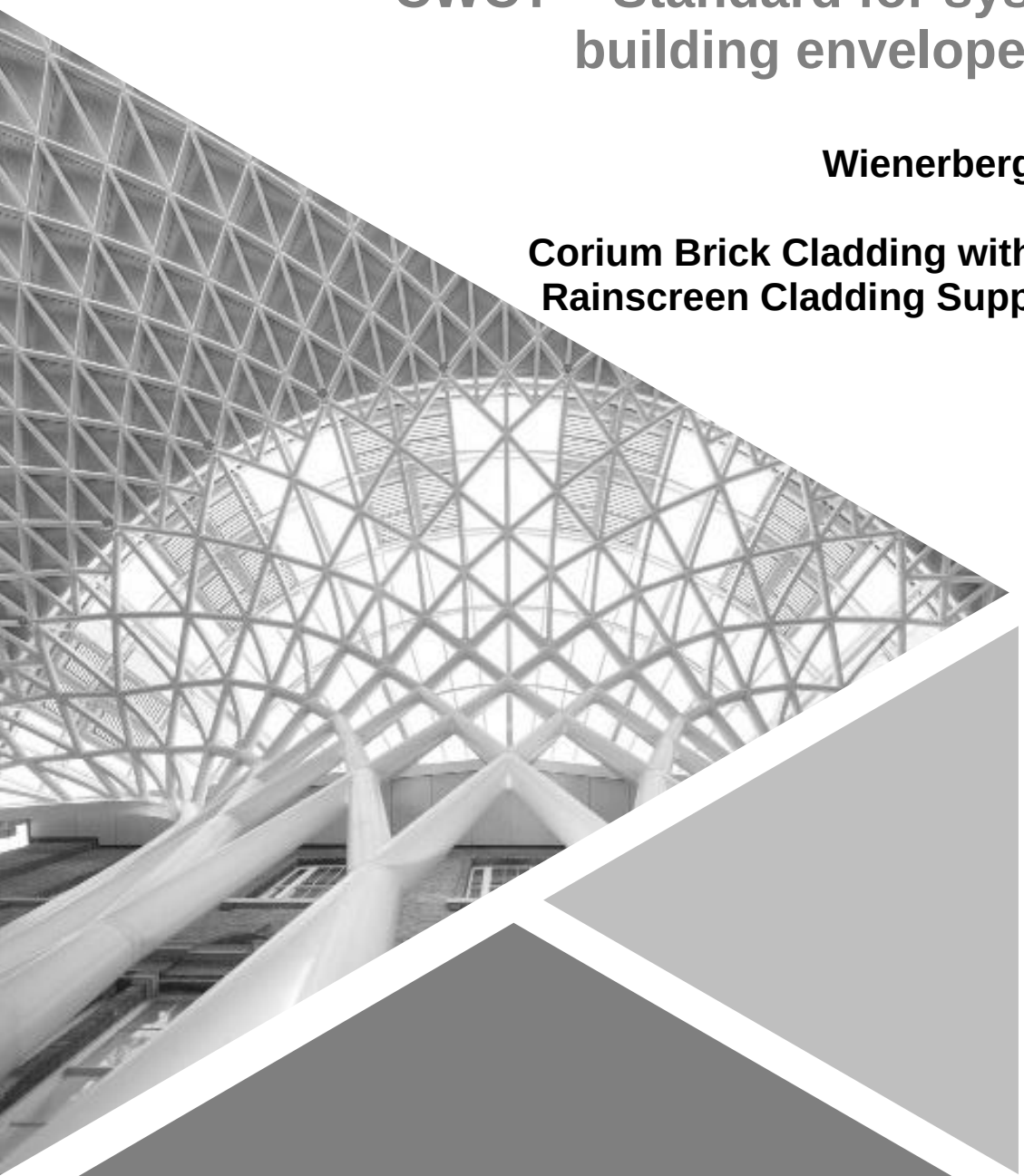
5772

Technical Report – R4790237930 CWCT – Standard for systemised building envelopes – 2005

Wienerberger Limited

Corium Brick Cladding with Floorspan Rainscreen Cladding Support System



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Contents

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:	Wienerberger Limited Wienerberger House Brooks Drive Cheadle Royal Business Park Cheadle SK8 3SA
Product Tested:	Corium Brick Cladding with Floorspan Rainscreen Cladding Support System
Date of Test:	16th, 20th, 27th and 28th February 2023 1st, 6th, 15th and 16th March 2023
Test Conducted at:	UL International (UK) Limited Halesfield 2 Telford Shropshire TF7 4QH
Test Conducted by:	J Dove – Senior Laboratory Assistant P Seymour – Laboratory Technician D Perkin – Laboratory Technician
Test Supervised by:	M Witkowska - Laboratory Leader
Test Witnessed by:	S Heesom - PFS M Franklin – Wienerberger Limited

Report Authorisation	
Report Compiled by:	D Price – Senior Engineering Associate
Authorised by:	M Wass – Engineering Manager

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This report and the results shown within are based upon the information, drawings, samples and tests referred to in the report. The results obtained do not necessarily relate to samples from the production line of the above-named company and in no way constitute any form of representation or warranty as to the performance or quality of any products supplied or to be supplied by them. UL International (UK) Limited or its employees accept no liability for any damages, charges, cost or expenses in respect of or in relation to any damage to any property or other loss whatsoever arising either directly or indirectly from the use of the report.

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.

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 +/- 1.69 %, for the mass of the dislodge fragments is +/- 0.03 % and for the size of the dislodge fragments is +/- 0.02 %.

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	Date of Test	Classification
Test 1 - Air Leakage – Infiltration	600 Pa	Pass	16.02.23	A4
Test 2 - Air Leakage – Exfiltration	100 Pa	N/A	16.02.23	N/A
Test 3 – Water Penetration (Static Pressure)	600 Pa	Pass	20.02.23	R7
Test 4 - Wind Resistance – Serviceability – Backing Wall	2400 Pa	Pass	27.02.23	-
Test 5 - Repeat Air Leakage – Infiltration	600 Pa	Pass	27.02.23	A4
Test 6 - Repeat Air Leakage – Exfiltration	100 Pa	N/A	27.02.23	N/A
Test 7 – Repeat Water Penetration (Static Pressure)	600 Pa	Pass	27.02.23	R7
Test 8 – Water Penetration – Dynamic Aero Engine	600 Pa	Pass	27.02.23	-
Test 9 - Water Penetration – Hose	-	Pass	28.02.23	-
Test 10 - Impact Resistance – Retention of Performance – Orange Zone	Cat B	Class 4	28.02.23 01.03.23 06.03.23	-
Test 11 - Impact Resistance – Safety to Persons – Orange Zone	Cat B	Low Risk	01.03.23 06.03.23	-
Test 10 - Impact Resistance – Retention of Performance – Green Zone	Cat B	Class 4	28.02.23 06.03.23	-
Test 11 - Impact Resistance – Safety to Persons – Green Zone	Cat B	Low Risk	01.03.23 06.03.23	-
Test 10 - Impact Resistance – Retention of Performance – Blue Zone	Cat B	Class 3	28.02.23 06.03.23	-
Test 11 - Impact Resistance – Safety to Persons – Blue Zone	Cat B	Low Risk	01.03.23 06.03.23	-
Test 10 - Impact Resistance – Retention of Performance – Red Zone	Cat B	Class 3	28.02.23 06.03.23	-
Test 11 - Impact Resistance – Safety to Persons – Red Zone	Cat B	Neg Risk	01.03.23 06.03.23	-
Test 12 - Wind Resistance – Serviceability – Cavity	2400 Pa	Pass	15.03.23	-
Test 13 - Wind Resistance – Safety – Backing Wall	3600 Pa	Pass	16.03.23	-
Test 14 - Wind Resistance – Safety – Cavity	3600 Pa	Pass	16.03.23	-
Dismantle, Inspect & Report	**Sample Passed**			

More comprehensive details are reported in Section 6.

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 the customer and has not been verified by UL International (UK) Limited.

See Section 7 for test sample drawings as supplied by Wienerberger Limited.

Product Description

Full product name:	Corium brick cladding with Floorspan rainscreen cladding support system.
Product type:	Brick cladding system with Floor-to-Floor support system.
Product description:	The Corium system comprises interlocking, horizontal steel sections (rails) screwed to vertical aluminium support rails. The Corium steel rails are profiled to allow fired clay brick tiles to be clipped in, providing a mechanical fix. The vertical and horizontal joints between the tiles are pointed with mortar to provide a traditional masonry finish. Floorspan is an extruded aluminium facade framing system, spanning floor to floor, comprising primary angles brackets, sheeting rails, link brackets, expansion joint links and all associated fixings as required to complete the support structure.
Manufactured by:	Wienerberger Ltd PFS Ltd

Support Framing and bracketry

Material:	Extruded Aluminium Alloy
Finish:	Mill Finish
Vertical rail Ref:	Proprietary extruded T- Rail, TR1
Horizontal rail Ref:	N/A
Fixing method (bracket to backing wall):	M12 Bolts to horizontal steel frame member
Fixing Ref:	Lindapter Type HB Hollo-Bolt
Brackets ref:	PB1
Fixing method (rail to bracket)	Proprietary extruded aluminium link bracket
Fixing Ref:	LB1 also 4.8x18mm large head rivet Alu ST/ST (PPC) to fix dead load clip
Fixing method (rail to rail)	Proprietary extruded aluminium expansion joint link
Fixing Ref:	EJ1
Max Span between vertical rails:	900mm
Max Span between horizontal rails:	N/A
Construction tolerance allowed between fixings, rails and brackets (+/-)	Lateral Tolerance: +/- 15mm In / Out Tolerance: +/- 25mm Angular Tolerance: +/- 15deg.

Panels/tiles/brickslip

Material:	Fired clay brick slips and steel backing rails.
Material ref (source, spec):	Backing rails: 0.7mm thick Arcelor Mittal Magnelis ZM 310 metallic coated steel. Brick slips: Standard Corium 32mm thick brick tiles, 52mm thick brick tiles, 82mm thick brick tiles,

	CM.5 soffit return tiles and CM.1 one-piece corners.
Finish:	Standard 32mm thick brick tiles in colour 74439 52mm thick tiles in colour 14019 82mm thick tiles in colour 74430 CM.5 Soffit return tiles in colour 14019 CM.1 One-piece corners in colour 14019
Thickness:	32.7mm, 52.7mm and 82.7mm
Reinforcing:	None
Max height of panel:	N/A
Max width of panel:	N/A
Max size of panel by area (m2):	N/A
Fixing method:	Corium backing rails fixed to the aluminium sub-frame using stainless steel self-drilling fasteners with an 8mm hexagonal head and integral sealing washer.
Bracket/clip ref:	N/A
Screws/fixings ref:	Evolution Bi-Metal (ST/ST) 5.5 x 25mm tek screws with 16mm washer.
Mortar:	Parex Historic KL
Horizontal movement joint:	Backing rail arrangement as per standard Corium detail with Everbuild 825 low mod mastic (310ml tubes)

Interface Details (curtain wall to window/door inserts)

Window interface detail:	Window fixed and bedded to SFS, epdm bonded to window and dressed to sheathing board, window fixed to fully welded window pod via F trim, secured to studwork and silicon sealed.

Backing Wall

Structural support type:	100mm SFS Metsec
Insulation type:	N/A
Insulation thickness:	N/A
Airtight membrane:	200mm wide Cortex 0500FR Class B-s3, d0 EPDM Membrane with Cortex 0771FR Class B-s1,d0 paste adhesive.
Watertight membrane:	As above with inclusion of the Class B Cortex 0520FR Breather membrane with Cortex UV Façade Tape 75mm wide.
Particle board detail:	Y Wall 12mm by RCM.
Sealants and tapes:	Obex Cortex EPDM tapes and paste adhesive.
Fixings ref:	Wing Tip Self Drilling Screws.
Construction tolerance allowed between SFS (+/-)	+/- 5mm

Drainage

Drainage type (pressure equalised etc.):	Gravity rear drained and ventilated.
Drainage specification and weep holes etc.	8mm drilled holes to bottom of the base flashing.

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:	As detailed in Section 7

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:	Wienerberger Ltd
Name:	Marcus Franklin
Position:	Senior Technical and Design Advisor
Date:	04/04/2023

Sample during testing

Photograph No. 1

Photograph No. 2

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 test sample and used to create average deflections equal to those recorded at a positive pressure differential of 600 Pa during the static water penetration, for the specified period of at least 15 minutes.

Where multiple tests were required, testing was started at the bottom of the test sample, working upwards towards the top of the sample. The water spray was adjusted so that it only covered the area affected by the wind generator. The tests were performed consecutively with each zone being monitored for the specified time.

During the test, 25% of the overall test load was applied using static pressure.

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

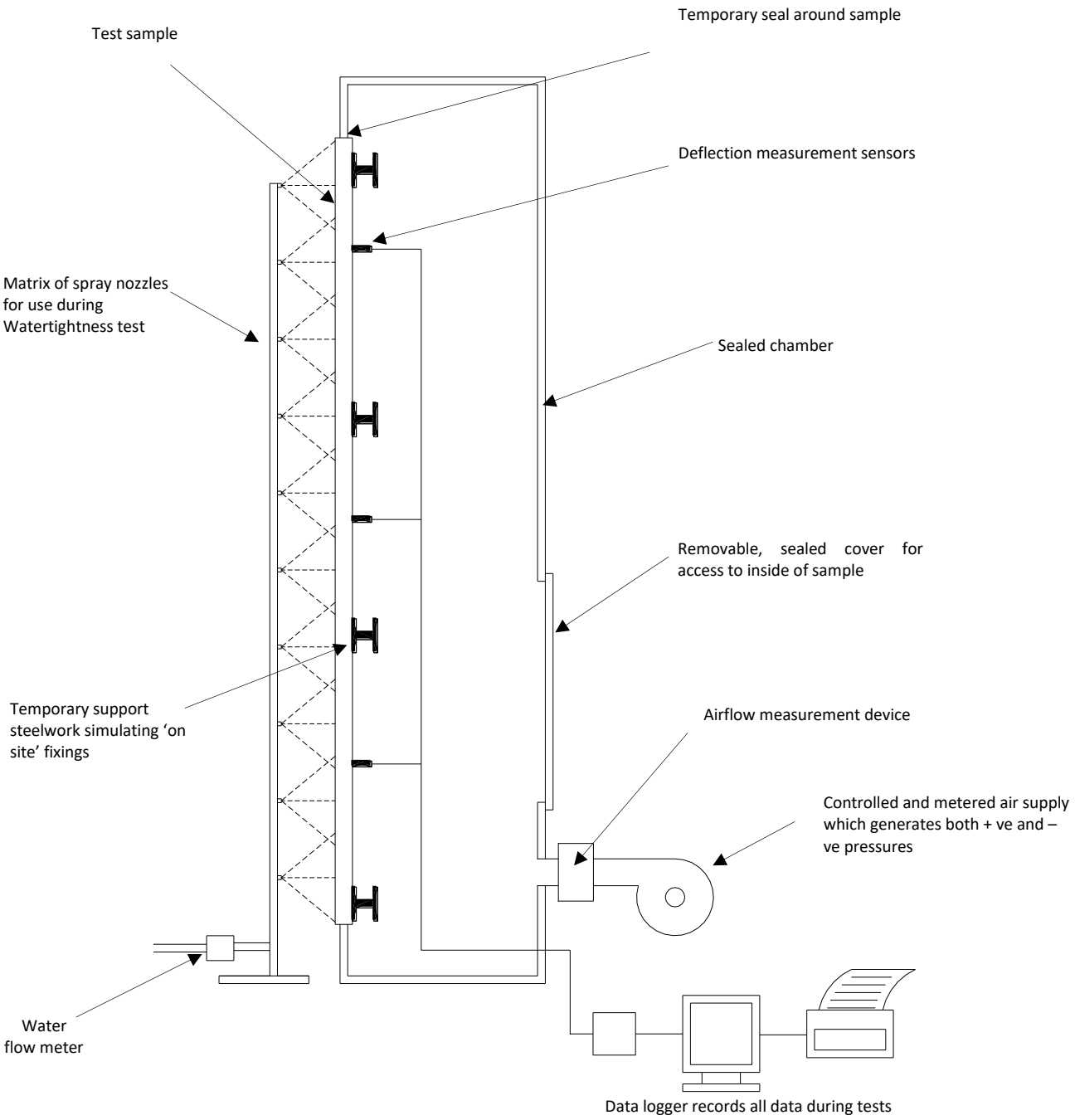
4.5.2 Hard (H2) Body Impactor

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 - Impact Resistance – Retention of Performance
Test 11 - Impact Resistance – Safety to Persons
Test 12 - Wind Resistance – Serviceability – Cavity
Test 13 - Wind Resistance – Safety – Backing Wall
Test 14 - Wind Resistance – Safety – Cavity

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.

Note: Due to the design of the sample being permeable, it was necessary to apply a coating of PVA adhesive over the entire face of the sample in order to allow the above test to be conducted on the cavity area.

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.

Note: Due to the design of the sample being permeable, it was necessary to apply a coating of PVA adhesive over the entire face of the sample in order to allow the above test to be conducted to the cavity area.

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

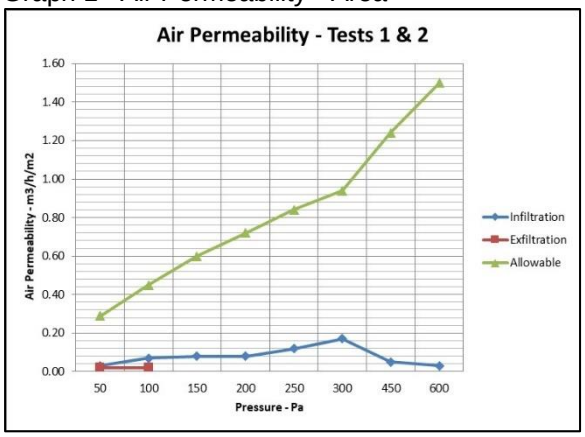
Calculated area of test sample 40.0 m^2

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 No. 1		Test No. 2	
	Ambient ° C	14.1	Ambient ° C	14.1
50	0.03		0.02	
100	0.07		0.02	
150	0.08			
200	0.08			
250	0.12			
300	0.17			
450	0.05			
600	0.03			

Note: The standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%, for the above measurements is ± 5.33 % of the reading

Graph 1 –Air Permeability - Area



6.2.2 Tests 5 & 6 - Repeat Air Permeability

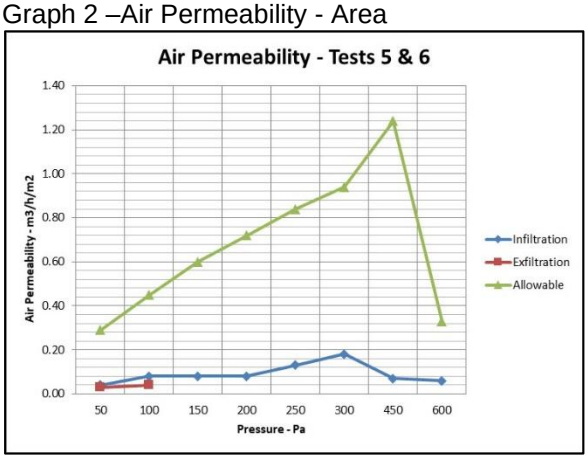
6.2.3 Fixed Element

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 ° C	5.7	Ambient ° C	5.7
50	0.04		0.03	
100	0.08		0.04	
150	0.08			
200	0.08			
250	0.13			
300	0.18			
450	0.07			
600	0.06			

No areas of concentrated leakage were found during testing.

Note: The standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95%, for the above measurements is ± 5.33 % of the reading

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)	Water	10.6
	Ambient	13.1

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)	Water	6.6
	Ambient	6.2

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

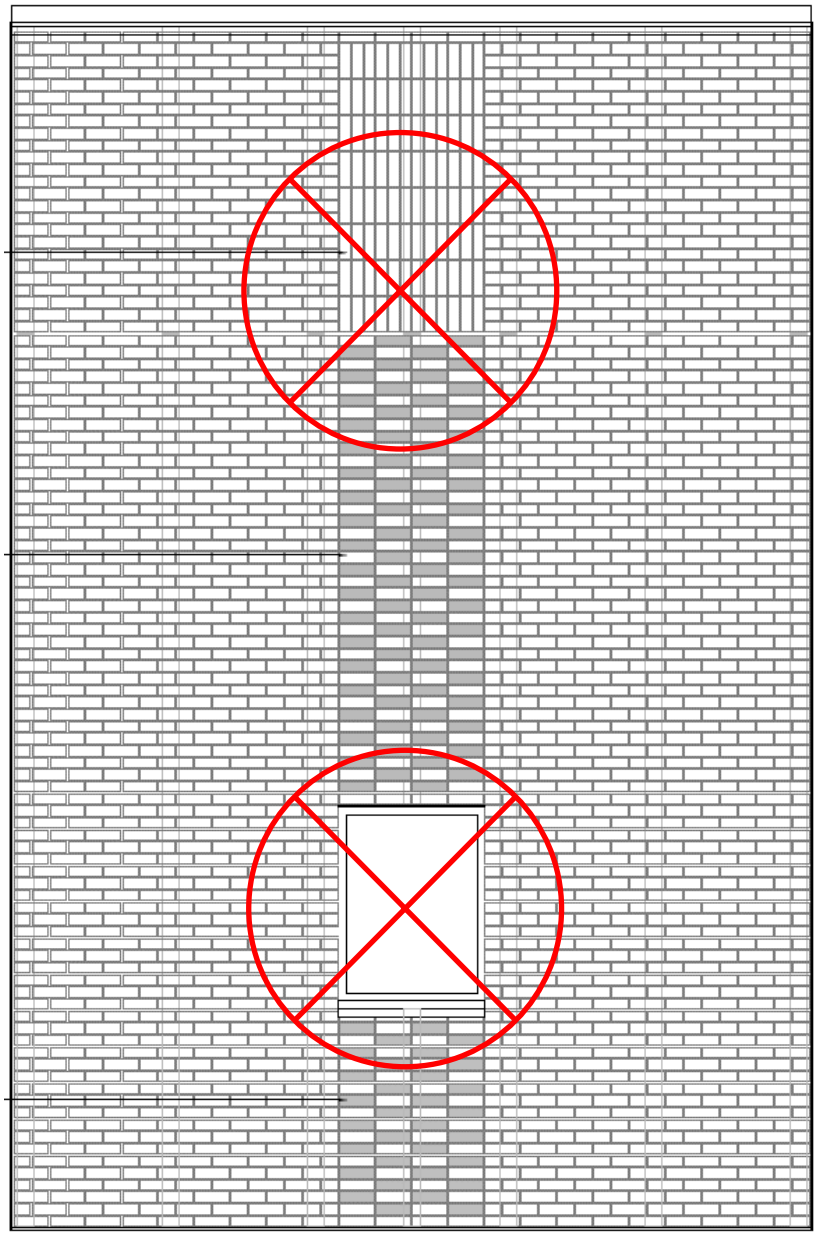
There was no water leakage observed during the water spray.

6.3.4 Test 8 - Water Penetration – Dynamic Aero Engine

Temperatures (°C)	**Water**	7.3
	Ambient	7.4

Figure 2

Dynamic Test Areas



View from Outside
Not to Scale

Observations

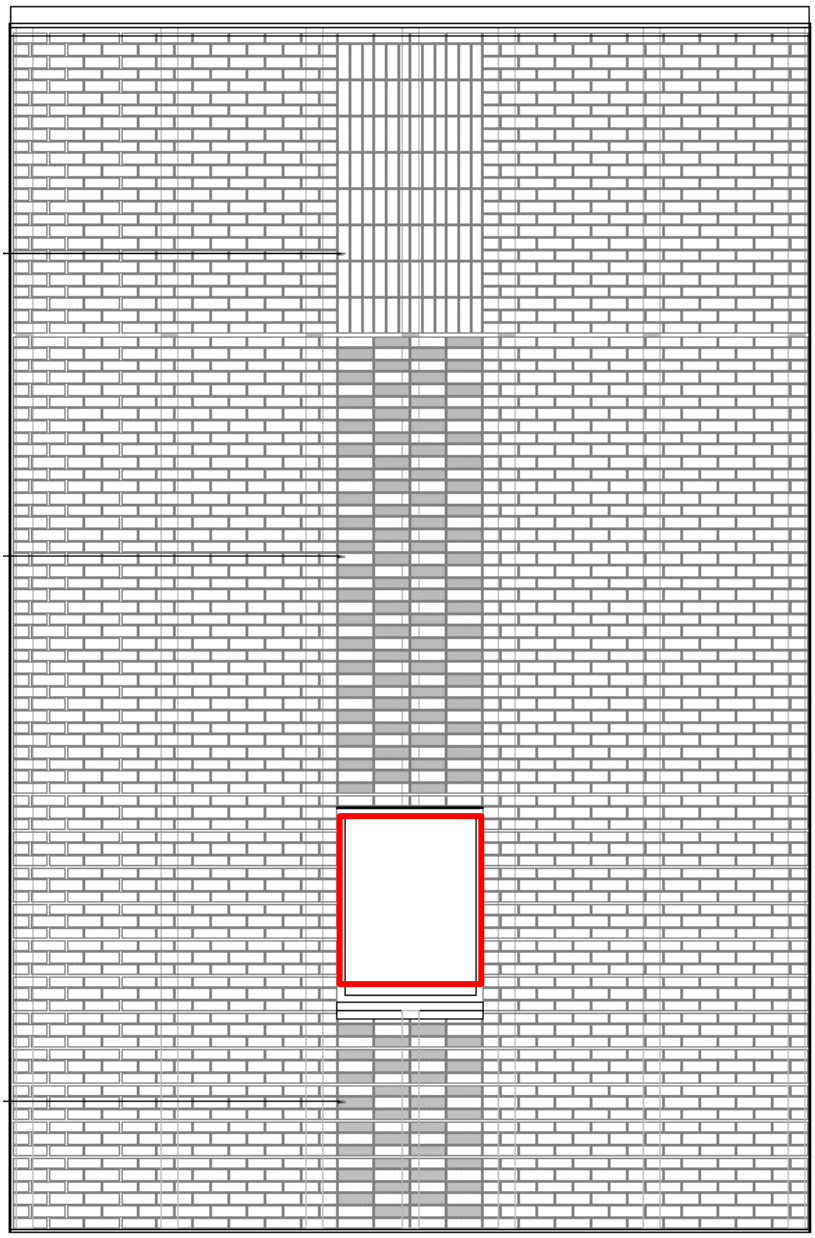
The sample was subjected to testing as described in section 5.2.1, for a period of not less than 15 minutes, during which no water leakage was observed through the sample.

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 3

Hose Test Areas



View from Outside
Not to Scale

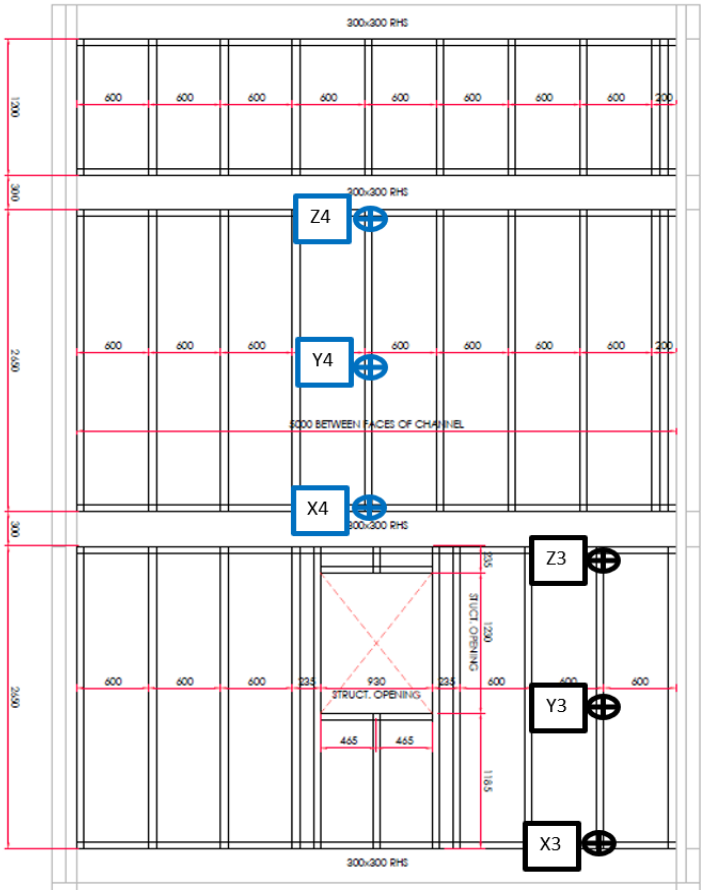
6.4 Wind Resistance

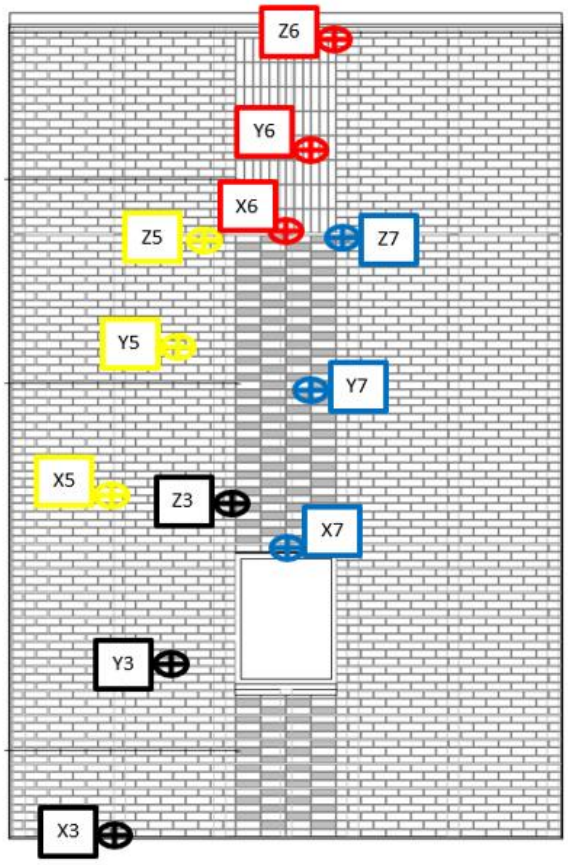
Probe Group Identification	Calculation of deflection
Group A comprised of probes X3, Y3 & Z3 – Backing Wall	= Probe Y3 – ((Probe X3 + Probe Z3)/2)
Group B comprised of probes X4, Y4 & Z4 – Backing Wall	= Probe Y4 – ((Probe X4 + Probe Z4)/2)
Group C comprised of probes X3, Y3 & Z3 – Cavity	= Probe Y3 – ((Probe X3 + Probe Z3)/2)
Group E comprised of probes X5, Y5 & Z5 – Cavity	= Probe Y5 – ((Probe X5 + Probe Z5)/2)
Group F comprised of probes X6, Y6 & Z6 – Cavity	= Probe Y6 – ((Probe X6 + Probe Z6)/2)
Group D comprised of probes X7, Y7 & Z7 – Cavity	= Probe Y7 – ((Probe X7 + Probe Z7)/2)

An inspection carried out following tests 4, 12, 13 and 14, after both positive and negative pressure testing, showed no evidence of any permanent deformation or damage to the test sample.

Figure 3

Positions of Deflection Measurement Probes





View from Outside
Not to Scale

6.4.1 Tests 4 & 12 - Wind Resistance, Serviceability

Test Date	27.02.23	15.03.23
Temperatures (°C)	6.1	5.5

Measured Length of Framing Member (mm)		Allowable Deflection	
		Ratio	Calculated (mm)
Group A	2502	L/360 or 10mm	7.0
Group B	2498	L/360 or 10mm	6.9
Group C	3192	L/360	8.9
Group D	3155	L/360	8.8
Group E	3230	L/360	9.0
Group F	1850	L/360	5.1

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

6.4.1.1 Wind Resistance, Serviceability - Positive Pressure

Backing Wall		
Positive Pressure Pa	Results	
	Group A	Group B
0	0.0	0.0
600	1.3	1.1
1200	2.5	2.2
1800	3.8	3.2
2400	5.1	4.3
Residuals Immediately following test	0.1	0.1

Cavity				
Positive Pressure Pa	Results			
	Group C	Group D	Group E	Group F
0	0.0	0.0	0.0	0.0
600	0.9	1.9	2.0	0.4
1200	1.9	3.4	3.5	0.8
1800	3.0	5.3	5.2	1.3
2400	4.2	7.5	6.8	1.7
Residuals Immediately following test	0.3	0.9	0.1	0.0

6.4.1.2 Wind Resistance, Serviceability - Negative Pressure

Backing Wall		
Negative Pressure Pa	Results	
	Group A	Group B
0	0.0	0.0
600	1.5	1.1
1200	3.0	2.2
1800	4.5	3.4
2400	6.1	4.6
Residuals Immediately following test	0.2	0.1

Cavity				
Negative Pressure Pa	Results			
	Group C	Group D	Group E	Group F
0	0.0	0.0	0.0	0.0
600	1.3	2.0	2.2	0.3
1200	2.5	3.9	4.3	0.3
1800	4.2	6.3	6.3	0.8
2400	6.2	8.6	8.6	1.7
Residuals Immediately following test	0.6	0.3	0.1	0.5

6.4.2 Tests 13 & 14 - Wind Resistance, Safety

Temperatures (°C)	9.8

Measured Length of Framing Member (mm)		Allowable Residual Deformation	
		Ratio	Calculated (mm)
Group A	2502	L/500	5.0
Group B	2498	L/500	5.0
Group C	3192	L/500	6.4
Group D	3155	L/500	6.3
Group E	3230	L/500	6.5
Group F	1850	L/500	3.7

6.4.2.1 Wind Resistance, Safety - Positive Pressure

Backing Wall		
Positive Pressure Pa	Results	
	Group A	Group B
0	0.0	0.0
3600	7.2	6.4
Residuals Immediately following test	0.2	0.1

Cavity				
Positive Pressure Pa	Results			
	Group C	Group D	Group E	Group F
0	0.0	0.0	0.0	0.0
3600	7.1	12.3	11.2	3.0
Residuals Immediately following test	0.5	1.7	0.8	0.3

6.4.2.2 Wind Resistance, Safety - Negative Pressure

Backing Wall		
Negative Pressure Pa	Results	
	Group A	Group B
0	0.0	0.0
3600	8.2	6.2
Residuals Immediately following test	0.2	0.1

Cavity				
Negative Pressure Pa	Results			
	Group C	Group D	Group E	Group F
0	0.0	0.0	0.0	0.0
3600	12.8	13.5	14.9	2.2
Residuals Immediately following test	0.7	0.2	0.8	0.2

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 10 – Impact – Retention of Performance (Soft Body S1)

Test Date	28.02.23
Ambient Temperatures (°C)	6.8
Humidity (%RH)	84

Impact Category	Cat B
Impact Energy	120 Nm
Class Achieved	Class 1

Orange Zone						
Impact Reference	**Test Category**	**Impactor Type**	**Impact Energy (Nm)**	**Drop Height (mm)**	**Observations**	**Result**
A1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
Green Zone						
A1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1

B2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
Blue Zone						
A1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
Red Zone						
A1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
A4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
B4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
C4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
D4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E1	Cat B	Soft Body (S1)	120	245	No Damage	Class 1

E2	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E3	Cat B	Soft Body (S1)	120	245	No Damage	Class 1
E4	Cat B	Soft Body (S1)	120	245	No Damage	Class 1

6.5.2 Test 10 – Impact – Retention of Performance (Hard Body H2)

Test Date	06.03.23
Ambient Temperatures (°C)	7.8
Humidity (%RH)	79

Impact Category	Cat B
Impact Energy	10 Nm
Class Achieved	Class 4

Orange Zone						
Impact Reference	**Test Category**	**Impactor Type**	**Impact Energy (Nm)**	**Drop Height (mm)**	**Observations**	**Result**
A1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
A2	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
A3	Cat B	Hard Body (H2)	10	898	Cracked slip along three sides	Class 2
A4	Cat B	Hard Body (H2)	10	898	Cracked slip along three sides	Class 2
B1	Cat B	Hard Body (H2)	10	898	Chipped away piece weighing 42.64g	Class 4
B2	Cat B	Hard Body (H2)	10	898	Cracked away edge 4.25g	Class 4
B3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
B4	Cat B	Hard Body (H2)	10	898	Cracked edge of slip	Class 2
C1	Cat B	Hard Body (H2)	10	898	Cracked slip along three sides	Class 2
C2	Cat B	Hard Body (H2)	10	898	Cracked away edge 7.78g	Class 3
C3	Cat B	Hard Body (H2)	10	898	Cracked away edge 12.64g	Class 3
C4	Cat B	Hard Body (H2)	10	898	Cracked away edge 11.51g	Class 3
D1	Cat B	Hard Body (H2)	10	898	Cracked brick	Class 3
D2	Cat B	Hard Body (H2)	10	898	Cracked away edge 8.03g	Class 4
D3	Cat B	Hard Body (H2)	10	898	Cracked away edge 0.79g	Class 3
D4	Cat B	Hard Body (H2)	10	898	Chipped edge 0.06g	Class 3
E1	Cat B	Hard Body (H2)	10	898	Corner chipped away 3.97g fell away	Class 4
E2	Cat B	Hard Body (H2)	10	898	Corner chipped away 4.78g	Class 4
E3	Cat B	Hard Body (H2)	10	898	Corner chipped away 9.22g	Class 4

E4	Cat B	Hard Body (H2)	10	898	Corner chipped away 3.63g	Class 4

Green Zone						
A1	Cat B	Hard Body (H2)	10	898	Cracked along slip	Class 2
A2	Cat B	Hard Body (H2)	10	898	Cracked along slip	Class 2
A3	Cat B	Hard Body (H2)	10	898	Cracked along slip	Class 3
A4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
B1	Cat B	Hard Body (H2)	10	898	Cracked edge 3.05g	Class 2
B2	Cat B	Hard Body (H2)	10	898	Cracked along slip	Class 2
B3	Cat B	Hard Body (H2)	10	898	Cracked along slip	Class 2
B4	Cat B	Hard Body (H2)	10	898	Mortar fell away 3.50g	Class 2
C1	Cat B	Hard Body (H2)	10	898	Cracked along slip	Class 2
C2	Cat B	Hard Body (H2)	10	898	Cracked edge of slip 0.90g	Class 3
C3	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
C4	Cat B	Hard Body (H2)	10	898	Mortar fell away 0.01g	Class 2
D1	Cat B	Hard Body (H2)	10	898	Scuff mortar fell away 1.08g	Class 2
D2	Cat B	Hard Body (H2)	10	898	Cracked corner away 2.14g	Class 3
D3	Cat B	Hard Body (H2)	10	898	Chipped away edge 0.36g	Class 3
D4	Cat B	Hard Body (H2)	10	898	Cracked mortar	Class 2
E1	Cat B	Hard Body (H2)	10	898	Corner cracked away 7.21g	Class 4
E2	Cat B	Hard Body (H2)	10	898	Cracked corner	Class 3
E3	Cat B	Hard Body (H2)	10	898	Corner cracked away 3.28g	Class 4
E4	Cat B	Hard Body (H2)	10	898	Corner cracked away 2.29g	Class 4
Blue Zone						
A1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
A2	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
A3	Cat B	Hard Body (H2)	10	898	Cracked slip mortar fell away 3.29g	Class 2
A4	Cat B	Hard Body (H2)	10	898	Cracked slip mortar fell away 2.85g	Class 3
B1	Cat B	Hard Body (H2)	10	898	Scuff mortar fell away 2.49g	Class 2
B2	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
B3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
B4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2

C1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
C2	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
C3	Cat B	Hard Body (H2)	10	898	Cracked slip mortar fell away 2.72g	Class 2
C4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
D1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
D2	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
D3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
D4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
E1	Cat B	Hard Body (H2)	10	898	Cracked corner	Class 3
E2	Cat B	Hard Body (H2)	10	898	Cracked corner	Class 3
E3	Cat B	Hard Body (H2)	10	898	Cracked corner	Class 2
E4	Cat B	Hard Body (H2)	10	898	Cracked corner	Class 3
Red Zone						
A1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
A2	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
A3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
A4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
B1	Cat B	Hard Body (H2)	10	898	No Damage	Class 1
B2	Cat B	Hard Body (H2)	10	898	No Damage	Class 1
B3	Cat B	Hard Body (H2)	10	898	No Damage	Class 1
B4	Cat B	Hard Body (H2)	10	898	Cracked mortar	Class 2
C1	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
C2	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
C3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
C4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
D1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
D2	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
D3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 2
D4	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
E1	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
E2	Cat B	Hard Body (H2)	10	898	Scuff	Class 2
E3	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3
E4	Cat B	Hard Body (H2)	10	898	Cracked slip	Class 3

Photograph No. 3

Showing damage caused following impact reference C2 on the orange zone

Photograph No. 4

Showing damage caused following impact reference B2 on the orange zone

Photograph No. 5

Showing damage caused following impact reference E3 on the orange zone

Photograph No. 6

Showing damage caused following impact reference D3 on the orange zone

Photograph No. 7

Showing damage caused following impact reference E4 on the orange zone

Photograph No. 8

Showing damage caused following impact reference D4 on the orange zone

Photograph No. 9

Showing damage caused following impact reference B1 on the orange zone

Photograph No. 10

Showing damage caused following impact reference D2 on the orange zone

Photograph No. 11

Showing damage caused following impact reference E2 on the orange zone

Photograph No. 12

Showing damage caused following impact reference D2 on the green zone

Photograph No. 13

Showing damage caused following impact reference E1 on the green zone

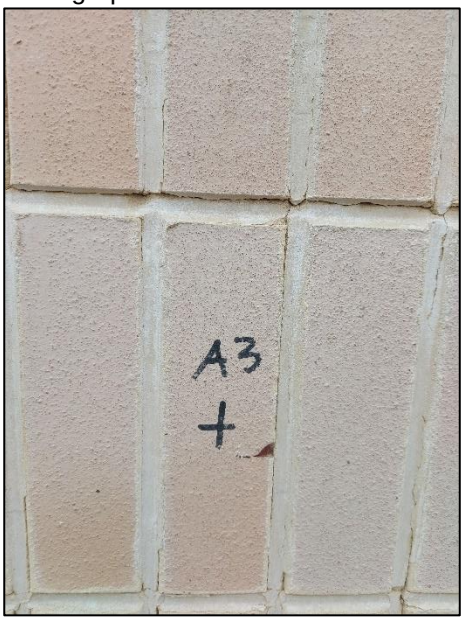
Photograph No. 14

Showing damage caused following impact reference C4 on the blue zone

Photograph No. 15

Showing damage caused following impact reference D4 on the blue zone

Photograph No. 16



Showing damage caused following impact reference A3 on the red zone

6.5.3 Test 11 - Impact – Safety to Persons (Soft Body S1)

Test Date	01.03.23
Ambient Temperatures (°C)	5.1
Humidity (%RH)	91

Impact Category	Cat B
Impact Energy	500 Nm
Risk Category	Negligible Risk

Orange Zone						
Impact Reference	**Test Category**	**Impactor Type**	**Impact Energy (Nm)**	**Drop Height (mm)**	**Observations**	**Result**
A1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A3	Cat B	Soft Body (S1)	500	1020	Mortar fell away	Low Risk
A4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
Green Zone						
A1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk

E3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
Blue Zone						
A1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
Red Zone						
A1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
A4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
B4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
C3	Cat B	Soft Body (S1)	500	1020	Cracking on mortar noticed on areas	Neg Risk
C4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D2	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
D4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E1	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E2	Cat B	Soft Body (S1)	500	1020	Cracking on mortar noticed on areas	Neg Risk
E3	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk
E4	Cat B	Soft Body (S1)	500	1020	No Damage	Neg Risk

6.5.4 Test 11 – Impact – Safety to Persons (Hard Body H2)

Test Date	01.03.23	06.03.23
Ambient Temperatures (°C)	5.1	7.8
Humidity (%RH)	91	79

Impact Category	Cat B
Impact Energy	10 Nm
Risk Category	Low Risk

Orange Zone						
Impact Reference	Test Category	Impactor Type	Impact Energy (Nm)	Drop Height (mm)	Observations	Result
A1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
A2	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
A3	Cat B	Hard Body (H2)	10	898	Cracked slip along three sides	Negligible Risk
A4	Cat B	Hard Body (H2)	10	898	Cracked slip along three sides	Negligible Risk
B1	Cat B	Hard Body (H2)	10	898	Chipped away piece weighing 42.64g	Low Risk
B2	Cat B	Hard Body (H2)	10	898	Cracked away edge 4.25g	Low Risk
B3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
B4	Cat B	Hard Body (H2)	10	898	Cracked edge of slip	Negligible Risk
C1	Cat B	Hard Body (H2)	10	898	Cracked slip along three sides	Negligible Risk
C2	Cat B	Hard Body (H2)	10	898	Cracked away edge 7.78g	Low Risk
C3	Cat B	Hard Body (H2)	10	898	Cracked away edge 12.64g	Low Risk
C4	Cat B	Hard Body (H2)	10	898	Cracked away edge 11.51g	Low Risk
D1	Cat B	Hard Body (H2)	10	898	Cracked brick	Negligible Risk
D2	Cat B	Hard Body (H2)	10	898	Cracked away edge 8.03g	Low Risk
D3	Cat B	Hard Body (H2)	10	898	Cracked away edge 0.79g	Low Risk
D4	Cat B	Hard Body (H2)	10	898	Chipped edge 0.06g	Low Risk
E1	Cat B	Hard Body (H2)	10	898	Corner chipped away 3.97g fell away	Low Risk
E2	Cat B	Hard Body (H2)	10	898	Corner chipped away 4.78g	Low Risk
E3	Cat B	Hard Body (H2)	10	898	Corner chipped away 9.22g	Low Risk

E4	Cat B	Hard Body (H2)	10	898	Corner chipped away 3.63g	Low Risk

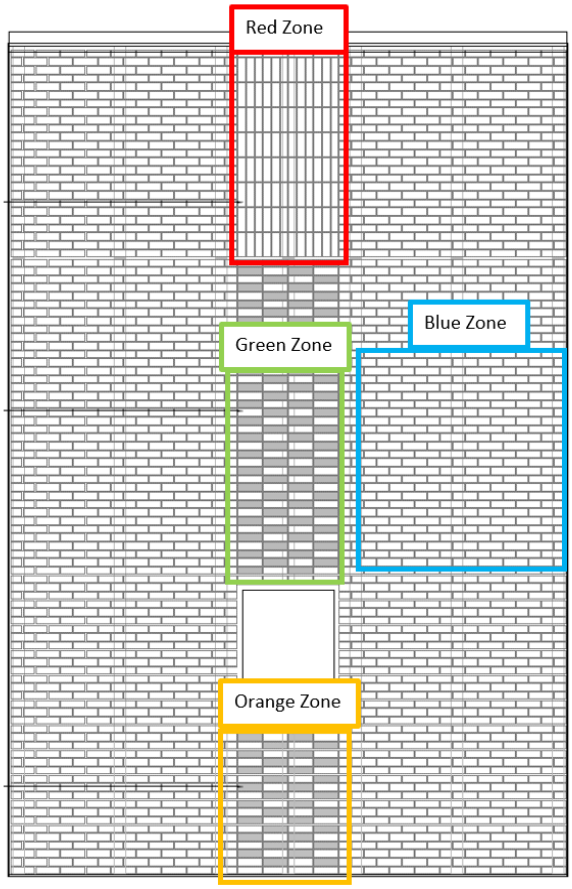
Green Zone						
A1	Cat B	Hard Body (H2)	10	898	Cracked along slip	Negligible Risk
A2	Cat B	Hard Body (H2)	10	898	Cracked along slip	Negligible Risk
A3	Cat B	Hard Body (H2)	10	898	Cracked along slip	Negligible Risk
A4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
B1	Cat B	Hard Body (H2)	10	898	Cracked edge 3.05g	Low Risk
B2	Cat B	Hard Body (H2)	10	898	Cracked along slip	Negligible Risk
B3	Cat B	Hard Body (H2)	10	898	Cracked along slip	Negligible Risk
B4	Cat B	Hard Body (H2)	10	898	Mortar fell away 3.50g	Low Risk
C1	Cat B	Hard Body (H2)	10	898	Cracked along slip	Negligible Risk
C2	Cat B	Hard Body (H2)	10	898	Cracked edge of slip 0.90g	Low Risk
C3	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
C4	Cat B	Hard Body (H2)	10	898	Mortar fell away 0.01g	Low Risk
D1	Cat B	Hard Body (H2)	10	898	Scuff mortar fell away 1.08g	Low Risk
D2	Cat B	Hard Body (H2)	10	898	Cracked corner away 2.14g	Low Risk
D3	Cat B	Hard Body (H2)	10	898	Chipped away edge 0.36g	Low Risk
D4	Cat B	Hard Body (H2)	10	898	Cracked mortar	Negligible Risk
E1	Cat B	Hard Body (H2)	10	898	Corner cracked away 7.21g	Low Risk
E2	Cat B	Hard Body (H2)	10	898	Cracked corner	Negligible Risk
E3	Cat B	Hard Body (H2)	10	898	Corner cracked away 3.28g	Low Risk
E4	Cat B	Hard Body (H2)	10	898	Corner cracked away 2.29g	Low Risk
Blue Zone						
A1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
A2	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
A3	Cat B	Hard Body (H2)	10	898	Cracked slip mortar fell away 3.29g	Low Risk

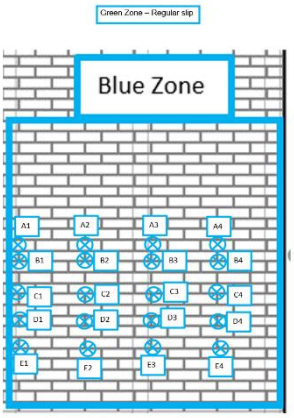
A4	Cat B	Hard Body (H2)	10	898	Cracked slip mortar fell away 2.85g	Negligible Risk
B1	Cat B	Hard Body (H2)	10	898	Scuff mortar fell away 2.49g	Low Risk
B2	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
B3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
B4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
C1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
C2	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
C3	Cat B	Hard Body (H2)	10	898	Cracked slip mortar fell away 2.72g	Low Risk
C4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
D1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
D2	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
D3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
D4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
E1	Cat B	Hard Body (H2)	10	898	Cracked corner	Negligible Risk
E2	Cat B	Hard Body (H2)	10	898	Cracked corner	Negligible Risk
E3	Cat B	Hard Body (H2)	10	898	Cracked corner	Negligible Risk
E4	Cat B	Hard Body (H2)	10	898	Cracked corner	Negligible Risk
Red Zone						
A1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
A2	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
A3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
A4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
B1	Cat B	Hard Body (H2)	10	898	No Damage	Negligible Risk
B2	Cat B	Hard Body (H2)	10	898	No Damage	Negligible Risk
B3	Cat B	Hard Body (H2)	10	898	No Damage	Negligible Risk
B4	Cat B	Hard Body (H2)	10	898	Cracked mortar	Negligible Risk
C1	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk

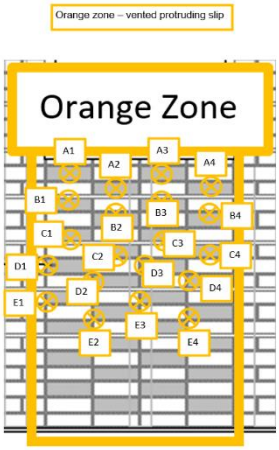
C2	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
C3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
C4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
D1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
D2	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
D3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
D4	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
E1	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
E2	Cat B	Hard Body (H2)	10	898	Scuff	Negligible Risk
E3	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk
E4	Cat B	Hard Body (H2)	10	898	Cracked slip	Negligible Risk

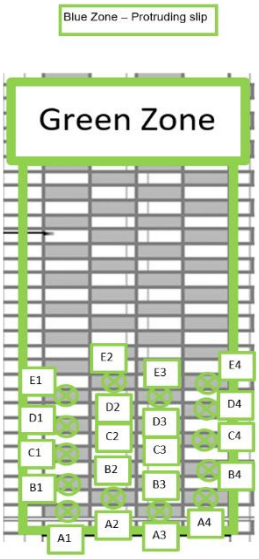
Photographs as shown in Section 6.5.2 - Impact – Retention of Performance (Hard Body H2)

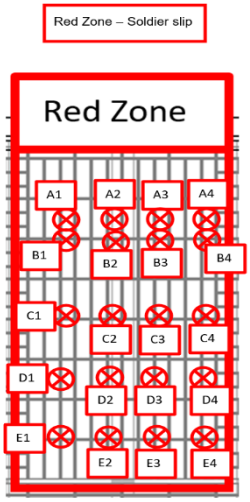
6.5.5 Impact Locations







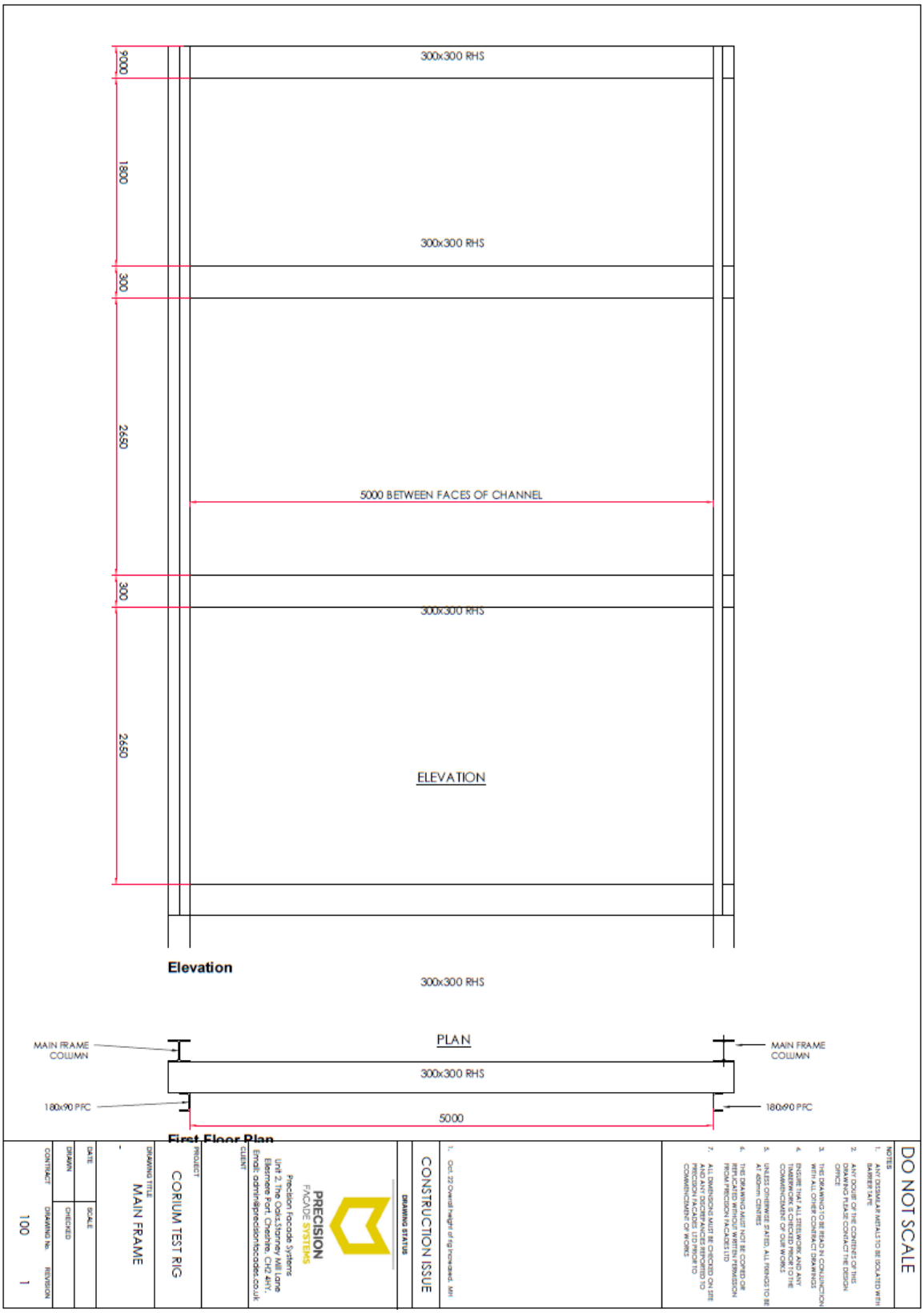


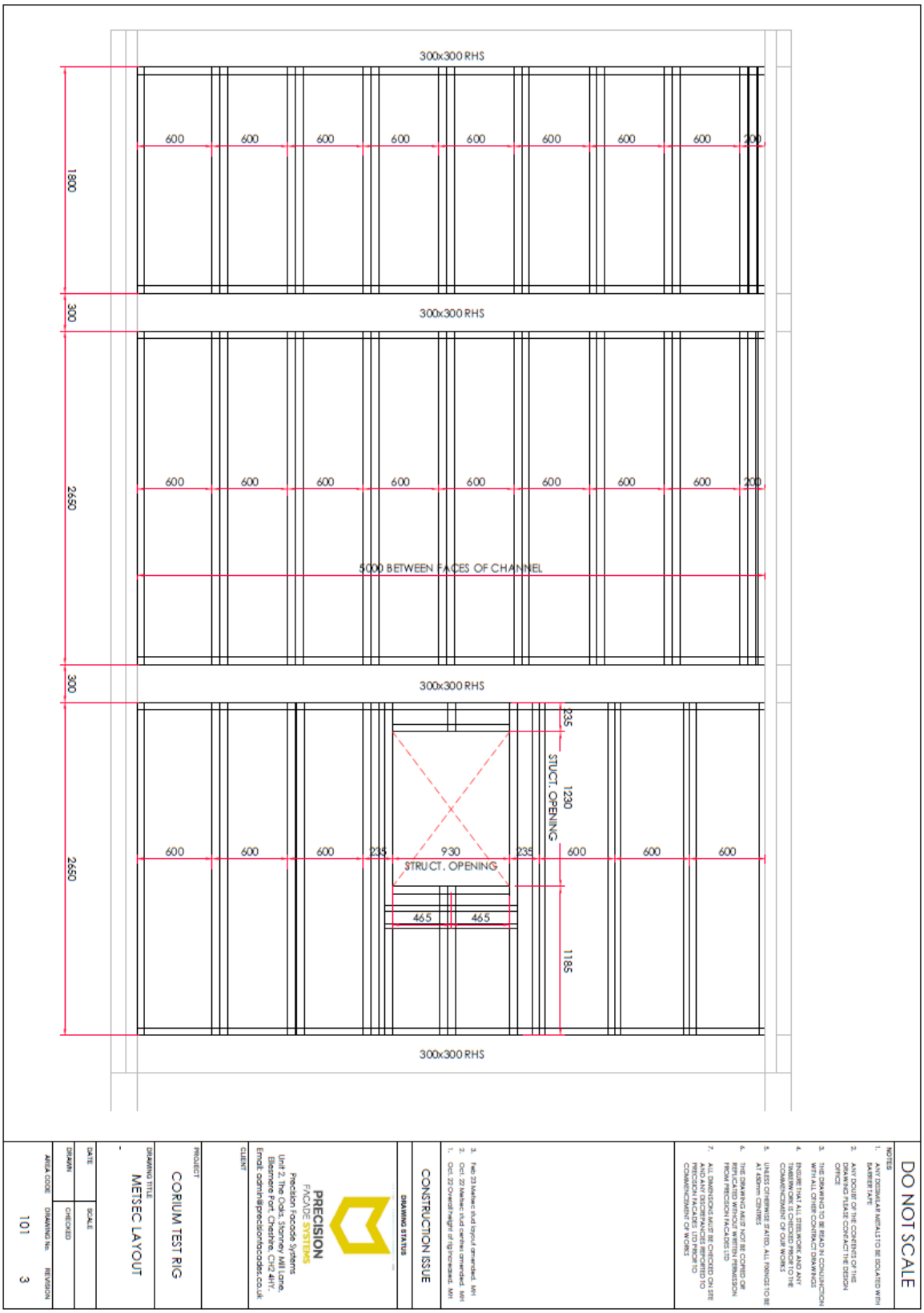


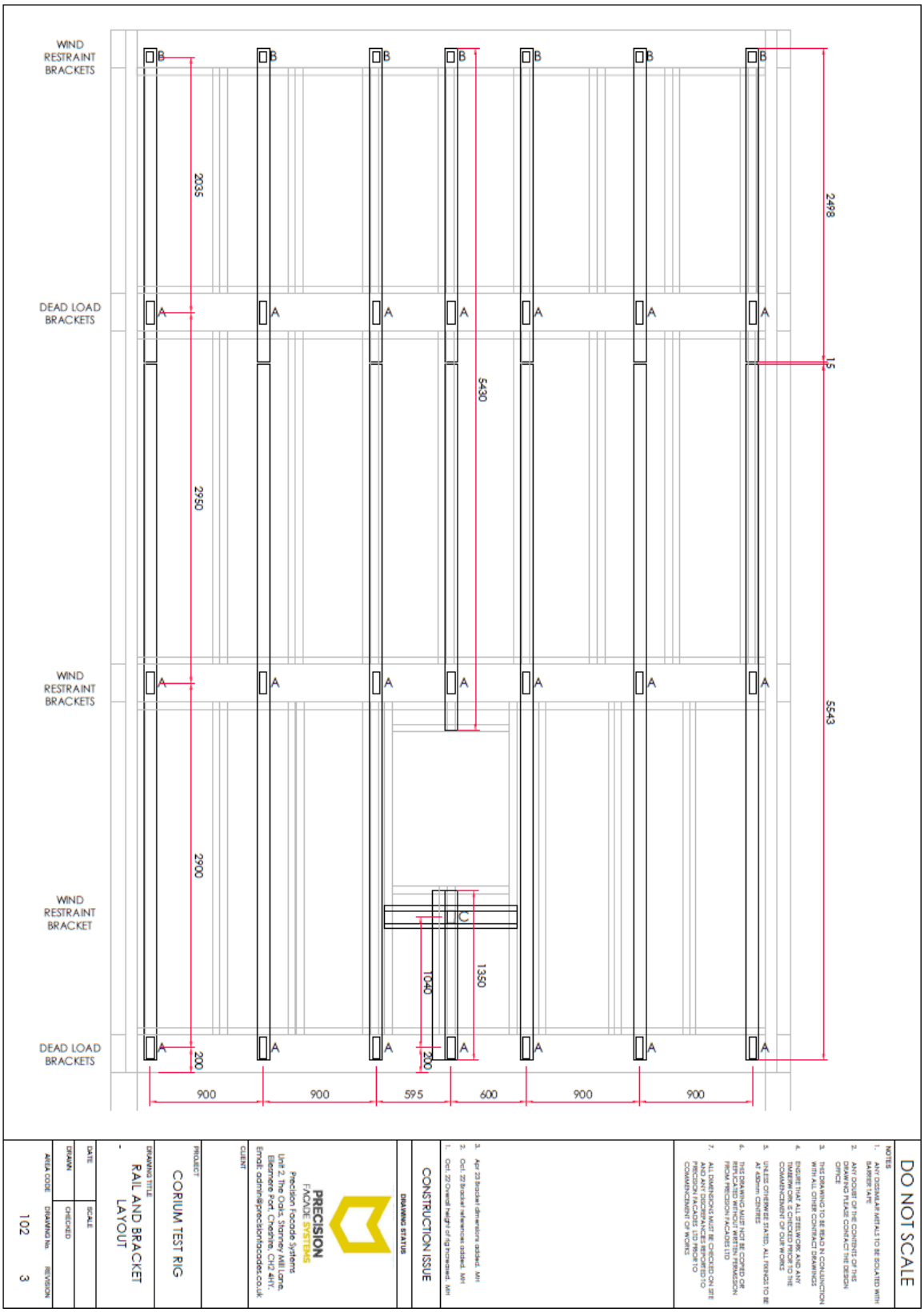
Impact Location	Description
A	Centre of slip
B	Top edge of slip
C	Bottom edge of slip
D	Corner of slip
E	Side of slip

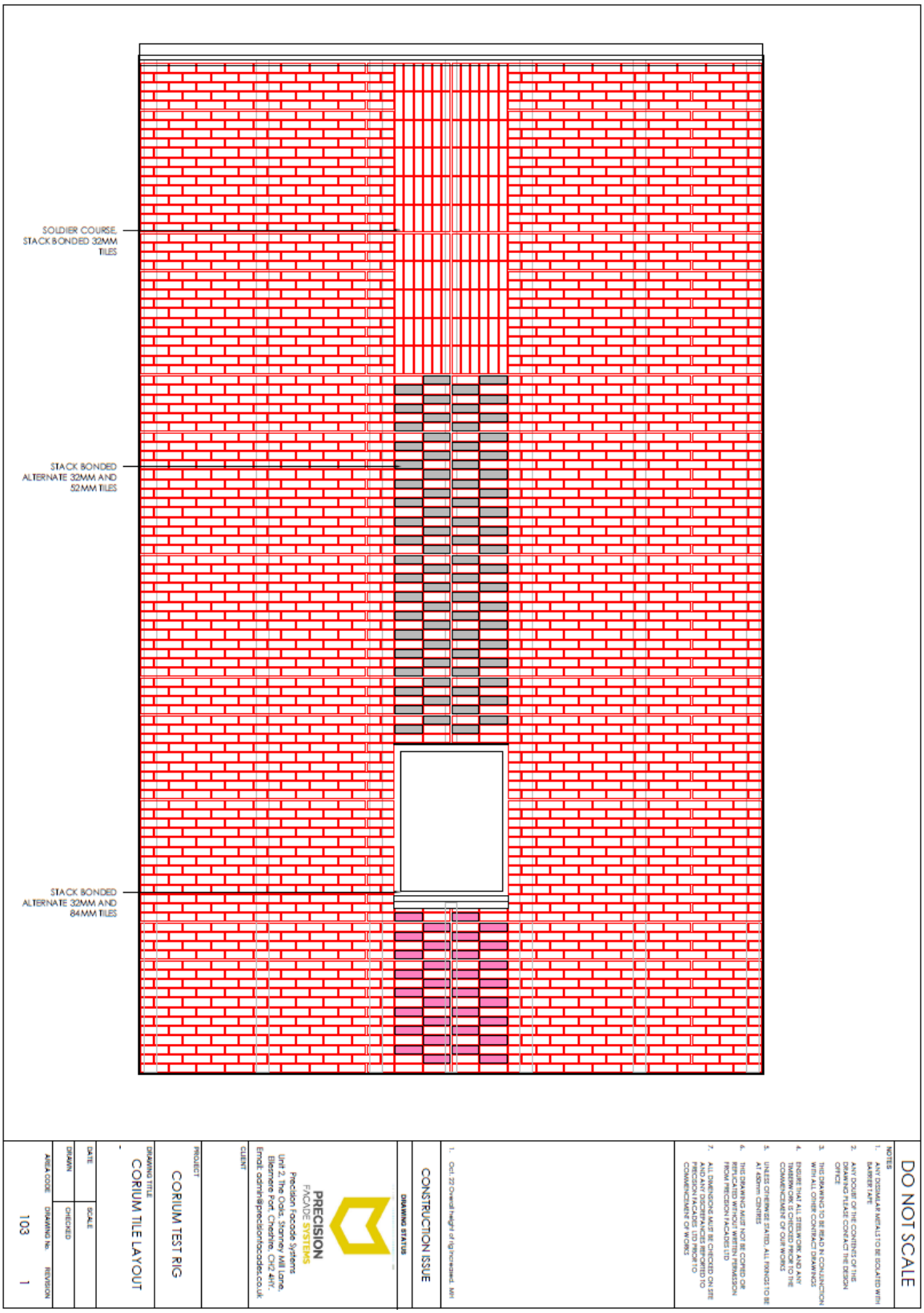
View from Outside
Not to Scale

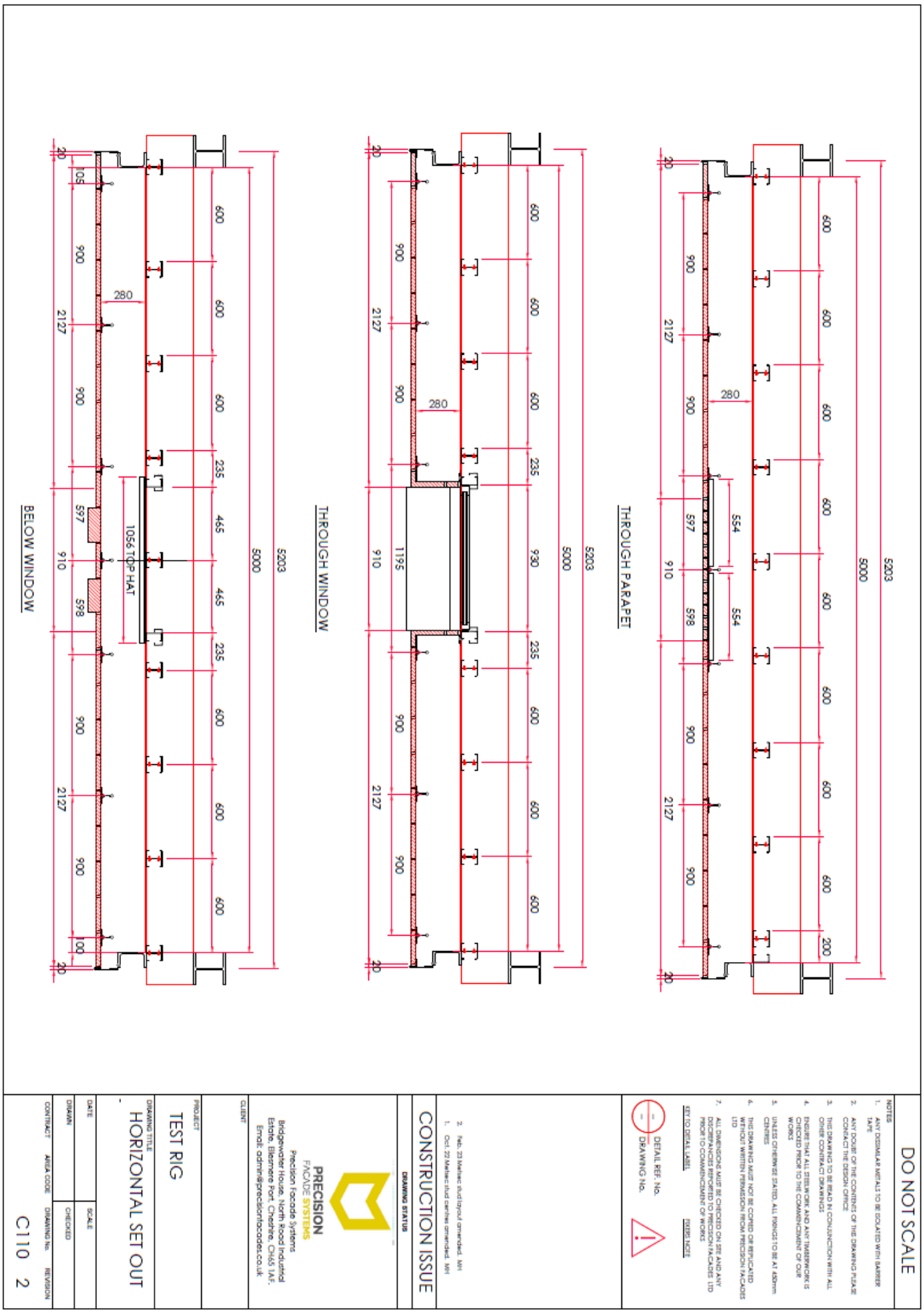
7. System Drawings

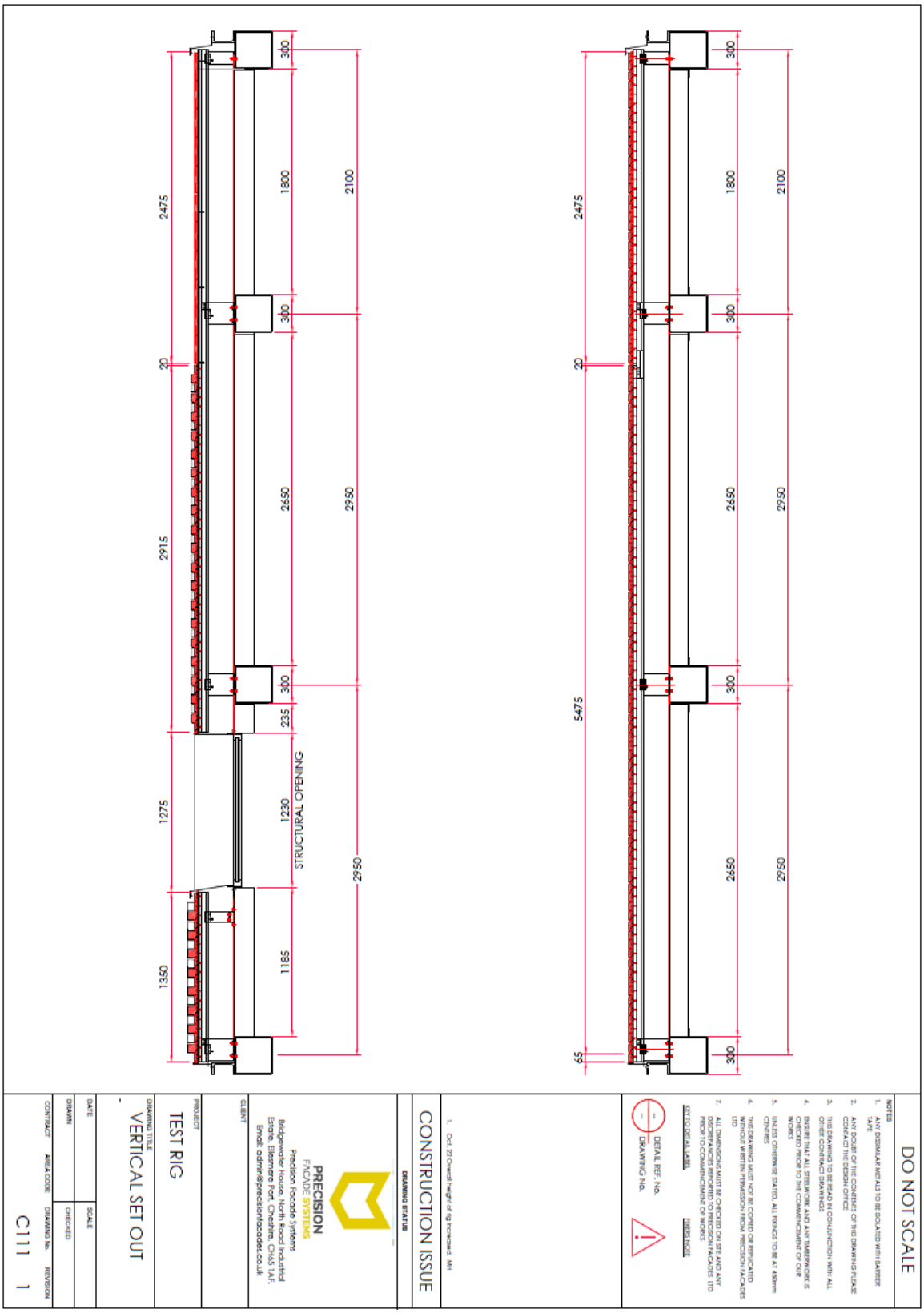


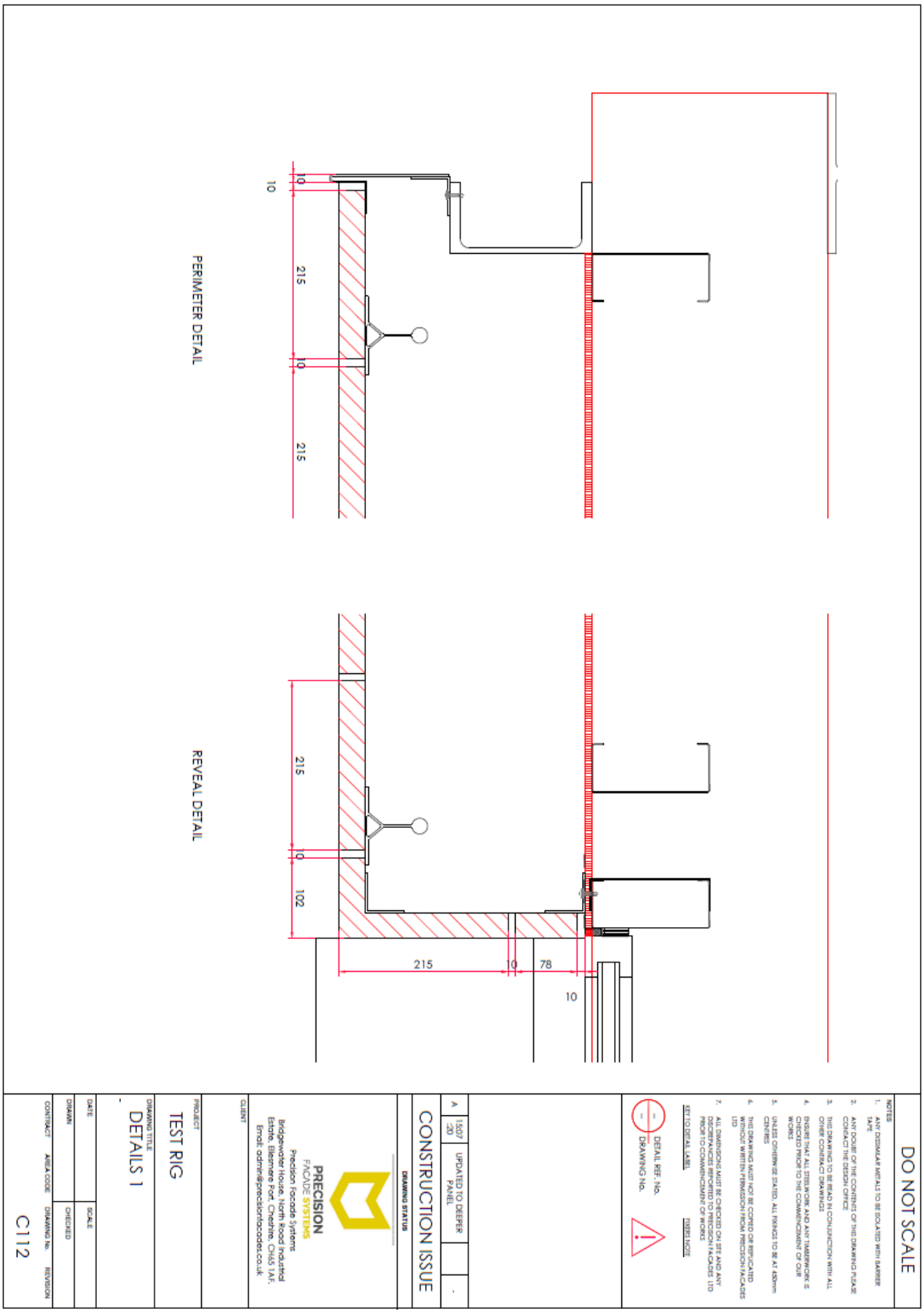


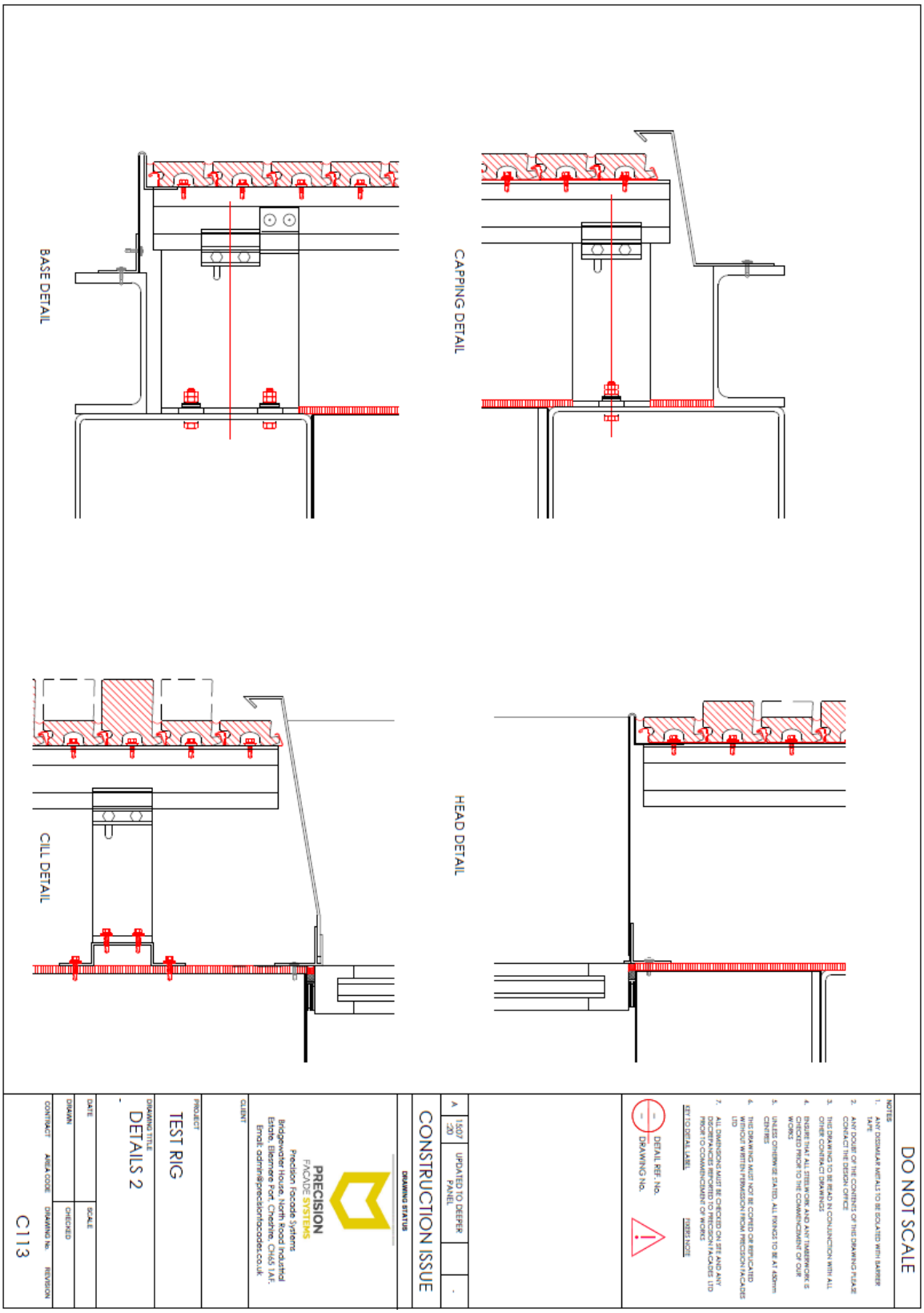


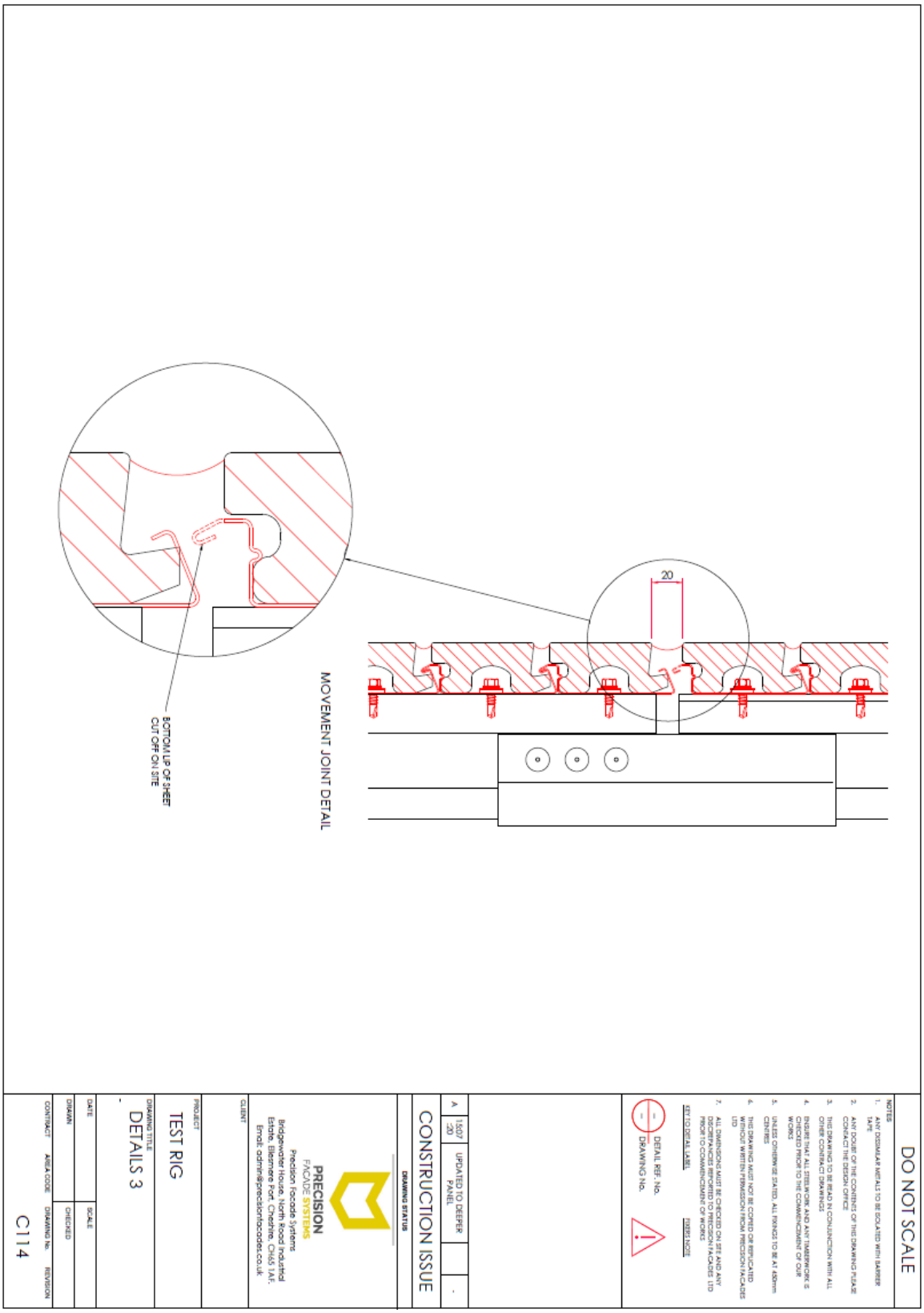


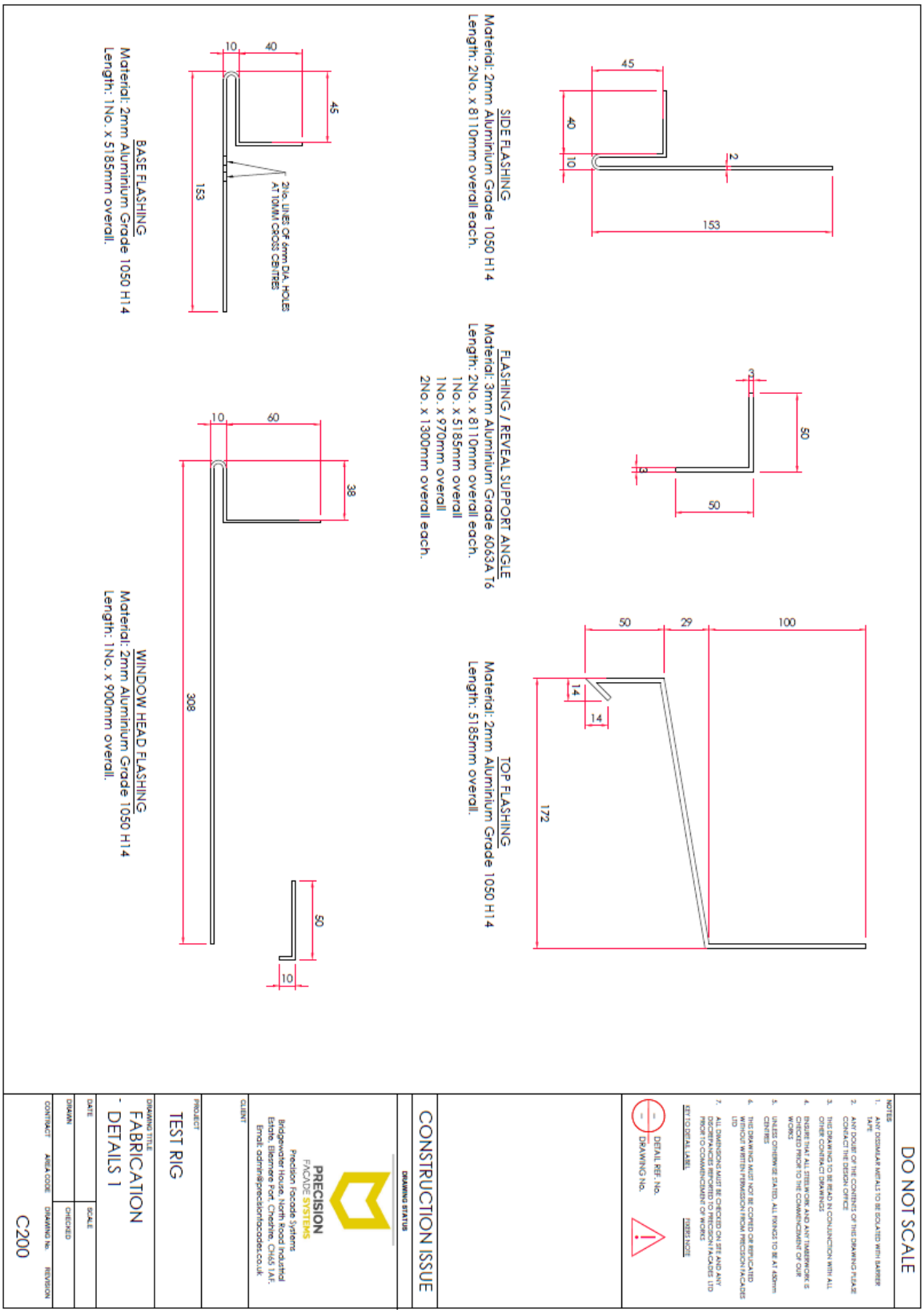


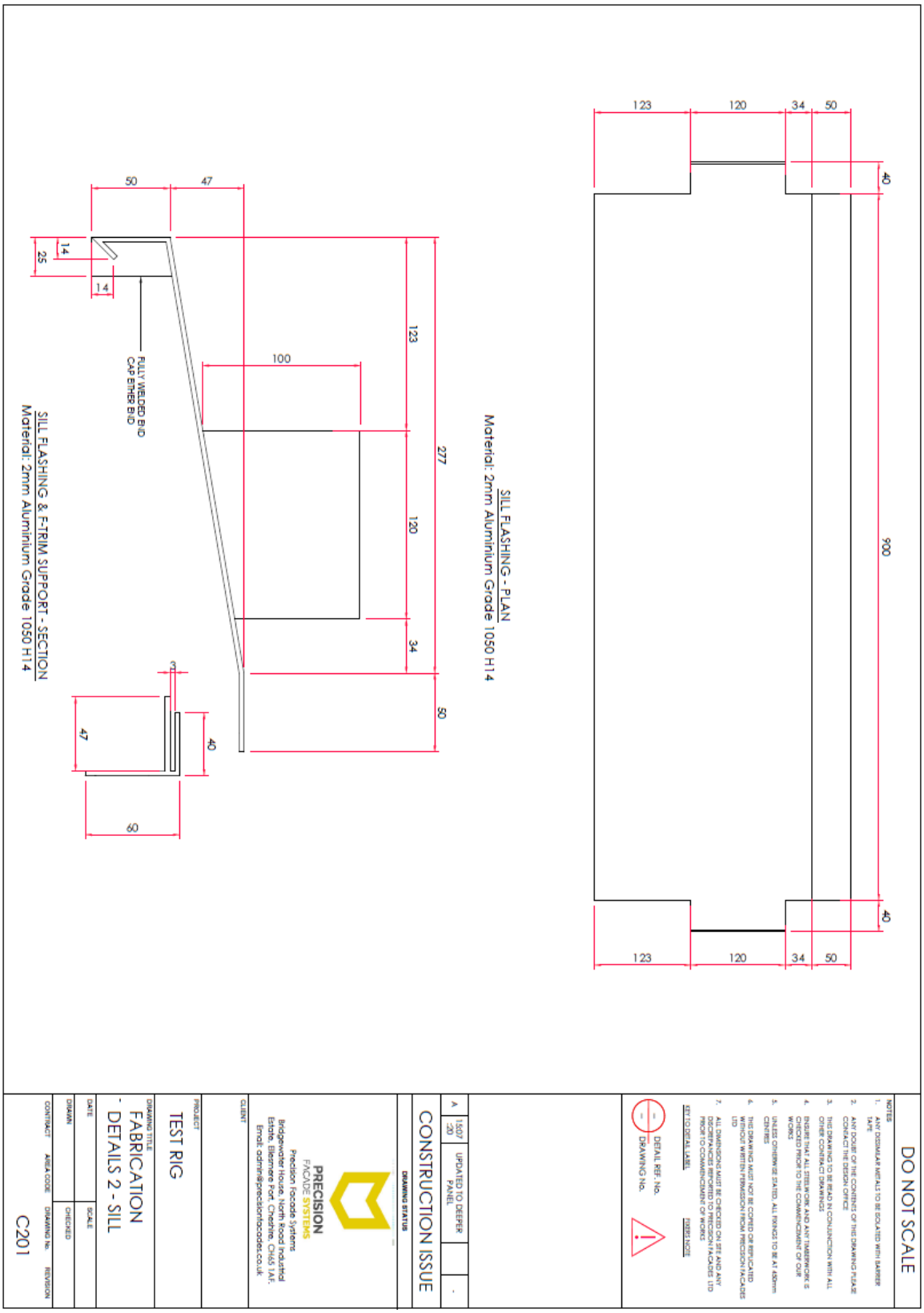


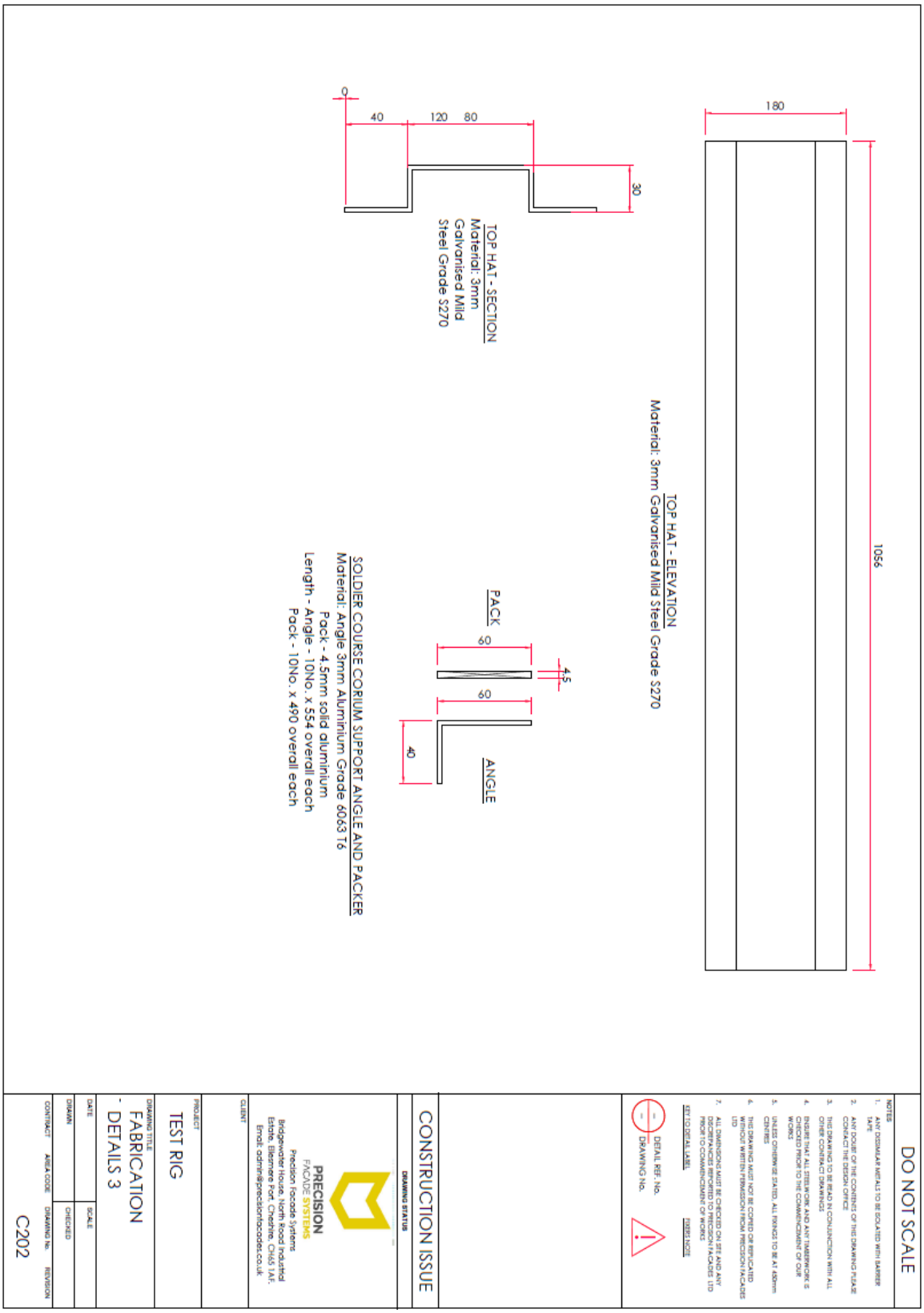


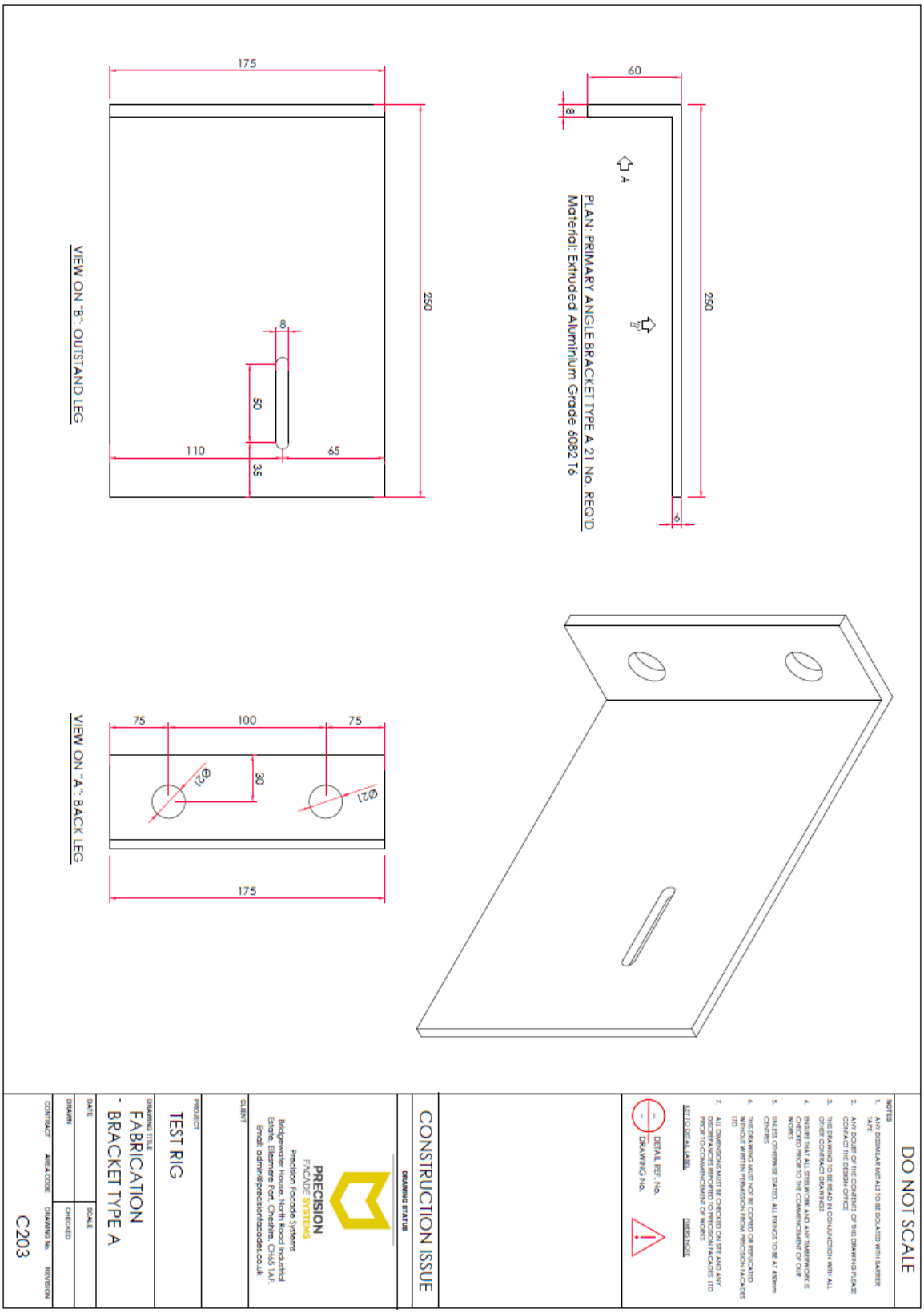


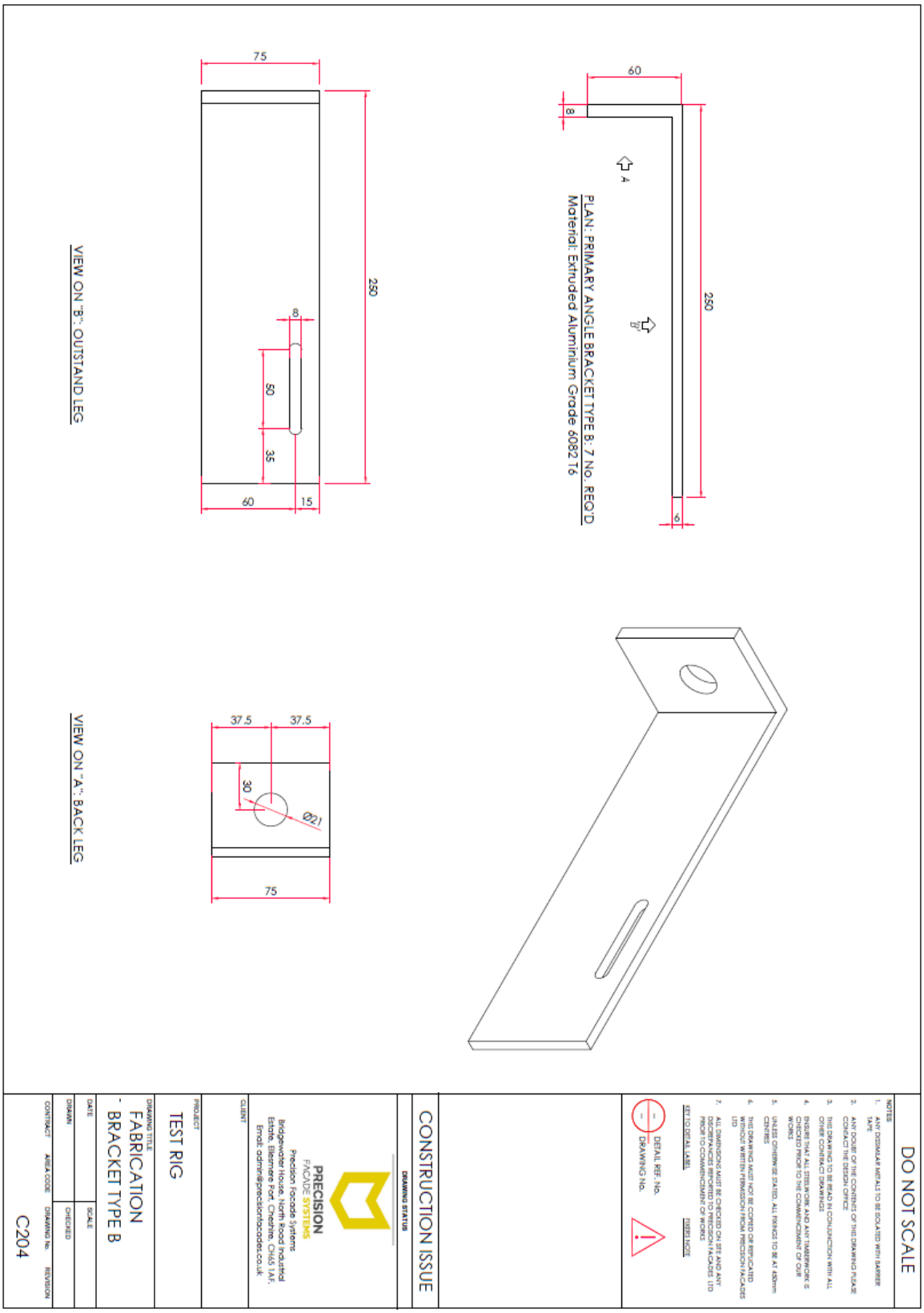




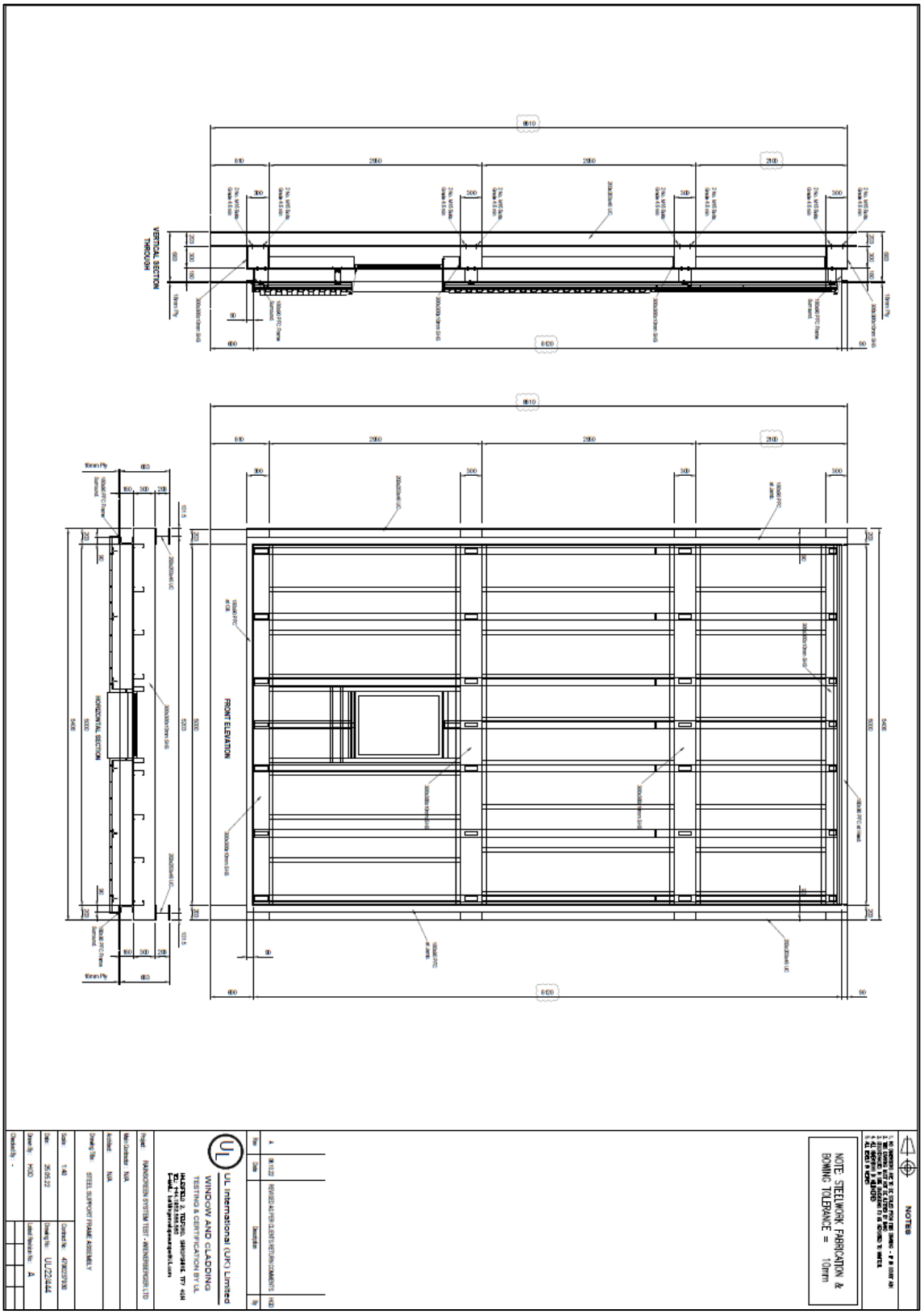








8. Support Steelwork Drawing

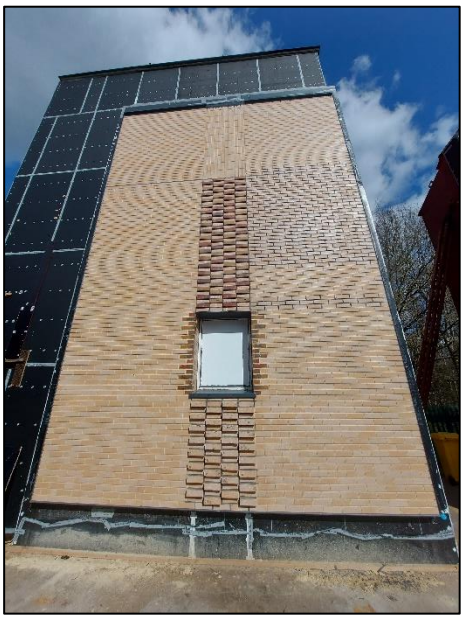


9. Dismantling

The dismantling was conducted on 27th March 2023 by representatives of Wienerberger Limited and was witnessed by representatives of UL International (UK) Limited.

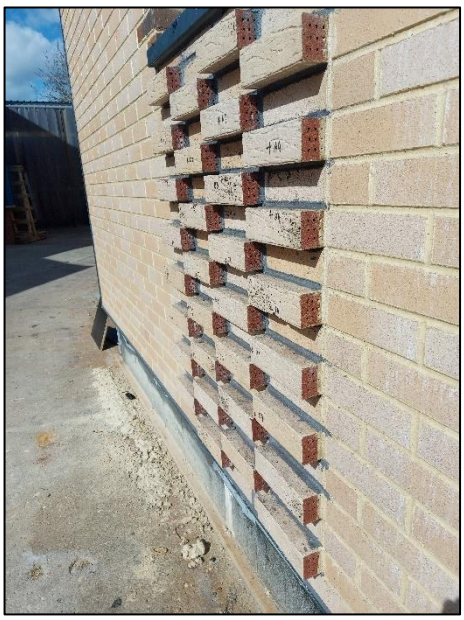
There was no water evident in the system in parts designed not to be wetted, and it was found that the system fully complied with the system drawings in Section 7 provided by Wienerberger Limited at the time of the dismantle.

Photograph No. 17



Sample prior to dismantle

Photograph No. 18



Perforated brick section

Photograph No. 19

Window and SFS detail

Photograph No. 20

Sample with bricks removed from front face

Photograph No. 21

Vertical rails with horizontal trays removed

Photograph No. 22

Vertical rails with horizontal trays removed

Photograph No. 23

Bottom of window system

Photograph No. 24

Bottom of window system

Photograph No. 25

Perforated brick depth
50 mm

Photograph No. 26

Perforated brick length 219 mm

Photograph No. 27

Regular brick length 215 mm

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

UL International (UK) Limited is an independent UKAS accredited testing laboratory and certification body. We provide a comprehensive range of services to the building and construction industries, either onsite or at our own state-of-the-art test laboratory in Telford, Shropshire, in the heart of industrial England.

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