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TEST REPORT No. 12/16

Page 1 of 6 pages

REFERENCE: Kaneba Limited

P.O. Box 303388,

North Harbour, Auckland, 0751

Performance tests on Alucobond Fixed Cassette and Suspended Cassette cladding system (hereinafter referred to as Alucobond System) in accordance with:

- 1) AS/NZS 4284:2008 Testing of Building Facades.
- 2) Further specific requirements from the client.

**DATE OF TEST:** 05 & 06 July 2012

#### **SUMMARY:**

## Structural Test at Serviceability Limit State Wind Pressure:

Initially he Alucobond System with a sealed external face and partially removed air barrier was exposed to Serviceability test pressure of +2000 Pa and -1500 Pa, to evaluate panel deflection and fixing strengths. Following reinstatement of the air barrier and removal of external tape seals, no additional AS/NZS 4284 structural deflection tests on the timber framed test unit were required.

## Water penetration test by Static pressure:

The Alucobond System demonstrated "no water penetration" at a test pressure of 534 Pa.

#### Water penetration test by Cyclic pressure:

The Alucobond System demonstrated "no water penetration" at the cyclic test pressures up to 534 - 1068 Pa,

## Structural test at Ultimate limit state wind pressure:

As the Alucobond System is a cavity system in which all static wind pressure is applied to the timber framing and negligible loading is impacted on the cladding or support system, no Ultimate limit State structural test was undertaken.

### Serviceability Seismic Test:

A seismic displacement of  $\pm$  20mm was repeated 5 times.

## Water penetration test by Static pressure following Seismic Serviceability

The Alucobond System demonstrated "no water penetration" at a test pressure of 534 Pa.

## Water penetration test by Cyclic pressure following Seismic Serviceability

The Alucobond System demonstrated "no water penetration" at the cyclic test pressures up to 534 - 1068 Pa.

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#### **Ultimate Limit State Seismic Test:**

Maximum movements were constrained by the hydraulic load mechanism and provided a maximum horizontal movement of 88 mm in one direction only. The loading cycle was repeated 5 times with no structural damage of the cladding system or supporting structure observed.

#### **DESCRIPTION:**

The test sample consisted of a 4m high x 4.3m wide timber framed structure with a rigid air barrier formed with plywood & clear acrylic sheet. The Alucobond cladding was mounted onto the structure with various mounting methods providing junctions of internal and external corners, a window penetration, and a soffit detail. There were a total of 26 panels. Part of the sample cladding, as shown on drawing A01, was constructed in accordance with the Alucobond Suspended Cassette System details and the remainder in accordance with the Alucobond Fixed Cassette System details. The major features between the two cassette systems are as follows:

Characteristic	Suspended Cassette System	Fixed Cassette System		
Support frame	Structural aluminium Cassette Rails are provided as an integral part of the system to act as an intermediary between the building structure and the Alucobond panels.			
Panel Joins	Joints between Alucobond panels are open joints with no sealant	This Alucobond system is designed with the integration of sealant to provide an exterior weatherseal		
Weathering system	The Alucobond cladding forms a rainscreen over a drained & ventilated cavity with an air barrier	The Alucobond cladding forms a rainscreen over a drained & ventilated cavity with an air barrier		

Full details of the Alucobond test sample are shown on Kaneba test sample drawings project #500, A01/A to A16/A

The Suspended Cassette System consisted of proprietary Cassette Rails fixed to the Sample Structure. The Cassette Rails as shown on 18/A08 were offset from the Sample Structure with non absorbent shims and fixed with stainless steel screws through the continuous fixing flanges located at the sides of the rail. 8 Gauge, 50mm long fixings were spaced at approximately 800mm centres to fix into nogs as shown on drawing A15. The Cassette Rails were fitted with Hook Pins at 400mm centres to secure the Alucobond Cassette Panels in position.

Alucobond panels formed from 4mm thick Alucobond material (comprising two skins of 0.5mm Aluminium and a 3mm core material) were hooked (by means of Attachment Slots cut in the vertical edges of the Alucobond panels as per example detail 7/A08) onto the Cassette Rails and secured from vertical movement with stainless steel screws to the aluminium Fixing Cleats on the Cassette Rails. The Alucobond panels engage with the pins in the Cassette Rails at 400mm centres securing the Alucobond panels in the vertical plane and allowing sideways movement of the Alucobond panels. Some Alucobond panels were fitted with Stiffeners and others not – as shown on drawing A01. The Stiffeners were formed from profiled Alucobond material and attached to the Alucobond panels with 3M VHB Double Sided Tape.

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The Alucobond panels were also provided with ventilation slots at the bottom edge of each panel, in addition to the ventilation slots at the base of the test assembly – as shown on details 8/A09, 11/A11 and 12/A11. The windows were installed as shown on details 8/A09 and 9/A09.

The Fixed Cassette System consisted of Cassette Panel formed from 4mm thick Alucobond material (comprising two skins of 0.5mm Aluminium and a 3mm core material) fixed with stainless steel screws to the Sample Structure. The positions of the 8 gauge 50mm long fixings are shown on drawing A16 – generally to comply with guidance not to exceed fixing spacings of 600mm centres. Non-absorbent shims were used to offset the Alucobond panels from the structure by about 16mm. The sample had one unsealed horizontal joint as shown on 14 / A13 (simulating an interstorey arrangement) with the rest of all horizontal and vertical joints sealed as shown on 15 / A13. Only some of the panels had stiffeners fitted to them as shown on drawing A01.

The Alucobond panels above the open joint and at the base of the test assembly were provided with 3mm x 20mm ventilation slots at 50mm centres as shown on 14 / A13 and 16 / A14.

**The Sample Structure** supporting the Alucobond System consisted of the following:

1) 150mm x 50mm timber framing with 50mm x 50mm timber battens screwed to the sides to provide additional width to the studs. The purpose of the battens was to build the structure to support maximum seismic movement.

- 2) An Air Barrier was provided to the Sample Structure where Building Underlay / Air Barrier will usually exist on the building. The Air Barrier was formed of 7mm Plyseal for toughness in seismic racking. The plywood had 7mm holes to provide movement around the shafts of the wafer head screws it was fixed with. Neoprene washers were used to ensure slippage and movement between the wafer head screw-head and the plywood. There was a layer of 1.6mm closed foam tape between the RAB and timber frame to provide an air seal. Inspection ports were formed in the RAB and filled in with 6 mm clear Polycarbonate for viewing the cavity.
- 3) An Alucobond upstand was provided in the Test Assembly behind the open joint in the Fixed Cassette Panel section of the wall to simulate an Air Barrier / Building Underlay usually present in this location on a building to practically construct the open joint detail. Refer 14 /A13.
- 4) A combination of steel brackets, aluminium extrusions and timber rails provided offsets to the flat timber wall to provide depth for testing internal and external corners as shown on 6 / A07.

### PERFORMANCE SPECIFICATIONS:

The following performance requirements for the Alucobond System were agreed with the clients for assessing performance:

Serviceability Wind Pressure Water penetration by Static pressure; Water penetration by Cyclic pressures Structural Test at Ultimate Limit State Serviceability seismic displacement Ultimate seismic displacement 1780 Pa (equivalent to ULS of 2.5 kPa)

534 Pa

up to 534 - 1068 Pa

2.5 kPa ±20 mm

up to 100 mm if achievable

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#### **TESTING:**

The tests were performed using the testing procedures of AS/NZS 4284:2008 Testing of Building Facades, in the IANZ accredited window test facility of FMI Laboratories, Timaru Place, Mt Wellington, Auckland with representatives of Kaneba Limited in attendance.

As the Alucobond System was installed onto a timber framed support structure, generally complying with the requirements of NZS 3604:2011, the measurement of deflections of structural elements was not required. The AS/NZS 4284: 2008 optional air infiltration tests were not conducted on the test sample.

The preset series of Static and Cyclic pressure water penetration tests were based on a serviceability wind pressure of 1780 Pa, being 71% of the 2.5 kPa ULS, exceeding the Extra High Wind Zone serviceability pressures of 1515 Pa. The Structural test at the agreed Ultimate Limit State pressures of  $\pm 2.50$  kPa was not conducted following the cyclic water penetration tests as the cladding was a cavity system in which only the air barrier and frame structure would be evaluated, These were constructed in accordance with NZS 3604: 2011.

Serviceability Seismic movement was applied at the top of the full height test sample following release of side and head infill panels and flashing. Following replacement of the side panels and flashing, repeat static and cyclic water penetration tests were conducted. An ultimate seismic displacement test was conducted following the second static and cyclic water penetration tests.

**NOTE** The seismic displacement tests are currently not included in the IANZ Laboratory Scope of Testing procedures.

The following additional measurements Outside of AS/NZS 4284 were carried out at the request of the client.

- 1) Testing attachment of Alucobond panels to the structure by applying pressure on the wall up to 2.0 kPa. The purpose was to determine if the fixing arrangement is sufficient to secure the Alucobond panels under these very high loads.
- 2) Measuring deflection of Alucobond panels under load. (see results below)
- 3) Measuring cavity pressure in relation to exterior pressure during cyclic testing

Within the scope of the response time of the digital manometer used for the differential pressure measurement, and the possible transient effects of the approximately 3m of connecting tubing, the differential pressure indicated that pressure equalization on this system is almost instantaneous, and that the maximum net loading on the cladding panels was in the order of 1 Pa.

As a conservative assessment the net differential pressure is unlikely to exceed 3 Pa.

#### **RESULTS:**

# STRUCTURAL TEST AT SERVICEABLITY LIMIT STATE (AS/NZS 4284:2008)

With the Alucobond System having a tape sealed external face and partially removed air barrier, exposure to Serviceability test pressure of up to  $\pm 2000$  Pa was undertaken to evaluate panel deflection and fixing strengths.

Comparison was made of deflections between panels with and without a stiffener using a single point measurement at the centre of each panel. The test at -2000 Pa was not achieved due to the external sealing tapes releasing.

Tested by: Checked by

Test Pressure, Pa	Without stiffener	With stiffener
+1500	12.0 mm	6.5 mm
+2000	14.6 mm	8.6 mm
-1500	9.0 mm	5.2 mm

No structural failure of panels or fastening was observed.

Following reinstatement of the air barrier and removal of the temporary external tape seals, the Alucobond System was not exposed to further Serviceability test pressures, as no structural deflection measurements were required.

# STATIC PRESSURE WATER PENETRATION (AS/NZS 4284:2008)

Test pressure

534 Pa

Test duration

15 minutes

Some water observed on internal face of Alucobond panels adjacent to window sill through observation ports in the rigid air barrier, at the maximum test pressure of 534 Pa. Water not contacting rigid air barrier. Acceptable

# CYCLIC PRESSURE WATER PENETRATION (AS/NZS 4284:2008)

Test Pressure, Pa	Duration, mins	Comments
267 - 534	5	No other water penetration observed
356 - 712	5	No other water penetration observed
534 - 1068	5	No other water penetration observed

No additional water penetration was visible through any of the purpose constructed observation ports through the rigid air barrier, during the cyclic water penetration tests up to 534 - 1068 Pa. Water not contacting rigid air barrier. Acceptable

### STRUCTURAL TEST AT ULTIMATE LIMIT STATE (AS/NZS 4284:2008)

Not tested as structure in compliance with NZS 3604: 2011 and cladding is fully pressure equalised.

# SERVICEABILITY SEISMIC TEST (AS/NZS 4284:2008) (Not IANZ accredited)

A seismic displacement of  $\pm$  20mm was repeated 5 times.

# STATIC PRESSURE WATER PENETRATION (AS/NZS 4284:2008) following seismic displacements

Test pressure

534 Pa

Test duration

15 minutes

No additional water penetration was visible through any of the purpose constructed observation ports through the rigid air barrier, during the static

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water penetration test at 534 Pa. Water not contacting rigid air barrier. Acceptable.

# CYCLIC PRESSURE WATER PENETRATION (AS/NZS 4284:2008) following seismic displacements

Test Pressure, Pa	Duration, mins	Comments
267 - 534	5	No other water penetration observed on Open joint panels
356 - 712	5	No other water penetration observed on Open joint panels
534 - 1068	5	No other water penetration observed on Open joint panels On fixed cassette panel water observed from an external corner joint and settling on horizontal joint below (see photo below)

No additional water penetration was visible through any of the purpose constructed observation ports through the rigid air barrier, during the cyclic water penetration tests up to 534 - 1068 Pa. Water not contacting rigid air barrier. Acceptable



# ULTIMATE LIMIT STATE SEISMIC TEST (AS/NZS 4284:2008) (Not IANZ accredited)

Maximum movements were constrained by the hydraulic load mechanism and provided a maximum horizontal movement of 88 mm in one direction and <5 mm in the opposite direction. The loading cycle was repeated 5 times with no structural damage of the cladding system or supporting structure observed.

......John Yolland
Authorised Signatory

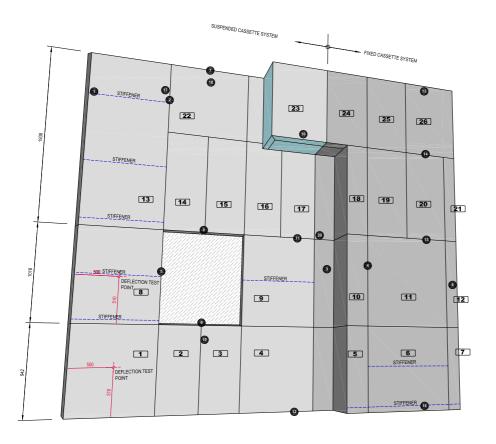
27 July 2012

Tested by:

Checked by.....

ALUCOBOND.

SHOP DRAWINGS



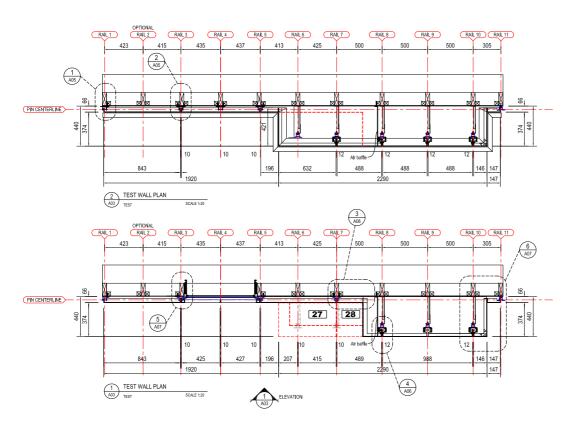
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AS/NZS 4284 TEST WALL	DIAGRAMMATIC INDEX

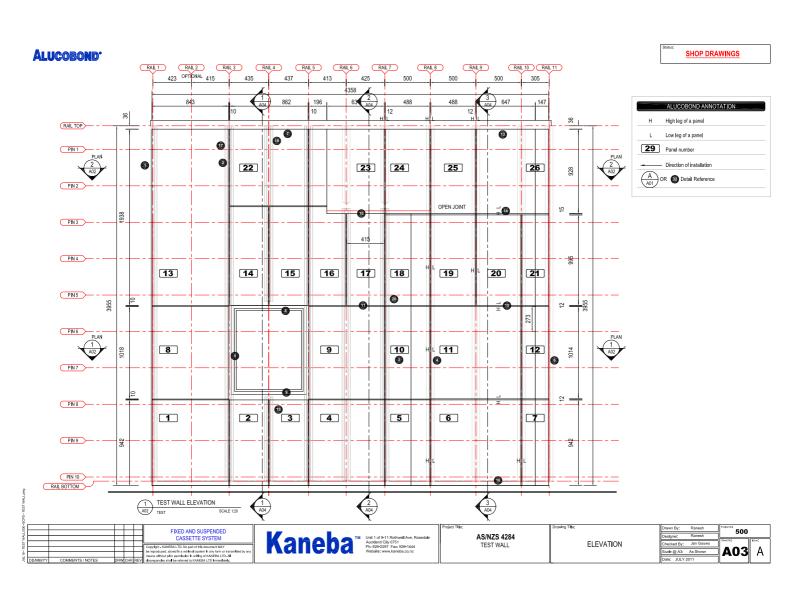
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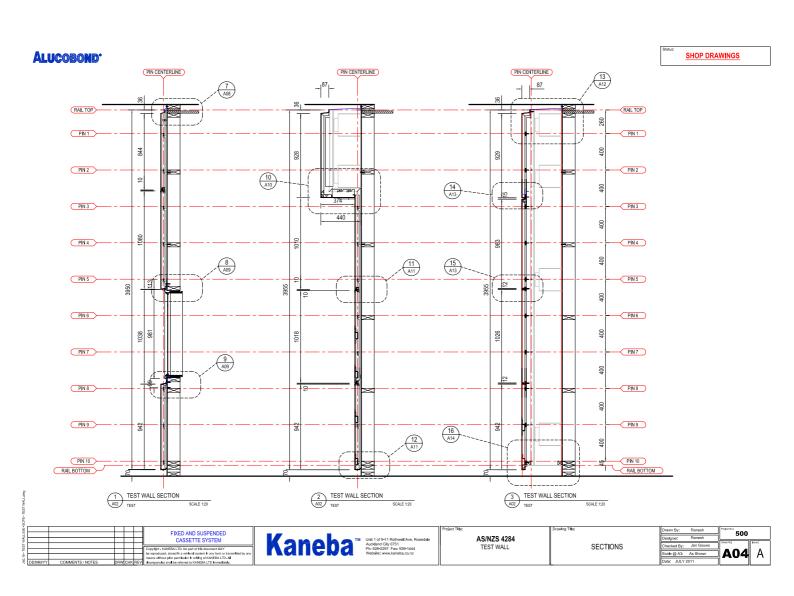
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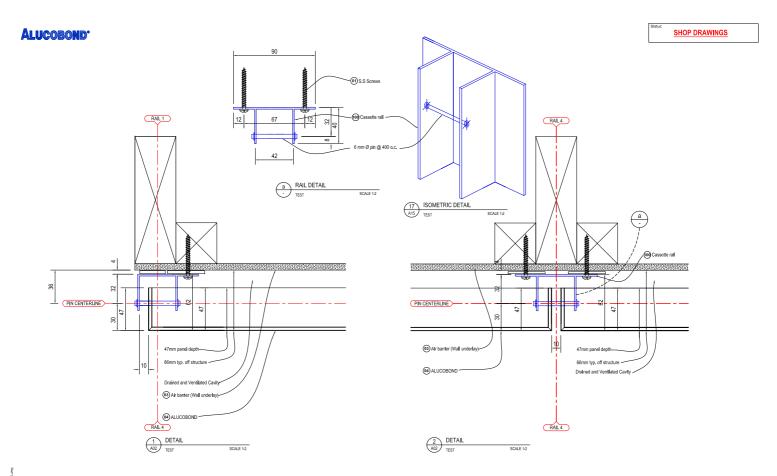
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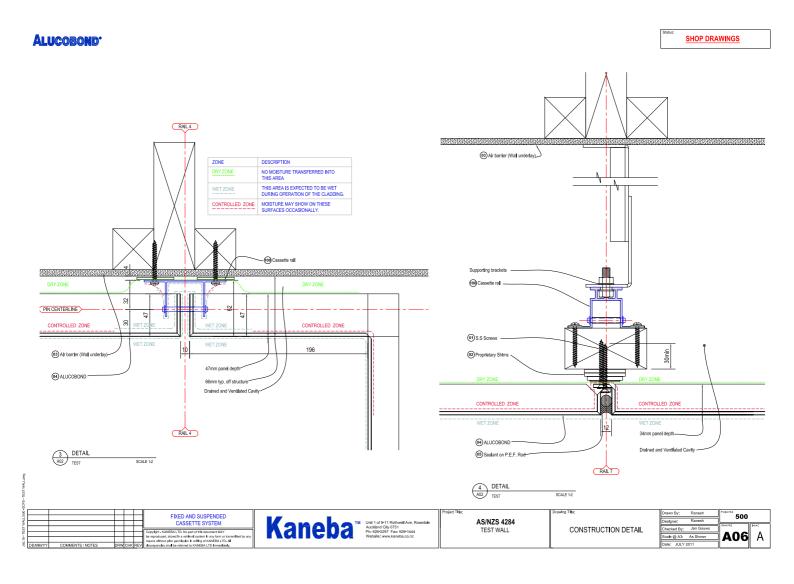
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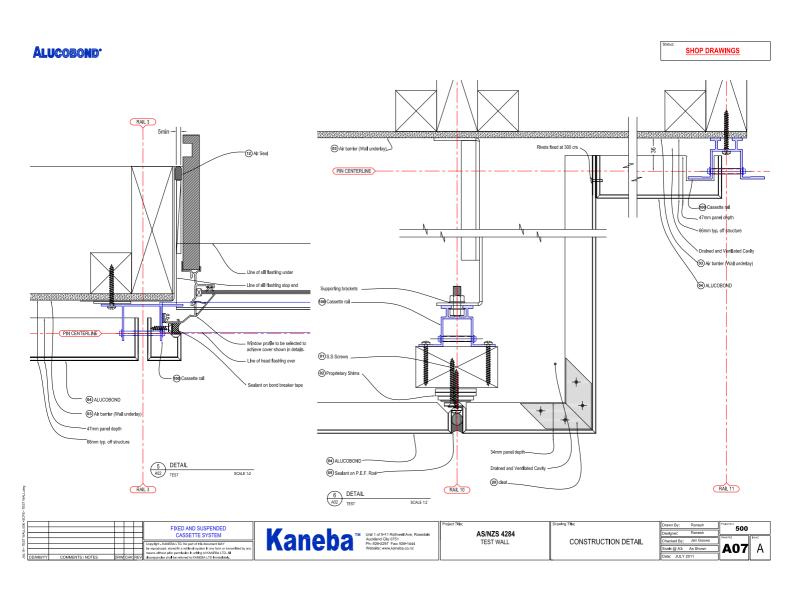












FRONG CLEAT

Kaneba TM Unit 1 of 6-11 Rothwell Ave, Rosedate Academic City (751 Per 150-2628) Fast 1506-1644

AS/NZS 4284 TEST WALL

CONSTRUCTION DETAIL

PIN CENTERLINE

66 Flashing Tape —

RAIL TOP

PICTORIAL VIEW OF PANEL

18 ISOMETRIC DETAIL
A15 TEST SCALE 1:2

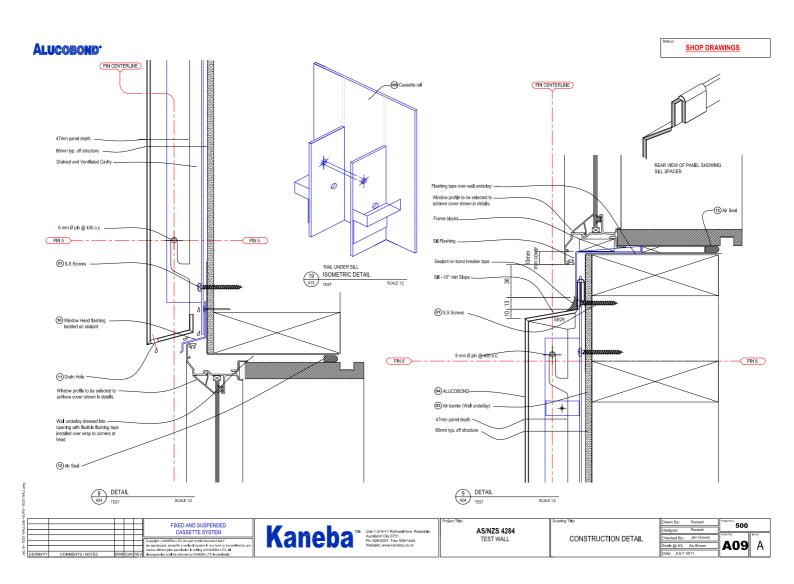
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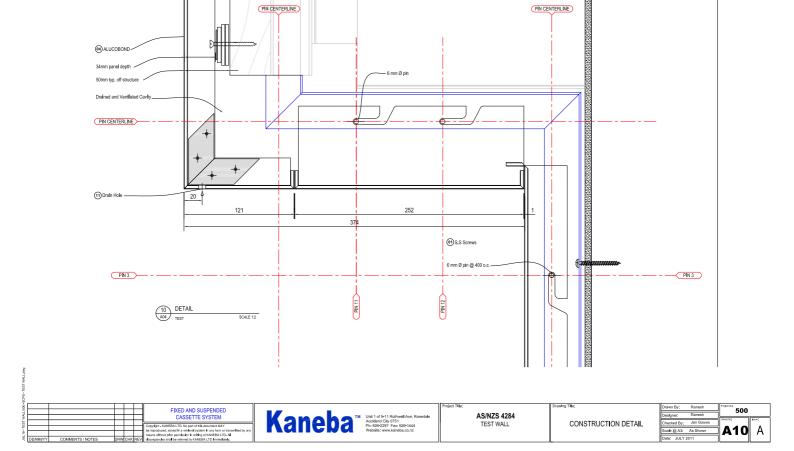
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RAIL TOP

500

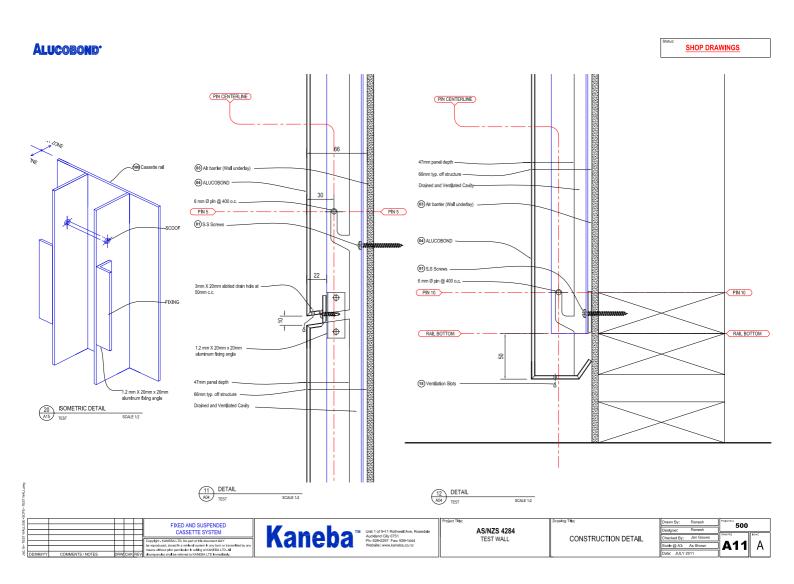
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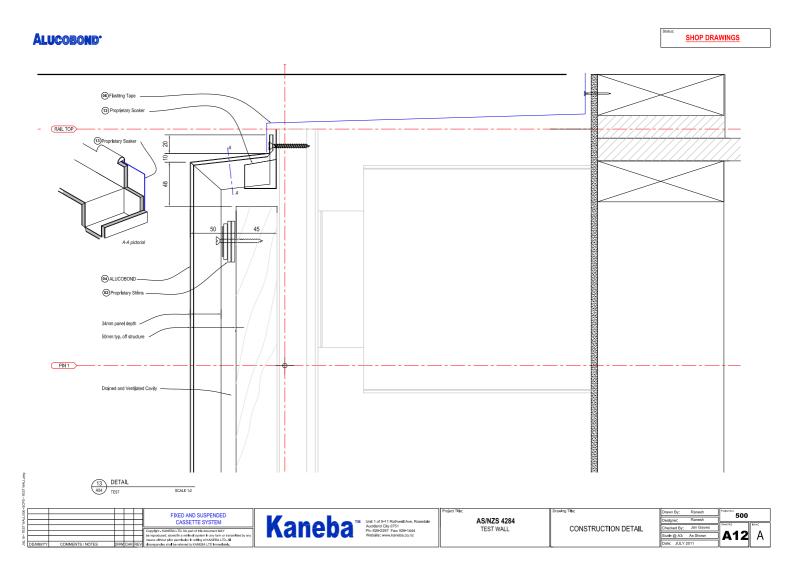


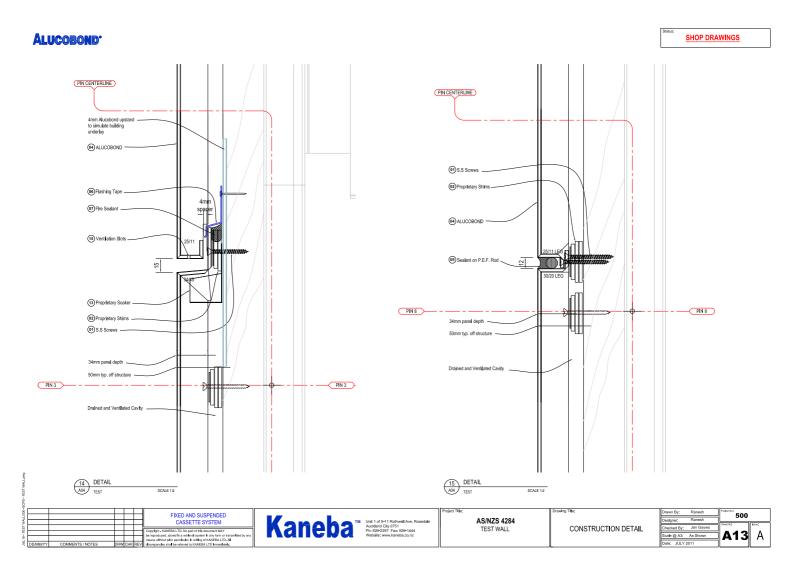


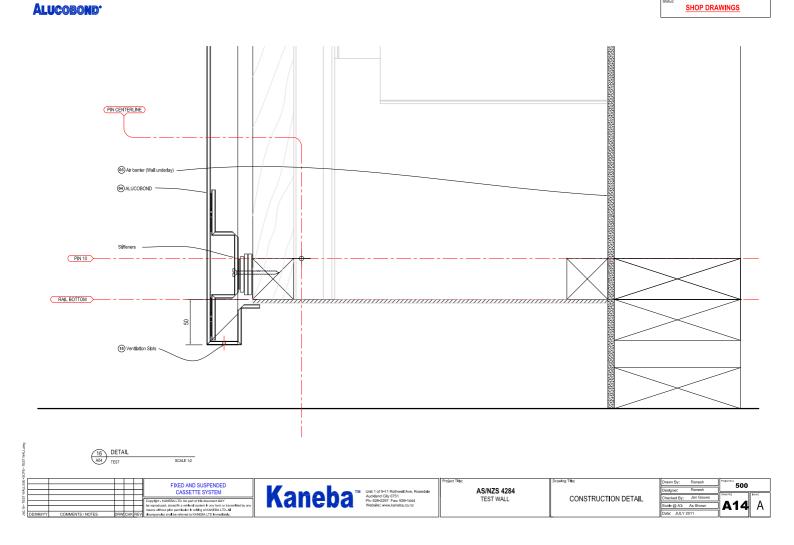
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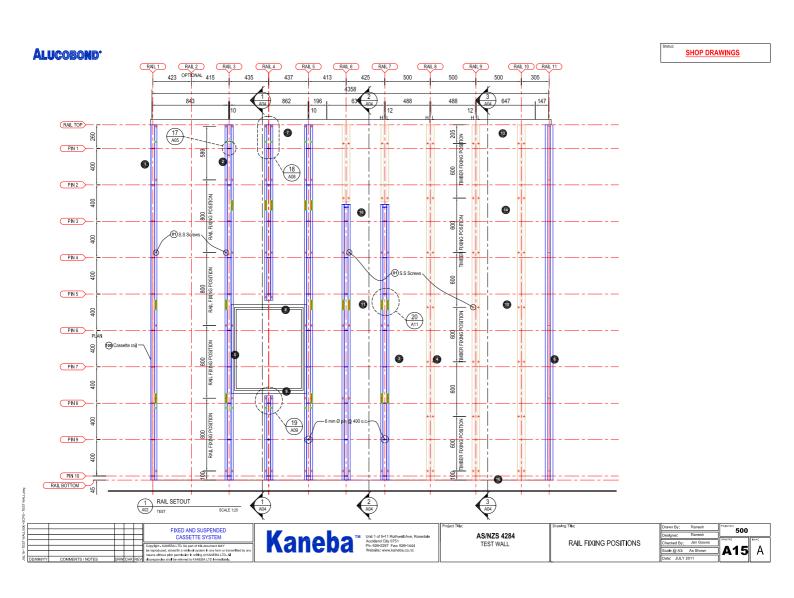
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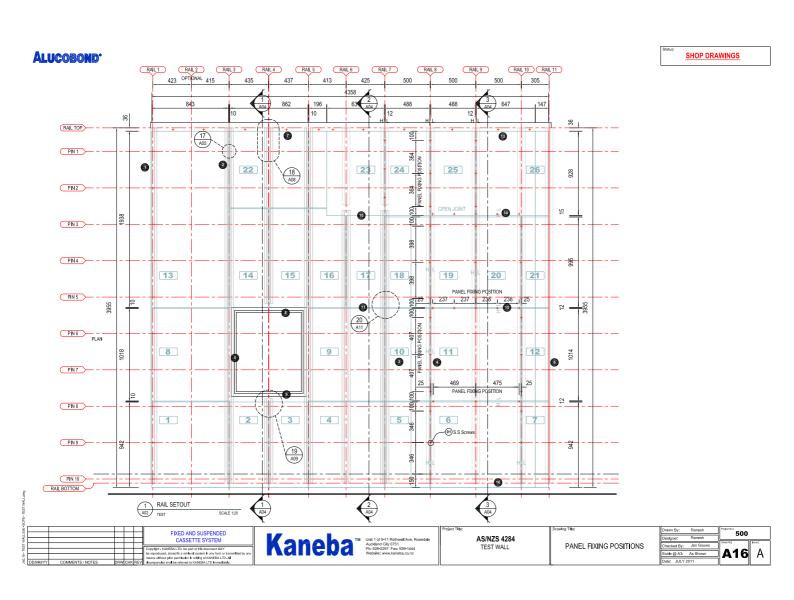






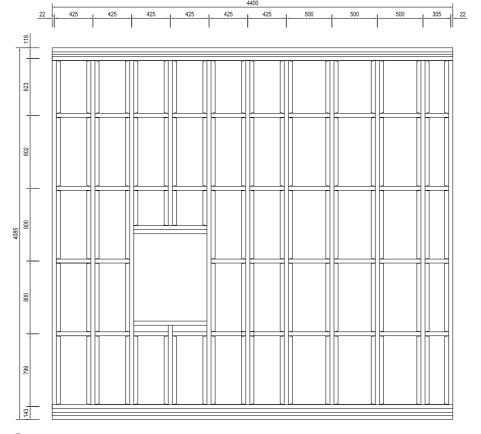






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SHOP DRAWINGS



TIMBER FRAMING

TEST SCALE 1:20

TIMBER FRAMING

TIMBER