

WINTech

BUILDING ENVELOPE TESTING

Technical Report

Report No: R12845-2



**Bailey Total Building Envelope
Blatchford Close
Horsham
West Sussex
RH13 5RF**

Project

**Platinum Rainscreen System including Linear, Modular & Fusion
Panel Types
CWCT Test Sequence
Project Ref: 12845**

24th June 2014

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Testing Conducted by: Wintech Engineering Ltd
Halesfield 2
Telford
Shropshire
TF7 4QH

Test Conducted at: Above Address

Test Conducted for: Bailey Total Building Envelope

Standards Specified: CWCT Test Methods for Building Envelopes – Dec 2005;
Sections 7, 11 & 12, CWCT TN 76 & BS 8200 as per method
statement DPP/M12845-2 dated 22nd May 2014

The Test Sequence
was Witnessed Wholly
or in Part by:

D Gilmore	Bailey Total Building Envelope
N Brautigam	Prater Ltd
D Walker	WSP Group Plc
L Gilmore	Bailey Total Building Envelope
I Rubery	Costain Group Plc
K Rice	Bailey Total Building Envelope
G Martin	Bailey Total Building Envelope

Project No: 12845

Dates of Final
Test Sequence: 27th May 2014
6th & 11th June 2014

Product/System Tested: Platinum Rainscreen System including Linear, Modular & Fusion
Panel Types

Tests Performed: As Listed in Section 5 – Test Procedures

Final Test Sequence
Conducted by: D Reynolds Wintech Engineering Ltd
D Price Wintech Engineering Ltd

Report Compiled by: J Hollins
Technical Administrator



Testing Supervised by: M Cox
Works Director



Technical Approval:
(Authorising Signatory) M Wass
Technical Director



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1. INTRODUCTION

This report describes tests conducted at the test site of Wintech Engineering Ltd on a sample of rainscreen, on behalf of Bailey Total Building Envelope.

The following test sequence was conducted on the 27th May, 6th & 11th June 2014 in order to determine the weather tightness of the sample with respect to water penetration, wind and impact resistance. The test methods were in accordance with the following standards, and testing was conducted at the request of Bailey Total Building Envelope.

CWCT Standard Test Methods for Building Envelopes - December 2005

Water Penetration – Dynamic Aero Engine	CWCT Section 7
Wind Resistance – Serviceability	CWCT Section 11
Wind Resistance – Safety	CWCT Section 12
Impact – Safety (Hard & Soft body)	BS 8200 & CWCT TN 76

Testing was conducted in accordance with the following method statement; DPP/M12845-2 dated 22nd May 2014 by Wintech Engineering Ltd.

Wintech Engineering Ltd is accredited by the United Kingdom Accreditation Service as UKAS Testing Laboratory No. 2223.

The test sample was supplied and erected on to the test chamber by Bailey Total Building Envelope.

2. SUMMARY OF TEST RESULTS

The following summarises the results of tests carried out. The sample was tested in the following sequence and the associated results are as follows;

	Peak Test Pressure	Result	Date of test	Category
Test 1 – Water Penetration (Dynamic Aero Engine)	600 Pa	Pass	27.05.14	-
Test 2 – Wind Resistance (Serviceability)	1800 Pa	Pass	11.06.14	-
Test 3 – Wind Resistance (Safety)	2400 Pa	Pass	11.06.14	-
Test 4a – Impact Resistance (Retention of performance of exterior wall surfaces) - External	-	Pass	06.06.14	B
Test 4b – Impact Resistance (Safety to persons) - External	-	Pass	06.06.14	B

NOTE: The system achieved a Class 2 during serviceability impacting and a 'Negligible Risk' class during the safety impacting in accordance with CWCT TN 76.

The test sample successfully passed all of the above CWCT test requirements and all tests are either equal to or in excess of the requirements for current BS EN Standards for Curtain Walling.

THESE RESULTS ARE VALID ONLY FOR THE CONDITIONS UNDER WHICH THE TESTS WERE CONDUCTED.

3. DESCRIPTION OF TEST SAMPLE

<u>Manufactured by:</u>	Bailey Total Building Envelope
<u>Sample Size:</u>	5000mm wide x 5000mm high
<u>Rainscreen Type:</u>	Platinum Rainscreen System including Linear, Modular & Fusion Panel Types
<u>Framing Material/ Rail System:</u>	Pre-galvanised Zed-rails fixed vertically 35 x 46 x 35mm at centres as shown on the drawing in Appendix A
<u>Vapour Barrier:</u>	N/A
<u>Finish:</u>	Mill finish
<u>Gaskets:</u>	N/A
<u>Panel Types:</u>	<u>Linear</u> Secret fix system in 3mm aluminium. Panels are 1000mm wide, fixed to vertical rails at 600mm centres nominal, or on rail positions on the female cassette as shown on the drawing in Appendix A. The male part of the cassette is held in place by the profile of the female as also shown on the drawing in Appendix A. The 3m & 2m length panels abut each other with a joint strap & joggle system as shown on the drawing in Appendix A. This is a loose joint strap with the joggle taped to the back of the panel purely as a locator <u>Modular</u> Identical to the Linear system with a male/female cassette for fixing. The difference in this type of panel is that the ends of the panel have either a cassette or a return fold. This gives additional strength and removes the requirement for the joint strap as in the Linear <u>Fusion</u> Similar to the Modular system in fixing but is made up of 1.5mm aluminium with a pressure bonded honeycomb panel on the inside. The honeycomb is aluminium foil sandwiched between 2 sheets of 0.7mm aluminium. The overall thickness of the honeycomb and panel face 14.5mm. To give additional strength to the 1.5mm aluminium at the fixing point, a 1.5mm zed-rail is bonded to the back of the female cassette and to the back of the honeycomb All systems are fixed to the rails around the perimeter as shown on the drawing in Appendix A
<u>Insulation Type:</u>	N/A
<u>Drainage & Ventilation:</u>	N/A
<u>Fixing Bracket Details:</u>	Fixing Zed-rails to wall – M8 through bolts at 600mm centres Fixing panels to Zed-rails – DF 5.5 x 25mm self drill fixings (1 at rail centres or 600mm centres on Linear & Modular systems & 2 at rail centres on Fusion system)

Further details of the test sample and façade system can be found in Appendix A – System Drawings.

Test Sample During Testing

Photograph No. 1



4. TEST ARRANGEMENT

4.1 TEST CHAMBER

A rainscreen specimen, supplied for testing in accordance with CWCT requirements, was mounted on to a concrete block backing wall with a rendered finish.

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 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 $\pm 5\%$.

4.2.3 Deflection

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

4.2.4 Temperature & Humidity

A digital data logger capable of measuring temperature with an accuracy of $\pm 1^\circ\text{C}$ and humidity with an accuracy of $\pm 5\%$ Rh was used.

4.2.5 Atmospheric Pressure

A digital barometer was used to take atmospheric pressure readings with an accuracy of ± 1 Kpa.

4.2.6 General

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

4.3 PRESSURE GENERATION

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.

4.3.1 Static Air Pressure

The air supply system comprised of a centrifugal fan assembly and associated ducting and control valves which were 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.

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

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/m²/min.

4.5 IMPACTORS

4.5.1 Soft (S1) Body Impactor

A spherical/conical, glass bead filled impactor with a mass of 50 Kg.

4.5.2 Hard (H2) Body Impactor

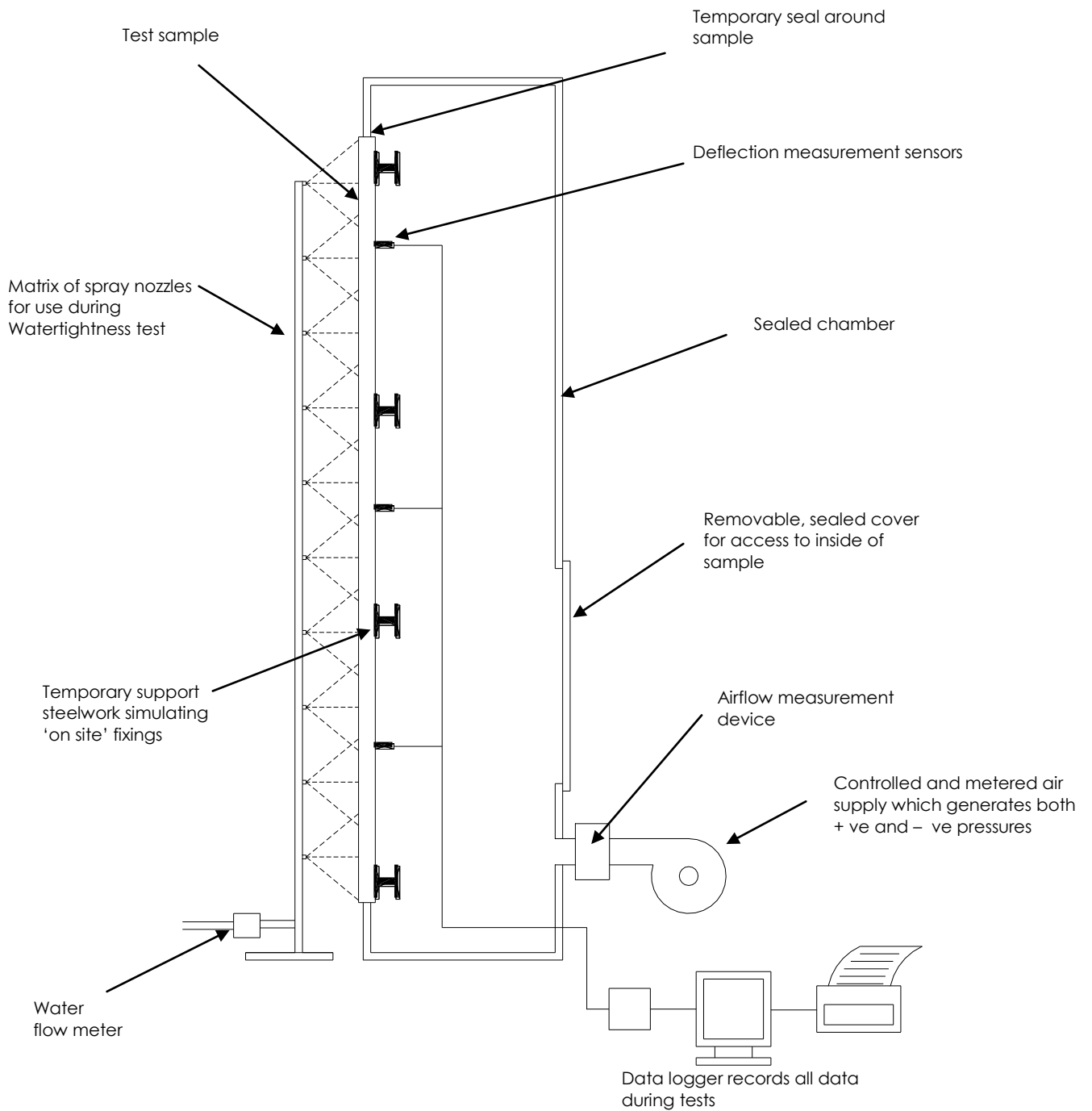
A steel ball with a diameter of 62.5 mm and a mass of 1.135 Kg, modified to allow it to swing from a nylon cord, rather than being dropped onto the sample as required in BS 8200, was released from the height, calculated to result in the required impact energies and allowed to fall under gravity until it impacted the designated test zone of the sample.

Note: The test standard requires that the hard body impactor is to be dropped vertically on to the sample however as the test sample is mounted in a vertical arrangement, the above method has been adopted and as such is a deviation from the test standard.

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

Figure 1

General Arrangement of a Typical Test Assembly



5. TEST PROCEDURES

5.1 SEQUENCE OF TESTING

1. Water Penetration – Dynamic Aero Engine
2. Wind Resistance – Serviceability
3. Wind Resistance – Safety
4. Impact Resistance – Retention of performance of exterior wall surfaces (BS 8200)
5. Impact Resistance – Safety to persons (BS 8200)

5.2 WATER PENETRATION

5.2.1 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 **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.

5.3 WIND RESISTANCE

5.3.1 Wind Resistance – Serviceability

Three (3) preparatory pulses of **900 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 and finally sealed with tape. All deflection sensors were then zeroed.

The sample was then subjected to positive pressure stages of **450, 900, 1350 and 1800 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. All sensors other than those used for recording the movement of framing members adjacent to their fixings to building structure were zeroed following preparation pulses.

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

5.3.2 Wind Resistance – Safety

Three preparatory positive air pressure pulses of **900 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 **2400 Pa (1800 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.

5.4 IMPACT - SAFETY

5.4.1 Impact Test Procedure – Retention of performance

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

The Impactors, as described in section 4.5, 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 to the selected impact points.

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

5.4.2 Impact Test Procedure – Safety to persons

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

The Impactors, as described in section 4.5, 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 6.3.2 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 WATER PENETRATION

6.1.1 Test 1 – Water Penetration – Dynamic Aero Engine

Temperatures (°C)

Water	11.3
Ambient	15.3

Test Time	Water collected (Litres)
15 minutes	11.64 ltrs

Observations

The sample was subjected to testing as described in section 5.3.2, for a period of not less than 15 minutes, during which water leakage was observed through the sample, by the means of observation holes cut in the support backing wall. The water was also collected by means of a drainage system at the bottom of the sample, which was then weighed at the end of the test.

6.2 WIND RESISTANCE TESTING

Group A comprised of probes 1, 2 & 3

Group B comprised of probes 4, 5 & 6

Group C comprised of probes 7, 8 & 9

Calculation of deflection

= Probe 2 – ((Probe 1 + Probe 3)/2)

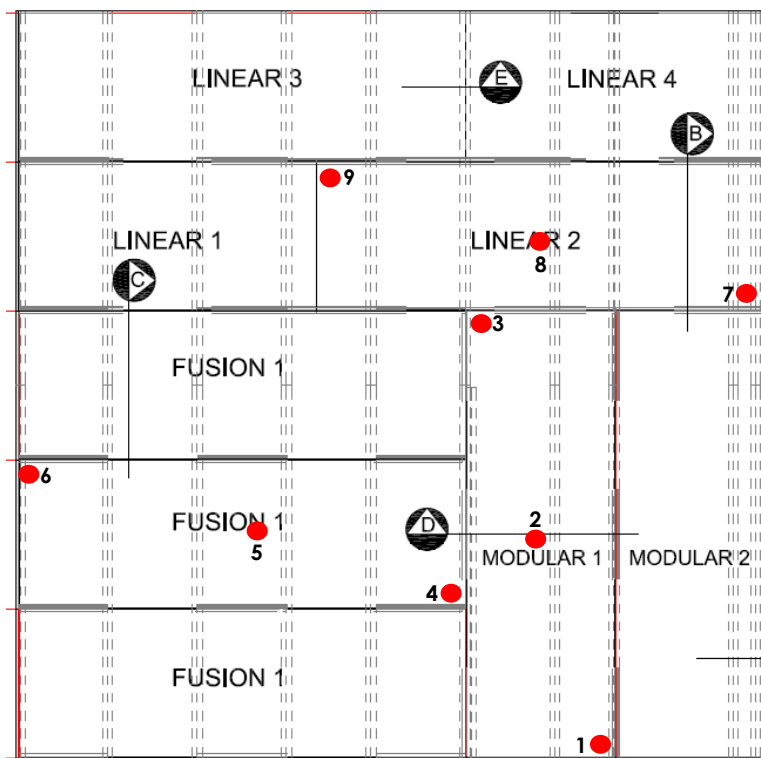
= Probe 5 – ((Probe 4 + Probe 6)/2)

= Probe 8 – ((Probe 7 + Probe 9)/2)

An inspection carried out following tests 2 and 3, after both positive and negative pressure testing, showed no evidence of any permanent deformation or damage to the test sample.

Positions of Deflection Measurement Probes

Figure 2



● - Deflection probe position

Not to Scale

6.2.1 Test 2 - Wind Resistance, Serviceability

Temperatures (°C)	Ambient	15.0
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Measured Length of Framing Member (mm)		Allowable Deflection	
		Ratio	Calculated (mm)
Group A	3070	L/90	34.1
Group B	3070	L/90	34.1
Group C	3060	L/90	34.0

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

6.2.1.1 Wind Resistance, Serviceability - Positive Pressure

Positive Pressure Pa	Results		
	Group A	Group B	Group C
0	0.0	-0.1	0.0
450	-10.9	-1.3	-8.7
900	-18.5	-2.2	-17.7
1350	-23.0	-3.1	-28.5
1800	-23.9	-3.8	-33.9
Residuals immediately following test	-0.3	0.2	-0.9

6.2.1.2 Wind Resistance, Serviceability - Negative Pressure

Negative Pressure Pa	Results		
	Group A	Group B	Group C
0	0.0	-0.1	0.0
450	11.1	1.1	9.9
900	17.9	2.1	17.1
1350	23.0	3.1	24.0
1800	27.1	4.3	30.0
Residuals immediately following test	0.5	0.0	0.5

6.2.2 Test 3 - Wind Resistance, Safety

Temperatures (°C)	Ambient	15.0
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Measured Length of Framing Member (mm)		Allowable Residual Deformation	
		Ratio	Calculated (mm)
Group A	3070	L/500	6.1
Group B	3070	L/500	6.1
Group C	3060	L/500	6.1

6.2.2.1 Wind Resistance, Safety - Positive Pressure

Positive Pressure Pa	Results		
	Group A	Group B	Group C
0	0.1	-0.1	0.1
2400	-24.1	-4.8	-36.3
Residuals immediately following test	-0.3	-0.1	-0.8

6.2.2.2 Wind Resistance, Safety - Negative Pressure

Negative Pressure Pa	Results		
	Group A	Group B	Group C
0	0.0	-0.1	0.0
2400	32.2	6.3	38.5
Residuals immediately following test	1.1	0.8	1.1

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

6.3 IMPACT TESTING

6.3.1 Test 4a – Impact – Retention of performance of exterior wall surfaces (Soft & Hard Body)

Temperatures (°C)	Ambient	14.0
Humidity (%RH)		89.0

Impact Reference	Test Category	Impactor Type	Impact Energy (Nm)	Drop Height (mm)	Observations
E1	B	H2	10	898	Bounce – Slight Indentation 0.02mm
E2	B	H2	10	898	Bounce – Slight Indentation 0.03mm
E3	B	H2	10	898	Bounce – Slight Indentation 0.02mm
E4	B	H2	10	898	Bounce – Slight Indentation 0.04mm
E5	B	H2	10	898	Bounce – Slight Indentation 0.77mm
E6	B	H2	10	898	Bounce – No Damage
E7	B	H2	10	898	Bounce – Slight Indentation 1.08mm
E8	B	H2	10	898	Bounce – No Damage
E9	B	H2	10	898	Bounce – No Damage
E10	B	H2	10	898	Bounce – No Damage
E11	B	H2	10	898	Bounce – No Damage
E12	B	S1	120	245	Bounce – No Damage
E13	B	S1	120	245	Bounce – No Damage
E14	B	S1	120	245	Bounce – No Damage
E15	B	S1	120	245	Bounce – No Damage
E16	B	S1	120	245	Bounce – No Damage
E17	B	S1	120	245	Bounce – No Damage
E18	B	S1	120	245	Bounce – No Damage
E19	B	S1	120	245	Bounce – No Damage
E20	B	S1	120	245	Bounce – No Damage
E21	B	S1	120	245	Bounce – No Damage
E22	B	S1	120	245	Bounce – No Damage

NOTE: The system achieved a Class 2 during the serviceability impacting in accordance with CWCT TN 76.

6.3.2 Test 4b – Impact – Safety to persons (Soft Body)

Temperatures (°C)	Ambient	14.0
Humidity (%RH)		89.0

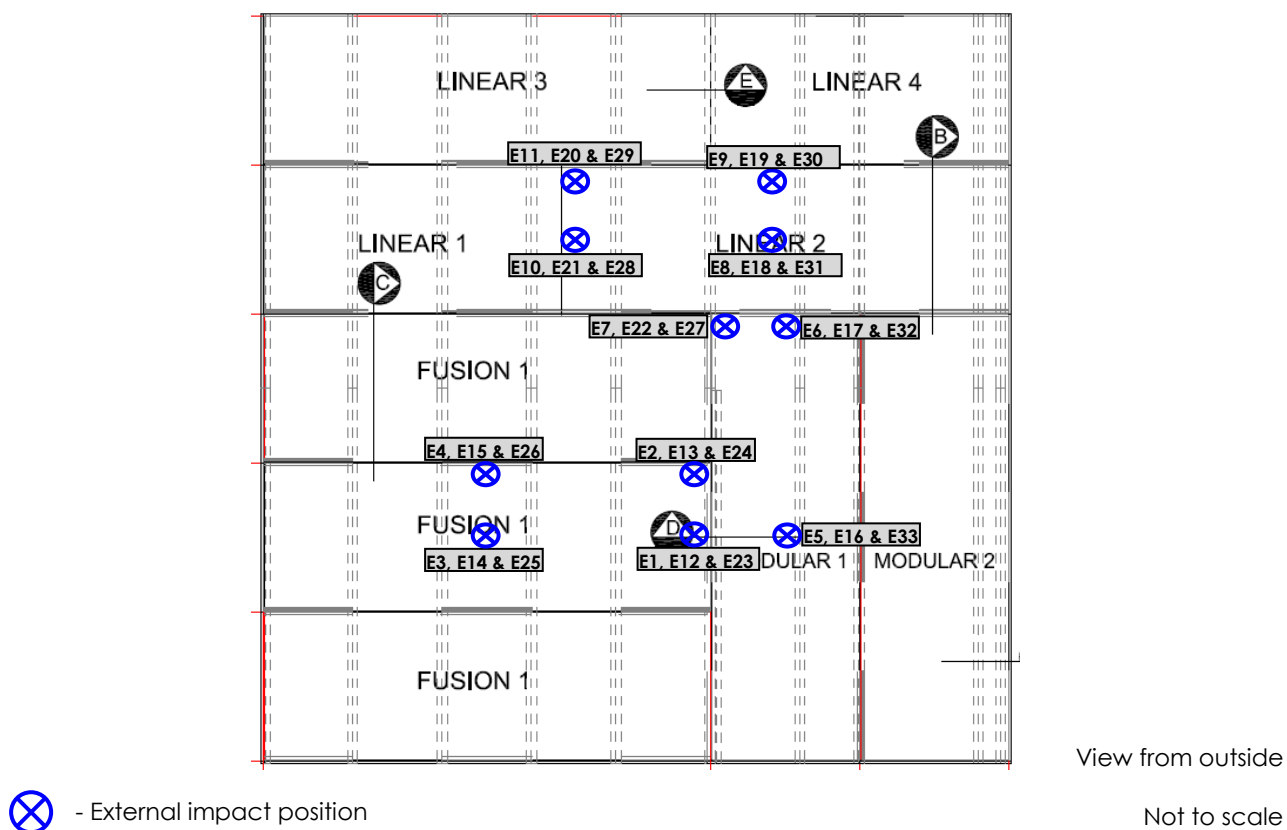
Impact Reference	Test Category	Impactor Type	Impact Energy (Nm)	Drop Height (mm)	Observations
E23	B	S1	500	1020	Bounce – No Damage
E24	B	S1	500	1020	Bounce – No Damage
E25	B	S1	500	1020	Bounce – No Damage
E26	B	S1	500	1020	Bounce – No Damage
E27	B	S1	500	1020	Bounce – No Damage
E28	B	S1	500	1020	Bounce – No Damage
E29	B	S1	500	1020	Bounce – No Damage
E30	B	S1	500	1020	Bounce – No Damage
E31	B	S1	500	1020	Bounce – No Damage

E32	B	S1	500	1020	Bounce – No Damage
E33	B	S1	500	1020	Bounce – No Damage

NOTE: The system achieved a 'Negligible Risk' class during the safety impacting in accordance with CWCT TN 76.

6.3.3 Impact Positions

Figure 3



APPENDIX A

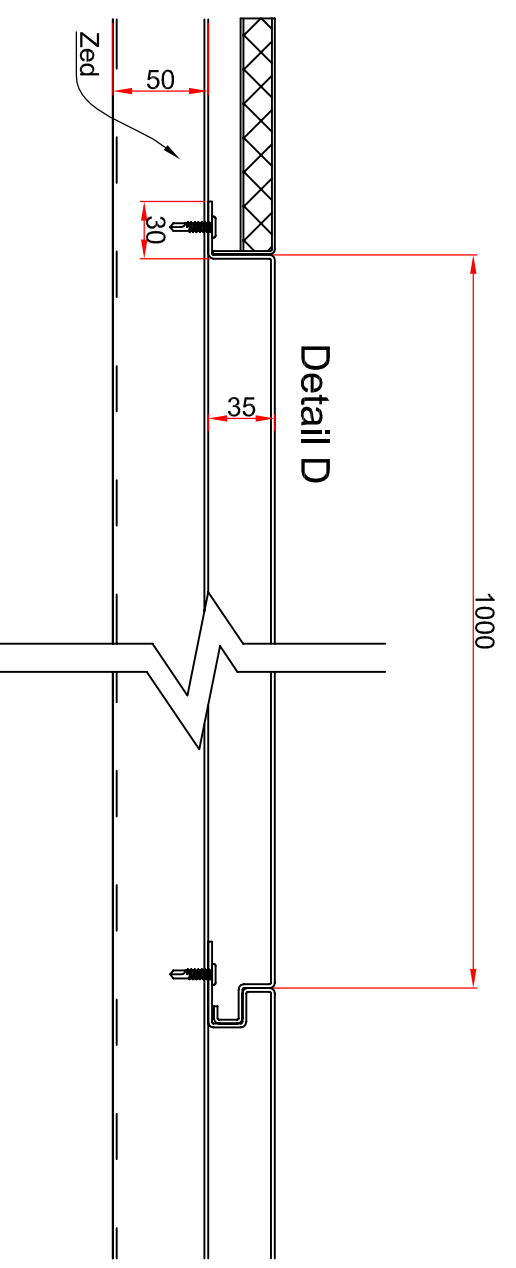
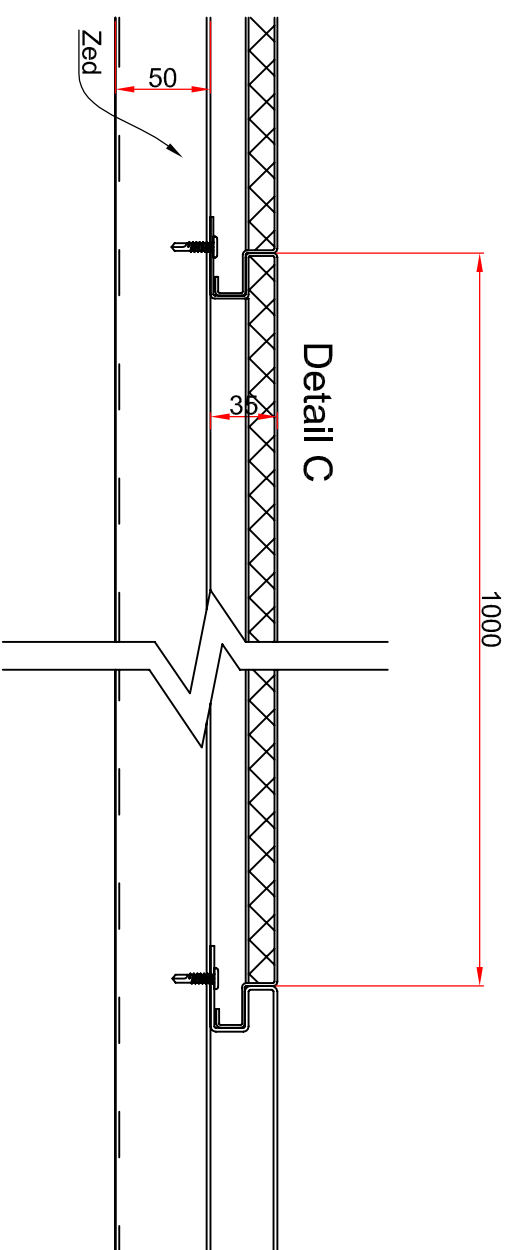
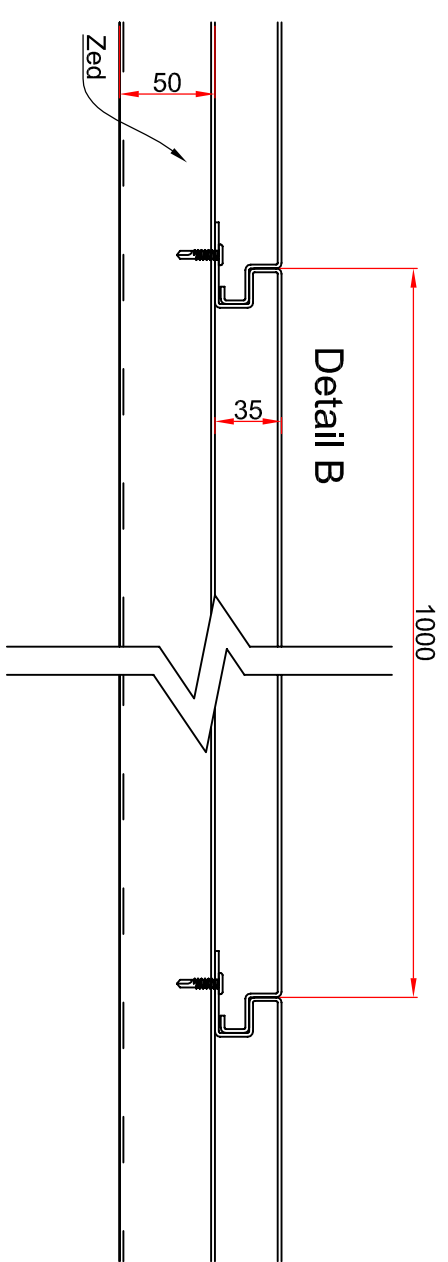
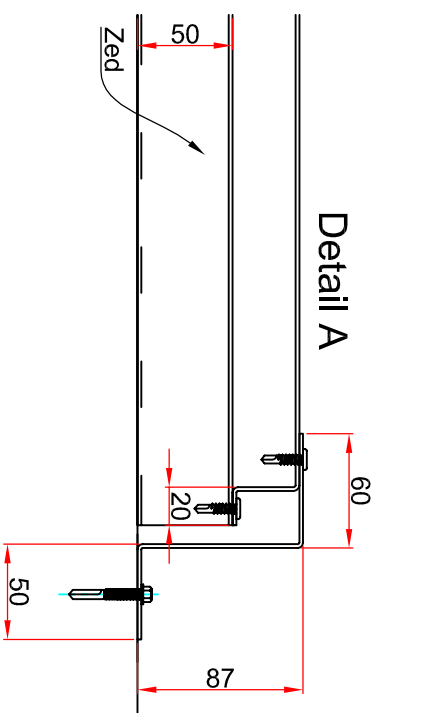
System Drawings

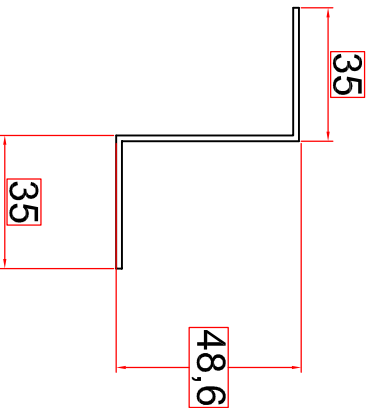
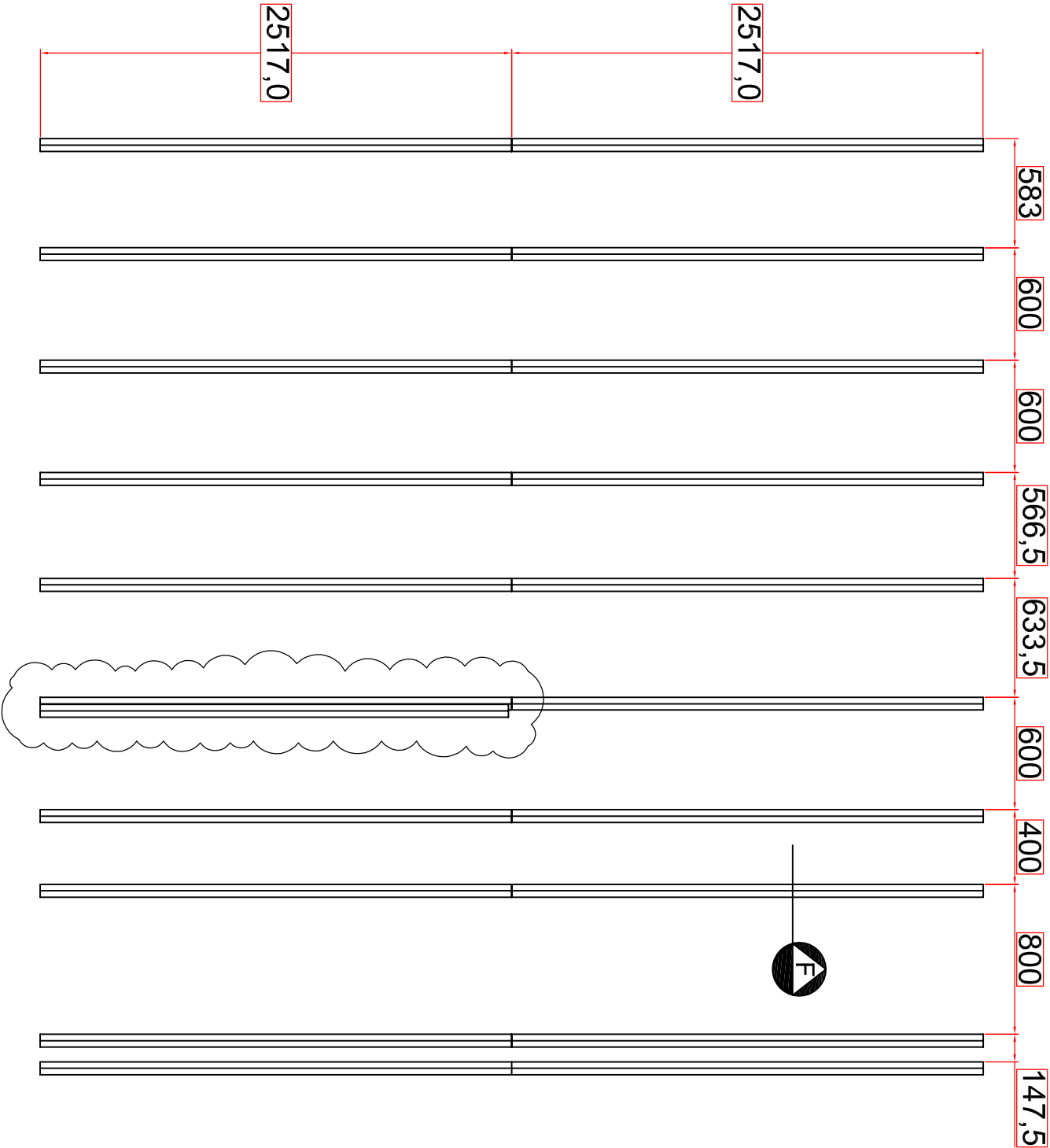
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CWCT-01 Rev A

CWCT-02 Rev A

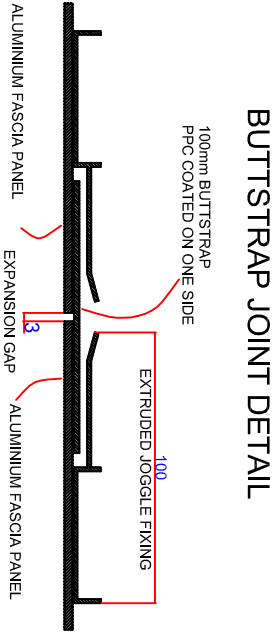
CWCT-03 Rev A





DETAIL "F"

*Note,
This additional length of PG1 though
present was not used for fixing soffits



DETAIL E: DO NOT SCALE

PROJECT TITLE: PLATINUM RANGE TEST WALL	REVISIONS:	DRAWING DATE: 19/06/14	DRAWING TITLE: Soffit Layout	
CUSTOMER: Whitech Testing	A	19/06/14	DRAWING SCALE: AS BUILT	DRAWING NUMBER: CWCT-01
		Issued as sub	SCALE: 1:10@A3	REVISION: A

APPENDIX B

Dismantling

B1. DISMANTLING

The dismantling was conducted on 11th June 2014 by representatives of Bailey Total Building Envelope and was witnessed by D Price of Wintech Engineering Ltd.

There was no water evident in the system in parts designed not to be wetted. The system was found to be as per the drawings in Appendix A as provided by Bailey Total Building Envelope at the time of dismantle.

END OF REPORT
