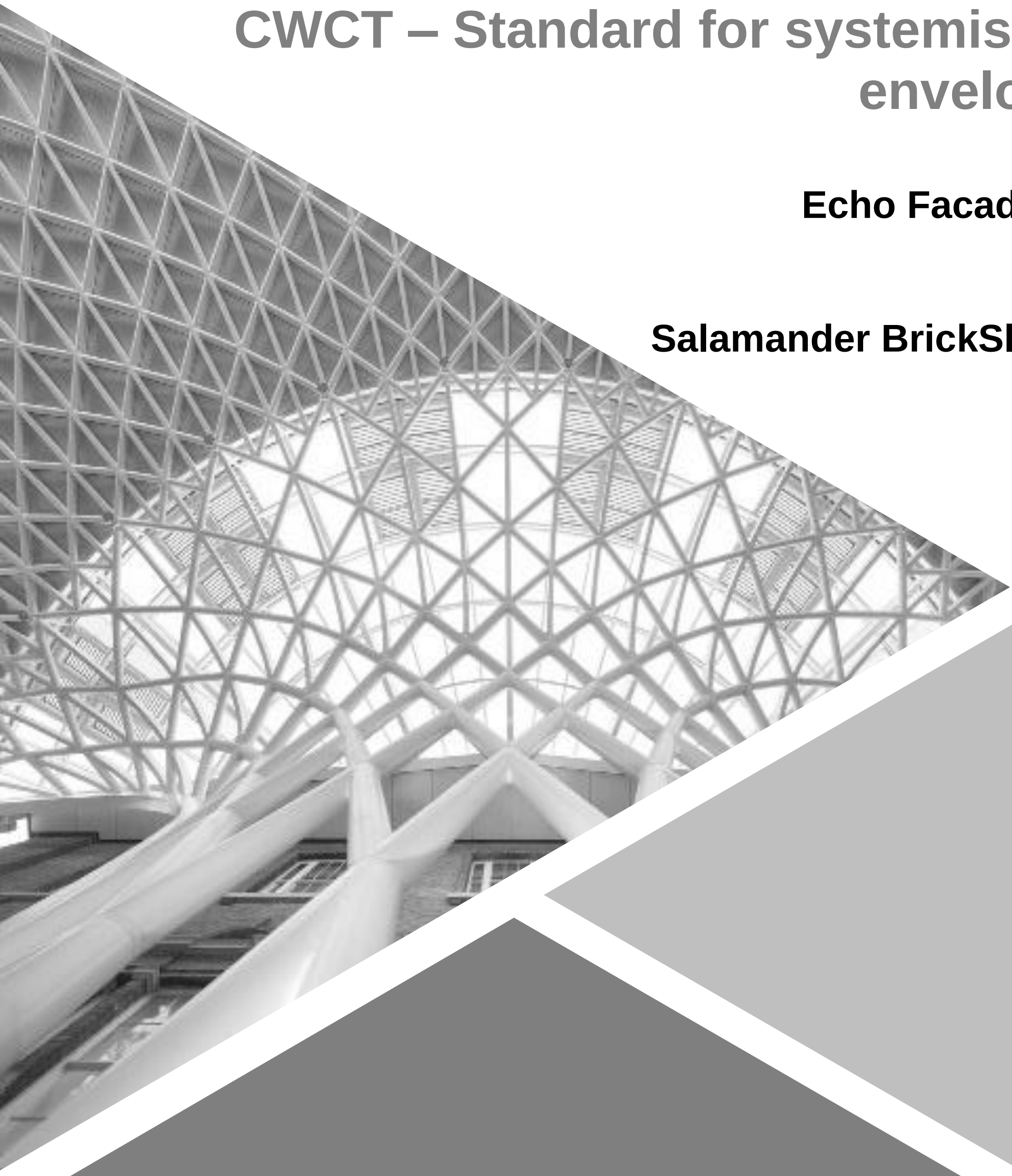
Technical Report – R4790609825 Rev 1 CWCT – Standard for systemised building envelopes – 2005

Echo Facades Engineering Solutions Ltd

Salamander BrickSlip System Test



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Contents

Rev 1 (Revised Report) – this report has been amended as shown in Section 10 and it replaces previous report No. R4790609825 dated 24th June 2024.

1. Introduction

This report describes tests carried in order to determine the weather tightness of the sample with respect to water penetration, wind and impact resistance on sample supplied as follow:

Test Details	
Customer:	Echo Facades Engineering Solutions Ltd Unit 10 Churchill House 114 Windmill Road Brentford TW8 9NB
Product Tested	Salamander BrickSlip System Test
Date of Test:	19th, 22nd and 29th April 2024 3rd, 8th, 9th and 13th May 2024
Test Conducted at:	UL International (UK) Limited Halesfield 2 Telford Shropshire TF7 4QH
Test Conducted by:	P Seymour *Laboratory Technician* J Dove *Senior Laboratory Assistant* C Niven *Laboratory Assistant* D Price *Senior Engineering Associate* K Alden *Senior Engineering Technician*
Test Supervised by:	M Witkowska *Laboratory Manager* [signature]
Test Witnessed by:	S Hough Black Wolf Façade Consultants

Report Authorisation	
Report Compiled by:	R Cooper *Project Handler* [signature]
Authorised by:	M Wass *Business Manager* [signature]

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2. Summary of Results

2.1 The test methods

The performance of the sample tested has been assessed against the criteria described in below standards.

CWCT Standard Test Methods for Building Envelopes - December 2005	
Air Leakage (Infiltration & Exfiltration)	CWCT Section 5
Water Penetration – Static	CWCT Section 6
Water Penetration – Dynamic Aero Engine	CWCT Section 7
Water Penetration – Hose	CWCT Section 9
Wind Resistance – Serviceability	CWCT Section 11
Wind Resistance – Safety	CWCT Section 12
Impact – Retention to Performance & Safety to Persons	CWCT TN 76

2.2 Decision Rule

Classifications reported in Section 5 indicate that the product conforms with the relevant accuracy requirements of the testing standards (as summarised below) and the expanded measurement uncertainty (k = 2 for approximately 95% coverage probability) is no greater in magnitude than the accuracy requirements defined in Section 2 of CWCT Standard Test methods for Building Envelopes. If the measured value is on the limit, the result is defined as a pass. This means that the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8: 2019.

2.3 Measurement Uncertainty

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%, and for the air leakage measurements and wind resistance measurements is +/- 2.08 %, for the mass of the dislodge fragments is +/- 0.02 % and for the size of the dislodge fragments is +/- 0.06 %.

2.4 Summary of Results

The following summarises the results of testing carried out, in accordance with the relevant testing and classification standards.

Test Type	Peak Test Pressure	Result	Classification
Test 1 - Air Leakage - Infiltration	600 Pa	Pass	A4
Test 2 - Air Leakage - Exfiltration	100 Pa	N/A	N/A
Test 3 - Water Penetration (Static Pressure)	600 Pa	Pass	R7
Test 4 - Wind Resistance - Serviceability - Backing Wall	2400 Pa	Pass	-
Test 5 - Repeat Air Leakage - Infiltration	600 Pa	Pass	A4
Test 6 - Repeat Air Leakage - Exfiltration	100 Pa	N/A	N/A
Test 7 - Repeat Water Penetration (Static Pressure)	600 Pa	Pass	R7
Test 8 - Water Penetration - Dynamic Aero Engine	600 Pa	Pass	-
Test 9 - Water Penetration - Hose	-	Pass	-
Test 10 - Wind Resistance - Serviceability - Cavity	2400 Pa	Pass	-
Test 11 - Wind Resistance - Safety - Backing Wall	3600 Pa	Pass	-
Test 12 - Wind Resistance - Safety - Cavity	3600 Pa	Pass	-
Test 13 - Impact Resistance - Retention of Performance	Cat B	Class 2	-
Test 14 - Impact Resistance - Safety to Persons	Cat B	Negligible Risk	-
Dismantle, Inspect & Report	Pass		

More comprehensive details are reported in Section 6.

Note: The top window pod interface detail was excluded from the above test sequence due to it being the same detail as installed on the bottom half of the sample as per the requirements of Echo Facades Engineering Solutions and detailed on the system drawings in Section 7.

These results are valid only for the conditions under which the test was conducted.

All measurement devices, instruments and other relevant equipment were calibrated and traceable to National Standards.

3. Description of Test Sample

The description of the test sample in this section has been supplied by Echo Facades Engineering Solutions Ltd and has not been verified by UL International (UK) Limited.

See Section 7 for test sample drawings as supplied by Echo Facades Engineering Solutions Ltd

Product Description

Full product name:	Salamander BrickSlip
Product type:	BrickSlip Façade system
Product description:	BrickSlips Push fit into the Salamander Profile (1-7 rows)
Manufactured by:	Echo Facades Engineering Solutions Ltd.

Support Framing and brackety

Material:	Nvelope NV1 (helping hand support system)
Finish:	Aluminium
Vertical rail Ref:	02/T60-100-2.2-3000 & 02/L60-40-2.2-3000
Fixing method (rail to backing wall):	Nvelope Standard Fixings
Fixing Ref:	04/SX3/28-S16-6.0X48
Fixing method (rail to rail):	Nvelope Standard Fixings
Fixing Ref:	04/SDA5/5.5X22
Max Span between vertical rails:	600mm
Brackets ref:	01/VB150S & 01/VB150D-6.5
Construction tolerance allowed between fixings, rails and brackets (+/-)	2-5 mm

Panels/tiles/brickslip

Material:	Brickslip Façade System
Material ref (source, spec):	Echo Facades Engineering Solutions Ltd.
Finish:	Pointing Mortar - Parex Historic KL Clay brick slips - Salamander Brickslip Metal sheet / Profile Salamander Profile (metal rails comprising S220GD+ZM310 hot dip zinc-magnesium coating to BS EN 10346) / Stainless Steel (Grades 304/316) Salamander M-Linear Profile (Galvanized metal rails)
Thickness:	Salamander Profile – 0.7mm Salamander Profile – 0.7mm BrickSlips – 20mm
Fixing method:	Metal sheet / Profile - Mechanically fixed to sub frame with Screws BrickSlips - Mechanically push fit into the Salamander Profile
Screws/fixings ref:	Rawlplug OCS-55070, OCS-55038S16 R-CWT-48038, R-LP-55025-A2 Rawlplug R-LP-55038 (with / without Washer)

Interface Details (curtain wall to window/door inserts)

Window interface detail:	The window was fixed back to the SFS using metal straps. Arbo Membrane was installed using Arbo adhesive to the exposed edge around the perimeter of the window to seal it to the sheathing board.

Backing Wall

Structural support type:	LGSF Wall
Insulation type:	Insulation not used for the Test
Insulation thickness:	N/A
Airtight membrane:	Arbo tape & Breather membrane TYVEK Fire Curb House wrap (DuPont)
Watertight membrane:	Arbo tape & Breather membrane TYVEK Fire Curb House wrap (DuPont)
Particle board detail:	EcoBoard - Fibrecement Board
Sealants and tapes:	Soudal FR, Arbosil 1090, Arbo tape
Fixings ref:	EJOT: HS 5.5 X 38 R-CWT-55050-LG
Construction tolerance allowed between SFS (+/-)	5-10mm

Additional brackets & Fixings

Ref:	Perimeter flashings to close the cavity (test purposes only)

Drawings

Drawing/s must be provides covering the below; -Full drawing of sample including front elevation -Cross Sections (Panels/Rails Etc.) -Hardware Locations -Fixings -Drainage Points Note: drawings are required to show all relevant dimensions.	As detailed in Section 7
Test sample size:	5000mm (wide) x 8300mm (high)

Confirmation

Customer is to confirm that the samples provided for testing are representative of standard production. Please note: the details given above, as well as the drawings supplied by the customer as confirmed as typical of normal production are not verified by UL International (UK) Limited.	
Company:	Echo Facades Engineering Solutions Ltd.
Name:	Cadem Rubie
Position:	Business Development Director
Date:	27-May-2024

Sample during testing

Photograph No. 1 – Dynamic Fan Test

Photograph No. 2 – Hose Fan Test

4. Test Arrangement

4.1 Test Chamber

A specimen, supplied for testing in accordance with CWCT requirements, was mounted on to a rigid test chamber constructed from steel, timber and plywood sheeting.

The pressure within the chamber was controlled by means of a centrifugal fan and a system of ducting and valves. The static pressure difference between the outside and inside of the chamber was measured by means of a differential pressure transmitter.

4.2 Instrumentation

4.2.1 Static Pressure

A differential pressure transmitter capable of measuring rapid changes in pressure to an accuracy within 2%, was used to measure the pressure differential across the sample.

4.2.2 Air Flow

A laminar flow element, mounted in the air system ducting, was used along with differential pressure transducers to measure the airflow required to obtain pressures within the test chamber and has the capability of measuring airflow through the sample to an accuracy within 2%.

4.2.3 Water Flow

An in-line flowmeter, mounted in the spray frame water supply system, was used to measure water flow to the test sample to an accuracy of ± 5%.

4.2.4 Deflection

Digital linear measurement devices with an accuracy of +/- 0.1 mm were used to measure deflection of principle framing members.

4.2.5 Temperature & Humidity

A digital data logger capable of measuring temperature with an accuracy of ± 1°C and humidity with an accuracy of ± 5 %Rh was used.

4.2.6 Barometric Pressure

A digital barometer capable of measuring barometric pressure with an accuracy of ± 1 kPa was used.

4.2.7 General

Electronic instrument measurements were scanned by a computer-controlled data logger, which processed and recorded the results.

4.3 Pressure Generation

4.3.1 Static Air Pressure

The air supply system comprised of a centrifugal fan assembly and associated ducting and control valves and was used to create both positive and negative static pressure differentials. The fan provided a constant airflow at the required pressure and period required for the tests.

Note: *References are made to both positive and negative pressures in this document, it should be noted that in these instances, positive pressure is when pressure on the weather face of the sample is greater than that on the inside face and vice versa.*

4.3.2 Dynamic Aero Engine

A wind generator was mounted adjacent to the external face of the test sample and used to create positive pressure differential during dynamic testing.

4.4 Water Spray System

4.4.1 Spray frame arrangement

A water spray system was used which comprised of nozzles spaced on a uniform grid, not more than 700 mm apart and mounted approximately 400 mm from the face of the sample. The nozzles provided a full cone pattern, as per the requirements outlined by CWCT. The system delivered water uniformly to the entire surface of the test sample at a rate of not less than 3.4 lt/m^2/min.

4.4.2 Hose arrangement

The water was applied using a brass nozzle which produced a solid cone of water droplets with a nominal spread of 30˚. The nozzle was provided with a control valve and a pressure gauge between the valve and the nozzle. The water flow to the nozzle was adjusted to produce 22 $\pm$ 2 litre/min when the water pressure at the nozzle inlet was 220 $\pm$ 20kPa

4.5 Impactors

4.5.1 Soft (S1) Body Impactor

A spherical/conical, glass bead filled impactor with a mass of 50 Kg, as required in CWCT TN76

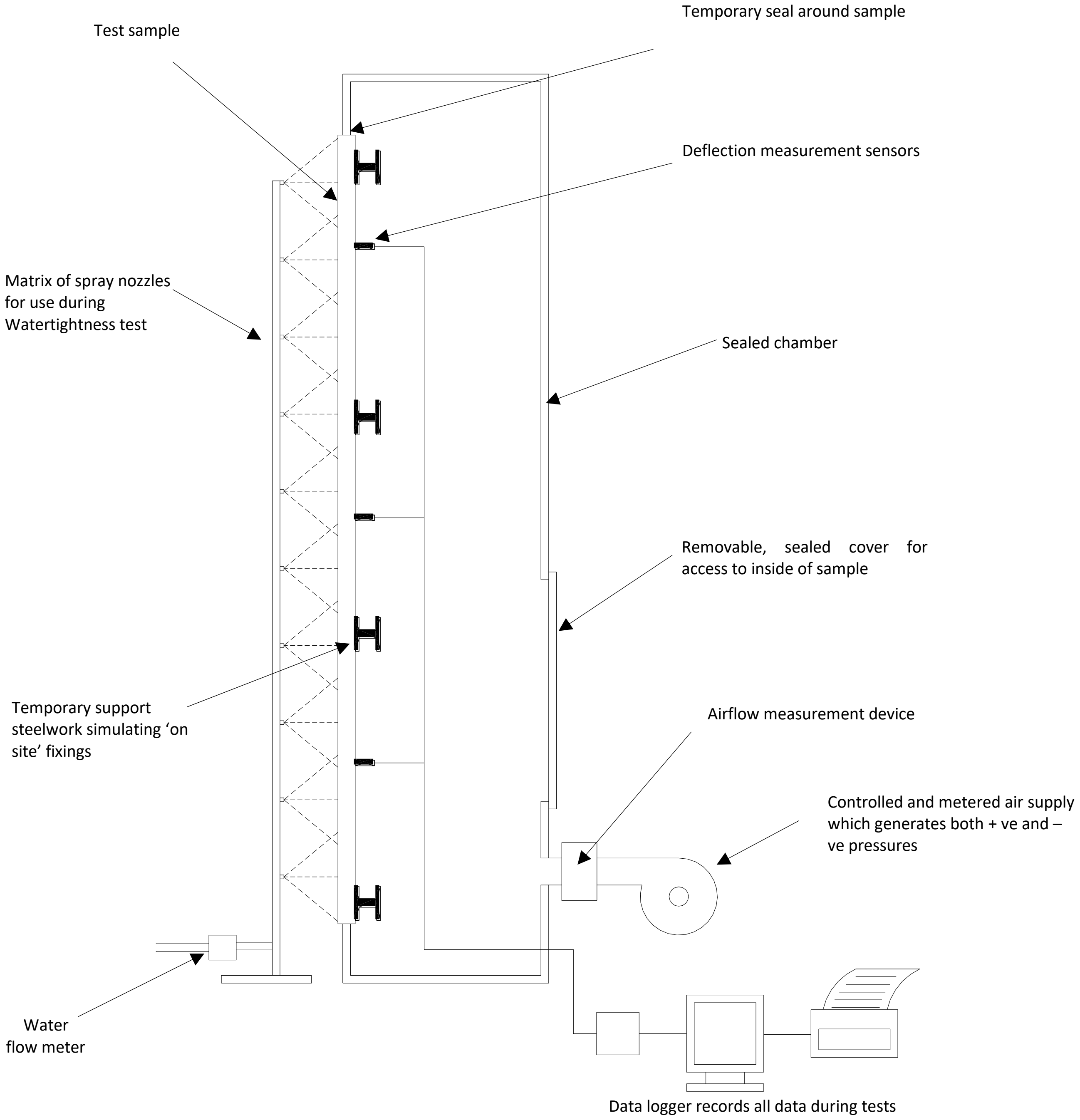
4.5.2 Hard (H2) Body Impactor

A steel ball with a diameter of 62.5 mm and a mass of 1.135 Kg, was released from the height, calculated to result in the required impact energies and allowed to fall under gravity until it impacted the designated test zone of the sample.

All measurement devices, instruments and other relevant equipment were calibrated and are traceable to National Standards.

Figure 1 – Test arrangement

General Arrangement of a Typical Test Assembly



5. Test Procedures

5.1 Sequence of Testing

Test 1 - Air Leakage - Infiltration
Test 2 - Air Leakage - Exfiltration
Test 3 - Water Penetration (Static Pressure)
Test 4 - Wind Resistance - Serviceability - Backing Wall
Test 5 - Repeat Air Leakage - Infiltration
Test 6 - Repeat Air Leakage - Exfiltration
Test 7 - Repeat Static Water (Static Pressure)
Test 8 - Water Penetration - Dynamic Aero Engine
Test 9 - Water Penetration - Hose
Test 10 - Wind Resistance - Serviceability - Cavity
Test 11 - Wind Resistance - Safety-Backing Wall
Test 12 - Wind Resistance - Safety - Cavity
Test 13 - Impact Resistance - Retention of Performance
Test 14 - Impact Resistance - Safety to Persons

5.2 Air Permeability – Infiltration

Three (3) preparatory pulses of 1200 Pa (50% of design wind load) positive pressure were applied to the test sample. An airtight seal comprising of plastic sheeting and adhesive tape was then attached to the face of the test sample.

Leakage through the test chamber and joints between the chamber and test sample was determined by measuring the air flow at the following positive pressures; 50, 100, 150, 200, 250, 300, 450 and 600 Pa each step being held for at least 10 seconds.

Although not required by CWCT Section 5, an additional air pressure step of 250 Pa has been added during the air leakage tests to satisfy the requirements of EN 12153:2000.

Test results for the sample were determined by repeating the above sequence with the sample unsealed. The difference between the readings being the air leakage through the sample.

A check for concentrated air leakage was conducted following the above sequence.

5.3 Air Permeability – Exfiltration

Three (3) preparatory pulses of 1200 Pa (50% of design wind load) negative pressure were applied to the test sample. An airtight seal comprising of plastic sheeting and adhesive tape was then attached to the face of the test sample.

Leakage through the test chamber and joints between the chamber and test sample was determined by measuring the air flow at the following positive pressure; 50 and 100 Pa, which was held for at least 10 seconds.

Test results for the sample were determined by repeating the above sequence with the sample unsealed. The difference between the readings being the air leakage through the sample.

5.4 Watertightness – Static Pressure

Three (3) preparatory pulses of 1200 Pa (50% of design wind load) positive pressure were applied to the test sample.

Water was sprayed on to the sample as described in section 4.4.1 for 15 minutes at zero (0) Pa.
The water spray continued, and the pressure was increased in the following positive increments; 50, 100, 150, 200, 300, 450 and 600 Pa, each stage being held for 5 minutes.

The interior face of the sample was continuously monitored for water ingress throughout the test.

5.4.1 Water Penetration – Dynamic Aero Engine

Water was sprayed on to the sample as described in section 4.4.1.

The sample was subjected to airflow from the wind generator, as described in 4.3.2, which achieved average deflections equal to those produced at a static pressure differential of 600 Pa and these conditions were met for the specified 15 minutes.

The interior face of the sample was continuously monitored for water ingress throughout the test.

5.4.2 Water Penetration – Hose

Working from the exterior, the window pod interface detail between the window and SFS backing wall was wetted from the bottom up, progressing from the lowest horizontal joint then the intersecting vertical joints.

Water was applied to the sample for 5 mins per 1.5 m length of joint, as described in section 4.4.2.

Throughout the water penetration testing, and for 30 minutes following the cessation of spraying, the internal face of the sample was examined for water penetration. The emergence of any water on the inside face would be recorded, and the location and extent of any leakage noted on a drawing of the test specimen.

5.5 Wind Resistance

5.5.1 Wind Resistance – Serviceability

Three (3) preparatory pulses of 1200 Pa (50% of design wind load) positive pressure were applied to the test sample. Upon returning to 0 Pa, any opening parts of the test specimen were opened and closed five (5) times, secured in the closed position. All deflection sensors were then zeroed.

The sample was then subjected to positive pressure stages of 600, 1200, 1800 and 2400 Pa (25%, 50%, 75% and 100% of design wind load) and held at each step for 15 seconds (± 5 secs).

The deformation status of the sample was recorded at each step at characteristic points as stated in the standard, following which the pressure was reduced to 0 Pa and any residual deformations recorded within 1 hour of the test.

The above test sequence was then repeated, including preparation pulses, at a negative pressure differential.

Following each of the above tests, the sample was inspected for permanent deformation or damage.

5.5.2 Wind Resistance – Safety

Three preparatory positive air pressure pulses of 1200 Pa (50% of design wind load) positive pressure were applied to the test sample, and the deflection sensors were zeroed.

The sample was subjected to a positive pressure pulse of 3600 Pa (2400 Pa x 150%). The pressure was applied as rapidly as possible but in not less than 1 second and was maintained for 15 seconds (± 5 secs).

Following this pressure pulse and upon returning to zero (0) pressure, residual deformations were recorded and any change in the condition of the specimen was noted.

After the above sequence, a visual inspection was conducted, any moving parts were operated and any damage or functional defects noted.

The above test sequence was then repeated, including preparation pulses, at a negative pressure differential. The deflection sensors were zeroed following the preparation pulses.

Following each of the above tests, the sample was inspected for any permanent deformation or damage.

5.6 Impact Resistance

5.6.1 Impact Test Procedure – Retention of Performance – CWCT TN 76

The test sample was tested using a drop height which corresponded with the required performance level.

The Impactors, as described in section 4.5.1 and 4.5.2 were suspended on a wire/Nylon cord and allowed to swing freely, without initial velocity, in a pendulum motion until they hit the sample normal to its face. Only one impact was performed at any single position during the hard body impacting and three times at each position during the soft body impacting.

Tests were conducted at the required impact energies as shown in section 6.3.1 and 6.3.2 to the selected impact points.

Drop heights were set to an accuracy of ± 10 mm.

5.6.2 Impact Test Procedure – Safety to Persons – CWCT TN 76

The test sample was tested using a drop height which corresponded with the required performance level.

The Impactors, as described in section 4.5.1 and 4.5.2 were suspended on a wire/Nylon cord and allowed to swing freely, without initial velocity, in a pendulum motion until they hit the sample normal to its face. Only one impact was performed at any single position.

Tests were conducted at the required impact energies as shown in section 6.3.3 and 6.3.4 to the selected impact points and the impactors were not allowed to strike the sample more than once.

Drop heights were set to an accuracy of ± 10 mm.

6. Test Results

6.1 Air Leakage

Permissible air infiltration rate as CWCT standard test methods for building envelopes – Section 5:

Fixed Element 1.5 m3/hr/m2

The permissible air infiltration rate at intermediate test pressures was determined as specified by CWCT standard test methods for building envelopes – Section 5.

Air permeability measured at maximum test pressure in the 2nd test should not increase by more than 0.3 $m^3/hr/m^2$ for fixed glazing above those recorded in the 1st test, as required in CWCT standard for systemised building envelopes: section 3 & BS EN 13116: 2001.

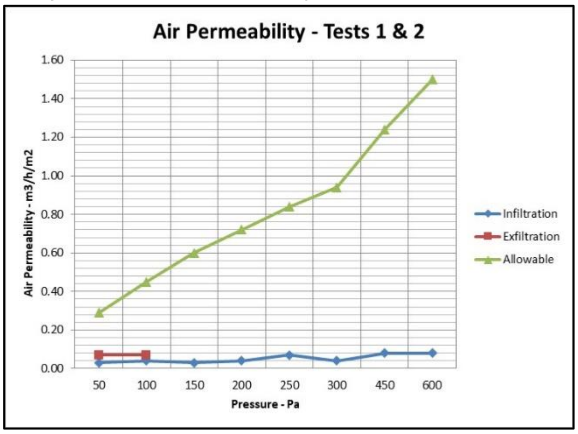
6.2 Air Permeability – Classification

Calculated area of test sample 41.7 m^2

6.2.1 Tests 1 & 2 - Fixed Element

Pressure Differential Pa	Maximum Air Permeability Rate – Infiltration $m^3/hr/m^2$		Maximum Air Permeability Rate – Exfiltration $m^3/hr/m^2$	
	Test 1		Test 2	
	Ambient temperature (° C)	13.7	Ambient temperature (° C)	13.7
50	0.03		0.07	
100	0.04		0.07	
150	0.03			
200	0.04			
250	0.07			
300	0.04			
450	0.08			
600	0.08			

Graph 1 – Air Permeability – Area



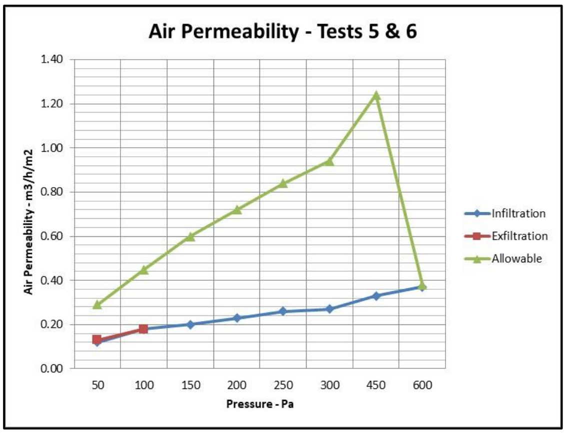
6.2.2 Tests 5 & 6 – Repeat Air Permeability

6.2.3 Fixed Element

Pressure Differential Pa	Maximum Air Permeability Rate – Infiltration $m^3/hr/m^2$		Maximum Air Permeability Rate – Exfiltration $m^3/hr/m^2$	
	Test No. 5		Test No. 6	
	Ambient temperature (° C)	10.9	Ambient temperature (° C)	10.9
50	0.12		0.13	
100	0.18		0.18	
150	0.20			
200	0.23			
250	0.26			
300	0.27			
450	0.33			
600	0.37			

No areas of concentrated leakage were found during testing.

Graph 2 –Air Permeability - Area



6.3 Watertightness Testing

6.3.1 Watertightness Penetration – Classification

Classification according to CWCT & BS EN 12154:2000	
Tests 3 & 7 – Water Penetration - Static	R7

6.3.2 Test 3 – Water Penetration – Static

Temperatures (°C)		
Temperatures (°C)	Water	10.6
	Ambient	7.8

Observations	
Air Pressure (Pa)	**Comments**
0 x 15 mins	No Leakage Observed
50 x 5 mins	No Leakage Observed
100 x 5 mins	No Leakage Observed
150 x 5 mins	No Leakage Observed
200 x 5 mins	No Leakage Observed
300 x 5 mins	No Leakage Observed
450 x 5 mins	No Leakage Observed
600 x 5 mins	No Leakage Observed

There was no water leakage observed during the water spray.

6.3.3 Test 7 – Repeat Water Penetration – Static

Temperatures (°C)		
Temperatures (°C)	Water	9.8
	Ambient	12.8

Observations	
Air Pressure (Pa)	**Comments**
0 x 15 mins	No Leakage Observed
50 x 5 mins	No Leakage Observed
100 x 5 mins	No Leakage Observed
150 x 5 mins	No Leakage Observed
200 x 5 mins	No Leakage Observed
300 x 5 mins	No Leakage Observed
450 x 5 mins	No Leakage Observed
600 x 5 mins	No Leakage Observed

There was no water leakage observed during the water spray.

6.3.4 Test 8 – Water Penetration – Dynamic Aero Engine

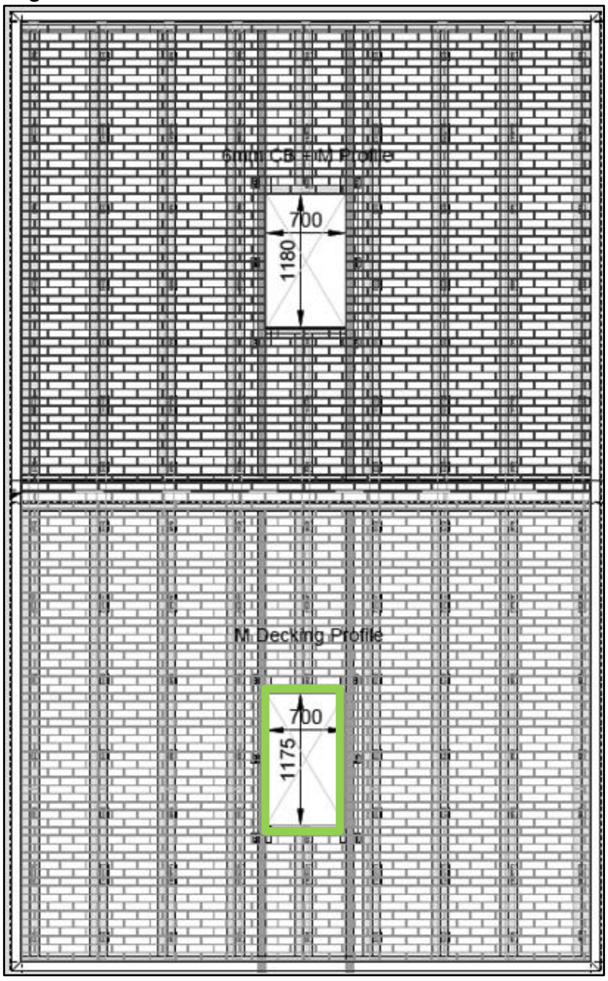
Temperatures (°C)	Water	12.1
	Ambient	10.7

The sample was subjected to testing as described in section 5.2.1, for a period of not less than 15 minutes, during which no water leakage was observed through the sample.

6.3.5 Test 9 – Water Penetration – Hose

The sample was subjected to hose testing, as described in section 5.2.2. During the test, and for 30 minutes following the cessation of spraying, the sample was monitored for water ingress and none was found.

Figure 2 - Hose Test Areas



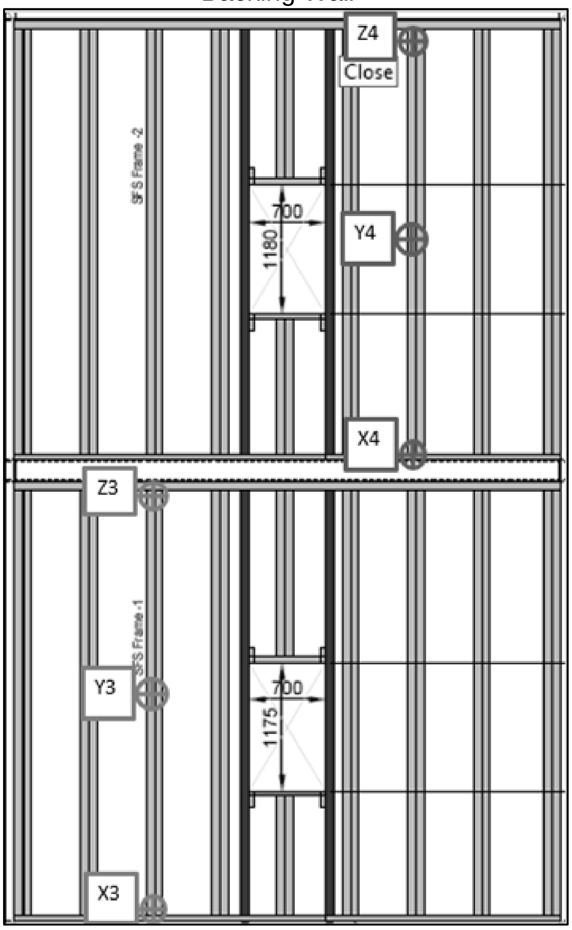
6.4 Wind Resistance

Backing Wall	
Probe Group Identification	**Calculation of deflection**
Group A comprised of probes X3, Y3 & Z3	= Probe Y3 – ((Probe X3 + Probe Z3)/2)
Group B comprised of probes X4, Y4 & Z4	= Probe Y4 – ((Probe X4 + Probe Z4)/2)
Cavity	
Probe Group Identification	**Calculation of deflection**
Group C comprised of probes X3, Y3 & Z3	= Probe Y3 – ((Probe X3 + Probe Z3)/2)
Group D comprised of probes X4, Y4 & Z4	= Probe Y4 – ((Probe X4 + Probe Z4)/2)
Group E comprised of probes X5, Y5 & Z5	= Probe Y5 – ((Probe X5 + Probe Z5)/2)
Group F comprised of probes X6, Y6 & Z6	= Probe Y6 – ((Probe X6 + Probe Z6)/2)

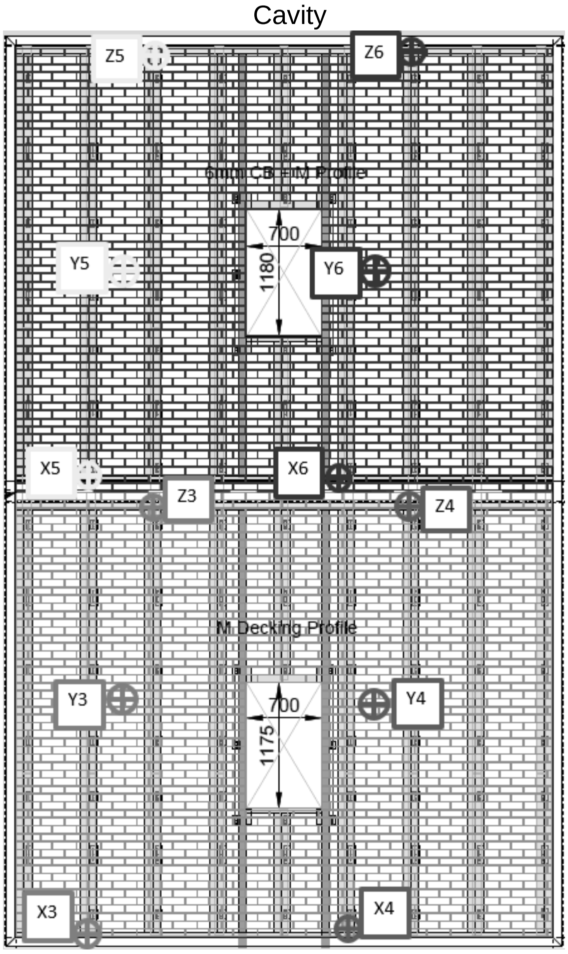
An inspection carried out following tests 4, 9, 10 and 11, after both positive and negative pressure testing, showed no evidence of any permanent deformation or damage to the test sample.

Figures 3 & 4 - Positions of Deflection Measurement Probes

Backing Wall



Cavity



6.4.1 Tests 4 & 10 – Wind Resistance, Serviceability

Test Date	29.04.24	08.05.24
Temperatures (°C)	10.9	24.6

Measured Length of Framing Member (mm)		Allowable Deflection	
		Ratio	Calculated (mm)
Group A	3980	L/360 or 10mm	10.0
Group B	3884	L/360 or 10mm	10.0
Group C	4080	L/360	11.3
Group D	4090	L/360	11.4
Group E	4060	L/360	11.3
Group F	4075	L/360	11.3

Frontal deflection shall recover by either 95%, or 1mm, whichever the greater.

6.4.1.1 Wind Resistance, Serviceability – Positive Pressure

Positive Pressure Pa	Results (mm)					
	Group A	Group B	Group C	Group D	Group E	Group F
0	0.0	0.0	0.0	0.0	0.0	0.0
600	1.2	1.2	1.3	1.5	1.5	1.7
1200	2.5	2.4	2.6	2.9	3.0	3.1
1800	4.0	3.8	4.1	4.2	4.3	4.9
2400	5.6	5.1	5.6	5.7	6.1	6.5
Residuals Immediately following test	0.3	0.4	0.3	0.3	0.2	0.5

6.4.1.2 Wind Resistance, Serviceability – Negative Pressure

Negative Pressure Pa	Results (mm)					
	Group A	Group B	Group C	Group D	Group E	Group F
0	0.0	0.0	0.0	0.0	0.0	0.0
600	1.3	1.3	1.5	1.6	1.5	1.6
1200	2.8	2.8	3.3	3.5	3.2	3.1
1800	4.7	4.5	5.0	5.3	5.1	4.9
2400	6.5	6.3	7.0	7.3	7.0	6.8
Residuals Immediately following test	0.3	0.3	0.3	0.3	0.4	0.6

6.4.2 Tests 11 & 12 – Wind Resistance, Safety

Test Date	13.05.2024
Temperatures (°C)	17.3

Measured Length of Framing Member (mm)		**Allowable Deflection**	
		Ratio	**Calculated (mm)**
Group A	3980	L/500	8.0
Group B	3884	L/500	7.8
Group C	4080	L/500	8.2
Group D	4090	L/500	8.2
Group E	4060	L/500	8.1
Group F	4075	L/500	8.2

6.4.2.1 Wind Resistance, Safety – Positive Pressure

Positive Pressure Pa	**Results (mm)**					
	Group A	**Group B**	**Group C**	**Group D**	**Group E**	**Group F**
0	0.0	0.0	0.0	0.0	0.0	0.0
3600	9.2	8.2	8.9	8.7	9.0	9.0
Residuals Immediately following test	0.2	0.2	0.6	0.4	0.4	0.5

6.4.2.2 Wind Resistance, Safety – Negative Pressure

Negative Pressure Pa	**Results (mm)**					
	Group A	**Group B**	**Group C**	**Group D**	**Group E**	**Group F**
0	0.0	0.0	0.0	0.0	0.0	0.0
3600	10.9	10.6	11.9	11.9	11.3	10.7
Residuals Immediately following test	0.5	0.7	0.5	0.6	0.7	1.0

Note: *The standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%, for the above measurements is ± 2.4 % of the reading*

6.5 Impacting

6.5.1 Test 13 – Impact – Soft Body

Ambient Temperatures (°C)	19.2
Humidity (%RH)	52

Blue Zone				
Impact Reference	**Test Classification**	**Impact Energy (J)**	**Observations**	**Result**
D1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk
E1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk
F1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk
G1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk

Red Zone				
Impact Reference	**Test Classification**	**Impact Energy (J)**	**Observations**	**Result**
D1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk
E1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk
F1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk
G1	Cat B Cat B	120 x 3 500 x 1	No Damage No Damage	Class 1 Negligible Risk

Class Achieved	Class 1 Negligible Risk

6.5.2 Test 9 – Impact – Hard Body H2

Ambient Temperatures (°C)	16.4
Humidity (%RH)	52

Blue Zone				
Impact Reference	Test Classification	Impact Energy (J)	Observations	Result
A1	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
A2	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
A3	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
A4	Cat B	10 x 1	No Damage	Class 1 Negligible Risk
B1	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
B2	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
B3	Cat B	10 x 1	No Damage	Class 1 Negligible Risk
B4	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
C1	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
C2	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
C3	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
C4	Cat B	10 x 1	No Damage	Class 1 Negligible Risk

Class Achieved	Class 2 Negligible Risk

Photograph No. 3 – Damage caused following impact at location A2 Blue Zone

Photograph No. 4 – Damage caused following impact at location B2 Blue Zone

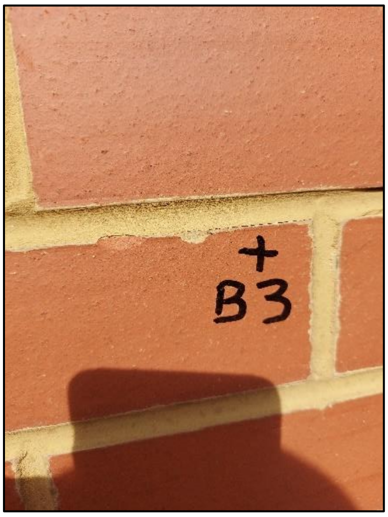
Photograph No. 5 – Damage caused following impact at location C1 Blue Zone

Red Zone				
Impact Reference	**Test Classification**	**Impact Energy (J)**	**Observations**	**Result**
A1	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
A2	Cat B	10 x 1	Chipped/Cracked Brick	Class 2 Negligible Risk
A3	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
A4	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
B1	Cat B	10 x 1	No Damage	Class 1 Negligible Risk
B2	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
B3	Cat B	10 x 1	Chipped Brick	Class 2 Negligible Risk
B4	Cat B	10 x 1	Cracked Brick	Class 2 Negligible Risk
C1	Cat B	10 x 1	No Damage	Class 1 Negligible Risk
C2	Cat B	10 x 1	No Damage	Class 1 Negligible Risk
C3	Cat B	10 x 1	No Damage	Class 1 Negligible Risk
C4	Cat B	10 x 1	No Damage	Class 1 Negligible Risk

Class Achieved	Class 2 Negligible Risk

Photograph No. 6 – Damage caused following impact at location B4 Red Zone

Photograph No. 7 – Damage caused following impact at location B3 Red Zone

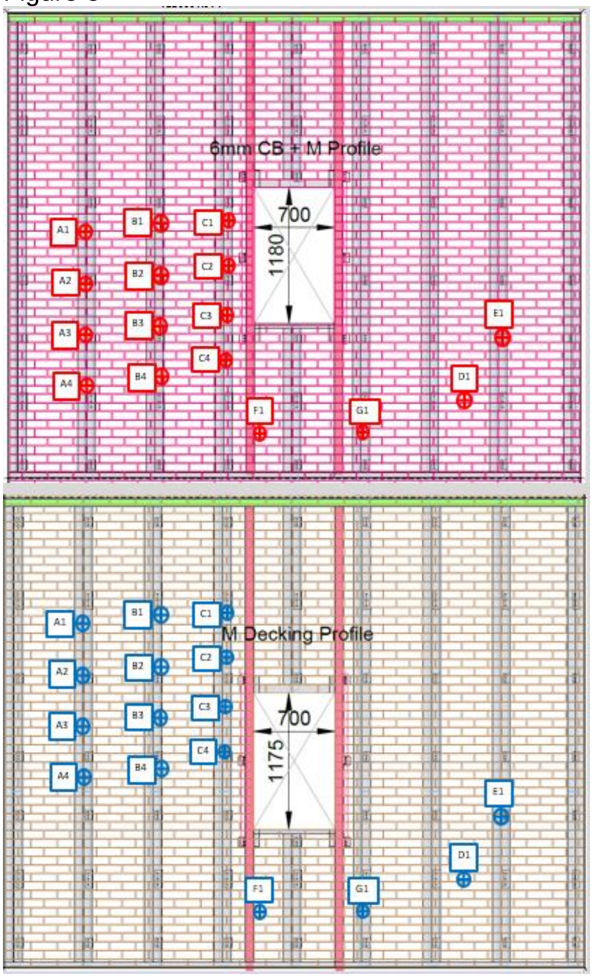


Photograph No. 8 – Damage caused following impact at location A2 Red Zone

Photograph No. 9 – Damage caused following impact at location A2 Red Zone

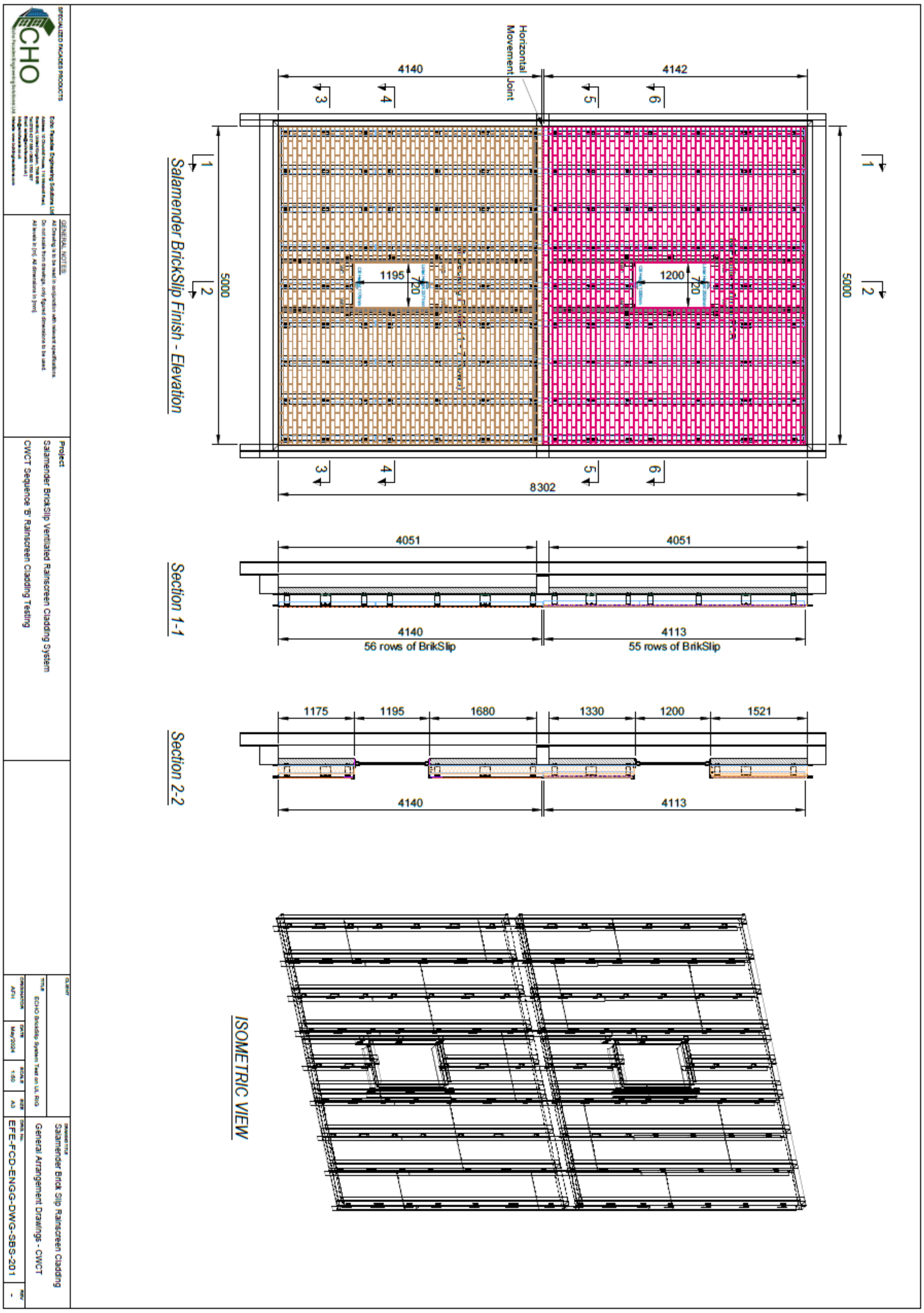
6.5.3 Impact Locations

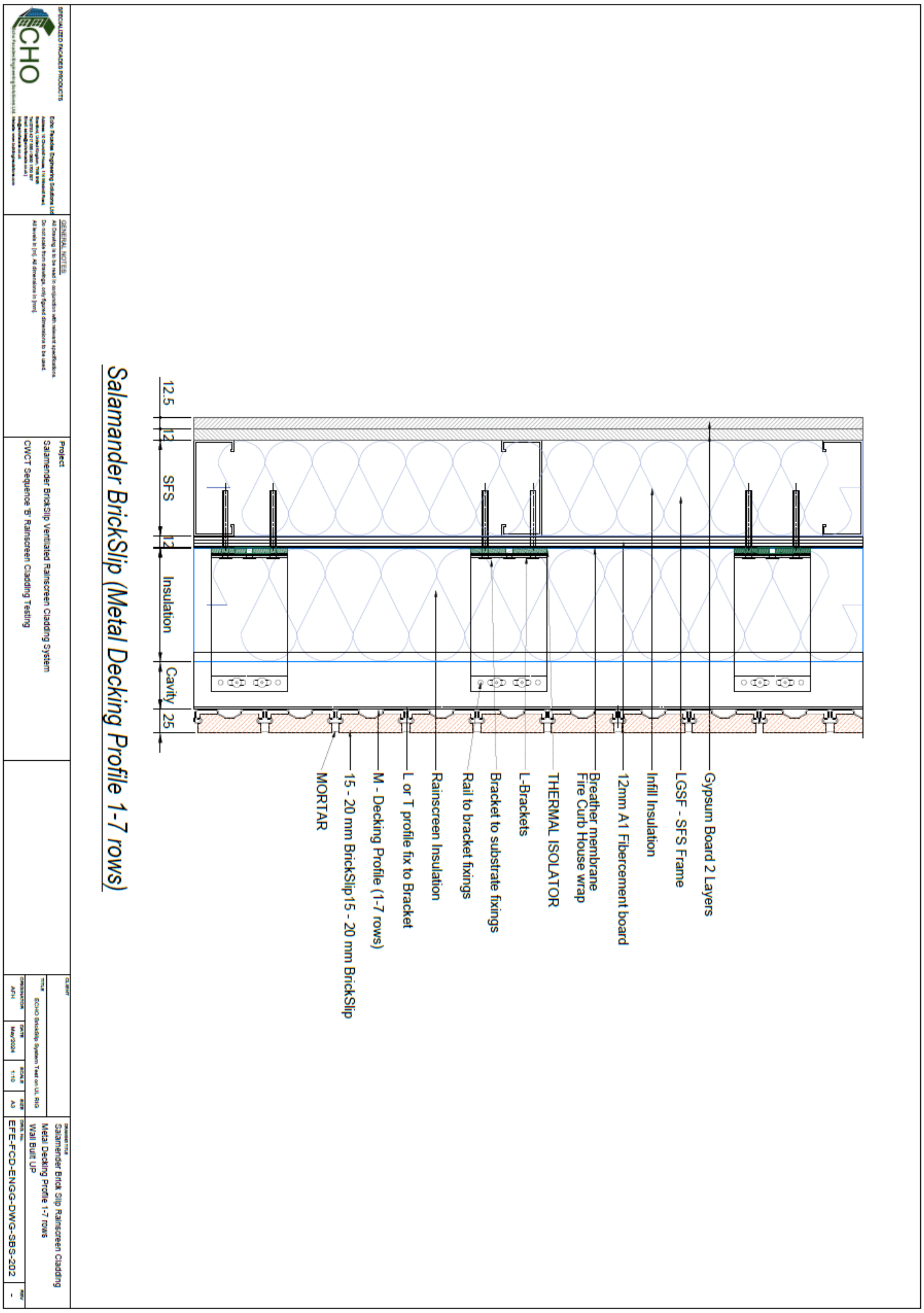
Figure 5

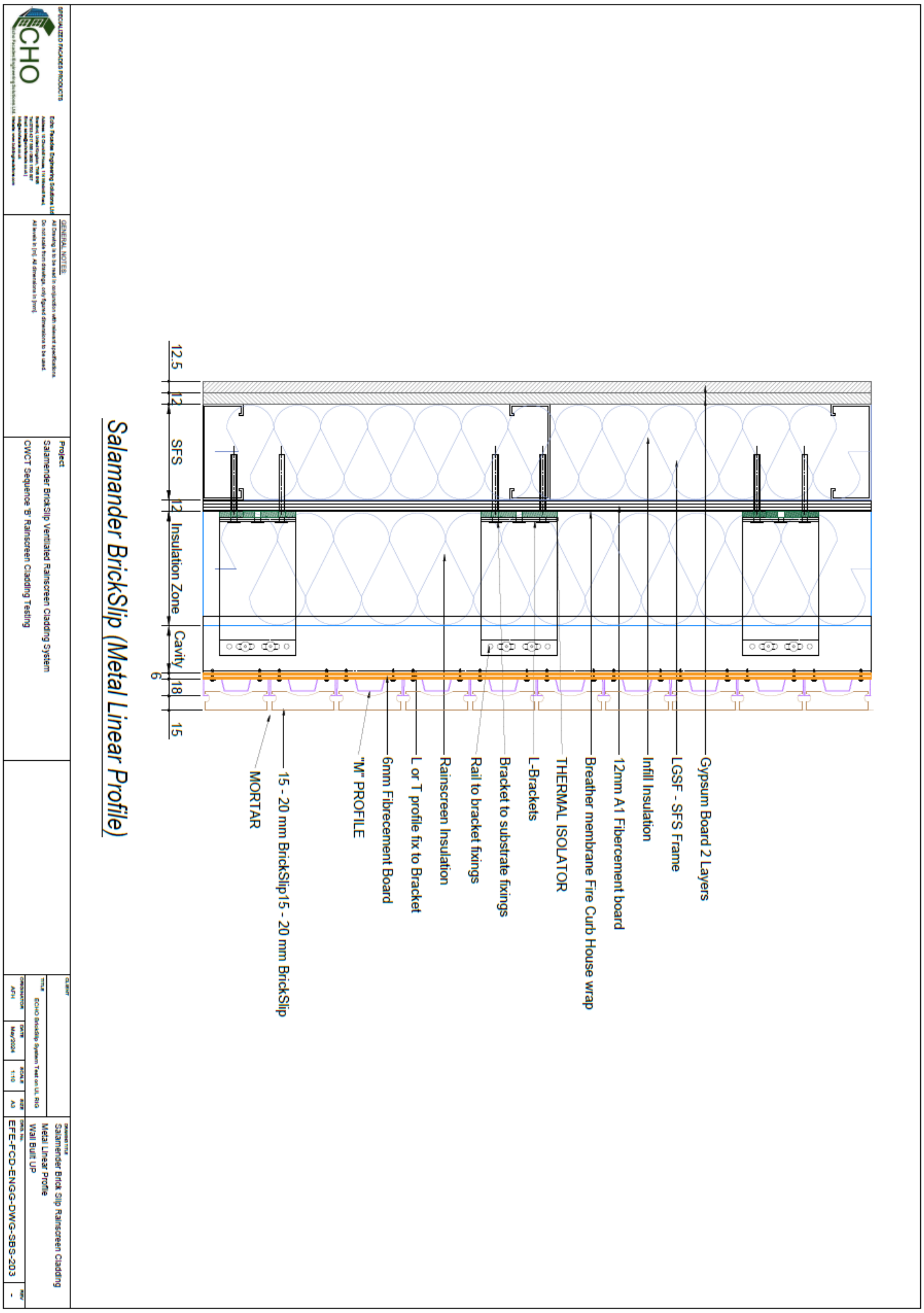


Impact Location	Description
A	Edge of slip 10mm
B	Corner of slip 25mm
C	Mortar T junction
D	Centre between brackets
E	On a bracket
F	Centre between rails
G	On a rail

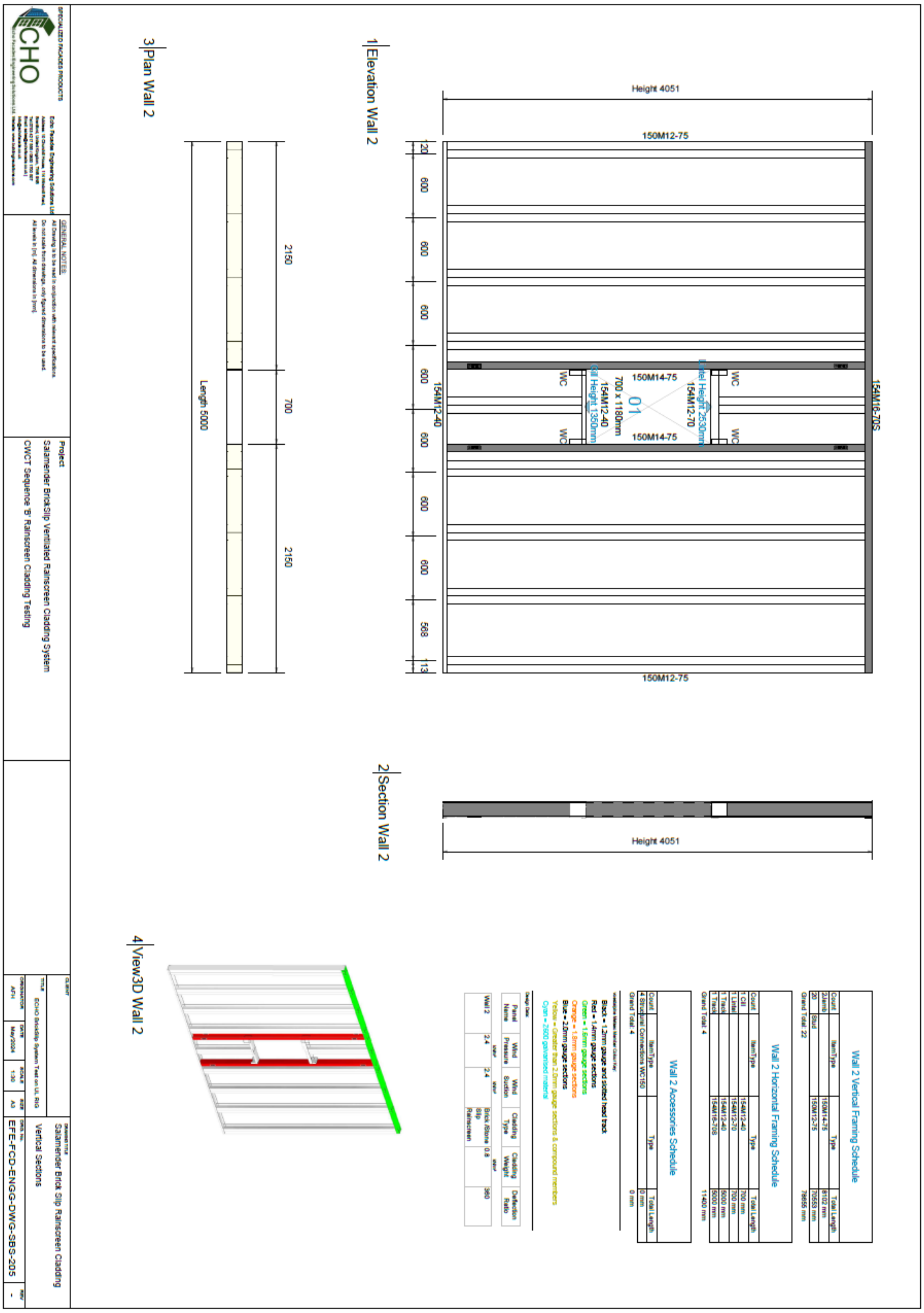
7. System Drawings

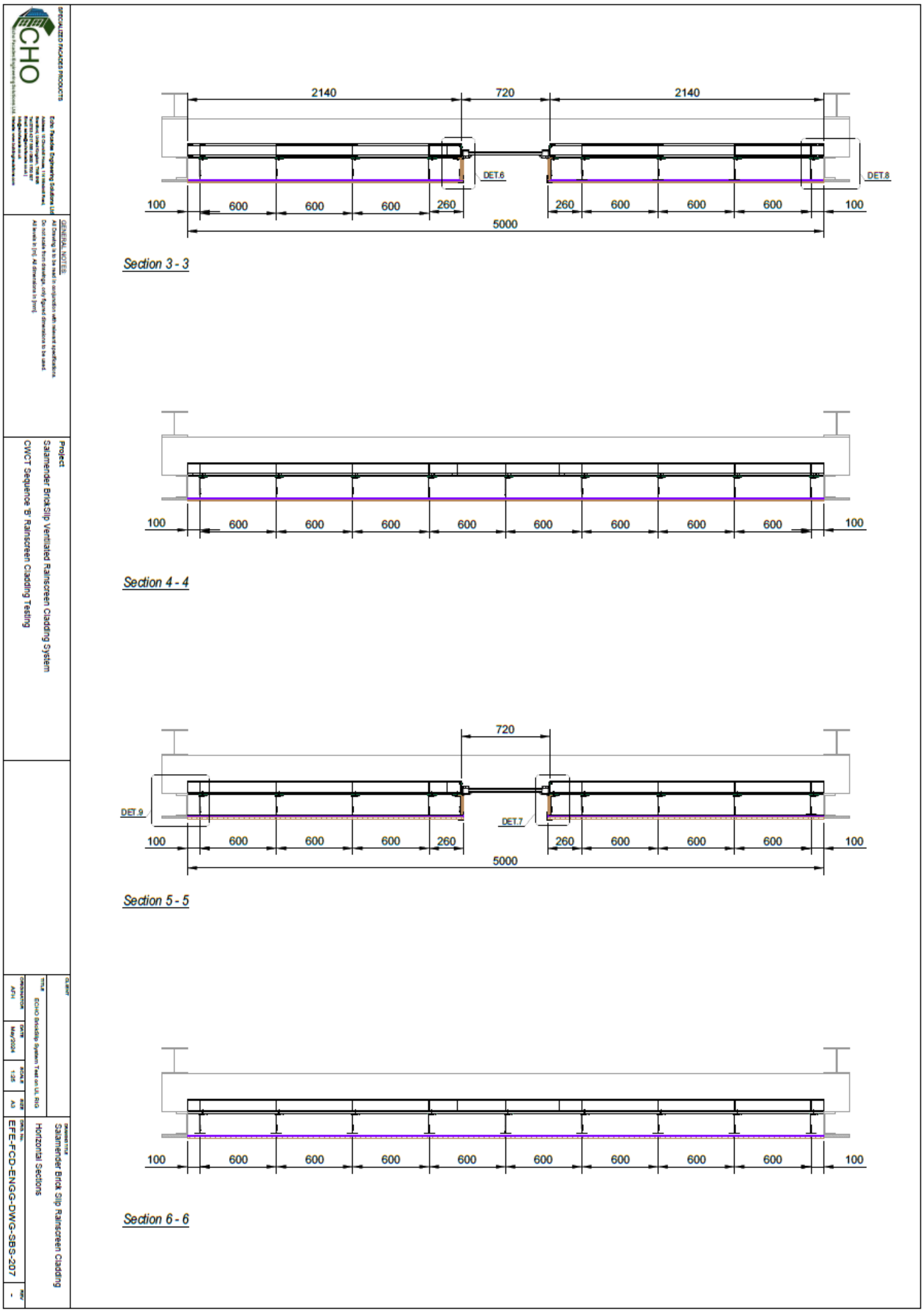


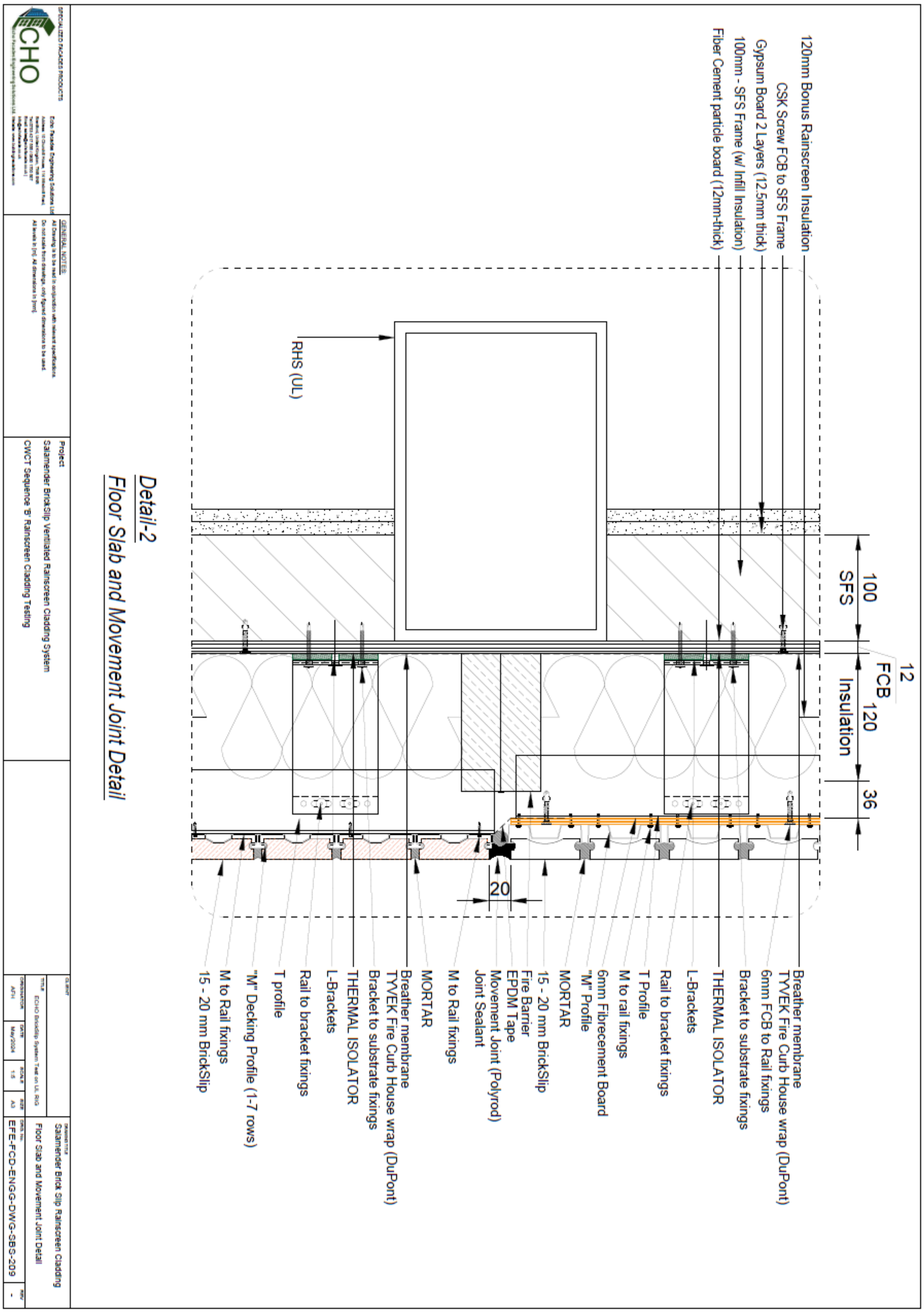

Salamander BrickSlip (Metal Decking Profile 1-7 rows)
12.5
12
SFS
12
Insulation
Cavity
25
Gypsum Board 2 Layers
LGSF - SFS Frame
Infill Insulation
12mm A1 Fibercement board
Breather membrane
Fire Curb House wrap
THERMAL ISOLATOR
L-Brackets
Bracket to substrate fixings
Rail to bracket fixings
Rainscreen Insulation
L or T profile fix to Bracket
M - Decking Profile (1-7 rows)
15 - 20 mm BrickSlip15 - 20 mm BrickSlip
MORTAR
CHO
Project
Salamander BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamender Brick Slip Rainscreen Cladding
Metal Decking Profile 1-7 rows
Wall Built UP
EFE-FCD-ENGG-DWG-SBS-202

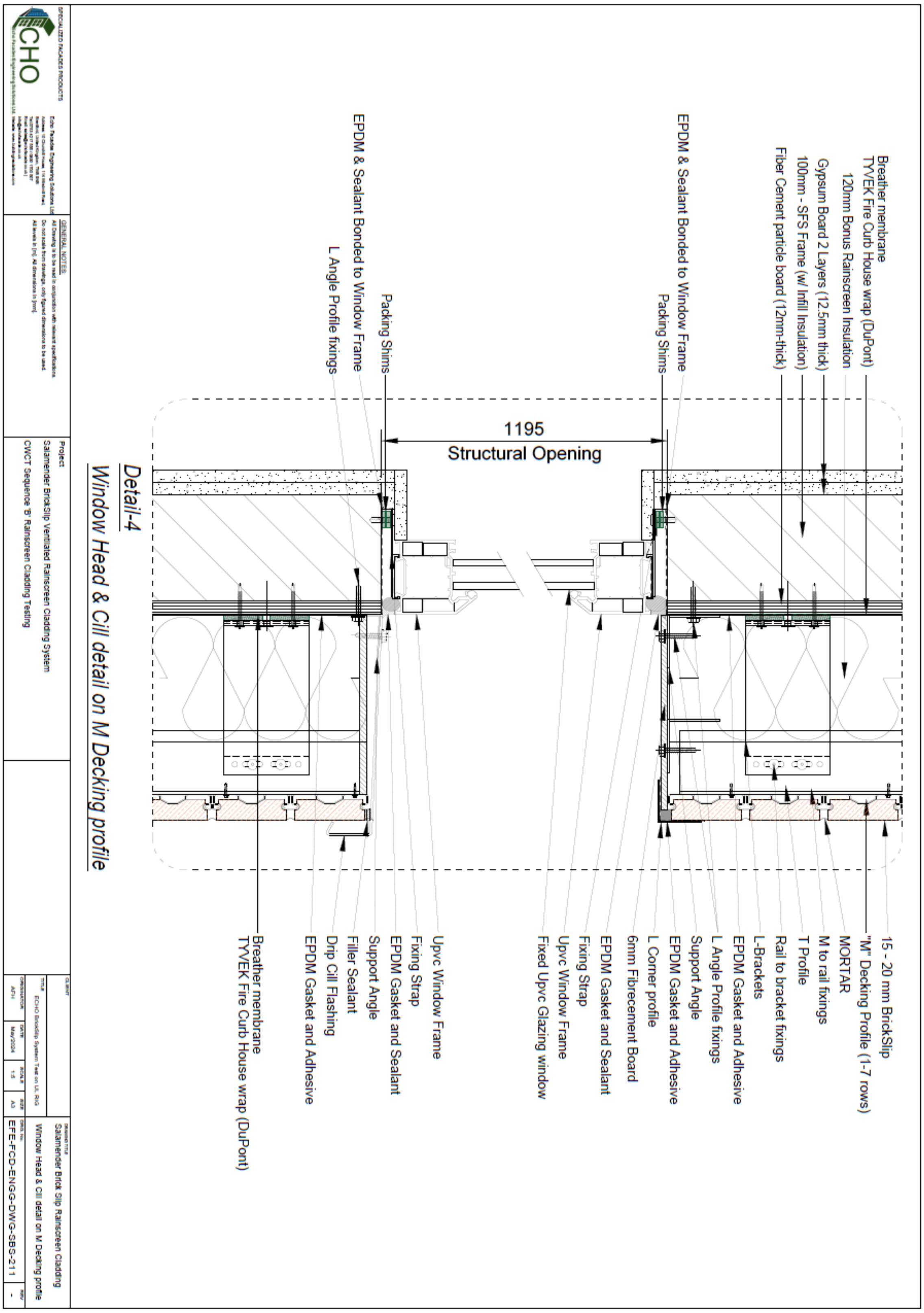

Salamander BrickSlip (Metal Linear Profile)
12.5
12
SFS
12
Insulation Zone
Cavity
6
18
15
Gypsum Board 2 Layers
LGSF - SFS Frame
Infill Insulation
12mm A1 Fibercement board
Breather membrane Fire Curb House wrap
THERMAL ISOLATOR
L-Brackets
Bracket to substrate fixings
Rail to bracket fixings
Rainscreen Insulation
L or T profile fix to Bracket
6mm Fibrecement Board
"M" PROFILE
15 - 20 mm BrickSlip15 - 20 mm BrickSlip
MORTAR
Project
Salamander BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamander Brick Slip Rainscreen Cladding
Metal Linear Profile
Wall Built Up
EFE-FCD-ENGG-DWG-SBS-203

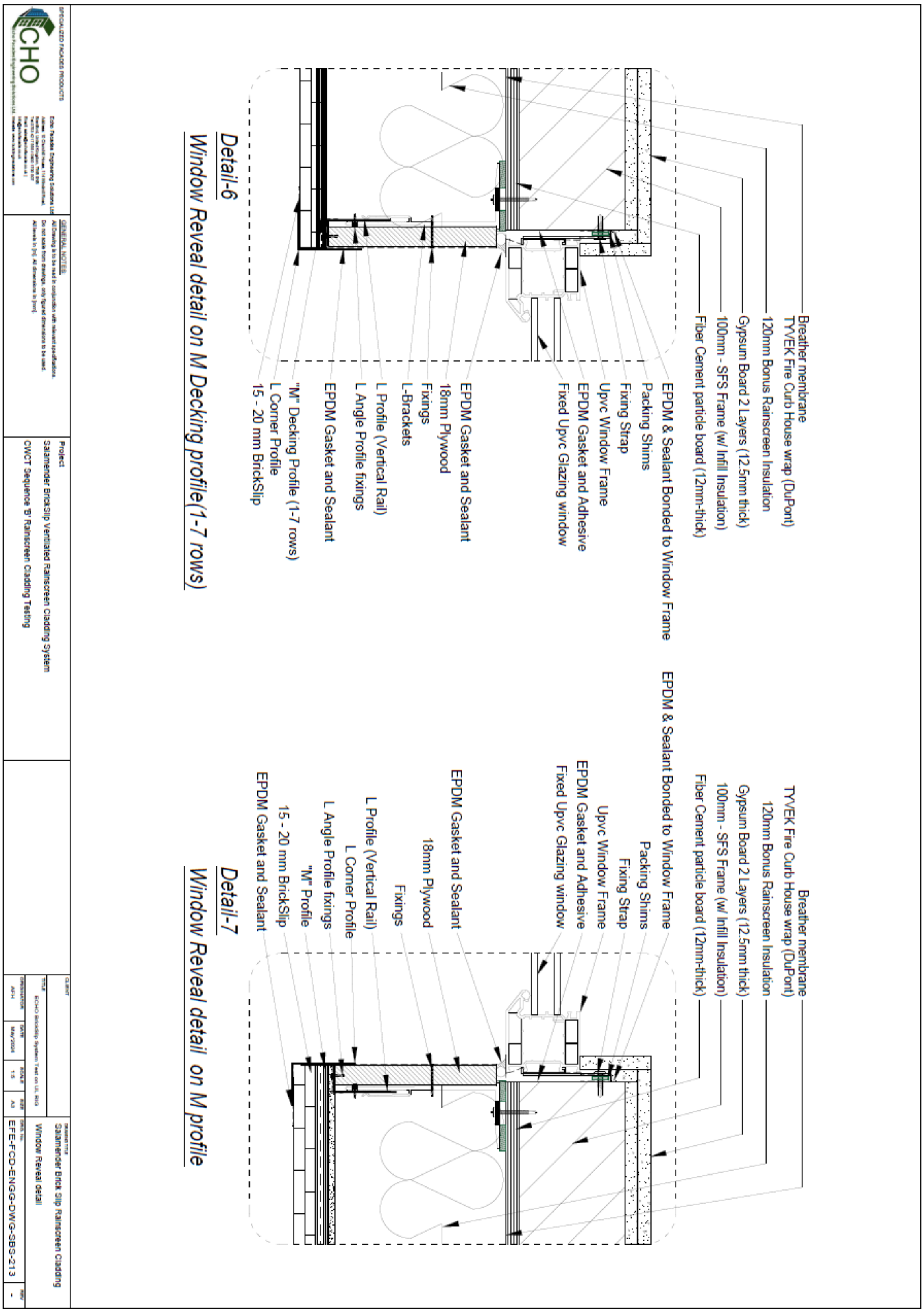
5772

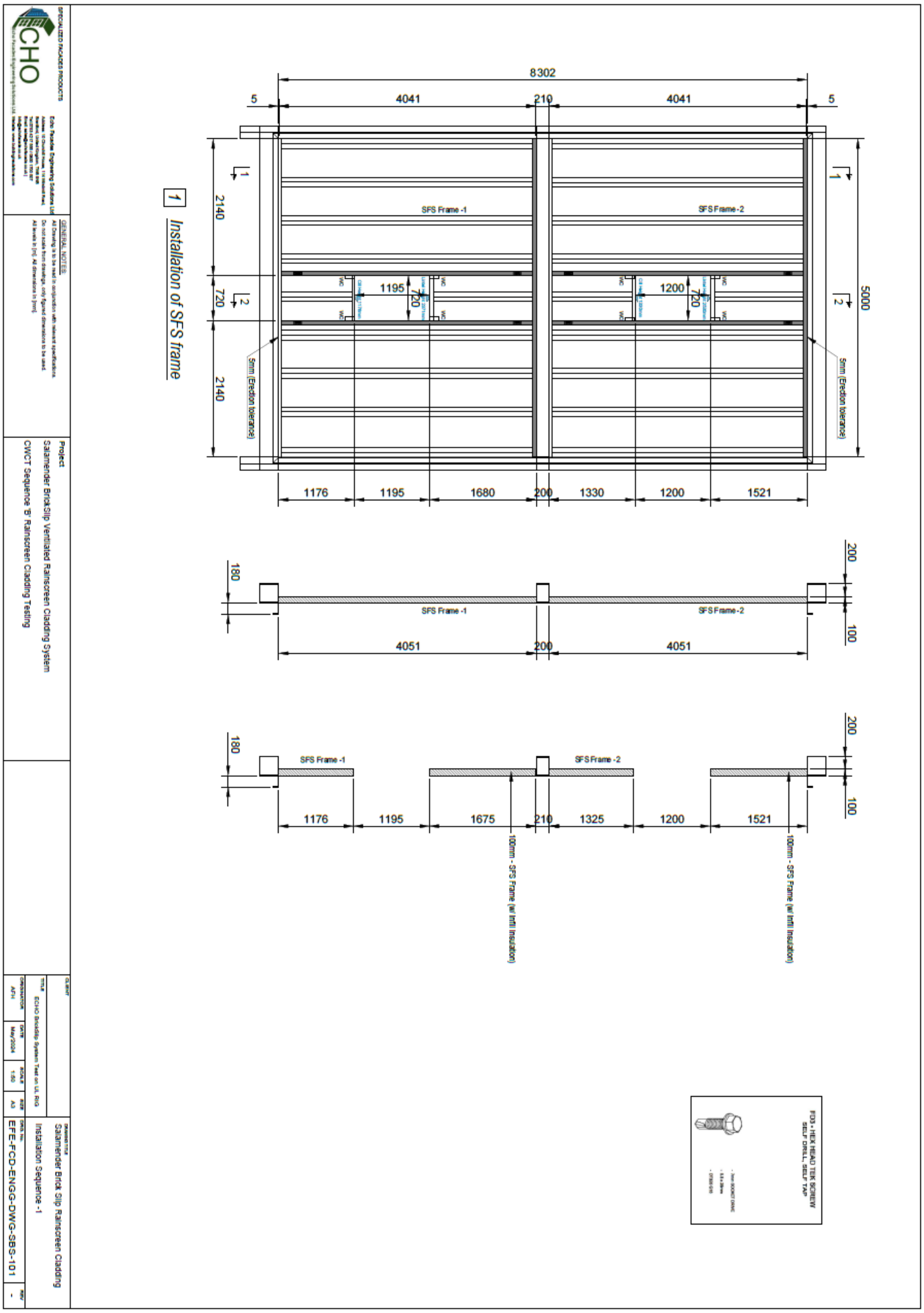

1 Elevation Wall 2
Height 4051
150M12-75
150M14-75
154M12-40
154M12-70
154M16-70S
700 x 1180mm
Sill Height 1350mm
Lintel Height 2530mm
WC
2 Section Wall 2
3 Plan Wall 2
Length 5000
2150
700
4 View3D Wall 2
Wall 2 Vertical Framing Schedule
Wall 2 Horizontal Framing Schedule
Wall 2 Accessories Schedule
Salamander BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamander Brick Slip Rainscreen Cladding
Vertical Sections
EFE-FCD-ENGG-DWG-SBS-205

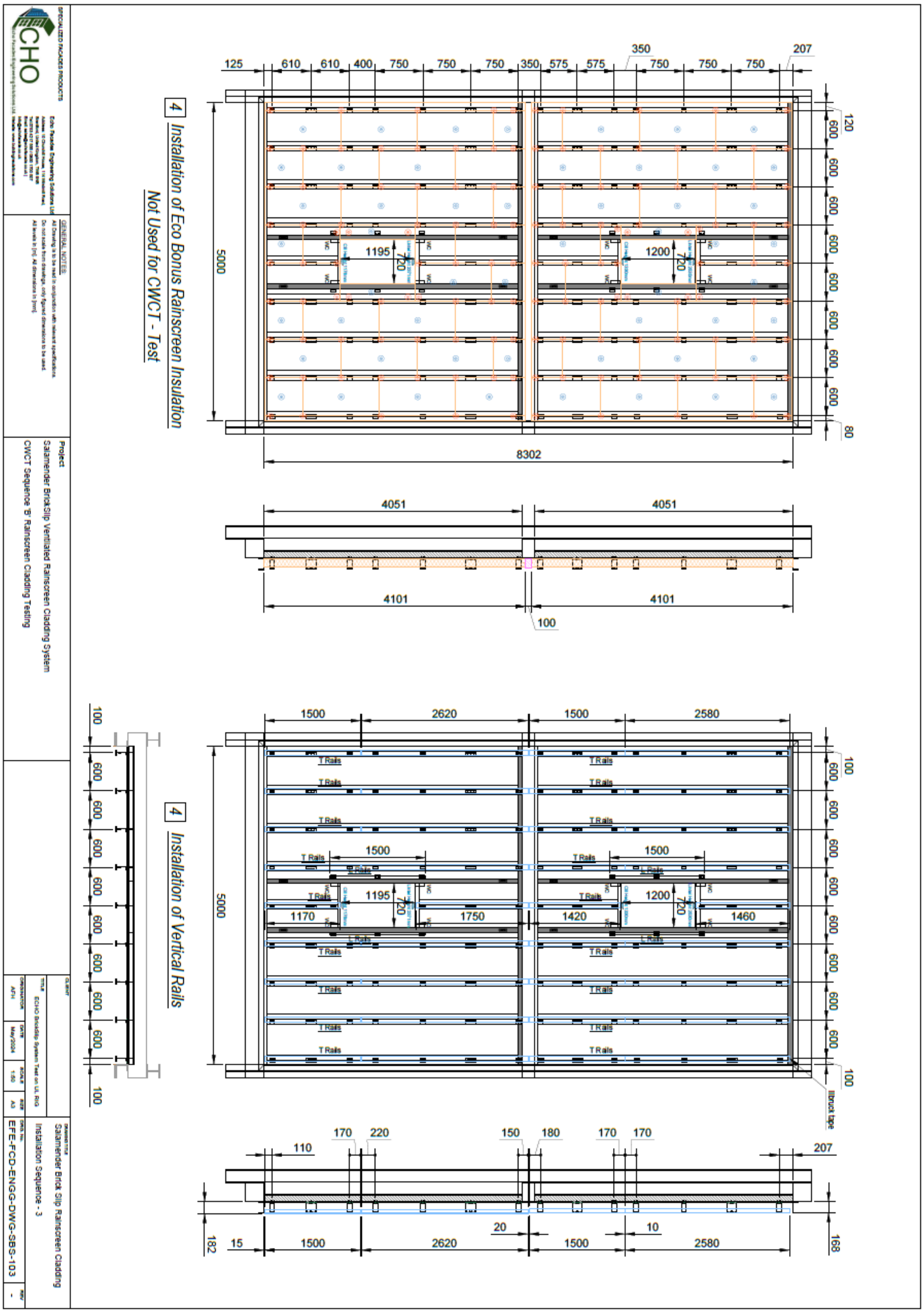

2140
720
2140
DET.6
DET.8
100
600
600
600
260
260
600
600
600
100
5000
Section 3 - 3
Section 4 - 4
DET.9
DET.7
Section 5 - 5
Section 6 - 6
Salamender BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamender Brick Slip Rainscreen Cladding
Horizontal Sections
EFE-FCD-ENGG-DWG-SBS-207


120mm Bonus Rainscreen Insulation
CSK Screw FCB to SFS Frame
Gypsum Board 2 Layers (12.5mm thick)
100mm - SFS Frame (w/ Infill Insulation)
Fiber Cement particle board (12mm-thick)
RHS (UL)
100
SFS
12
FCB
120
Insulation
36
20
Breather membrane
TYVEK Fire Curb House wrap (DuPont)
6mm FCB to Rail fixings
Bracket to substrate fixings
THERMAL ISOLATOR
L-Brackets
Rail to bracket fixings
T Profile
M to rail fixings
6mm Fibrecement Board
"M" Profile
MORTAR
15 - 20 mm BrickSlip
Fire Barrier
EPDM Tape
Movement Joint (Polyrod)
Joint Sealant
M to Rail fixings
MORTAR
Breather membrane
TYVEK Fire Curb House wrap (DuPont)
Bracket to substrate fixings
THERMAL ISOLATOR
L-Brackets
Rail to bracket fixings
T profile
"M" Decking Profile (1-7 rows)
M to Rail fixings
15 - 20 mm BrickSlip
Detail-2
Floor Slab and Movement Joint Detail
Project
Salamender BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamender Brick Slip Rainscreen Cladding
Floor Slab and Movement Joint Detail
EFE-FCD-ENGG-DWG-SBS-209

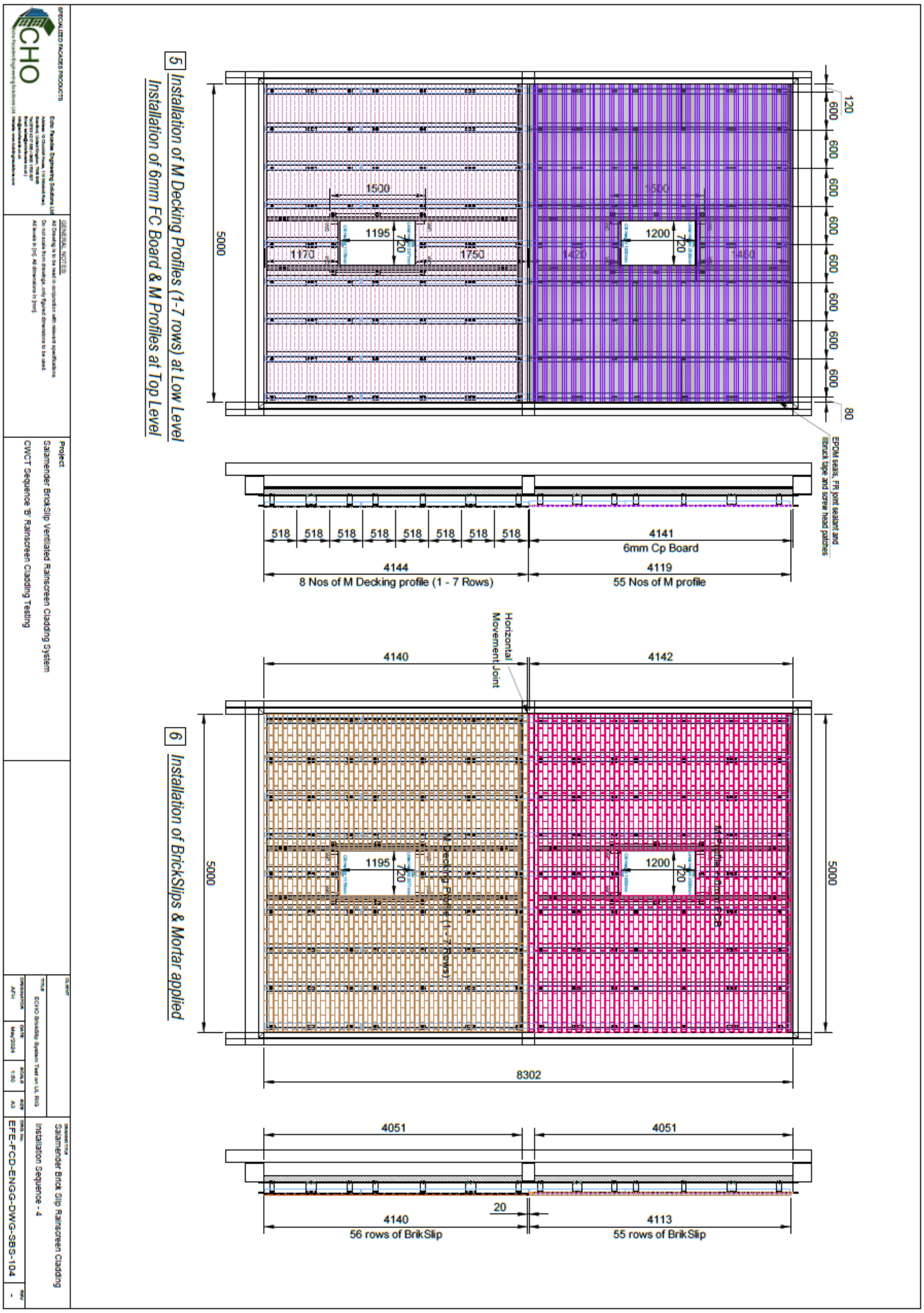

Breather membrane
TYVEK Fire Curb House wrap (DuPont)
120mm Bonus Rainscreen Insulation
Gypsum Board 2 Layers (12.5mm thick)
100mm - SFS Frame (w/ Infill Insulation)
Fiber Cement particle board (12mm-thick)
EPDM & Sealant Bonded to Window Frame
Packing Shims
L Angle Profile fixings
1195
Structural Opening
Detail-4
Window Head & Cill detail on M Decking profile
15 - 20 mm BrickSlip
"M" Decking Profile (1-7 rows)
MORTAR
M to rail fixings
T Profile
Rail to bracket fixings
L-Brackets
EPDM Gasket and Adhesive
L Angle Profile fixings
Support Angle
L Corner profile
6mm Fibrecement Board
EPDM Gasket and Sealant
Fixing Strap
Upvc Window Frame
Fixed Upvc Glazing window
Filler Sealant
Drip Cill Flashing
Project
Salamender BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamender Brick Slip Rainscreen Cladding
Window Head & Cill detail on M Decking profile
EFE-FCD-ENGG-DWG-SBS-211


Detail-6
Window Reveal detail on M Decking profile(1-7 rows)
Breather membrane
TYVEK Fire Curb House wrap (DuPont)
120mm Bonus Rainscreen Insulation
Gypsum Board 2 Layers (12.5mm thick)
100mm - SFS Frame (w/ Infill Insulation)
Fiber Cement particle board (12mm-thick)
EPDM & Sealant Bonded to Window Frame
Packing Shims
Fixing Strap
Upvc Window Frame
EPDM Gasket and Adhesive
Fixed Upvc Glazing window
EPDM Gasket and Sealant
18mm Plywood
Fixings
L-Brackets
L Profile (Vertical Rail)
L Angle Profile fixings
EPDM Gasket and Sealant
"M" Decking Profile (1-7 rows)
L Corner Profile
15 - 20 mm BrickSlip
Detail-7
Window Reveal detail on M profile
"M" Profile
L Corner Profile
EPDM Gasket and Sealant
CHO
GENERAL NOTES
Project
Salamender BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamender Brick Slip Rainscreen Cladding
Window Reveal detail
EFE-FCD-ENGG-DWG-SBS-213


Installation of SFS frame
8302
4041
210
4041
5
5
SFS Frame -1
SFS Frame -2
2140
720
2140
5000
1195
1200
5mm (Erection tolerance)
1176
1195
1680
200
1330
1200
1521
180
200
100
4051
200
4051
1176
1195
1675
210
1325
1200
1521
100mm - SFS Frame (w/ infill insulation)
Salamander BrickSlip Ventilated Rainscreen Cladding System
CWCT Sequence 'B' Rainscreen Cladding Testing
Salamander Brick Slip Rainscreen Cladding
Installation Sequence -1
EFE-FCD-ENGG-DWG-SBS-101



UKAS TESTING
5772



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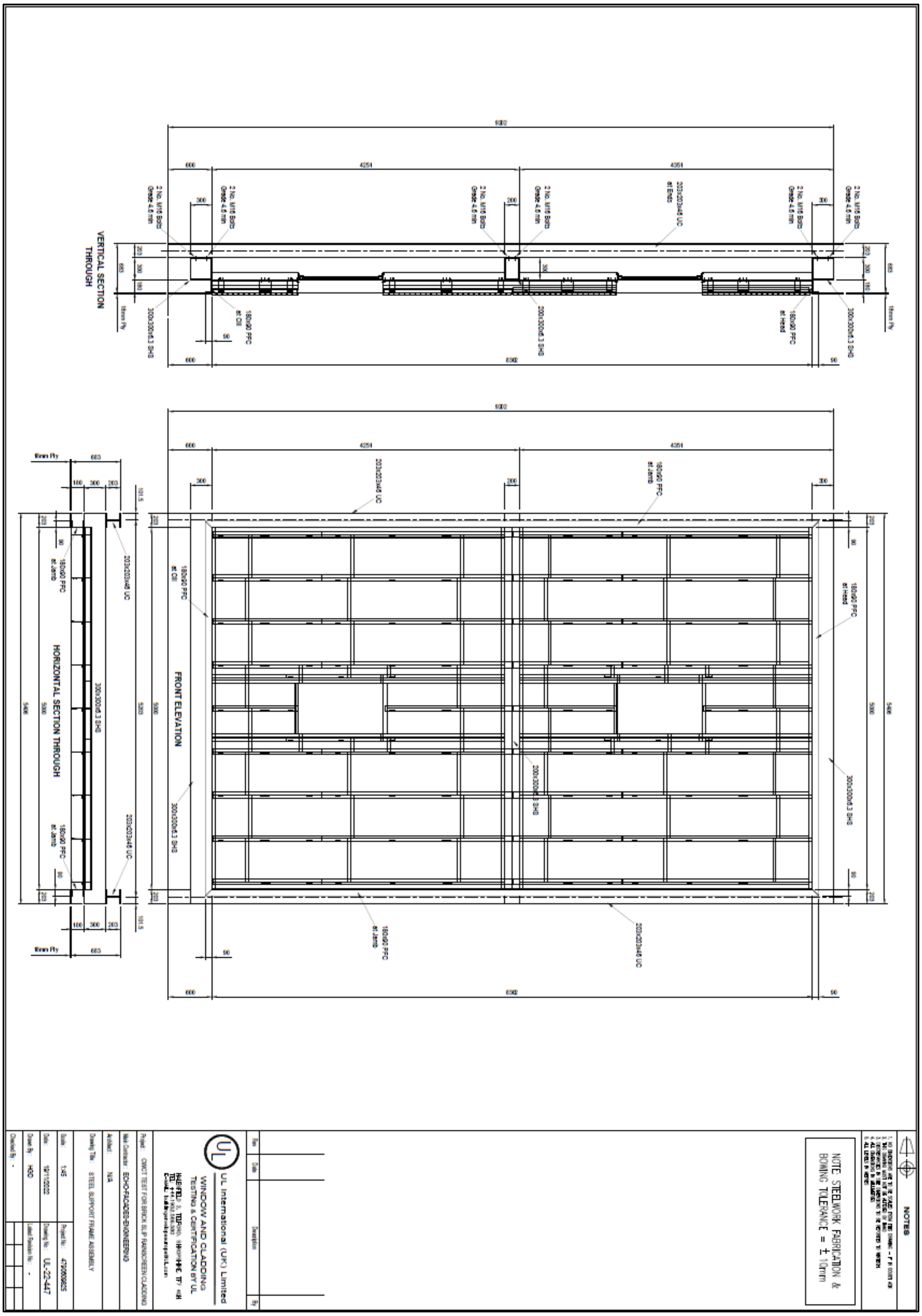
8. Support Steelwork Drawing



UKAS TESTING
5772

9. Dismantling

The dismantling was conducted on 15th, 16th and 17th May 2024 by representatives of Echo Facades Engineering Solutions Ltd and was witnessed by representatives of UL International (UK) Limited.

There was no water evident in the system in parts designed not to be wetted, and it was found that the system fully complied with the system drawings in Section 7 provided by Echo Facades Engineering Solutions Ltd at the time of the dismantle.

Photograph No. 10 - Sample prior to dismantle

Photograph No. 11 – Window pod detail

Photograph No. 12 - Internal window pod detail

Photograph No. 13 - Internal window pod detail

Photograph No. 14 - Internal window pod detail

Photograph No. 15 - Internal window pod detail

Photograph No. 16 - Sample with bricks partially removed

Photograph No. 17 - Sample with bricks partially removed

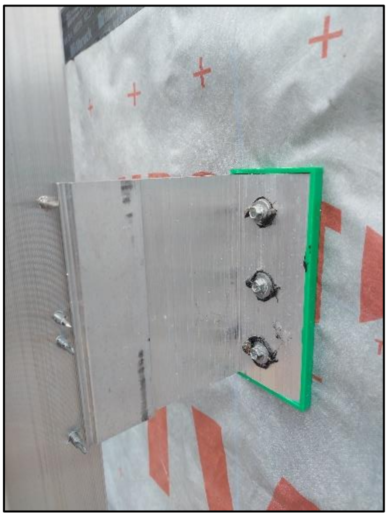
Photograph No. 18 - Brick Carrier rails

Photograph No. 19 – Backing wall and vertical rails

Photograph No. 20 – Internal view of SFS

Photograph No. 21 – Internal view of SFS

Photograph No. 22 – Helping hand bracket

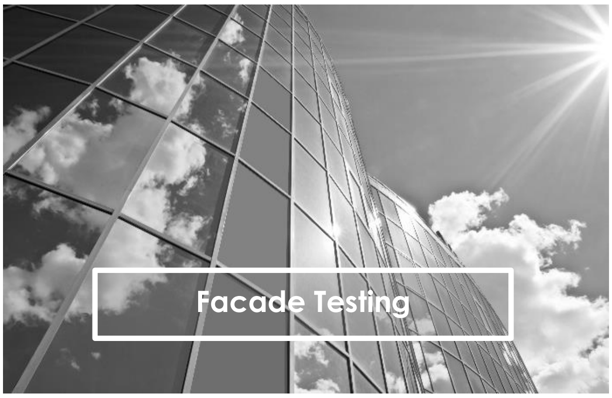


Photograph No. 23 – Backing wall and SFS

10. Amendments

Revision No.	Amendments	Date of Amendment
Rev 1	Section 3 updated as per comments received.	29th August 2024

----- END OF REPORT -----



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