TECHNOLOGY CENTRE

Technical Report

Title: Weathertightness product testing a GFRC Norskreen rainscreen sample

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Customer: Telling Architectural Ltd. 7 The Dell, Enterprise Drive, Four Ashes, Wolverhampton, WV10 7DF

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UKAS TESTING 0057

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1 INTRODUCTION

This report describes tests carried out at VINCI Technology Centre UK Limited at the request of Telling Architectural Ltd.

The test sample consisted of a GFRC Norskreen rainscreen.

The tests were carried out on 18 February 2014 and were to determine the weathertightness of the test sample. The test methods were in accordance with the CWCT Standard Test Methods for building envelopes, 2005, for:

Dynamic pressure – water penetration.

Wind resistance – serviceability & safety.

Impact resistance.

Note: The backing wall used for the test sample had been tested in December 2013 and the results are included in this report.

The testing was carried out in accordance with Technology Centre Method Statement C4777/MS/rev 0.

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

The results are valid only for sample(s) tested and the conditions under which the tests were conducted.

VINCI Technology Centre UK Limited is accredited to ISO/IEC 17025:2008 by the United Kingdom Accreditation Service as UKAS Testing Laboratory No.0057.

VINCI Technology Centre UK Limited is certified by BSI for:

- ISO 9001:2008 Quality Management System,
- ISO 14001:2004 Environmental Management System,
- BS OHSAS 18001:2007 Occupational Health and Safety Management System.

The tests were witnessed by David Adams of Telling Architectural Ltd.

2 CLASSIFICATION OF TEST RESULTS

The following summarises the results of the tests carried out. For full details refer to Sections 6, 7, 8 and 9.

2.1 CLASSIFICATION

TABLE 1

Test	Standard	Classification / Declared value
Air permeability	CWCT	A4 ± 600 pascals (Backing wall only)
Watertightness	CWCT	Dynamic + 600 pascals
Wind resistance	CWCT	Serviceability ± 2400 pascals Safety ± 3600 pascals
Impact resistance	CWCT TN75	Soft body – serviceability – Class 1 Soft body – safety – Negligible risk Hard body – serviceability – Class 2 Hard body – safety – Negligible risk

3 DESCRIPTION OF TEST SAMPLE

3.1 GENERAL ARRANGEMENT

The sample was as shown in the photo below and the drawings included as an appendix to this report.

The sample measured 3.0 m high by 4.4 m wide and comprised eleven GFRC Norskreen panels supported on an aluminium framework. The framework was mounted on a backing wall comprising a stud framework, cement particle boards and Tyvek sheeting.

PHOTO 3483

TEST SAMPLE ELEVATION

3.2 CONTROLLED DISMANTLING

During the dismantling of the sample no water penetration or discrepancies from the drawings were found.

PHOTO 3494

PANELS REMOVED FROM TEST RIG

PHOTO 3495

RAIL SUPPORT BRACKET

PHOTO 3497

PANEL SUPPORT CLIP

PHOTO 3498

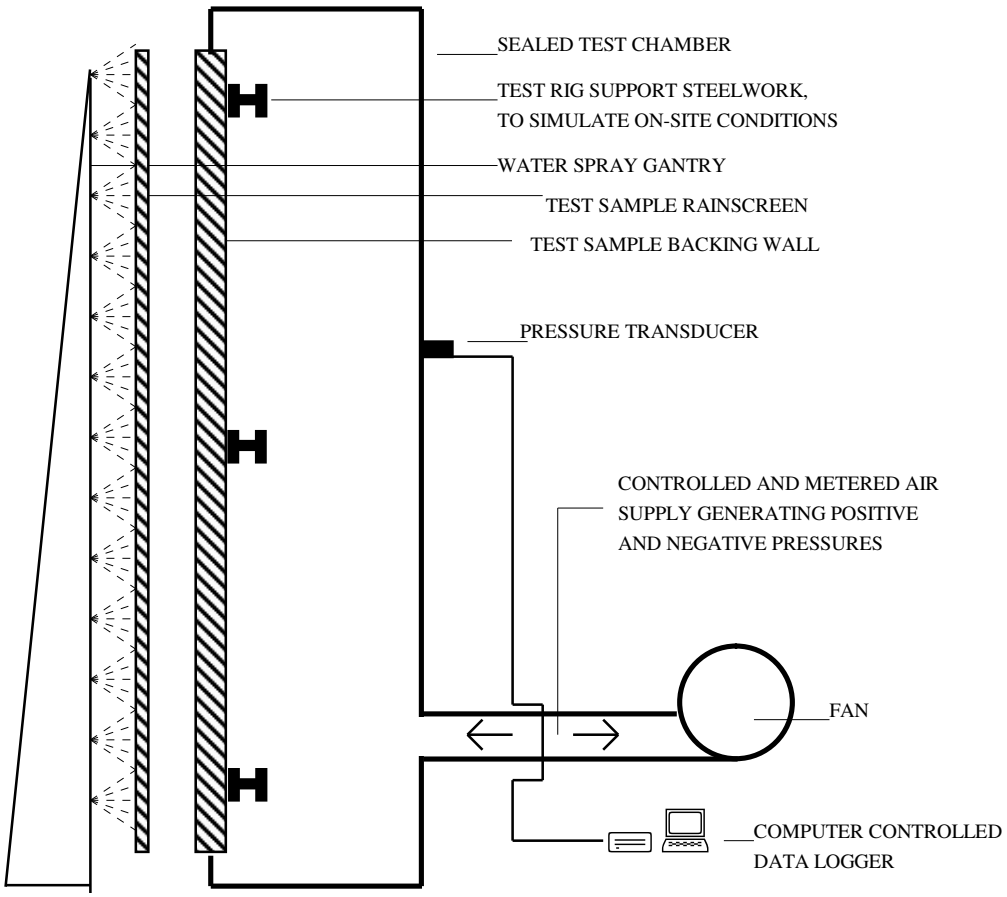
SUPPORT RAILS

4 TEST RIG GENERAL ARRANGEMENT

The test sample was mounted on a rigid test rig with support steelwork designed to simulate the on-site/project conditions. The test rig comprised a well sealed chamber, fabricated from steel and plywood. A door was provided to allow access to the chamber. Representatives of Telling Architectural installed the sample on the test rig. See Figure 1.

FIGURE 1

TEST RIG SCHEMATIC ARRANGEMENT



SECTION THROUGH TEST RIG

5 TEST SEQUENCE

The test sequence was as follows:

(1) Air permeability

(2) Watertightness – static

(3) Wind resistance – serviceability

(4) Air permeability

(5) Watertightness – static

(6) Watertightness – dynamic

(7) Wind resistance – safety

(8) Impact resistance

6 AIR PERMEABILITY TESTING

6.1 INSTRUMENTATION

6.1.1 Pressure

One static pressure tapping was provided to measure the chamber pressure and was located so that the readings were unaffected by the velocity of the air supply into or out of the chamber.

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

6.1.2 Air Flow

A laminar flow element mounted in the air system ductwork was used with a pressure transducer to measure the air flow into the chamber. This device was capable of measuring airflow through the sample to within 2%.

6.1.3 Temperature

Platinum resistance thermometers (PRT) were used to measure air temperatures to within 1°C.

6.1.4 General

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

All measuring instruments and relevant test equipment were calibrated and traceable to national standards.

6.2 FAN

The air supply system comprised a variable speed centrifugal fan and associated ducting and control valves to create positive and negative static pressure differentials. The fan provided essentially constant air flow at the fixed pressure for the period required by the tests and was capable of pressurising at a rate of approximately 600 pascals in one second.

6.3 PROCEDURE

Three positive pressure pulses of 1200 pascals were applied to prepare the test sample.

The average air permeability was determined by measuring the rate of air flow through the chamber whilst subjecting the sample to positive pressure differentials of 50, 100, 150, 200, 300, 450 and 600 pascals. Each pressure increment was held for at least 10 seconds.

Extraneous leakage through the test chamber and the joints between the chamber and the test sample was determined by sealing the sample with adhesive tape (polythene sheet as mentioned in CWCT clause 5.10.3.1 was not used on this occasion) and measuring the air flow at the pressures given above.

The test was then repeated with the sample unsealed; the difference between the readings being the rate of air flow through the backing wall.

The test was then repeated using negative pressure differentials.

6.4 PASS/FAIL CRITERIA

The permissible air flow rate, Q_o, at peak test pressure, p_o, could not exceed:
1.5 m^3 per hour per m^2.

At intermediate pressures, p_n, flow rates, Q_n, were calculated using $Q_n = Q_o(p_n/p_o)^{2/3}$
The area of the sample was 13.2 m^2.

6.5 RESULTS

TABLE 2

Pressure differential (pascals)	Measured air flow through backing wall (m^3/hour/m^2)			
	Test 1 Date: 12 December 2013		Test 4 Date: 13 December 2013	
	Infiltration	Exfiltration	Infiltration	Exfiltration
50	0.07	0.01	0.06	0.01
100	0.08	0.02	0.05	0.04
150	0.00	0.02	0.00	0.01
200	0.03	0.07	0.02	0.11
300	0.09	0.13	0.07	0.14
450	0.13	0.07	0.11	0.07
600	0.17	0.17	0.13	0.18
Temperatures	Ambient = 7°C Chamber = 8°C		Ambient = 9°C Chamber = 9°C	

The results are shown graphically in Figures 2 and 3.

FIGURE 2

Air infiltration test results

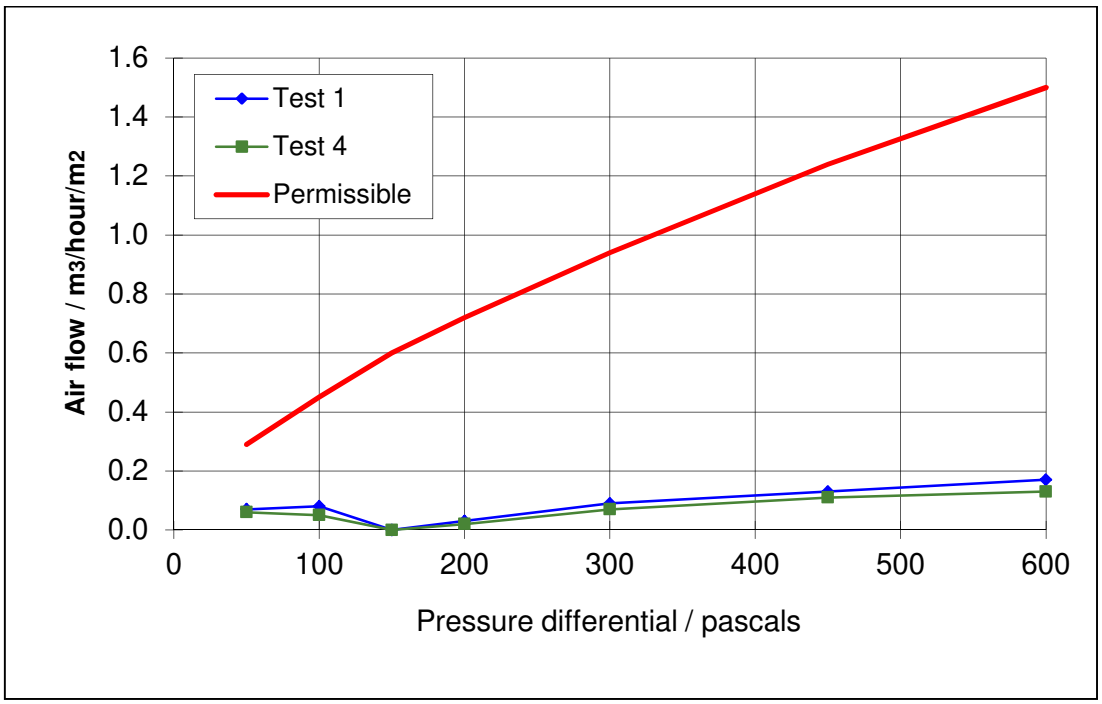
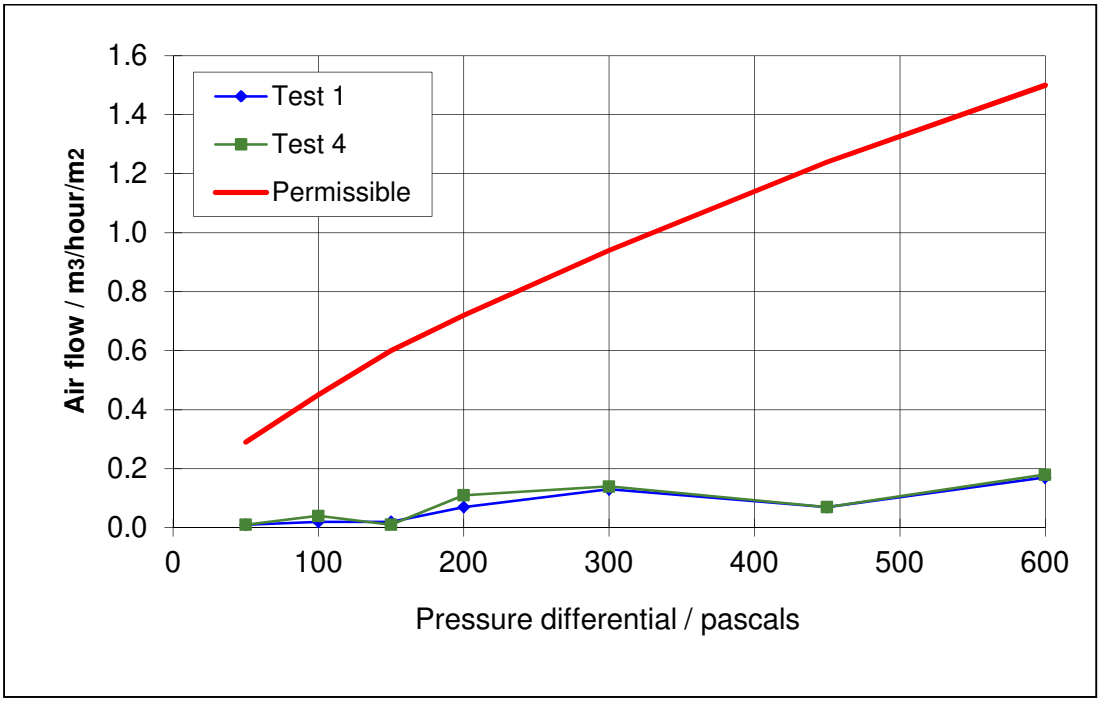


FIGURE 3

Air exfiltration test results



7 WATERTIGHTNESS TESTING

7.1 INSTRUMENTATION

7.1.1 Pressure

One static pressure tapping was provided to measure the chamber pressure and was located so that the readings were unaffected by the velocity of the air supply into or out of the chamber.

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

7.1.2 Water Flow

An in-line water flow meter was used to measure water supplied to the spray gantry to within 5%.

7.1.3 Temperature

Platinum resistance thermometers (PRT) were used to measure air and water temperatures to within 1°C.

7.1.4 General

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

All measuring instruments and relevant test equipment were calibrated and traceable to national standards.

7.2 FAN

7.2.1 Static Pressure Testing

The air supply system comprised a variable speed centrifugal fan and associated ducting and control valves to create positive and negative static pressure differentials. The fan provided essentially constant air flow at the fixed pressure for the period required by the tests and was capable of pressurising at a rate of approximately 600 pascals in one second.

7.2.2 Dynamic Pressure Testing

A wind generator was mounted adjacent to the external face of the sample and used to create positive pressure differentials during dynamic testing. The wind generator comprised a piston type aero-engine fitted with 4 m diameter contra-rotating propellers.

7.3 WATER SPRAY

The water spray system comprised 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 with a spray angle between 90° and 120°. The spray system delivered water uniformly against the exterior surface of the sample.

7.4 PROCEDURE

7.4.1 Watertightness – static

Three positive pressure pulses of 1200 pascals were applied to prepare the test sample.

Water was sprayed onto the sample using the method described above at a rate of at least 3.4 litres/m^2/minute for 15 minutes at zero pressure differential. With the water spray continuing the pressure differential across the sample was then increased in increments of: 50, 100, 150, 200, 300, 450 and 600 pascals, each held for 5 minutes.

Throughout the test the interior face of the sample was examined for water penetration.

7.4.2 Watertightness – dynamic

Water was sprayed onto the sample using the method described above at a flow rate of at least 3.4 litres/m^2/minute.

The aero-engine was used to subject the sample to wind of sufficient velocity to produce by a static pressure differential of 600 pascals. These conditions were maintained for 15 minutes. Throughout the test the inside of the sample was examined for water penetration.

PHOTO 3485

DYNAMIC WIND GENERATOR

7.5 PASS/FAIL CRITERIA

There shall be no water penetration to the internal face of the backing wall throughout testing. At the completion of the test there shall be no standing water in locations intended to remain dry.

7.6 RESULTS

Test 2 (Static pressure) Date: 12 December 2013

No water penetration was observed through the backing wall throughout the test.

Chamber temperature= 9°C
Ambient temperature = 7°C
Water temperature = 8°C

Test 5 (Static pressure) Date: 13 December 2013

No water penetration was observed through the backing wall throughout the test.

Chamber temperature= 10°C
Ambient temperature = 9°C
Water temperature = 9°C

Test 6 (Dynamic pressure) Date: 18 February 2014

No water penetration was observed through the backing wall throughout the test.

Chamber temperature= 10°C
Ambient temperature = 6°C
Water temperature = 8°C

8 WIND RESISTANCE TESTING

8.1 INSTRUMENTATION

8.1.1 Pressure

One static pressure tapping was provided to measure the chamber pressure and was located so that the readings were unaffected by the velocity of the air supply into or out of the chamber.

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

8.1.2 Deflection

Displacement transducers were used to measure the deflection of principle framing members to an accuracy of 0.1 mm. The gauges were set normal to the sample framework at mid-span and as near to the supports of the members as possible and installed in such a way that the measurements were not influenced by the application of pressure or other loading to the sample. The gauges were located at the positions shown in Figure 4.

8.1.3 Temperature

Platinum resistance thermometers (PRT) were used to measure air temperatures to within 1°C.

8.1.4 General

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

All measuring instruments and relevant test equipment were calibrated and traceable to national standards.

8.2 FAN

The air supply system comprised a variable speed centrifugal fan and associated ducting and control valves to create positive and negative static pressure differentials. The fan provided essentially constant air flow at the fixed pressure for the period required by the tests and was capable of pressurising at a rate of approximately 600 pascals in one second.

8.3 PROCEDURE

8.3.1 Wind Resistance – serviceability on backing wall

Three positive pressure differential pulses of 1200 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one positive pressure differential pulse from 0 to 2400 pascals to 0. The pressure was increased in four equal increments each maintained for 15 ±5 seconds. Displacement readings were taken at each increment. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

The test was then repeated using a negative pressure of -2400 pascals.

8.3.2 Wind Resistance – safety on backing

Three positive pressure differential pulses of 1200 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one positive pressure differential pulse from 0 to 3600 pascals to 0. The pressure was increased as rapidly as possible but not in less than 1 second and maintained for 15 ±5 seconds. Displacement readings were taken at peak pressure. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

The test was then repeated using a negative pressure of –3600 pascals.

8.3.3 Wind Resistance – serviceability on rainscreen

Note: *For this test the joints between the rainscreen panels were sealed over and the pressure applied to the cavity between the backing wall and panels, via holes in the plywood sides.*

Three positive pressure differential pulses of 1200 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one positive pressure differential pulse from 0 to 2400 pascals to 0. The pressure was increased in four equal increments each maintained for 15 ±5 seconds. Displacement readings were taken at each increment. Residual deformations were measured on the pressure returning to zero.

Any damage or functional defects were recorded.

The test was then repeated using a negative pressure of -2400 pascals.

8.3.4 Wind Resistance – safety on rainscreen

Note: *For this test the joints between the rainscreen panels were sealed over and the pressure applied to the cavity between the backing wall and panels.*

Three positive pressure differential pulses of 1200 pascals were applied to prepare the sample. The displacement transducers were then zeroed.

The sample was subjected to one positive pressure differential pulse from 0 to 3600 pascals to 0. The pressure was increased as rapidly as possible but not in less than 1 second and maintained for 15 ±5 seconds. Displacement readings were taken at peak pressure. Residual deformations were measured on the pressure returning to zero.

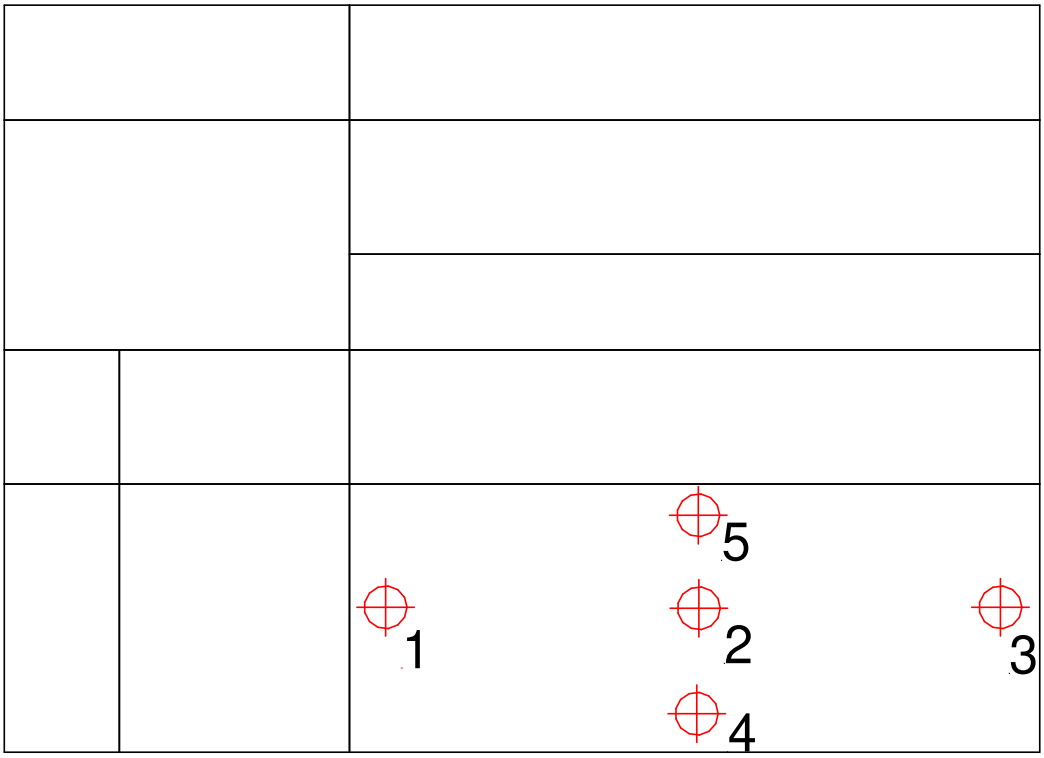
Any damage or functional defects were recorded.

The test was then repeated using a negative pressure of –3600 pascals.

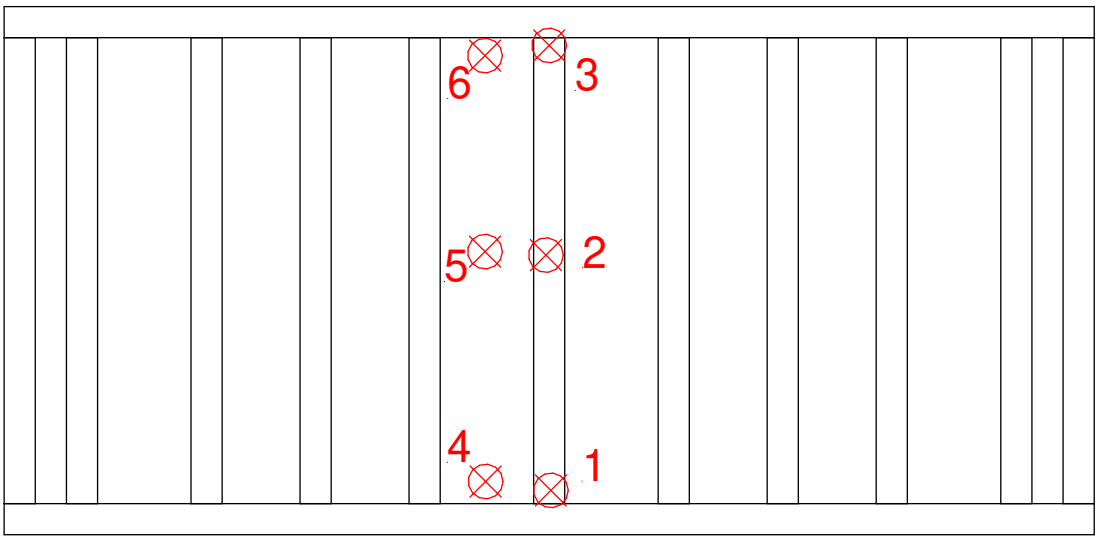
FIGURE 4

DEFLECTION GAUGE LOCATIONS

External and Internal Views



Location of gauges



Deflection gauge

8.4 PASS/FAIL CRITERIA

8.4.1 Calculation of permissible deflection for backing wall

Gauge number	Member	Span (L) (mm)	Permissible deflection (mm)	Permissible residual deformation
2, 5	Vertical span	3000	L/200= 15.0	1 mm

8.4.2 Calculation of permissible deflection for rainscreen panels

Gauge number	Member	Span (L) (mm)	Permissible deflection (mm)
2	Panel width	2988	L/90 = 33.2

8.5 RESULTS

Test 3 (serviceability) Date: 18 February 2014

The deflections measured during the wind resistance test, at the positions shown in Figure 4, are shown in Tables 3 and 4 for the backing wall and 6 and 7 for the rainscreen panels.

Summary Table for backing:

Gauge number	Member	Pressure differential (Pa)	Measured deflection (mm)	Residual deformation (mm)
2	Stud rail	2397 -2410	6.3 4.6	0.3 -0.4
5	Backing wall panel	2397 -2410	6.7 5.7	0.3 -0.3

No damage to the test sample was observed.

Summary Table for rainscreen:

Gauge number	Member	Pressure differential (Pa)	Measured deflection (mm)	Residual deformation (mm)
2	Horizontal span of panel	2402 -2392	9.4 -9.0	0.1 -0.2

No damage to the test sample was observed.

Ambient temperature = 7°C
Chamber temperature = 9°C

Test 7 (safety) Date: 18 February 2014

The deflections measured during the structural safety test, at the positions shown in Figure 4, are shown in Table 5 for the backing wall and Table 8 for the rainscreen panels.

No damage to the sample was observed.

Ambient temperature = 8°C
Chamber temperature = 10°C

TABLE 3

WIND RESISTANCE – POSITIVE **SERVICEABILITY** TEST RESULTS

BACKING WALL

Position	**Pressure (pascals) / Deflection (mm)**				
	606	**1195**	**1822**	**2397**	**Residual**
1	0.1	0.1	0.3	0.4	0.0
2	1.5	3.0	5.1	7.2	0.4
3	0.4	0.7	1.0	1.3	0.1
4	0.5	1.0	1.8	2.5	0.2
5	1.8	3.7	6.3	8.8	0.5
6	0.4	0.7	1.2	1.6	0.2
2 *	1.2	2.6	4.5	6.3	0.3
5 *	1.4	2.8	4.8	6.7	0.3

* Mid-span reading adjusted between end support readings

TABLE 4

WIND RESISTANCE – NEGATIVE **SERVICEABILITY** TEST RESULTS

BACKING WALL

Position	**Pressure (pascals) / Deflection (mm)**				
	-604	**-1193**	**-1798**	**-2410**	**Residual**
1	-0.1	-0.2	-0.3	-0.4	-0.1
2	-1.4	-2.5	-3.8	-5.4	-0.5
3	-0.3	-0.5	-0.8	-1.1	-0.1
4	-0.6	-1.0	-1.5	-2.2	-0.2
5	-1.9	-3.5	-5.3	-7.5	-0.4
6	-0.4	-0.6	-0.9	-1.3	-0.1
2 *	-1.2	-2.2	-3.3	-4.6	-0.4
5 *	-1.4	-2.6	-4.1	-5.7	-0.3

* Mid-span reading adjusted between end support readings

TABLE 5

WIND RESISTANCE - **SAFETY** TEST RESULTS

BACKING WALL

Position	**Pressure (pascals) / Deflection (mm)**			
	3599	**Residual**	**-3599**	**Residual**
1	0.7	0.1	-0.9	-0.3
2	10.9	0.0	-10.8	-1.0
3	1.8	0.2	-2.2	-0.4
4	3.8	0.2	-4.0	-0.6
5	13.3	0.4	-14.2	-0.9
6	2.3	0.2	-2.5	-0.3
2 *	9.6	-0.1	-9.5	-0.7
5 *	10.2	0.2	-11.0	-0.5

* Mid-span reading adjusted between end support readings

TABLE 6

WIND RESISTANCE – POSITIVE **SERVICEABILITY** TEST RESULTS

RAINSCREEN PANELS

Position	Pressure (pascals) / Deflection (mm)				
	603	1196	1788	2402	Residual
1	3.6	7.4	11.0	14.8	0.4
2	5.5	12.4	18.5	24.4	0.5
3	3.6	7.5	11.2	15.3	0.3
4	2.0	4.1	6.2	8.5	0.1
5	4.8	9.7	14.6	19.7	0.4
2 *	1.9	5.0	7.4	9.4	0.1

* Mid-span reading adjusted between end support readings

TABLE 7

WIND RESISTANCE – NEGATIVE **SERVICEABILITY** TEST RESULTS

RAINSCREEN PANELS

Position	Pressure (pascals) / Deflection (mm)				
	-601	-1204	-1823	-2392	Residual
1	-2.7	-5.4	-8.2	-11.0	-0.3
2	-4.4	-9.0	-13.6	-18.1	-0.5
3	-1.7	-3.6	-5.4	-7.3	-0.3
4	-2.2	-4.5	-6.8	-9.1	-0.1
5	-4.2	-8.6	-12.9	-17.5	-0.7
2 *	-2.2	-4.5	-7.8	-9.0	-0.2

* Mid-span reading adjusted between end support readings

TABLE 8

WIND RESISTANCE – **SAFETY** TEST RESULTS

RAINSCREEN PANELS

Position	**Pressure (pascals) / Deflection (mm)**			
	3591	**Residual**	**-3582**	**Residual**
1	20.2	0.5	-16.5	-0.4
2	36.9	0.9	-27.2	-0.7
3	20.4	1.1	-10.9	-0.4
4	10.8	0.0	-13.7	-0.1
5	27.6	0.8	-26.3	-1.0
2 *	16.6	0.1	-13.5	-0.4

* Mid-span reading adjusted between end support readings

9 IMPACT TESTING

9.1 IMPACTOR

9.1.1 Soft body

The soft body impactor comprised a canvas spherical/conical bag 400 mm in diameter filled with 3 mm diameter glass spheres with a total mass of approximately 50 kg suspended from a cord at least 3 m long.

9.1.2 Hard body

The hard body impactor was a solid steel ball of 50 mm or 62.5 mm diameter and approximate mass of 0.5 kg or 1.0 kg.

9.2 PROCEDURE (BS 8200)

9.2.1 Soft body

The impactor almost touched the face of the sample when at rest. It was swung in a pendular movement to hit the sample normal to its face. The test was performed at locations 1 to 7 shown in Figure 5. The impact energies were 120 Nm, 350 Nm and 500 Nm.

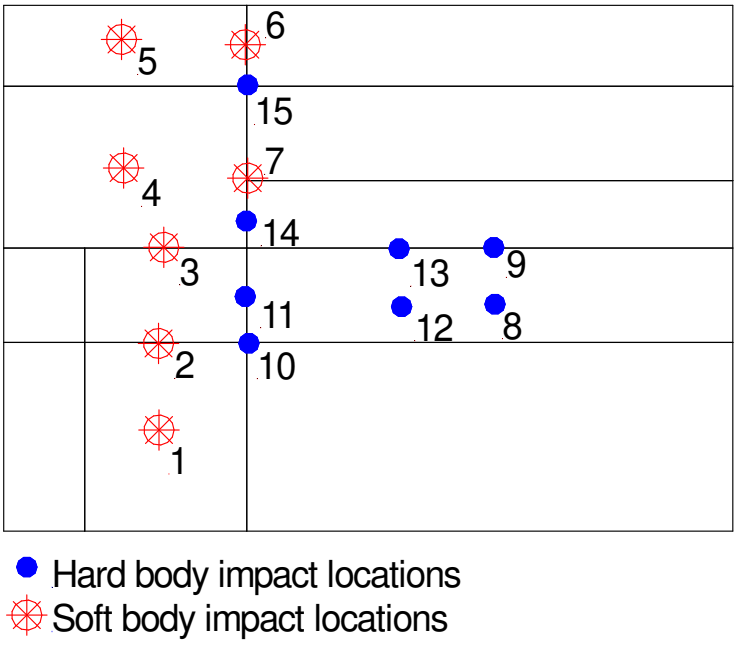
9.2.2 Hard body

The impactor almost touched the face of the sample when at rest. It was swung in a pendular movement to hit the sample normal to its face. The test was performed at locations 8 to 13 shown in Figure 5. The impact energies were 6 and 10 Nm.

FIGURE 5

IMPACT TEST LOCATIONS

External View



9.3 PASS/FAIL CRITERIA

Note: Tables 1 to 5 are taken from CWCT TN75.

Table 1 – Exposure categories

Category	Description	Examples	
A	Readily accessible to public and others with little incentive to exercise care. Prone to vandalism and abnormally rough use	External walls of housing and public buildings in vandal prone areas	Zone of wall up to 1.5 m above pedestrian or floor level
B	Readily accessible to public and others with little incentive to exercise care. Chances of accident occurring and of misuse	Walls adjacent to pedestrian thoroughfares or playing fields when not in category A	
C	Accessible primarily to those with some incentive to exercise care. Some chance of accident occurring and of misuse	Walls adjacent to private open gardens. Back walls of balconies	
D	Only accessible, but not near a common route, to those with high incentive to exercise care. Small chance of accident occurring or misuse	Walls adjacent to small fenced decorative garden with no through paths	
E	Above zone of normal impacts from people but liable to impacts from thrown or kicked objects	1.5 m to 6 m above pedestrian or floor level at location categories A and B	
F	Above zone of normal impacts from people and not liable to impacts from thrown or kicked objects	Wall surfaces at higher positions than those defined in E above	

Table 2 – Soft body test energy

Exposure category	Safety	Serviceability
A	No values are given as severity of potential vandalism needs to be assessed	
B	500 Nm	120 Nm
C	500 Nm	120 Nm
D	No values given as risk of impact is minimal	
E	350 Nm	120 Nm
F	350 Nm	120 Nm

Table 3 – Hard body test energy

Exposure category	Safety	Serviceability
A	No values are given as severity of potential vandalism needs to be assessed	
B	10 Nm	10 Nm
C	10 Nm	6 Nm
D	No values given as risk of impact is minimal	
E	10 Nm	6 Nm
F	3 Nm	3 Nm

Table 4 - Classes for safety performance

Class	Explanation/examples
Negligible risk	No material dislodged during test, and No damage likely to lead to materials falling subsequent to test, and No sharp edges produced that would be likely to cause severe injury to a person during impact, and Cladding not penetrated by impactor.
Low risk	Maximum mass of falling particle 50g, and Maximum mass of particle that may fall subsequent to impact 50g, and No sharp edges produced that would be likely to cause severe injury during impact.
Moderate risk	Maximum mass of falling particle less than 500g, and Maximum mass of particle that may fall subsequent to impact less than 500g, and Cladding not penetrated by impact, and No sharp edges produced that would be likely to cause severe injury during impact.
High risk	Maximum mass of falling particle greater than 500g, or Cladding penetrated by impact, or Sharp edges produced that would be likely to cause severe injury during impact.

Table 5 - Classes for serviceability performance

Class	Definition	Explanation/Examples
1	No damage.	No damage visible from 1m, and Any damage visible from closer then 1m unlikely to lead to significant deterioration.
2	Surface damage of an aesthetic nature which is unlikely to require remedial action.	Dents or distortion of panels not visible from more than 5m (note visibility of damage will depend on surface finish and lighting conditions – damage will generally be more visible on reflective surfaces), and Any damage visible from closer than 5m unlikely to lead to significant deterioration.
3	Damage that may require remedial action or replacement of components to maintain appearance or long term performance but does not require immediate action.	Dents or distortion of panels visible from more than 5m, or Spalling of edges of panels of brittle materials, or Damage to finishes that may lead to deterioration of the substrate.
4	Damage requiring immediate action to maintain appearance or performance. Remedial action may include replacement of a panel but does not require dismantling or replacement of supporting structure.	Significant cracks in brittle materials e.g. cracks that may lead to parts of tile falling away subsequent to test, or Fracture of panels causing significant amounts of material to fall away during test.
5	Damage requiring more extensive replacement than 4.	Buckling of support rails.

9.4 RESULTS

Test 8 Date: 18 February 2014

Ambient temperature = 8°C

TABLE 9

IMPACT TEST RESULTS

Impact location	Impactor	Impact energy (Nm)	Observations
1	Soft body	120 (x 3)	No damage observed.
2	Soft body	120 (x 3)	No damage observed.
3	Soft body	350	No damage observed.
4	Soft body	350	No damage observed.
5	Soft body	500	No damage observed.
6	Soft body	500	No damage observed.
7	Soft body	500	No damage observed.
8	Hard body	6	No damage observed.
9	Hard body	6	No damage observed.
10	Hard body	6	Minor edge damage.
11	Hard body	6	Minor indent.
12	Hard body	10	No damage observed.
13	Hard body	10	No damage observed.
14	Hard body	10	No damage observed.
15	Hard body	10	Minor corner damage.

PHOTO 3486

SOFT BODY IMPACTOR

PHOTO 3492

HARD BODY IMPACTOR

PHOTO 3488

LOCATION 10 IMPACT

PHOTO 3489

LOCATION 11 IMPACT

PHOTO 3458

LOCATION 15 IMPACT

10 APPENDIX - DRAWINGS

The following 5 unnumbered pages are copies of Telling Architectural Ltd. drawings numbered:

NOR-001 rev C,

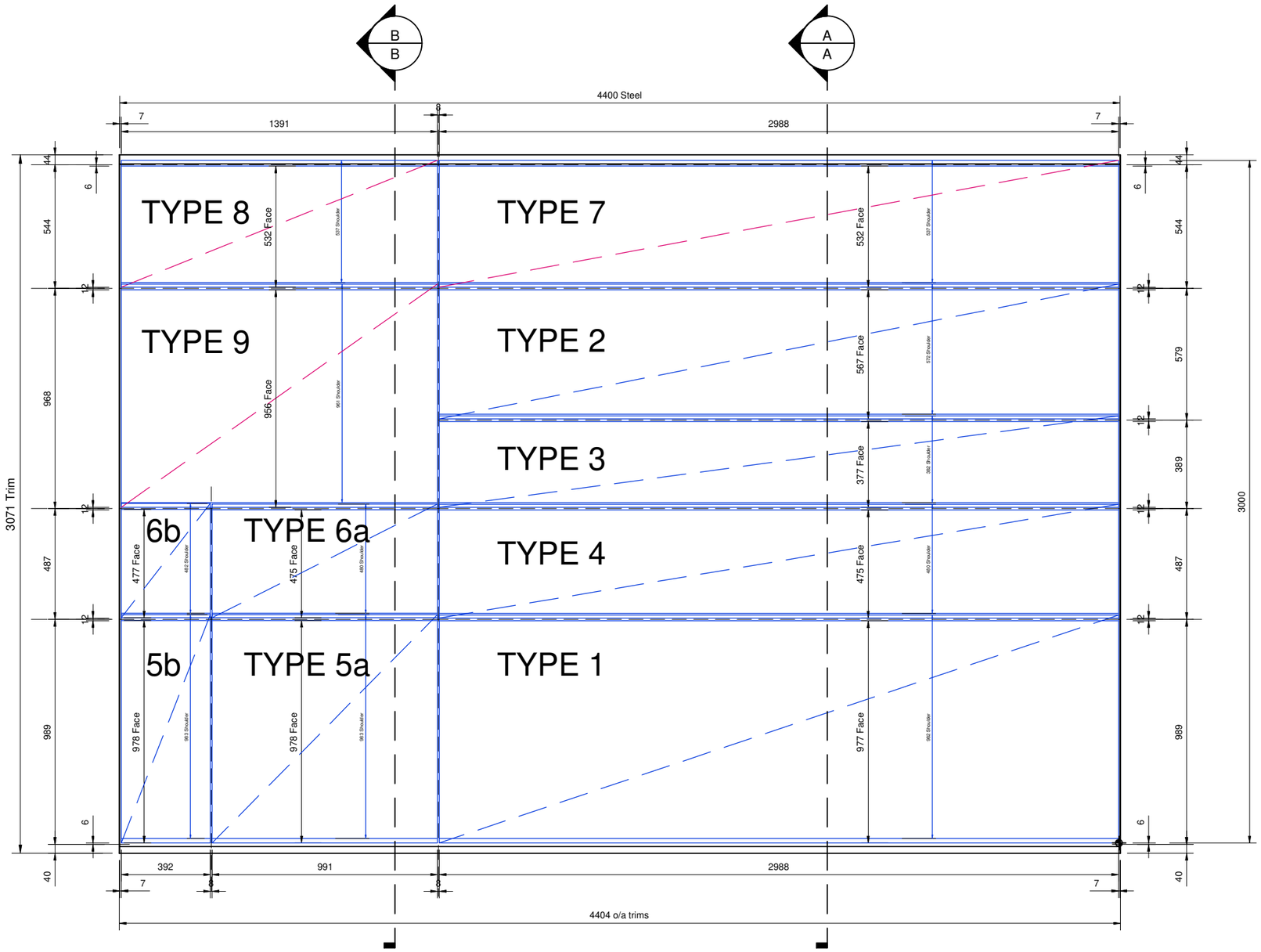
NOR-002 rev C,

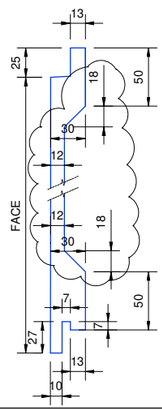
NOR-003 rev C,

NOR-004 rev C,

NOR-005 rev C.

END OF REPORT





PANEL REF.	MODULE SIZE H x W	FACE HEIGHT	PANEL LENGTH	QUANTITY
TYPE 1	989 X 2996	977mm	2988mm	1No.
TYPE 2	579 x 2996	567mm	2988mm	1No.
TYPE 3	389 X 2996	377mm	2988mm	1No.
TYPE 4	487 X 2996	475mm	2988mm	1No.
TYPE 5a	989 X 999	978mm	991mm	1No.
TYPE 5b	989 x 400	978mm	392mm	1No.
TYPE 6a	487 X 999	475mm	991mm	1No.
TYPE 6b	487 x 400	475mm	392mm	1No.
TYPE 7	544 X 2996	532mm	2988mm	1No.
TYPE 8	544 X 1399	532mm	1391mm	1No.
TYPE 9	968 X 1399	956mm	1391mm	1No.

ALL ELEVATIONS ARE VIEWED FROM OUTSIDE UNLESS OTHERWISE STATED

CONTRACT NUMBER :

SPECIFICATION

TILE SYSTEM :

MODULE SIZE :
COLOUR :

Rev.	Date	Comments
C	20.01.14	Panels changed to suit site
B	29.11.13	Dims updated. TEST ISSUE
A	7.11.13	Initial Issue

Drawing Status :

CONSTRUCTION

Contract :

GFRC NORSKREEN
VINCI TEST PANEL

Telling Architectural

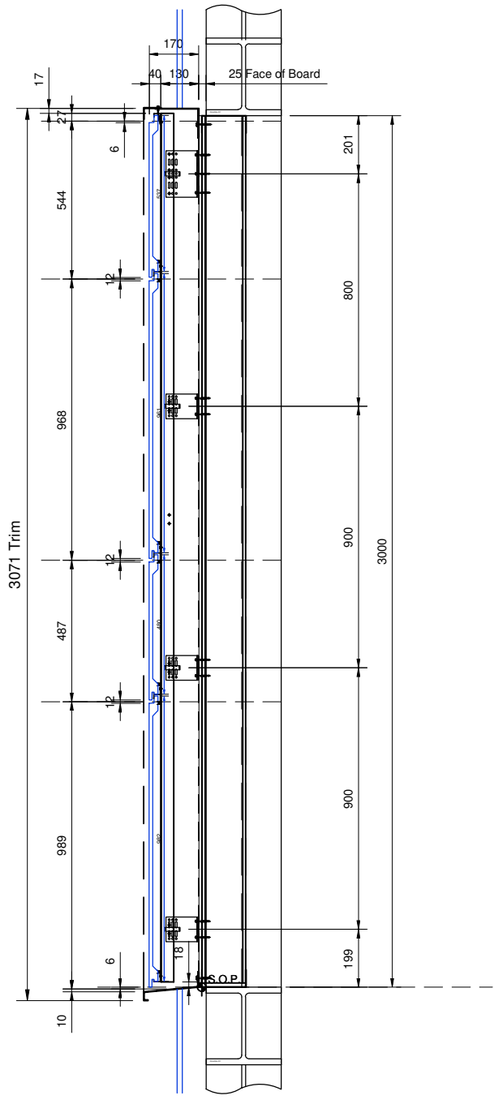
Telling Architectural Ltd
7 The Dell
Enterprise Drive
Four Ashes
Wolverhampton
WV10 7DF
Tel : 01902 797 700
Fax : 01902 797 720

Drawing Title :

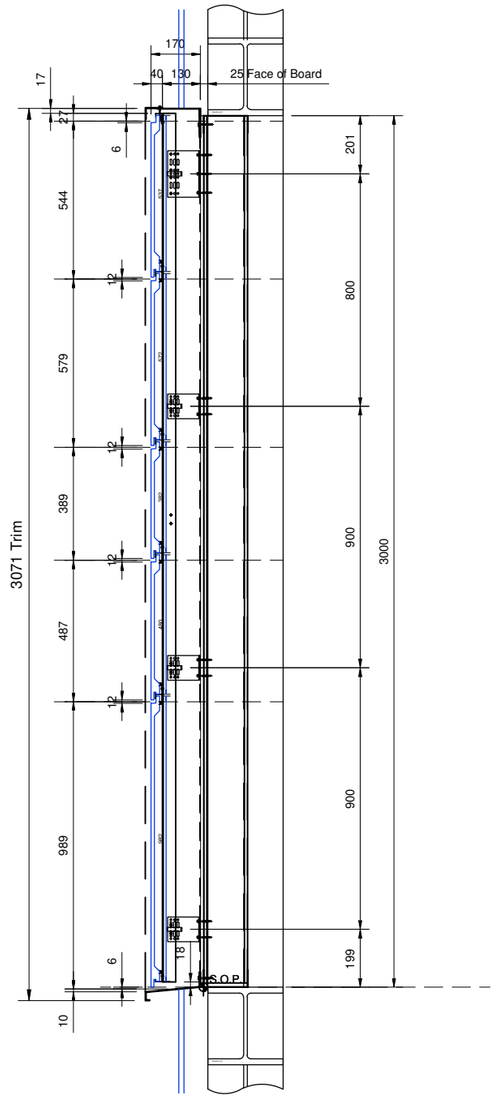
VINCI TEST PANEL
TELLING ARCHITECTURAL

Scale :	Drawn : HB
1 : 20	Date : 07.11.13

Size	Drawing No.	Rev.
A3	NOR-001	C



SECTION B-B



SECTION A-A

ALL ELEVATIONS ARE VIEWED FROM OUTSIDE UNLESS OTHERWISE STATED

CONTRACT NUMBER :

SPECIFICATION

TILE SYSTEM :

MODULE SIZE :
COLOUR :

Rev.	Date	Comments
C	20.01.14	Panels changed to suit site
B	29.11.13	Dims updated. TEST ISSUE
A	7.11.13	Initial Issue

Drawing Status :

CONSTRUCTION

Contract :

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Drawing Title :

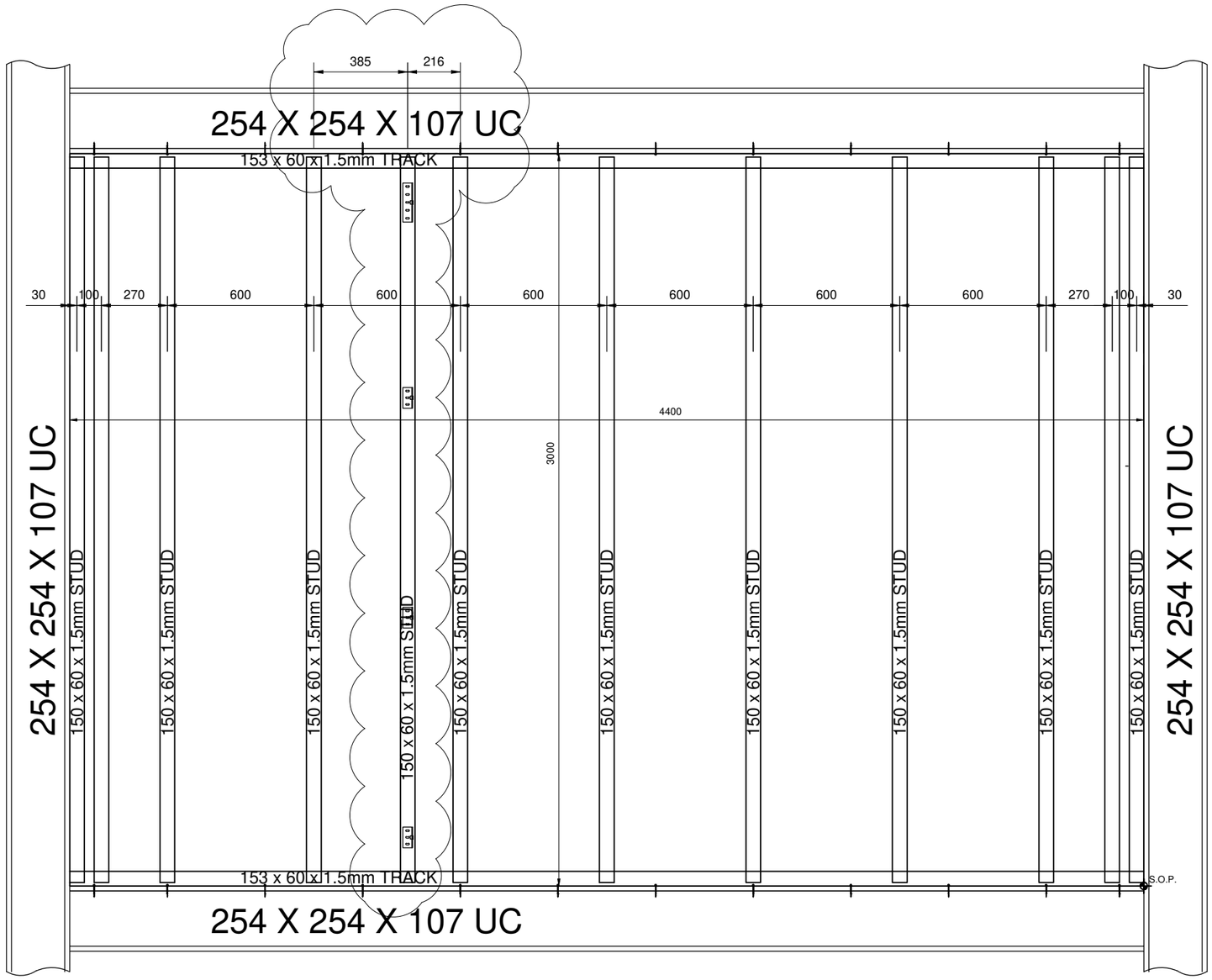
VINCI TEST PANEL
TELLING ARCHITECTURAL
SECTION DETAILS

Scale : 1 : 20

Drawn : HB

Date : 07.11.13

Size	Drawing No.	Rev.
A3	NOR-002	C



STUDS ELEVATION

ALL ELEVATIONS ARE VIEWED FROM OUTSIDE UNLESS OTHERWISE STATED

CONTRACT NUMBER :

SPECIFICATION

TILE SYSTEM :

MODULE SIZE :
COLOUR :

Rev.	Date	Comments
C	20.01.14	Stud added to suit site panels
B	29.11.13	Dims updated. TEST ISSUE
A	7.11.13	Initial Issue

Drawing Status :

CONSTRUCTION

Contract :

GFRC NORSKREEN
VINCI TEST PANEL

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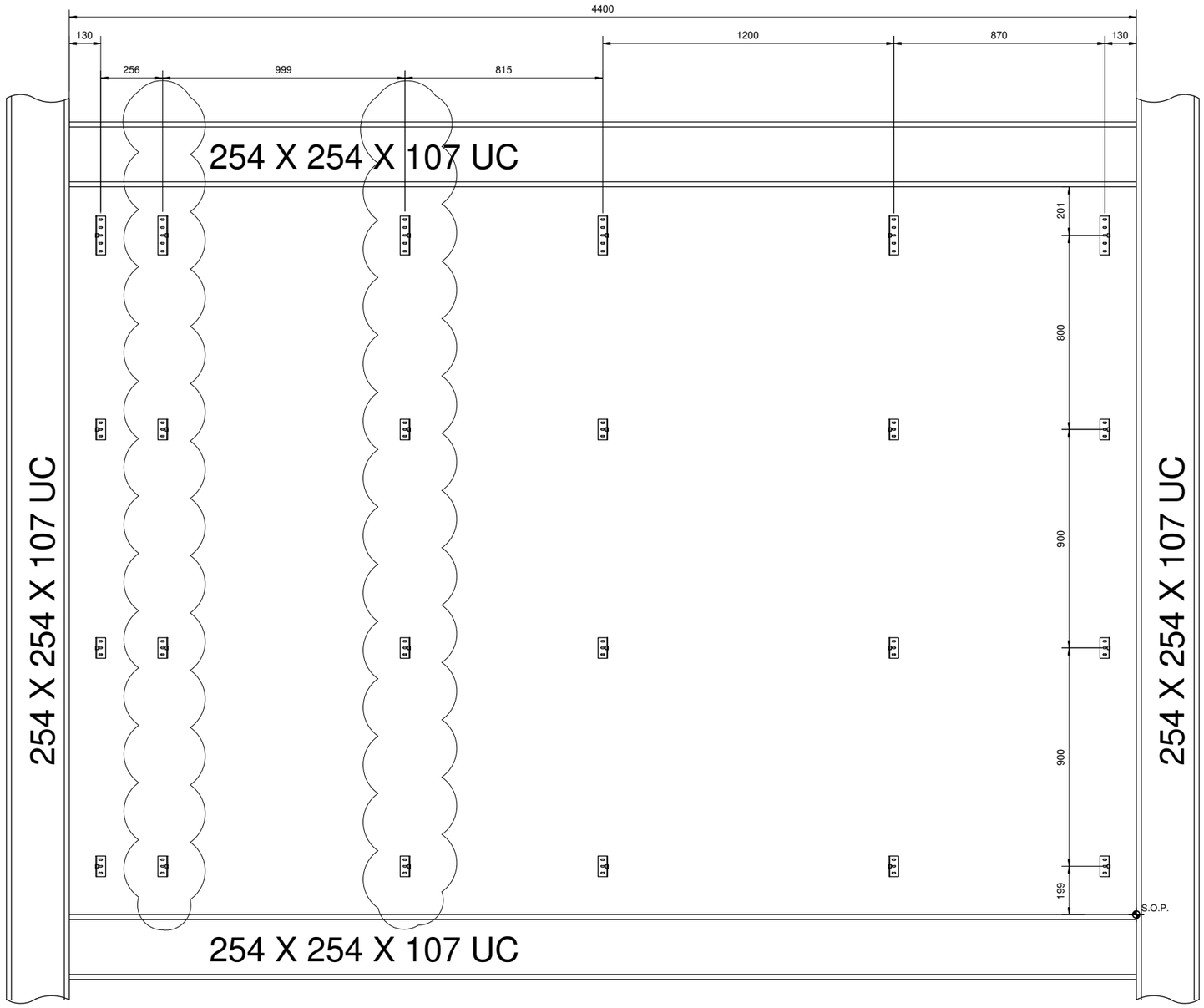
Drawing Title :

VINCI TEST PANEL
TELLING ARCHITECTURAL
STEEL STUD LAYOUT

Scale :	Drawn : HB
1 : 20	Date : 07.11.13

Size	Drawing No.	Rev.
A3	NOR-003	C



BRACKETS ELEVATION

ALL ELEVATIONS ARE VIEWED FROM OUTSIDE UNLESS OTHERWISE STATED

CONTRACT NUMBER :

SPECIFICATION

TILE SYSTEM :

MODULE SIZE :
COLOUR :

Rev.	Date	Comments
C	20.01.14	Changed to suit site panels
B	29.11.13	Dims updated. TEST ISSUE
A	7.11.13	Initial Issue

Drawing Status :

CONSTRUCTION

Contract :

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Drawing Title :

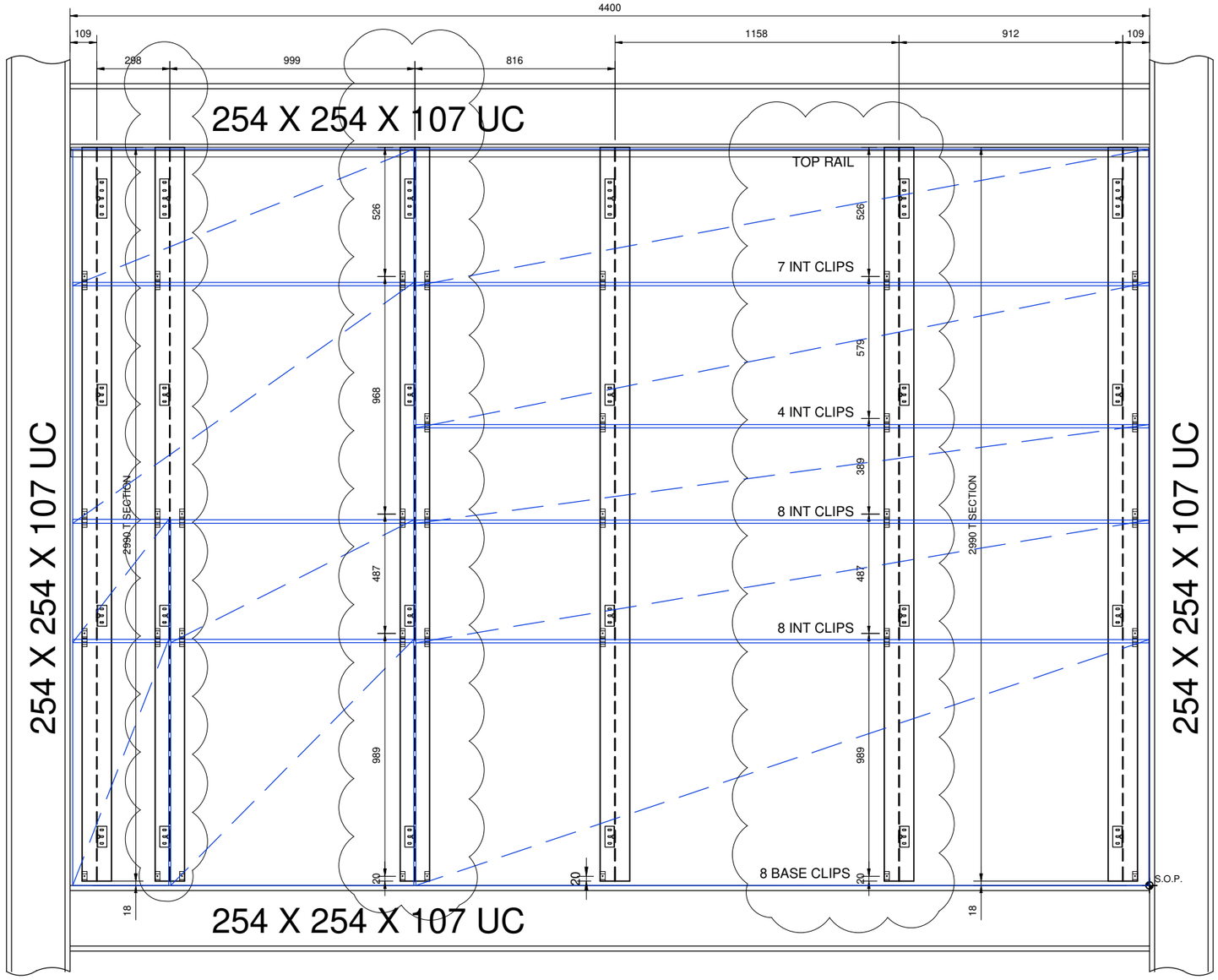
VINCI TEST PANEL
TELLING ARCHITECTURAL
BRACKETS LAYOUT

Scale : 1 : 20

Drawn : HB

Date : 07.11.13

Size	Drawing No.	Rev.
A3	NOR-004	C



T'S ELEVATION

ALL ELEVATIONS ARE VIEWED FROM OUTSIDE UNLESS OTHERWISE STATED

CONTRACT NUMBER :

SPECIFICATION

TILE SYSTEM :

MODULE SIZE :
COLOUR :

Rev.	Date	Comments
C	20.01.14	Panels changed to suit site
B	29.11.13	Dims updated. TEST ISSUE
A	7.11.13	Initial Issue

Drawing Status :

CONSTRUCTION

Contract :

GFRC NORSKREEN
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Fax : 01902 797 720

Drawing Title :

VINCI TEST PANEL
TELLING ARCHITECTURAL
VERTICAL T SECTION AND
CLIP LAYOUT

Scale : 1 : 20

Drawn : HB

Date : 07.11.13

Size	Drawing No.	Rev.
A3	NOR-005	C

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