Multi Residential

Design Guide

Liminal Wall Systems have developed a new and innovative non-combustible lightweight concrete autoclaved extruded panel for applications in multi residential developments for internal walls.

These panels replace products like plasterboard, AAC and other panel systems.

Extensive testing has been undertaken to the Australian Standards and compliant to the NCC (National Construction Code). Working with our fire, acoustic and structural engineers, we set out in this design guide the performances and design details.

Contents

1 Why Liminal?
2 Structural, Fire, Acoustic & Thermal
3 Panel Specification
4 Panel Installation

Liminal Wall Systems for Internal Walls – Multi Residential Design guide

Liminal Wall Systems have developed a new and innovative non-combustible lightweight concrete autoclaved extruded panel for applications in multi residential developments for internal walls.

These panels replace products like plasterboard, AAC and other panel systems.

Extensive testing has been undertaken to the Australian Standards and compliant to the NCC (National Construction Code). Working with our fire, acoustic and structural engineers, we set out in this design guide the performances and design details.

Compliance to the National Construction Code (NCC).

The Liminal panels have been designed and tested to the Australian Standards AS 1530.1 tested at Warrington Fire in Victoria passing for a non-combustible product. Fire testing to AS1530.4 was undertaken at Sirim Malaysia as part of ILAC MRA accreditation passing a rigorous fire testing program and meet the requirements of the NCC for fire.

Acoustics testing to the AS 1191 and AS/NZS ISO 717.1 at Resolute Laboratory in Brisbane achieving full compliance to the NCC. Ben White principal of Pulse White Noise Acoustic (PWNA) has reviewed the results providing their report for internal performance walls results and compliance to the NCC.

Material properties and structural capacity of the Liminal Wall Panels were tested in approved laboratories to International Standards ISO9001. The results have been confirmed and approved by Structural Engineering firm Macstructure Pty Ltd. This testing is evidence of suitability to comply with the NCC for structural capacity and performance.

The Liminal panel is polished through the final stages for manufacturing not only making the panel the structural component eliminating the requirements for stud and plasterboard as the quality of the panel when erected provides a solid concrete feel that only requires the joints to be set and sanded then painted, speeding up the installation and producing a high-quality finished product.

Liminal Wall has focused on 5 keys internal wall applications as follows

- Intertenancy (Party Wall)
- Corridor
- Wet Area
- Service Risers Non-Habitable/ Habitable
- Basements

In addition, the Liminal wall systems are high performing that have a very narrow wall footprint, this provides additional Net Saleable Area as well as providing design freedom for the designers.

Contained in the design guide is the following

1. Benefits
2. Wall systems detailed and performance compliance
3. Technical specification
4. Compliance to the NCC
5. Components
6. Design Considerations
7. Construction Details
8. Installation Process
9. Work Health and Safety
10. SDS
11. Warranty
12. Test results

CMI CERTIFICATION
CODEMARK Australia
Certificate CM40398

Benefits

Liminal Wall panels are available in two thickness of 35mm and 50mm depending on application.

Both panels are of high strength equal or greater than 40MPa providing excellent bending capacities and impact resistance. All panels are polished through the finishing process adding a high-quality smooth finish, having an "A" finished face of the panel and a "B" face that faces the back of the panels.

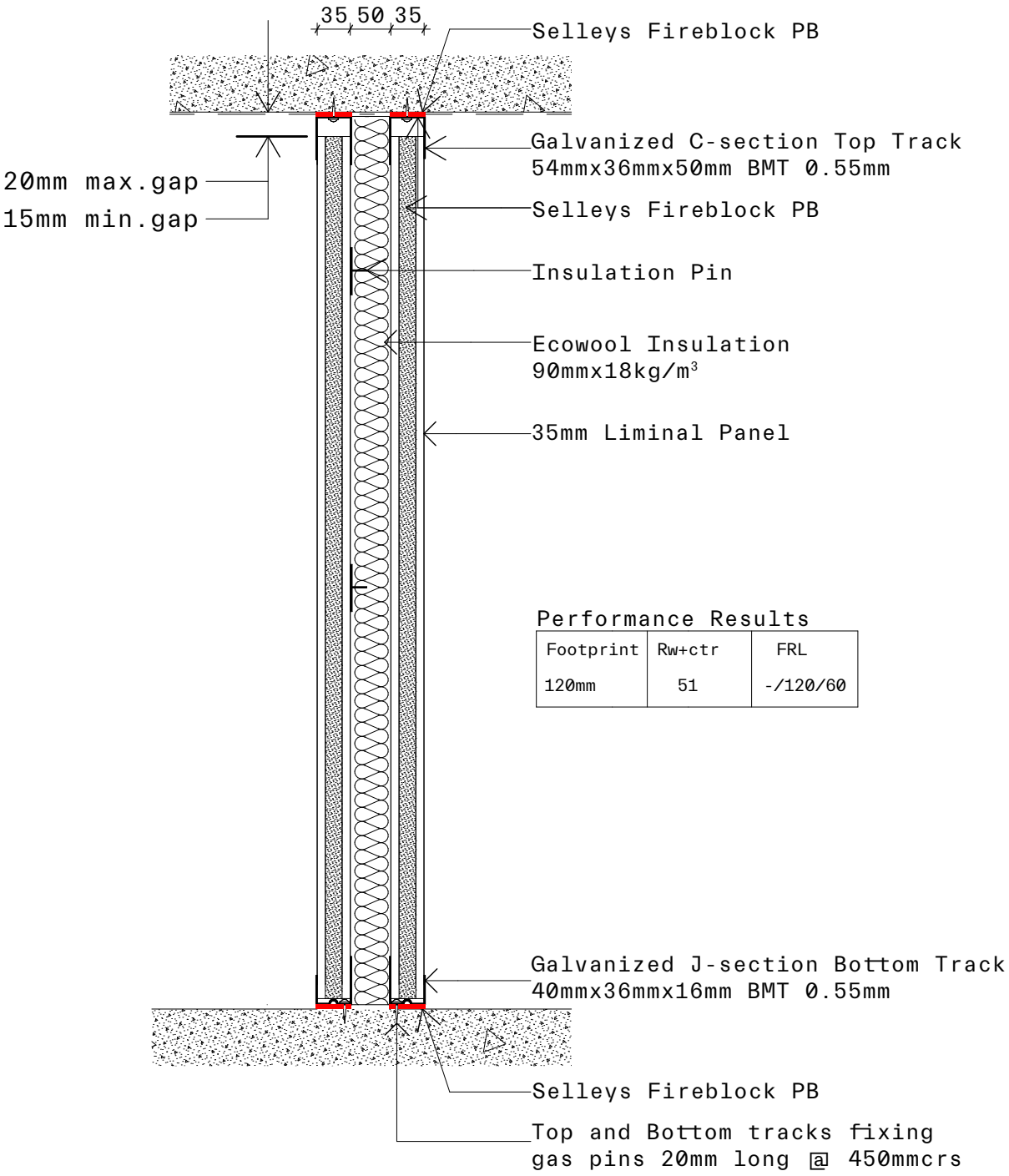
The joints have a tongue and groove that allow the panel when glued together acheiving excellent strength, the benefits are as follows

- High strength
- Impact resistance
- Not affected by water
- Narrow wall footprint
- Tested to the Australian Standards
- NCC compliance
- Fast to erect
- Reduced waste
- Cost competitive
- Reduced crane time

Wall Systems

Intertenancy (party wall)

This wall is the sole wall separating sole occupancy units (apartments) from each other. These are high-performance walls achieving RW+ctr of 51 and -/120/60 FRL that provide amenity and quality of life for the owners of each apartment. The base acoustic performance is a minimum of RW+ctr of 50 and 60minutes (-/60/60) FRL for fire and an internal structural wind pressure of .025KPa.



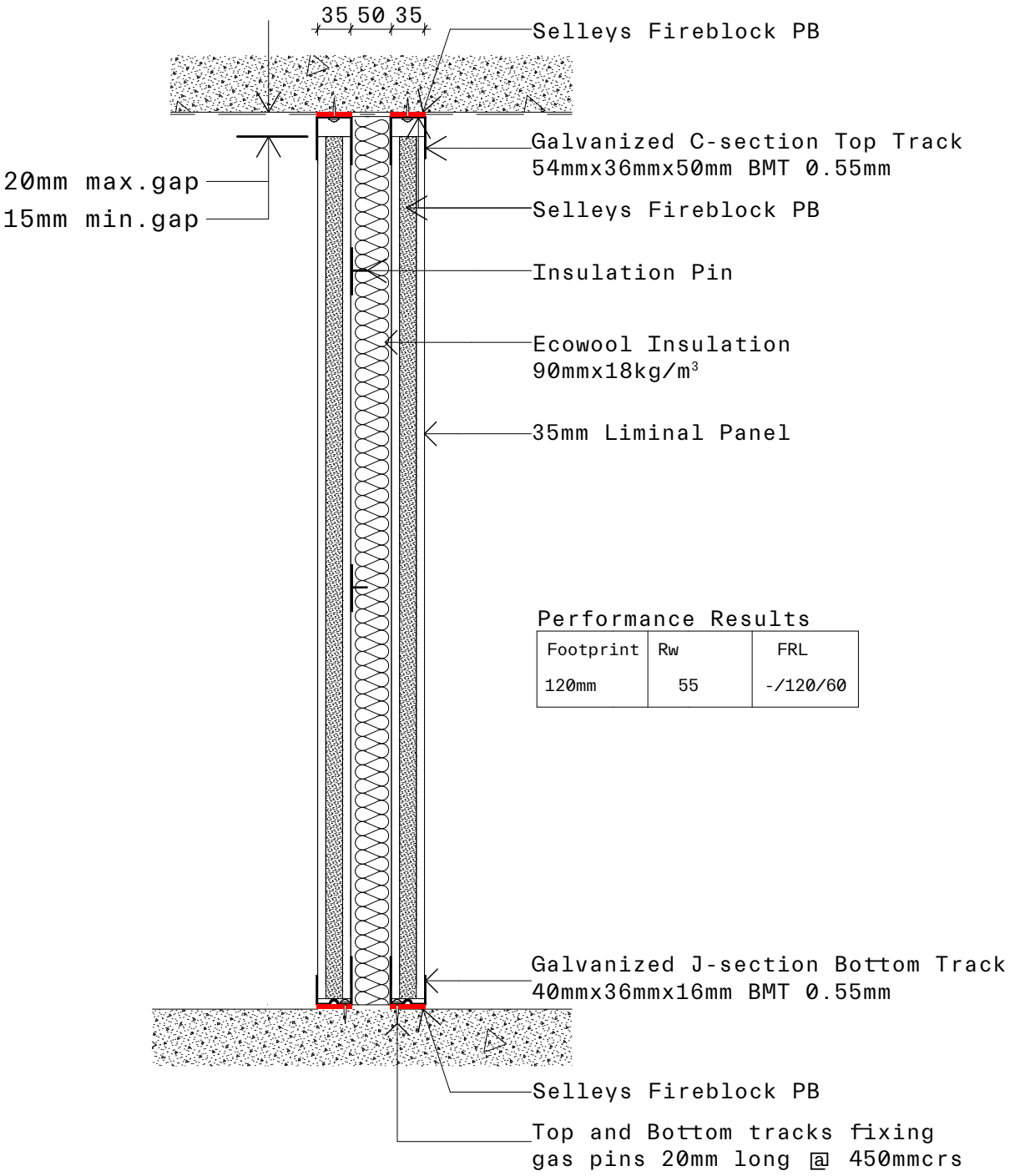
Performance Results

Footprint	Rw+ctr	FRL
120mm	51	-/120/60

Wall Systems

Corridor

The wall is the service wall between the sole occupancy unit (apartment) and the corridor, achieving RW 55 and -/120/60 FRL. There is NO ctr requirement as the noise is traveling not stationary. The base acoustic requirement is RW of 50, a FRL of 60minutes (-/60/60).



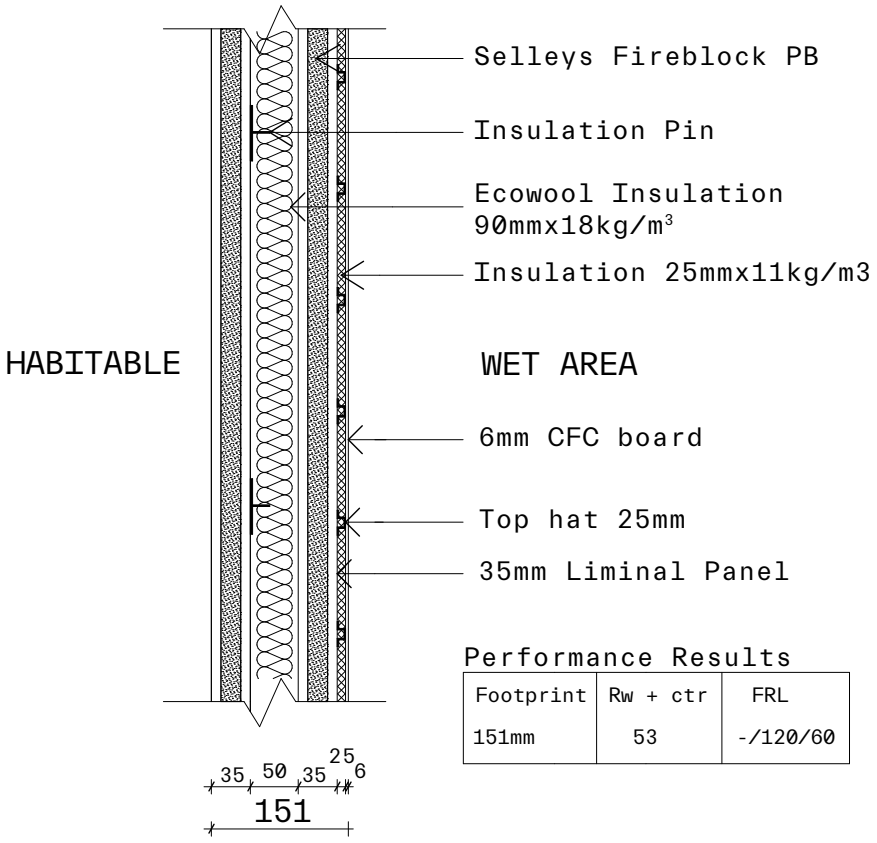
Performance Results

Footprint	Rw	FRL
120mm	55	-/120/60

Wall Systems

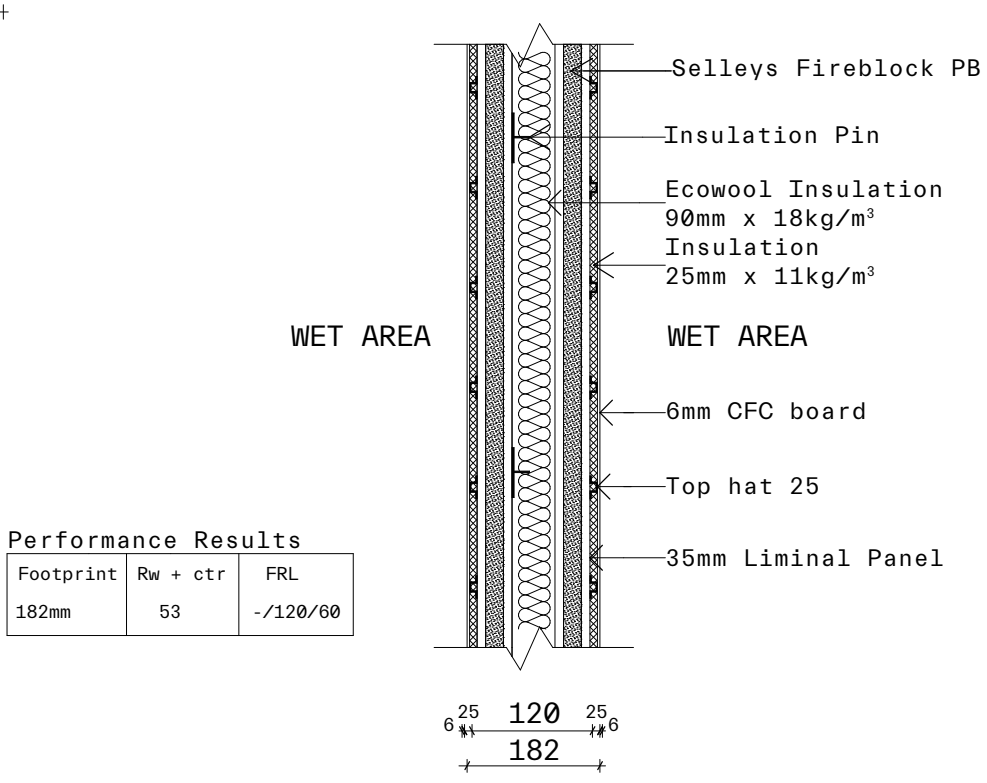
Wet Area

The wall is the service wall that have plumbing pipes running through the wall in separate linings attached to the panel. In apartment construction there are times that the bathroom in one apartment will join the opposite apartment.



Performance Results

Footprint	Rw + ctr	FRL
151mm	53	-/120/60



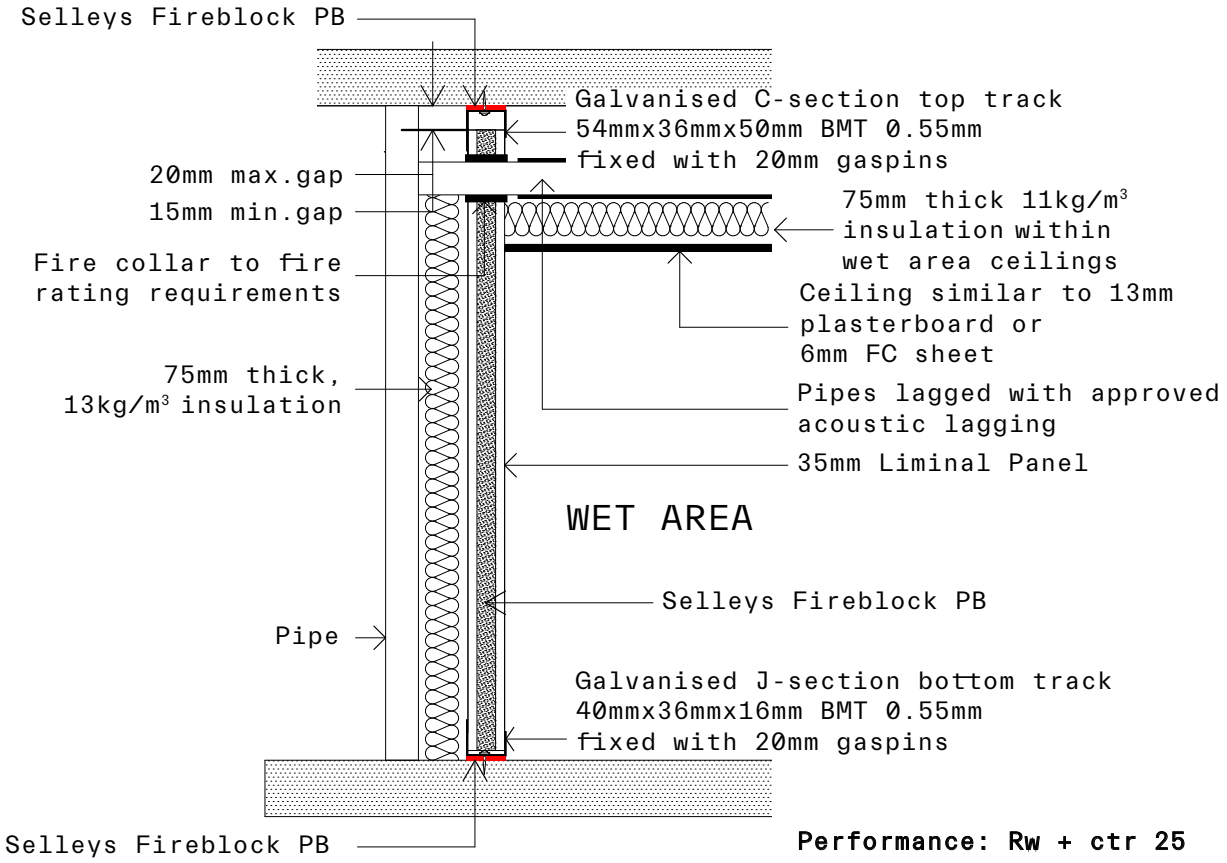
Performance Results

Footprint	Rw + ctr	FRL
182mm	53	-/120/60

Wall Systems

Service Risers

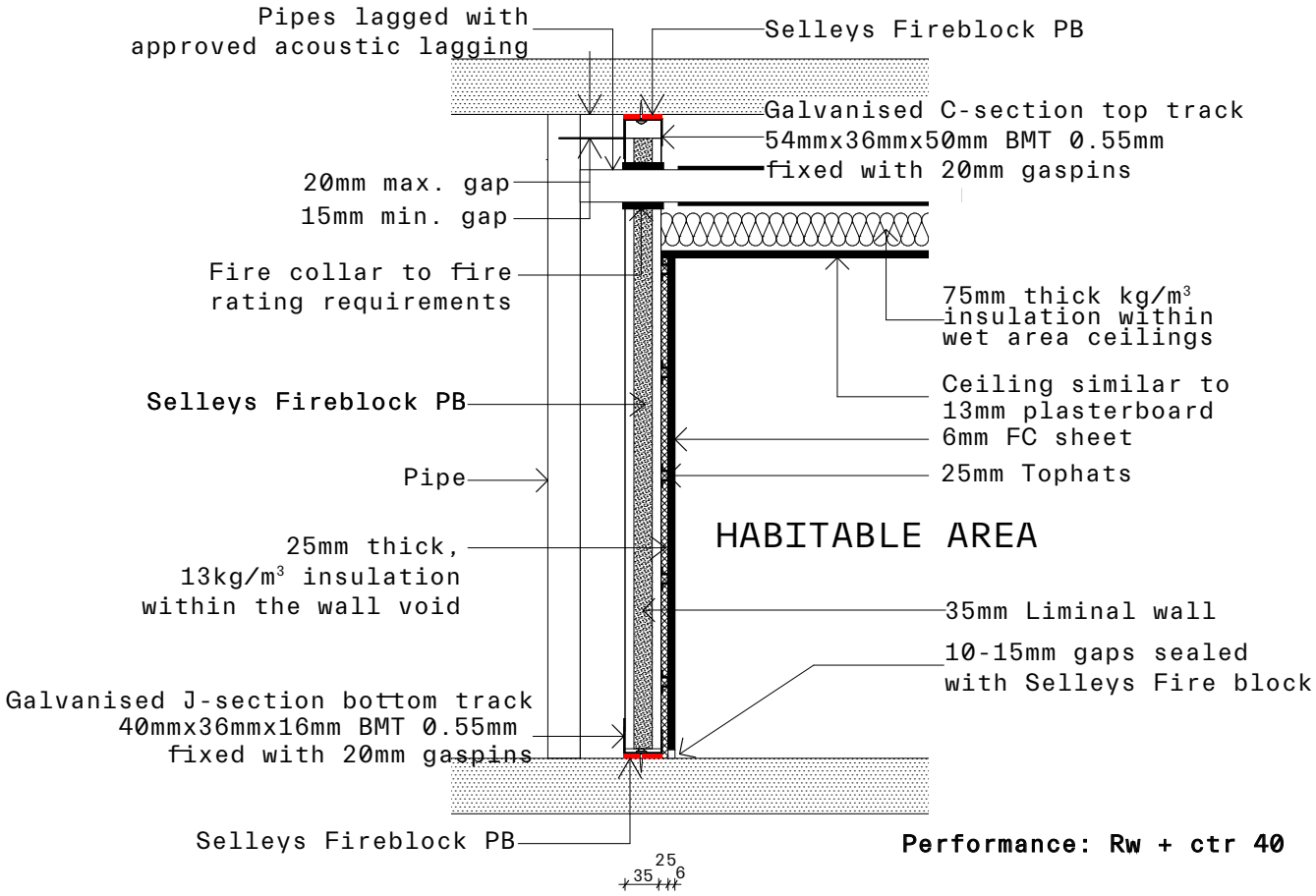
Service risers provide the service space (closure) to run service pipes for each apartment and to service the building. These walls generally are hidden in the bathroom and others in the corridor.



Performance: Rw + ctr 25

Wall Systems

Service Risers



Performance: Rw + ctr 40

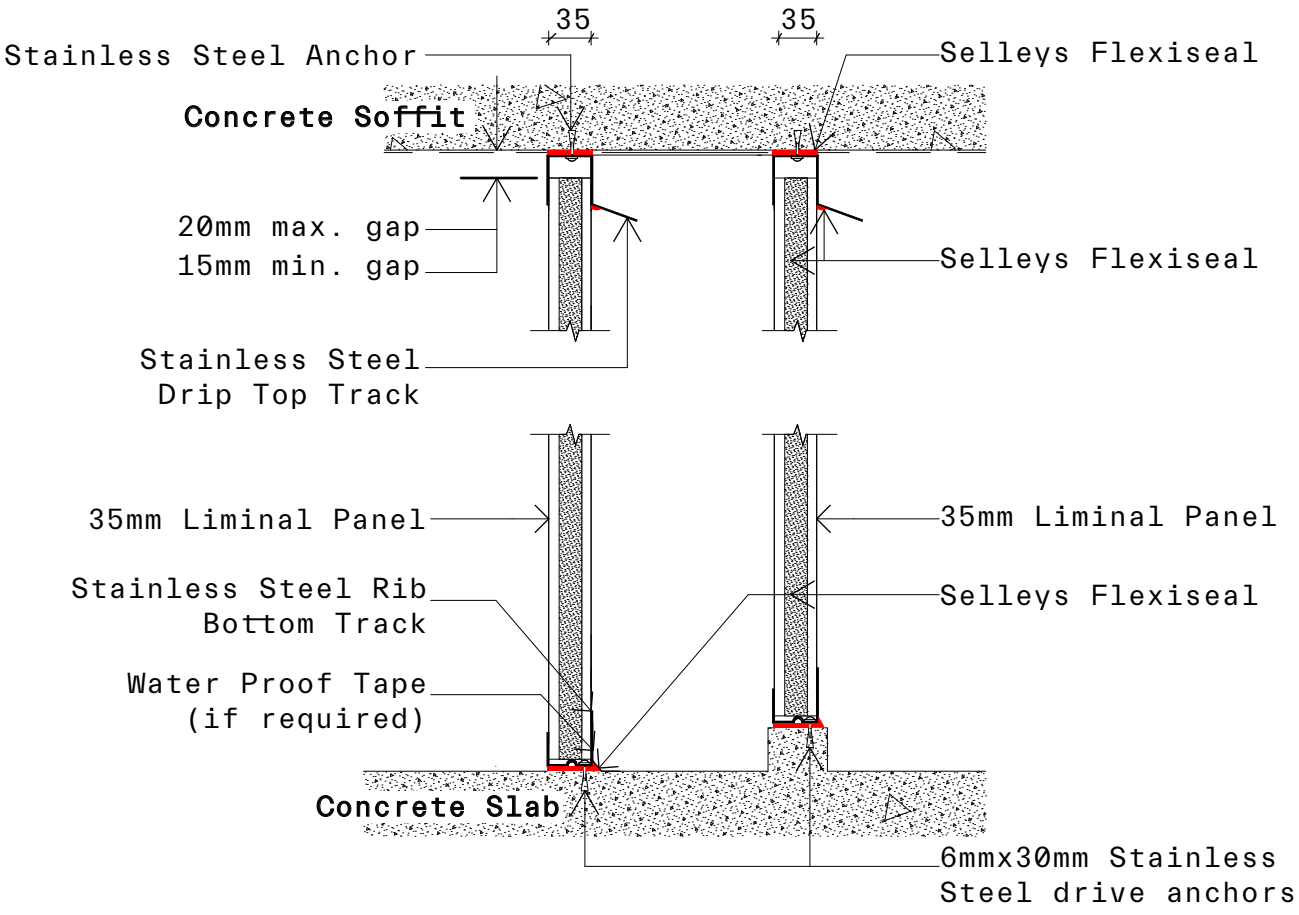
Wall Systems

Basement

The Liminal panel is the preferred choice for basements to enclose the car park from the excavated rock face and shoring, where a high-quality prefinished wall is required. Stainless steel base and head tracks are recommended for use. A maximum height for the 35mm panel is 3.0m and 4.0m for the 50mm panel.

Applications also include plenum walls.

1. On a hob
2 On the slab with water stop and membrane



Technical Specification

MECHANICAL PROPERTIES

Mechanical Properties	Minimum Performance
Characteristic compressive strength, f'c	>40MPa
Characteristic flexural strength, f'ct.f	14MPa
Mean Modulus of Elasticity, E	15,000 MPa

TECHNICAL DATA

Properties	Performance
Shrinkage	.07-.09%
Absorption	<18%
Dry Density	1800–1830 kg/m3 at 20°C
Moisture Content	<8%

SECTION PROPERTIES

Section Properties	Panel thickness 35mm	Panel thickness 50mm
Second Moment of Area, Ixx	184.426 x 104 mm4	532.293 x 104 mm4
Section Modulus, Zxx	109.402 x 103 mm3	213.171 x 103 mm3
Area, A	12,951 mm2	16,783 mm2

PANEL TYPE

Panel Thickness	35mm			50mm			
Panel Width	592	592	592	592	592	592	592
Panel Length	2600	2800	3000	2800	3200	3500	4000
Panel M2	1.54	1.66	1.78	1.66	1.89	2.07	2.37
Nominal Panel Mass @ 10% MC in KG / m2	39	39	39	51	51	51	51
Number of Panels per Pallet	16	16	16	12	12	12	12
Weight of Panel	60.00	64.74	69.42	84.66	96.39	105.57	120.87
Weight of Pallet	960.00	1035.84	1110.92	1015.92	1156.68	1266.84	1450.44

Components

1. 35mm Liminal recessed panel
2. Liminal gal tracks
   a. Top track 54mm x 36mm x 50mm .55BMT
   b. Bottom track 40mm x 36mm x 16mm .55BMT
   c. Gas pins 20mm long
3. Selleys
   a. Fireblock PB (red in colour) all rigid joints
   b. Fireblock (grey in colour) for all control joints
4. Ecowool Insulation, 90mm x 18kgm3
5. Insulation 25mm x 11kg/m3
6. Insulation pins
7. Joint setting compound, Wunderfixx rapid set
8. Howhua door frame and door (Fire tested approved)
9. Screws
10. Rondo P35

Design Consideration

Marked up plans should be used to identify the location of the various wall types, control joints and prepare for set out. Preload the floor with the panels for each apartment then set out the entry door frames and install the top and bottom tracks. Starting from one side of the door frame install the first panel and repeat building the wall.

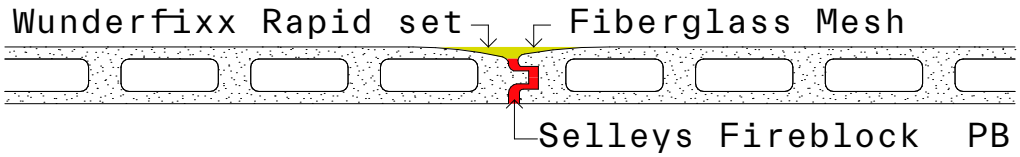
The caulking compound used to glue the panels together must be Selleys Fireblock PB for all rigid joints. All control joints must use Selleys Fireblock NOT the Fireblock PB. All tongue and groove joints must be fully filled with Fireblock PB so when the panels are pushed together the compound is expressed, this needs to be removed leaving a clean surface.

No screws are used to secure the panel to the tracks, the only screws used are for the door frames and the connection for corner panels.

Service penetrations have been fire tested using Promat products, with reports available on request. Important to note all caulking compounds for the fire services are only approved using Promat products NOT Selleys.

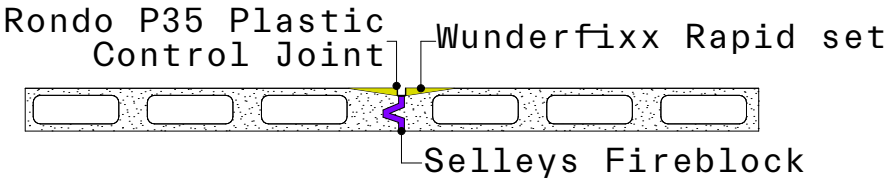
Construction Details

Setting the recessed joints, is a dual process where the Wunderfixx base coat is applied over the fibreglass mesh and allowed to dry for 24hours. The finish or topcoat Wunderfixx is applied over the base coat feathering the edges passed the recessed joint ready for sanding in 24 hours.



Control joints

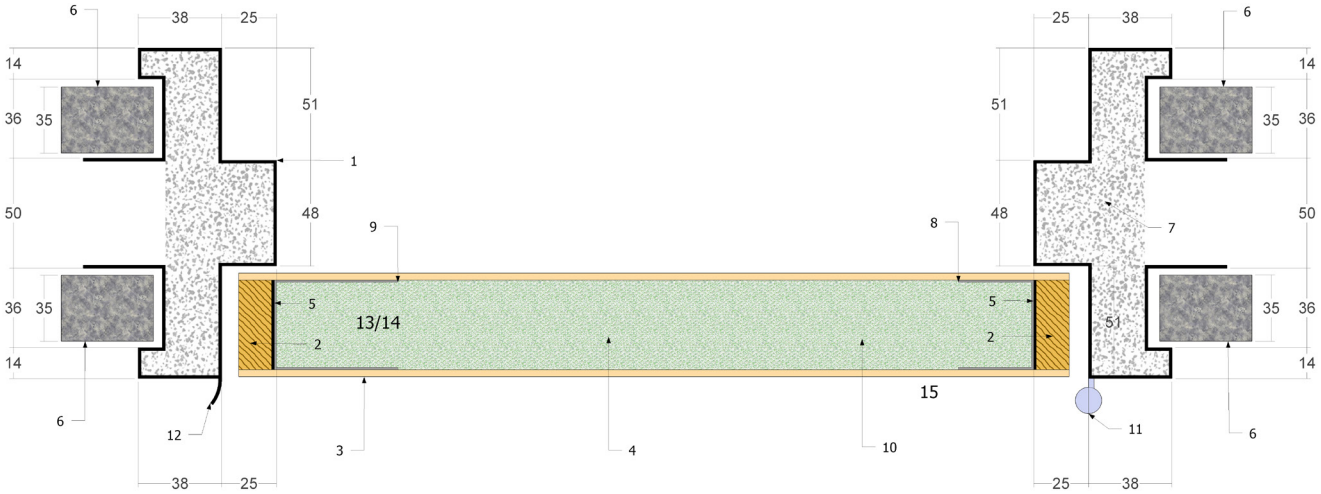
Control joints are required at a maximum of every 8m. In a corridor where the walls are long the control joint must have the panel joint open filled with Selleys Fireblock and a Rondo P35 mould fitted in the joint allowing for movement, the recess edges are then set to the edges of the P35 resulting in a flush wall with a 15mm x 10mm control joint.



Door frame details

Howhua door and door frame has been fire tested and approved to AS1530.4.

Door frame fixed to panels with 10–16 x 55mm counter sunk wing tip drill point screws @ 450mm centres.

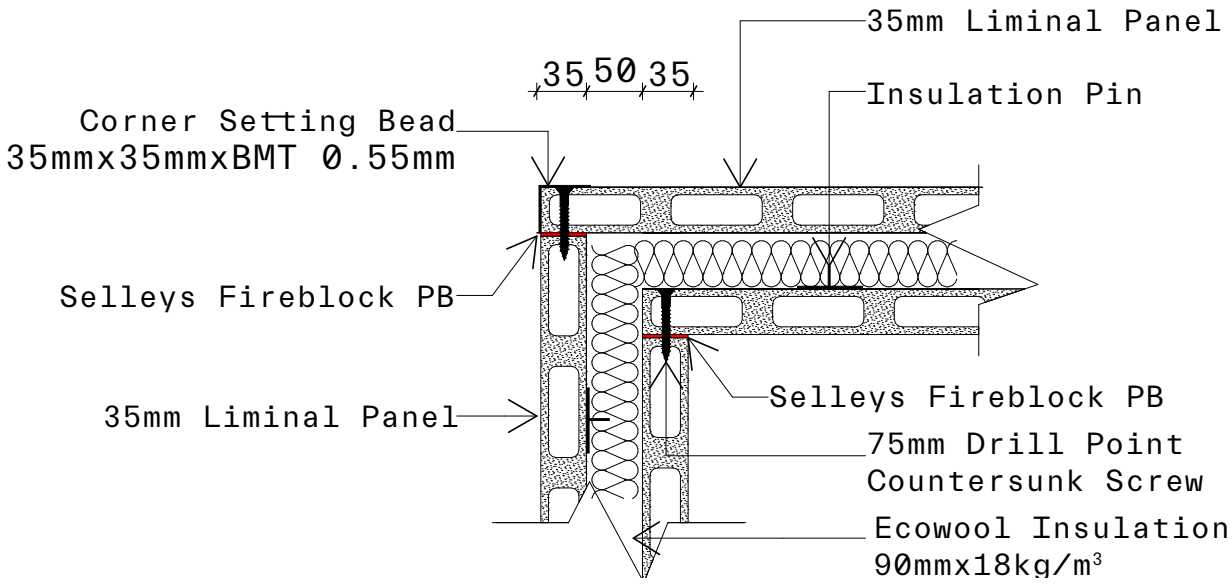


PLAN VIEW

1 1.4mm steel frame.
2 15mm hardwood edgestrips.
3 4mm medium density fibre board
4 Howshua “Maxi” core 39.5mm thick.
5 Black intumescent seals fitted to sides & head.
6 Liminal 120mm Intertenancy / Corridor Wall system.
7 Frame fully grouted with send cement & water mix.
8 Hinge plates 290mm x 80mm x 0.55 perforated gal.
9 Lock plates 300mm x 180mm x 0.55 perforated gal.
10 Closer plate 150mm x 470mm x 0.55 perforated gal.
11 Hinges 100mm x 100mm x 2.5mm.
12 Striker plate Standard universal type.
13 Lock details: ALLEGION / LEDGE 990MF - (L9MFS)
14 Furniture: madinoz MDZ - L21
15 Closer details: ALLEGION / Briton BNT - 1130B-DA-SE (Size 1–6)

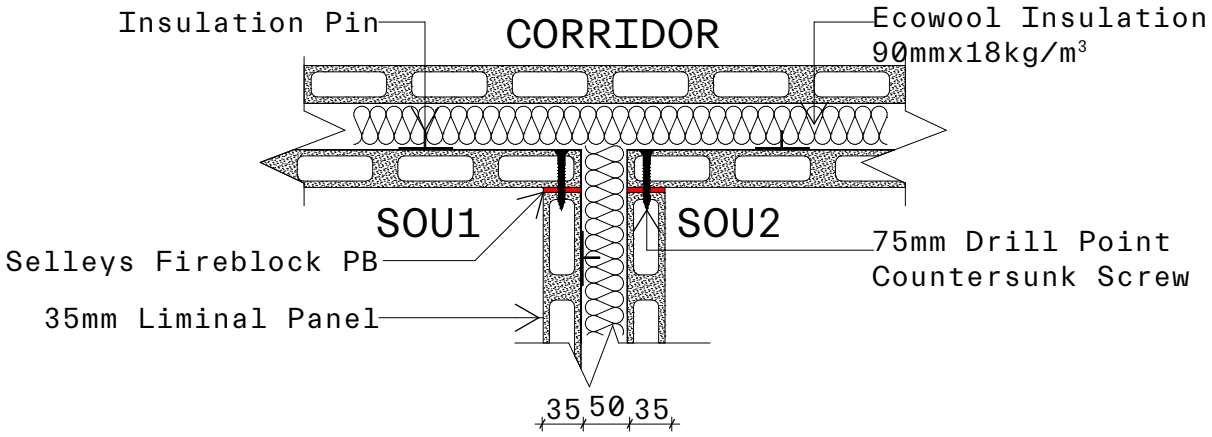
Corner detail

Corner connections are a common construction method where the panels are cut at 90 degrees and caulked together, and screw fixed with 75mm gal drill point countersunk screws. Square edges should be mechanically recessed. A corner set bead is screw fixed over the corner and set.



Corridor to Intertenancy detail

Corridor to intertenancy connection, this is a very important detail that must be followed. There is no connection of the internal wall panel of the corridor wall allowed to bridge the intertenancy wall between apartments.



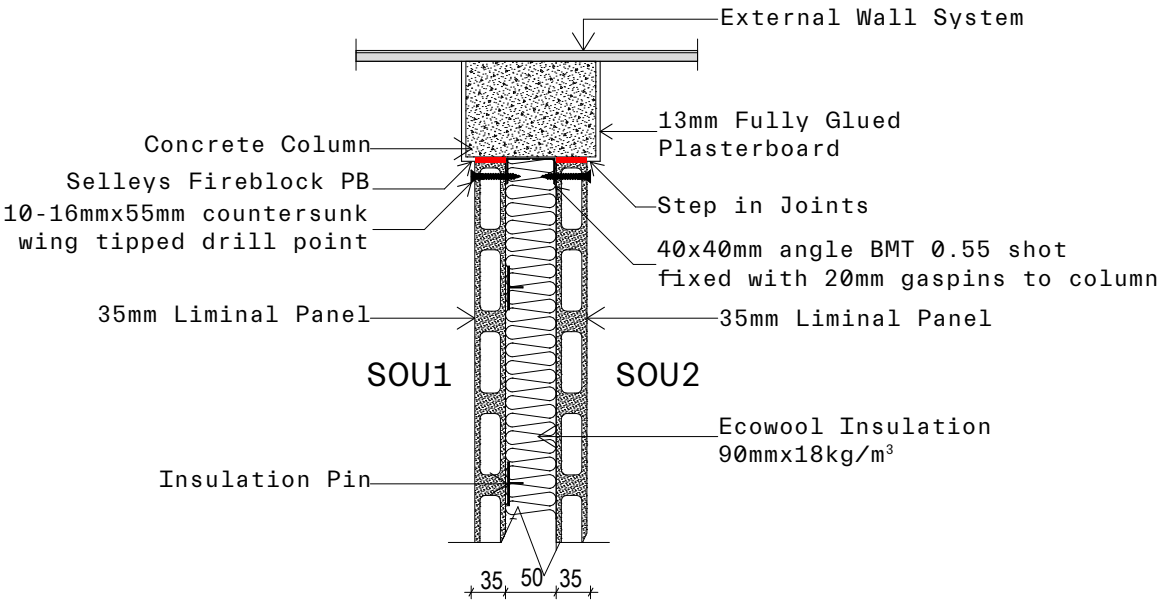
Intertenancy wall junctions

Intertenancy wall junctions to columns need special consideration when the intertenancy wall abuts the column, there are 4 options for the wall to intersect with the column where the concrete column is wider than the 120mm intertenancy wall.

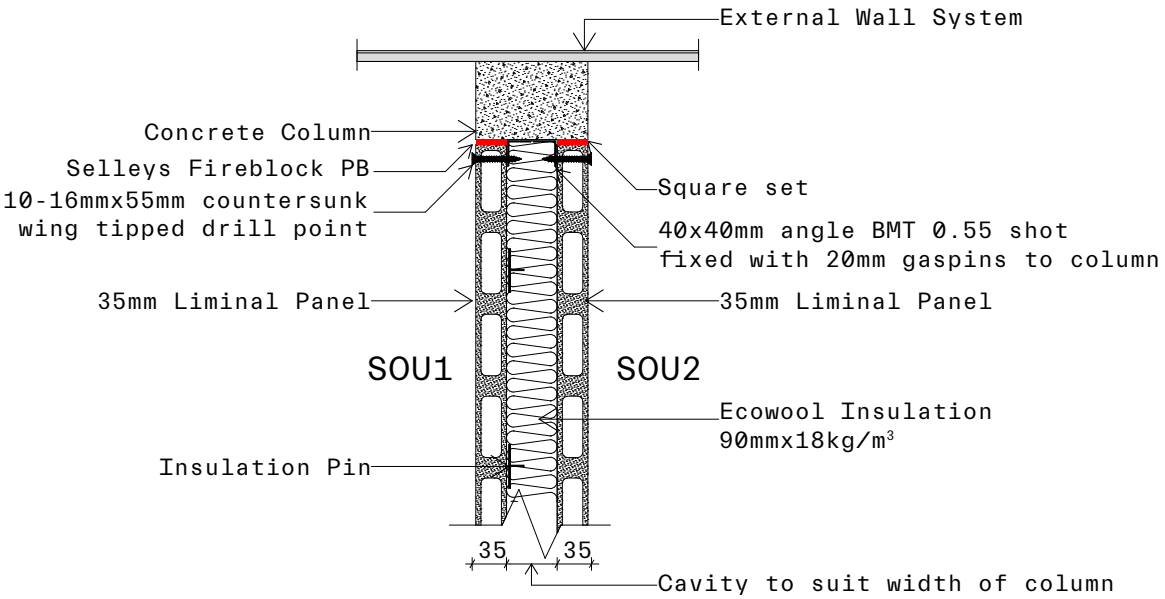
Option 1

Is for both panels to terminate at the column abutting the column, both sides of the column will need to be lined with plasterboard meeting the panels to finish the internal wall linings.

Intertenancy wall connection to column – Option 1 (Plan view)

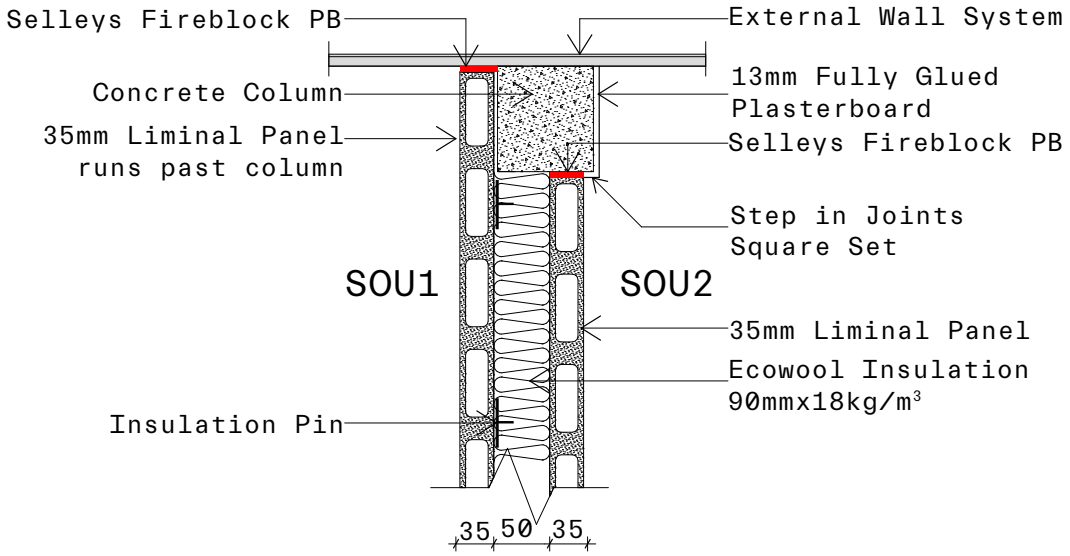


Intertenancy wall connection to column – Option 2 (Plan view)

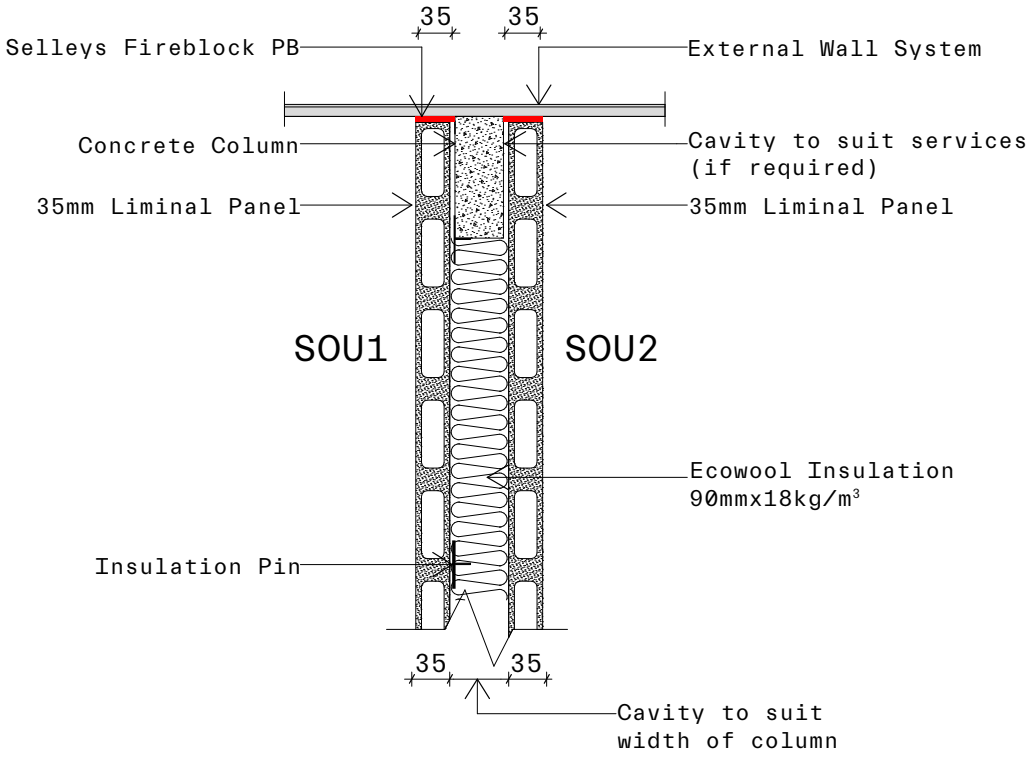


Intertenancy wall connection to column – Option 3 (Plan view)

This is when the panel on one side of the column runs past the column and the second skin of panel buts the column. Again the concrete column requires to be sheeted with plasterboard to finish the internal lining for the wall.



Intertenancy Wall running past Column – Option 4 (Plan view)



Installation

Following the set out of the walls the tracks are installed first, both top and bottom tracks have unequalled length legs. For the top track the longer 60mm leg goes to the cavity side of the wall allowing for easier installation of the panels into the head track. The bottom track longer leg of 40mm also goes to the cavity leaving the short 16mm leg facing the front.

Caulk between the underside of the track and the slab with Selleys Fireblock PB then shoot fix the tracks into their final position. Ensure the tracks are continuous around corners.

Measure the floor to soffit then measure the panel with a maximum of 20mm less for deflection of the building structure. This also allows for lifting the panels over the bottom track short leg of 16mm. Starting at a corner or a door frame install the first panel and plumb, caulk the installed panel groove and prepare and install the next panels until reaching the next-door frame or corner.

The corner connection should be rigid where a butt joint filled with Fireblock PB, and screw fixed with 75mm galvanised drill point countersunk screws.

Install one side of the tracks for the entire floor, then install the panels, this allows for the services to be installed. Next install the insulation and fix the tracks and install the second skin of panels. All recessed joints should have had during installation expressed compound, this compound should be buttered flat, and the fibreglass mesh installed into the fresh compound ensuring the recess is not over filled.

The door frame is Howhua and must be used as this wall system has been fire tested including this door frame and door. The frame is double rebated to receive the 35mm panel on either side of the wall with a backing plate allowing for grout filling of the frame. The frame has internal legs that the panel is screw fixed to using 50mm galvanised drill point countersunk screws. The infill panel above the door frame can be cut, bevelled edged and Fireblock PB joints into position.

Tools

The Liminal panel is a cement extruded panel with a strength of 40MPa. We recommend all cutting tools/blades to be diamond tipped.

1. Power saw with diamond tipped blade to cut the panels
2. Cordless angle grinder to cut the top hats
3. Cordless impact drill or auto feed screw driving screw system to fix panels to top hats
4. Power rebating tool
5. Power caulking gun to apply the caulking compound
6. 8mm masonry bit with a 6mm controlled depth, to counter sink the panel screw heads
7. Laser level
8. Class M or L vacuum for all cutting

OH&S

Personal Protection Equipment (PPE) is recommended to protect eyes, skin, ears, and respiration while working with the Liminal Panel.

Employers are responsible for providing appropriate personal protection equipment.

- A disposable P1 or P2 dust mask must be worn.
- We recommend wearing gloves to avoid skin abrasion and irritation.
- Wear eye and ear protection.

Cuffing

The Liminal Panel product is manufactured from concrete material. The fine dust that may be on the supplied panel or generated during working with the panel cutting, drilling, grinding, breaking, sawing, and finishing.

Cutting service penetrations must be dry cut using diamond tipped hole saws for circular penetrations and circular saw/ reciprocating saw for square penetrations. Penetrations need to be cut neatly with a maximum of 20mm over cut for fire penetrations.

Handling

The Liminal Panel products shall be bundled and strapped to pallets or gluts, to ensure the panels are clear off the ground and evenly supported. The panel bundles can be wrapped in plastic to secure any loose panel pieces caused by damage. A Safety Data Sheet shall be included inside the plastic wrap of every panel bundle.

The use of an approved lifting equipment is recommended when moving the panels in the work area and installation.

Storage

The Liminal Panel products shall be stored in a dry area clear off the ground and in areas which minimise the chance of damage.

SDS

Additional information is presented in the Safety Data Sheet.

Document number LW- SDS - 001-SEP 2021

Technical Specification

Additional information is presented in the Technical Specification Data Sheet.

Document number LW - TS-001-SEP 2021

Disclaimers and Warranty

1. **The Warranty is being provided by:**

   LIMINAL WALL SYSTEMS PTY LTD

2. **The Warranty and limitation of liability applies to:**

   The builder and the installer of LIMINAL WALL product, being building panel products supplied by LIMINAL WALL for the use in residential and commercial high rise building construction.

3. **The Warranty**

   Subject to the limitations and exclusions set out in this document, the LIMINAL WALL Product

   will be supplied free from defects arising from faulty material and manufacture and shall not materially degrade, corrode, or break down.

4. **The Warranty period**

   The Warranty is for 15 years from the date of purchase of the Product.

5. **Conditions**

   The warranty will only apply when:

   a) The Product is installed in accordance with a system described in a LIMINAL WALL system manual, the requirements of the Building Code of Australia, sound building practice and other codes and regulations in place at the time of installation;

   b) All components used in the installation of the Product were as described in the LIMINAL WALL system manual current at the time of installation of the system;

   c) The Product was installed by installers approved by LIMINAL WALL in writing.

6. **Exclusions**

   To the extent permitted by law LIMINAL WALL will not be liable where:

   a) Force majeure - damage arises from forces outside the control of LIMINAL WALL including, but not limited to circumstances where the Product has been affected by war, external forces, settlement, earthquake, movement, or structural defects of the building, fi re, hail, flood, lightning or acts of God, impact by foreign objects, mistreatment, or neglect.

   b) Faults are caused or contributed to by third party design, engineering, or construction of the building where the Product is installed.

7. **LIMINAL WALL Liability**

   a) Subject to the rights and remedies of a consumer under a law which cannot be limited, the obligations of LIMINAL WALL under this Warranty is limited, at the option of LIMINAL WALL to:

      i) the replacement of the Product;

      ii) the supply of equivalent Product;

      iii) the repair of the Product;

      iv) the payment of the cost of replacing the Product or of acquiring equivalent Product; and

      v) the payment of the cost of having the Product repaired.

   b) This Warranty shall not include or extend to:

      i) labour costs associated with the removal or repair of the defective Product or installation of the replacement Product;

      ii) injury to persons, damage to property, loss of income, profit or business, or any other indirect loss arising from or caused in any way by the defective Product

   c) For the avoidance of doubt this Warranty excludes all other warrantes, conditions, offers, promises or assurances, whether express or implied, except to the extent that such warrantes, conditions, offers, promises or assurances, cannot by virtue of law be so excluded.

8. **Consumer Guarantee provisions**

   a) If you acquire Product from LIMINAL WALL as a consumer according to Australian Consumer Law, our Product comes with guarantees that cannot be excluded under Australian Consumer Law. You are entitled to a replacement or refund for a major failure and compensation for any other reasonably foreseeable loss or damage. You are also entitled to have the Product repaired or replaced if the Product fails to be of acceptable quality and the failure does not amount to a major failure.

   b) Nothing in this Warranty should be interpreted as attempting to exclude, restrict or modify the application of any applicable provisions of the Australian Consumer Law or the consumer's rights to make a claim in respect of any consumer guarantees or under any other provision of the Australian Consumer Law.

9. **Making a claim**

   Should you ever need to lodge a warranty claim in relation to the Product you must provide proof of purchase, evidence of the date of installation of the Product and advise LIMINAL WALL at the address set out below in writing within 30 days after the defect was reasonably apparent, or if the defect was reasonably apparent prior to installation, the claim must be made prior to installation.

LIMINAL WALL SYSTEMS PTY LTD

Test results

FIRE, testing to AS1530.4 was undertaken and completed at Sirum Laboratory Malaysia over a 10day period. Full test of a 3m x 3m wall at 120mm thick was fire tested achieving a compliance of -/120/60 minutes FRL. A further 3 more full scale test were completed testing service penetrations for pipes, air conditioning, electrical and door all passing at -/120/60 FRL.

SIRIM QAS INTERNATIONAL

SIRIM QAS International Sdn.Bhd.
(Company No.: 199601037981 (410334-X))
No.1, Persiaran Dato' Menteri, Section 2, P.O.BOX 7035,
40700 Shah Alam, Selangor Darul Ehsan, Malaysia.
Tel: 03-55446465
Fax: 03-55446454
www.sirim-qas.com.my

ilac-MRA STANDARDS MALAYSIA ACCREDITED
SAMM NO. 085

TEST REPORT

REPORT NO.: 2022FE0539	PAGE : 1 OF 20

This Test Report refers only to samples submitted by the applicant to SIRIM QAS International Sdn. Bhd. and tested by SIRIM QAS International Sdn. Bhd. This Test Report shall not be reproduced, except in full and shall not be used for any purpose by any means or forms (including but not limited to advertising purposes) without written approval from the Head of Quality, Occupational Safety and Health & Environment (QOSHE), SIRIM QAS International Sdn. Bhd. Please refer to the last page of this Test Report for Conditions Relating to the Use of Test Report.

THIS TEST REPORT IS ISSUED IN SECURED PDF SOFTCOPY

Applicant	:	**LIMINAL WALL SYSTEMS PTY. LTD.** 7/56 Boundary Road, Rocklea, 4106, Brisbane, Queensland, AUSTRALIA.
Manufacturer/ Test sponsor	:	**Same as above.**
Product	:	**Liminal Wall Panel**
Reference standard/ Method of test	:	**AS 1530.4 : 2014** Method for fire tests on building materials, components and structures Part 4 : Fire resistance tests for elements of construction. Section 3 : Wall – Vertical Separating Elements
Description of test specimen	:	The non-loadbearing symmetrical wall system consisted of double sided of 35 mm (t) Laminal Wall panel (autoclaved cement extrusion panel) separated by 50 mm cavity. Brand : **Liminal Wall Panel** Overall size : 3000 mm wide x 3000 mm height x 120 mm thick
Date received	:	4 July 2022
Job number	:	J20221440327
Overall test result	:	**The test result of the submitted test sample are described in page 3 of this test report.**
Issued date	:	**30 September 2022**

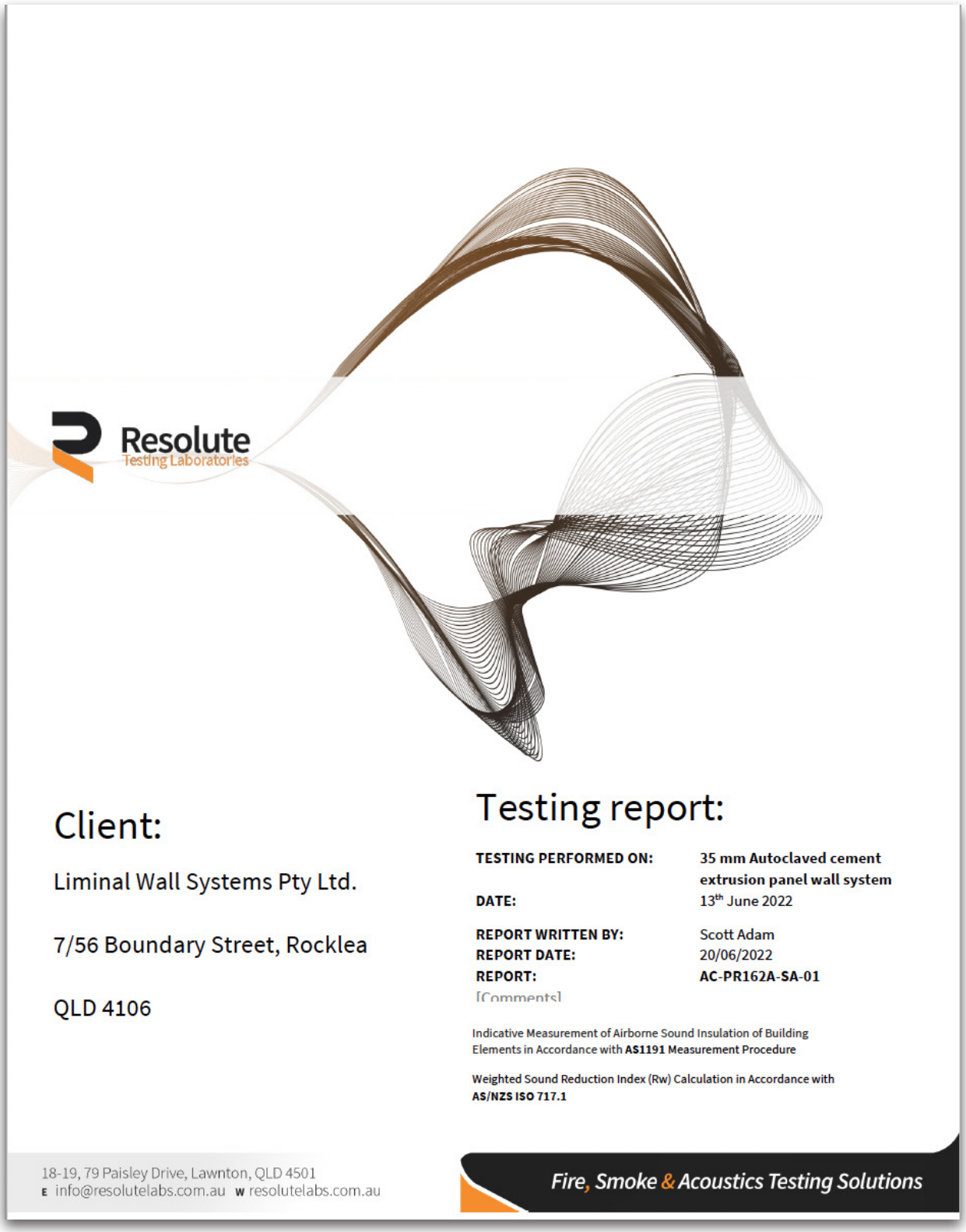
Approved Signatory :

SIRIM QAS International Sdn. Bhd. FIRE PROTECTION SECTION

(MOHD HAFEEZ AZWAN MOHD AZMI)
Testing Executive

(ZAINI AHMAD)
Head
Fire Protection Section
Testing Services Department

Resolute report 1



Resolute
Testing Laboratories

Client:

Liminal Wall Systems Pty Ltd.

7/56 Boundary Street, Rocklea

QLD 4106

Testing report:

TESTING PERFORMED ON:	**35 mm Autoclaved cement extrusion panel wall system**
DATE:	13th June 2022
REPORT WRITTEN BY:	Scott Adam
REPORT DATE:	20/06/2022
REPORT:	**AC-PR162A-SA-01**

[Comments]

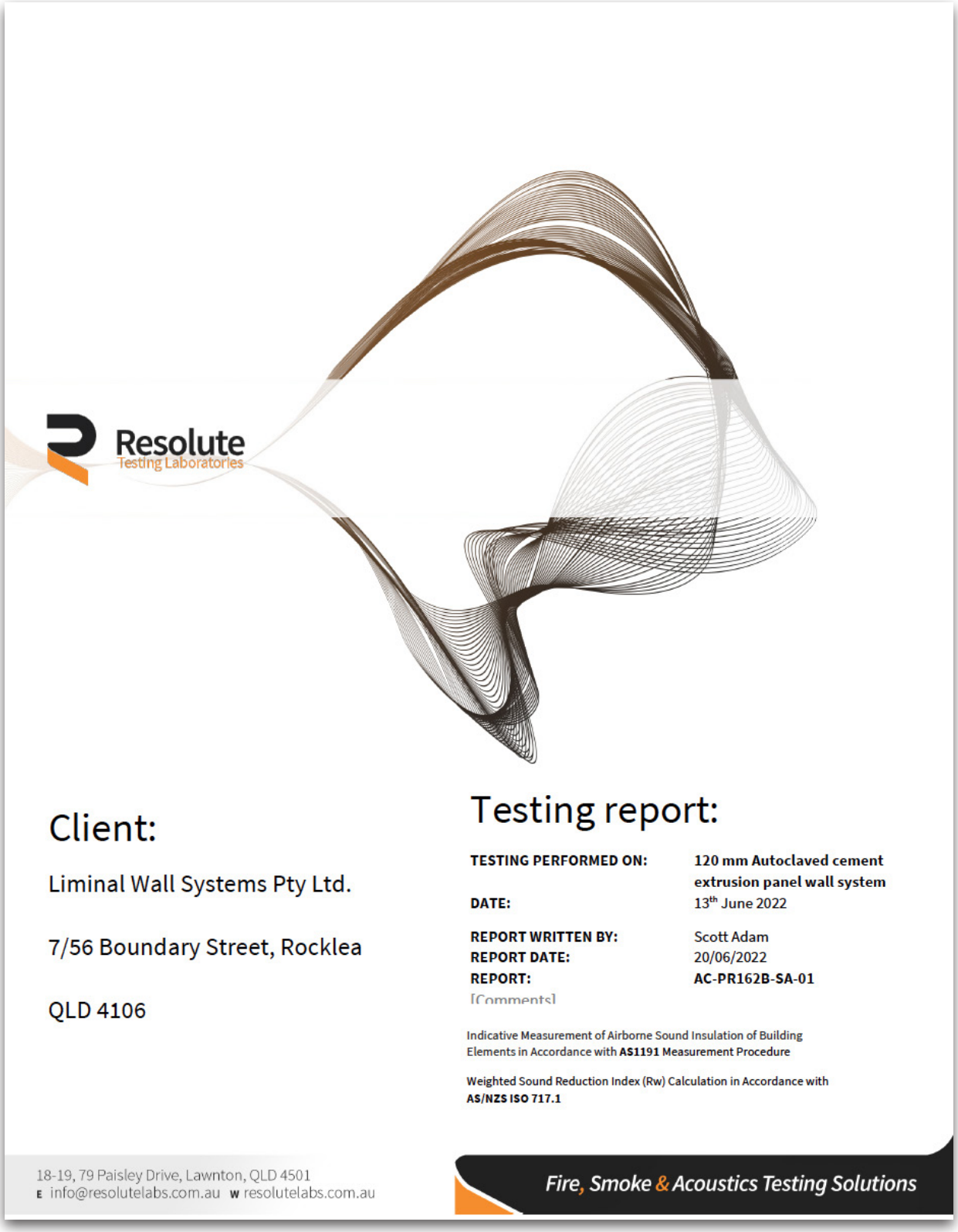
Indicative Measurement of Airborne Sound Insulation of Building Elements in Accordance with **AS1191** Measurement Procedure

Weighted Sound Reduction Index (Rw) Calculation in Accordance with **AS/NZS ISO 717.1**

18-19, 79 Paisley Drive, Lawnton, QLD 4501
E info@resolutelabs.com.au W resolutelabs.com.au

Fire, Smoke & Acoustics Testing Solutions

Resolute report 2



Resolute
Testing Laboratories

Client:

Liminal Wall Systems Pty Ltd.

7/56 Boundary Street, Rocklea

QLD 4106

Testing report:

TESTING PERFORMED ON:	**120 mm Autoclaved cement extrusion panel wall system**
DATE:	13th June 2022
REPORT WRITTEN BY:	Scott Adam
REPORT DATE:	20/06/2022
REPORT:	**AC-PR162B-SA-01**

[Comments]

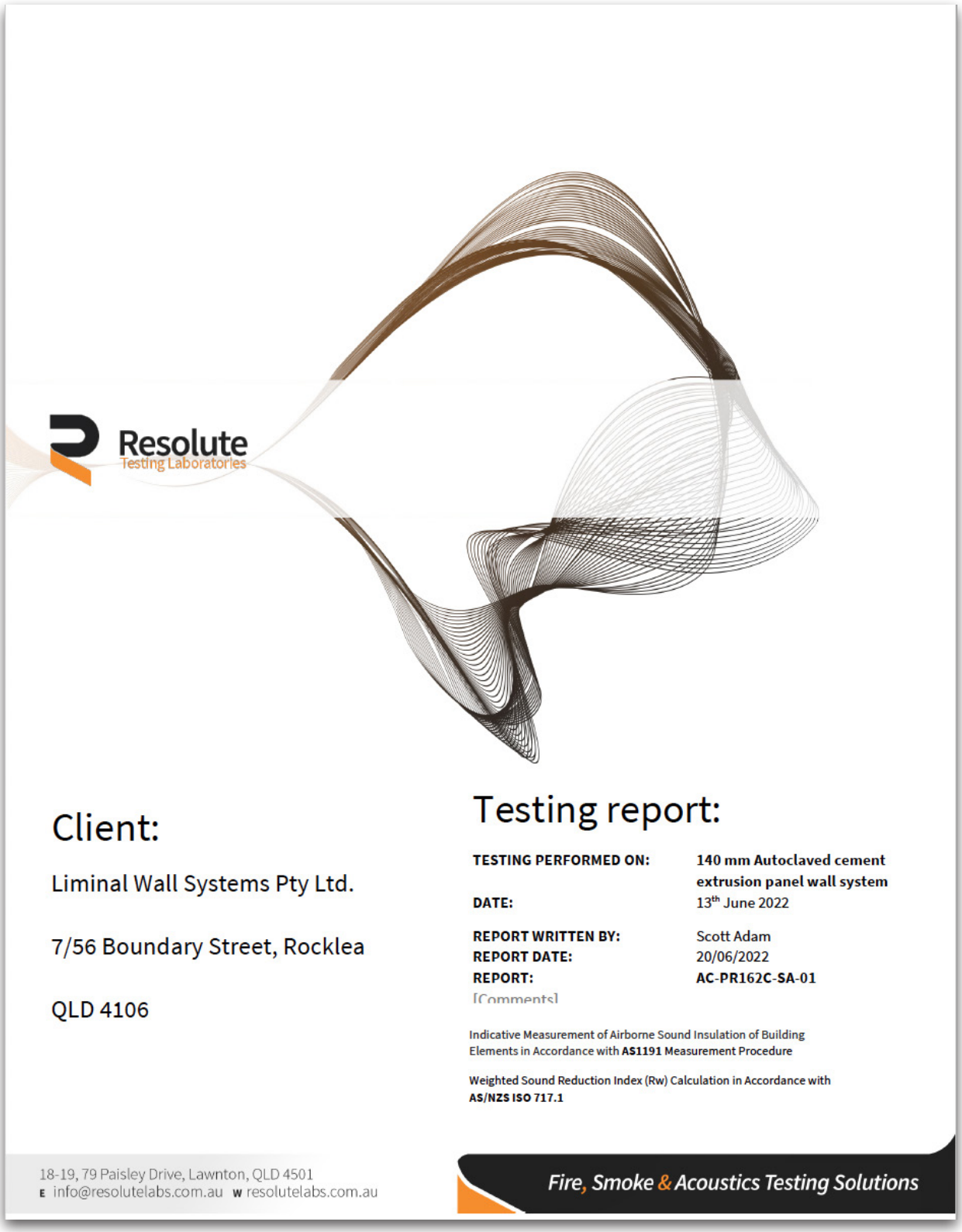
Indicative Measurement of Airborne Sound Insulation of Building Elements in Accordance with **AS1191** Measurement Procedure

Weighted Sound Reduction Index (Rw) Calculation in Accordance with **AS/NZS ISO 717.1**

18-19, 79 Paisley Drive, Lawnton, QLD 4501
E info@resolutelabs.com.au W resolutelabs.com.au

Fire, Smoke & Acoustics Testing Solutions

Resolute report 3



Resolute
Testing Laboratories

Client:

Liminal Wall Systems Pty Ltd.

7/56 Boundary Street, Rocklea

QLD 4106

Testing report:

TESTING PERFORMED ON:	**140 mm Autoclaved cement extrusion panel wall system**
DATE:	13th June 2022
REPORT WRITTEN BY:	Scott Adam
REPORT DATE:	20/06/2022
REPORT:	**AC-PR162C-SA-01**

[Comments]

Indicative Measurement of Airborne Sound Insulation of Building Elements in Accordance with **AS1191** Measurement Procedure

Weighted Sound Reduction Index (Rw) Calculation in Accordance with **AS/NZS ISO 717.1**

18-19, 79 Paisley Drive, Lawnton, QLD 4501
E info@resolutelabs.com.au W resolutelabs.com.au

Fire, Smoke & Acoustics Testing Solutions

Liminal Wall Systems Pty Ltd
ABN 22 646 545 137

sales@liminalwall.com.au
liminalwall.com.au

LIMINAL™