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Test report: 18-20

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Performance tests on Alfrex solid aluminium panel cassette cladding system, in accordance with AS/NZS 4284:2008 testing of Building Facades to some parameters from draft EM7

Project: Alfrex cassette panel system

Client: Alfrex - Unience USA Inc

Specifier: Alfrex - Unience USA Inc

Sample designer: Cladding Systems NZ Ltd, (CSNZL)

Manufacturer Alfrex - Unience USA Inc

Installer: CSNZL

Test dates: 6 – 8 November 2018

Test Schedule The test order specified in AS/NZS 4284:2008 was followed, including clauses a), b), c), d), e), g), and h). Preliminary testing was undertaken on 6 November 2018 and the balance of AS/NZS 4284:2008 testing performed on 7 and 8 November 2018. This included SLS testing of spandrel panels.

Persons present:

The following persons were present for some of the testing: Mark Judson (CSNZL), Richard Gibbs (facadelab GM), John Lukaszewicz, Phillipe Osorio, & Henry Lukaszewicz, Dmitri and Eric, Pat and Tony (CSNZL), Brian Aitken (Architect), Charles Costello (Alfrex)

Test facility: FacadeLab Limited
320 Rosedale Rd
Albany
Auckland

IANZ accredited testing officer: **John Burgess**

IANZ accreditation number for testing 1091, including AS/NZS 4284.

Tested by: John Burgess, IANZ Signatory. Checked by: Richard Gibbs

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Figure 1: Alfrex cassette panel system under test

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Summary

The Alfrex cladding system was subjected to tests from the AS/NZS 4284:2008 testing suite with the following results.

Preliminary Tests

Pass - air pressure loading to ± 2.25 kPa
Water to 675 static, and 675 – 1350 cyclic test pressure

Serviceability Deflection Test

Studs (± 2.25 kPa) met the deflection limit
Panels (± 2.25 kPa) showed deflections of up to 7.5 mm on the stiffener, and 11.4 mm off the stiffener

Air Infiltration

The air infiltration of the booth plus the sample met the requirement of <1.6 l/s.m² (Gross leakage 20 l/s) at 150 Pa

Water penetration tests

Static Water Penetration Test

Pass – at 675 Pa

Cyclic Water Penetration Test

Pass – at cyclic pressures up to 675 – 1350 Pa

Seismic SLS test

Pass – at displacements of ±15 mm, including cyclic water testing at pressures up to 675 – 1350 Pa

Seismic ULS test

Pass – at displacements of up to ±60 mm.

Ultimate Limit State Pressure Test

Pass – at ±3.2 kPa

Water was visible on the back of the wetwall, and on the cavity face of the rigid air barrier on occasion. Some of this was from rivet holes, This did not constitute a fail of the test, but may be of interest to the designer.

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Contents

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Figures

Tables

Notation

The reference numbers from the AS/NZS 4284:2008 'Testing of building facades' document are used in the following, for ease of reference.

Principle

A sample of a building façade forms one face of an eternally mounted pressure chamber and is sealed at its perimeter and then successively subjected to tests.

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Apparatus

The Alfrex cassette aluminium panel system was tested using the FacadeLab test facility located at 320 Rosedale Rd, Albany, Auckland.

Sample

7.1 Test sample

7.1.1 Orientation

The orientation of all elements is recorded in this report as viewed from the outside of the test booth (dry side), being the interior of the façade when constructed. The inside of the test booth has the exterior (wet side) of the façade.

7.2 Sample Description

The system was installed into a 3.72 m wide, by 3.36 m high timber-framed opening of the test booth by CSNZL. See Figure 1.

The test arrangement consisted of a test sample comprising Alfrex cassette aluminium panel system, set out in a similar manner as required for the E2/VM1 Class 2 testing.

The Alfrex cassette aluminium panel system was tested as open-jointed aluminium panels over a acrylic rigid air barrier, with no interior lining. The Alfrex cassette aluminium panel system includes 3 mm solid aluminium sheets, and other components to create a drained and ventilated cladding system. This was supported on a timber stud wall with a commercial window. All of the rigid air barrier was transparent, allowing un-obstructed viewing of the back of the Al panels and structure. Structural support was provided by 140 x 45 mm studs at 600 centres, with nogs at 600 centres.

The details in the system included:

- Top booth liner section detail 01
- Bottom booth liner section detail 02
- Horizontal joint section detail 03
- Soffit corner section detail 04
- Soffit/wall junction section detail 05
- Interstorey junction section detail 06
- Window head section detail 07
- Window sill section detail 08
- Window jamb plan detail 09
- Left jamb booth liner plan detail 10
- Penetration plan detail 11
- Internal corner plan detail 12
- External corner plan detail 13
- Vertical junction plan detail 14
- 3D aluminium stiffener fixing 16

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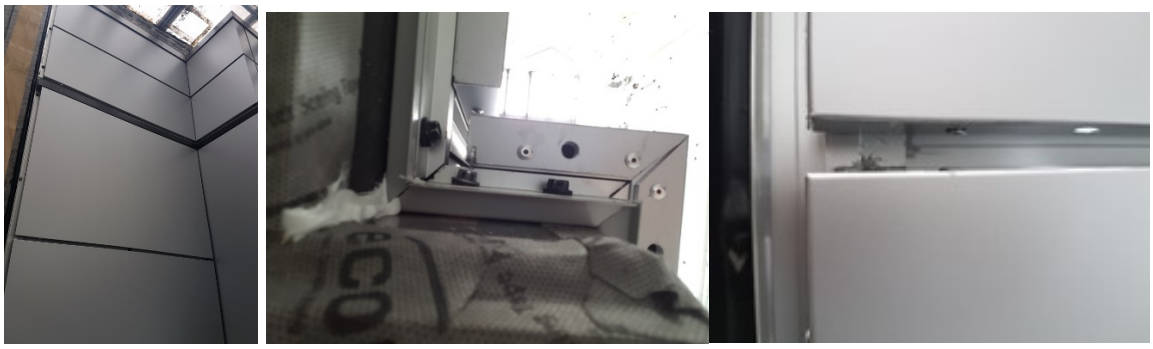

Figure 2: Top booth liner section detail photo, Bottom booth liner section detail, and Horizontal joint section detail

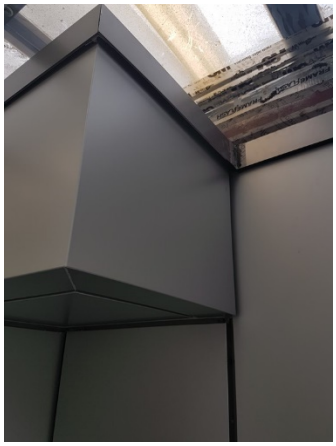

Figure 3: Soffit corner section detail

Figure 4: Soffit/wall junction section detail

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Figure 5: Interstorey junction section detail

Figure 6: Window head section detail

Figure 7: Window sill section detail

Figure 8: Window jamb plan detail

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Figure 9: Left jamb booth liner plan detail

Figure 10: Penetration plan detail

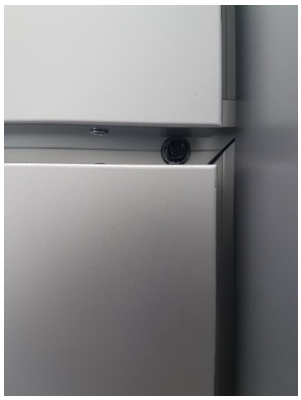

Figure 11: Internal corner plan detail

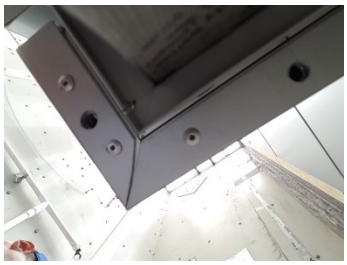

Figure 12: External corner plan detail

Figure 13: Vertical junction plan detail

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7.2.1 Drawings

The system is shown in drawings provided by CSNZL in 9.11
The components are listed below:

7.2.1.1 The Alfrex system aluminium components

12g timber tek screw 75 mm class 5 finish with neo washer
18 mm plywood booth liner
140 x 34 mm framing
90 x 45 framing
Aluminium shim packers up to 10 mm
6 mm acrytlic as RAB
Xx flashing tape
Al rainshield angle at head
1 x 18 mm UHB tape
CSACM-02 aluminium structural rail
3 mm pre-coated solid aluminium prefabricated panel with rivet-fixed edges
CSACM-01 aluminium structural rail
CSACM-04 aluminium rail
Aluminium flashing (extruded) 1.4 mm at panel foot
MS seal on bond-breaker
Proprietary two-part flashing at horizontal panel joint
Aluminium window joinery
Folded metal flashing at head of window
RKFL-19S-Sill flashing profile
Aluminium panel fixing angle – EA 25 x 25 x 3.0 mm
Single-sided Inseal 40 x 2 mm tape
"Approved sealant" on backing rod
Rainshield angle UA 50 x 50 x 1.2 mm
Vanluk escutcheon plate 3 mm stainless steel for pipe penetration
MG100-18 bondbreaker
Vanluk MG100-18 proprietary cavity flashing
Aluminium stiffeners and fixings

7.3 Modifications to the Sample

7.3.1 Panel deflection testing

In order to test the deflection of the aluminium panels, holes were made in the air barrier. The open joints at the foot of the panels (for ventilation and drainage) were also sealed with tape.

7.3.2 Modifications for seismic deflection tests

The infill panels on either side of the sample panel were removed for the Seismic SLS test, then re-instated for the water test, then removed again to allow free horizontal movement during the seismic ULS testing.

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Procedure

Note the same clause numbers have been used as in AS/NZS 4284 for ease of reference in the below.

8.1 Test Sequence

The tests were performed using the testing procedures of AS/NZS 4284:2008 in the cladding test facilities of FaçadeLab, 320 Rosedale Rd, Albany, Auckland.

Due to the need to modify the sample to measure the cladding panel deflections, SLS panel deflection measurements were undertaken after the completion of other testing. The order of testing therefore was:

- Preliminary air
- Preliminary water tests
- Structural deflection of timber stud only
- Air infiltration test
- Water test (Static and cyclic)

Holes were then formed in the air barrier, and the venting of the cladding closed off to allow the air pressure to be held across the cladding panels

- Structural deflection of cladding panels

These holes were then closed off to undertake the ULS test

- Strength at ULS

The blanking panels on either side of the sample were removed, to allow un-restricted movement of the sample under seismic movement

- Seismic SLS followed by cyclic water test (after reinstatement of the blanking panels on either side of the sample

The blanking panels on either side of the sample were removed (again), to allow un-restricted movement of the sample under seismic movement

- Seismic ULS test

8.2 Preliminary Tests

8.2.1 General

Preliminary testing at 8.2.2 was conducted.

8.2.2 Preliminary Static Pressure

The test sample was subjected to the positive and negative SLS design wind pressures for 10 seconds. Air pressures of ±2.25 kPa were applied to the test sample.

8.2.3 Preliminary static water test

Water was applied for a five minute pre-wet with no applied pressure, then with a 675 Pa static pressure, then in three stages of cyclic pressure from 338 – 675, 450 – 900, and 675 – 1350 Pa.

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8.3 Structural Test at Serviceability Limit State (SLS)

8.3.1 Structural Test Pressures

The SLS test pressures used were chosen by the client as ±2250 Pa to match the draft EM7 document under preparation by BRANZ Ltd.

8.3.2 Location of the Displacement Transducers

In accordance with the test procedure specified, a set of displacement transducers was positioned to record localised displacement and net deflection at the outer limits, and at mid-span of the nominated timber stud. The stud nominated is shown in Figure 14, chosen as the only full-height single stud, assumed to show the greatest deflection.

Figure 14: Photo showing location where displacement transducers were placed on full-height timber stud

8.3.3 Pressure Loading Sequence

The pressure loading sequence requested by the specifier was as per AS/NZS 4284 and required ramping up under positive pressure in five steps, being 20%, 40%, 60%, 80% and 100%, before continuing with the ramp down, and negative pressures, as in Fig 1 of AS/NZS 4284: 2008, with an SLS of ±2.25 kPa.

8.3.4 Displacement Measurement of Cladding Panels

(As noted above, this testing was performed after the water tests, since it required forming holes in the air barrier). Locations for the measurement of the cladding panel movement were nominated. This involved a horizontal line of transducers on the stiffener, and also across the middle of an un-stiffened panel. The effect of the acrylic air barrier was removed, by forming large holes in it, to allow a pressure to be developed across the cladding as can be seen in Figure 15.

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Figure 15: Set of three horizontal transducers setup at the vertical mid-point between stiffeners on a cladding panel.

A rigid structure was erected inside the booth to enable measurements of displacement of the cladding to be made, while isolating the transducers from movement in the booth walls.

8.3.5 Calculation of deflection/span ratio

The deflection/span ration of the stud and the largest single panel are calculated in section 9.2.

8.3.6 Calculation of successive member displacement

The calculation of successive member displacement is shown in Table 2.

8.4 Air Infiltration

The Air Infiltration test was requested as part of the AS/NZS 4284:2008 test procedure at a pressure difference of 150 Pa.

8.5 Water Penetration by Static pressure

The static water penetration test pressure of 675 Pa was chosen by the specifier to match the values in EM7.

8.6 Water penetration test by cyclic pressure

The three stages of cyclic water penetration were nominated as follows, to match the values in EM7:
Stage 1: 338 – 675 Pa
Stage 2: 450 – 900 Pa
Stage 3: 675 – 1300 Pa

8.7 BMU restraint test

A BMU restraint test was not requested.

8.8 Structural Test at Ultimate Limit State (ULS)

The test pressures of ±3.20 kPa were nominated by the specifier to match the ULS of the EM7 process.

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8.9 Seismic Test

The test parameters of EM7 were used.

8.9.1 Seismic test at Serviceability Limit State (SLS)

The test parameters of EM7 were used, being ±15 mm movement of the ram, with 15 cycles.

8.9.2 Seismic test at Ultimate Limit State (ULS)

The test parameters were chosen with cycles starting at ±20 mm, and rising in approximately 5 mm increments to ±50 mm in 10 cycles.

9 Results

9.1 Preliminary Static Pressure

The test sample was subjected to the positive and negative SLS design wind pressures for at least 10 seconds. Air pressures of ±2.25 kPa were applied to the test sample. There was no visible dislodgement of framing or cladding materials, failure of fixings, breakage of cladding or permanent distortion of cladding.

9.1.1 Preliminary water tests

9.1.1.1 Static water Pressure

Water was applied for a five minute pre-wet with no applied pressure, then with a 675 Pa static pressure, with water was found at a few places on the back of the wetwall. Several rivet holes (without rivets) were found to be allowing water to drip in the cavity, and spatter onto the cavity-side of the acrylic air barrier. These were found and sealed.

9.1.1.2 Cyclic water Pressure

Air pressure was then applied in three stages of cyclic pressure from 338 – 675, 450 – 900, and 675 – 1350 Pa. During the cyclic water testing, further un-filled rivet holes were found and sealed, and water continued to track down the back of the wetwall to drainage at the foot of panels.

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9.2 Structural test at serviceability limit state (SLS)

SLS deflection measurements were made as shown in the tables below.

Timber stud deflections	
Span	3412 mm
Pressure (Pa)	Adjusted net deflection (mm)
0	0
2250	5.95
0	0.365
450	1.14
900	2.315
1350	3.525
1800	4.765
2250	5.99
0	0.345
0	0
2250	5.61
1800	4.74
1350	3.765
900	2.645
450	1.345
0	0.015
0	0
-2250	-6.46
0	-1.485
-450	-2.335
-900	-3.4
-1350	-4.54
-1800	-5.615
-2250	-6.585
0	-1.655
0	0
-2250	-4.945
-1800	-4.41
-1350	-3.705
-900	-2.78
-450	-1.525
0	-0.12

Table 1: Net deflections

On stiffener	
Span	1120
Pressure (Pa)	Adjusted net deflection (mm)
0	0
2250	8.09
0	0.77
0	0
450	1.53
900	3.05
1350	4.565
1800	5.985
2250	7.33
0	0.015
0	0
2250	7.33
1800	6.025
1350	4.7
900	3.205
450	1.685
0	0.03
0	0
-2250	8.065
0	0.645
0	0
-450	1.79
-900	3.35
-1350	4.855
-1800	6.15
-2250	7.425
0	0.07
0	0
-2250	7.4
-1800	6.17
-1350	4.875
-900	3.435
-450	1.82
0	0.025
0	0
2250	-8.035
0	-0.535
0	0

Off stiffener	
Span	1122
Pressure (Pa)	Adjusted net deflection (mm)
0	0
0	0
-2250	4.59
0	0
-450	2.92
-900	4.96
0	0.72
0	0
-900	4.24
-1350	6.02
-1800	7.585
-2250	9.075
0	0.045
-2250	9.075
-1800	7.7
-1350	6.17
-900	4.405
0	0.05
0	0
2250	-11.475
0	-1.42
0	0
450	-1.595
900	-3.845
1350	-5.945
1800	-7.76
2250	-9.375
0	-0.795
0	0
2250	-10.055
1800	-8.45
1350	-6.795
900	-4.8
450	-2.465
0	-0.015
0	0.075

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9.2.1 Deflection/span ratios

These are shown in Table 3.

The maximum net deflection in both directions for the timber stud (5.99 and -6.46 mm) was less than the allowed maximum deflection of span/250 (12.3 mm).

The maximum net deflection for the panel on the stiffener was 7.33 mm in the positive direction and -7.47 mm in the negative direction, being about span/150.

The maximum net deflection for the panel off the stiffener was 11.43 mm in the positive direction (span/98) and -9.08 mm (span/124) in the negative direction.

9.2.2 Successive member displacement

These are shown as the 'Zero table' in Table 2.
The dashes indicate that not all data was available. The displacement does not exceed 3.0 mm, as required in the standard.

Zero table			
Z's	Stud	On stiffener	Off stiffener
Z1	0.37	0.77	0.00
Z2	0.35	0.02	0.58
Z3	-0.01	-0.73	0.04
Z4	-1.13	-0.08	0.00
Z5	-0.17	0.07	0.04
Z6	-0.29	0.10	0.05
Z7	-	-0.44	-1.37

Table 2: Successive member displacements. All measurements in mm.

9.2.3 Maximum displacement

The stud where deflection measurements were made is shown in the photo at Figure 14.

The deflections for the timber stud at positive and negative test pressures, together with the spandrel panel deflections on the stiffener, and between stiffeners are recorded in Table 1. Maximum net deflections are shown in Table 3, with the full set of results shown in the appendices.

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Maximum net deflections				
Stud/Panel Reference	Span (mm)	Pressure (Pa)	Max Net Deflection (mm)	Span/ deflection
Timber stud	3080	±2250	-6.46	-477
Deflections on stiffener	1120	±2250	-7.47	-150
Deflections off stiffener	1122	±2250	-11.43	-98

Table 3: Summary of maximum net deflections of stud and panels in serviceability limit state testing

9.3 Air Infiltration

The air infiltration through the sample, including the aluminium panel and the rigid acrylic air barrier was measured at both 75 Pa and 150 Pa.

This test was undertaken to evaluate the air leakage of the system under the requirements of AS/NZS 4284:2008.

Allowable leakage: 1.6 l/s.m²
Total Area: 12.5 m²
Sample allowable leakage: 20.0 l/s

Airtightness measurements @ 150 Pa		
	Positive pressure (infiltration) l/s	Negative pressure (exfiltration) l/s
Measured (booth + sample)	11.1 ± 0.2	11.8 ± 0.1
Measured (booth)	Not measured	Not measured
Calculated sample leakage	<11.1	<11.8

Table 4: Air leakage data

Note: As allowed in Appendix D of AS/NZS 4284, since the total air leakage of the sample and the booth was less than the allowable leakage, no further testing was undertaken as the system passed the requirement.

Airtightness measurements @ 75 Pa		
	Positive pressure (infiltration) l/s	Negative pressure (exfiltration) l/s
Measured (booth + sample)	7.0 ± 0.1	7.4 ± 0.1
Measured (booth)	Not measured	Not measured
Calculated sample leakage	<7.0	<7.4

Table 5: Air leakage data

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9.4 Water Penetration

The results of the static and cyclic water tests, as per clause 8.5 are shown below.

9.4.1 Static Pressure Water Penetration

Static water test			
Stage	Air pressure (Pa)	Duration	Result
0	0	5 minutes	No water leaks – water on back of cladding only
1	675	15 minutes	No water leaks – minor spatters at several locations on cavity side of acrylic only
2	0	5 minutes	No water leaks

Table 6: Static water leakage results

There were no water leaks, meeting the requirement of the standard.

Water on the back of the cladding and on the cavity side of the acrylic air barrier provided information to the specifier.

9.4.2 Cyclic Pressure Water Penetration

Cyclic water test			
Phase	Air pressure (Pa)	Duration	Result
	0	5 minutes	No water leaks
1	338-675	5 minutes	No water leaks
2	450 - 900	5 minutes	No water leaks
3	675- 1350	5 minutes	No water leaks
	0	5 minutes	No water leaks

Table 7: Cyclic water test results

There were no water leaks, meeting the requirement of the standard.

9.5 Seismic Testing at Serviceability Limit State

	Displacements in structure from ram during SLS seismic tests - 15 cycles with ± 15 mm.															
Displ (mm)	Cycle #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Pos	16	15	15	15	15	15.3	16.5	15.1	15.2	15.3	15.5	15.1	15	15.5	15.2
	Neg	17	15	15.6	17	19	15.4	18.5	16.5	18	17.3	16.7	17	16	15.5	16.4

There was no evidence of panel dislodgement or permanent displacement.

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9.5.1 Water Penetration

The results of the static water tests following the seismic test, as per clause 8.5 are shown below.

9.5.2 Cyclic Pressure Water Penetration

Cyclic water test			
Phase	Air pressure (Pa)	Duration	Result
	0	5 minutes	No water leaks
1	338-675	5 minutes	No water leaks
2	450 - 900	5 minutes	No water leaks
3	675- 1350	5 minutes	No water leaks
	0	5 minutes	No water leaks

Table 8: Cyclic water test results

There were no water leaks, meeting the requirement of the standard.

9.6 BMU Restraint Test

Not requested.

9.7 Structural Test at Ultimate Limit State Air Pressure

Ultimate Limit State (ULS) air pressure test	
Air pressure (kPa)	Result
+3.2	OK
-3.2	OK

Table 9: Ultimate limit state air pressure results

On inspection, there was no visible dislodgement of framing or cladding materials, failure of fixings, breakage of cladding or permanent distortion of cladding following ULS pressure testing.

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9.8 Seismic test at ultimate limit state displacement

	Displacements during ULS seismic tests - 10 cycles .										
Displ (mm)	Cycle #	1	2	3	4	5	6	7	8	9	10
	Pos	20	25	30	38	40	45	52	58	58	58
	Neg	20	25	30	36	40	45	55	62	65	65

There was no collapse or permanent damage to any seals, members or panels evident during or after the cessation of the ULS seismic testing.

Prepared By:

John Burgess (IANZ-accredited test engineer)

March 2019

Verified By:

Richard Gibbs (facadelab manager)

March 2019

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Appendices

9.9 Serviceability Deflections

9.9.1 Timber stud

		Timber stud					Pressure	Adjusted net deflection
	Pressure	Up	Mid	Low	Net	Calculated	(Pa)	(mm)
	0	0	0	0	0		0	0
	2250	5.27	10.63	4.09	5.98	5.95	2250	5.95
Z1	0	0.84	1.12	0.67	0.37	0.37	0	0.37
	450	2.28	2.83	1.1	1.14	1.14	450	1.14
	900	2.94	4.63	1.69	2.28	2.32	900	2.32
	1350	3.73	6.6	2.42	3.52	3.53	1350	3.53
	1800	4.53	8.66	3.26	4.77	4.77	1800	4.77
	2250	5.32	10.75	4.2	5.98	5.99	2250	5.99
Z2	0	0.91	1.2	0.8	0.35	0.35	0	0.35
	0	0	0	0	0	0.00	0	0.00
	2250	5.32	10.77	4.31	5.96	5.96	2250	5.59
	1800	4.81	9.42	3.86	5.09	5.09	1800	4.72
	1350	4.22	7.86	3.28	4.11	4.11	1350	3.75
	900	3.54	6.08	2.64	2.98	2.99	900	2.63
	450	2.79	4.01	1.85	1.69	1.69	450	1.33
Z3	0	1.03	1.35	0.95	0.36	0.36	0	-0.01
	0	0	0	0	0	0.00	0	0.00
	-2250	-6.65	-13.65	-8.45	-6.1	-6.10	-2250	-6.46
Z4	0	-3.24	-5.36	-5.23	-1.13	-1.13	0	-1.13
	-450	-4.41	-7.04	-5.72	-1.98	-1.98	-450	-0.85
	-900	-4.94	-8.68	-6.34	-3.04	-3.04	-900	-1.92
	-1350	-5.5	-10.45	-7.04	-4.18	-4.18	-1350	-3.06
	-1800	-6.1	-12.21	-7.81	-5.25	-5.26	-1800	-4.13
	-2250	-6.76	-13.95	-8.69	-6.23	-6.23	-2250	-5.10
Z5	0	-3.51	-5.82	-5.54	-1.29	-1.30	0	-0.17
	0	0	0	0	0	0.00	0	1.13
	-2250	-6.88	-14.16	-8.96	6.28	-6.24	-2250	-5.12
	-1800	-6.49	-13.26	-8.62	-5.71	-5.71	-1800	-4.58
	-1350	-6.1	-12.11	-8.12	-5	-5.00	-1350	-3.88
	-900	-5.6	-10.64	-7.53	-4.07	-4.08	-900	-2.95
	-450	-4.95	-8.69	-6.79	-2.82	-2.82	-450	-1.70
Z6	0	-3.61	-6.14	-5.84	-1.42	-1.42	0	-0.29
	0	0	0	0	0	0.00	0	0.00

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9.9.2 On Stiffener

On Stiffener							
	Pressure	Up	Mid	Low	Net	Calculated	Ref to 0
	2250	12.11	18.31	8.33	8.1	8.09	8.09
Z1	0	3.03	2.97	1.37	0.77	0.77	0.77
	0	0	0	0	0	0.00	0.00
	450	1.11	2.82	1.47	1.53	1.53	1.53
	900	2.86	5.85	2.74	3.05	3.05	3.05
	1350	4.8	9.07	4.21	4.57	4.57	4.57
	1800	6.92	12.25	5.61	5.99	5.99	5.99
	2250	9.21	15.47	7.07	7.32	7.33	7.33
Z2	0	0.63	0.43	0.2	0.02	0.02	0.02
	0	0	0	0	0	0.00	0.00
	2250	9.35	15.56	7.08	7.34	7.35	6.58
	1800	8.84	13.6	6.28	6.04	6.04	5.27
	1350	7.59	11.17	5.32	4.71	4.72	3.95
	900	5.96	8.28	4.16	3.22	3.22	2.45
	450	3.91	4.93	2.55	1.7	1.70	0.93
Z3	0	0.95	0.71	0.38	0.04	0.04	-0.73
	0	0	0	0	0	0.00	0.00
	-2250	20.09	23.91	11.51	8.11	8.11	7.34
Z4	0	10.96	8.25	4.16	0.68	0.69	-0.08
	0	0	0	0	0	0.00	0.00
	-450	12.12	11.31	5.54	2.47	2.48	1.79
	-900	13.93	14.53	7.05	4.04	4.04	3.35
	-1350	15.95	17.83	8.62	5.54	5.55	4.86
	-1800	18.08	20.97	10.18	6.85	6.84	6.15
	-2250	20.19	24.07	11.72	8.12	8.12	7.43
Z5	0	11.61	8.79	4.45	0.76	0.76	0.07
	0	0	0	0	0	0.00	-0.69
	-2250	19.74	23.9	11.74	8.16	8.16	7.47
	-1800	18.92	21.78	10.78	6.94	6.93	6.24
	-1350	18.76	19.87	9.71	5.64	5.64	4.95
	-900	17.1	16.94	8.39	4.19	4.20	3.51
	-450	14.95	13.41	6.71	2.58	2.58	1.89
Z6	0	12.26	9.26	4.69	0.79	0.79	0.10
	0					0.00	-0.69
	2250	-8.9	-15.2	-7	-7.25	-7.25	-7.94
Z7	0	-2.14	-0.79	0.06	-0.26	0.25	-0.44
	0	0	0	0	0	0.00	0.00

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9.9.3 SLS deflections off stiffener

	Off stiffener						
	Pressure	Up	Mid	Low	Net	Calculated	Ref to 0
	0	0	0	0	0		
	0	0	0	0	0	0.00	0.00
	-2250	17.59	23.26	19.75	4.59	4.59	4.59
	0	14.9	17.38	18.46	0.7	0.70	0.00
	-450	16.13	20.73	19.49	2.92	2.92	2.92
	-900	17.59	24.05	20.59	4.96	4.96	4.96
Z4	0	14.92	17.42	18.48	0.71	0.72	0.72
	0	0	0	0	0	0.00	0.00
	-900	17.54	24.02	20.58		4.96	4.24
	-1350	19.2	27.28	21.88	6.74	6.74	6.02
	-1800	21.09	30.49	23.28	8.3	8.31	7.59
	-2250	23.19	33.74	24.7	9.8	9.80	9.08
Z5	0	15.45	17.87	18.76	0.76	0.77	0.04
	-2250	23.29	33.79	24.7	9.79	9.80	9.08
	-1800	22.45	31.66	24.03	8.42	8.42	7.70
	-1350	21.33	29.1	23.09	6.89	6.89	6.17
	-900	19.81	25.97	21.88	5.13	5.13	4.41
Z6	0	15.78	18.11	18.9	0.78	0.77	0.05
	0	0	0	0	0	0.00	0.00
	2250	-17.92	-24.46	-9.59	-10.71	-10.71	-11.43
Z7/Z1	0	-10.4	-7.84	-3.98	-0.65	-0.65	-1.37
	0	0	0	0	0	0.00	0.00
	450	-1.32	-3.44	-1.07	-2.25	-2.25	-1.60
	900	-2.7	-6.91	-2.13	-4.49	-4.50	-3.85
	1350	-4.24	-10.38	-3.33	-6.59	-6.60	-5.95
	1800	-6.01	-13.69	-4.55	-8.41	-8.41	-7.76
	2250	-7.79	-16.8	-5.76	-10.03	-10.03	-9.38
Z2	0	-0.37	-0.39	-0.26	-0.08	-0.08	0.58
	0	0	0	0	0	0.00	0.65
	2250	-7.91	-17.01	-5.85	-10.13	-10.13	-9.48
	1800	-7.09	-14.66	-5.18	-8.53	-8.53	-7.88
	1350	-6.01	-12.07	-4.39	-6.87	-6.87	-6.22
	900	-4.68	-8.9	-3.37	-4.88	-4.88	-4.23
	450	-3.05	-5.12	-2.11	-2.54	-2.54	-1.89
Z3	0	-0.59	-0.57	-0.37	-0.1	-0.09	0.56
	0	0	0	0	0	0.00	0.08

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9.10 Test Request

As above

SPECIFIC TEST REQUIREMENTS

Section	Test Name	Clause	Required parameters		
(a)	Preliminary test	8.2.1			
	SLS pressure	8.2.2/8.3	SLS(+) = 2250 Pa		
			SLS(–) = 2250 Pa		
	Water static	8.2.3/8.5	Static water test pressure = 675 Pa		
	Water—Cyclic	8.2.3/8.6	Cyclic test pressure Stage 1 = 675 Pa		
		8.2.3/8.6	Cyclic test pressure Stage 2 = 900 Pa		
		8.2.3/8.6	Cyclic test pressure Stage 3 = 1350 Pa		
(b)	Structural test at SLS	8.3.2	Location of transducers noted on drawings? Y/N		
		8.3.3	Pressure steps?		
			Max. displacement? = 12.3 mm (span/250)		
Members or panels		Deflection/span limit ratio			
(c)	Air infiltration test	Test pressure	(+) = 150 Pa		
			(–) = 150 Pa		
		Air infiltration limit = 12.5/16 l/m²s) 20 k max			
(d)	Water test (static and cyclic)	Pressure (Pa)	Duration (mins)	Duration and spray intensity	
	Static	675		15 min, 0.05 L/m² s	
	Cyclic 1	675		5 min, 0.05 L/m² s	
	Cyclic 2	900		5 min, 0.05 L/m² s	
	Cyclic 3	1350		5 min, 0.05 l/m²s	
Additional water penetration requirements?					
(e)	Seismic at SLS		(Water test repeated after)		
	Support beam movement allowed = 15mm				
	Number of cycles = 15				
	Frequency of movement = /				
X	BMU restraint		Test load across face of sample = kN		
			Test load perpendicular to sample = kN		
(g)	Strength at ULS	Test pressure	(+) = 3200 Pa		
			(–) = 3200 Pa		
(h)	Seismic at ULS				
	Support beam movement allowed = 20–50 mm				
	Number of cycles = 10				
	Frequency of movement = Hz				
X	Seal degradation		10% air seal removal? Y/N		
Describe seals to be altered					

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9.11 Drawings

ALFREX Solid PSP

ALFREX SOLID OPEN JOINT TEST - DRAWING INDEX

Sheet N°	Issue Date	Revision	Sheet Description	Products
A101	28/03/2019	B	FRAMING 3D VIEWS	PSP
A102	28/03/2019	B	FRAMING REFERENCE ELEVATION	PSP
A103	28/03/2019	B	FRAMING SECTIONS	PSP
A104	28/03/2019	B	FRAMING PLANS	PSP
A105	28/03/2019	B	PANEL LAYOUT LEFT	PSP
A106	28/03/2019	B	PANEL LAYOUT RIGHT	PSP
A107	28/03/2019	B	PANELS ELEVATION	PSP
A108	28/03/2019	B	PANEL LAYOUT PLANS	PSP
A109	28/03/2019	B	PANEL LAYOUT SECTIONS	PSP
A110	28/03/2019	B	3D REFERENCE ELEVATIONS LEFT	PSP
A111	28/03/2019	B	3D REFERENCE ELEVATION RIGHT	PSP
A112	28/03/2019	B	COMPONENTS LIST	PSP
01	28/03/2019	B	TOP BOOTH LINER SECTION DETAIL	PSP
02	28/03/2019	B	BOTTOM BOOTH LINER SECTION DETAIL	PSP
03	28/03/2019	B	HORIZONTAL JOINT SECTION DETAIL	PSP
04	28/03/2019	B	SOFFIT CORNER SECTION DETAIL	PSP
05	28/03/2019	B	SOFFIT / WALL JUNCTION SECTION DETAIL	PSP
06	28/03/2019	B	INTERSTOREY JUNCTION SECTION DETAIL	PSP
07	28/03/2019	B	WINDOW HEAD SECTION DETAIL	PSP
08	28/03/2019	B	WINDOW SILL SECTION DETAIL	PSP
09	28/03/2019	B	WINDOW JAMB PLAN DETAIL	PSP
10	28/03/2019	B	LEFT JAMB BOOTH LINER PLAN DETAIL	PSP
11	28/03/2019	B	PENETRATION PLAN DETAIL	PSP
12	28/03/2019	B	INTERNAL CORNER PLAN DETAIL	PSP
13	28/03/2019	B	EXTERNAL CORNER PLAN DETAIL	PSP
14	28/03/2019	B	VERTICAL JUNCTION PLAN DETAIL	PSP
15	28/03/2019	B	CRUCIFORM SOAKER FIXING DETAIL	PSP
16	28/03/2019	B	3D ALUMINIUM STIFFENER FIXING	PSP

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Name: ALFREX SOLID OPEN JOINT TEST
INDEX
Job number: C0186

1:2 @ A4	28/03/2019	B	IDX-00
Scale	Date	Revision	Dwg

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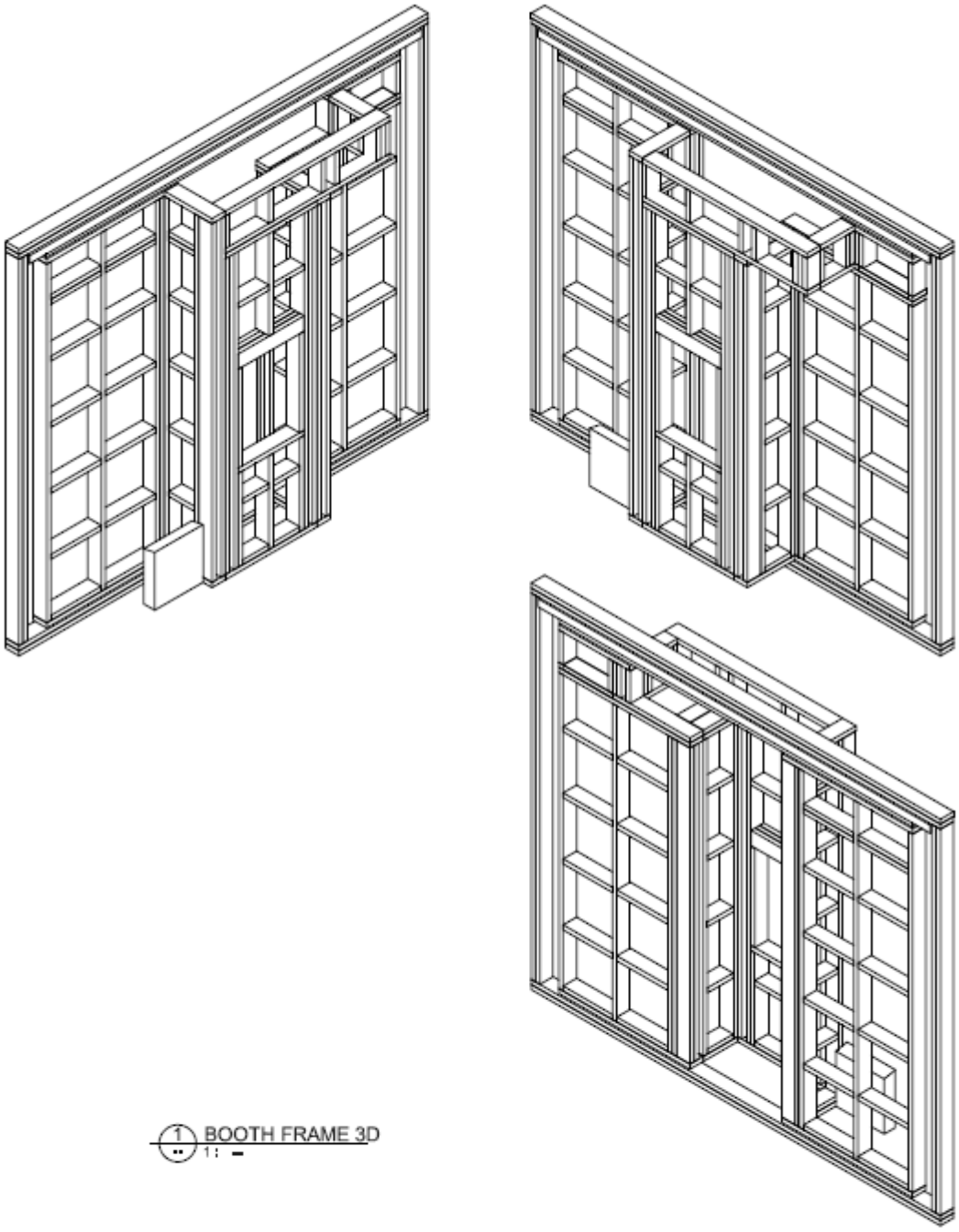

1 BOOTH FRAME 3D
1 : -

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Name:
ALFREX SOLID OPEN JOINT TEST

FRAMING 3D VIEWS

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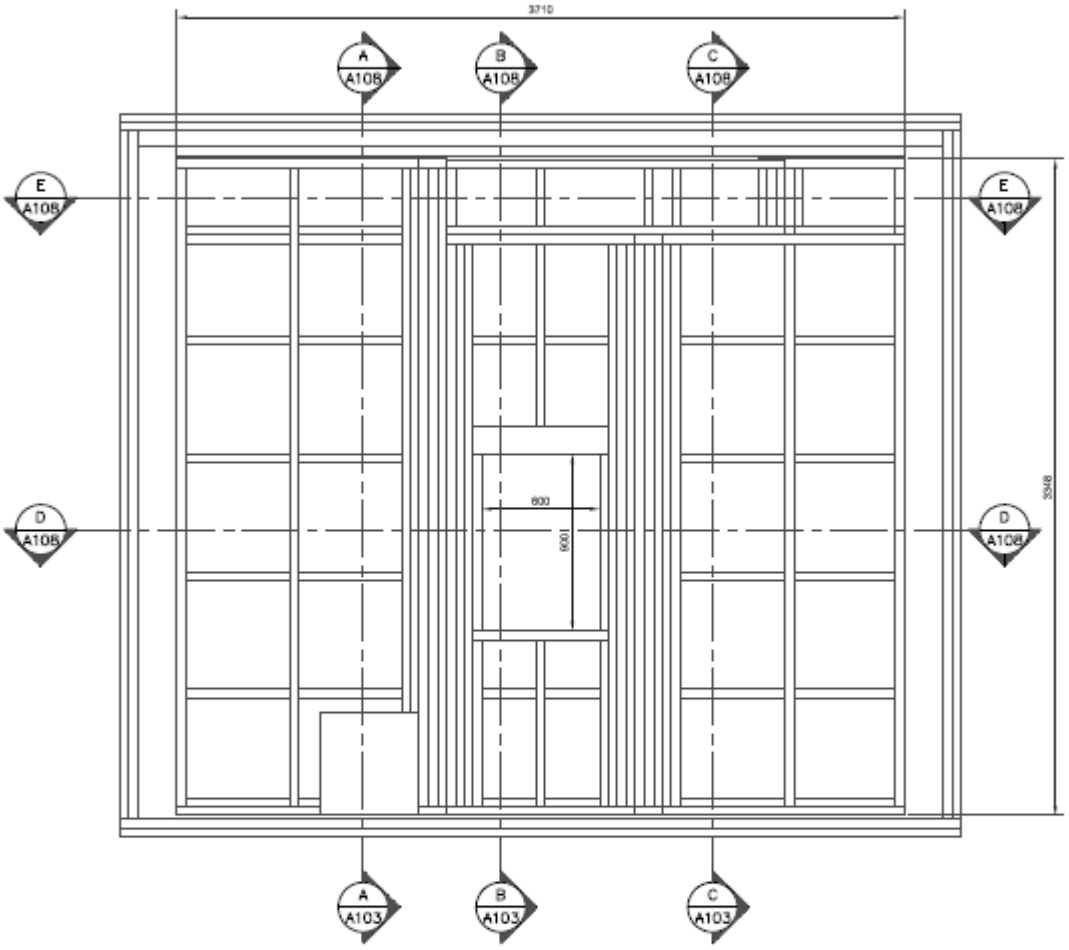

2 BOOTH FRAME REF ELEVATION
1 : 20

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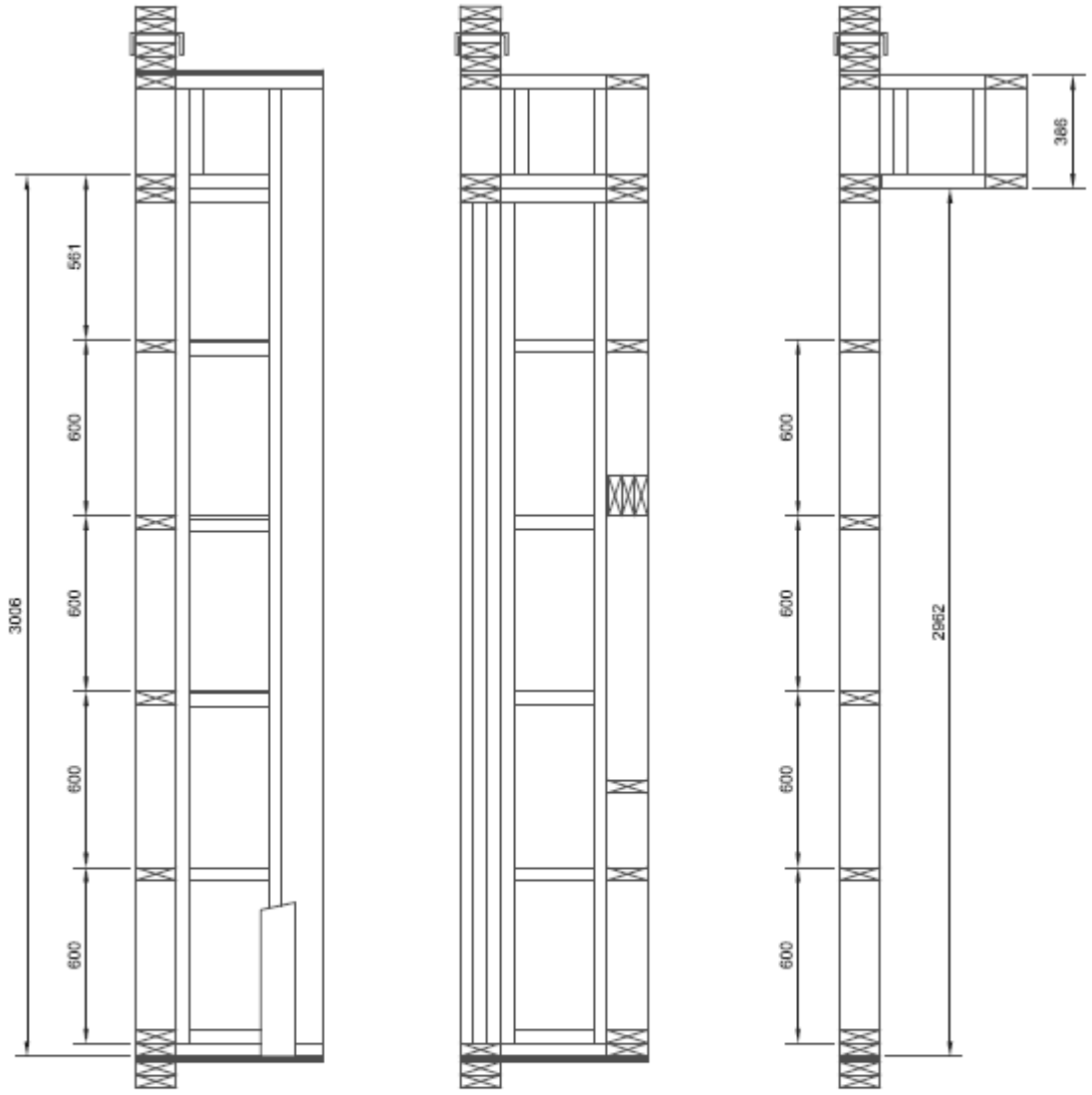

3 SECTION A 1 : 20

4 SECTION B 1 : 20

5 SECTION C 1 : 20

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FRAMING SECTIONS
Job number: C0188

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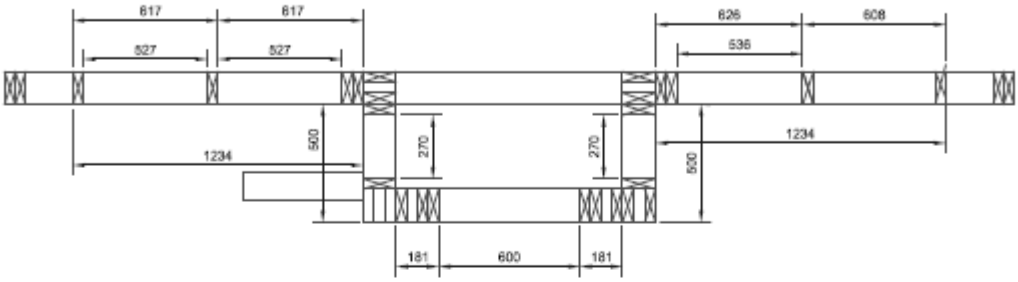
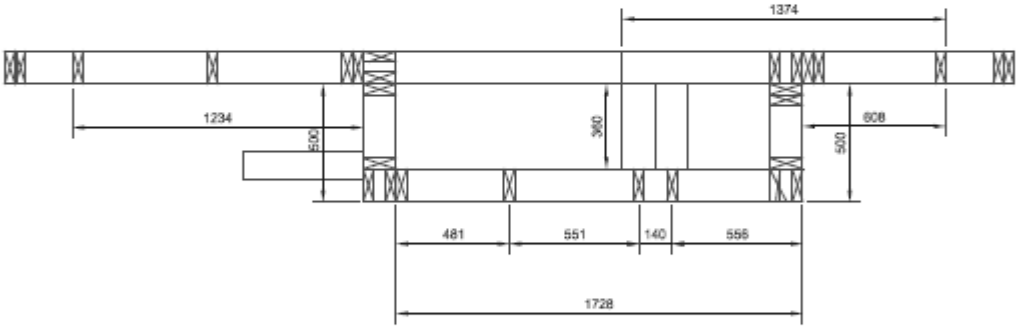


6 SECTION D
1 : 20



7 SECTION E
1 : 20

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Name:
ALFREX SOLID OPEN JOINT TEST
FRAMING HORIZONTAL SECTIONS
Job number: C0186

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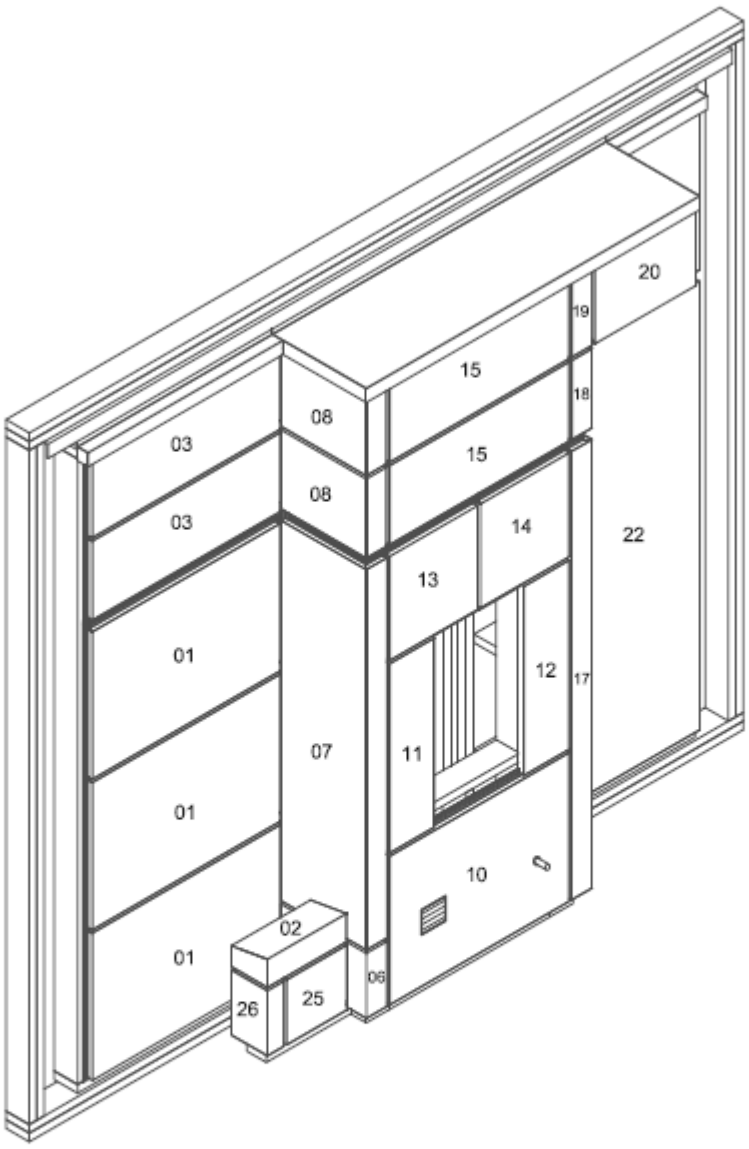

8 PRABRICATED PANELS INDEX
1 : 20

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Name:
ALFREX SOLID OPEN JOINT TEST
PANEL LAYOUT LEFT
Job number: C0186

NTS @ A4	28/03/2019	B	A105
Scale	Date	Revision	Dwg

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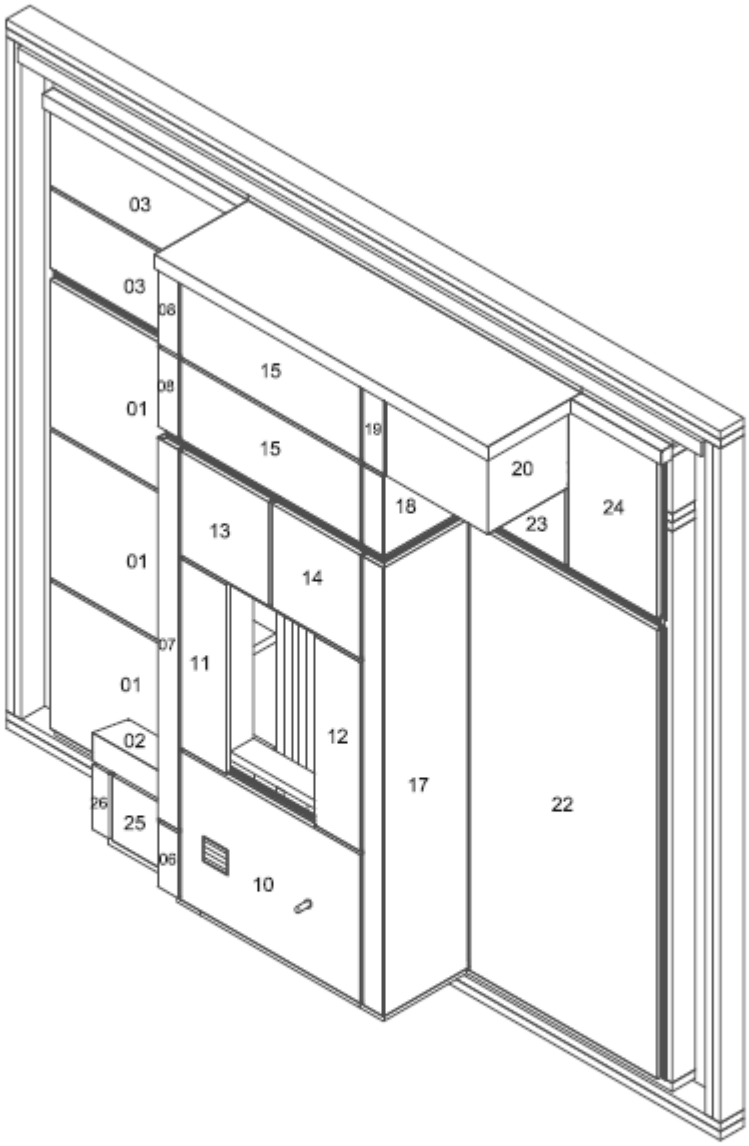

9 PREFABRICATED PANELS INDEX
1 : 20

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PANEL LAYOUT RIGHT
Job number: C0186

NTS @ A4	28/03/2019	B	A106
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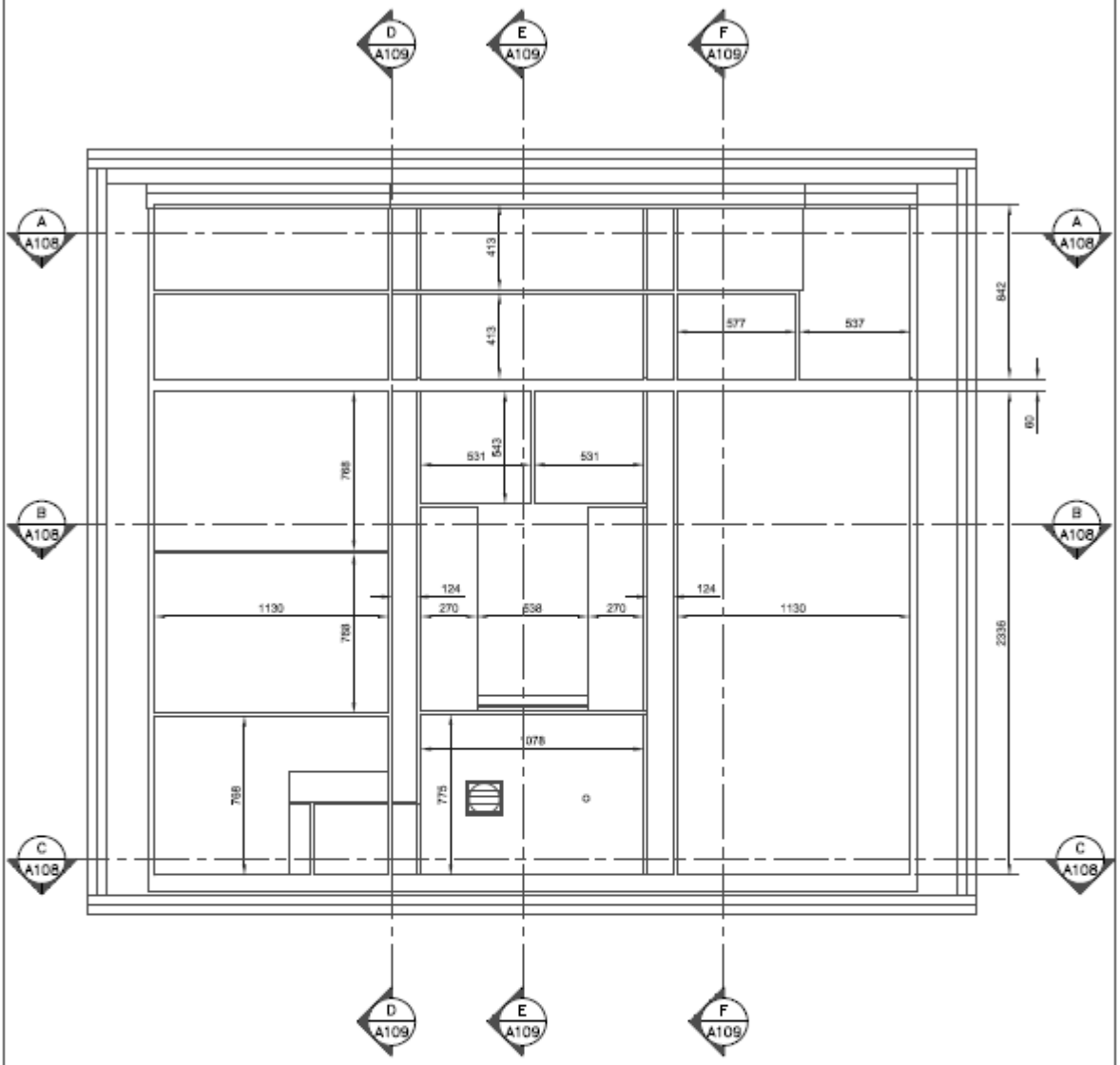

10 TOP BOOTH LINER SECTION DETAIL
1 : 20

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Name:
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PANEL ELEVATION
Job number: C0186

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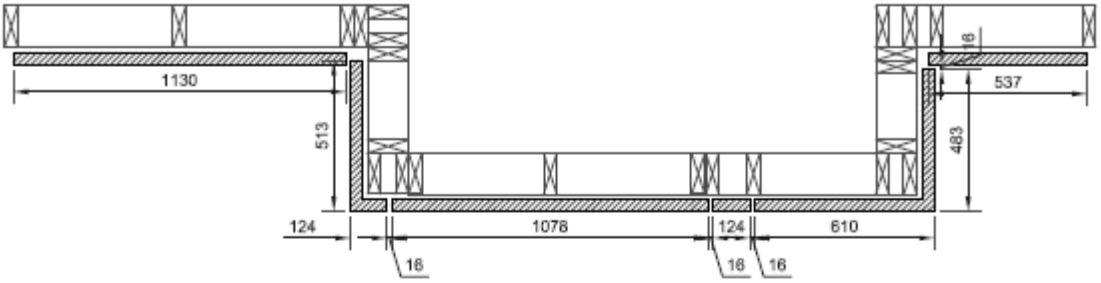
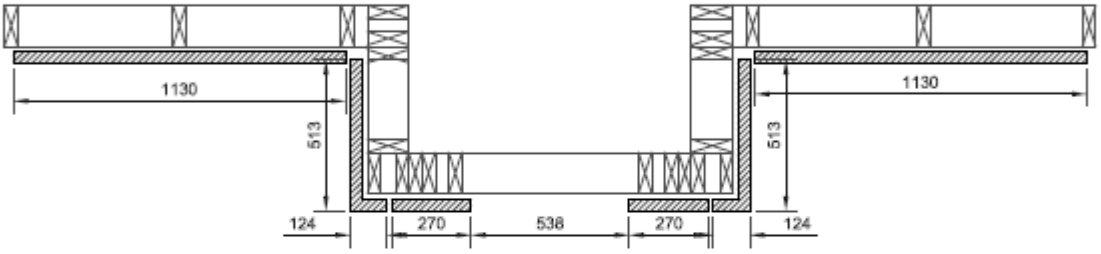
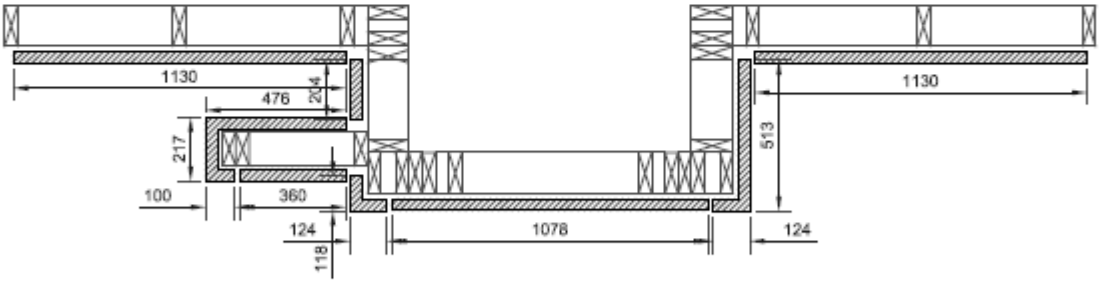


11 SECTION A
1 : 20



12 SECTION B
1 : 20



13 SECTION C
1 : 20

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Name:
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PANEL LAYOUT PLANS
Job number: C0188

NTS @ A4	28/03/2019	B	A108
Scale	Date	Revision	Dwg

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ALFREX Solid

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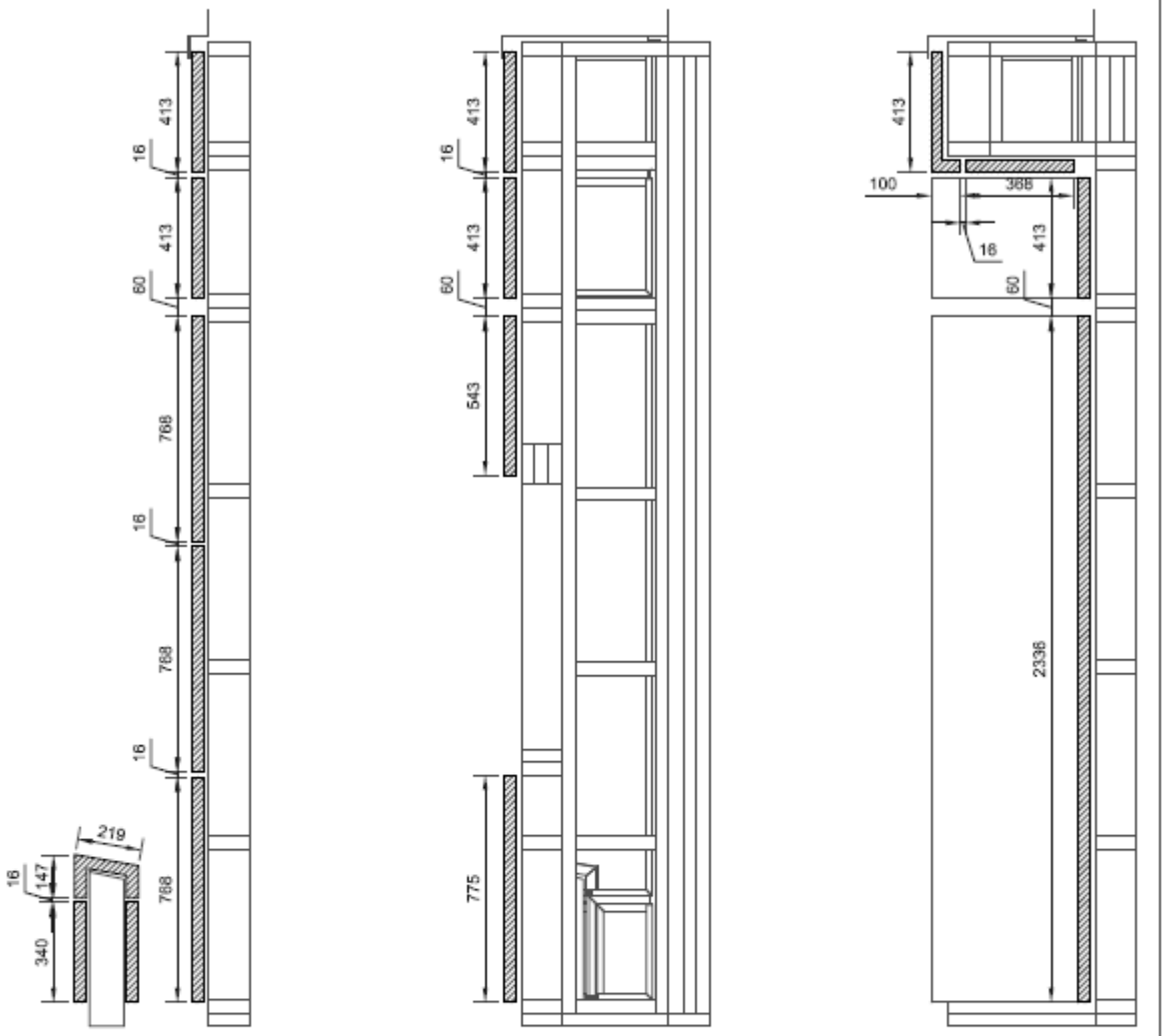

14 SECTION D 1 : 20

15 SECTION E 1 : 20

16 SECTION F 1 : 20

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Name:
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PANEL VERTICAL SECTIONS
Job number: C0186

NTS @ A4	28/03/2019	B	A109
Scale	Date	Revision	Dwg

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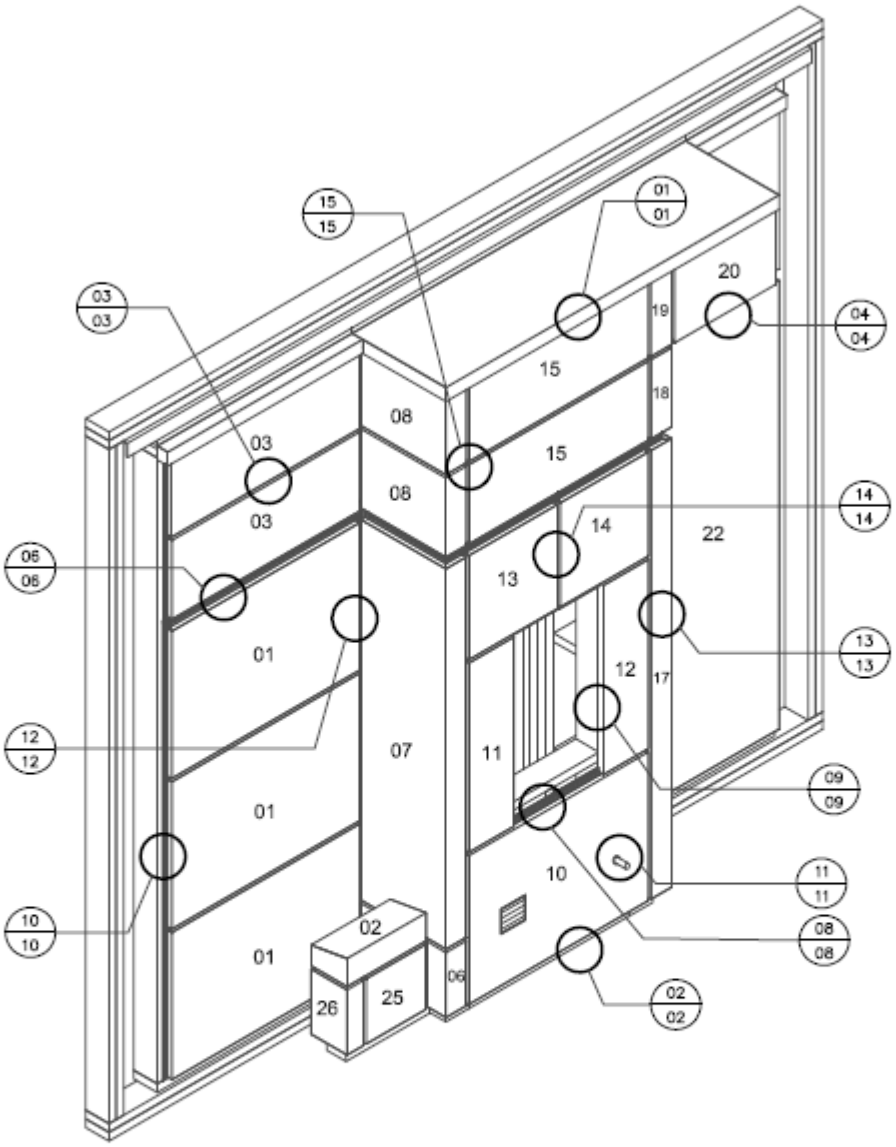

17 3D REF ELEVATION
1 : 2

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Name:
ALFREX SOLID OPEN JOINT TEST
3D REFERENCE ELEVATION LEFT
Job number: C0188

NTS @ A4	28/03/2019	B	A110
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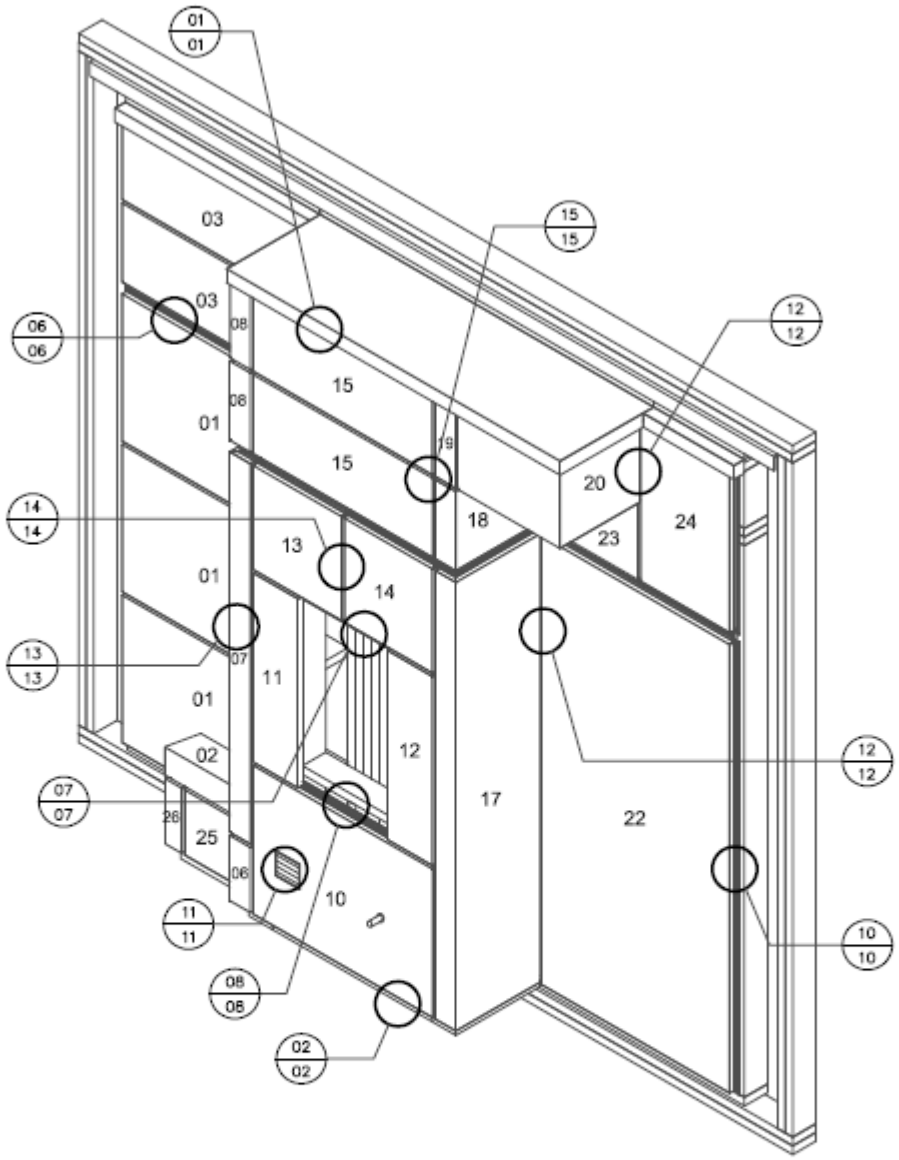

18 TOP BOOTH LINER SECTION DETAIL
1 : 2

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Name:
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PANEL LAYOUT RIGHT
Job number: C0188

NTS @ A4	28/03/2019	B	A111
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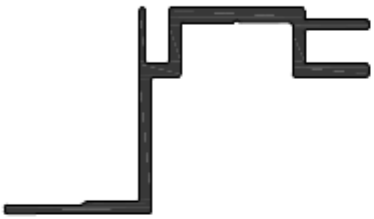
PSP

CSACM-01

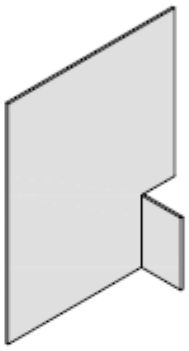
Blind Rivet 73 AS5-5

10g Metal Tek screw x20 long

12g Timber Tek screw x75 long
Class 5 finish with neo washer



CSACM-02



Cruciform Soaker

CSACM-03

CSACM-04

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Name:
ALFREX SOLID OPEN JOINT TEST
COMPONENTS
Job number: C0188

NTS @ A4	28/03/2019	B	A112
Scale	Date	Revision	Dwg

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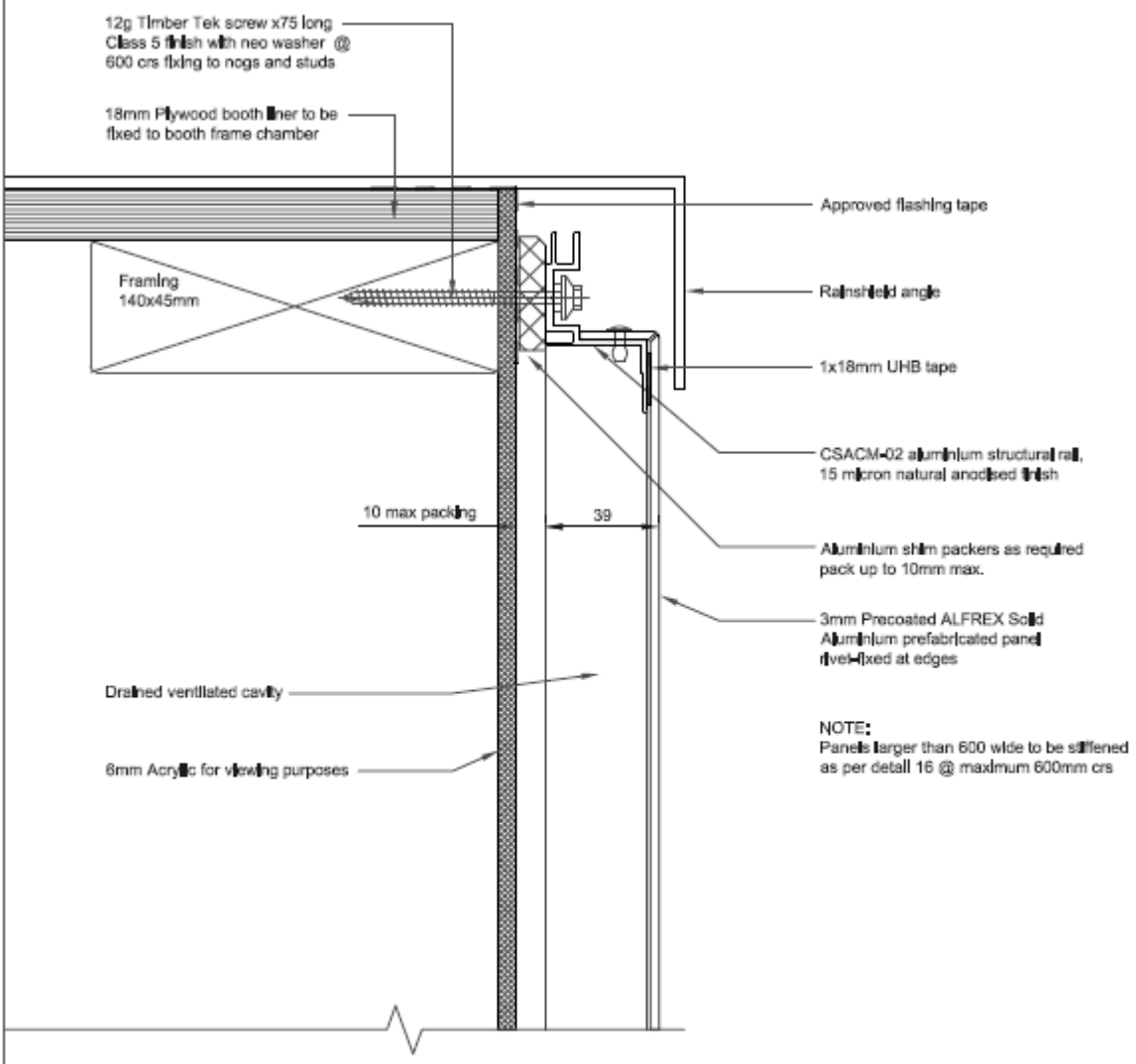

01 - TOP BOOTH LINER SECTION DETAIL
1 : 2

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Name:
ALFREX SOLID OPEN JOINT TEST
TOP BOOTH LINER SECTION DETAIL
Job number: C0186

1:2 @ A4	28/03/2019	B	01
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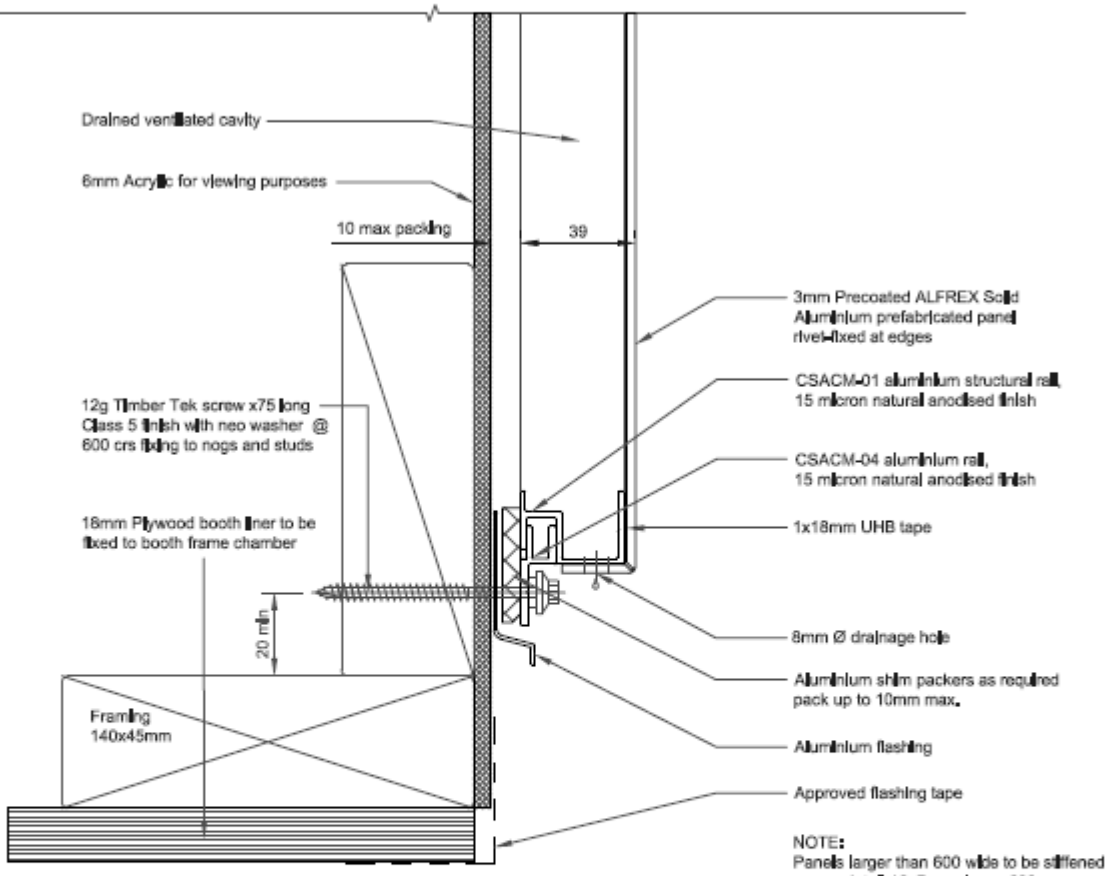

02 BOTTOM BOOTH LINER SECTION DETAIL
1 : 2

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Name:
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BOTTOM BOOTH LINER SECTION DETAIL
Job number: C0188

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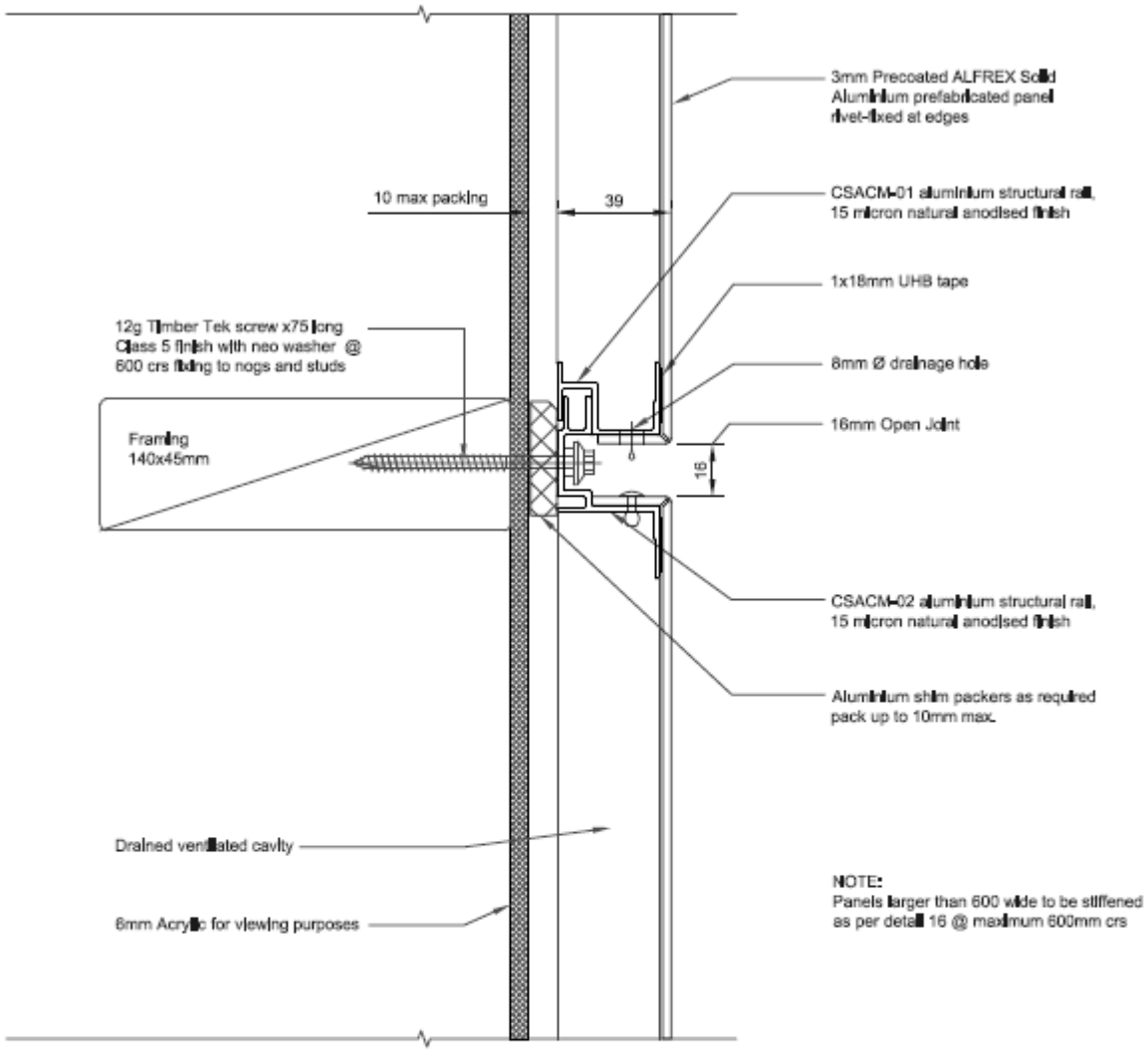

03 HORIZONTAL JOINT SECTION DETAIL
1 : 2

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Name:
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HORIZONTAL JOINT SECTION DETAIL
Job number: C0188

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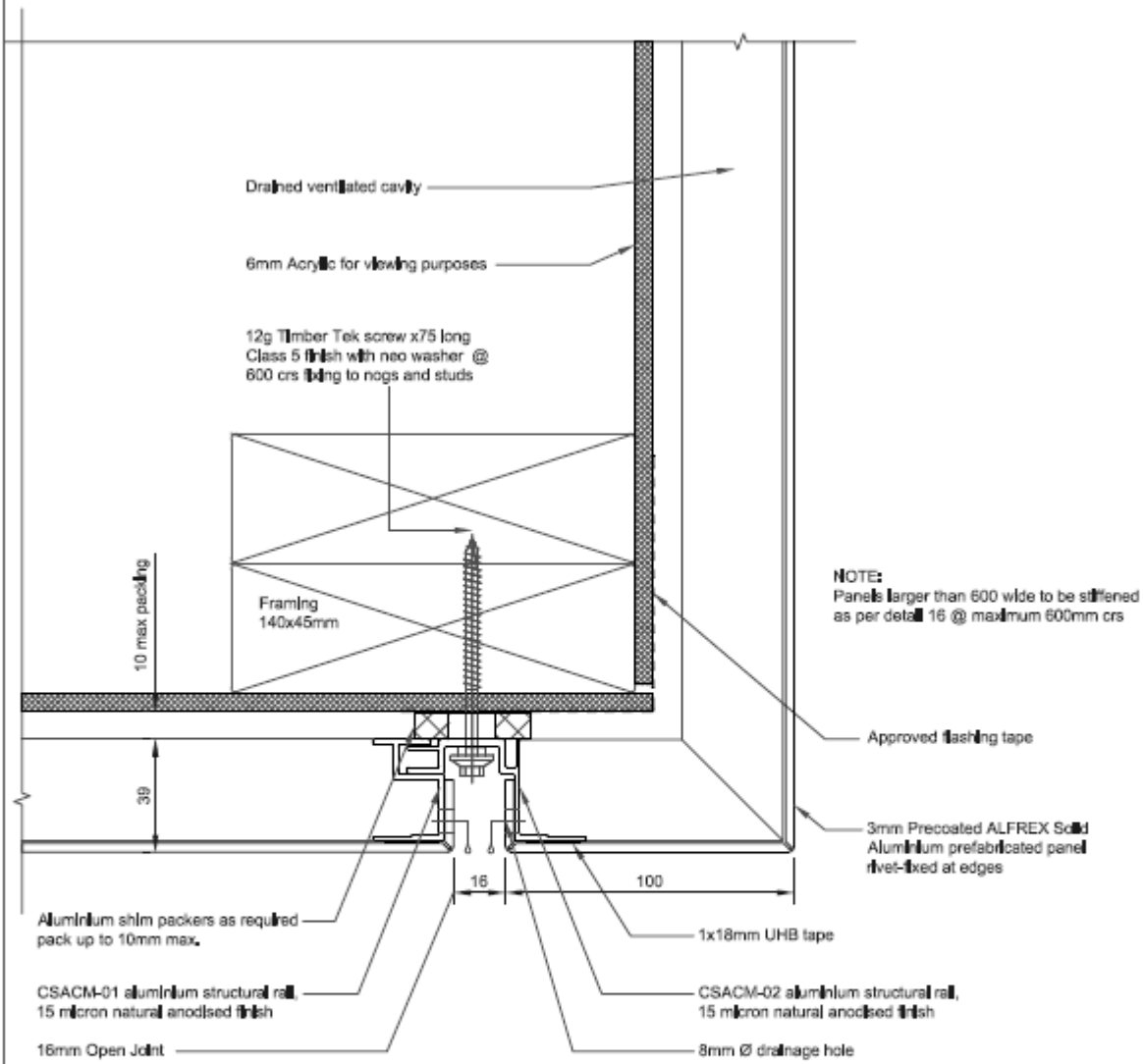

04 SOFFIT CORNER SECTION DETAIL
1 : 2

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Name:
ALFREX SOLID OPEN JOINT TEST
SOFFIT CORNER SECTION DETAIL
Job number: C0188

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Scale	Date	Revision	Dwg

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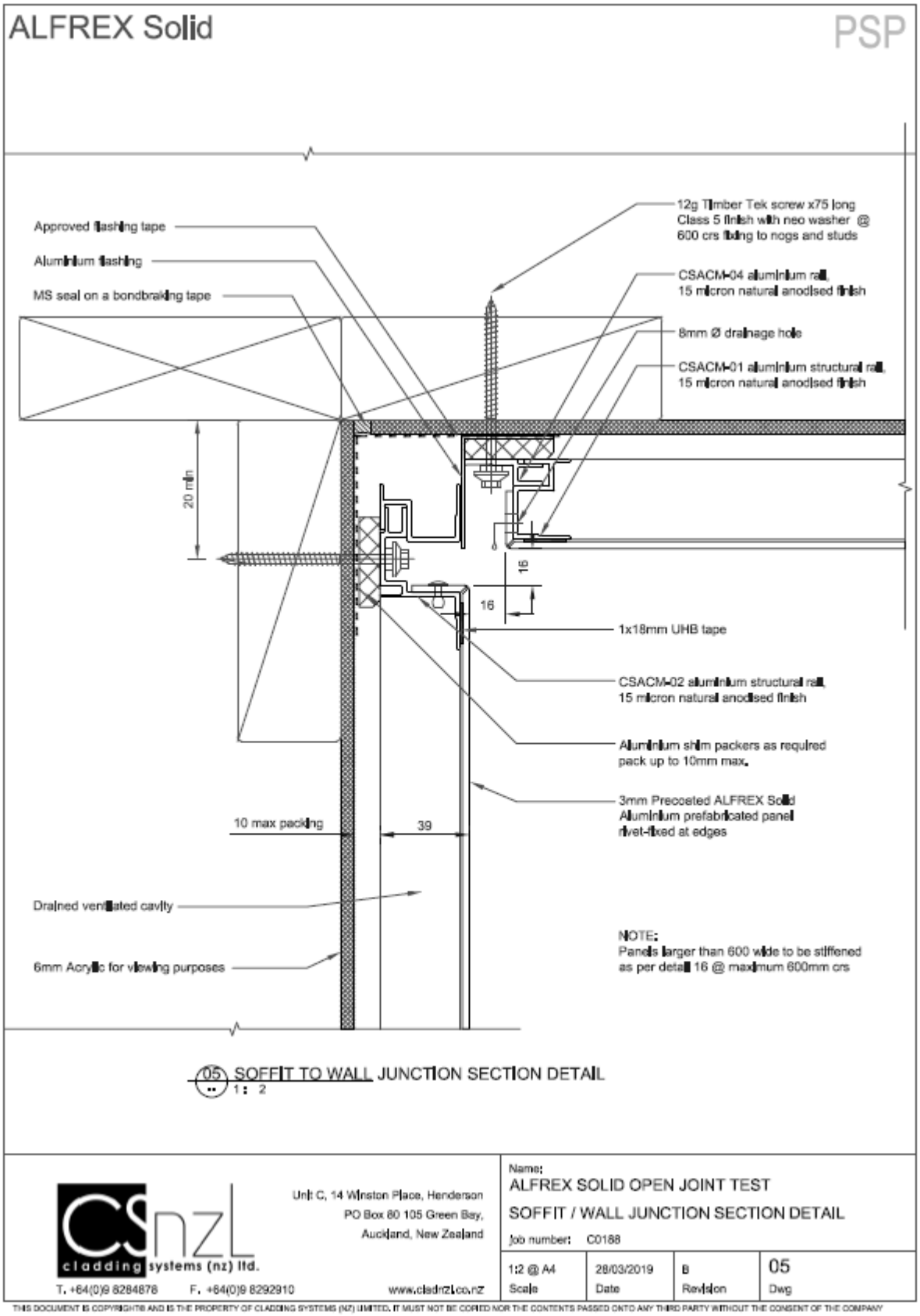

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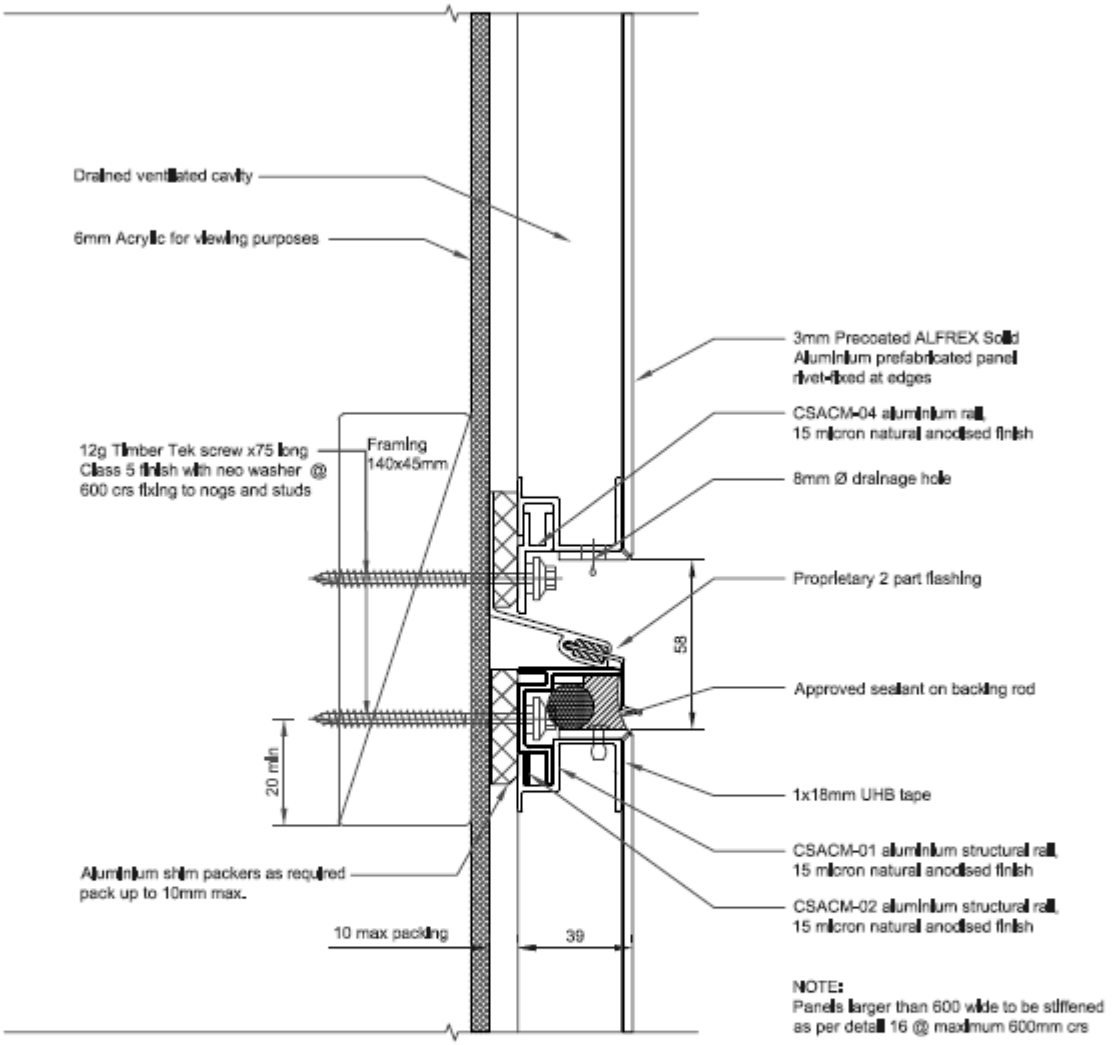

06 INTERSTOREY JUNCTION SECTION DETAIL
1 : 2

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Name:
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INTERSTOREY JUNCTION SECTION DETAIL
Job number: C0188

1:2 @ A4	24/11/2018	B	06
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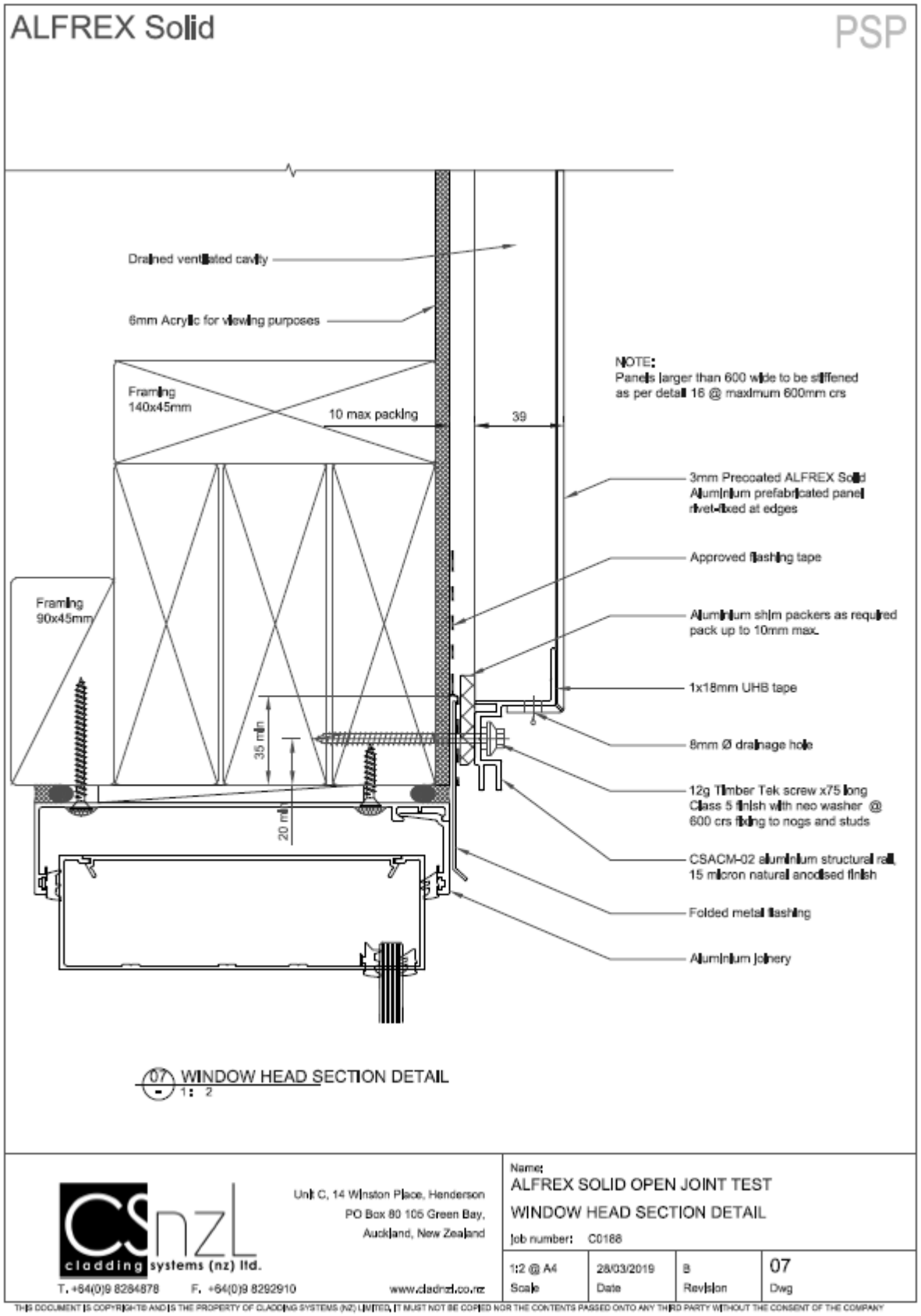

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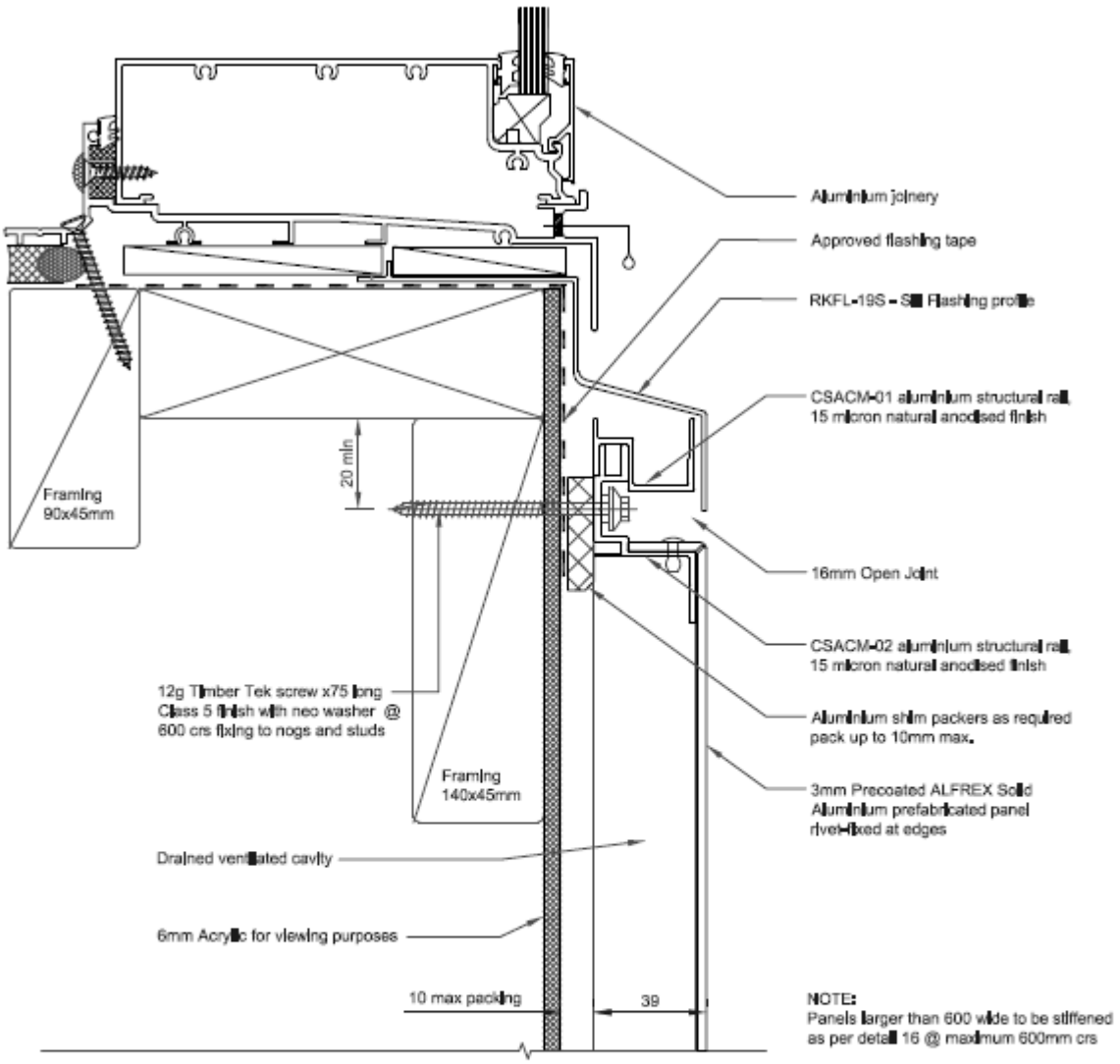

08 WINDOW SILL SECTION DETAIL CHANGES
1: 2

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Name:
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WINDOW SILL SECTION DETAIL
Job number: C0188

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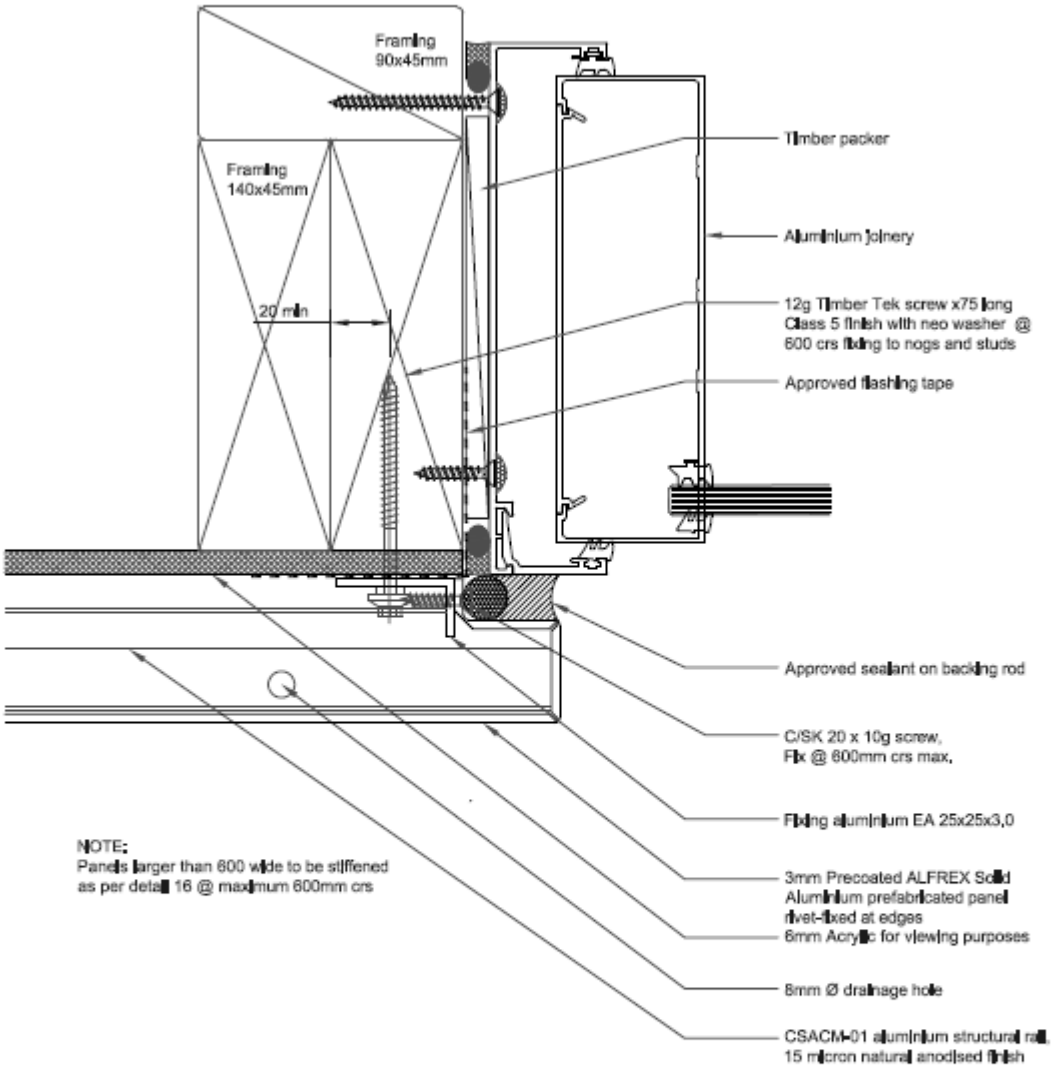

09 WINDOW JAMB PLAN DETAIL
1: 2

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Name:
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WINDOW JAMB PLAN DETAIL
Job number: C0188

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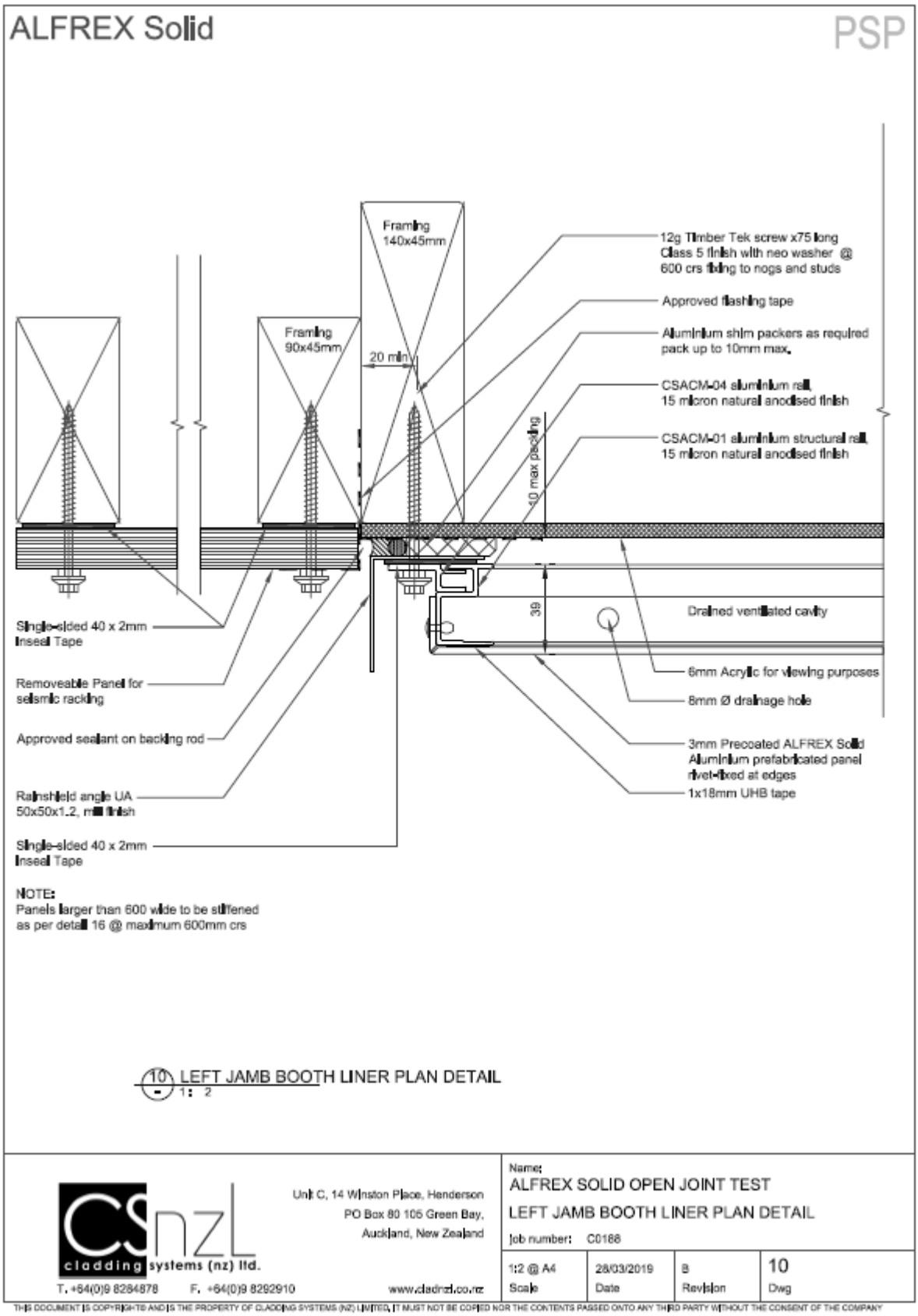

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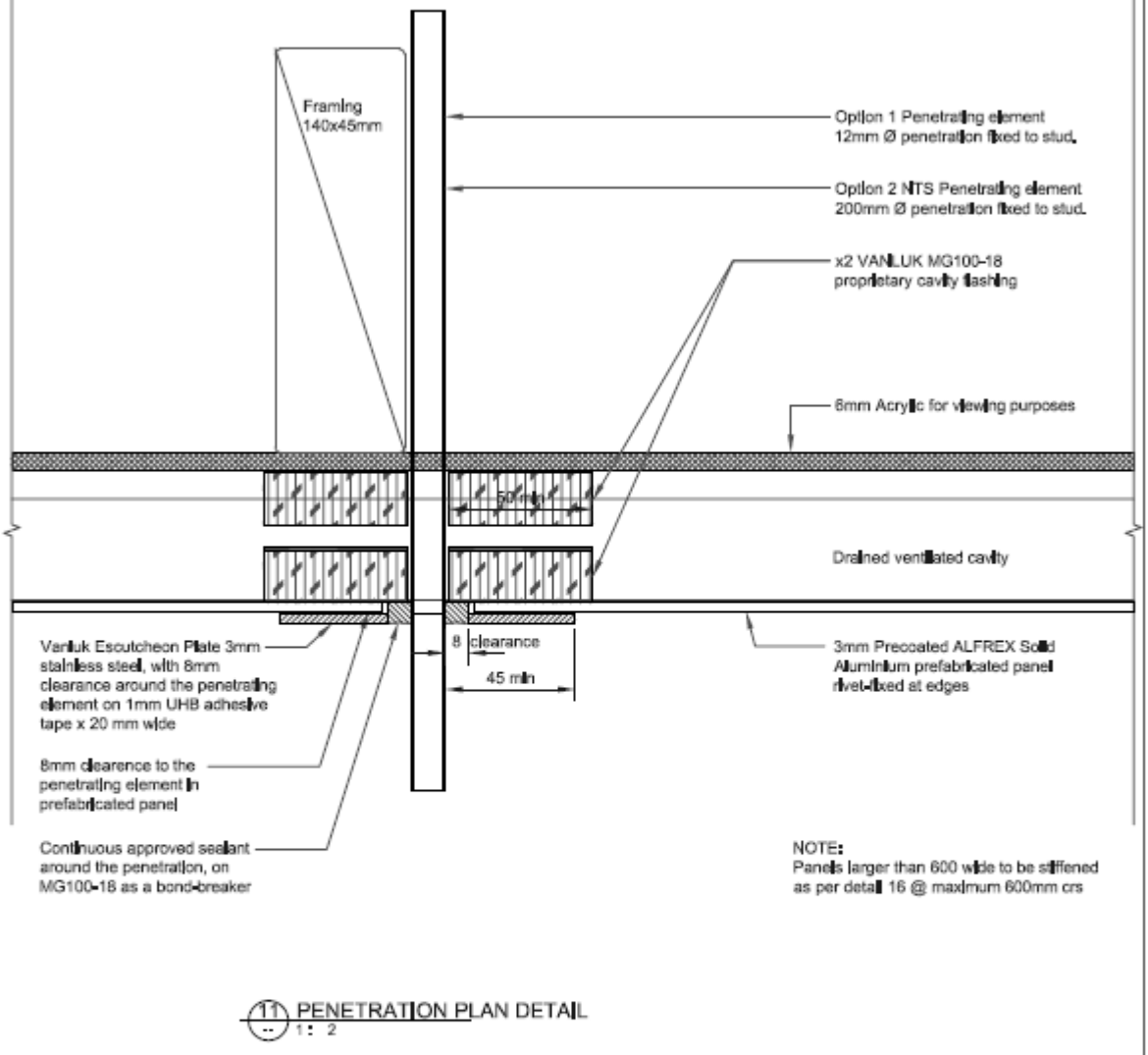

11 PENETRATION PLAN DETAIL
1 : 2

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Name:
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PENETRATION PLAN DETAIL
Job number: C0188

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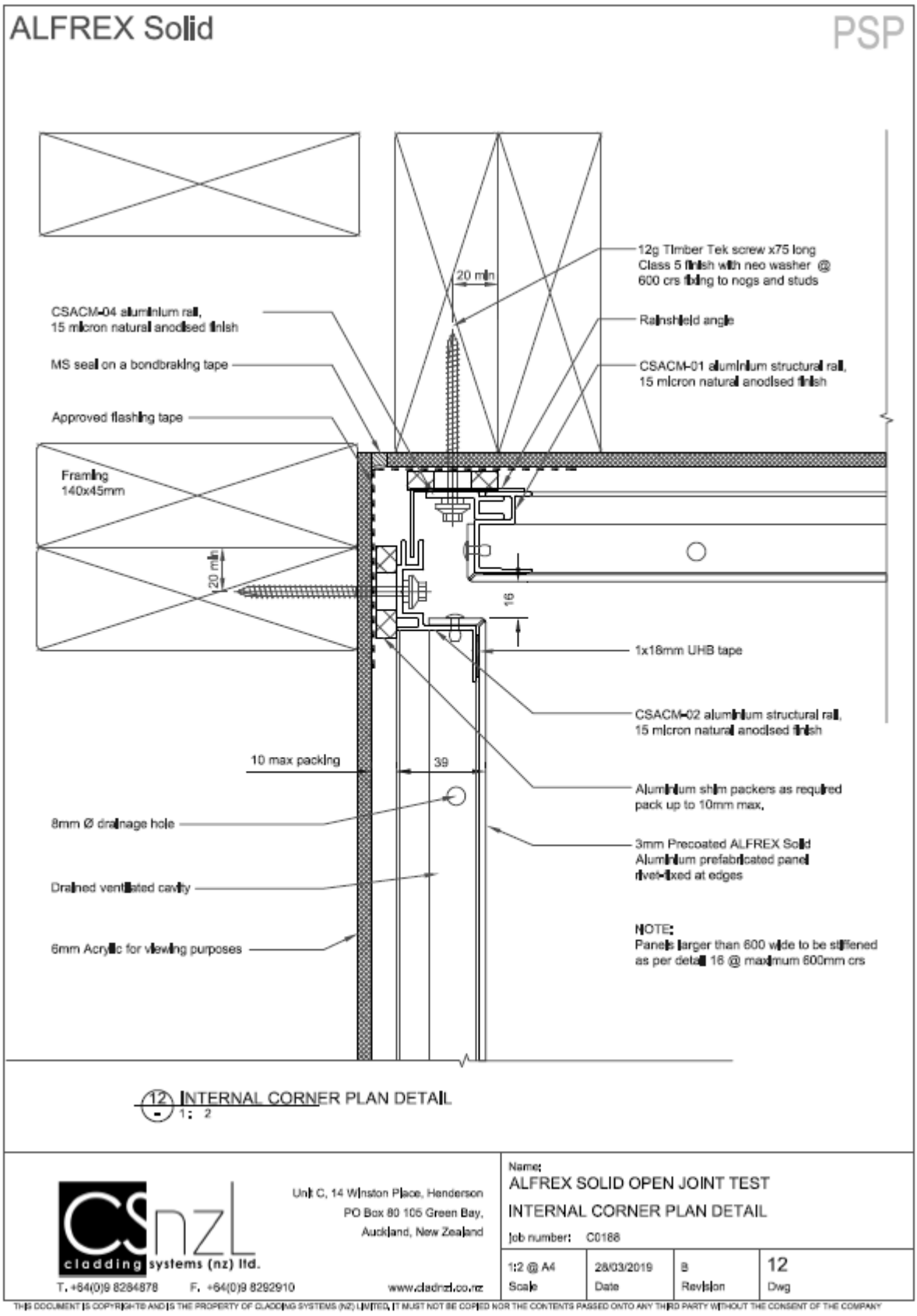

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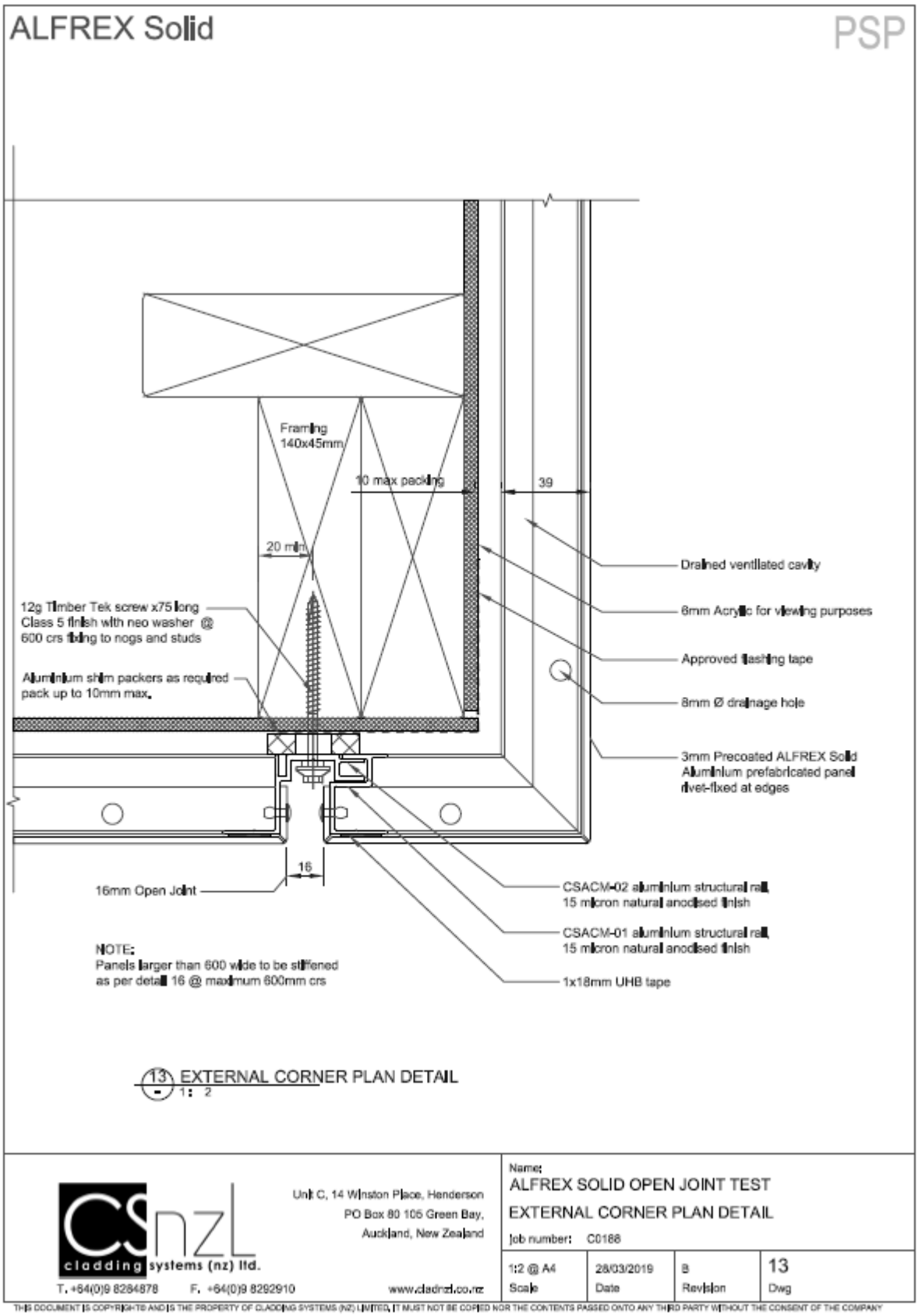

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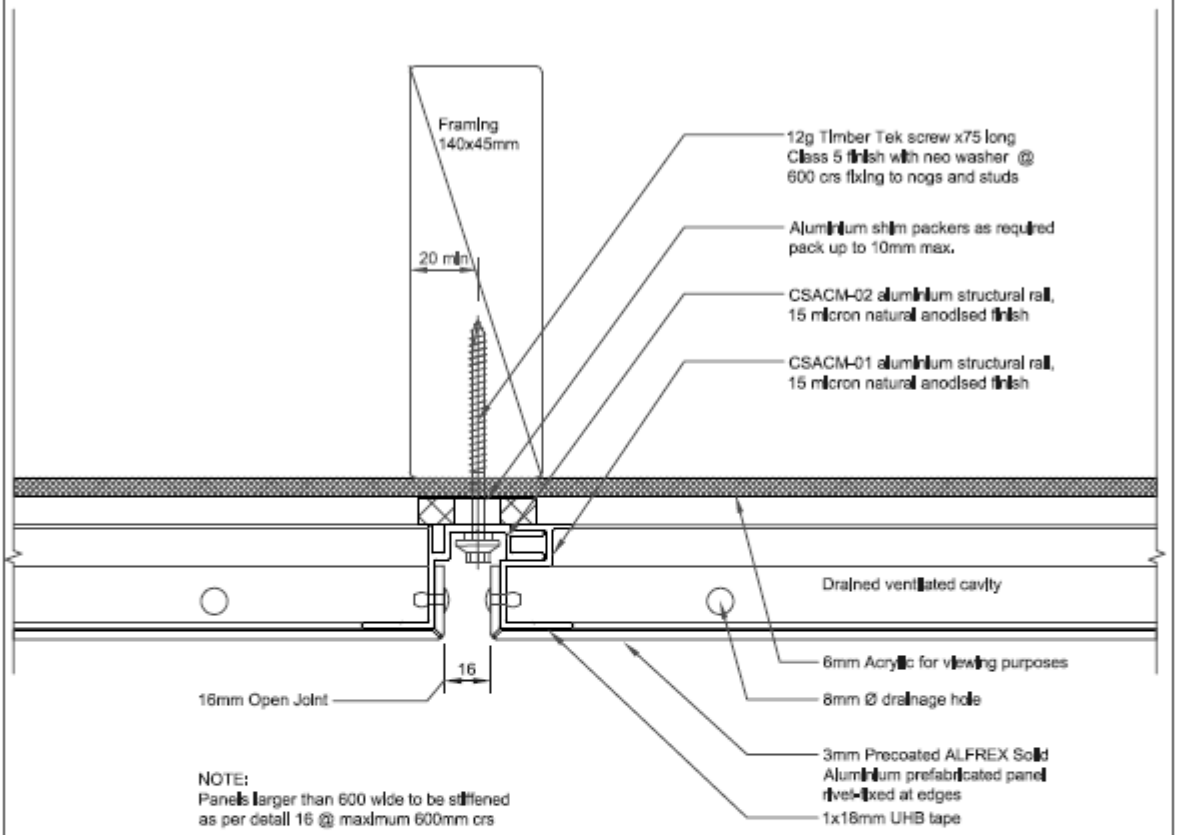

14 VERTICAL JUNCTION PLAN DETAIL
1 : 2

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Name:
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VERTICAL JUNCTION PLAN DETAIL
Job number: C0188

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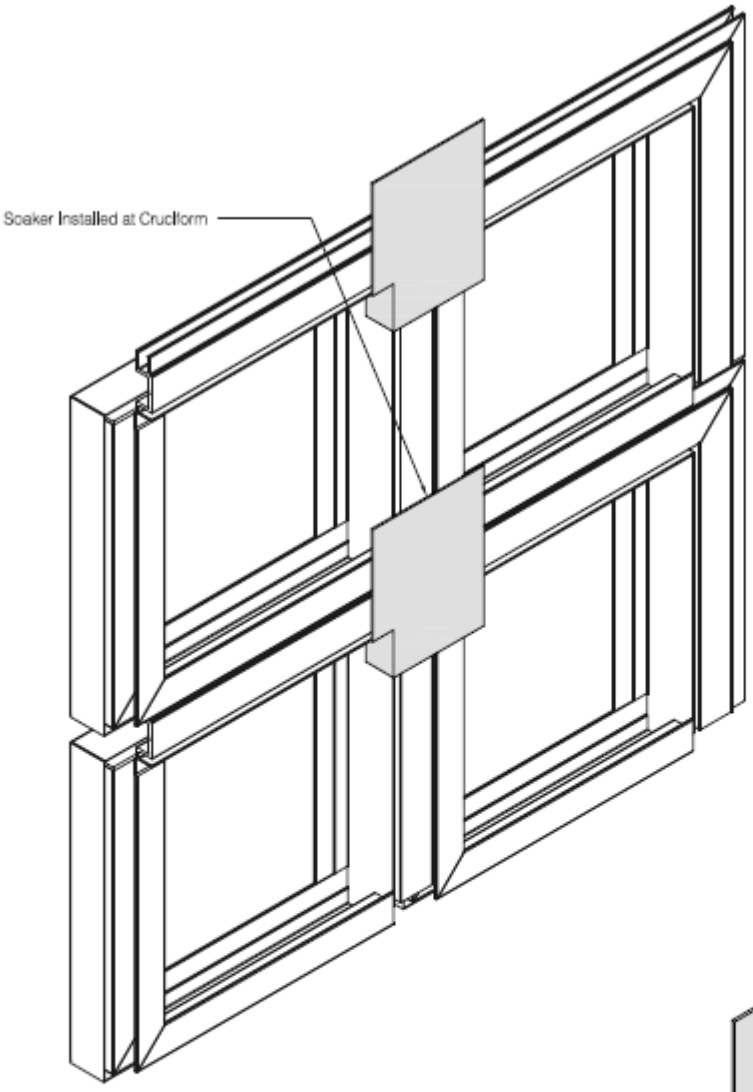

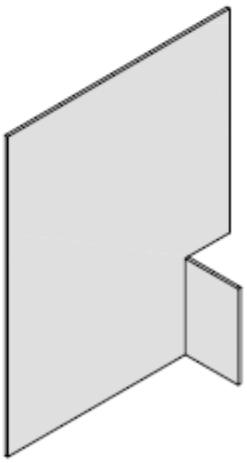

15 CRUCIFORM 3D DETAIL
1 : 2

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Name:
ALFREX SOLID OPEN JOINT TEST
CRUCIFORM SOAKER DETAIL
Job number: C0188

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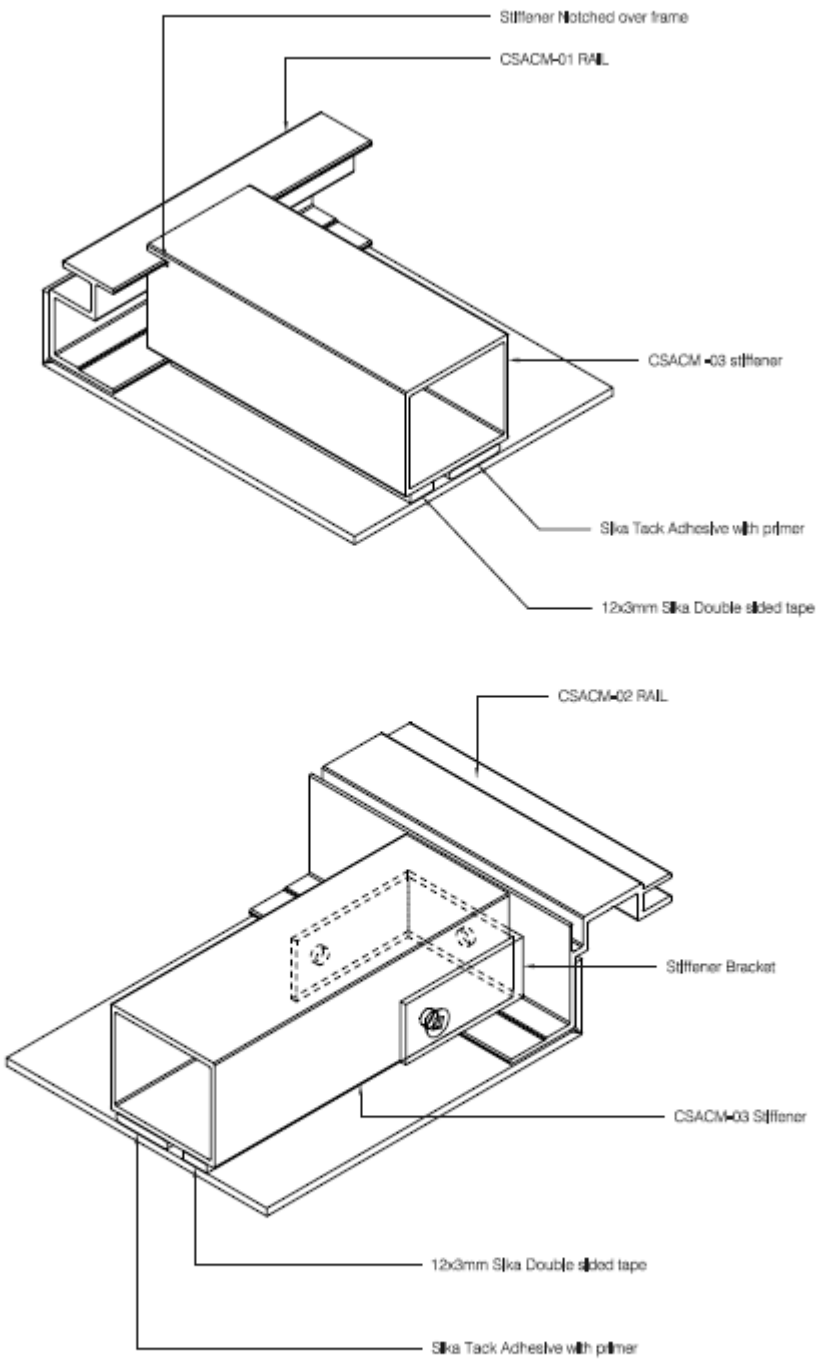

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Name:
ALFREX SOLID OPEN JOINT TEST
3D ALUMINIUM STIFFENER FIXING
Job number: C0188

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