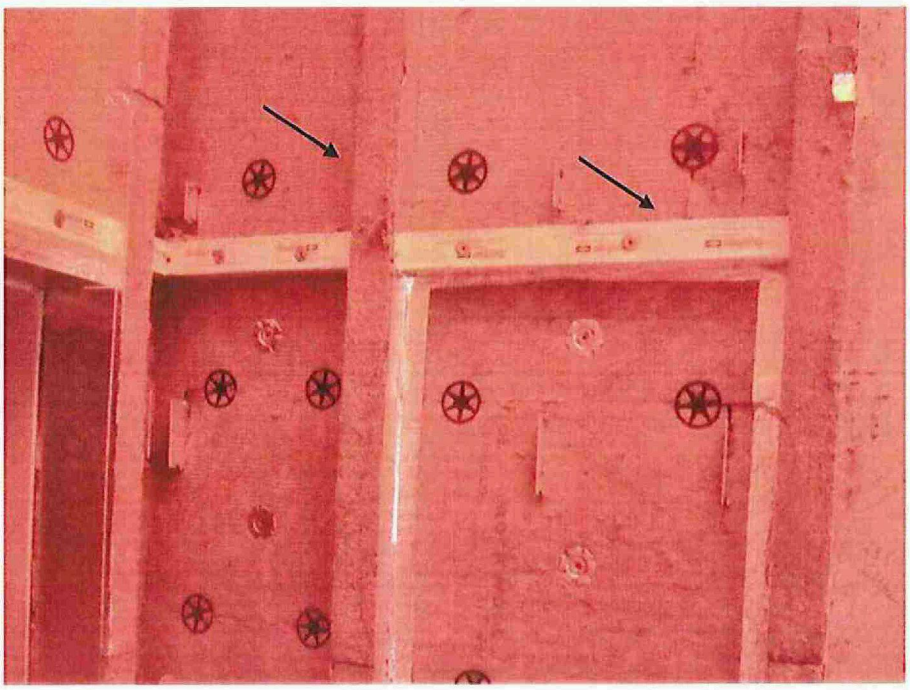
Pre-test Phase



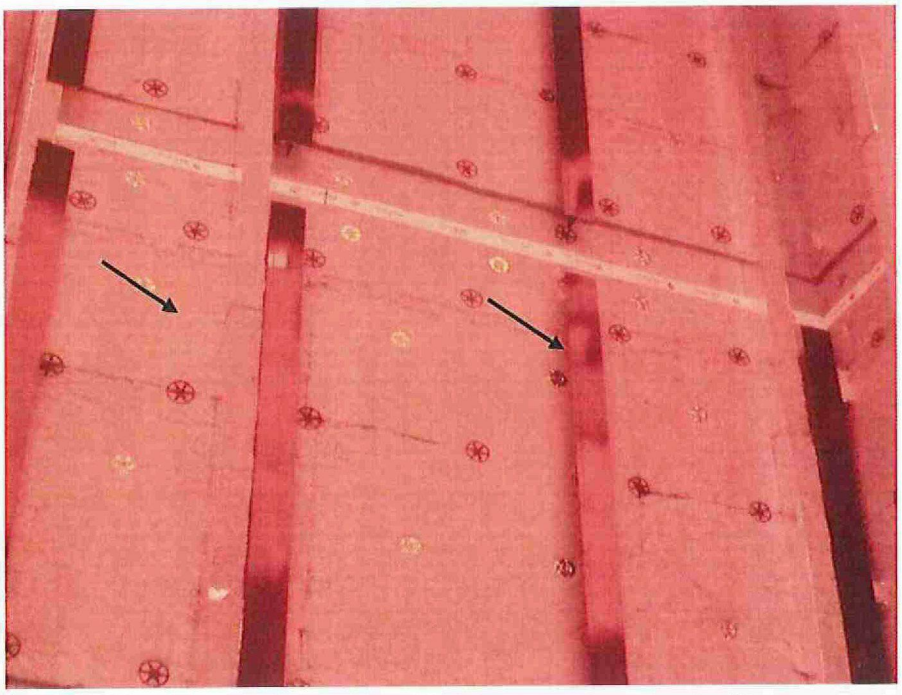
DLP C2881/1955 Fischer cavity barriers and Rockwool Duo Slab insulation



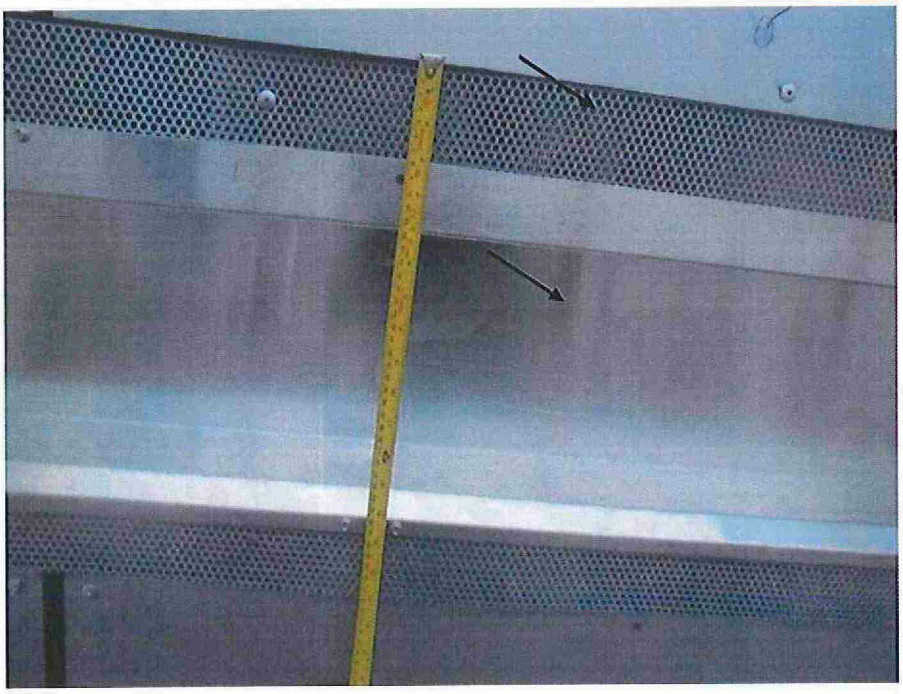
DLP C2881/1919 Helping Hand bracket



DLP C2881/1957 Fischer vertical and horizontal intumescent cavity barriers



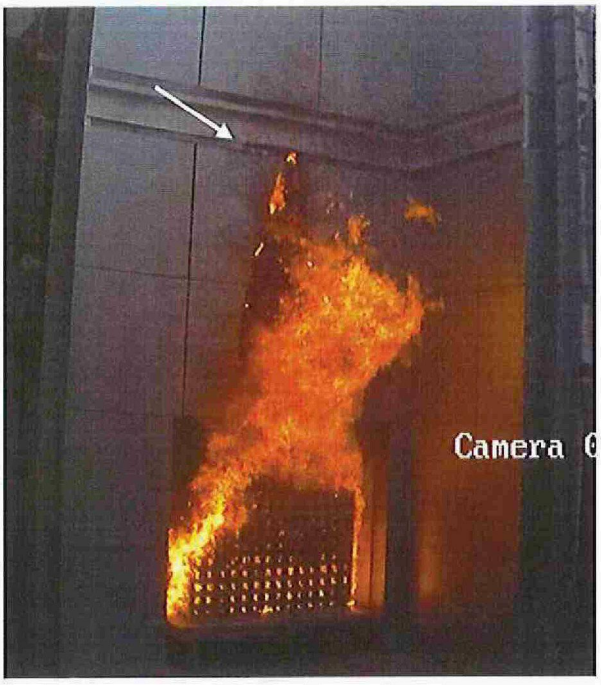
DLP C2881/2023 Rockwool Duo Slab insulation and railings



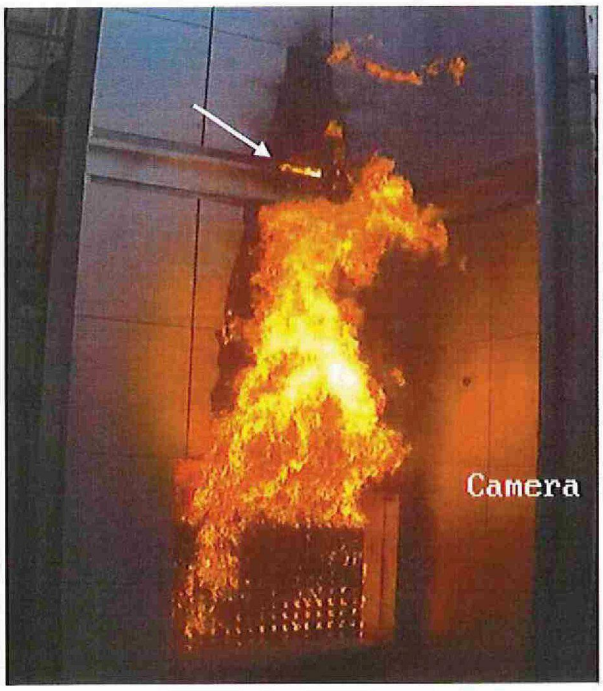
DLP C2881/2119 'I' beam and perforated zinc insect mesh

DLP C2881/2114 Alucobond A2 composite panel fixing

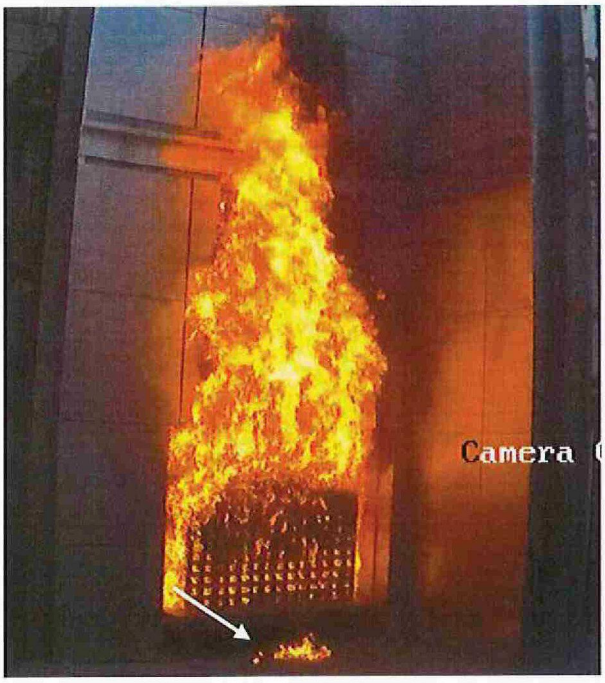
Testing Phase



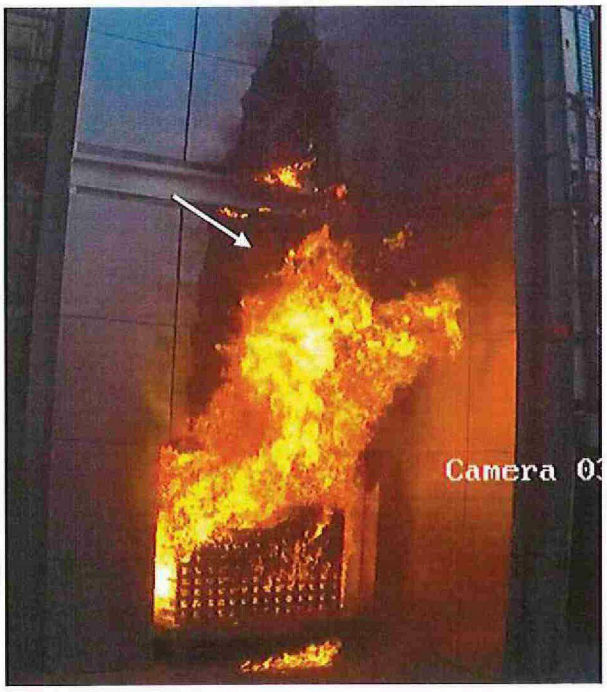
DLP C2881/0001 Perforated zinc mesh located at 2m above the combustion chamber buckled



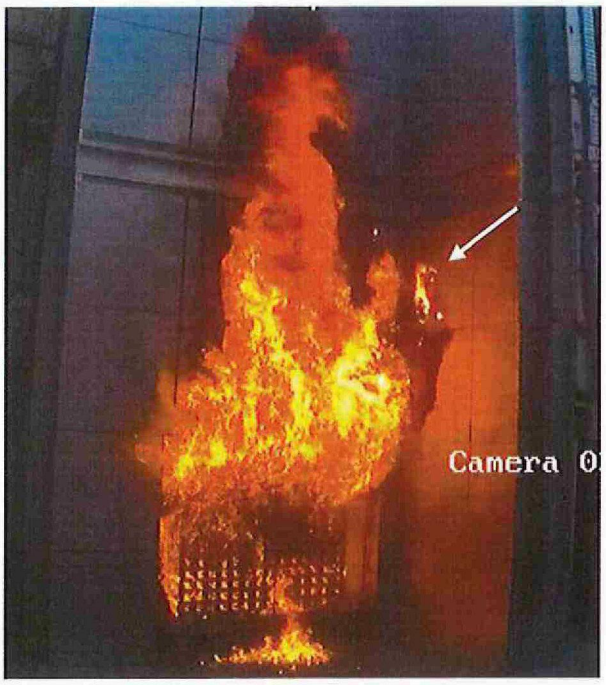
DLP C2881/0002 Self-sustained flames at 'I' beam and panel M12 horizontal joint



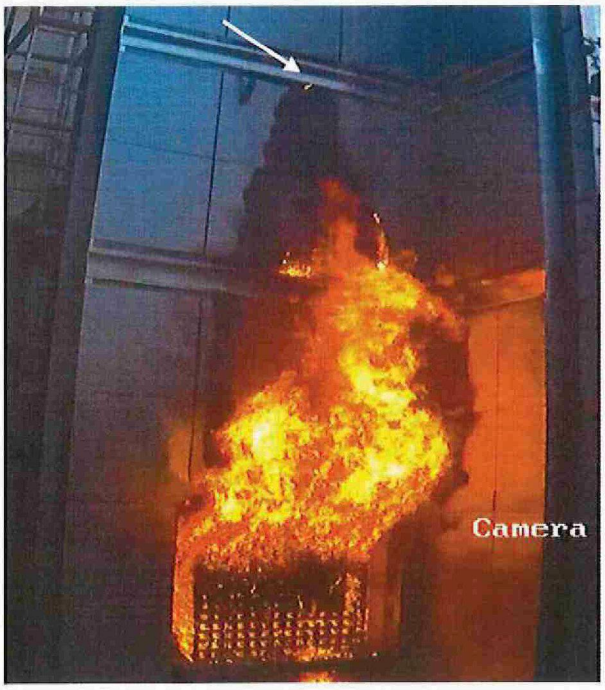
DLP C2881/0003 Flaming debris observed on the floor



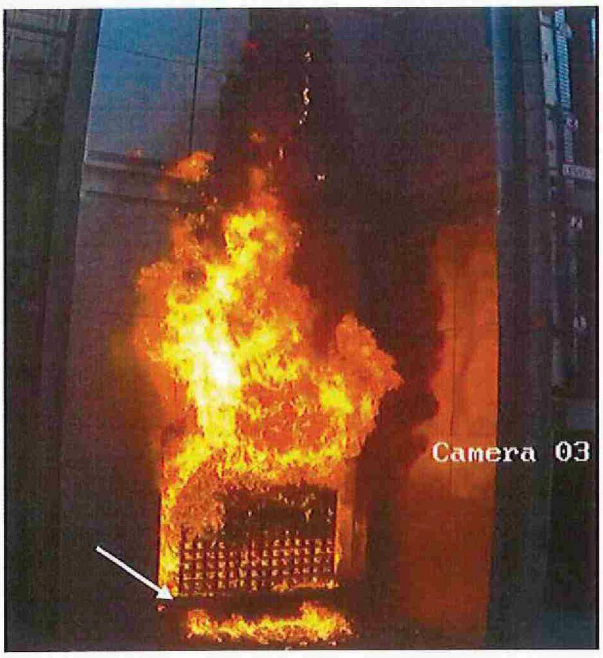
DLP C2881/0004 Panel M12 partially melted and insulation exposed



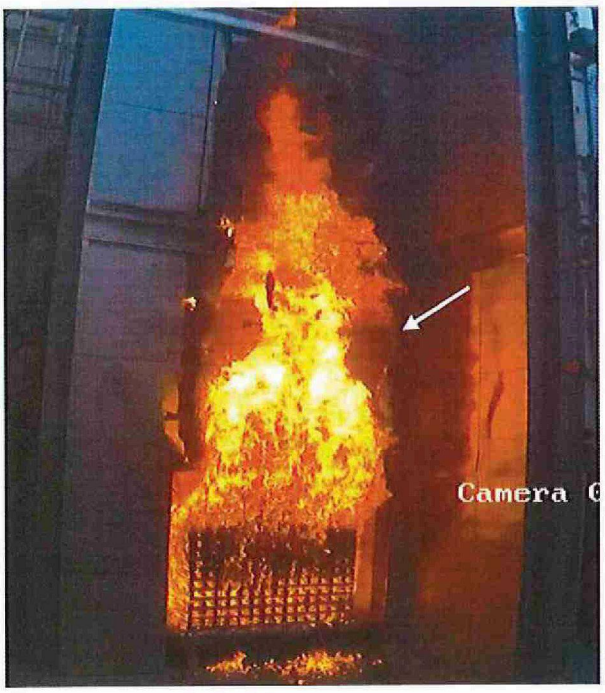
DLP C2881/0005 Flame on the coating of panel W7



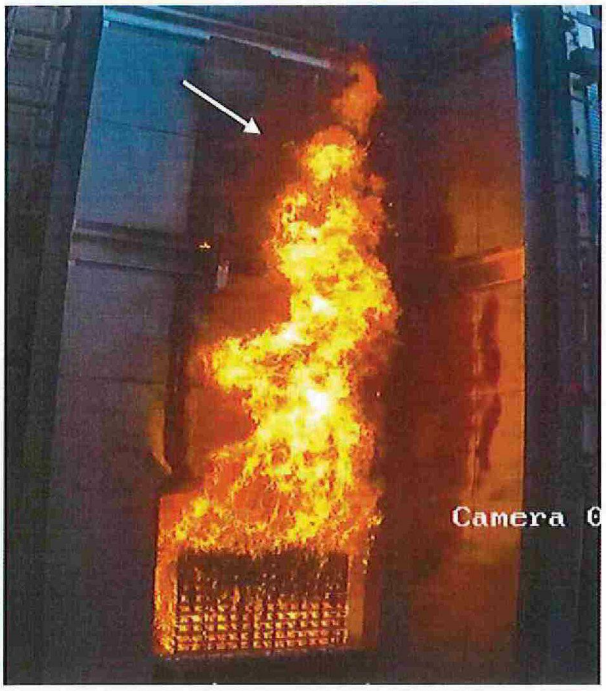
DLP C2881/0006 Self-sustained flames at 'I' beam and panel M15 horizontal joint



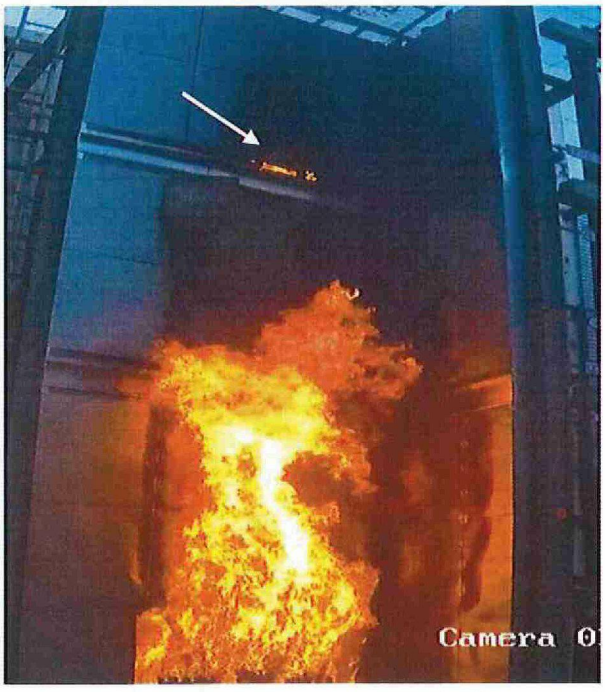
DLP C2881/0007 High intensity flaming debris on the floor.



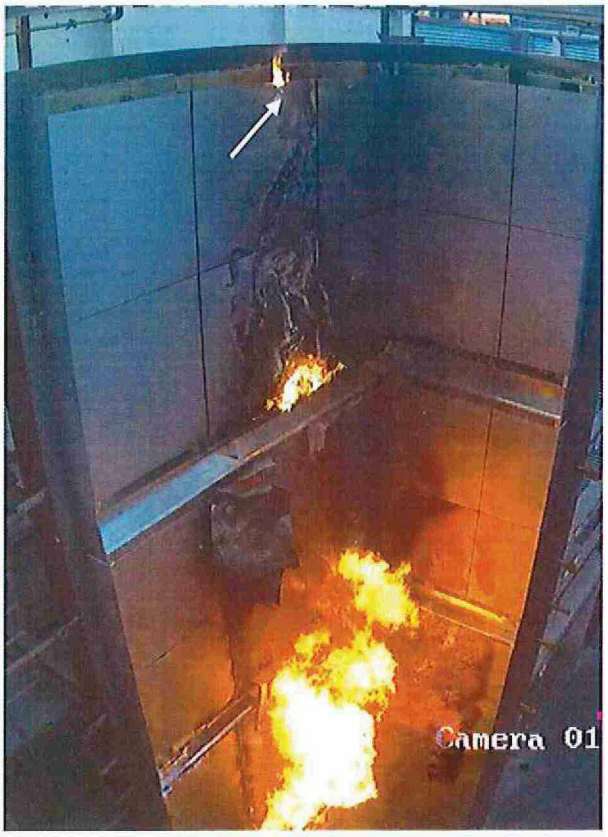
DLP C2881/0008 Aluminium debris of panel M15 fell off



DLP C2881/0009 Railings behind panels M12 and M15 melted

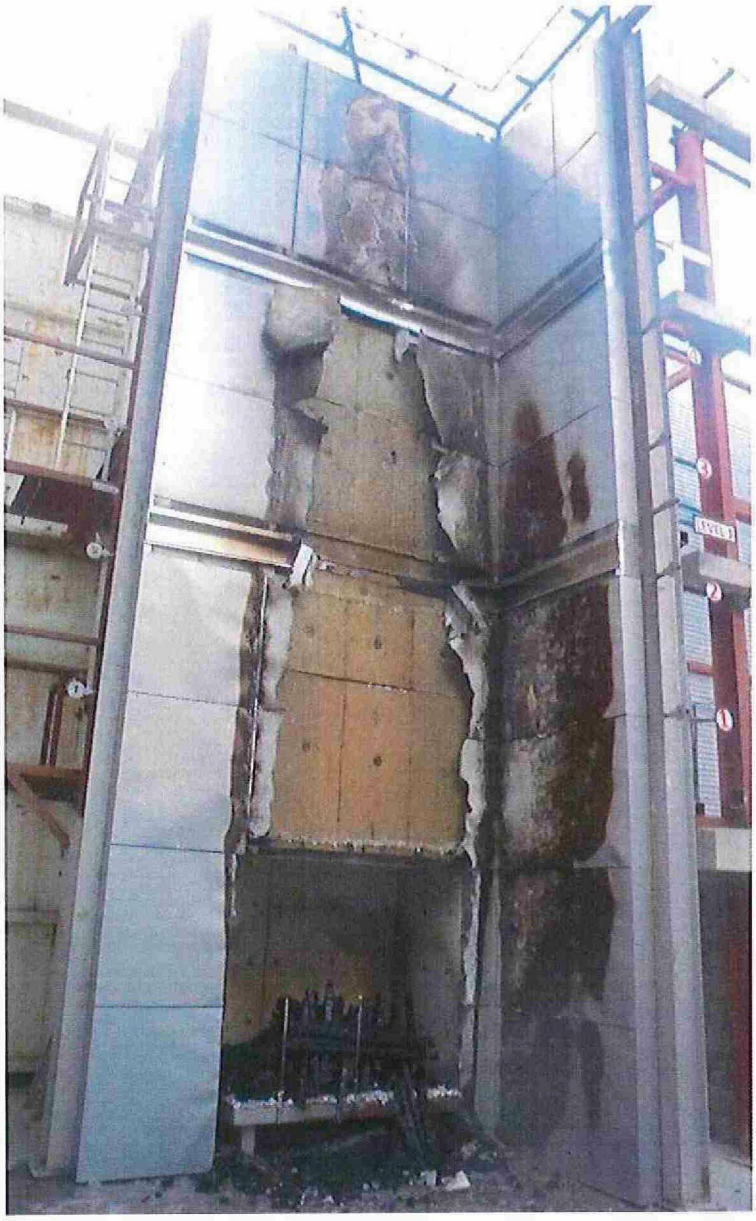


DLP C2881/0010 Self-sustained flames at 'I' beam and panel M18 horizontal joint.



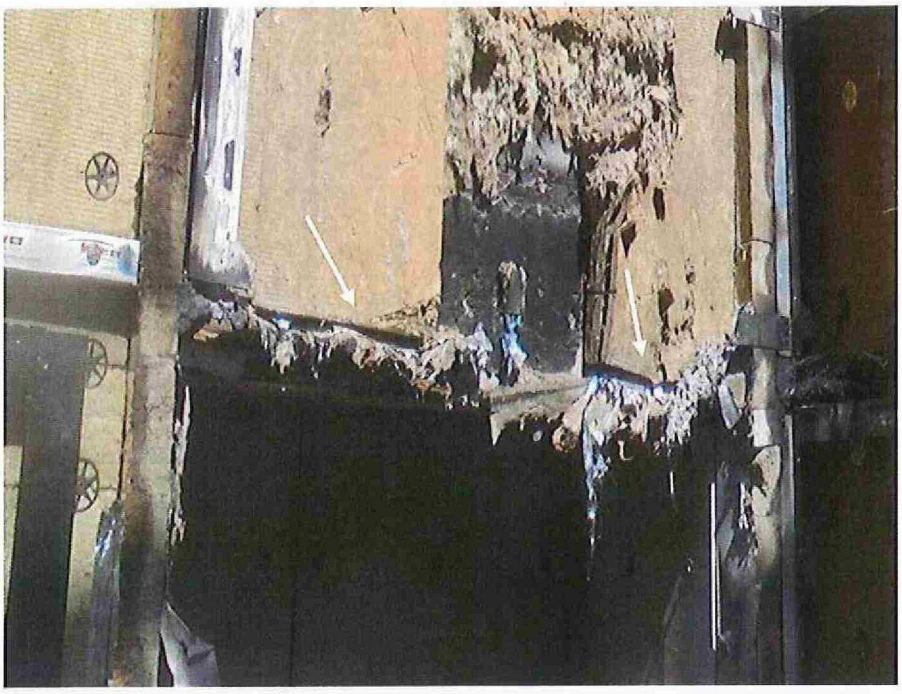
DLP C2881/0011 Flame reached above the test apparatus

Post-Test Phase



DLP C2881/0012 View of the sample after the test

DLP C2881/0013 Fischer cavity barriers, Rockwool Duo Slab insulation and railings

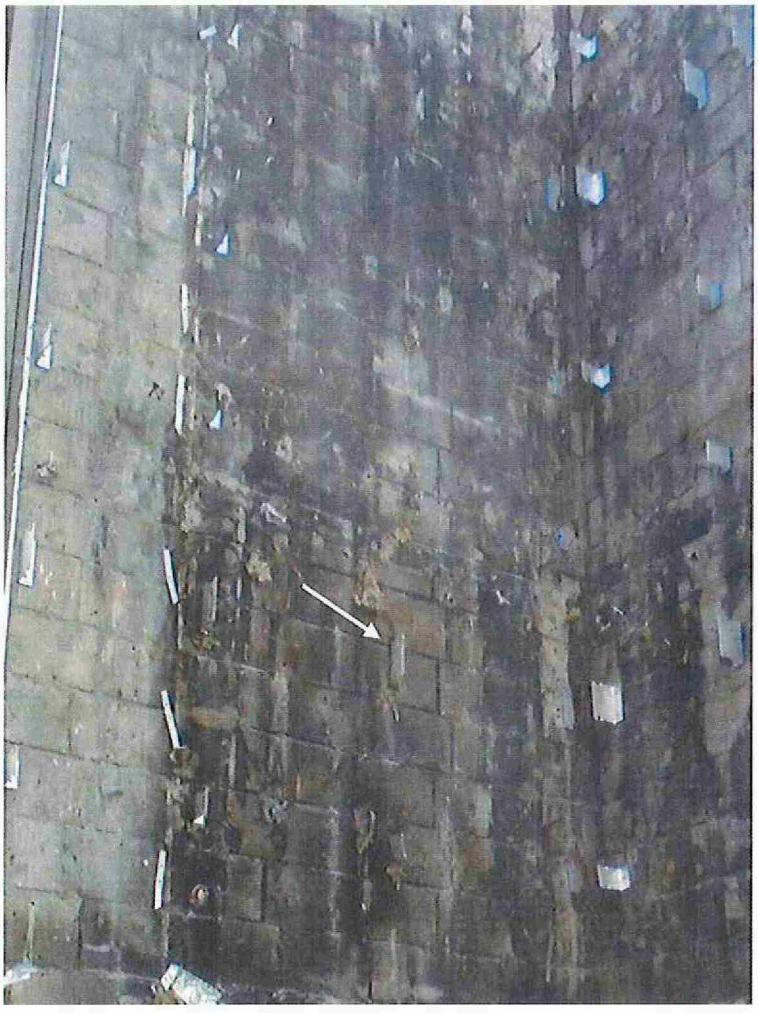


DLP C2881/0014 Fischer horizontal intumescent cavity barrier above the combustion chamber

DLP C2881/0015 'I' beam at level 1

DLP C2881/0016 Fischer vertical cavity barrier, insulation and railings on main wall

DLP C2881/0017 Fischer vertical cavity barrier, insulation and railings on wing wall



DLP C2881/0018 Helping Hand brackets

Appendix B

Drawings

The following ten un-paginated sheets are copies of NDM (Metal Roofing & Cladding) Ltd drawings numbered:

- ndm_LV_RIG_D001 Rev. C1
- ndm_LV_RIG_D002 Rev. C1
- ndm_LV_RIG_D003 Rev. C1
- ndm_LV_RIG_D004 Rev. C1
- ndm_LV_RIG_D005 Rev. C1
- ndm_LV_RIG_D006 Rev. C1
- ndm_LV_RIG_D007 Rev. C1
- ndm_LV_RIG_D008 Rev. C1
- ndm_LV_RIG_D009 Rev. C1
- ndm_LV_RIG_D010 Rev. C1

SIDE ELEVATION

FRONT ELEVATION

PLAN VIEW OF RIG STRUCTURE

NOTES -

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Approval Note

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REVISIONS

Rev. C1 (27.04.18) - Issued for Construction

ndm
metal roofing and cladding ltd
29 Clarence Street, 1st & 2nd Floor,
Staines-Upon-Thames, Surrey, TW18 4SY
Tel: 020 8961 7310 Fax: 020 8961 7311
Web: www.ndmltd.com
Email: enquiries@ndmltd.com

Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 1
Visual indication of completed rig

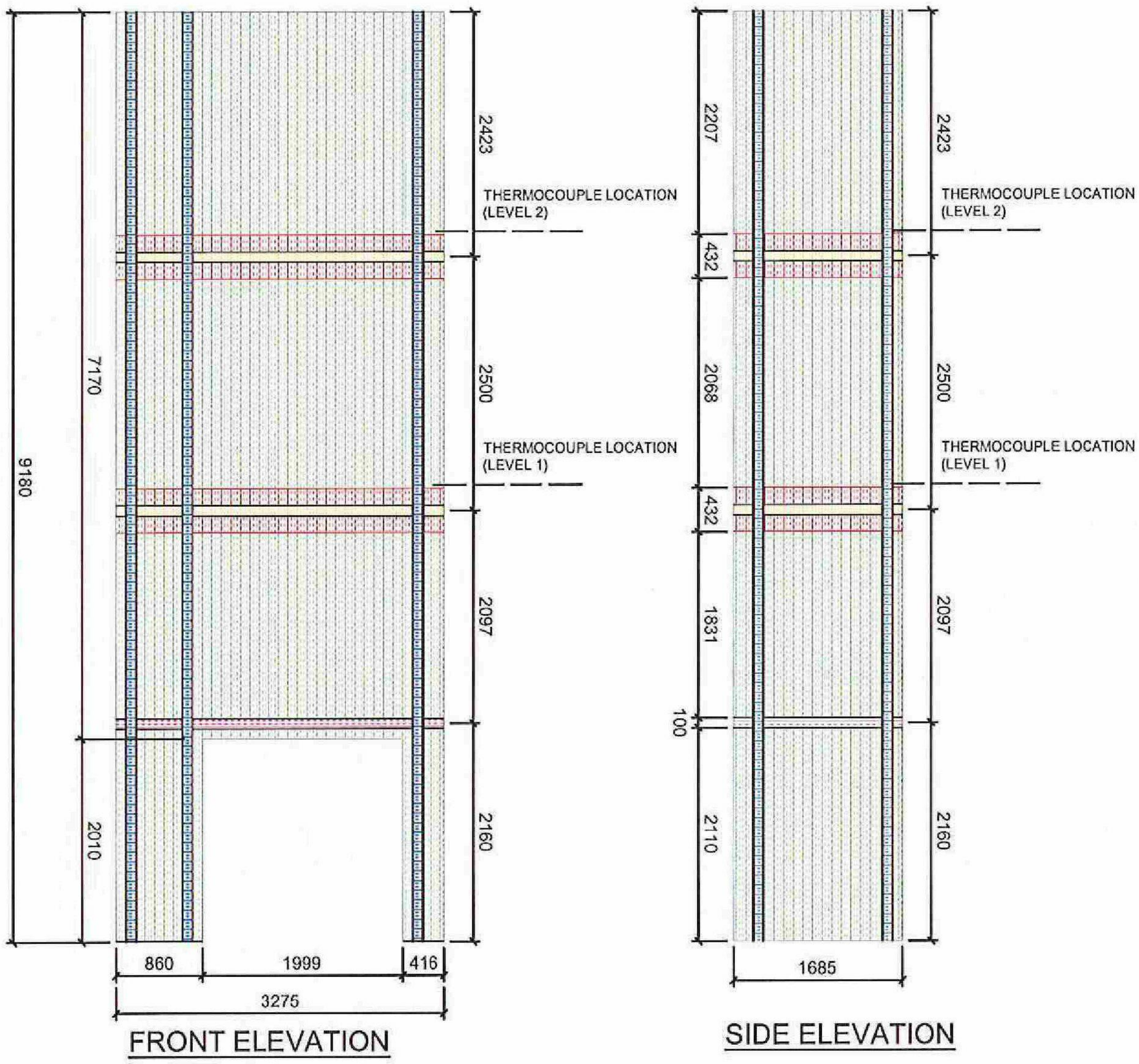
Drawing Status.
CONSTRUCTION

Drawing No.	Rev
ndm_LV_RIG_D001	C1

Scale	Date
1:50 @ A3	27/04/18

Drawn	Checked by
CP	SS

AP/39 [ ] [ ]



Key to coloured areas

- Green Hatch; 100mm thk Rockwool Duo Slab
- Red Hatch; 75mm thkRockwool DuoSlab insulation - behind 'I' beam detail where cavity is reduced
- Blue Hatch; 200mm thk vertical Fischer cavity barrier; closes to back of panel
- Yellow Hatch; Horizontal Intumescent Fischer cavity barrier; to suit 100mm cavity behind 'I' Beam
- Magenta Hatch; Horizontal Intumescent Fischer cavity barrier; to suit 200mm cavity behind A2 panel

Al-Futtaim Exova
Facade Testing & Advisory Services Division

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Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 2 Rockwool Insulation & Fischer firebreak layouts

Drawing Status
CONSTRUCTION

Drawing No.
ndm_LV_RIG_D002

Rev
C1

Scale
1:50 @ A3

Date
27/04/18

Drawn

Checked by

SIDE ELEVATION

FRONT ELEVATION

PLAN VIEW OF RIG STRUCTURE

NOTES -

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Email: enquiries@ndmltd.com

Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 3
Indicative rail layout/position relative to rig blockwork

Drawing Status.
CONSTRUCTION

Drawing No. ndm_LV_RIG_D003 Rev C1

Scale 1:50 @ A3
Date 27/04/18

Drawn OP
Checked by SS

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Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 4
Full sections (horizontal & vertical) and detail reference guide

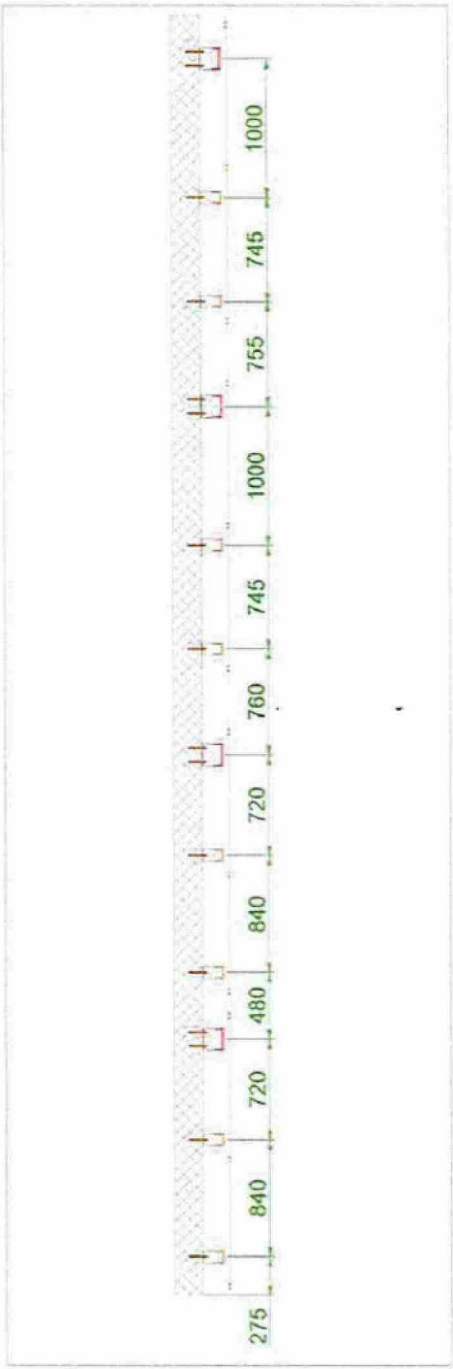
Drawing Status.
CONSTRUCTION

Drawing No. ndm_LV_RIG_D004 Rev C1

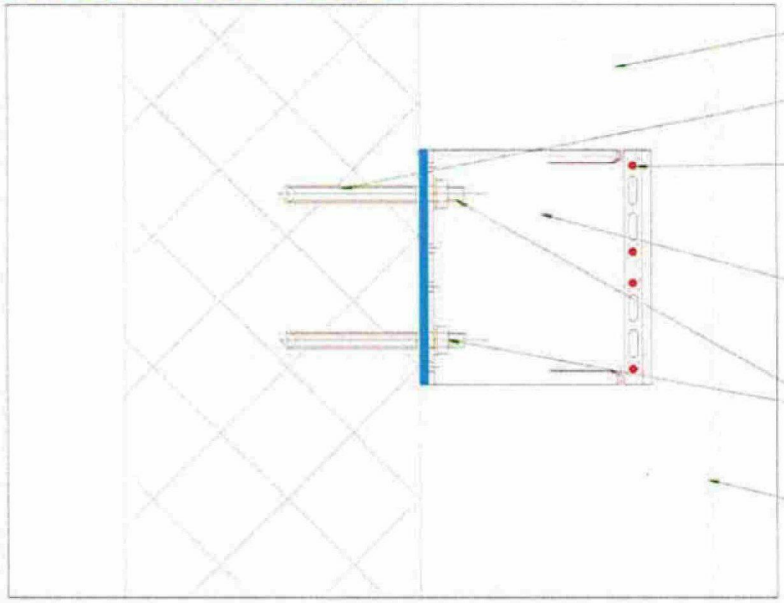
Scale 1:50 @ A3 Date 27/04/18

Drawn Checked by

AP/39 [ ]



Fixed Point Holder Detail



Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk

Fischer thermal isolation pad

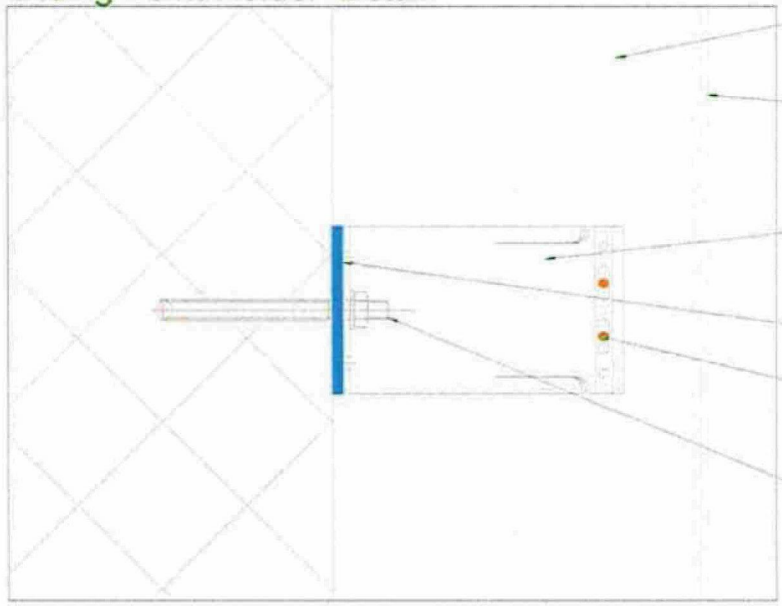
EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw (4 pos'ns, in **HOLES** only)

140 x 150 x 3mm Fischer Wall bracket (fixed-point holder) in mill finish aluminium

Fischer ULTRACUT FBS II Concrete Screw (2 pos'ns)

4mm Thk3A composites Alucobond panel (A2 grade) secured to Fisher vertical rail using Mainline SSAL5/5.0 Aluminium/Stainless steel rivets

Sliding Point Holder Detail



Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk

4mm Thk 3A composites Alucobond panel (A2 grade) secured to Fisher vertical rail using Mainline SSAL5/5.0 Aluminium/Stainless steel rivets

140 x 80 x 3mm Fischer Wall bracket (sliding-point holder) in mill finish aluminium

Fischer thermal isolation pad

EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw (2 pos'ns, in **SLOTS** only)

Fischer ULTRACUT FBS II Concrete Screw (1 pos'n)

Note: Vertical positions of wallholders can be adjusted by a maximum of ±1 block height to ensure fixings are not in grout joint

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Email: enquiries@ndmltd.com

Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 5 Bracket location (relative to rail) and fixing detail (fixed & sliding point holders)

Drawing Status
CONSTRUCTION

Drawing No. ndm_LV_RIG_D005 Rev C1

Scale 1:50 @ A3 Date 27/04/18

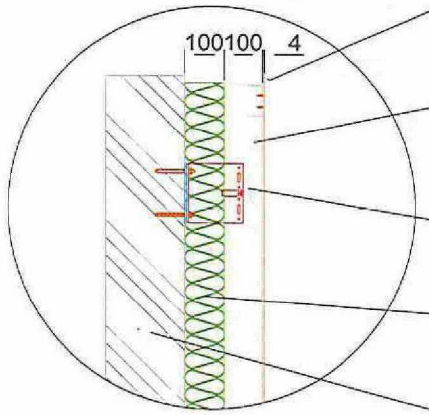
Drawn [redacted] Checked by [redacted]

Al-Futtaim Exova
Façade Testing & Advisory Services Division

KIN0002084743
KIN0002084743

AP/39 [ ]

Detail 1



Fischer horizontal 'C' profile extrusion; mill finish aluminium, 2mm Thk, secured to and spanning between Fischer 'T' profile extrusion using 4 no 4.0 x 10 Stainless/Stainless countersunk rivets per length.

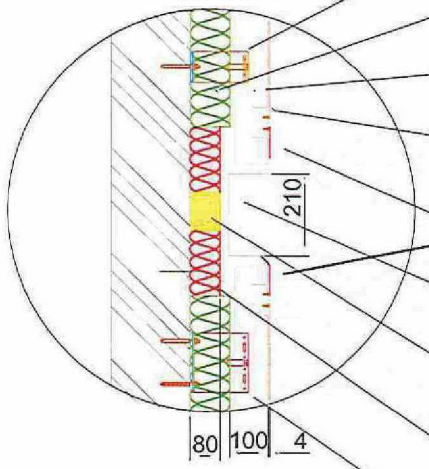
Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand wall bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

140 x 150 x 3mm Fischer helping hand wall bracket (fixed-point holder) in mill finish aluminium. Secured to rig blockwork using 2no Fischer ULTRACUT FBS II Concrete Screw

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

Indicative rig Blockwork

Detail 2



140 x 80 x 3mm Fischer helping hand wall bracket (sliding-point holder) in mill finish aluminium. Secured to rig blockwork using 1no Fischer ULTRACUT FBS II Concrete Screw

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

Fischer horizontal 'C' profile extrusion; mill finish aluminium, 2mm Thk, secured to and spanning between Fischer 'T' profile extrusion using 4 no 4.0 x 10 Stainless/Stainless countersunk rivets.

1mm Thk perforated zinc insect mesh for facade ventilation

Proprietary decorative 'I' beam feature detail in Mill finish aluminium; secured to Fischer extrusions above/below using 5.0x12x14mm Flange AL/SS rivets.

80mm Thk Fischer intumescent cavity barrier (VentiStop FFB-VS) to suit 100mm cavity (local only to behind decorative 'I' beam feature detail. Secured to blockwork using 2 x DHM 100 A2 stainless steel fixing per metre.

80mm Thk Rockwool Duoslab insulation. Secured to blockwork using 2 x DHM 100 A2 stainless steel fixing per metre

140 x 150 x 3mm Fischer helping hand wall bracket (fixed-point holder) in mill finish aluminium. Secured to rig blockwork using 2no Fischer ULTRACUT FBS II Concrete Screw

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Email: enquiries@ndmltd.com

Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 6
Enlarged details; page 1 of 4

Drawing Status.
CONSTRUCTION

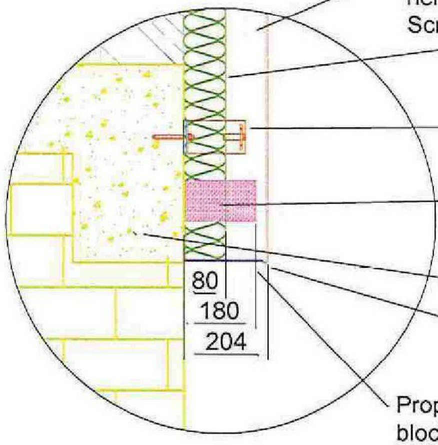
Drawing No. ndm_LV_RIG_D006 Rev C1

Scale 1:50 @ A3 Date 27/04/18

Drawn Checked by

Al-Futtaim Exova
Facade Testing & Advisory Services Division

Detail 3



Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand wall bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

140 x 80 x 3mm Fischer helping hand wall bracket (sliding-point holder) in mill finish aluminium. Secured to rig blockwork using 1no Fischer ULTRACUT FBS II Concrete Screw

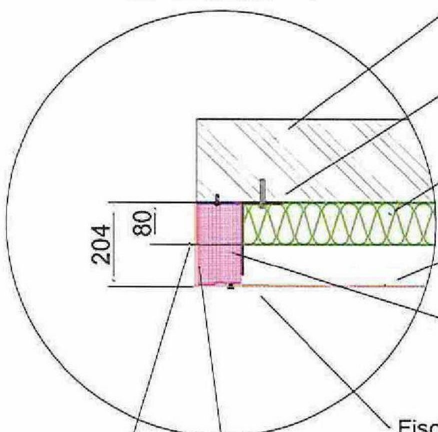
180mm Thk Fischer intumescent cavity barrier (VentiStop FFB-VS) to suit 200mm cavity. Secured to blockwork using 2 x DHM 100 A2 stainless steel fixing per metre

Indicative concrete lintel at head of burn crib

horizontal closure in 4mm Thk A2 grade Alucobond, formed as integral panel return/ pre-formed external corner, secured to support angle using 5.0x12x14mm Flange AL/SS rivets.

Proprietary support angle; 3mm Thk mill finish aluminum, once bent and secured to rig blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

Detail 4



Indicative rig Blockwork

140 x 80 x 3mm (sliding-point holder) OR 140 x 150 x 3mm (fixed-point holder) Fischer helping hand wall bracket (dependant on vertical location) in mill finish aluminium. Secured to rig blockwork using 2no (FPH) or 1 no (SPH) Fischer ULTRACUT FBS II Concrete Screw

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

4mm Thk A2 Grade Alucobond composite material by 3A composites. Perimeter fixed to rails behind using 5.0x12x14mm Flange AL/SS rivets.

Fischer FCFcl 100 vertical fire barrier (under 10% compression) to suit 200mm cavity, installed to Fischer Multi-Purpose Bracket, secured to blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

Proprietary support angle; 3mm Thk mill finish aluminum, once bent and secured to rig blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

Vertical closure at edge of rig in 4mm Thk A2 grade Alucobond, formed as integral panel return/ pre-formed external corner, secured to support angle using 5.0x12x14mm Flange AL/SS rivets.

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ndm
metal roofing and cladding ltd
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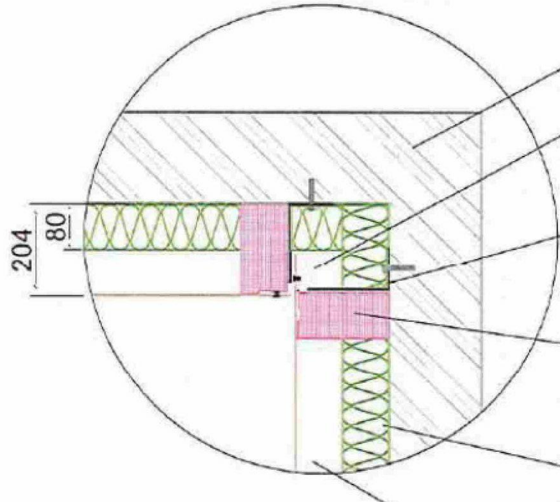
Project	Little Venice Towers Wates Construction
Drawing Title	NDM - Little Venice - Test Rig Drawing 7 Enlarged details; page 2 of 4
Drawing Status	CONSTRUCTION
Drawing No.	ndm_LV_RIG_D007
Rev	C1
Scale	1:50 @ A3
Date	27/04/18
Drawn	
Checked by	

Detail 5



Indicative rig Blockwork

Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand wall bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

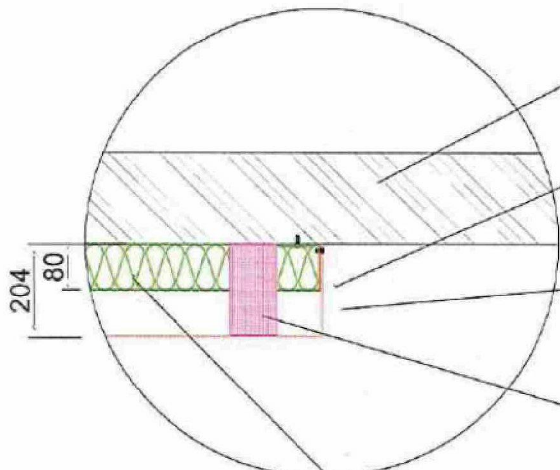
140 x 80 x 3mm (sliding-point holder) OR 140 x 150 x 3mm (fixed-point holder) Fischer helping hand wall bracket (dependant on vertical location) in mill finish aluminium. Secured to rig blockwork using 2no (FPH) or 1 no (SPH) Fischer ULTRACUT FBS II Concrete Screw

Fischer FCFcl 100 vertical fire barrier (under 10% compression) installed to Fischer Multi-Purpose Bracket, secured to blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

4mm Thk A2 Grade Alucobond composite material by 3A composites.
Perimeter fixed to rails behind using 5.0x12x14mm Flange AL/SS rivets.

Detail 6



Indicative rig Blockwork

Proprietary support angle; 3mm Thk mill finish aluminum, once bent and secured to rig blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

Vertical closure to jamb of burn crib in 4mm Thk A2 grade Alucobond, formed as integral panel return/ pre-formed external corner, secured to support angle using 5.0x12x14mm Flange AL/SS rivets.

Fischer FCFcl 100 vertical fire barrier (under 10% compression) installed to Fischer Multi-Purpose Bracket, secured to blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

NOTES -

This drawing is solely intended to illustrate the correct application of Proteus Industrial Technologies Ltd's products and systems. All other elements bearing reference to structural and/or thermal design within the detail are shown indicatively and should not be used in whole or part for any aspect of project design without consulting the relevant authorities.

For refurbishment projects, all aspects of the existing roof are deemed to be fully compliant with BS6229 : 2003 (Code of practice for flat roofs with continuously supported coverings) or improved upon for instances where these standards are not met.

1. Drawings must be read and fully understood before work commences. If in doubt please ask.

2. This drawing must be read in conjunction with all relevant Architect's and Engineers's drawings.

Approval Note

The Building Designer is responsible for providing correct dimensional and loading information along with any relevant and necessary information.

All dimensions and details to be approved by the Building Designer. Please ensure that our design details are correct interpretations of your requirements and are also compatible with the supporting superstructure. Please pay close attention is to the building dimensions (comparing this to both your own drawings and to the building being constructed).

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REVISIONS

Rev. C1 (27.04.18) - Issued for Construction

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metal roofing and cladding ltd

Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 8
Enlarged details; page 3 of 4

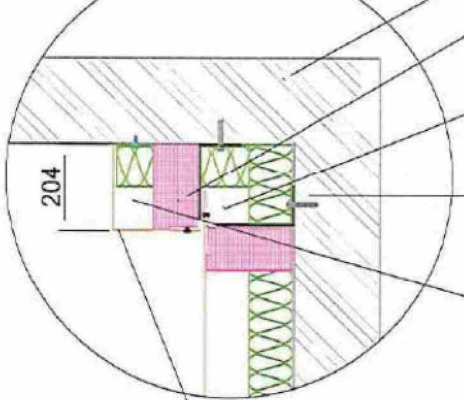
Drawing Status.
CONSTRUCTION

Drawing No. ndm_LV_RIG_D008 Rev C1

Scale 1:50 @ A3
Date 27/04/18

Drawn [redacted]
Checked by [redacted]

Detail 7



Indicative rig Blockwork

Fischer FCFcl 100 vertical fire barrier (under 10% compression) installed to Fischer Multi-Purpose Bracket, secured to blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

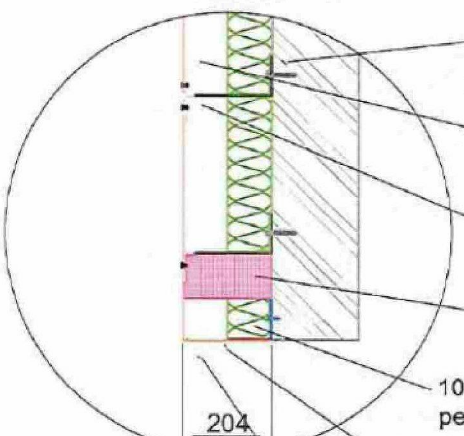
Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

140 x 80 x 3mm (sliding-point holder) OR 140 x 150 x 3mm (fixed-point holder) Fischer helping hand wall bracket (dependant on vertical location) in mill finish aluminium. Secured to rig blockwork using 2no (FPH) or 1 no (SPH) Fischer ULTRACUT FBS II Concrete Screw

Proprietary support angle; 3mm Thk mill finish aluminum, once bent and secured to rig blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

Vertical closure to jamb of burn crib in 4mm Thk A2 grade Alucobond, formed as integral panel return/ pre-formed external corner, secured to support angle using 5.0x12x14mm Flange AL/SS rivets.

Detail 8



140 x 80 x 3mm (sliding-point holder) OR 140 x 150 x 3mm (fixed-point holder) Fischer helping hand wall bracket (dependant on vertical location) in mill finish aluminium. Secured to rig blockwork using 2no (FPH) or 1 no (SPH) Fischer ULTRACUT FBS II Concrete Screw

4mm Thk A2 Grade Alucobond composite material by 3A composites. Perimeter fixed to rails behind using 5.0x12x14mm Flange AL/SS rivets.

Fischer vertical 'T' profile extrusion; mill finish aluminium, 2mm Thk, secured to Fischer helping hand bracket using EJOT Super-SAPHIR Self-Drilling JT4-4 Ø4.8mm Tec Screw

Fischer FCFcl 100 vertical fire barrier (under 10% compression) installed to Fischer Multi-Purpose Bracket, secured to blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

100mm Thk Rockwool Duoslab insulation. Secured to blockwork using DHK 100 plastic perimeter fixings & 1 x DHM 100 A2 stainless steel fixing per insulation board

Proprietary support angle; 3mm Thk mill finish aluminum, once bent and secured to rig blockwork using Fischer ULTRACUT FBS II Concrete Screws at 600mm ccs

Vertical closure at edge of rig in 4mm Thk A2 grade Alucobond, formed as integral panel return/ pre-formed external corner, secured to support angle using 5.0x12x14mm Flange AL/SS rivets.

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REVISIONS

Rev. C1 (27.04.18) - Issued for Construction

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Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 9
Enlarged details; page 4 of 4

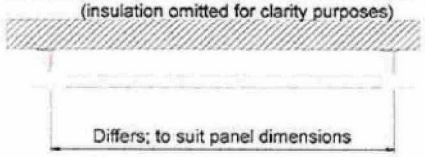
Drawing Status.
CONSTRUCTION

Drawing No. ndm_LV_RIG_D009 | Rev C1

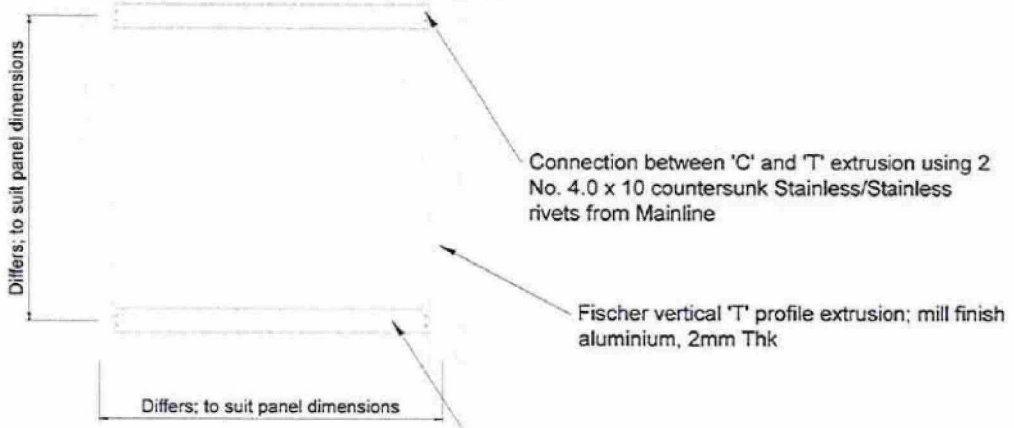
Scale 1:50 @ A3 | Date 27/04/18

Drawn [redacted] | Checked by [redacted]

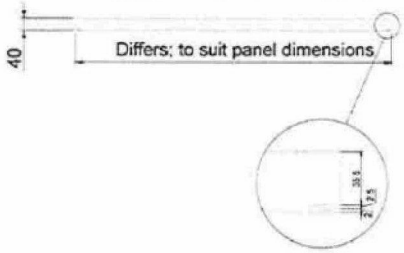
Plan of Vertical 'T' extrusion and Horizontal 'C' extrusion connection
(insulation omitted for clarity purposes)



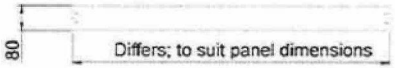
Vertical 'T' extrusion and Horizontal 'C' extrusion connection in elevation
(all other system elements omitted for clarity purposes)



Plan view of horizontal 'C' extrusion



Elevation of horizontal 'C' extrusion



'C' to 'T' extrusion; exploded isometric view

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Project
Little Venice Towers
Wates Construction

Drawing Title
NDM - Little Venice - Test Rig Drawing 10
Enlarged detail of vertical and horizontal connection

Drawing Status
CONSTRUCTION

Drawing No.	Rev
ndm_LV_RIG_D010	C1

Scale	Date
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[redacted]	[redacted]

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Table 5 Document Status

Rev No.	Author	Reviewed & Approved for Issue		
		Name	Signature	Date
0	[redacted]	Lab. Manager	[redacted]	11/12/2018