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REPORT NO: ACA – 191009

FENCO PANEL

EXTERNAL WALL CLADDING SYSTEM

NCC 2019(AMDT.1) VOL.2 APPRAISAL – EXTERNAL WALLS

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DATE: APRIL 4TH 2022

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25 October 2019	ACA 191009 191025	Initial Issue
3 March 2021	ACA 191009 210303	Update of Scope, incl. Bushfire, Updated Manual, Exova Warringtonfire FRL Report, Top-hat spacing calculations
29 March 2021	ACA 191009 210329	Updated Technical Installation Manual V3.0, Include 10.3 photographs
4 April 2022	ACA 191009 220404	Update Section 4.2, evidence of suitability supporting P2.2.2 for the inclusion of horizontal & vertical control joints. New Section 4.4 Condensation Management, Pliable Building Membrane. Updated Technical Installation Manual V4.0 (see Manual page 3 of 40 for details).

1 Scope

A *Performance Solution* is typically made for innovative solutions that are not addressed by D*eemed-to-Satisfy* provisions, and may be difficult to assess by individual building surveyors. A *Performance Solution* for a project is typically founded on the completion of a *performance-based design brief* in consultation with relevant stakeholders in which the results of testing and assessments are evaluated against acceptance criteria to achieve the *Performance Requirements* of the NCC.

This report describes the foundation of a *Performance Solution* for an external wall. It addresses the relevant *Performance Requirements* and *Deemed-to-Satisfy* provisions of the National Construction Code 2019(Amdt.1), Volume Two, for structural stability, weatherproofing, damp-proofing, condensation, bushfire and energy efficiency for external walls. Combined with additional site/project-specific information, this report may be used to satisfy *performance-based design brief* acceptance criteria as part of developing a *Performance Solution*.

This report is based on the test reports and other documentation as referenced. Whilst the responsibility for the accuracy and applicability of these documents remains with their authors, I am of the opinion that such documentation has been prepared on a sound basis.

This report covers only those matters and products listed and should not be interpreted as covering any other matter or product.

When combined with site/project-specific information and other documentation, this report may be incorporated as part of a *Performance Solution* that shall demonstrate compliance with all relevant *Performance Requirements* (e.g., Structure, Fire Resistance, Weatherproofing, Damp Proofing, Condensation, Bushfire Performance & Energy Efficiency).

2 *Fenco Panel External Wall Cladding System*

Fenco Panel External Wall Cladding System incorporates Fenco Panel 2400mm x 600mm x 80mm thick light grey foamed ceramic panel weighing 43.8 kg (380kg/m^3) tested and supplied by Australia Fenco Low Carbon Construction for use in NCC 2019(Amdt.1) Volume Two, Class 1 & 10 buildings.

Key elements of the *Fenco Panel External Wall Cladding System* (see Figure 1) include:

- Fenco Panel

- Horizontal steel top-hat battens
- Vapour permeable wall wrap
- R2.7 m^2K/W, 90 mm thickness Glasswool insulation within the framing cavity.
- 10mm Plasterboard typical internal lining

Additional accessories, supplied by others include damp proof course, flashing tape, mortar, sealants, optional starter channel, external angles, backing rod, fixing screws, project specific metal flashings.

Comprehensive construction details and installation requirements are provided in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.

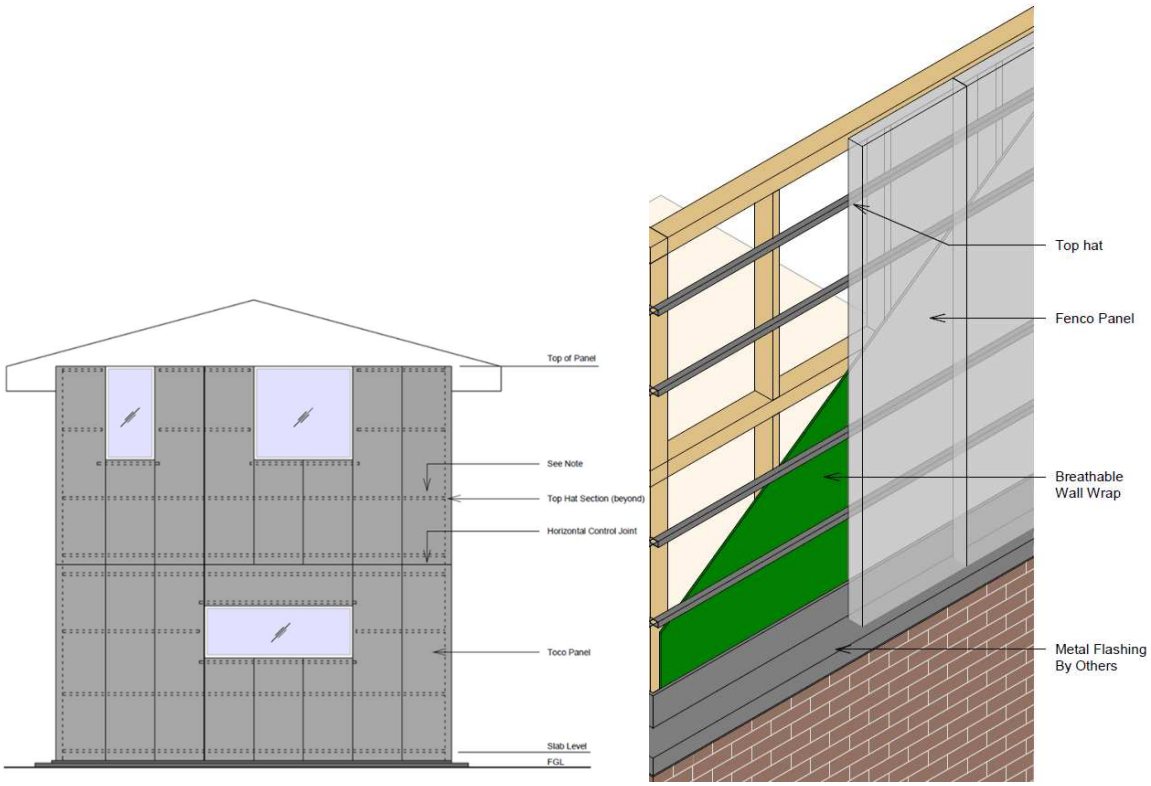


Figure 1: Fenco Panel External Wall Cladding System

3 NCC Performance Requirements and Deemed-to-Satisfy Provisions

The use of *Fenco Panel External Wall Cladding System* is not addressed in the NCC 2019(Amdt.1) Volume Two as a *Deemed-to-Satisfy Solution*.

The *Fenco Panel External Wall Cladding System* has been appraised as the basis of a *Performance Solution* that must satisfy the relevant NCC 2019(Amdt.1) Volume Two

Performance Requirements and Deemed-to-Satisfy provisions for strength, weatherproofing, damp-proofing, bushfire, condensation and thermal performance of an external wall for:

1. P2.1.1 regarding the structural performance of external wall cladding of buildings.
2. P2.2.2 regarding the weatherproofing of external walls of buildings.
3. P2.2.3 regarding the damp-proofing of external walls of buildings.
4. 3.8.7.2 regarding condensation management, pliable building membrane.
5. 3.10.5.0(c)- Bushfire Attack Level of external walls of buildings
6. 3.12.1.4 regarding the thermal performance of external walls of buildings.

4 Achieving the Relevant Performance Requirements & Deemed-to-Satisfy Provisions

In all cases, it is a requirement that the *Fenco Panel External Wall Cladding System* is installed in accordance with *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*, and incorporates NCC 2019(Amdt.1) Volume Two compliant framing either;
- A timber frame constructed in accordance with AS 1684.2 or AS 1720.1, from minimum MGP10 with minimum dimensions 90 mm x 35 mm & 450 mm maximum stud spacing; or
- A cold-formed steel frame constructed in accordance with NASH Standard for Residential & Low-rise Steel Framing, Part 1: Design Criteria, or AS3623 Domestic Metal Framing with minimum stud specification of 0.55 mm BMT G550 & 450 mm maximum stud spacing; or
- Framework compliant with the above minimum requirements and other standards, and the Building Code of Australia as applicable.

4.1 P2.1.1 - Structural stability and resistance to actions.

The structural performance of the *Fenco Panel External Wall Cladding System* has been assessed on the basis of a combination of;
- Reports issued by *Accredited Testing Laboratory*; and
- Another form of documentary evidence.

On the basis of the comparison between the tested performance and the required design performance, the *Fenco Panel External Wall Cladding System* has been appraised for external wall applications when constructed in accordance with the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.

4.1.1 Wind Actions

The maximum design actions for the *Fenco Panel External Wall Cladding System* have been determined by testing at an *Accredited Testing Laboratory* for Design Ultimate Limit State Wind loadings, see Appendix D.

Test Reports:	**Prepared by:**	**Date:**
Fenco Panel External Wall Cladding System – Cavity Fixed, Static Ultimate Wind Load Tests to AS 4040.2 for Fenco, Test Report No. 2018-116-S2.	Ian Bennie and Associates	25 October 2018
Engineering Report:	**Prepared by:**	**Date:**
Top Hat and fixing spacing for Wind Classifications 2018-116-S2 201005Fenco Panel Wind Table	Acronem Consulting Australia	02/03/2021

In all cases the external cladding system shall be fixed to framing designed and constructed by others in accordance with:

- AS 1684.2 Residential timber-framed construction for non-cyclonic areas; or AS 1720.1 to BCA requirements from minimum MGP10 with minimum dimensions 90 mm x 35 mm at 450 mm maximum stud spacing: or,
- A cold-formed steel frame constructed in accordance with NASH Standard for Residential and Low-rise Steel Framing, Part 1: Design Criteria, or AS 3623 Domestic Metal Framing with minimum stud specification of 0.55 mm BMT G550 at 450 mm maximum stud spacing; or
- Framework compliant with the above minimum requirements and other standards, and the Building Code of Australia as applicable.
- Horizontal top-hat battens at maximum vertical spacings described in the table below, with two (2) screw fixings to every stud.
- Each panel shall be fixed to a minimum of two (2) top-hats. i.e. minimum 6 screw fixings per panel.

AS 4055 Wind Classification	N1		N2		N3		N4	
	Away from Corners	Within 1200mm of Corners	Away from Corners	Within 1200mm of Corners	Away from Corners	Within 1200mm of Corners	Away from Corners	Within 1200mm of Corners
Design Wind Pressure (kPa)	0.62	-0.94	0.86	-1.3	1.35	-2.03	2.01	-3.01
Max. top-hat spacing (mm)	1100	950	1000	750	750	650	650	550
Min. No. of Screws/top-hat	3	3	3	3	3	3	3	4
Min. No. top-hats/panel	3	3	3	4	4	4	4	5
Note: Panels up to 800mm length may be supported by min. 2 top-hats per panel, with max. top-hat spacing 450mm.								

The strength of the *Fenco Panel External Wall Cladding System* is sufficient to resist non-cyclonic Design Ultimate Limit State Wind Pressures:

- AS/NZS 1170.2 Structural Design Actions Part 2: Wind Actions, of ±3.01 kPa, and
- AS 4055 Wind Classifications N1, N2, N3 and N4.

4.1.2 Other Actions

Other actions in accordance with NCC 2019(Amdt.1) Volume Two, P2.1.1 governing the structural performance of external walls of buildings are addressed below.

- P2.1.1(b)(i) Permanent actions (dead loads) - *Fenco Panel External Wall Cladding System* is not required to provide load bearing capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed.

- P2.1.1(b)(ii) Imposed actions (live load arising from occupancy and use) - *Fenco Panel External Wall Cladding System* is not required to provide load bearing capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed.

- P2.1.1(b)(iii) Wind action - The *Fenco Panel External Wall Cladding System* receives its out-of-plane rigidity from the inherent strength and stiffness of the installed system. *Fenco Panel External Wall Cladding System* meets the requirements for serviceability

and ultimate limit state loading in accordance with the requirements AS/NZS 1170.2, AS 4055 & AS/NZS 4284 for the relevant design wind pressures detailed above.

- P2.1.1(b)(iv) Earthquake action – *Fenco Panel External Wall Cladding System* is not required to provide earthquake resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed.
- P2.1.1(b)(v) Snow action – *Fenco Panel External Wall Cladding System* is not required to provide snow resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed.
- P2.1.1(b)(vi) Liquid Pressure action – Not applicable for above ground applications for which the product is designed.
- P2.1.1(b)(vii) Ground water action - *Fenco Panel External Wall Cladding System is* not required to provide hydrostatic resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed. The integrity of the system is maintained by 'control jointing' as referenced in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.
- P2.1.1(b)(viii) Rainwater action (including ponding action) - *Fenco Panel External Wall Cladding System* is not required to provide ponded rainwater resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed. Ponding is not applicable in the applications for which the product is designed.
- P2.1.1(b)(ix) Earth pressure action - Not applicable for above ground applications for which the product is designed.
- P2.1.1(b)(x) Differential movement - *Fenco Panel External Wall Cladding System is* not required to provide differential movement resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed. The

integrity of the system is maintained by 'control jointing' as referenced in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.

- P2.1.1(b)(xi) Time dependent effects (including creep and shrinkage) - *Fenco Panel External Wall Cladding System is* not required to provide creep or shrinkage resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed. The integrity of the system is maintained by 'control jointing' as referenced in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.
- P2.1.1(b)(xii) Thermal effects – *Fenco Panel External Wall Cladding System is* not required to provide thermal movement resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed. The integrity of the system is maintained by 'control jointing' as referenced in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.
- P2.1.1(b)(xiii) Ground movement caused by swelling, shrinkage or freezing of the sub-soil, landslip, subsidence, site works - *Fenco Panel External Wall Cladding System is* not required to provide ground movement resistance capacity to the wall system to which it is installed and is not designed to resist axial loading, in-plane shear or other imposed loads which must be resisted by the structure to which it is affixed. The integrity of the system is maintained by 'control jointing' as referenced in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022.*
- P2.1.1(b)(xiv) Construction activity actions – Prior to installation the panels should remain in the original manufacturers packaging until use. Panels should be handled in accordance with manufacturer's recommendations and any instructions in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022.*

- P2.1.1(b)(xv) Termite actions – The *Fenco Panel External Wall Cladding System is* not classified as a 'primary building element'. The requirements of Part 3.1.3 are applicable when primary building elements are subject to termite attack. The *Fenco Panel External Wall Cladding System* does not form part of a termite barrier and is installed clear of the ground as required by the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022,* which does not allow termites to enter a building via a concealed route. While the components of the *Fenco Panel External Wall Cladding System* are not considered a food source for termites, appropriate protection measures in accordance with the BCA must be taken to protect the building from termite attack.

4.2 P2.2.2, Weatherproofing of External Walls of Buildings

The weatherproofing performance of the *Fenco Panel External Wall Cladding System* to prevent the penetration of water has been verified by prototype testing by an *Accredited Testing Laboratory* to the requirements of NCC Weatherproofing Verification Method V2.2.1 with test procedures in accordance with Australian Standard AS/NZS 4284:2008 Testing of Building Facades; and, and reporting by a *professional engineer* (this report). Details of the testing performed are as follows:

Test Report:	**Prepared by:**	**Date:**
Fenco Panel External Wall Cladding - Cavity Fixed, Specimen Tests to Verification Methods NCC 2016 FV1 & V2.2.1 for Fenco, Test Report No. 2018-116-S1, Test Date: 19-30/11/2018.	Ian Bennie and Associates	8 October 2019

The weatherproofing result in accordance with V2.2.1 demonstrates the required performance for applications where the external wall;
(i) has a risk score of 20 or less, when the sum of all risk factor scores are determined in accordance with NCC 2019(Amdt.1) Volume Two, Table V2.2.1(a); and
(ii) is not subjected to an ultimate limit state wind pressure of more than 2.5 kPa; and
(iii) includes only windows that comply with AS 2047.

It is noted that the test frame incorporated maximum horizontal spacing between studs of approximately 600 mm. Installation of the *Fenco Panel External Wall Cladding System,* made in accordance with the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*, is performed in an identical manner onto

studs up to a maximum of 450 mm. These tests in accordance with V2.2.1 are recognised for applications with structural frame spacing up to 450 mm as detailed in *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022,* with maximum design serviceability limit state wind pressures of +0.82 kPa and -1.23 kPa, and maximum design ultimate limit state wind pressures of ± 2.5 kPa.

It is noted that the test frame did not incorporate horizontal or vertical control joint details in accordance with V2.2.1(b)(i)(A), detailed as 'horizontal expansion joint' & 'vertical expansion joint' in *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022.*

I am of the opinion that had horizontal and vertical control joints been incorporated in the construction of the test specimen in accordance with *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*, that; these would not have altered the results of testing in accordance with V2.2.1; and *Fenco Panel External Wall Cladding System* is capable of satisfying P2.2.2.

This opinion is given on the basis of the;

- tested and proven weatherproofing performance of the *Fenco Panel External Wall Cladding System* to V2.2.1 where the test specimen did not include horizontal and vertical control joints, and did including internal & external corner details; and
- identical materials used for making horizontal and vertical control joints, as used for internal & external joints; and
- similarities between the joint sealing details as-tested, and the 'horizontal expansion joint' & 'vertical expansion joint' details in *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*; and,
- detailing of the system components (supporting structure, fixings, breathable wall wrap) in the vicinity of the 'horizontal expansion joint' & 'vertical expansion joint' per *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022.*

The weatherproofing performance of *Fenco Panel External Wall Cladding System* installed in applications where an external wall;

(i) has a risk score of 20 or less, when the sum of all risk factor scores are determined in accordance with NCC 2019(Amdt.1) Volume Two, Table V2.2.1a; and

(ii) is subjected to an absolute ultimate limit state wind pressure of more than 2.5 kPa but not more than 3.01 kPa; and

(iii) includes only windows that comply with AS 2047,

has been verified by a combination of prototype testing in accordance with the requirements of AS/NZS 4284 and simulated wind strength testing. For these cases, the maximum design serviceability limit state wind pressures remain equal to +0.83 kPa and -1.23 kPa.

Based on these results, the *Fenco Panel External Wall Cladding System* is limited to external wall applications where the design serviceability limit state wind pressure, calculated in accordance with AS/NZS 1170.2 Structural Design Actions Part 2: Wind Actions, does not exceed +0.83 kPa and -1.23 kPa.
This is deemed to include AS 4055 Wind Classifications N1, N2, N3 & N4 (and excludes AS 4055 Wind Classifications, N5, N6, C1, C2, C3 & C4).

4.3 P2.2.3, Rising Damp, External Walls of Buildings

The damp-proofing performance of the *Fenco Panel External Wall Cladding System* to prevent unhealthy or dangerous conditions, or loss of amenity and undue dampness or deterioration of building elements is primarily achieved based on detailing that requires the *Fenco Panel External Wall Cladding System* to be installed with a minimum 75mm clearance to well drained open ground or finished concrete or concrete/tiled level in *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*. In addition, a damp proof course achieving the requirements of AS/NZS 2904 must be installed as referenced in the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.

4.4 3.8.7.2 Condensation Management, Pliable Building Membrane

As required by 3.8.7.2, *Fenco Panel External Wall Cladding System,* incorporates a vapour permeable pliable building membrane in accordance with AS/NZS 4200.1:2017, installed in accordance with AS 4200.2:2017, see *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022.*

4.5 3.10.5.0(c) Bushfire Attack Level External Walls of Buildings

The bushfire performance of the *Fenco Panel External Wall Cladding System* as an external wall has been assessed based on;

- A report issued by an *Accredited Testing Laboratory*, see Appendix D.
- Another form of documentary evidence, see Appendix E.

Fenco Panel External Wall Cladding System including 90x45 MGP10 timber framing, steel top-hat battens, light-duty wall wrap, and glasswool insulation has been tested in accordance with AS 1530.4 and achieved a test result of FRL 30/30/30.

Test Reports:	**Prepared by:**	**Date:**
Fire resistance test in accordance with AS1530.4-2014 of Fenco loadbearing wall system with Rockcote® Render on the exposed side and plasterboard on the unexposed side, EWFA Report No: 54286200.1	Exova Warringtonfire Aus	29/10/2018
Another form of Documentary Evidence:	**Prepared by:**	**Date:**
RE: Fenco Panel - Bush Fire Assessment, by email Tues, Jan 14, 2020, at 10:06 AM.	Ignis Solutions – Brad Robson, Fire Safety Engineer	14/1/2020

AS 3959:2018 Section 7, Construction requirements for BAL-FZ, Clause 9.4.1(c) is satisfied for a wall system with an FRL of 30/30/30 when tested from the outside.

Fenco Panel External Wall Cladding System configuration described in EWFA Report No: 54286200.1 has demonstrated achievement of FRL 30/30/30. This result complies with AS 3959:2018 Construction of buildings in bushfire-prone areas Clause 9.4.1(c) for walls in BAL-FZ. AS 3959:2018 Clause 3.4 allows construction requirements specified for a particular BAL shall be acceptable for a lower level. On this basis the *Fenco Panel External Wall Cladding System* configuration described in EWFA Report No: 54286200.1 is also suitable for BAL-Low, BAL-12.5, BAL-19, BAL-29, BAL-40, (ref. Ignis Solutions above). Requirements for joints, vents and weepholes, specific to each Bushfire Attack Level (BAL) are listed in AS 3959:2018 Clause 3.6 and Sections 4 to 9.

Any technical service that is with respect to the determination of compliance of a Class 1 or 10 Building with AS 3959:2018 shall be undertaken by a suitably qualified building professional.

4.6 3.12.1.4 Total R-value of External Walls

The Total R-value of the *Fenco Panel External Wall Cladding System* is achieved through the combination of materials, other components, and construction detailing as described in *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*. This has been verified by *Accredited Testing Laboratory* testing, and calculation by a *professional engineer*, see Appendices D & E.

Test Report:	**Prepared by:**	**Date:**
ASTM C518 – 2010, "Fenco Australia "Toco Lightweight Ceramic Wall Panelling", 80mm, Test Number: 19-000678	AWTA Product Testing	14 Feb. 2019
Engineering Report:	**Prepared by:**	**Date:**
Overall "Total R" (Thermally Bridged) Thermal Performance Calculations to AS/NZS 4859 Parts 1 & 2:2018, 80mm Fenco Toco Panel System: Calculations: 367w05 (i), (ii), (iii), (iv).	James M Fricker	15/10/2019

The Total R-values of the *Fenco Panel External Wall Cladding System* have been determined in accordance with AS/NZS 4859 Parts 1 & 2:2018. As described in *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*, incorporating R2.7 glasswool insulation achieves Total R-value of $R_{T(Summer)}$ 3.07 m^2K/W, $R_{T(Winter)}$ 3.20 m^2K/W and $R_{T(Average)}$ 3.13 m^2K/W. *Fenco Panel External Wall Cladding System* incorporating R2.7 m^2K/W, 90 mm thick glasswool batts exceeds the NCC 2019(Amdt.1) Volume Two, 3.12.1.4(b) *Deemed-to-Satisfy* minimum required Total R-value of R2.8 m^2K/W for Climate Zones 1, 2, 3, 4, 5, 6 & 7.

5 Conditions and Limitations

For the purposes of this report, the specific limitations of use applying to the *Fenco Panel External Wall Cladding System* include;

1. In all cases, it is a requirement that *Fenco Panel External Wall Cladding System* incorporates NCC 2019(Amdt.1) Volume Two compliant framing either;

   - A timber frame constructed in accordance with AS 1684.2 or AS 1720.1, from minimum 90 mm x 35 mm MGP10 framing and 450 mm maximum stud spacing; or

- A cold-formed steel frame constructed in accordance with NASH Standard for Residential and Low-rise Steel Framing, Part 1: Design Criteria, or AS 3623 Domestic Metal Framing with minimum stud specification of 0.55 mm BMT G550 and 450 mm maximum stud spacing; or
- Framework compliant with the above minimum requirements and other standards, and the Building Code of Australia as applicable.

2. Construction shall be in strict accordance with the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022*.
3. This appraisal does not deal with materials safety, site safety or safe work practices in any form and should be considered in conjunction with a suitable Safety Data Sheets.
4. This appraisal does not deal with the quality assurance aspects of the manufacturing and construction process and should be considered in conjunction with the necessary safety analyses.
5. It is a requirement that product selection, incorporation into the building design, and consideration of durability and maintenance requirements, shall only be made by a building professional who is conversant with the application and the technical aspects of the product, and has ready access to the relevant technical information relating to the product use.

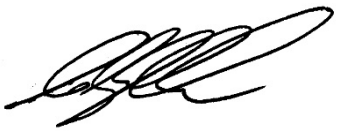
6 Validity

The information presented in this report is valid for the shortest of the following periods:

- Until the system becomes modified in any way; or
- Until superseded by more recent technical information or by other certification; or
- Until the *Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022* is superseded; or
- Until the particular referenced parts of the NCC are superseded in the NCC or in State and territory Building Regulations; or
- Until the expiry of any supporting documentation contained in this report; or
- Until the particular referenced Standards or Codes of Practice are superseded.

Note:

1. Acronem Consulting Australia Pty Ltd (Acronem) shall not be liable for loss, cost, damages or expenses incurred by the client or any other person or company, resulting from the use of any information or interpretation given in this report.
2. In no case shall Acronem be liable for consequential damages including, but not limited to, lost profit, damages for failure to meet deadlines or other losses arising from this report.
3. This document shall not be reproduced except in full and relates only to the analysis as detailed.
4. It remains the responsibility of the client to verify that the information provided is applicable for their intended purpose.
5. Acronem shall take no responsibility for the interpretation or misinterpretation of this report.



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QLD. (STRUCTURAL): 15370
VIC. (CIVIL): PE0000967

7 Appendix A: General NCC Clauses Establishing the Certification Options

The following clauses of NCC 2019(Amdt.1) Volume Two, provide the criteria upon which compliance can be substantiated.

7.1 NCC 2019(Amdt.1) Volume Two, Class 1 & 10 Buildings

7.1.1 Clause A2.0 Compliance

Requirement: *Compliance with the NCC is achieved by complying with—*

(1) the Governing Requirements of the NCC; and

(2) the Performance Requirements.

Path to Compliance: In this case a Performance Solution shall be based on complying with this clause.

7.1.2 Clause A2.1 Compliance with the Performance Requirements

Requirement: *Performance Requirements are satisfied by one of the following, as shown in Figure 1:*

(1) A Performance Solution.

(2) A Deemed-to-Satisfy Solution.

(3) A combination of (1) and (2).

Path to Compliance: In this case, compliance shall be based on

(c) combination of (1) and (2).

7.1.3 Clause A2.2 Performance Solution

Requirement:

(1) A Performance Solution is achieved by demonstrating—

(a) compliance with all relevant Performance Requirements; or

(b) the solution is at least equivalent to the Deemed-to-Satisfy Provisions.

(2) A Performance Solution must be shown to comply with the relevant Performance Requirements through one or a combination of the following Assessment Methods:

(a) Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets the relevant Performance Requirements.

(b) A Verification Method including the following:

(i) The Verification Methods provided in the NCC.

(ii) Other Verification Methods, accepted by the appropriate authority that show compliance with the relevant Performance Requirements.

(c) Expert Judgement.

(d) Comparison with the Deemed-to-Satisfy Provisions.

(3) Where a Performance Requirement is satisfied entirely by a Performance Solution, in order to comply with (1) the following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Performance Solution:

(a) Identify the relevant Performance Requirements from the Section or Part to which the Performance Solution applies.

(b) Identify Performance Requirements from other Sections or Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Performance Solution.

Path to Compliance: The Performance Solution (in-part) shall demonstrate:-

(a) compliance with all relevant Performance Requirements; or

(a) Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets the relevant Performance Requirements.

(b) A Verification Method including the following:

(i) The Verification Methods provided in the NCC.

(c) Expert Judgement.

(d) Comparison with the Deemed-to-Satisfy Provisions.

7.1.4 Clause A2.3 Deemed-to-Satisfy Solution

(1) A solution that complies with the Deemed-to-Satisfy Provisions is deemed to have met the Performance Requirements.

(2) A Deemed-to-Satisfy Solution can show compliance with the Deemed-to-Satisfy Provisions through one or more of the following Assessment Methods:

(a) Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets a Deemed-to-Satisfy Provision.

(b) Expert Judgement.

(3) For Volume Two:

(a) Where an acceptable construction manual and an acceptable construction practice contained in the same Part are considered to satisfy the same component of a Performance Requirement, in order to comply with the Deemed-to-Satisfy Provisions it is only necessary to satisfy—

(i) the appropriate acceptable construction manual; or

(ii) the appropriate acceptable construction practice.

(b) Where an acceptable construction manual and an acceptable construction practice contained in the same Part are deemed to satisfy different components of a Performance Requirement, compliance with the Deemed-to-Satisfy Provisions may require satisfying both the listed acceptable construction manual and the acceptable construction practice for their specific components unless otherwise stated.

Path to Compliance: A Deemed-to-Satisfy Solution (in-part) shall demonstrate:-

(a) Evidence of suitability in accordance with Part A5 that shows the use of a material, product, plumbing and drainage product, form of construction or design meets a Deemed-to-Satisfy Provision.

7.1.5 Clause A2.4 A combination of solutions

(1) Performance Requirements may be satisfied by using a combination of Performance Solutions and Deemed-to-Satisfy Solutions.

(2) When using a combination of solutions, compliance can be shown through the following, as appropriate:

(a) A2.2 for assessment against the relevant Performance Requirements.

(b) A2.3 for assessment against the relevant Deemed-to-Satisfy Provisions.

(3) Where a Performance Requirement is satisfied by a Performance Solution in combination with a Deemed-to-Satisfy Solution, in order to comply with (1), the following method must be used to determine the Performance Requirement or Performance Requirements relevant to the Performance Solution:

(a) Identify the relevant Deemed-to-Satisfy Provisions of each Section or Part that are to be the subject of the Performance Solution.

(b) Identify the Performance Requirements from the same Sections or Parts that are relevant to the identified Deemed-to-Satisfy Provisions.

(c) Identify Performance Requirements from other Sections or Parts that are relevant to any aspects of the Performance Solution proposed or that are affected by the application of the Deemed-to-Satisfy Provisions that are the subject of the Performance Solution.

Path to Compliance: The combination of solutions shall demonstrate compliance with A2.2 and A2.3 as above.

7.1.6 Clause A5.0 Suitability

(1) A building and plumbing or drainage installation must be constructed using materials, products, plumbing products, forms of construction and designs fit for their intended purpose to achieve the relevant requirements of the NCC.

(2) For the purposes of (1), a material, product, plumbing product, form of construction or design is fit for purpose if it is—

(a) supported by evidence of suitability in accordance with—

(i) A5.1; and

(ii) A5.2 or A5.3 as appropriate; and

(b) constructed or installed in an appropriate manner

Path to Compliance: Compliance with the relevant requirements of A5.1 and A5.2 shall be demonstrated as required.

7.1.7 Clause A5.1 Evidence of suitability—Volumes One, Two and Three

Requirement:

(1) The form of evidence used must be appropriate to the use of the material, product, plumbing product, form of construction or design to which it relates.

(2) Any copy of documentary evidence submitted must be a complete copy of the original certificate, report or document.

Path to Compliance: Compliance with these requirements shall be established and demonstrated.

7.1.8 Clause A5.2 Evidence of suitability – Volumes One and Two

Requirement:

(1) Subject to A5.4, A5.5 and A5.6, evidence to support that the use of a material, product, form of construction or design meets a Performance Requirement or a Deemed-to-Satisfy Provision may be in the form of any one, or any combination of the following:

(a) A current CodeMark Australia or CodeMark Certificate of Conformity.

(b) A current Certificate of Accreditation.

(c) A current certificate, other than a certificate described in (a) and (b), issued by a certification body stating that the properties and performance of a material, product, form of construction or design fulfil specific requirements of the BCA.

(d) A report issued by an Accredited Testing Laboratory that—

(i) demonstrates that a material, product or form of construction fulfils specific requirements of the BCA; and

(ii) sets out the tests the material, product or form of construction has been subjected to and the results of those tests and any other relevant information that has been relied upon to demonstrate it fulfils specific requirements of the BCA.

(e) A certificate or report from a professional engineer or other appropriately qualified person that—

(i) certifies that a material, product, form of construction or design fulfils specific requirements of the BCA; and

(ii) sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice or other publications have been relied upon to demonstrate it fulfils specific requirements of the BCA.

(f) Another form of documentary evidence, such as but not limited to a Product Technical Statement, that—

(i) demonstrates that a material, product, form of construction or design fulfils specific requirements of the BCA; and

(ii) sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice or other publications have been relied upon to demonstrate it fulfils specific requirements of the BCA.

(2) Evidence to support that a calculation method complies with an ABCB protocol may be in the form of any one, or any combination of the following:

(a) A certificate from a professional engineer or other appropriately qualified person that—

(i) certifies that the calculation method complies with a relevant ABCB protocol; and

(ii) sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice and other publications have been relied upon.

(b) Another form of documentary evidence that correctly describes how the calculation method complies with a relevant ABCB protocol.

Path to Compliance: In this case, compliance shall be based on the following:

(d) A report issued by an Accredited Testing Laboratory that—
(i) demonstrates that a material, product or form of construction fulfils specific requirements of the BCA; and
(ii) sets out the tests the material, product or form of construction has been subjected to and the results of those tests and any other relevant information that has been relied upon to demonstrate it fulfils specific requirements of the BCA.
(e) A certificate or report from a professional engineer or other appropriately qualified person that—
(i) certifies that a material, product, form of construction or design fulfils specific requirements of the BCA; and
(ii) sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice or other publications have been relied upon to demonstrate it fulfils specific requirements of the BCA.
(f) Another form of documentary evidence, such as but not limited to a Product Technical Statement, that—
(i) demonstrates that a material, product, form of construction or design fulfils specific requirements of the BCA; and
(ii) sets out the basis on which it is given and the extent to which relevant standards, specifications, rules, codes of practice or other publications have been relied upon to demonstrate it fulfils specific requirements of the BCA.

8 Appendix B: Qualifications and Experience

Dr Cameron Chick BE(Civil), Ph.D, M.AIRAH, RPEQ
Director – Acronem Consulting Australia Pty Ltd

Contact Details

Phone: +61 437 407 176
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Qualifications

BE (Civil), University of Sydney
Ph.D (Eng.), University of Sydney
GC Comm. (Marketing), Swinburne University of Technology
GC Performance-Based Building & Fire Codes, Victoria University

Professional Overview

A widely networked well respected building industry professional linked to manufacturers, consultants, associations and regulators.

Possesses strong technical engineering abilities combined with B2B marketing experience.

A passionate advocate of energy efficiency, experienced at driving strategic business objectives to achieve sustainable sales and profit targets.

Achievement oriented, talented problem solver able to provide direction, motivation and development of direct and indirect reports.

Able to implement this experience and engage with customers, key influencers or regulators to negotiate present or persuade and extract maximum value for the business.

Career Highlights

Acronem Consulting Australia	Director
Hudson Global Resources	Consultant
Melbourne Testing Services	Consultant
Fletcher Insulation	- Marketing Manager Industrial - Product Manager Commercial Roofing - Technical Manager
BHP Steel USA	Plant Engineer
BHP Research	Research Engineer
Centre for Advanced Structural Engineering	Engineer
University of Sydney	PhD Candidate

Areas of Expertise

Industry Networks

Respected and knowledgeable building industry representative in the residential, commercial, mechanical services and industrial market segments. Experienced in maximising business opportunities within changing regulatory frameworks. Active within a number of building industry associations.

Leading Technical Teams

Recruitment, training and development of technical teams to service and educate industry professionals responsible for the specification of projects.

Industry Knowledge

Possesses the ability to identify market trends and develop marketing initiatives. Maintains a keen interest in industry developments as drivers for new product opportunities. Understands manufacturing processes, capabilities and limitations to ensure realistic targets are developed and achieved.

Project Management

Management of product development, commissioning market research, market audits. Led teams of production, finance, logistics, marketing and sales representatives to achieve process improvement, reduced costs and increased amenity.

B2B Marketing and Product Development

Experienced in the development and implementation of business cases and marketing plans to achieve budgeted targets. Delivered presentations and authored handbooks to educate both clients and the building industry.

New Business Development

New and existing supplier negotiations involving procurement, quality and unit pricing. Customer negotiations to provide profitable outcomes.

Employment History

ACRONEM CONSULTING AUSTRALIA – Director (December 2010 – current)
Multi-disciplinary consulting in Marketing (Building Product & Technical Literature Development), Energy Efficiency (Insulation, Total R-values),
NCC, BCA & Australian Standards – Testing, Appraisal, Certification, PBDB, PSR (Building Facades, Structural Engineering, Acoustic, Fire, Energy Efficiency),
Structural Engineering (Design, Research Reporting).
Acknowledged expert, ABCB Energy Efficiency Provisions, Condensation Handbook.
CodeMark, BRAC Accreditation of Appraisals & Certifications.

HUDSON GLOBAL RESOURCES – Energy Efficiency Consulting (2010)

MELBOURNE TESTING SERVICES – Structural Engineering Consulting (2010)

FLETCHER INSULATION (July 1999 – August 2010)

Industry representative to Australian Government, Standards Australia, Australian Building Codes Board, inter-industry and intra-industry committees.

Marketing Manager Industrial (2008-2010)
B2B marketing to Mechanical Services, Automotive, Marine and Mining market segments through relationships with building industry professionals, mechanical services specifiers.

Marketing Technical Manager (2007-2008)
Recruited, Trained and developed National Technical Services Managers to address product specification and technical sales support.

Product Manager Industrial (2006-2007)
Key Account Management of the automotive tier one suppliers to Toyota, Ford and GM Holden.

Product Manager Commercial Roofing (2005 – 2006)
Commercial roofing market segment management dealing with major roll-formers & roofing contractors.

Marketing Technical Manager (2001 – 2005)
Insulation and contractor industry associations, ICANZ, TICA, ABCB, Standards Australia.
Provide technical leadership, plant, process & sales liaison.

Technical Support Marketing (1999 – 2000)
Liaison with insulation contractors and distributors on major building projects.
Promotion of insulation products and technical services to specifiers and designers.

BHP RESEARCH AND TECHNOLOGY DEVELOPMENT, Melbourne (1996 – May 1999)
Research Engineer

- **Structural Engineering:** Developed innovative design procedures to improve Australian best practice in steel and composite construction.

  Team Awards: Engineering Excellence Award 1997, (AS 2327.1).
  Australian Design Award 1997, (BHP DECKMESH™).
- **Engineering Consulting:** Technical expert to BHP Steel liaising with consulting engineers on major projects. Implementation of advanced structural engineering designs.
- **Product Promotion:** Presented at international conferences, national seminar series and at consulting engineering firms to achieve a wide acceptance of steel products, design methods and commercially available engineering software.
- **Technology Development:** Issue 'resolution with consulting engineers to improve the perception of structural steel in markets traditionally held by other building materials. Achieved through review and verification of international best practice.

BHP STEEL BUILDING PRODUCTS USA Inc, Los Angeles, CA (Jan. 1997- Aug. 1997)
Plant Engineer

- **Quality Assurance:** Developed manuals to ISO 9000 series of quality standards.
- **Technical Assistance:** Provided solutions client queries/complaints. Performed site investigations and initiated remedial procedures.
- **Market Development:** Identification and implementation of initiatives to expand the steel building product range and to gauge the market share of existing products.
- **Product Manufacture:** Production line experience developing an intimate understanding of steel building products. Improved production efficiencies and safety.
- **Document Preparation:** Standard operating procedures and job safety analyses.

THE UNIVERSITY OF SYDNEY - School of Civil Engineering, (1991- 1996)
PhD Research Candidate – Thin-Walled I-sections in Combined Compression & Bending
CENTRE FOR ADVANCED STRUCTURAL ENGINEERING, The Univ. of Syd. (1991- 92)
Engineer
THE UNIVERSITY OF SYDNEY - School of Civil Engineering, (1991- 1995)
Tutor - ST.PAULS COLLEGE - The University of Sydney
THE WOMENS COLLEGE - The University of Sydney
TAYLOR AND HERBERT, Sydney (1989- 1990)
BHP ENGINEERING, Sydney (1985)

PUBLICATIONS

Chick, Cameron & Hodson, Stephen, (2016), "Mitigating the risk of fire spread from pipe insulation", Ecolibrium, April 2016, Volume 15.3, Australian Institute of Refrigeration, Air Conditioning and Heating (Inc)., Melbourne, Australia.

C.G. Chick, M. Patrick & K. Wong, (1999), "Ductility of Reinforced-Concrete Beams and Slabs, and AS 3600 Design Requirements", *Concrete Institute of Australia, Concrete '99*, May 1999, Sydney, **Australia**.

C.G. Chick & K.J.R. Rasmussen, (1999), "Thin-Walled I-Section Beam-columns: Sequential Loading and Moment Gradient Tests", *American Society of Civil Engineers, Journal of Structural Engineering*, **125**(11), pp. 1257-66, **USA**.

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C.G. Chick, P.H. Dayawansa & M. Patrick, (1998), "Strength Design of Simply-Supported Composite Beams With Large Steel Web Penetrations", *Australasian Structural Engineering Conference*, Sept.-Oct. 1998, Auckland, **New Zealand**.

C.G. Chick, (1998), "Residual Stress in Hot-rolled Structural Steel Sections", *BHP Integrated Steel - Whyalla Operations, Company Confidential*, July 1998.

C.G. Chick, P.H. Dayawansa & M. Patrick, (1997), "Design of Composite Beams With Large Steel Web Penetrations", *15th Australasian Conference on the Mechanics of Structures and Materials*, December 1997, Melbourne, **Australia**.

C.G. Chick, (1997), "Review of 'Fasteners Research' Report and Metal Roofing Contractor Videos", *BHP Research - Port Kembla Laboratories, Company Confidential*, Nov., 1997.

C.G. Chick, J. Coubal, D. Rosen, S. Heintz, R. Preddy & R. Preddy, (1997), "Roofing Systems in Concrete Tilt-up Construction", *BHP Steel Building Products USA, Sacramento, CA*, **USA,** June, 1997.

C.G. Chick, (1997), "Welding Quality Assurance Manual", *BHP Steel Building Products USA, Fontana, CA*, **USA,** April 1997.

Australian Institute of Steel Construction & Standards Australia, (1997), "Composite Beam Design Handbook, in accordance with AS2327.1-1996", 1st Edtn., (C.G. Chick, P.H. Dayawansa, C.C. Goh, M. Patrick, N. van der Kreek and K. Watson).

C.G. Chick, (1997), "Thin-Walled I-Sections in Combined Compression and Minor-Axis Bending", Ph.D Thesis, School of Civil Engineering, University of Sydney, **Australia**.

C.G. Chick & K.J.R Rasmussen, (1995), "Tests of Thin-Walled I-Sections in Combined Compression and Minor Axis Bending", *International Conference on the Stability of Steel Structures*, Coimbatore, **India**.

C.G. Chick & K.J.R. Rasmussen, (1995), "Tests of Thin-Walled I-Sections in Combined Compression and Minor-Axis Bending, Part I - Sequential Loading and Moment Gradient Tests", Research Report R712, School of Civil and Mining Engineering, The University of Sydney, **Australia**.

C.G. Chick & K.J.R. Rasmussen, (1995), "Tests of Thin-Walled I-Sections in Combined Compression and Minor-Axis Bending, Part II - Proportional Loading Tests", Research Report R717, School of Civil and Mining Engineering, The University of Sydney, **Australia**.

C.G. Chick & K.J.R. Rasmussen, (1994), "Section Capacity of Thin-Walled I-Sections in Combined Compression and Minor Axis Bending", *Australasian Structural Engineering Conference 1994*, Sydney, **Australia**.

C.G. Chick & K.J.R. Rasmussen, (1993), "Linear Elastic Analysis of Plates and Shells", *13th Australasian Conference on the Mechanics of Structures and Materials*, Wollongong, **Australia**.

PROFESSIONAL MEMBERSHIPS

RPEQ (Structural) Reg: 15370 – Registered Professional Engineer of Queensland.
Registered Professional Engineer, Vic. (Civil): PE0000967.
ACSEV – Association of Consulting Structural Engineers, Victoria.
M.AIRAH – Member, Australian Institute of Refrigeration, Air Conditioning and Heating

PROFESSIONAL AWARDS

AIRAH, WR Ahearn Award, Best AIRAH Member Technical Paper in Ecolibrium, 2016.

ACADEMIC QUALIFICATIONS

VICTORIA UNIVERSITY, College of Engineering and Science (2021-2022)
Graduate Certificate In Performance-Based Building & Fire Codes

SWINBURNE UNIVERSITY OF TECHNOLOGY, Faculty of Business and Enterprise (2010 – 2012)
Graduate Certificate of Commerce (Marketing)

THE UNIVERSITY OF SYDNEY, School of Civil Engineering, (1991-1996)
Doctor of Philosophy, PhD (Engineering)

Thesis: 'Thin-Walled I-sections in Combined Compression and Minor Axis Bending', (Co-Supervisors Prof. G.J. Hancock and Dr. K.J.R. Rasmussen)
Awards:

- Australian Postgraduate Research Award
- Civil & Mining Engineering Foundation Scholarship
- Centre for Advanced Structural Engineering Scholarship
- G.H.S. and I.R. Lightoller International Travel Scholarship

THE UNIVERSITY OF SYDNEY, School of Civil Engineering, (1987-1990)
Bachelor of Engineering (Civil, 1st Class Hons)

Thesis: 'Comparison of Design Methods for Concrete Filled Tubular Steel Columns', (Supervisor Assoc. Prof. R.Q. Bridge)
Topics: Steel & Concrete Structures, Soil Engineering & Civil Engineering Design.
Awards:

- Wargon Chapman Partners - R.F. Chapman Memorial (First) Prize for design submissions of excellence in Civil Engineering Design
- Association of Consulting Structural Engineers of NSW, Prize for Civil Engineering Design, 4th year
- Association of Consulting Structural Engineers of NSW, Prize for Civil Engineering Design, 3rd year

9 Appendix C: Specifications

9.1 Fenco Panel External Wall Cladding System, Technical Information and Installation Manual, Version 4.0, 4 April 2022.

FENCO TECHNICAL & INSTALLATION MANUAL

FENCO PANEL
EXTERNAL WALL CLADDING SYSTEM

TECHNICAL INFORMATION
AND INSTALLATION MANUAL

FOR:

NCC 2019, Vol. 2, BCA Class 1 and Class 10 Buildings

AUSTRALIA FENCO LOW CARBON CONSTRUCTION PTY LTD
Apt 9 / 259 Canterbury Road, Forest Hill, Vic., 3131, Australia

Version 4.0 – 4 April 2022

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Document Revision Status:

Date Issued	Issue No:	Details:
15 October 2019	Version 1.0	Initial Issue
25 February 2021	Version 2.0	Include Bushfire Performance up to BAL-FZ, and updated top-hat spacing details.
29 March 2021	Version 3.0	Include Typical Panel Layout in Fig.1. Amend 4.9 Optional Starter-Channel. Amend 6.1(6) max. top-hat spacing. Revised 7.1 Concrete Slab Rebate Detail. Revised 7.4 Wall to Balcony Detail
4 April 2022	Version 4.0	Included changes; Installation Steps 6.2(1) & 6.2(2); Notes to Construction Details; Section 3.2 add 'aluminium' windows; Section 7.5 Garage/Bulkhead/Overhang Detail;

1 Introduction

1.1 Fenco Panel External Wall Cladding System

Fenco Panel External Wall Cladding System uses an 80mm thick grey foamed ceramic wall panel fixed to steel top-hat battens as a cavity-battened external wall solution with a render coating system finish.

This technical information & installation manual is to be referenced by architects, builders & installers as a source of information regarding the selection, incorporation into the design, and installation specification to meet Building Code of Australia (BCA) requirements.

Fenco Panel External Wall Cladding System has been tested and certified to meet the following National Construction Code 2019 (NCC 2019) – Building Code of Australia, Volume 2 relevant performance requirements as an external wall cladding for Class 1 & 10 buildings:

- **Structure:** (P2.1.1 Structural stability and resistance to actions)
  Tested and appraised for wind actions up to and including AS 4055 Wind Class N4, and for AS/NZS 1170.2 serviceability wind loads of +0.82 kPa & -1.23 kPa and ultimate strength wind loads ±3.01 kPa.
- **Weatherproofing and Rising Damp:** (P2.2.2 Weatherproofing, P2.2.3 Rising Damp)
  Tested and appraised for resistance to moisture from the ground and the penetration of water for wind actions up to and including AS 4055 Wind Class N4, and for AS/NZS 1170.2 serviceability wind loads of +0.82 kPa & -1.23 kPa.
- **Bushfire** Tested up to BAL-FZ (includes BAL-Low, BAL-12.5, BAL-19 & BAL-40.)
- **Energy Efficiency:** (P2.6.1 Building)
  The tested Material R-value (R_m) of 80mm Fenco Panel is 0.44m²K/W.

2 System Summary

Fenco Panel External Wall Cladding System is based on Fenco Panel, an 2400mm x 600mm x 80mm thick foamed ceramic panel weighing 43.8 kg (380kg/m³). The panel is installed over horizontal top-hat battens that create a drained cavity to help improve the weather proofing performance of the external wall cladding system.

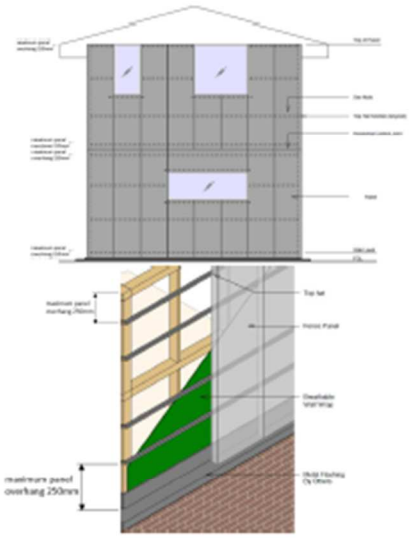


Figure 1: Fenco Panel External Wall Cladding System

The Fenco Panel External Wall Cladding System steel top-hat battens are fixed through breathable wall wrap onto studs at maximum spacing 450 mm spacing. The 80mm panel is finished on-site with a 3-layer polymer-modified render system. This incorporates an initial base coat of render, texture coat, and top membrane coat.

The design, selection and installation of any external wall cladding system must only be made by a building professional with a thorough understanding of all relevant local and national building requirements, including the technical aspects of the product and its proper use. Installation must only be performed by a tradesman under the direction of a Registered Builder both with an understanding of the system and its installation.

2.1 Benefits

Fenco Panel External Wall Cladding System External Wall panels are available as a standard size of 2400mm x 600mm x 80mm (43.7kg/m², 380kg/m³).

Fenco Panel External Wall Cladding System benefits include:

- System tested for weatherproofing,
- Strong and rigid with impact resistance,
- Able to be used with well-known manufacturers render systems,
- R-value of 80mm panel is R0.44 (m²K/W).

Fenco Panel External Wall Cladding System is tested in Australia for Australian design conditions.

3 National Construction Code (NCC) 2019

The NCC is a performance-based code that allows both Deemed-to-Satisfy, or Performance Solutions. Any external wall cladding system not included in the Deemed-to Satisfy provisions can only comply with the NCC as a Performance Solution. This includes all External Wall Cladding Systems not listed in BCA Volume 2.

External Walls are required to comply with BCA performance requirements including as a minimum, structure, damp & weatherproofing and energy efficiency.
Fenco Panel External Wall Cladding System has been tested and complies with these requirements.

3.1 Structural Performance

Fenco Panel External Wall Cladding System has been designed, tested and achieves the following wind load performances. It may be installed in AS 4055 Wind Classifications N1, N2, N3 and N4 only, and cannot be installed in cyclonic wind regions. Maximum wind loads for buildings designed in accordance with AS/NZS 1170.2 are +0.82 kPa & -1.23 kPa for serviceability and ±3.01 kPa for strength. The design wind loads for a building are provided by the builder and are based on the height and the site classification of the building in accordance with AS 4055 Wind Loads for Housing, or AS/NZS 1170.2.

Fenco Panel External Wall Cladding System is designed to resist wind loading only. All framing must be fully braced prior to installation of the top-hat battens. Control jointing, to allow for building movement, must be designed by the builder. Fenco Panel External Wall Cladding System is not load-bearing and attachments must be made directly to the structural framing.

Where Fenco Panel External Wall Cladding System is installed on buildings designed to AS 4055 wind load requirements, the;

- Height from ground level to the;
  - underside of eaves shall not exceed 6.0m, and
  - highest point of the roof, not including chimneys, shall not exceed 8.5m.
- Width including roofed verandas, excluding eaves, shall not exceed 16.0m.
- Length shall not exceed five times the width.
- Roof pitch shall not exceed 35 degrees.

3.2 Damp & Weatherproofing Performance

Fenco Panel External Wall Cladding System performance has been confirmed by testing in accordance with the verification method V2.2.1 in the NCC 2019.

Fenco Panel External Wall Cladding System complies with the NCC 2019 performance requirements for damp, weatherproofing for an external wall where;

- The serviceability limit state design wind pressure is up to N4, and
- has aluminium windows that comply with AS 2047, and
- has a Risk Score of 20 or less determined in accordance with NCC 2019, BCA Volume 2 Table V2.2.1a, see the following.

3.3 Condensation Performance

As required by NCC 2019(Amdt.1) Cl.3.8.7.2, Fenco Panel External Wall Cladding System, incorporates a vapour permeable pliable building membrane in accordance with AS/NZS 4200.1:2017, installed in accordance with AS 4200.2:2017.

3.4 Bushfire Performance

Fenco Panel External Wall Cladding System performance has been confirmed by testing in accordance with AS/NZS 1530.4:2014 for an FRL of 30/30/30.
Construction details required to achieve this performance include: 80mm thickness Fenco Panel, 6mm thickness pre-blended cement render, horizontal steel top-hat battens, 90x45 MGP10 timber framing, light-duty sarking with a flammability index not greater than 5, 10mm plasterboard. Refer to EWFA Report No: 54286200.1 for specific detailing requirements, and AS 3959:2018 Clause 3.6 & Sections 4 to 9 for joints, vents and weepholes requirements in walls.
This result complies with *AS 3959:2018 Construction of buildings in bushfire-prone areas*, Clause 9.4.1(c) for walls in BAL-FZ, and Clause 3.4 for higher levels of construction to include walls in BAL-Low, BAL-12.5, BAL-19, BAL-29, BAL-40.

3.5 Thermal Performance

At 80mm thickness, the Fenco Panel has a Material R-value of R0.44 (m^2K/W).
The Fenco Panel External Wall Cladding System achieves high Total R-values with the addition of R2.7, 90mm thick glasswool batts within the framing cavity. This thermal performance may be used to satisfy the Total R-values required by NCC 2019, BCA Vol. 2 Part 3.12.1.4.

Fenco Panel External Wall Cladding System with breathable reflective wall wrap, R2.7, 90mm thick glasswool batts, and 10mm plasterboard lining achieves the following Total R-values in accordance with AS/NZS 4859.1 & .2:2018.

Fenco Panel External Wall Cladding System PANEL THICKNESS	Total R-value (m^2K/W) (incorporating R2.7 glasswool batts)		
	Winter (Heat flow outwards)	Summer (Heat flow inwards)	Average
80 mm	3.20	3.07	3.13

4 Materials

The Fenco Panel External Wall Cladding System must only be installed with components that meet the specifications in this manual and the required building product standards.

The following materials are required to install the Fenco Panel External Wall Cladding System.

4.1 Damp Proof Course

Damp proof course (DPC), installed by builder, must meet the requirements of AS/NZS 2904.

4.2 Vapour Permeable Wall Wrap

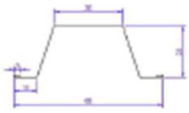
The framing must be wrapped with vapour permeable wall wrap product that meets the requirements of AS/NZS 4200.1. At a minimum it must be Medium Duty (MD) Classification and have a Low Flammability Classification, (Flammability Index (FI) equal or less than 5) in accordance with AS 1530.2.

4.3 Flashing tape

Flashing tape must be Aluminium faced Butyl Flashing Tape, 48mm wide x 1.5mm thick. It shall be used to seal the breathable wall wrap at windows, doors, electrical, plumbing, other services, and along the base of the wall (e.g., Tenacious Tapes – Waterproof/Sealing).

4.4 Top-Hat Battens

Battens used to fix the Fenco Panel to timber or steel framing shall be steel top-hats with minimum 22 mm depth, 0.42mm steel thickness, manufactured using TRUECORE® steel (aluminium/zinc alloy coated) complying with AS1397 G550, AM150 (550 MPa minimum yield stress).



4.5 Insulation

Insulation shall non-combustible glasswool batts within the framing cavity.

4.6 Fenco Panel

Only Fenco Panel 2400mm x 600mm x 80mm thick light grey foamed ceramic panel weighing 43.8 kg (380kg/m^3), as described in this manual, tested and supplied by Australia Fenco Low Carbon Construction can be used as part of the Fenco Panel External Wall Cladding System.

4.7 Mortar

Mortar to be used at Fenco Panel joints is sand, cement, lime based.

4.8 Screws

Screws shall be Class 3 (Class 4 in corrosive environments) to suit timber or steel framing. Screws must comply with the corrosion protection requirements of AS 4773 (Part 4 and Appendix C). Screws must penetrate at least 30mm into timber wall framing (e.g., when fixing top-hats), or at least 3-full threads through steel wall framing or through top-hats.

Screw Type	Application
12-11x35mm hex head type 17 screw	Top-hat to timber frame
10-16x16mm hex head self-drilling screw	Top-hat to steel frame
14-10x100mm hex head type 17 screw	Fix panel to top-hat

4.9 Starter Channel

Starter channel with weepholes in U-shape (boot) or L-shape, aluminium/PVC is optional on all exposed panel edges and as detailed for penetrations.

4.10 Aluminium/PVC External Angles

External angles must be 32 mm x 32 mm Aluminium or PVC and must be installed at openings and edges as detailed.

4.11 Backing Rod / Ableflex

The 'backing rod' material is a closed-cell polyethylene foam, 10 mm diameter as 'back-blocking' for flexible adhesive sealants placed in joints as detailed.

4.12 Coating System

Fenco panels require an appropriate external coating system and sealant detailing to ensure the following minimum performance for water resistance and vapour permeability of the building envelope is achieved. A simple paint coating is not adequate.

The selection of an appropriate coating system is the responsibility of the specifier, and installation is the responsibility of the builder.
Where a coating manufacturers' coating system is chosen for application to Fenco panels, the coating system must be warranted by the coating manufacturer as appropriate for external application to Autoclaved Aerated Concrete (AAC) substrate with the following minimum characteristics.

4.12.1 Surface Adhesion

The substrate preparation and coating application must be in accordance with the coating manufacturer's specification. Before applying the coating system in coastal areas, all Fenco panels must be thoroughly washed with fresh water to remove any salt residue. Also refer to any coating manufacturers' additional surface preparation requirements.

4.12.2 Water Resistance

The primary objective of the coating system is to prevent water ingress through it, yet allow vapour in and out of the Fenco Panel. The coating system shall have a tested water resistance transmission rate of <10 g/m^2/24hr/1kPa.

4.12.3 Water Vapour Permeability

For a coating to allow the 'escape' of water vapour, the coating system must be vapour permeable. The coating system shall be tested and achieve:
W. $S_d \leq 0.2$ kg/(m.$h^{0.5}$), where;
coefficient of water absorption W ≤ 0.5 kg/($m^2.h^{0.5}$), and
equivalent air layer thickness of water vapour diffusion $S_d \leq 2$m.

4.12.4 Compatibility

Confirm the coating system is compatible with Fenco Panel and all other construction system components. Coating systems suitable for external application onto AAC substrates satisfy this requirement.

4.12.5 Elasticity

The coating system must be able to bridge a 1mm minimum crack width. The coating manufacturer can specify the minimum design specification (thickness), so that the coating is serviceable and durable.

4.13 Sealant

Sealant to be used at all articulation & control joints, penetrations, junctions with other substrates etc. shall be external grade acoustic and/or fire rated paintable sealant (e.g., Bostik Fireban one or Fuller Firesound).

5 Specifications

Fenco Panel External Wall Cladding System can only be installed once all wall framing is constructed and detailed to comply with the relevant regulations.
The design, location, placement, detailing, and correct installation of control joints is the joint responsibility of the Designer and Builder to ensure the structure and cladding system will accommodate any project specific movement.
Good building practice typically requires horizontal control joints located at each floor level, vertical control joints at 6 m maximum width, in-line with openings, where potential cracking may occur, and at all joints to dissimilar construction materials.

All elements of the design, supply, and correct installation of penetrations in the cladding system, including windows and doors are outside the scope of the Fenco Panel External Wall Cladding System. The Designer and Builder must ensure the building, including all weep holes and integral flashings in all cladding penetrations prevent the ingress of rainwater behind the Fenco Panel, and will drain to the outside of the building.

All elements of the specification, supply, and construction of light-gauge steel or timber wall framing do not form part of the Fenco Panel External Wall Cladding System. The Designer and Builder must ensure all framing has been constructed in accordance with the relevant requirements of either AS 1684.2 Residential Timber Framed Construction – Non-cyclonic areas, or NASH Standard Residential and low-rise steel framing, or another appropriate standard.
Variations in the strength, stiffness, straightness, and squareness of the wall framing will affect the cladding system and must be corrected before the installation of the Fenco Panel External Wall Cladding System.

In all cases the Fenco Panel External Wall Cladding System may only be installed in accordance with this manual onto light-gauge steel or timber wall framing with a maximum stud spacing of 450mm.

6 Installation

Specification and incorporation of the Fenco Panel External Wall Cladding System into the building design, must be made by a Designer and Builder who are familiar with the application and technical aspects of the system, and have access to all the relevant technical information relating to the system.

Installation must be carried out by a competent carpenter or other tradesman under the direction of a Builder, both of whom are familiar with the method of installation and have access to all the relevant technical information relating to the system, including the installation instructions contained in this Manual.

6.1 Prior to Installation

1. Ensure the wall frame is square, level, and plumb.
2. Check that the stud spacing does not exceed 450 mm.
3. Ensure eave linings, flashings, damp proof course and termite protection are provided as per the project requirements and the specifications contained herein.
4. Ensure back blocking is installed for wall mounted services, downpipes, penetrations etc.
5. Ensure windows are aligned to meet the project specific detailing requirements for battens, finished reveal depth etc.
6. Check the maximum top-hat spacing does not exceed the requirements in Section 6.7.

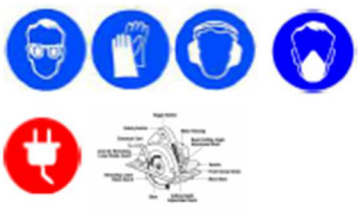
6.2 Installation Steps

1. Install breathable wall wrap in accordance with the manufacturers' instructions and in accordance with AS 4200.2:2017 ensuring that all joints, edges, and penetrations are sealed with flashing tape.
2. Once the wall wrap has been installed, where required flashing must be installed as required by the manufacturer specifications and the NCC.
3. Fix the horizontal steel top-hats in accordance with the project requirements for the design wind pressures.
   a. Check the top-hat vertical spacing.
   b. Check the screw type and number of screws for fixing the top-hat to the framing.
   c. Install top hats below and above openings. Ensuring panel edges are within 100mm to 250mm from the top-hat.

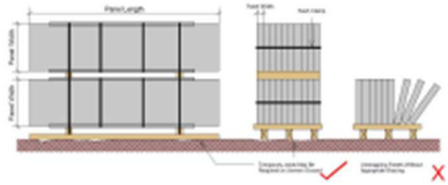
   d. Ensure top hats are discontinuous at control joints.
4. Install panels
   a. Corner panel installed first.
   b. Check required number of screws per top-hat per-panel.
   c. Check control joint layout
   d. Cut panel to suit as required.
   e. Apply Mortar to vertical and horizontal joints (not at control joints).
   f. Each panel must be screwed to at least 2 top-hats.
5. Form all control joints at the locations specified using backing rod and sealant as detailed in the construction drawings.
6. Coating:
   a. Apply the specified coating system in accordance with the coating manufacturer's specification.

6.3 Health & Safety

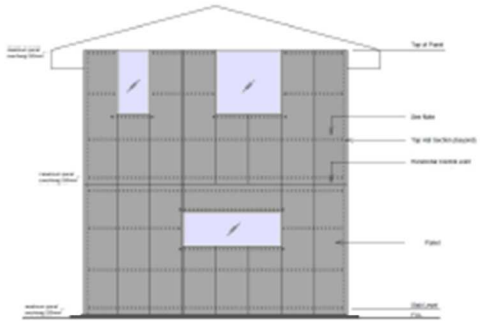
Installation instructions do not deal with specific site safety or safe work practices, these should be considered in conjunction with a suitable Material Safety Data Sheets prior to commencing installation. However, as with all building materials, the use of personal protective equipment is recommended. Basic safety clothing and gloves should be worn when handling or cutting the Fenco Panel External Wall Cladding System. When cutting Fenco Panel External Wall Cladding System External Wall Cladding with a power saw it is recommended that a face mask and protective glasses be worn. Quality assurance aspects of the construction process should be considered in conjunction with the necessary safety analyses.



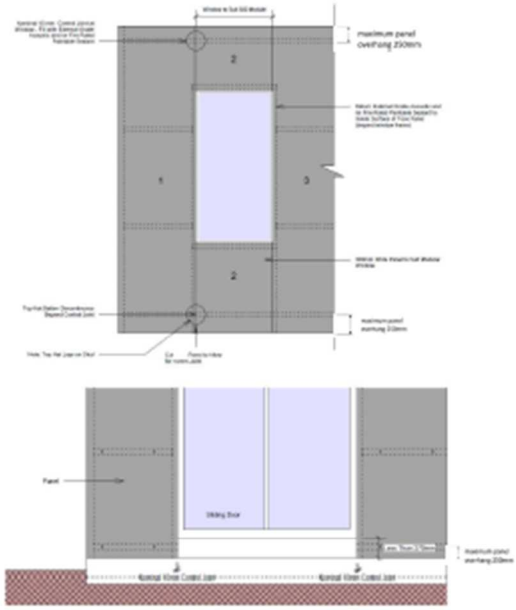
6.4 Panel Handling On-Site



6.5 Typical Panel Layout



6.6 Typical Panel Layout for Openings



6.7 Top Hat Spacing

In all cases the maximum top-hat spacing shall not exceed those listed in the table below.
The maximum overhang of Fenco Panel from the top-hat batten is 250mm.
Top-hats must be fixed with two (2) screws to each stud as described in Section 4.8.

AS 4055 Wind Classification	N1		N2		N3		N4	
	Away from Corners	Within 1200mm of Corners	Away from Corners	Within 1200mm of Corners	Away from Corners	Within 1200mm of Corners	Away from Corners	Within 1200mm of Corners
Design Wind Pressure (kPa)	0.62	-0.94	0.86	-1.3	1.35	-2.03	2.01	-3.01
Max. top-hat spacing (mm)	1100	950	1000	750	750	650	650	550
Min. No. of Screws/top-hat	3	3	3	3	3	3	3	4
Min. No. top-hats/panel	3	3	3	4	4	4	4	5

Note: Panels up to 800mm length may be supported by min. 2 top-hats per panel, with max. top-hat spacing 450mm.

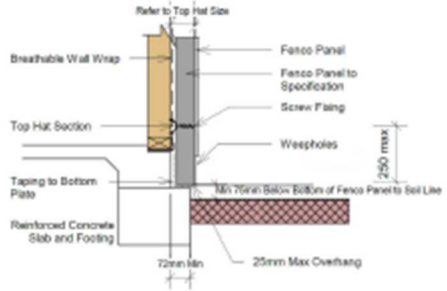
6.8 Fixing Spacing and Edge Distances

Fenco Panel is 600mm width and fixed to the top-hat battens with the screw-types described in Section 4.8.
The minimum screw edge distance is 100mm.
The minimum number of screws per top hat is:
- 3 screws for N1, N2, N3, N4(away from corners), and

- 4 screws for N4(within 1200mm of corners).

7 Construction Details

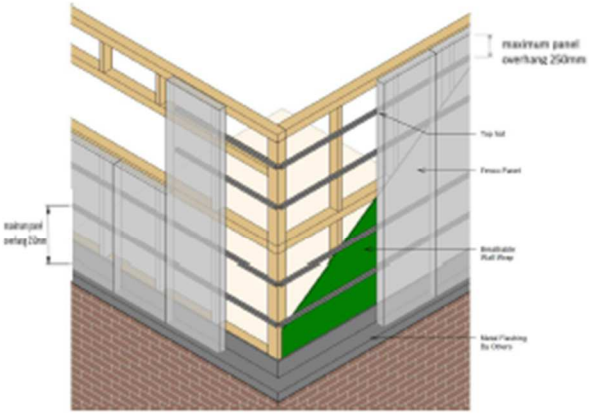
7.1 Concrete Slab Rebate



Notes:
1) Batten spacing must be determined by a qualified engineer in accordance with Section 4.7).
2) Top-hats shall be fastened direct to timber framing with 10 - 11x45mm hex head type 17 screws (min 32mm penetration into framing), or to steel framing with 10 - 10x16mm hex head self-drilling screws (min. 8 full threads into framing).
3) 80mm Fenco Panels shall be fastened in direct contact with top hats with 14-10x100mm hex head type 17 screws finishing flush with the panel external surface (min. 20mm penetration through the top hat).
4) Wall framing specification, supply & construction (steel or timber) "by others" must be in accordance with AS1684.2, NASH Standard, or another appropriate standard.
5) Specification of the Fenco Panel External Wall Cladding System must be made by a Designer or Builder familiar with the application, all technical aspects, and system technical information.
6) Installation must be by a competent carpenter/bricklayer/builder under the direction of a Builder, all with access to system technical information and the installation instructions contained in this Manual.

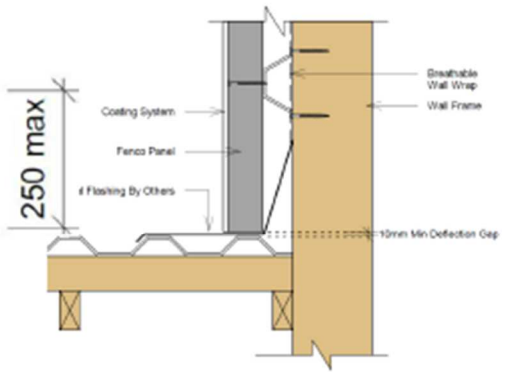
As-tested, bottom-edge without starter channel, Wall Wrap taped to DPC.

7.2 Panel Over Masonry Wall



Notes:
1) Batten spacing must be determined by a qualified engineer in accordance with Section 6.7).
2) Top hats shall be fastened direct to timber framing with 12- 11x65mm hex head type 17 screws (min 50mm penetration into framing), or to steel framing with 10- 14x16mm hex head self-drilling screws (min. 5 full threads into framing).
3) 80mm Fenco Panels shall be fastened in direct contact with top hats with 14-10x100mm hex head type 17 screws finishing flush with the panel external surface (min. 20mm penetration through the top hat).
4) Wall framing specification, supply & construction (steel or timber) 'by others' must be in accordance with AS1684.2, NASH Standard, or another appropriate standard.
5) Specification of the Fenco Panel External Wall Cladding System must be made by a Designer or Builder familiar with the application, all technical aspects, and system technical information.
6) Installation must be by a competent carpenter/tradesman under the direction of a Builder, all with access to system technical information and the installation instructions contained in this Manual.

7.3 Wall Over Roof



Notes:
1) Batten spacing must be determined by a qualified engineer in accordance with Section 6.7).
2) Top hats shall be fastened direct to timber framing with 12- 11x65mm hex head type 17 screws (min 50mm penetration into framing), or to steel framing with 10- 14x16mm hex head self-drilling screws (min. 5 full threads into framing).
3) 80mm Fenco Panels shall be fastened in direct contact with top hats with 14-10x100mm hex head type 17 screws finishing flush with the panel external surface (min. 20mm penetration through the top hat).
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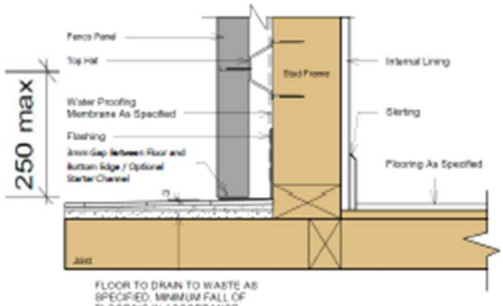
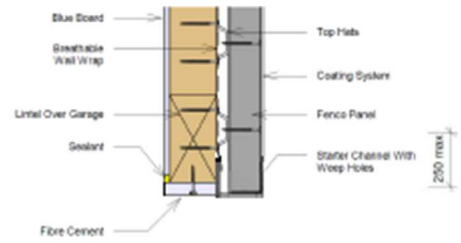
7.4 Wall to Balcony



Notes:
1) Batten spacing must be determined by a qualified engineer in accordance with Section 6.7).
2) Top hats shall be fastened direct to timber framing with 12- 11x65mm hex head type 17 screws (min 50mm penetration into framing), or to steel framing with 10- 14x16mm hex head self-drilling screws (min. 5 full threads into framing).
3) 80mm Fenco Panels shall be fastened in direct contact with top hats with 14-10x100mm hex head type 17 screws finishing flush with the panel external surface (min. 20mm penetration through the top hat).
4) Wall framing specification, supply & construction (steel or timber) 'by others' must be in accordance with AS1684.2, NASH Standard, or another appropriate standard.
5) Specification of the Fenco Panel External Wall Cladding System must be made by a Designer or Builder familiar with the application, all technical aspects, and system technical information.
6) Installation must be by a competent carpenter/tradesman under the direction of a Builder, all with access to system technical information and the installation instructions contained in this Manual.

7.5 Garage / Bulkhead / Overhang / Drip



Notes:
1) Batten spacing must be determined by a qualified engineer in accordance with Section 6.7).
2) Top hats shall be fastened direct to timber framing with 12- 11x65mm hex head type 17 screws (min 50mm penetration into framing), or to steel framing with 10- 14x16mm hex head self-drilling screws (min. 5 full threads into framing).
3) 80mm Fenco Panels shall be fastened in direct contact with top hats with 14-10x100mm hex head type 17 screws finishing flush with the panel external surface (min. 20mm penetration through the top hat).
4) Wall framing specification, supply & construction (steel or timber) 'by others' must be in accordance with AS1684.2, NASH Standard, or another appropriate standard.
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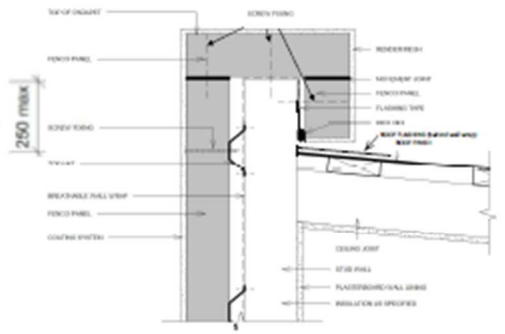
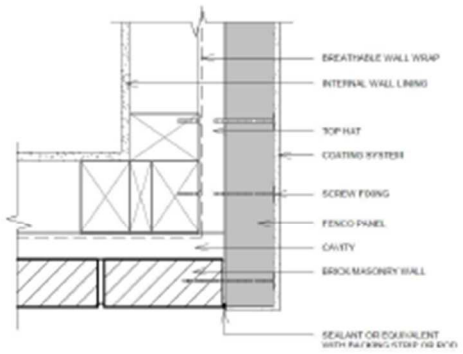
6) Installation must be by a competent carpenter/tradesman under the direction of a Builder, all with access to system technical information and the installation instructions contained in this Manual.

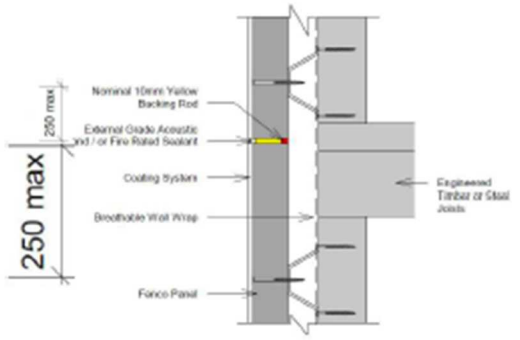
7.6 Parapet Detail



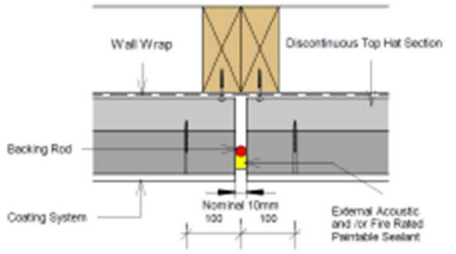
7.7 Junction to Masonry Wall



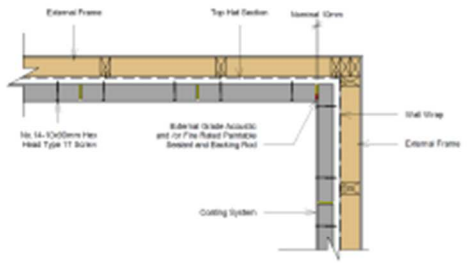
7.8 Horizontal Expansion Joint



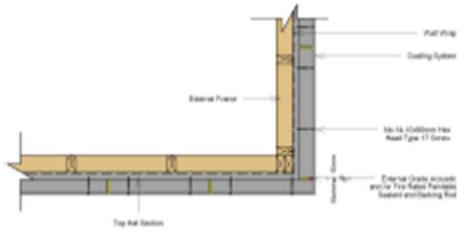
7.9 Vertical Expansion Joint



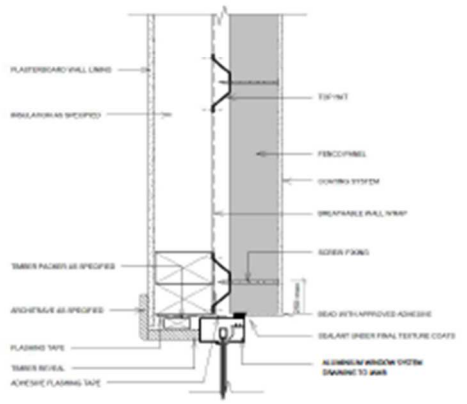
7.10 Internal Corner



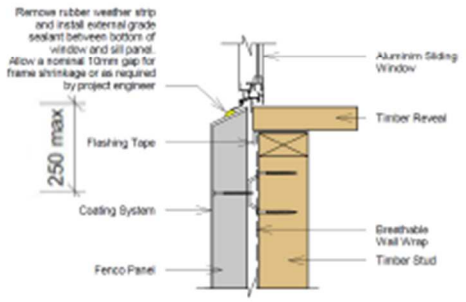
7.11 External Corner



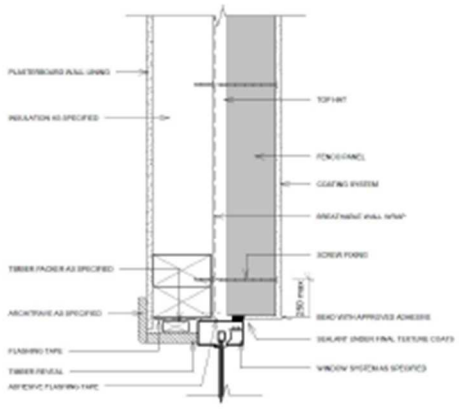
7.12 Window Head



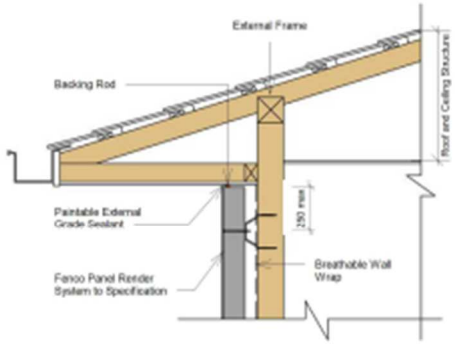
7.13 Window Sill



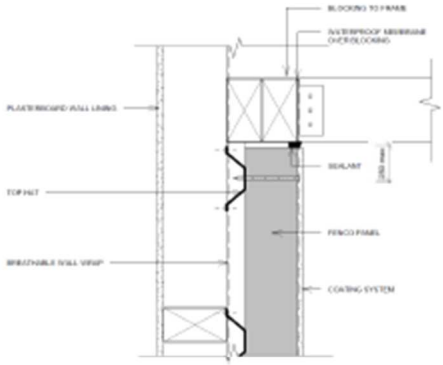
7.14 Window Jamb



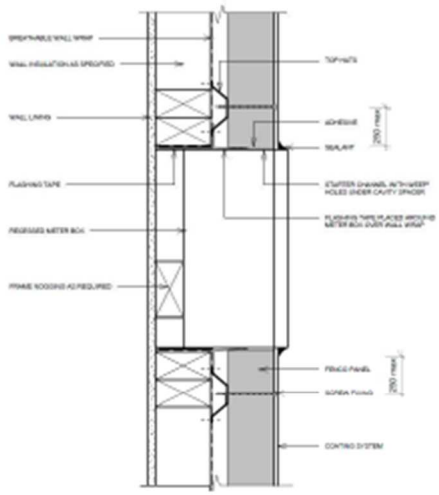
7.15 Eave Soffit



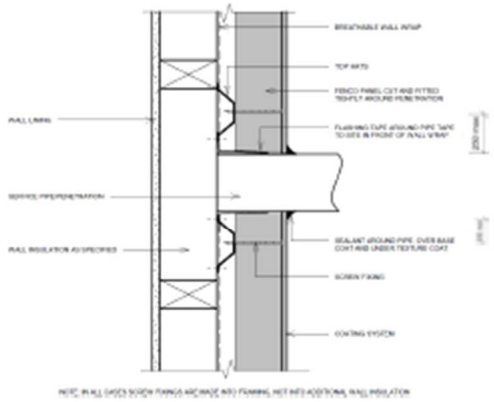
7.16 Beam Penetration



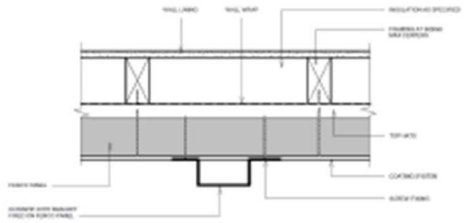
7.17 Large Penetration



7.18 Service Penetration



7.19 Downpipe Fixing



8 Warranty

Australia Fenco Low Carbon Construction Pty Ltd (Fenco) warrants for a period of (20) years ("the warranty period") from the date of purchase that all Fenco products ("the product") will be free from defects due to faulty manufacture or materials, and will be resistant to cracking, rotting, fire and damage to the extent set out in Fenco published literature current at the time of installation, and strictly subject to the conditions set out below.

The Warranty is strictly subject to the following conditions:-

1. The product, and any other products including fasteners and joining systems, applied to, or used in conjunction with the product must be used and installed strictly in accordance with the approved installation manual at the time of installation.
2. Under no circumstances will Fenco be liable for defects arising from:
   a. A failure to use and/or install the product, or any products, strictly in accordance with the product installation manual.
   b. Render coating system not recommended or applied to Fenco Panels, Render system must be applied as stated in coating system.
   c. Defective materials not supplied by Fenco; or
   d. Impact.
3. Fenco will not be liable for breach of Warranty, and no breach of Warranty claim will be accepted, unless the Claimant makes a written claim and provides proof of purchase within 30 days of the alleged defect becoming apparent.
4. This Warranty is not transferable under any circumstances without the prior written consent of Fenco.
5. A Claimant's sole remedy for breach of Warranty is (at Fenco option) that Fenco will either replace or repair the defect, supply replacement product, or pay for the cost of replacement or rectification of the affected product.
6. Under no circumstances shall Fenco be liable for any consequential loss, property damage or personal injury, economic loss or loss of profits, arising in Contract or negligence or howsoever arising.
   Without limiting the foregoing, Fenco will not be liable for any claims, damages or defects arising from or in any way attributable to poor or defective workmanship, defective materials or poor design or detailing, settlement or structural movement and/or movement or materials to which the product is attached, incorrect design of the structure, acts of God

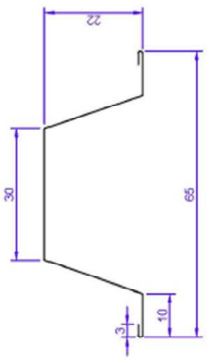
including but not limited to earthquakes, cyclones, floods or other severe weather conditions or unusual climatic conditions, normal wear and tear, or growth of any organism on any product surface.

7. The express warranties set out above are in lieu of all other representations, warranties, or conditions, express or implied including but not limited to implied warranties or conditions of merchantable quality and fitness for a particular purpose, and those arising by statute or otherwise in law or from a course of dealing or use of trade and which are excluded to the fullest extent permitted by law.
8. The joint and coating system must be applied by experienced applicators, as suggested by the joint and coating manufacturer.
   Any sand-based rendering systems must use ionised sand bases.
   The selected joint and coating system must be applied to dry, clean sheet only. application must be completed within 30 days of the sheets being fixed on site.
   It is the applicator's responsibility to use the appropriate compounds in the coating system sufficient to eliminate cracking of the joints under normal building settlement conditions.

9.2 RFI (Bunnings) Steel Top-Hats

RFI 22 mm Ceiling Batten

RFI ROLL FORM INDUSTRIES



RFI 22 mm Ceiling Batten is manufactured using TRUECORE® steel (aluminium/zinc alloy coated) complying with AS1397 G550, AM150 (550 MPa minimum yield stress). Also available in Zincalume® steel

- The lips of the bottom flanges are rounded for improved safety during handling and installation by trades.
- The top flange has an embossed surface to make it easier for the plasterboard screws to grip
- quick and easy to install because they can be lapped, eliminating the time-consuming process of cutting to length.
- nominal lapping will ensure continuity and straightness of fastener alignment
- high strength, lightweight and won't shrink, warp or twist

Fixing Details	Timber	Metal
	M5.5-11x40 BATTENZIPS	12-14x20 Hex Head
Capacity	13 mm Plasterboard	13 mm Plasterboard
Maximum Span	1200 mm	1200 mm
Maximum Spacing	600 mm	600 mm

® Indicates trade marks owned by BlueScope Steel Limited. There is no connection between BlueScope Steel Limited and the Ausdeck Group.

9.3 Fuller Firesound

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TECHNICAL DATA SHEET 技术资料

FIRESOUND™

Description

Firesound™ is a one part, water based construction sealant for sealing joints and penetrations where fire resistance is required, or where an acoustic rated sealant is required.

Benefits

- Fire rating for gaps up to 50mm
- Intumescent, expands when exposed to fire or heat above 90°C
- +/- 20% joint movement capability
- Non flammable
- Water clean up
- Non toxic, contains no heavy metals such as antimony, cadmium, lead or mercury
- Isocyanate free
- Asbestos free
- Excellent Acoustic properties
- Excellent UV stability and weather resistance
- Australian Made
- Very easy to apply and gives a smooth finish
- Low odour
- Paintable
- Priming not normally required

Uses

- Sealing exterior and interior construction joints that are subject to movement (up to ±20%) in pre-cast concrete panels, blockwork and brickwork
- Gaps around cables, metal pipes, conduits, busways and ducts that penetrate walls, floors and ceilings
- If joint movement is not required, Firesound can be used as a putty for filling holes in fire rated substrates

Compatible Substrates

Concrete	Cable coverings (PVC)
Mortar	Plasterboard
Steel	Aluminium

Coverage

Joint Width mm	Joint Depth mm	Yield (450g cartridge (Linear metres)	Yield (600ml sausage (Linear metres)
6 (min)	6	8.4	16.7
10	10	3.0	6.0
12	12	2.1	4.2
18	12	1.4	2.7
24	12	1	2.1
30	15	0.7	1.5
40	20	0.4	0.8
50	25	0.24	0.5

Standards Compliance

Firesound sealant has up to four (4) hour fire rating when tested in accordance with AS1530.4 supplemented by AS4072.1 as well as BS476: part 20; and as appropriate on a gap-sealing system protecting joints and penetrations between various substrates. Please refer to hbfuller.com.au to download specific tests and appraisals, or contact Customer Service. Due to variations in fire rating results using different thicknesses and types of substrates, advice should be sought concerning the suitability of Firesound™ in specific applications.
Firesound™ has been tested in accordance with AS1276.1 and found to perform as an excellent acoustic sealant obtaining a rating of Rw 65 (-2, -5) in a wall constructed using 2

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leaves of aerated concrete plus plasterboard facings. In tests involving 10mm joints in brick walls, Sound Insulation Rating of Rw + Ctr 49 was achieved in a 220mm brick wall, and Rw + Ctr 55 in a 220mm brick wall with plasterboard facing. As acoustic performance is determined according to the type and dimension of substrates, advice should be sought regarding the overall design concept.

Firesound™ meets the requirements of LEED Certification: Indoor Environmental Quality - Credit 4.1 (Low-Emitting Materials: Adhesives and Sealants). Refer to HB Fuller for a VOC Datasheet.

In many regions applicators of fire rated sealants require certification or licences - check local regulations to ensure compliance.

Schedule of Acoustic Test Configurations and Results Summary AS1276.1

Test	Wall	Gap	Covering	STC	Rw	Ctr	Rw + Ctr
2	110 brick wall	Firesound	Standard Brick	45	45	-4	41
5	220 brick wall	Firesound	Standard Brick	54	54	-5	49
14	220 brick wall	Blocked / Firesound	Standard Brick & Plasterboard	71	66	-55	55

Performance Summary

Colour	Grey and white
Skinning time	15 minutes
Working time	30 minutes
Hardness (Shore A)	25-35
Service temperature	-20°C to 80°C
Specific Gravity	~1.5
Shelf Life	12 months

Surface Preparation

Ensure substrate surfaces are clean, sound, dry and free of oil, grease and surface contaminants such as dust, loose particles, release agents, silicone and water repellents. This is particularly important regarding highly porous surfaces such as aerated concrete or cut edges of plasterboard. In circumstances where it is difficult to ensure completely dust free surfaces applying by brush a 1:1 solution of Firesound™ and water as a primer will assist to improve the integrity of the substrate. Refer to HB Fuller Technical Department in case of limitations concerning application to damp surfaces. Areas adjacent to joints may be masked to provide a neat finish. Masking should be removed immediately after tooling.

Application

Apply Firesound™ in ambient conditions between 5 and 35 degrees centigrade. Higher temperatures should be avoided to prevent the possibility of bubbling of the sealant due to rapid moisture evaporation. Do not apply below 5 degrees centigrade. Fill joint with trowel or caulking gun, then tool off with a spatula and clean off excess with a damp cloth. Protect from water for at least 24 hours until a suitable skin has cured (will require significantly longer at temperatures below 15 degrees centigrade). Some shrinkage is normal during curing, and should be anticipated when measuring joints.

Curing

Time to cure is highly variable and depends on weather conditions, ambient temperature and depth of joint. Allow longer curing times in cold or damp conditions. Do not allow water contact until at least a thick skinned surface has formed.

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Firesound™ is not recommended for use in external applications where 2 non-porous substrates are to be sealed. In these situations Firesound™ will find it very difficult to cure and any moisture from rain, dew, fog etc may result in wash-out of Firesound™ from the joint.

Clean Up

After applying Firesound™, clean all tools and metal surfaces with warm water while the sealant is still wet. Cured sealant will need to be removed mechanically.

Painting

Firesound™ sealant is suitable for painting when cured. To minimize paint cracking, at least 24 hours should be left before painting where possible. In standard conditions (25 degrees centigrade) Firesound™ may be painted after 6 hours, however, care should be taken to ensure a flexible acrylic coating is used and that a firm skin has developed. In cooler conditions or where the humidity is high, allow a longer cure period before painting.

Limitations

- Do not apply to wet surfaces.
- Firesound™ sealant may be used both for interior and exterior sealing, but not suitable for use in water retaining structures or where pooling of water may occur.
- Firesound™ is not recommended in external applications where 2 non-porous substrates are to be sealed
- Firesound™ sealant has good servicing characteristics when unprotected in internal applications.
- For external use, Firesound™ sealant must be protected from rain or water, until such time as the sealant builds up a thick skin to avoid washout. Therefore do not apply sealant when rain exposure is likely, or before a thick skin can develop. This is typically 24 hours in summer (25 to 30 degrees C), but will be significantly longer in winter, or at times of high humidity
- In many regions applicators of fire rated sealants require certification or licenses - check local regulations to ensure compliance

Safety Information

Firesound™ is not considered hazardous under the classification of GHS WHS Version 3. A Safety Data Sheet is available from the H.B. Fuller representative in your state, HB Fuller Australia customer service, or downloadable from the HB Fuller web site, www.hbfuller.com.au

Disclaimer

This technical data sheet summarises at the date of issue to the best technical knowledge of HB Fuller Australia. Since HB Fuller Australia cannot anticipate or control the conditions under which the product may be used, each user must, prior to usage, review this technical data sheet in the context of how the user intends to handle and use the product in the workplace. If clarification or further information is needed to ensure that an appropriate assessment can be made, the user should contact this company. Our responsibility for the products sold is subject to our standard terms and conditions, a copy of which is sent to our customers and is also available on request.

Version 15
TDS Date: 28/02/2019

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9.4 Bostik Fireban one

Bostik
smart adhesives

FIREBAN® ONE

ONE PART FIRE RATED INTUMESCENT POLYURETHANE JOINT SEALANT

25th October 2017

YOUR SMART ADVANTAGES

- Fire Rated up to 4 hours
- Acoustic rated
- One component, no mixing required
- Low modulus 50 %(+ 25%)
- Excellent durability
- Retains its original properties even after years of weather and UV exposure
- Resistant to weathering conditions
- Paintable*
- Non staining
- Does not support fungal growth
- Australian made

USES

Bostik Fireban® One is a fire rated intumescent, low modulus, one component, Class-A polyurethane sealant. When cured it will form a tough, flexible fire rated seal capable of cyclic expansion and compression movement of 50% (± 25%) of the original installed joint width. Bostik Fireban One is resistant to normal weathering conditions such as rain, sunlight, snow, sleet, ozone, atmospheric contamination and pollution. Bostik Fireban One can be used on:

- Insitu concrete floors and walls
- Precast and tilt up panels
- Brickwork and blockwork
- Rendered masonry
- Plasterboard (Fire rated and/or acoustic rated)
- Fibre cement sheet (Fire rated and/or acoustic rated)

PRODUCT CHARACTERISTICS

Colours	Limestone Off White Grey (Export) White (Export)
Viscosity	Non-sag, smooth thixotropic paste
Cure method	Moisture curing
Chemical resistance	Dilute acids, alkalis and some solvents. Intermittent contact with petroleum and diesel.
Coverage	Refer to coverage table
Application temperature	5 to 35°C

Product codes 600ml sausage/20 per carton	
Limestone	30840044
Off White	30609405
Limestone (Export)	30800514
Grey (Export)	30840730
White (Export)	30840480

TYPICAL PERFORMANCE DATA (approx.)

Specification	
Fire test certification	AS 1530.4-2014, AS4072.1 and BS476-20 REF: CSIRO FLO 1785 and BOS S.02.
CSIRO RILEM Long-term Sealant Durability Study DBCE	Doc. 97/196 (M)
ISO 11600	Class F-25LM
Approval as a low modulus external joint sealant	DIN 18540 (German) and SNJF (French)
External joint sealant	ASTM C.920-87 & 98 (USA) as Type S, Grade NS, Class 25, use NT, G, A, M, & O AS4020
Water potable	AS1157-1972
Resistance to fungal growth	Approved
BOMBA Malaysia	Approved
TUV SUD PSB Singapore	
Service temperature	-40 to 70°C
Tack free time	6-12 hours
Cure rate	2mm/24 hours on porous substrates

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BOSTIK FIREBAN® ONE

Full cure	7 days on porous substrates.
Specific gravity	1.45 g/ml
Shore A hardness	30
Tensile strength	> 1.3 N/mm²
Elongation at break	> 900%
Total joint movement	± 25%
Maximum joint width	Up to 50mm

DIRECTIONS FOR USE

Read and understand the Safety Data Sheet before using this product. SDS can be acquired by visiting www.bostik.com.au or by scanning the relevant QR code on pack.

SURFACE PREPARATION

1. Clean and dry all surfaces by removing foreign matter and contaminants such as laitance, oil, dust, grease, frost, water, dirt, old sealants, curing agents and any protective coating.
2. Dust and loose particles should be vacuum cleaned.

Priming
Priming of all surfaces is recommended to achieve stated performance properties.
DO NOT USE METHYLATED SPIRITS OR TURPS.

Porous substrates:
1. Absorbent or porous substrates will allow a bead of water to easily soak into and wet out the surface of the substrate
2. For maximum performance on porous surfaces and in all periodically immersed and submerged applications, use Bostik N49 Primer (refer to the Bostik N49 Primer Technical Data Sheet)
3. Porous substrates not subject to immersion or ponded water e.g. vertical expansion joints in concrete or masonry structures so not require priming if clean, dry and uncontaminated

Non-porous substrates:
1. Non-absorbent substrates will cause a bead of water to be retained on the surface of the substrate as a raised droplet. The droplet does not easily soak into the surface of the substrate.
2. Bostik Ultraseal is recommended for non-porous or burnished/overworked concrete substrate as per Bostik Ultraseal Technical Data Sheet.
3. Bostik N40 Primer is recommended for non-porous plastic and metal substrates.
4.Prime all plastics and metallic non-porous substrates with Bostik N40 Primer using the two-cloth method described below. E.g. UPVC outlets and pipe work: brass, copper fittings, stainless steel trays and flashings.

APPLICATION

Bostik Fireban One should be dispensed from the sausage by means of a sausage barrel gun.

Sausage application:
1. Clip the end of the sausage and place in a barrel gun
2. Screw the end cap and nozzle onto the barrel gun
3. Use the trigger to extrude the sealant. To stop; depress the catch plate.

Apply Bostik Fireban One in a continuous operation using enough pressure to properly fill the joint. Tool off the surface of the sealant with an appropriate sized spatula or trowel. Apply sufficient pressure to leave a smooth, consistent surface and ensure maximum contact with the interface of the joint.

Joint sealing hints:
- Prime prior to the installation of the backing rod
- Always use backing rod for correct sealant geometry & contact with the substrate
- Ensure maximum adhesion to bond face and depth to width ratio of 1:1 for 10mm joints and 1:2 for joints over 10mm up to 50mm and 3:4 for some joints in specialist applications (refer to Application manual BOS 5.02 for specific joint Configurations).
- Tool sealant to achieve concave shape

COVERAGE

The estimated lineal metre yield per pack size is recommended in the following table. No allowance has been made for waste or irregular joint geometry.

JOINT SIZE (D x W)	10mm x 10mm	20mm x 10mm	40mm x 20mm	50mm x 25mm
600ml Sausage	6	3	0.75	0.48

W=Joint width (mm), D=Joint depth (mm), L=Length (metres)

CLEANING

The use of protective goggles, barrier creams and ointments, gloves and protective clothing is recommended. Cured material can be removed by mechanical means only. Aromatic solvent clean up is not recommended. Clean off uncured material and equipment immediately after use using Bostik Handy Wipe towels to remove adhesive from skin.

*PAINTABILITY

Bostik Fireban One can be painted after a minimum of 7 days. Coatings containing solvents such as enamels, oil based or other coatings may cause the surface of the sealant to react creating a tacky surface. Surface coatings may discolour in direct contact with cured Bostik Fireban One. Surface coatings may crack and craze as a result of cyclical movement of supporting sealant joint. A field test is recommended to ensure compatibility of any coating with Bostik Fireban One.

LIMITATIONS

Not recommended for:
– Use in chlorinated water such as swimming pools, spas etc.
- Use on any material containing bitumen
- Constant immersion in salt water
- Use in glazing applications
- Application to cement based substrates within 28 days of initial pour or set
- Use in trafficable joints greater than 10mm in width
- Application at temperatures below 5°C or above 35°C
- Exposure to water and/or alcohol before it has completely cured
- Wet tooling techniques, such as soapy water
- Application in less than 6mm in width and depth

STORAGE AND SHELF LIFE

Store in cool (between 5°C to 30°C) dry, well-ventilated area out of direct sunlight. Store away from oxidizing agents and acids. Shelf life is 12 months in original unopened container.

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BOSTIK FIREBAN® ONE

DISPOSAL

Empty foils may be disposed via local landfill. If spilt, absorb with clay, sand or earth. Collect and seal in properly labeled metal container. Dispose of according to local authority regulations. Do not dispose of down drains or into local waterways.

VOC INFORMATION

649/litre

HEALTH AND SAFETY

POISON
KEEP OUT OF REACH OF CHILDREN.
READY SAFETY DIRECTIONS BEFORE OPENING OR USING.

CAUSES SKIN IRRITATION.
MAY CAUSE AN ALLERGIC SKIN REACTION.
MAY CAUSE ALLERGY OR ASTHMA SYMPTOMS OR BREATHING DIFFICULTIES IF INHALED.

Keep out of reach of children. Read label before use. Avoid breathing dust, fume, gas, mist, vapours or spray. Wash hands, face and all exposed skin thoroughly after handling. Contaminated work clothing should not be allowed out of the workplace. Wear protective clothing, gloves, eye/face protection and suitable respirator. In case of inadequate ventilation wear respiratory protection.

Fire: If material is involved in a fire use water fog (or if unavailable fine water spray), alcohol resistant foam, standard foam, dry agent (carbon dioxide, dry chemical powder).

Spills & Leaks: Clear area of all unprotected personnel. Slippery when spilt. Wear protective equipment. Absorb with sand or soil. Collect and seal in properly labelled drums. Dispose of contents/container in accordance with local, regional, national and international regulations.

FIRST AID
Swallowed: Do NOT induce vomiting. Give a glass of water. Seek medical advice.
Eye: If in eyes, hold eyes open, flood with water for at least 15 minutes and see a doctor.
Skin: If skin contact occurs, remove contaminated clothing and wash skin thoroughly. If irritation occurs seek medical advice.
Inhaled: Remove from contaminated area. Apply artificial respiration if not breathing. Seek medical advice.

For emergency information contact the Poisons Information Centre, phone 131 126 or the Emergency Response Service, phone 1800 033 111.

BOSTIK HOTLINE
Smart help 1800 898 551

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10 Appendix D: Test Reports

10.1 AS 4040.2 Non-Cyclonic Wind Strength 2018-116-S2 (N4, ULS 3.01 kPa)

IAN BENNIE AND ASSOCIATES

TEST REPORT NO. 2018-116-S2

FENCO PANEL EXTERNAL WALL CLADDING SYSTEM – CAVITY FIXED

TEST AT 450 MM STUD SPACING

STATIC ULTIMATE WIND LOAD TESTS to AS4040.2

for

Fenco

October 2019

NATA

Accreditation No. 2371
Accredited for compliance with ISO/IEC 17025 - Testing.

IAN BENNIE & ASSOCIATES PTY. LTD.

Building Performance Testing

ACN : 007 133 263

TEST REPORT NUMBER 2018-116-S2

Test Client **Fenco**

Sample Identification A sample of **Fenco Panel external wall cladding system – Cavity Fixed** was installed by the client on a timber stud frame. The stud frame was 1800 mm by 1800 mm with 450 mm stud centres. The configuration of the sample is shown in Appendix.

Test Method Strength limit state testing was conducted in accordance with AS4040.2 Methods of testing sheet roof and wall cladding, Method 2: Resistance to wind pressures for non-cyclone regions.

Procedure: AS4040.2 nominates for Strength limit state testing test loads shall be applied for a period of 1 minute. In order to ensure the full test pressure was applied to the cladding boards, holes were cut in the sarking.

Test Location: Ian Bennie & Associates
Dandenong South, Victoria

Sample(s) Received: 27th November 2018
Test Date(s): 27th November 2018

Observations: The sample sustained the load of 4.4 kPa for a period of 1 minute.

Requirement: AS1562.1 Design and installation of sheet roof and wall cladding specify that the cladding system remain substantially in position, notwithstanding any permanent distortion, fracture or damage that might occur in the sheeting or fastenings.

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Telephone : (03) 9768 3640 International : +613 9768 3640 Facsimile: (03) 9768 3642

Conclusion: AS 4040.2 nominates that design pressures should be multiplied by the appropriate variability factor to determine the test pressures. For Strength Limit State tests, AS/NZS 1170.0 nominates that for one sample being tested the variability factor is 1.46. Based on this factor, the Fenco Panel external wall cladding system – Cavity Fixed sample passed the Strength Limit State test requirements of Australian Standard AS4040.2 Methods of testing sheet roof and wall cladding, Method 2: Resistance to wind pressures for non-cyclone regions up to the strength limit state pressure of **3.01 kPa**, corresponding to **Housing Rating N4** for building corners

Report Distribution:
Ian Bennie & Associates 3
Fenco ..... PDF

Ian Bennie 25 October 2019
Authorised Signatory
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APPENDIX A - DETAILS OF THE TEST SPECIMEN

TOP HAT

The top hats in galvanised steel can be provided in norminal widths of 24mm and 38mm. The following table is based on 24mm top hat section.

INSTALLATION STEPS

1. Frame and trusses complete

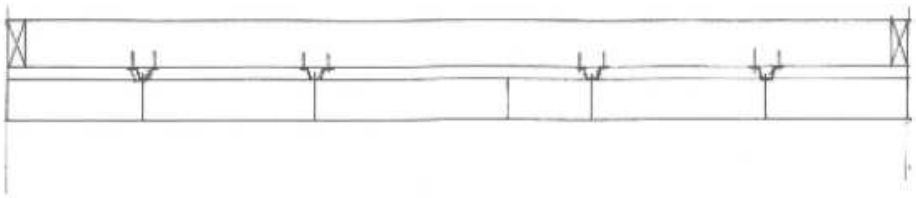
2. Install DPC
   - Fix to bottom plate
   - Cover rebate completely
   - Overlap DPC at corners
   - Install sarking as specified

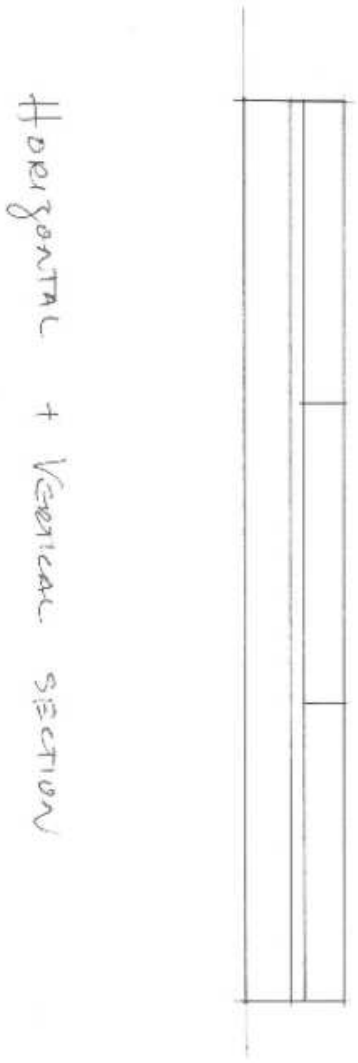
3. Fix top hats
   - Check number of top hats required
   - Number of screws as the Table
   - Install top hats below and above openings
   - Ensure top hats are discontinuous at control joints

4. Install panels
   - Corner panel installed first
   - Number of screws as the Table
   - Mortar to vertical and horizontal joints
   - Site cutting to suit
   - Check control joint layout
   - Minimum panel width 250mm

5. Coating
   - As per specification detail shown in coating requirements.

Type of screw	Application	Socket type
12-11x35mm hex head type 17 screw	Fix top hat to timber frame	5/16" hex mag. socket
10-16x16mm hex head self drilling screw	Fix top hat to steel stub frame	5/16" hex mag. socket
14-10x100mm hex head type 17 screw	Fix panel to top hat	3/9" hex mag. socket





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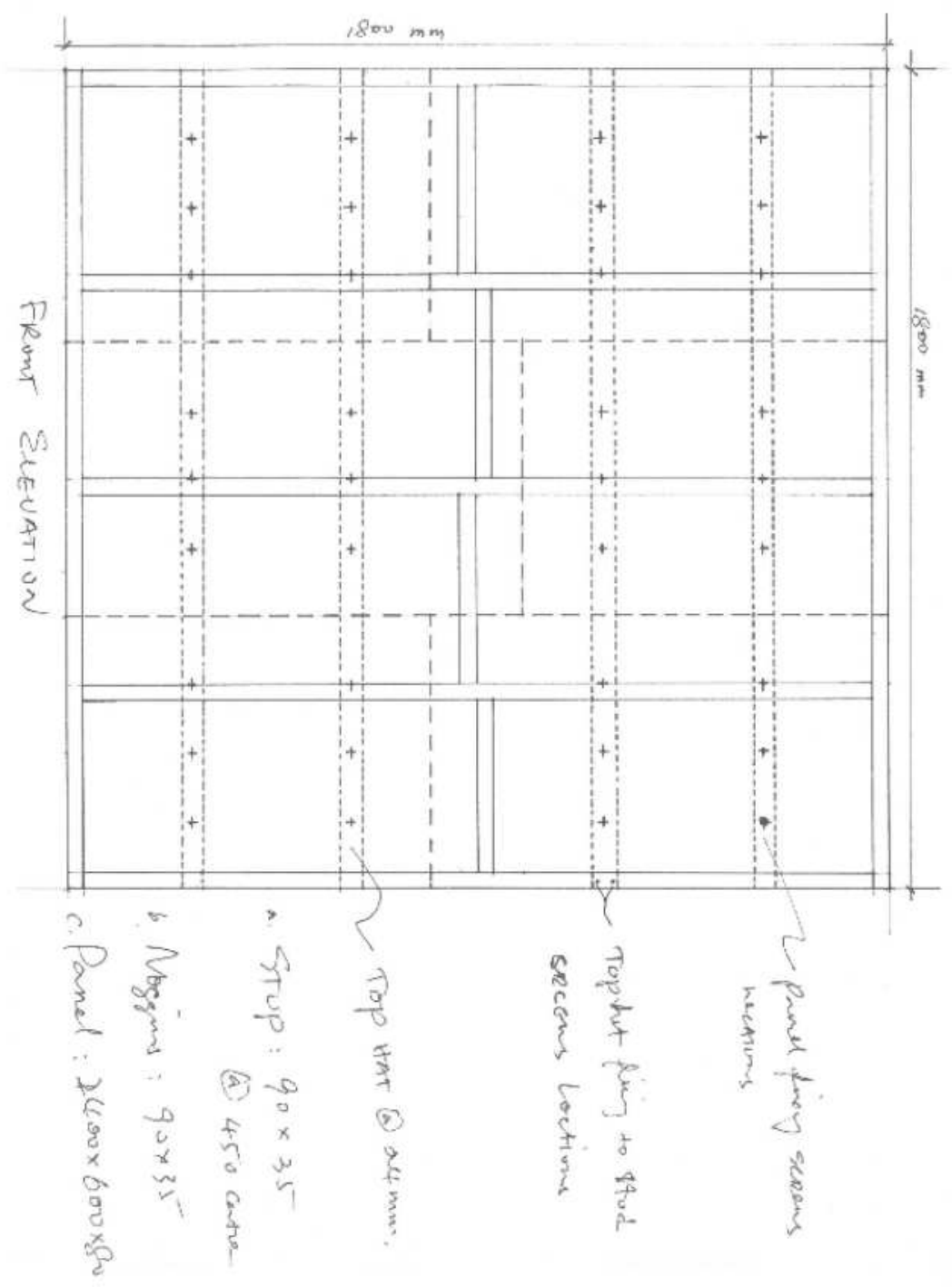

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10.2 V2.2.1 – Weatherproofing, 2018-116-S1 (N4, SLS +0.82 & -1.23 kPa)

IAN BENNIE & ASSOCIATES PTY. LTD.
Building Performance Testing
ACN : 007 133 253

NATA Registered Laboratory No. 2371

TEST REPORT NUMBER 2018-116-S1

Test Client: **Fenco**
Address not specified

Specimen Identification: A **Fenco Panel external wall cladding – Cavity Fixed** test specimen measuring 2300 mm in height x 3600 mm in width was installed on a timber stud wall by the client. The sample consisted of cladding panels fixed to horizontal battens on the studs. The sample included a 600 mm recess, window, meter box, wall junctions, parapet and balcony drainage conditions. No control joints were included in the sample. Full details of the cladding system were provided by the Client and relevant details are included in Appendix C. Due to there being a leak through the seal at the front of the parapet in the initial 2 water tests, the detailing shows the seal condition that finally passed.

Construction: For the purposes of the NCC the specimen was deemed to be a Cavity Wall utilising appropriate breather wrap to prevent water ingress to the stud framing. For the purposes of observations during the test, acrylic sheets were used as the internal lining on the stud frame. Holes were introduced through the internal lining to create an air infiltration of 1.6 L/s.m^2 at 150 Pa of pressure on the sample, being the highest allowable infiltration rate specified in AS/NZS 4284.

Test Method: NCC-2016 Weatherproofing Verification Methods V2.2.1 and FV1 with test procedures in accordance with Australian Standard AS/NZS 4284:2008, Testing of building facades.

Nominated serviceability limit state pressures: + 820 Pa and –1230 Pa
(these are the serviceability limit state wind pressures for N4 and C2 housing classifications in accordance with AS 4055 Table 3.4)

1 Luisa Avenue, Dandenong 3175, Victoria , Australia
Telephone : (03) 9768 3640 International : +613 9768 3640 Facsimile: (03) 9768 3642

Test Location: Ian Bennie & Associates, Dandenong South, Victoria
Sample(s) Received: 19th November 2018
Test Date(s): 19th-30th November 2018

Requirement: The compliance requirements of the NCC-2016 Weatherproofing Verification Methods V2.2.1 & FV1 are given in Appendix B.

Conclusions: The Fenco Panel external wall cladding – Cavity Fixed passed all the compliance requirements of the NCC-2016 Weatherproofing Verification Methods V2.2.1 & FV1 at the nominated test parameters in its third water test. Complete details of all tests conducted and results are given in the body of this report.

Report Distribution:
Ian Bennie & Associates 3
Fenco .....PDF

Ian Bennie 8 October 2019
Authorised Signatory

IBA Report: - Page 2 of 4

TEST METHODS & PARAMETERS

Test Sequence

NCC-2016 Weatherproofing test procedures were conducted in accordance with Australian Standard AS/NZS 4284:2008, Testing of building facades, as detailed in Appendix A in the following sequence:

Static Pressure Wind Load Test.

Positive and negative serviceability limit state pressures were applied to the external face of the specimen for periods of 1 minute each.

Static Pressure Water Test.

A water penetration test was then carried out in accordance with Clause 8.5 of AS/NZS 4284:2008 at a static pressure of 300 Pa for a period of 15 minutes.

Cyclic Pressure Water Test.

A water penetration test was then carried out in accordance with Clause 8.6 of AS/NZS 4284:2008 at the cyclic pressures of 245 - 490 Pa for 5 minutes.

Cyclic Pressure Water Test with 6mm Holes in Cladding.

6mm diameter holes were inserted in the external face of the specimen at the following locations:

(AA) Wall/window joint at 3/4 height of the window

(BB) Immediately above the window

(CC) Above the meter box and the downpipe penetrations.

Water penetration test were then carried out in accordance with Clause 8.6 of AS/NZS 4284:2008 at the Static and Cyclic pressures as detailed above.

Static Pressure Water Test with Internal Lining Removed.

The internal acrylic lining of the sample was removed and a static water penetration test was then carried out in accordance with Clause 8.5 of AS/NZS 4284:2008 at a static pressure of 50Pa for a period of 15 minutes.

Test Equipment

Water was applied via sprays located 300 mm away from the outdoor face of the test specimen. Water flow rate to the sprays was measured with a calibrated pressure gauge to an accuracy of 2% and was maintained at a level of 0.05 l/s.m^2 over the test area throughout the test. Water application was maintained continuously and water was observed to evenly cover the exterior face of the test specimen. All pressure transducers are calibrated against NATA certified manometers and may be taken to have a measurement accuracy of 1%.

Test Requirement

As per the Compliance requirements of NCC-2016 Weatherproofing Verification Methods V2.2.1 and FV1 that are given in Appendix B.

.

TEST 3 RESULTS

Static Pressure Wind Load Test

The loads were sustained and there was no visible evidence of any cracking in the cladding.

Static Pressure Water Test

No leakage through the cladding system was observed during the test.

Cyclic Pressure Water Test

No leakage through the cladding system was observed during the test.

Cyclic Pressure Water Test with 6mm Holes in Cladding

No leakage through the cladding system was observed during the test.

Static Pressure Water Test with Lining Removed

No leakage through the cladding system was observed during the test. After the test the building wrap was cut away and there was evidence of water having penetrated cladding boards however there was no pooling of water on horizontal surfaces.

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APPENDIX A - TEST PROCEDURES FOR AS4284:2008

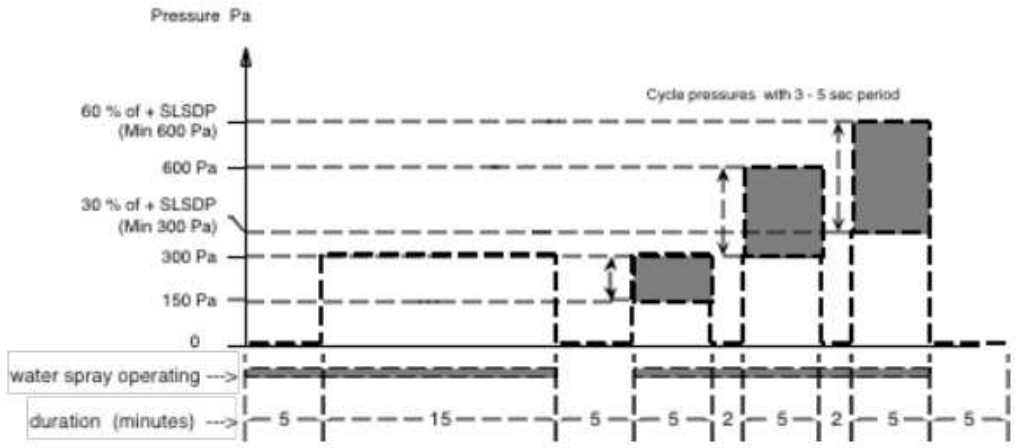
Water Penetration Tests

Test Parameters

Test pressures :	Static	**30% of W_s (at least 300 Pa)**	duration = 15 minutes
	Cyclic	**15% - 30% of W_s**	duration = 5 minutes
		20% - 40% of W_s	duration = 5 minutes
		30% - 60% of W_s	duration = 5 minutes

Water application rate : **0.05 L/m^2.s**

Water penetration test sequence



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APPENDIX B - COMPLIANCE REQUIREMENTS

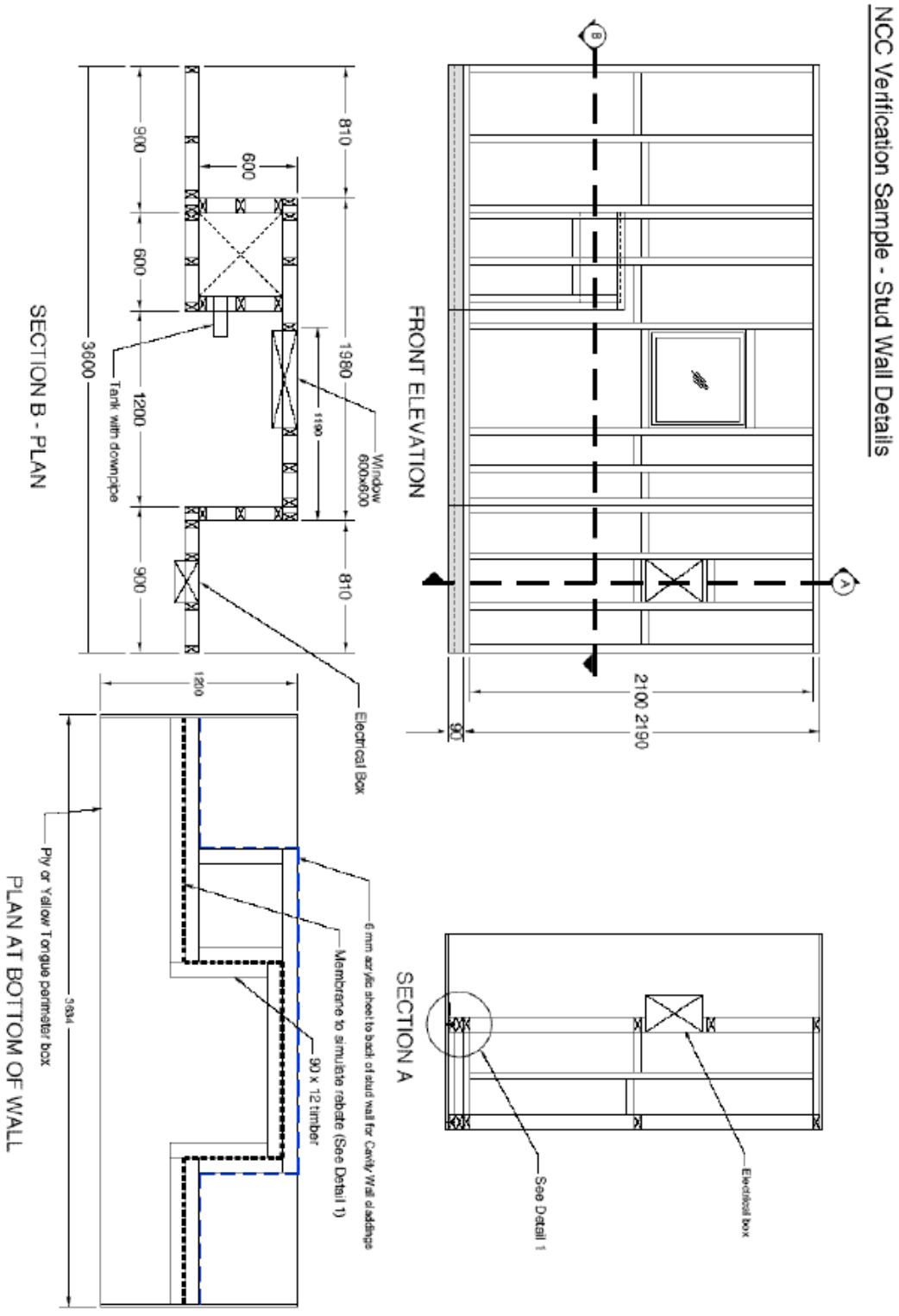
Compliance requirements:

(i) A *direct fix cladding wall* and *unique wall* are verified for compliance with **FP1.4** if there is no presence of water on the inside surface of the facade.

(ii) A *cavity wall* is verified for compliance with **FP1.4** if there is no presence of water on the removed surface of the cavity, except that during the simulation of the failure of the primary weather-defence or sealing, water may—

(A) transfer to the removed surface of the cavity due to the introduced defects (6 mm holes); and

(B) contact, but not pool on, battens and other cavity surfaces.



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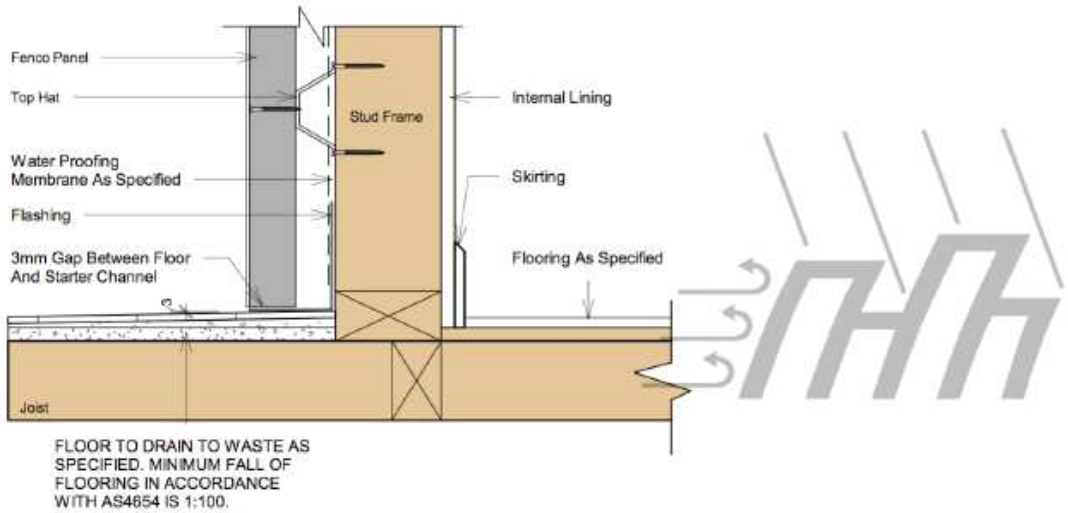
1 Fenco Panel External Wall Cladding System

Construction Details

1.4 Wall to Balcony



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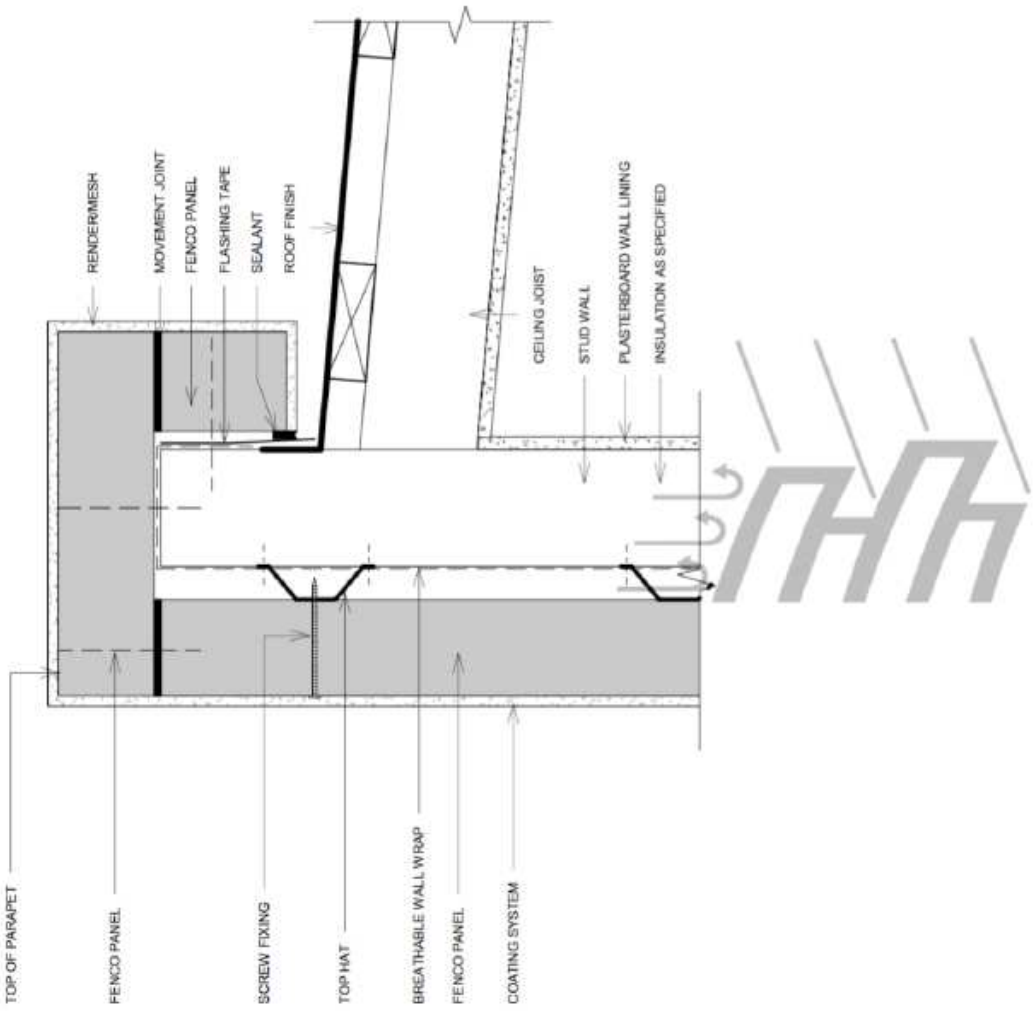
1.6 Parapet Detail



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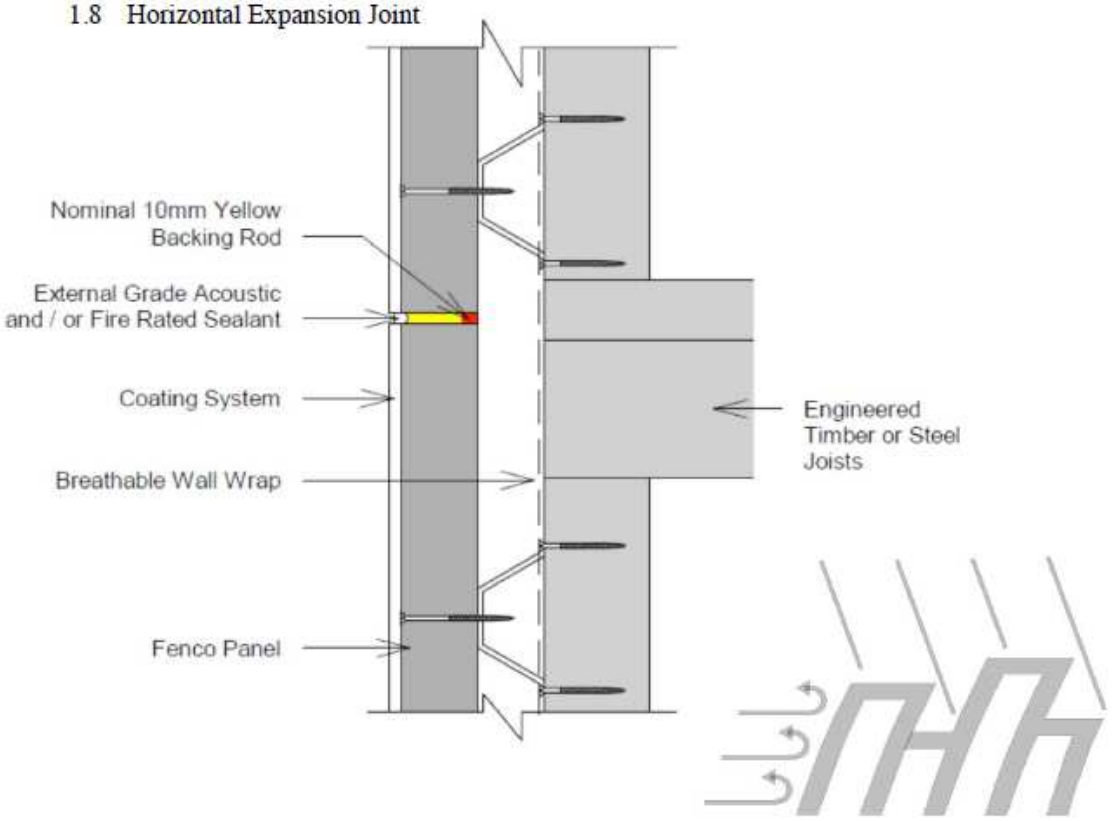
1.8 Horizontal Expansion Joint



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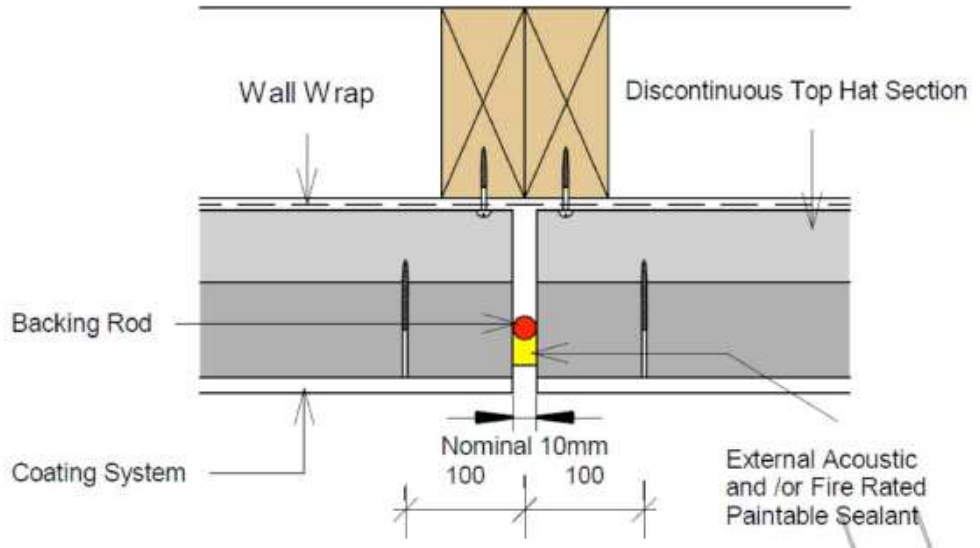
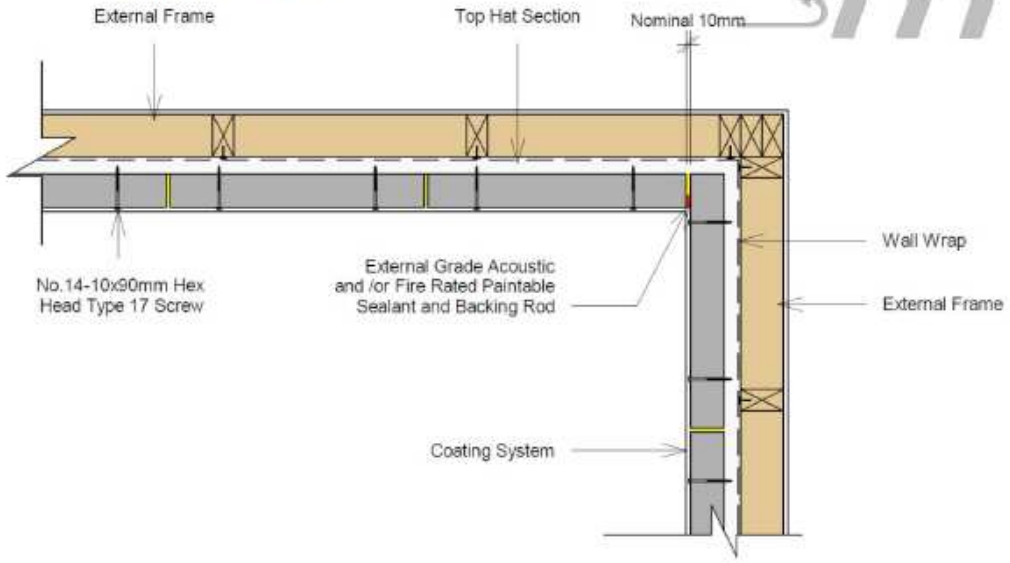
1.9 Vertical Expansion Joint



1.10 Internal Corner



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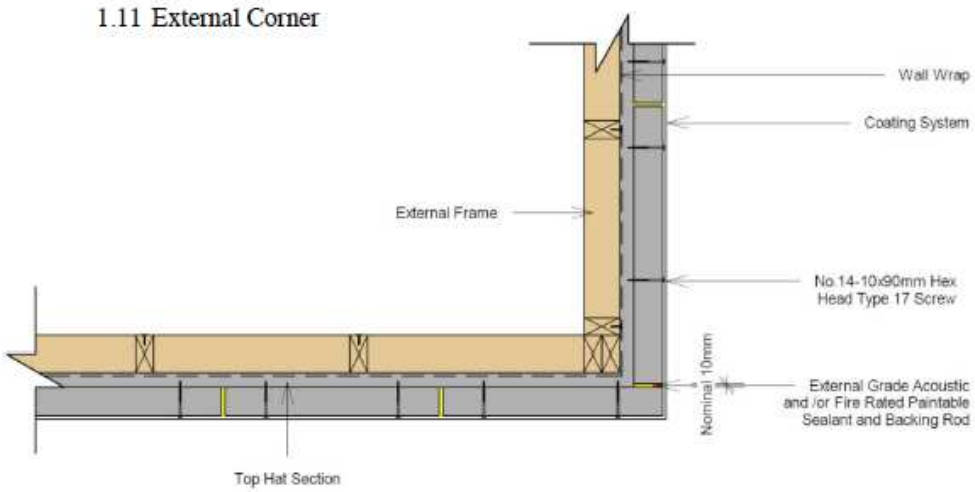

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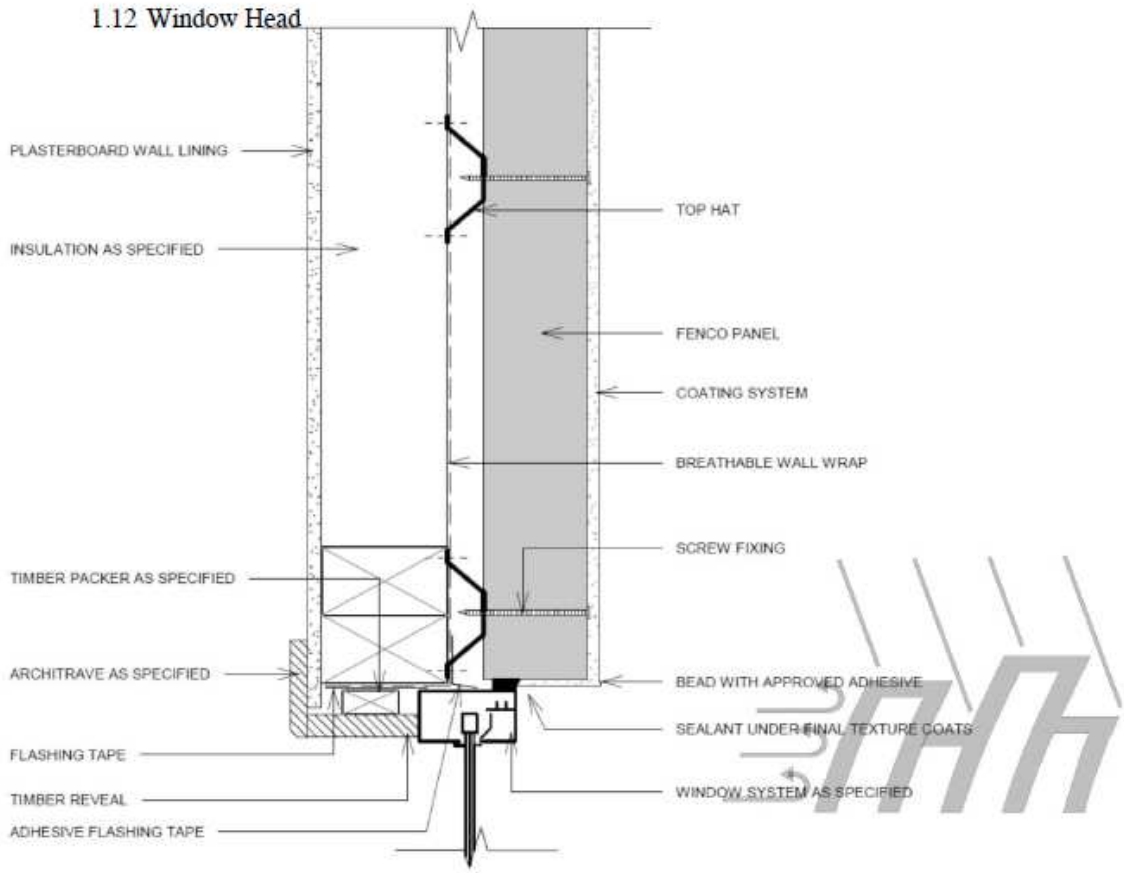

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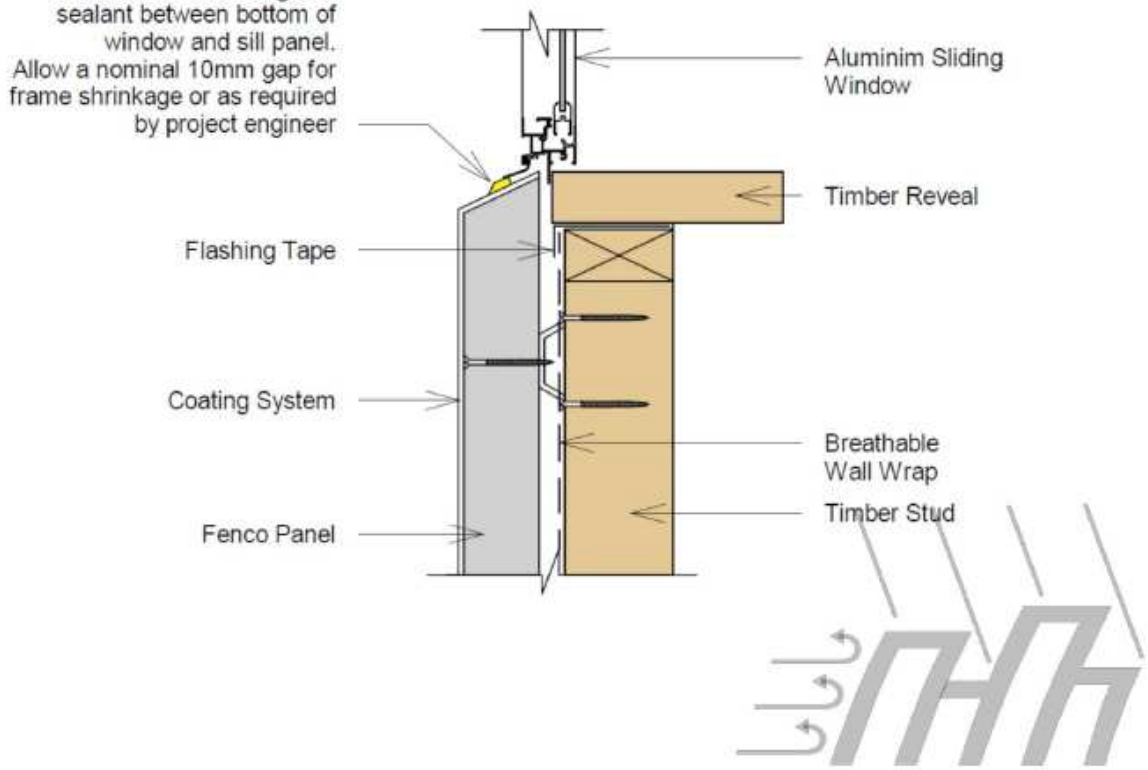
1.13 Window Sill

Remove rubber weather strip and install external grade sealant between bottom of window and sill panel. Allow a nominal 10mm gap for frame shrinkage or as required by project engineer



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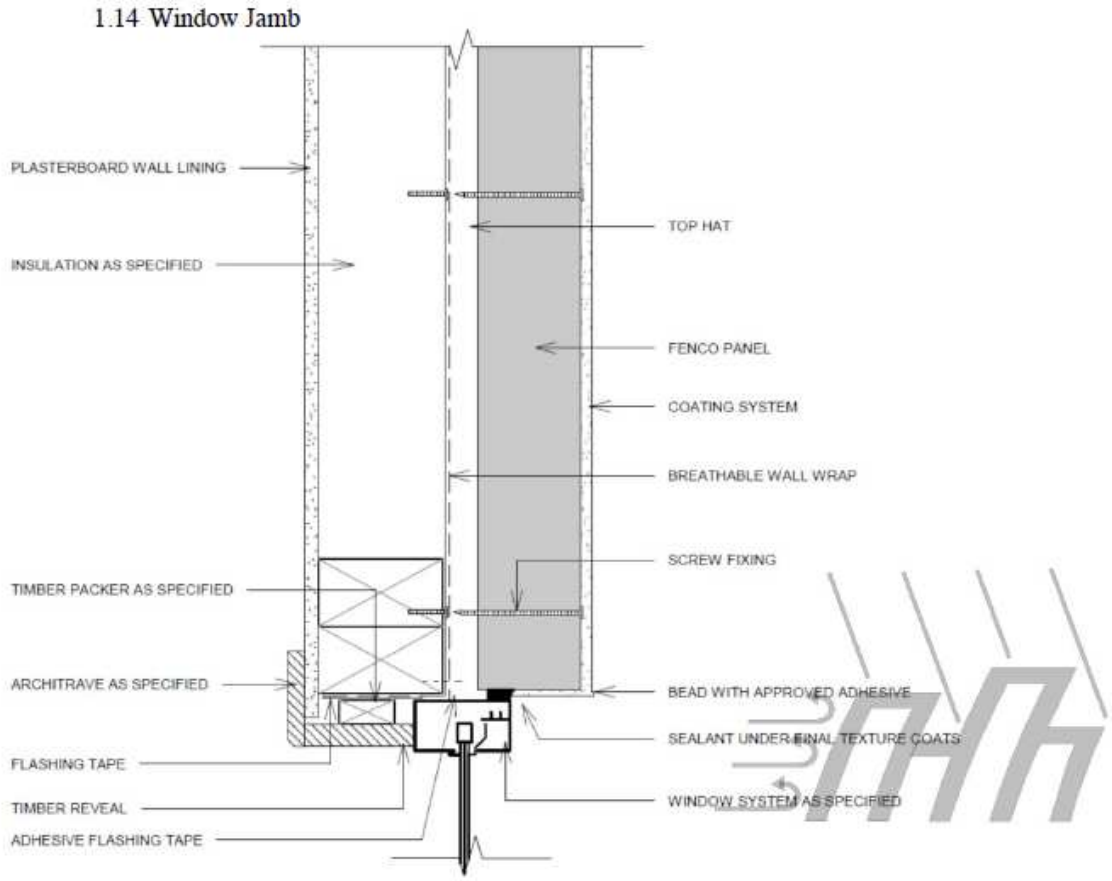

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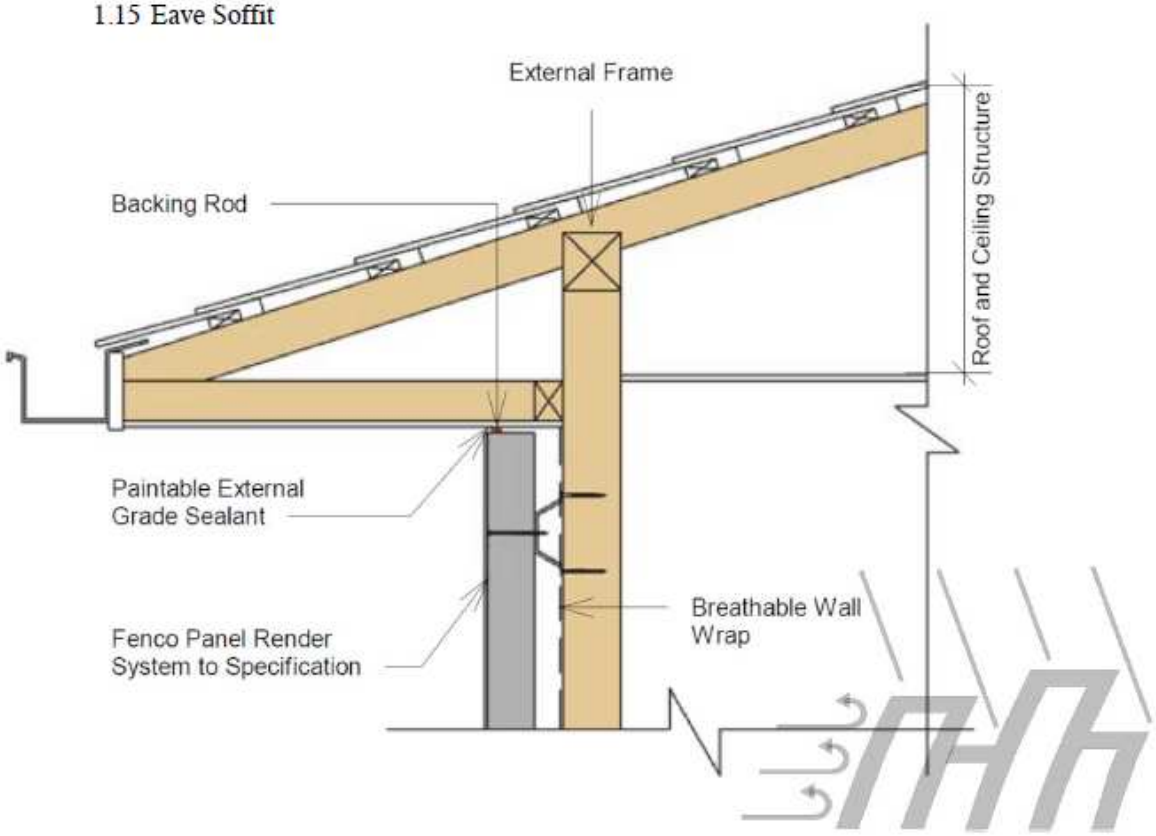
1.15 Eave Soffit



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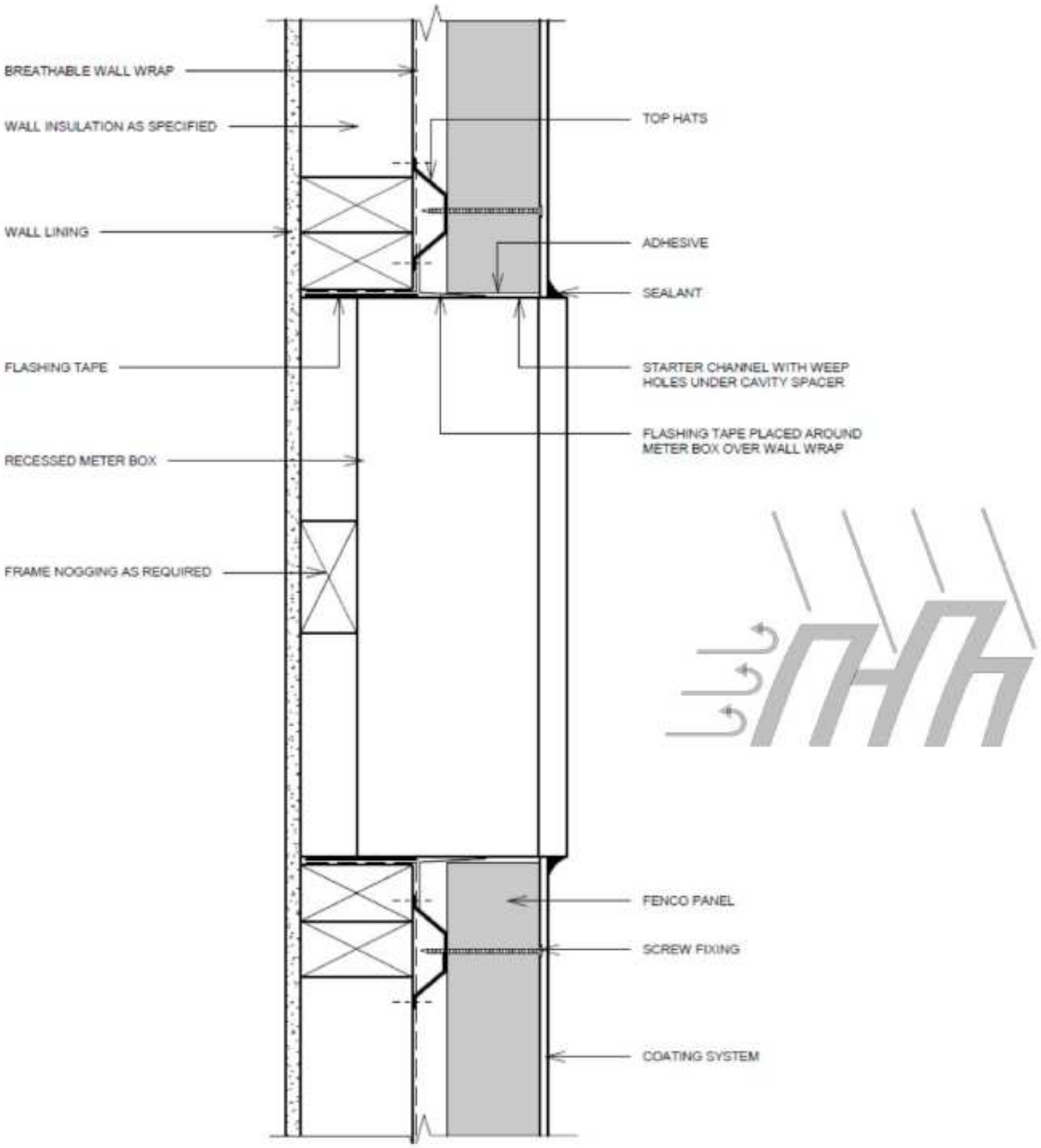
1.17 Large Penetration



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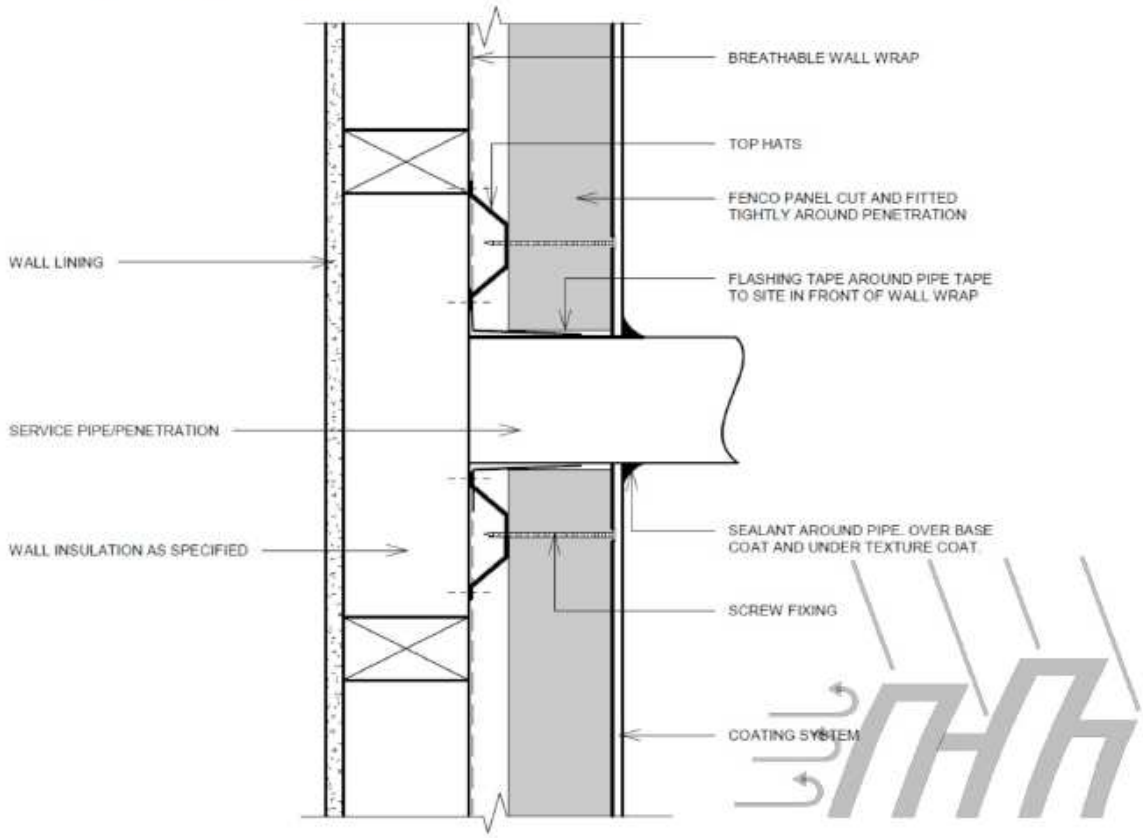
1.18 Service Penetration



NOTE: IN ALL CASES SCREW FIXINGS ARE MADE INTO FRAMING, NOT INTO ADDITIONAL WALL INSULATION

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10.3 Test Specimen Photographs (bottom edge, no starter-channel)

10.4 Test Report 54286200.1, AS1530.4-2014 FRL 30/30/30

TEST REPORT

Fire resistance test in accordance with AS1530.4-2014 of Fenco load bearing wall system with Rockcote® Render on the exposed side and plasterboard on the unexposed side

EWFA Report No:

54286200.1

Report Sponsor:

Australia Fenco Low Carbon Construction Pty Ltd
132 Auburn Road
Hawthorn, VIC 3122

Test Date:

22 June 2018

Testing. Advising. Assuring.

DOCUMENT REVISION STATUS

Date Issued	Issue No	Description
29/10/2018	54286200.1	Initial Issue

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GENERAL CONDITIONS OF USE

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Exova Warringtonfire

1 CONSTRUCTION DETAILS

TEST ASSEMBLY

The test assembly comprised a nominal 3000mm wide × 3000mm high × 208mm thick loadbearing panel wall system.

The wall was restrained at the bottom and was supported at the top with loading jacks. The north and south vertical edges were free from lateral restraint.

TEST SPECIMENS

The test specimen was comprised of 90mm × 45mm MGP 10 timber frame work with 22mm top hats on the exposed side and clad with 10mm regular plasterboard on the unexposed side. A layer of Ametalin SLIVERWRAP™ light duty sarking was installed between the top hat and the timber frame.

The cavity of the timber frame was filled with Knauf Earthwool insulation R2.0.

The Fenco panels were screw fixed to the top hats and had nominal 6mm ROCKCOTE® render applied on the exposed side.

The full description of the specimen is provided in Figures A1.1 to A1.4 and the 'Schedule of Components' in Section 2.

ASSEMBLY AND INSTALLATION METHODS

The wall system was constructed on the 13 April 2018 by the representatives of Australia Fenco Low Carbon Construction Pty LTD and completed on the 25 May 2018.

ORIENTATION

The wall system was asymmetrical as the Fenco panels and the ROCKCOTE® render were on the exposed side and the regular plasterboard on the unexposed side.

2 SCHEDULE OF COMPONENTS

Item	Description	
1	**Item Name**	Fenco panel
	Size	2400mm long × 600mm wide × 80mm thick (large) 680mm long × 600mm wide × 80mm thick (small)
	Density	383kg/m^3 (measured)
	Installation	The panels were oriented vertically; installed in a staggered formation on top of the top hat (item 4) and secured with screws (item 8). The screws (item 8) fixing were at nominal 90mm from the edges of the panel and at nominal 210mm at the centre of the board. The screw holes were covered with Dunlop Construction Grout (Item 10). The edges of the panel were secured together with Dunlop Construction Grout (item 11). The 6mm thick ROCKCOTE® Render (Item 3) was applied on the exposed side of the panel.
2	**Item Name**	Timber Framing (MGP 10)
	Size	90mm × 45mm
	Installation	The framing was comprised of 8-off timber studs, a top plate, a bottom plate and 14-off nogging. The timber elements were fixed together with 2-off framing nails (item 10) on each end. The studs were fixed to top and bottom plates at nominal 450mm centres and 240mm centres between last two studs on the north side. There were two layers of staggered noggings installed between the studs. The top layer was at nominal 2010mm and the bottom layer was at nominal 960mm above the sill. Extra metal nogging and timber nogging were installed on the timber frame for data gathering purpose. The metal nogging was located at mid-height between the 3rd and 4th stud from south edge. The timber nogging was located at mid-height between 6th and 7th stud from the south edge.
3	**Item Name**	ROCKCOTE® Render
	Product Name	ROCKCOTE® Pre-Blended Cement Render
	Thickness	6mm
	Installation	Applied on the exposed side of the Fenco Panel (Item 1).
4	**Item Name**	Top hat
	Product name	TOPSPAN® 22
	Dimension	30mm top × 22mm sidewall × 12mm flange × 61mm overall wide.
	Installation	6-off top hats were installed between the Fenco panels (item 1) and the timber frame (item 2) with a layer of Ametalin SLIVERWRAP™ light duty sarking (item 5) on top of the timber frame. The top hats were screwed to the studs at both top and bottom flange. The top hats were located 200mm, 400mm and 600mm away from the top and bottom timber plate.
5	**Item Name**	Ametalin SLIVERWRAP™ light duty sarking
	Installation	A layer of sarking was installed between the timber frame (item 2) and the top hat (item 3). The sarking was fixed to the timber frame with nails at nominal 300mm centres

Item	Description	
6	Item Name	Cavity Insulation
	Product name	Knauf Earthwool R2.0
	Size	580mm wide × 90mm thick
	Density	21kg/m^3 (measured)
	Installation	The insulation was inserted into the cavity of the of the timber frame (item 2).
7	Item	Unexposed cladding
	Product name	Gyprock Plus RE 10mm plasterboard
	Size	1200mm × 2400mm × 10mm
	Density	566kg/m^3 (measured)
	Installation	The plasterboard sheets were oriented horizontally and installed on the unexposed side of the specimen with screws (item 9). The screws were at nominal 400mm centres and 600mm centres. The exact location of the screws was shown on figure below:  The screw holes were covered by Base Coat. The board joints were covered with Base Coat and Paper tape (item 12).
8	Item name	Fenco panel fixing screws
	Product name	Timber Screws type 17 Batten, Bugle Head, Internal Hex Drive,
	Size	14 – 10 × 100mm
	Installation	Fixing the Fenco Panel (item 1) to the top hat (item 4) at nominal 210mm centres and 90mm from the edges of the panel.
9	Item name	Fixing screws
	Product name	Chipboard Screws Countersunk Rib Head, Phillips Drive
	Size	8 – 10 × 30mm
	Installation	Fixing top hat (item 4) to the timber frame (item 2) at nominal 450mm centres on top and bottom flange. Fixing the plasterboard (item 7) to the timber frame at nominal 400mm and 600mm centres.

Item	Description	
10	Item name	Framing nail
	Product name	Melbourne Nail Bright smooth shank Framing nail
	Size	Ø3.1mm × 75mm long
	Installation	Framing nails were used to fixing the timber framing (item 2) structure together. 2-off nails were used on each end of the timber.
11	Item name	Fenco board adhesive
	Product name	Dunlop Construction Grout
	Installation	The adhesive was applied between the Fenco panels (item 1) joints and over Fenco panel fixing screw locations
12	Item Name	Jointing Compound
	Product	Basecoat and jointing tape.
	Installation	Applied onto the plasterboard (item 7) joints and screw fixing locations on the unexposed side.

3 TEST PROCEDURE

STATEMENT OF COMPLIANCE

The test was performed in accordance with the requirements of AS1530.4- 2014 Sections 2 & 3 as appropriate for a loadbearing wall subject to the variations below.

VARIATIONS TO TEST METHOD

The furnace pressure was above the limits stated in AS 1530.4-2014, clause 2.11.3.1(c) by 2Pa between 30-35 minutes and 2Pa between 35-40 minutes. See table A5.2 for details.
The variation was caused by deterioration of the specimen. As the more onerous nature of the increase in pressure, it is unlikely to have invalidated the FRL result.

PRE-TEST CONDITIONING

The wall installation was completed on 25 May 2018. Test specimen was subjected to normal laboratory temperatures and conditions during this period.

SAMPLING / SPECIMEN SELECTION

The laboratory was not involved in the sampling or selection of the test specimen for the fire resistance test.

AMBIENT TEMPERATURE

The ambient temperature at the start of the test was 15°C and varied between 15°C and 16°C during the test.

TEST LOADING

The specimen was subjected to a total axial load of 4.4kN for the duration of the test. The load was applied through a 100PFC (24.5kg) on top of the specimen with two hydraulic jacks. The applied load at each hydraulic jack was 2.145kN, which also included a 3% increase in load for accuracy.

TEST DURATION

The test duration was 40 minutes.

INSTRUMENTATION AND EQUIPMENT

The instrumentation was provided in accordance with AS 1530.4-2014 and as detailed below:

The furnace temperature was measured by 9-off mineral insulated metal sheathed Type K thermocouples with wire diameters not greater than 1mm and overall diameter of 3mm with the measuring junction insulated from the sheath. The thermocouples protruded a minimum of 25mm from steel supporting tubes.

The non-fire side specimen temperatures were measured by Type K thermocouples with wire diameters less than 0.5mm soldered to 12mm diameter × 0.2mm thick copper discs covered by 30mm × 30mm × 2.0 mm inorganic insulating pads.

The temperature of the timber nogging, metal nogging and the hot hat were measured by Type K thermocouples with wire diameters less than 0.5mm soldered to 12mm diameter × 0.2mm thick copper discs.

The thermocouple positions are described in Table A4.1, and are shown on Figure A4.1 in Appendix 4.

A roving thermocouple was available to measure temperatures at positions that appeared hotter than the positions monitored by the fixed thermocouples.

The furnace pressure was measured at approximately 500mm above the base of the wall.

Cotton pad and gap gauges were available during the test to assess the performance under the criteria for integrity.

The load was applied though a 100PFC Parallel Flange Channel along the top edge of the specimen. The loading equipment was capable of measuring the load applied within an accuracy of ±2.5% of the test load.

Deflection measurements were taken from SICK BCG08-K1KM03PP Wire Draw Encoders at the positions shown of Figure A4.1 in Appendix 4.

4 TEST MEASUREMENTS

FURNACE TEMPERATURE AND PRESSURE MEASUREMENTS

Furnace temperature and pressure data are provided in Figure A5.1 and Table A5.1 in Appendix 5.

SPECIMEN TEMPERATURES

Specimen temperature data is provided in A 5.3 to Figure A5.10 and Table A5.2 in Appendix 5.

OBSERVATIONS

A table that includes observations of the significant behaviour of the specimen and details of the occurrence of the various performance criteria specified in AS 1530.4-2014 is provided in Appendix 2. Photographs of the specimen are included in Appendix 6.

5 TEST RESULTS

The specimen tested achieved the following performance with respect to the performance criteria listed in AS 1530.4-2005, Section 2 & 3.

Criteria	Result
Structural Adequacy	No failure at 40 minutes
Integrity	Failure at 34 minutes
Insulation	Failure at 34 minutes
FRL	30/30/30

6 APPLICATION OF TEST RESULTS

TEST LIMITATIONS

The results of this fire test may be used to directly assess fire hazard, but it should be recognized that a single test method will not provide a full assessment of fire hazard under all fire conditions. The results only relate to the behaviour of the specimen of the element of the construction under the particular conditions of the test; they are not intended to be the sole criteria for assessing the potential fire performance of the element in use nor do they necessarily reflect the actual behaviour in fires.

VARIATIONS FROM THE TESTED SPECIMENS

This report details the methods of construction, the test conditions and the results obtained when the specific element of construction described herein was tested following the general procedure outlined in AS1530.4. Any significant variation with respect to size, constructional details, loads, stresses, edge or end conditions, other than those allowed under the field of direct application in the relevant test method, is not addressed by this report. It is recommended that any proposed variation to the tested configuration other than as permitted under the field of direct application specified in Appendix 3 should be referred to the test sponsor in the first instance to obtain appropriate documentary evidence of compliance from Exova Warringtonfire Aus Pty Ltd or another Registered Testing Authority.

UNCERTAINTY OF MEASUREMENT

Because of the nature of fire resistance testing and the consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

Exova Warringtonfire

APPENDIX 1 DRAWINGS OF TEST ASSEMBLY

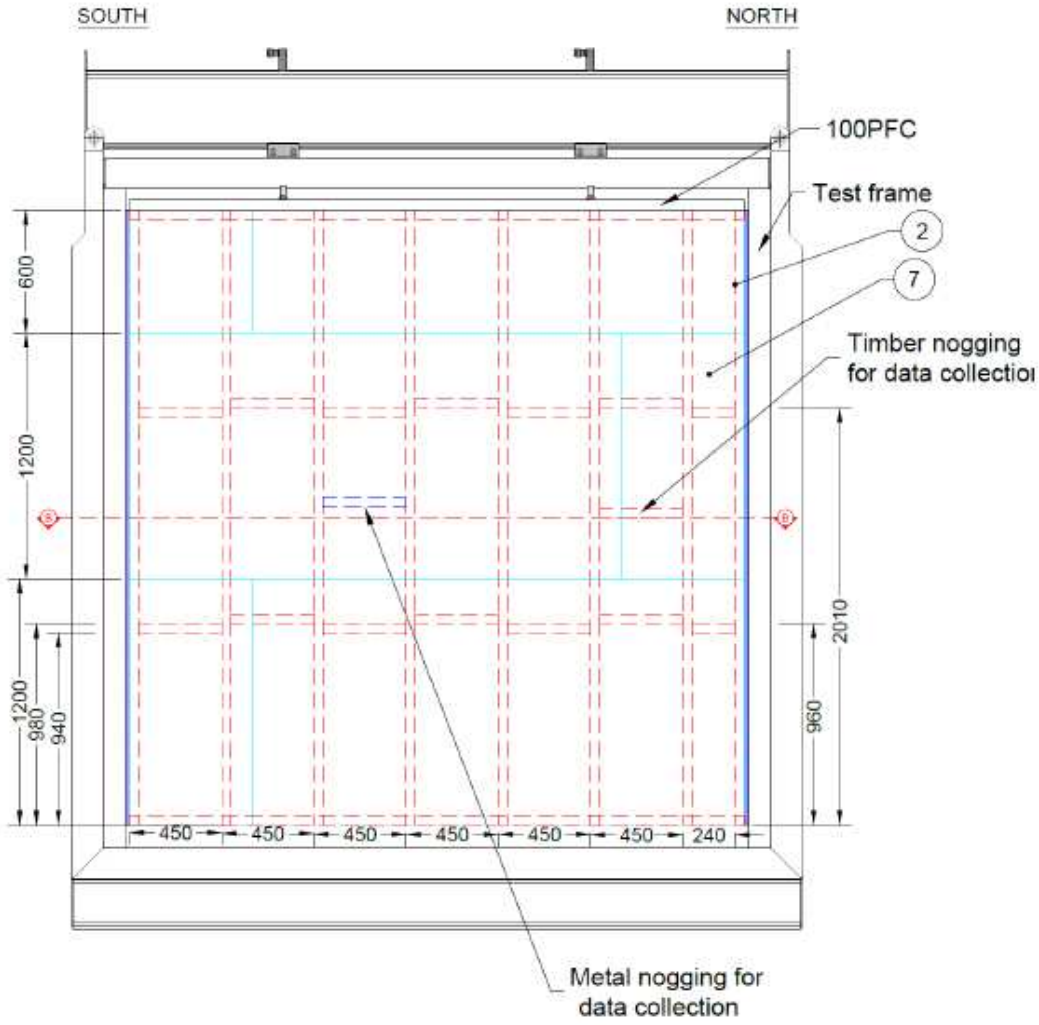


Figure A1.1: Elevation of Test Specimen (Unexposed side with timber frame shown)

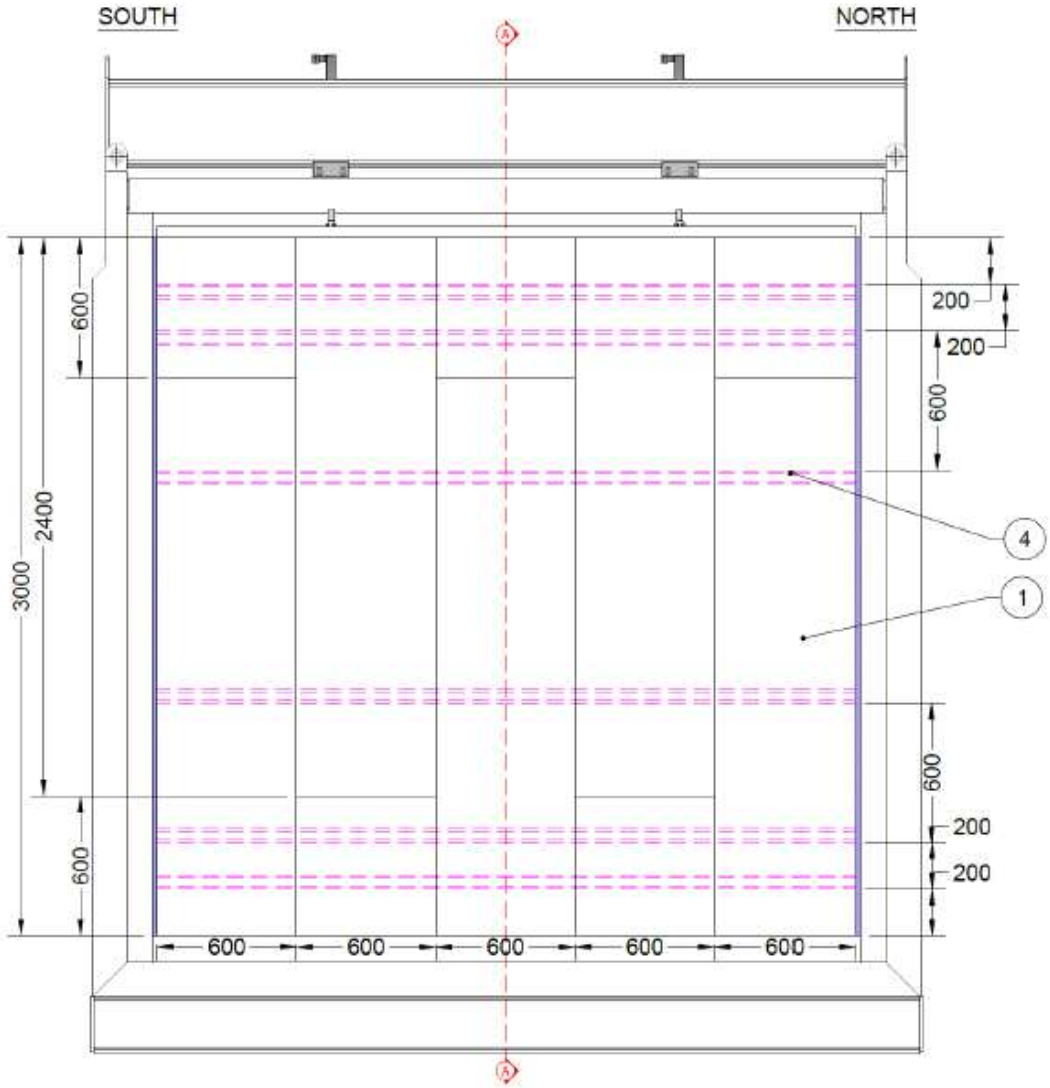


Figure A1.2: Elevation of Test Specimen (Exposed side without Render layer and with top hat shown)

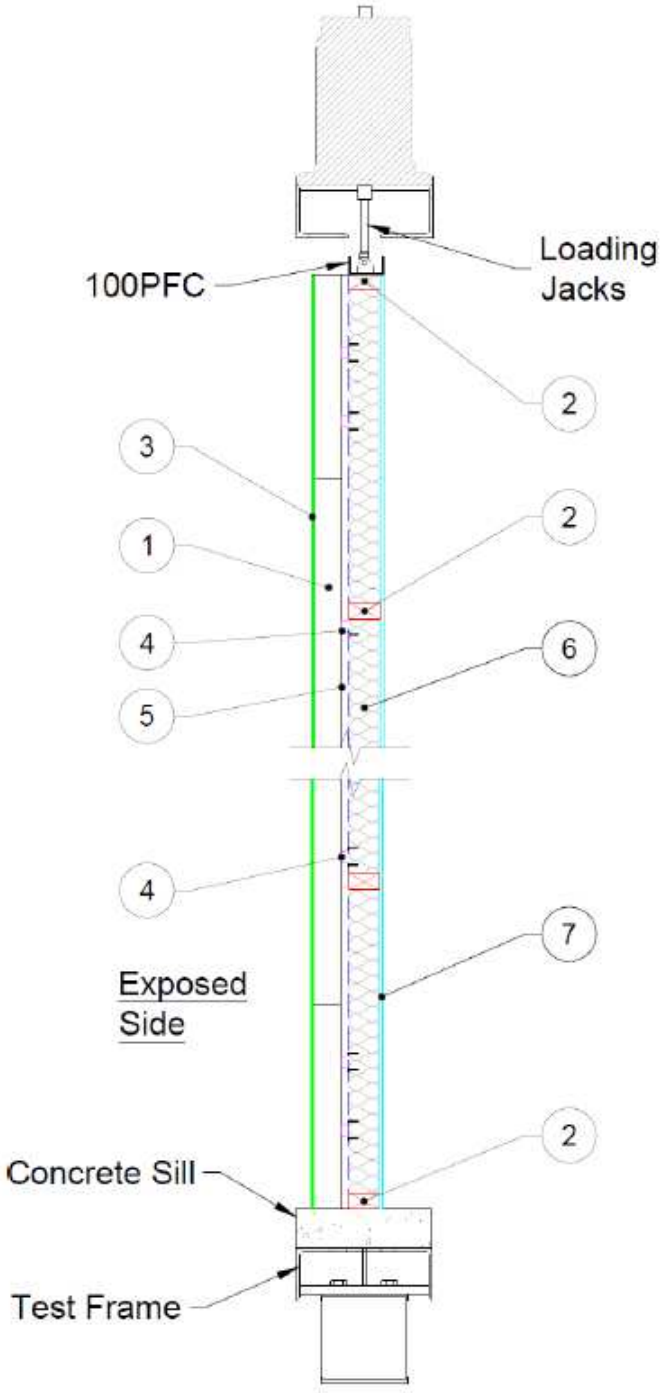


Figure A1.3: Vertical Cross-Section A-A

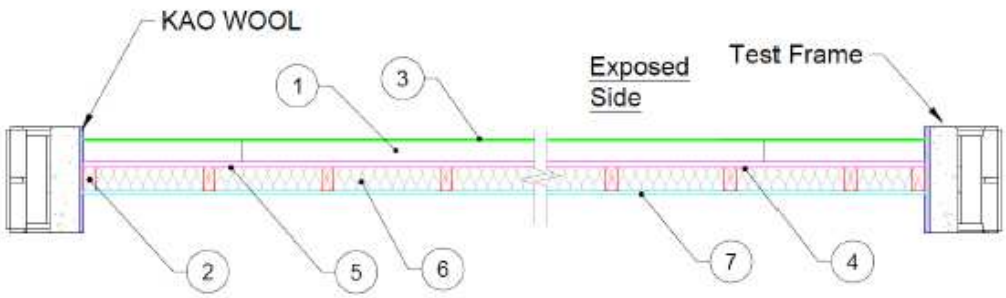


Figure A1.4: Horizontal Cross-Section B-B

APPENDIX 2 TEST OBSERVATIONS

The following include observations of the significant behaviour of the specimen.

Time		Observation
Min	sec	
-15	00	The required loading had applied to the specimen
00	00	Fire resistance test commenced and the average initial temperature of the specimen was approximately 15°C.
02	21	Intensive popping sounds could be heard from the furnace
07	39	The intensity of the popping sound had been reduced
30	00	The specimen had continued to maintain structural adequacy, integrity and insulation in accordance with AS 1530.4-2014
33	51	Crack appeared on the plasterboard next to the vertical joint near mid-height.
34	00	The crack at the mid-height near the vertical joint had opened up.
34	46	**A gap greater than 6mm × 150mm had become evident at the crack on the plasterboard at mid-height near the vertical joint. Failure of integrity in accordance with AS 1530.4-2014 clause 2.13.2.3 due to a gap greater than 6mm × 150mm gap opening up into the furnace.**
35	13	Flaming for greater than 10 seconds had become evident at the crack on the plasterboard at mid-height near the vertical joint. Integrity failure in accordance with AS 1530.4-2014 Clause 2.13.2.4 due to flaming for more than 10 seconds on the unexposed side.
40	00	Test stopped at the request of the sponsor.

APPENDIX 3 DIRECT FIELD OF APPLICATION

A 3.1 GENERAL

The results of the fire test contained in the test report are directly applicable, without reference to the testing authority, to similar constructions where one or more of the following changes have been made provided no individual component is removed or reduced:

a) Increased in the length of a wall of identical construction if the specimen was tested with one vertical edge unrestrained.
b) Increased in thickness of the wall.
c) For framed wall:
   I) Increased in timber density;
   II) Increase in cross-sectional dimensions of the framing element(s);
   III) Increase in steel thickness up to a maximum of 2mm;
   IV) Decrease in sheet or panel sizes;
   V) Decrease in stud spacing; or
   VI) Decrease in fixing centres of wall sheet materials.

APPENDIX 4 INSTRUMENTATION POSITIONS

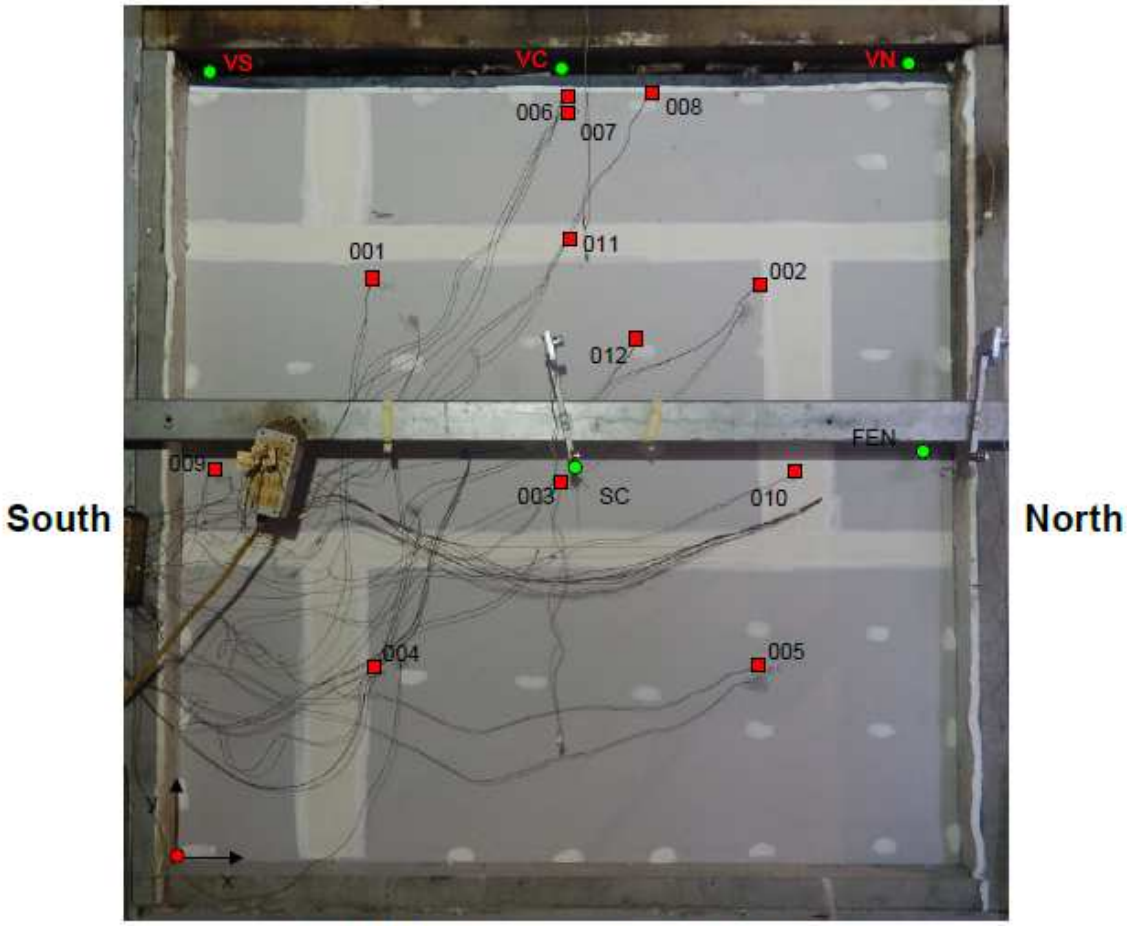


Figure A4.1: Unexposed surface thermocouple locations
Note: The green dots indicated deflection locations

Table A4.1: Thermocouple Locations

Location	T/C No.	x	y	Description
Qtr. points	001	750	2242	Upper south quarter point
	002	2250	2242	Upper north quarter point
	003	1500	1495	Centre of specimen
	004	750	747	Lower south quarter point
	005	2250	747	Lower north quarter point
Other Surface	006	1500	2975	At the head of the specimen, mid-width
	007	1500	2930	At the head of the specimen, mid width, below the timber track
	008	1830	2975	At the head of the specimen, in line with stud
	009	100	1495	Mid-height of the south free edge, 100mm from the edge
	010	2400	1495	Mid-height, 15mm from a vertical joint
	011	1500	2410	Mid-width, 15mm from the horizontal joint
	012	1785	2000	15mm away from the stud and nogging joint
Internal Qtr. point	021			Upper south quarter point on the unexposed side of the Fenco panel
	022			Upper north quarter point on the unexposed side of the Fenco panel
	023			Centre of specimen on the unexposed side of the Fenco panel
	024			Lower south quarter point on the unexposed side of the Fenco panel
	025			Lower north quarter point on the unexposed side of the Fenco panel
Top hat	031			On the side wall of the top hat
	032			On the top of the top hat
Metal nogging	033			On the exposed side flange
	034			On the Web
	035			On the unexposed side flange
Timber nogging	041			On the surface of the exposed side
	042			10mm deep away from the surface of the exposed side
	043			20mm deep away from the surface of the exposed side
	044			On the surface of the top side
	045			10mm deep away from the top side
	046			On the surface of the bottom side
	047			10mm deep away from the bottom side
	048			On the surface of the unexposed side

Table A4.2: Deflection Locations

Part of specimen	Ref.	x	y	Description
Horizontal	SC	1500	1500	Centre point of the specimen
	FEN	2950	1500	Mid-height of the North free edge, 50mm from the edge
Vertical	VN	50	3000	North base of the wall
	VC	1500	3000	Centre base of the wall
	VS	2950	3000	South base of the wall

APPENDIX 5 TEST DATA

A 5.1 FURNACE TEMPERATURE

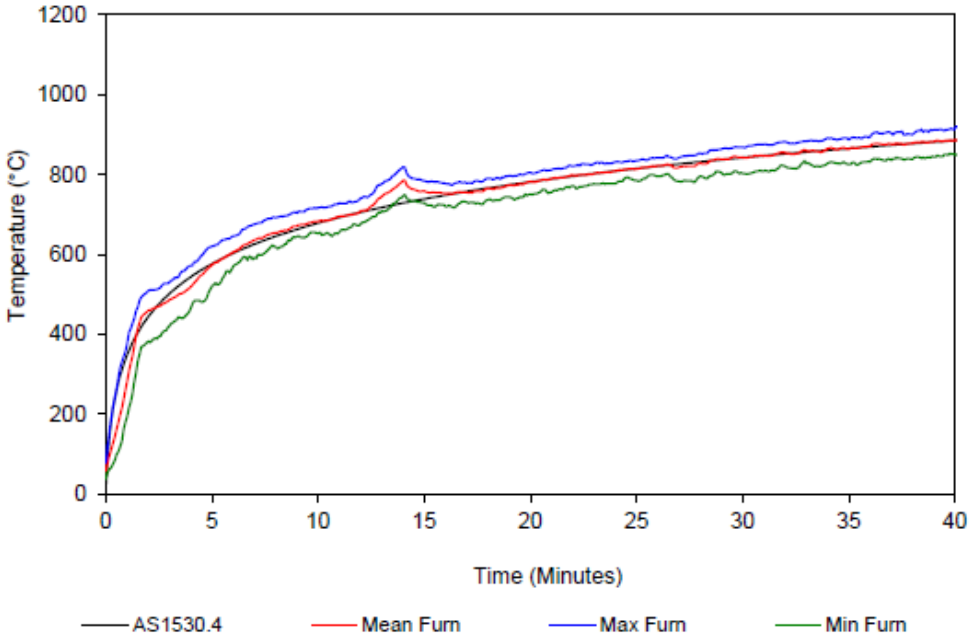


Figure A5.1: Furnace Temperatures vs. Time

A 5.2 FURNACE PRESSURE

The pressure was measured 500mm above the base of the wall.

Table A5.1: Pressure

Time (minutes)	Pressure (Pa) Avg.
5-10	1
10-15	0
15-20	1
20-25	1
25-30	5
30-35	4
35-40	0

A 5.3 SPECIMEN TEMPERATURES

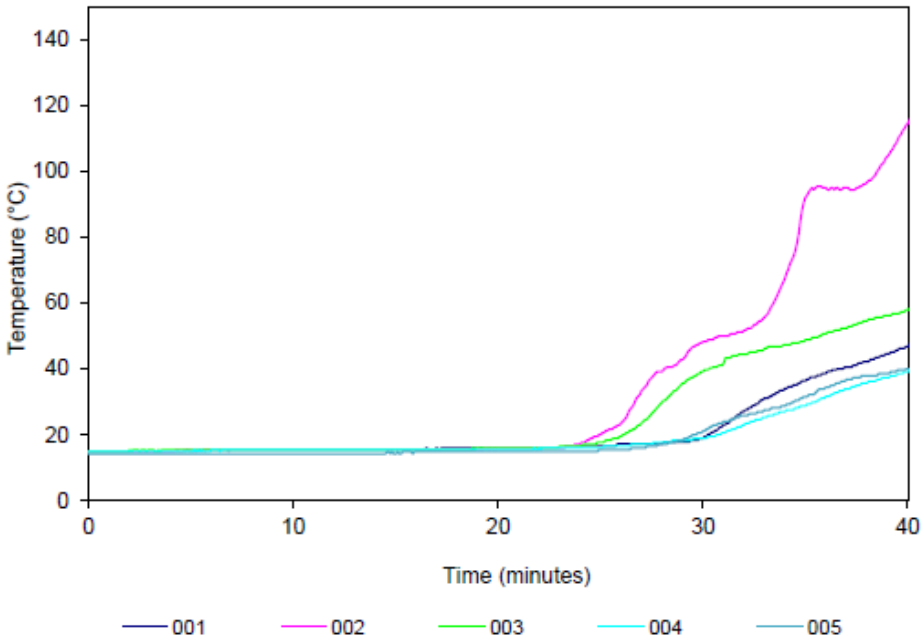


Figure A5.2: Quarter point and centre on unexposed face. Temperatures vs. time

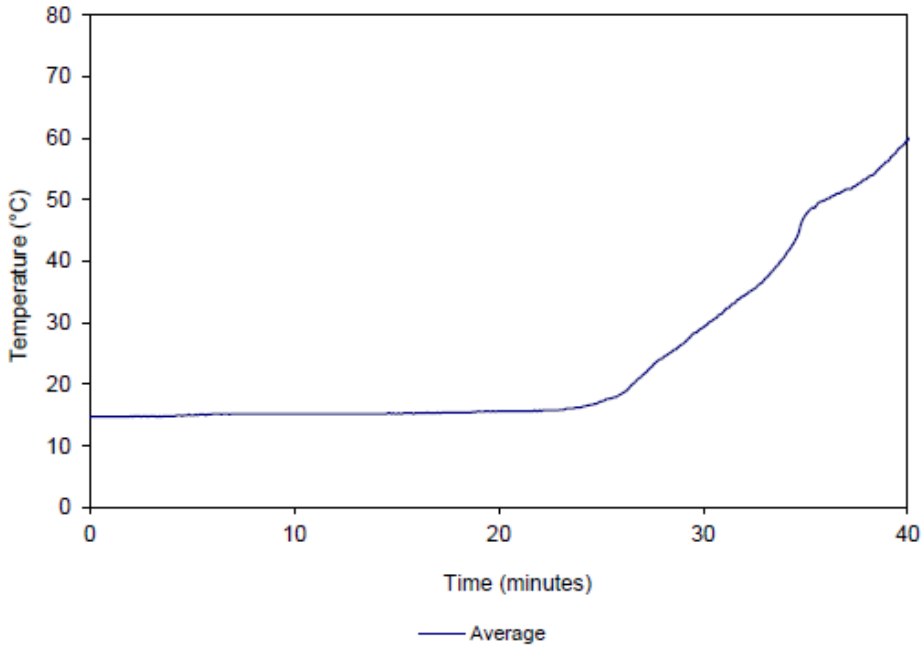


Figure A5.3: Average of Quarter point and centre on unexposed face. Temperatures vs. Time

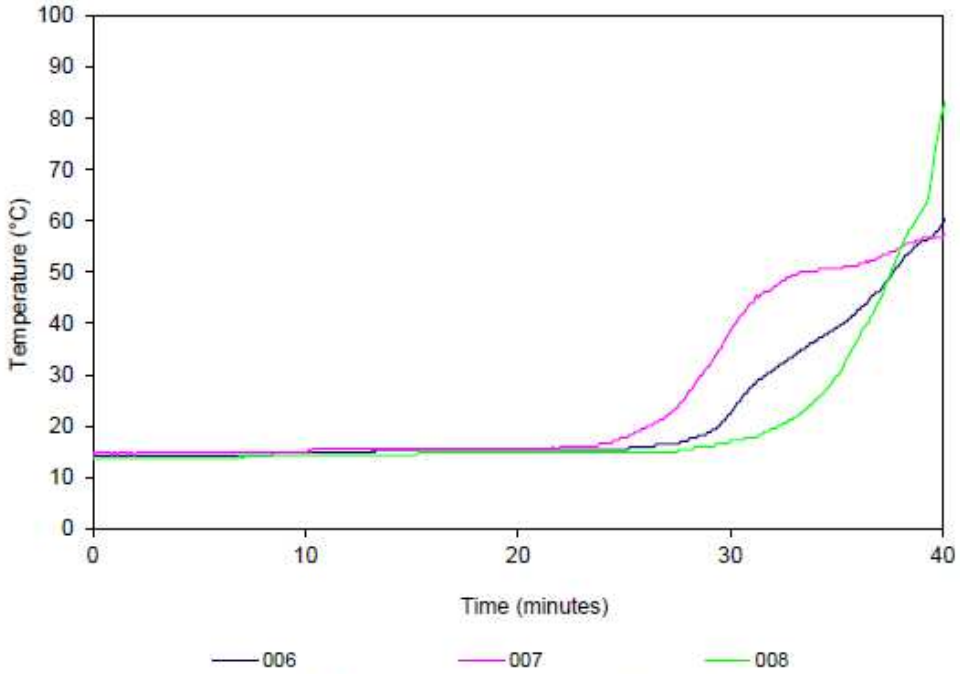


Figure A5.4: Other Surface - Head. Temperatures vs. time

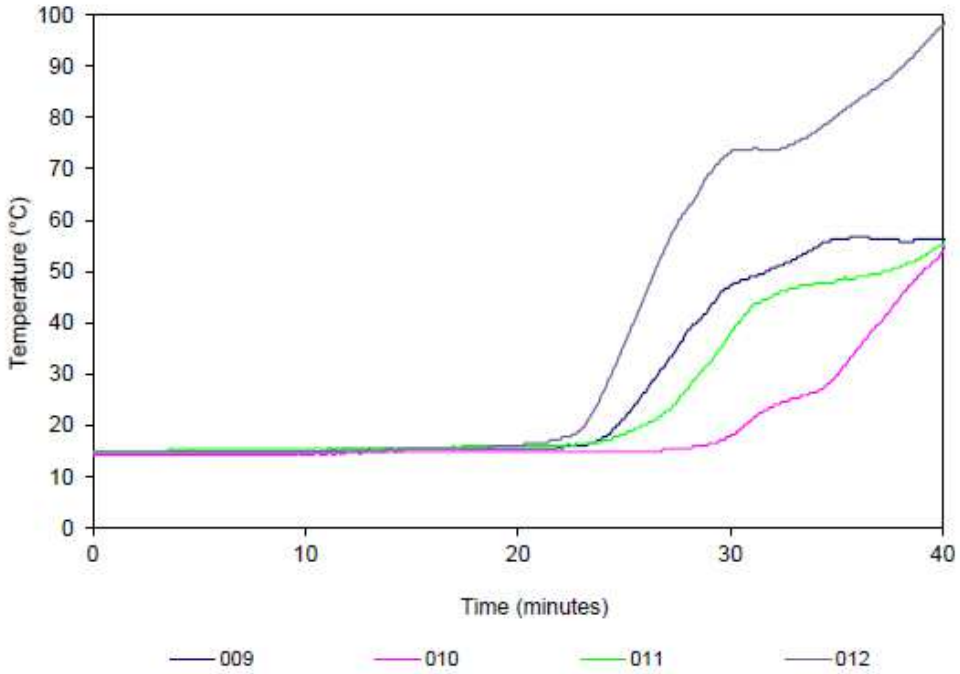


Figure A5.5: Other Surface - Vertical joint, Horizontal joint, nogging and stud, Free Edge. Temperatures vs. time

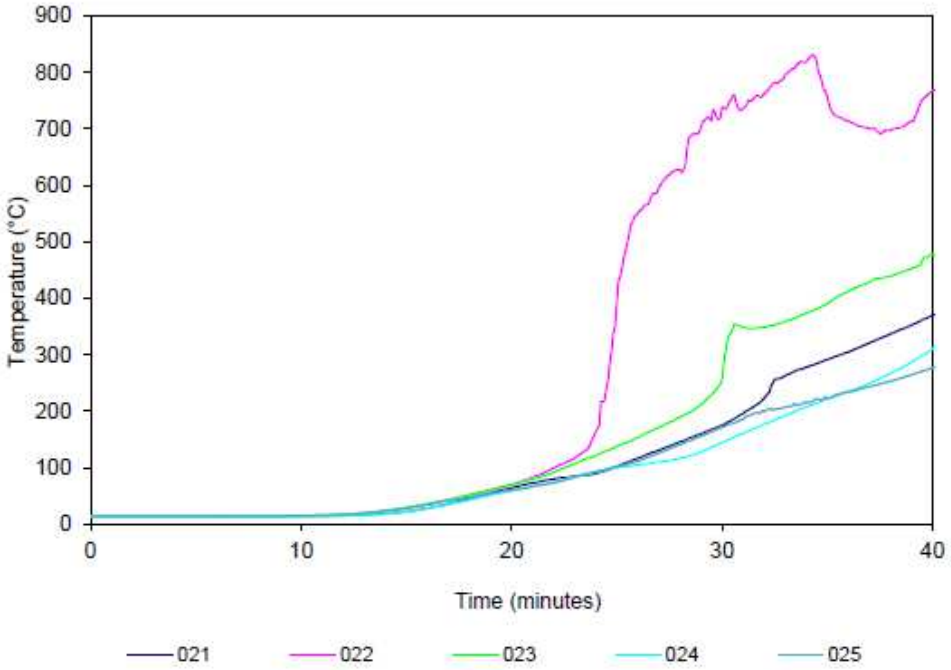


Figure A5.6: Internal structure – Centre and quarter point on the Fenco panel. Temperatures vs. time

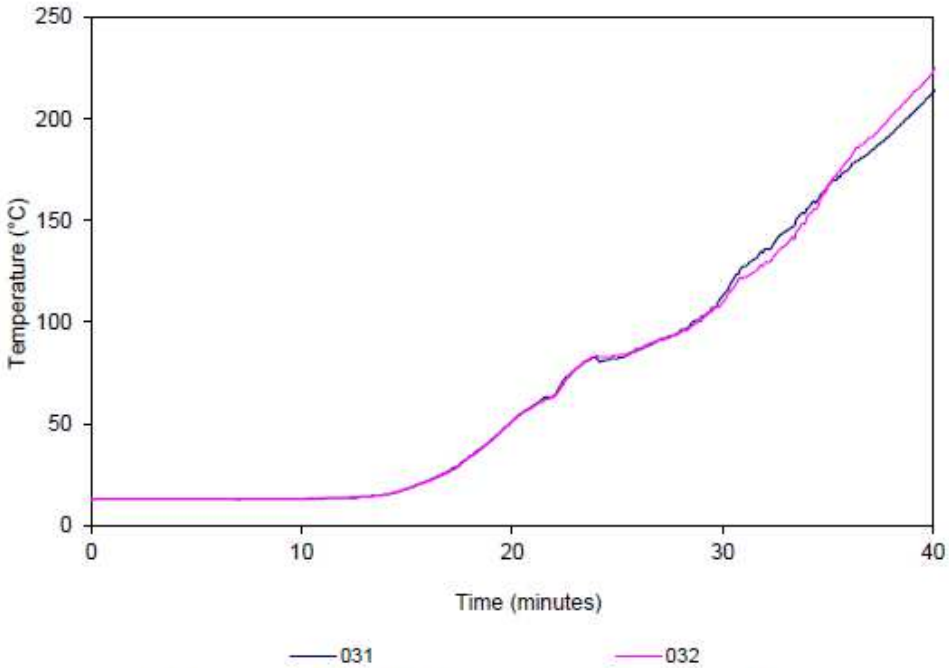


Figure A5.7: Internal structure – Top hat. Temperatures vs. time

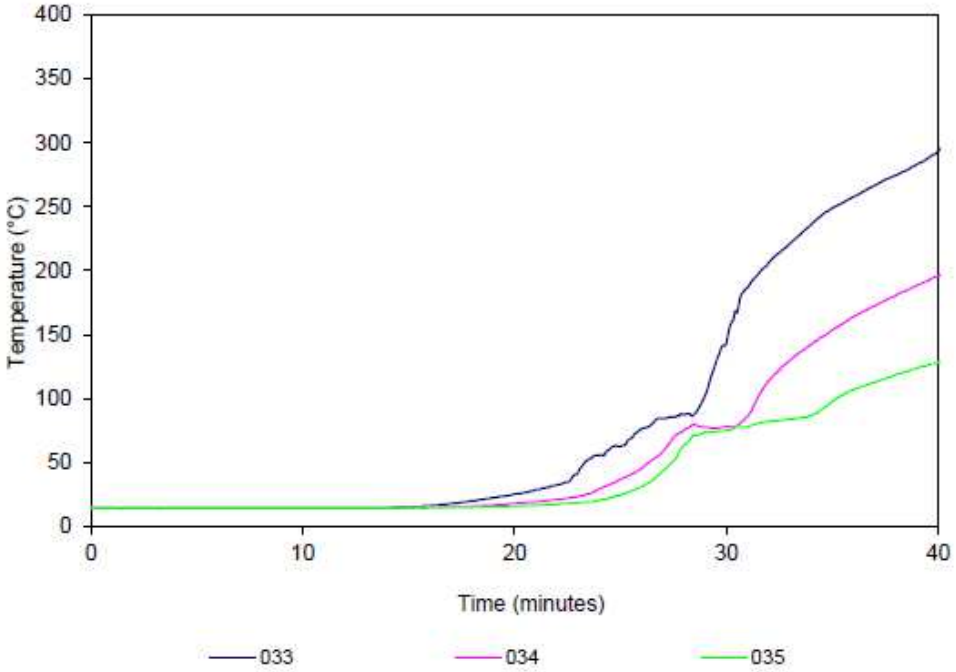


Figure A5.8: Internal structure – Metal nogging. Temperatures vs. time

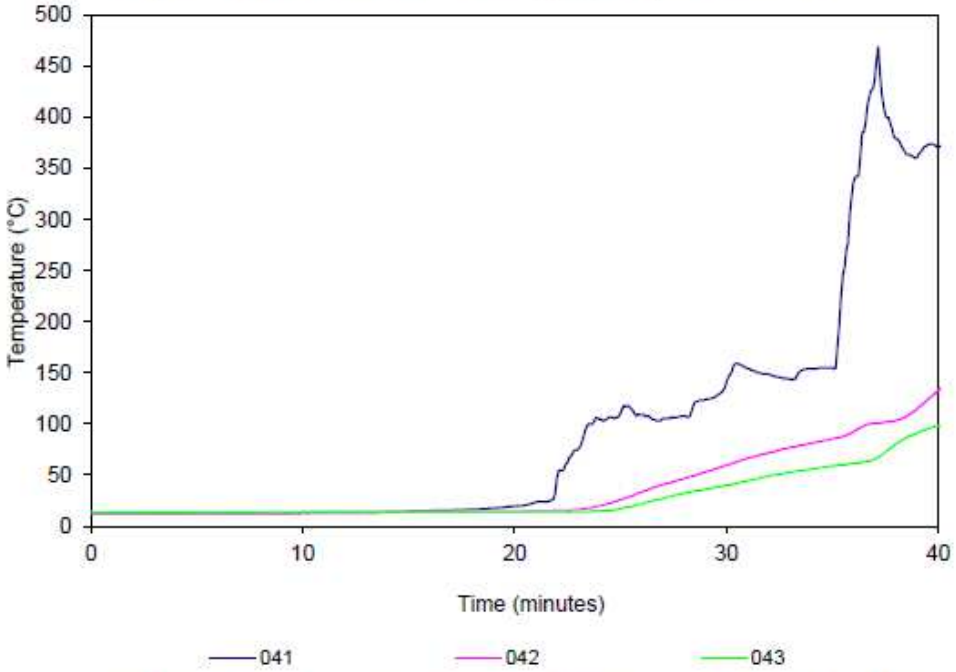


Figure A5.9: Internal structure – timber nogging on the exposed side. Temperatures vs. time

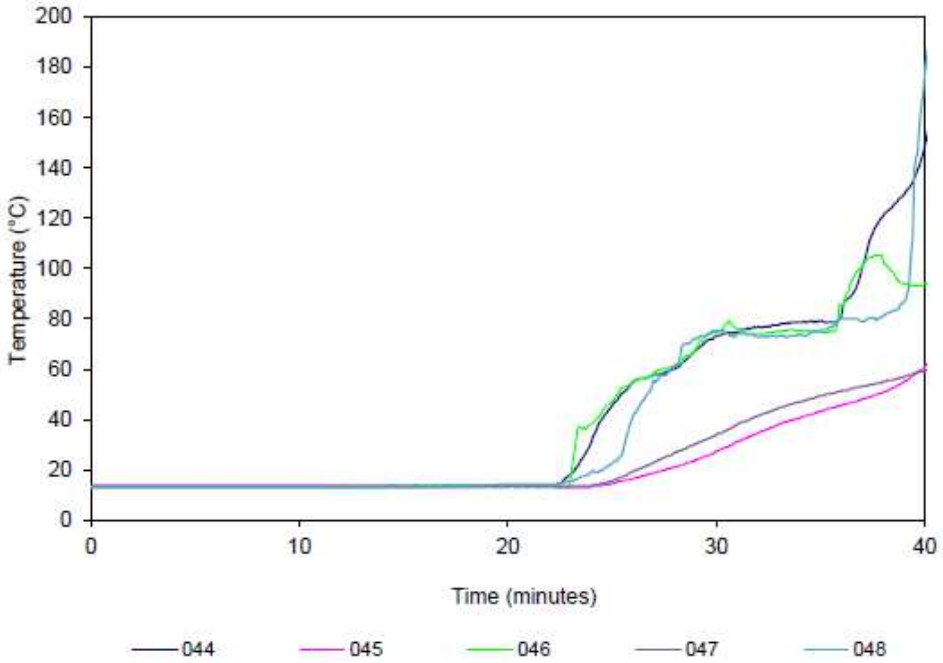


Figure A5.10: Internal structure – timber nogging on the top, bottom and unexposed side. Temperatures vs. time

Table A5.2: Test Specimen Temperatures

Location	T/C No.	Description[2]	Temp (°C) at t (minutes)					Limit[1] (Mins)
			t=0	t=10	t=20	t=30	t=40	
Qtr. points	001	Upper south quarter point	15	16	16	19	46	-
	002	Upper north quarter point	15	15	16	48	111	-
	003	Centre of specimen	15	15	16	39	57	-
	004	Lower south quarter point	15	15	15	19	39	-
	005	Lower north quarter point	14	14	15	21	40	-
Quarter point average			15	15	16	29	59	-
Other surface	006	At the head of the specimen, mid-width	14	15	15	22	58	-
	007	At the head of the specimen, mid width, below the timber track	15	15	16	39	57	-
	008	At the head of the specimen, in line with stud	14	14	15	17	74	-
	009	Mid-height of the south free edge, 100mm from the edge	15	15	16	47	56	-
	010	Mid-height, 15mm from a vertical joint	14	15	15	18	52	-
	011	Mid-width, 15mm from the horizontal joint	15	16	16	38	55	-
	012	15mm away from the stud and nogging joint	15	15	16	73	97	-
Internal Qtr. point	021	Upper south quarter point on the Fenco panel	14	15	62	175	364	NA
	022	Upper north quarter point on the Fenco panel	13	14	66	739	756	NA
	023	Centre of specimen on the Fenco panel	13	14	67	255	472	NA
	024	Lower south quarter point on the Fenco panel	13	13	57	145	302	NA
	025	Lower north quarter point on the Fenco panel	14	15	58	171	272	NA
Top hat	031	On the side wall of the top hat	13	13	48	113	210	NA
	032	On the top of the top hat	13	13	48	110	219	NA
Metal nogging	033	On the exposed side flange	14	14	24	143	289	NA
	034	On the Web	14	14	17	78	194	NA
	035	On the unexposed side flange	14	14	15	75	127	NA
Timber nogging	041	On the surface of the exposed side	13	13	19	140	373	NA
	042	10mm deep away from the surface of the exposed side	13	13	14	60	126	NA
	043	20mm deep away from the surface of the exposed side	14	14	14	40	96	NA
	044	On the surface of the top side	14	14	14	73	139	NA
	045	10mm deep away from the top side	14	14	14	28	59	NA
	046	On the surface of the bottom side	13	13	14	75	93	NA
	047	10mm deep away from the bottom side	13	13	13	34	59	NA
	048	On the unexposed side	13	13	14	75	146	NA

Notes

1 Limit time is the time to the nearest whole minute, rounded down to the nearest minute, at which the temperature recorded by the thermocouple does not rise by more than 180K above the initial temperature.

2 Refer to Appendix 4 for locations of thermocouples as only a generic description is included in the table.

Thermocouple failure.

'-' Under Limit column indicates the temperature limit was not exceeded during the test period or up until the time of integrity failure if a failure occurred.

A 5.4 DEFLECTIONS

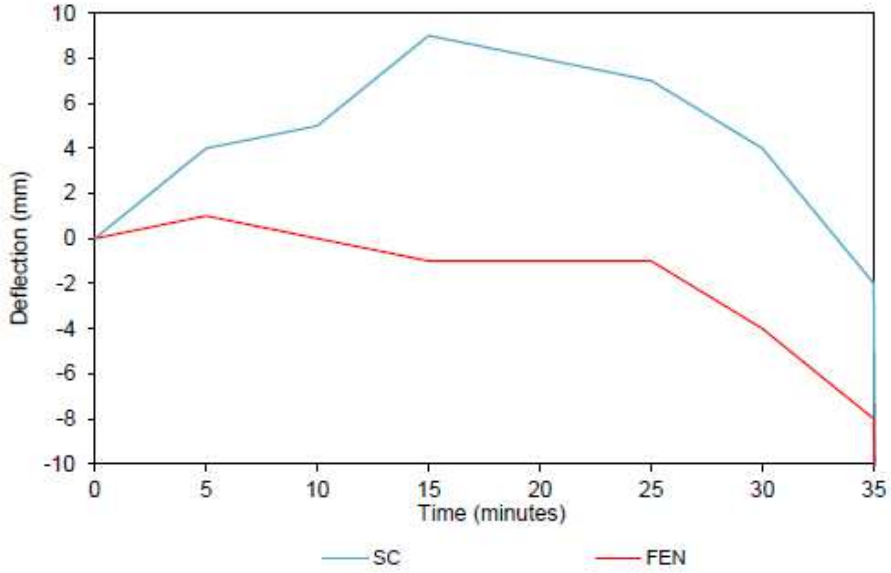


Figure A5.11: Deflection of the wall vs. Time (Horizontal Deflection)
Positive measurements show movement of the wall towards furnace
Negative measurements show movement of wall away from furnace.

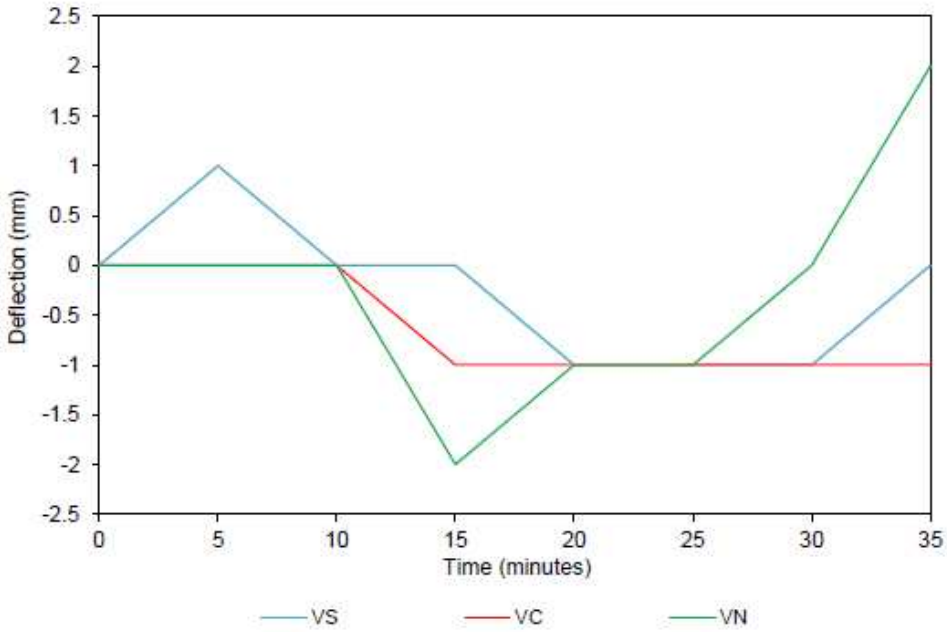
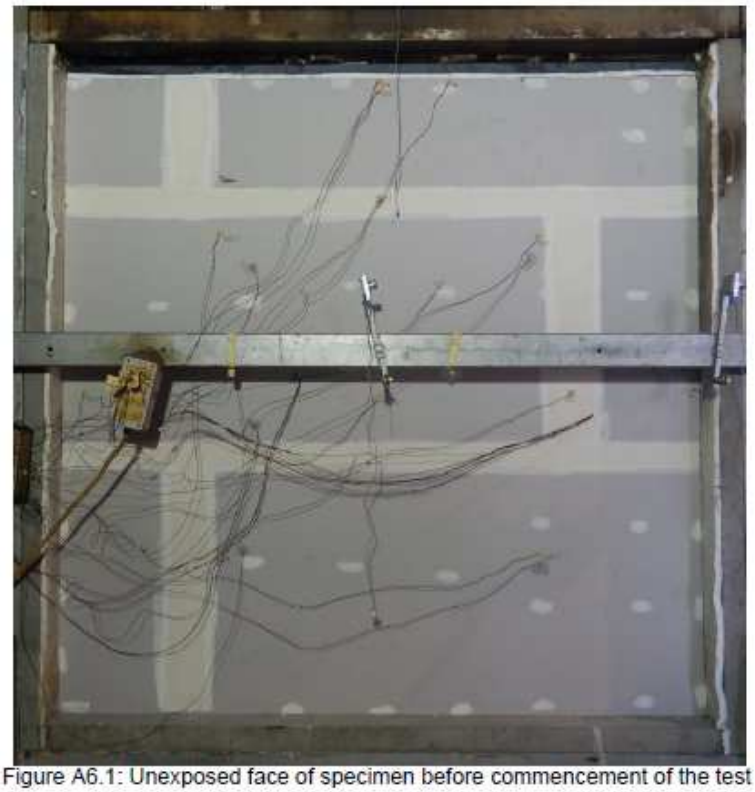


Figure A5.12: Deflection of the wall vs. Time (Vertical Deflection)
Negative measurements show movement of the base of the wall upwards
Positive measurements show movement of the base of wall downward

APPENDIX 6 PHOTOGRAPHS

South



North

Figure A6.1: Unexposed face of specimen before commencement of the test

North

South

Figure A6.2: Exposed face of specimen before commencement of the test

South

North

Figure A6.3: Unexposed face of specimen at the end of the test.

North

South

Figure A6.4: Exposed face of specimen at the end of the test.

10.5 ASTM C518 Thermal Conductivity

AWTA PRODUCT TESTING

Australian Wool Testing Authority Ltd - trading as AWTA Product Testing
A.B.N 43 006 014 106
1st Floor, 191 Racecourse Road, Flemington, Victoria 3031
P.O Box 240, North Melbourne, Victoria 3051
Phone (03) 9371 2400 Fax (03) 9371 2499

TEST REPORT

Client : Fenco Australia Low Carbon Construction Pty Ltd
132 Auburn Road
Hawthorn VIC 3122

Test Number : 19-000678
Issue Date : 14/02/2019
Print Date : 14/02/2019

Sample Description

Clients Ref : "Toco Lightweight Ceramic Wall Panelling"
Wall Panelling
Colour : Lt Grey
End Use : External Wall Cladding
Nominal Composition : Foamed Ceramic
Nominal Mass per Unit Area/Density : Approx: 380kg/m3
Nominal Thickness : 80mm

ASTM C518-2017 — **Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus**

Test Date		12/02/2019	
Test Apparatus		Lasercomp Fox 600	
Sample Orientation		Horizontal	
Heat Flow Direction		Up	
Mean Test Temperature		23	°C
Temperature Differential		20	°C
Average Thermal Gradient		245.1	K/m
Estimated uncertainty in results		3.9	%
Specimen	1	2	
Specimen Thickness (as received)	81	81	mm
Specimen Thickness (as tested)	81	81	mm
Specimen Density (as tested)	427	420	kg/m³
Test Duration	02:00	01:42	hrs:mins

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NATA Accredited for compliance with ISO/IEC 17025 - Testing
- Chemical Testing : Accreditation No. 983
- Mechanical Testing : Accreditation No. 985
- Performance & Approvals Testing : Accreditation No. 1356

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APPROVED SIGNATORY

AWTA LIMITED

MICHAEL A. JACKSON B.Sc.(Hons)
MANAGING DIRECTOR

0204/11/06

AWTA PRODUCT TESTING

Australian Wool Testing Authority Ltd - trading as AWTA Product Testing
A.B.N 43 006 014 106
1st Floor, 191 Racecourse Road, Flemington, Victoria 3031
P.O Box 240, North Melbourne, Victoria 3051
Phone (03) 9371 2400 Fax (03) 9371 2499

TEST REPORT

Client : Fenco Australia Low Carbon Construction Pty Ltd
132 Auburn Road
Hawthorn VIC 3122

Test Number : 19-000678
Issue Date : 14/02/2019
Print Date : 14/02/2019

Measured Heat Flux	45.3	44.2	W/m²
Measured Thermal Conductance	0.2267	0.2209	W/m²K
Measured Thermal Conductivity	0.1847	0.1805	W/m.K
Thermal Resistance	0.44	0.45	m²K/W

The calibration of the Heat Flow Apparatus was checked immediately prior to the commencement of the test.

156332 33976 Page 2 of 2

NATA Accredited for compliance with ISO/IEC 17025 - Testing
- Chemical Testing : Accreditation No. 983
- Mechanical Testing : Accreditation No. 985
- Performance & Approvals Testing : Accreditation No. 1356

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AWTA LIMITED

0204/11/06

APPROVED SIGNATORY

MICHAEL A. JACKSON B.Sc.(Hons)
MANAGING DIRECTOR

11 Appendix E: Engineering & Other Documentation

11.1 Bushfire Assessment (BAL based on FRL)

cameron@acronem.com.au

From: Kim <kiyuenc@gmail.com>
Sent: Wednesday, 15 January 2020 10:18 AM
To: Cameron Chick
Cc: zhaozancheng123@gmail.com
Subject: Fwd: Fenco Panel - Bush Fire Assessment

Hi Cameron,

Please refer below comments below by Ignis confirming the fire report is conforming and suitable for construction in all fire prone areas.

Kind Regards,

Kim Chan
Architect 20199
M 0490374799

---------- Forwarded message ---------
From: **Brad | Ignis Solutions** <brad@ignissolutions.com.au>
Date: Tue, Jan 14, 2020 at 10:06 AM
Subject: RE: Fenco Panel - Bush Fire Assessment
To: kiyuenc@gmail.com <kiyuenc@gmail.com>
Cc: zhaozancheng123@gmail.com <zhaozancheng123@gmail.com>, Wesley | Ignis Solutions <wesley@ignissolutions.com.au>

Hi Kim,

I tried to call you to discuss the below but for some reason the call is not going through.

AS 3959 Clause 3.4 details that construction requirements specified for a particular BAL are acceptable for a lower level BAL. As you have detailed, the proposed wall system achieves and FRL of 30/30/30 which is suitable for BAL FZ. Based on Clause 3.4, this product would then also be suitable for BAL 19.

3.4 HIGHER LEVELS OF CONSTRUCTION

The construction requirements specified for a particular BAL shall be acceptable for a lower level.

NOTE: For example, if the site has been assessed at BAL—12.5, BAL—12.5 construction is required; however any element or combination of elements contained in BAL—19, BAL—29, BAL—40 and BAL—FZ levels of construction may be used to satisfy this Standard.

Does this resolve your issue?

1

Please feel free to contact me if you would like to discuss.

Kind Regards,

Brad Robson | Fire Safety Engineer | Ignis Solutions

Ignis Solutions | Unit 8 14 Lonsdale Street Braddon ACT 2612 | T: (02) 6100 3900

Ignis Labs | 3 Cooper Place Queanbeyan NSW 2620 | T: (02) 6111 2909

PO Box 5174 Braddon ACT 2612 | Web: www.ignissolutions.com.au | www.ignislabs.com.au

Email: brad@ignissolutions.com.au

Ignis is a member of LIVE Group International.

Canberra | Queanbeyan | Dubai | Sydney | Toronto

GOLD MEMBER
FPA AUSTRALIA Fire Protection Association Australia

From: Kim <kiyuenc@gmail.com>
Sent: Friday, 10 January 2020 3:30 PM
To: Wesley | Ignis Solutions <wesley@ignissolutions.com.au>
Cc: mail@ignissoultions.com.au; zhaozancheng123@gmail.com
Subject: Fenco Panel - Bush Fire Assessment

Hi Wesley,

It was nice talking to you on the phone today.

As discussed, our product Fenco Panel is looking to get an assessment to confirm compliant in bush fire construction. We have done a fire resistance test in accordance with AS1530.4-2014 which result in 30/30/30 FRL, however as AS3959 Construction of Buildings in Bushfire Prone Areas require -

Section 6 (BAL 19 - Moderate) Clause 6.1 allows for any element of construction that satisfies the test criteria of AS 1530.8.1 to be used in lieu of the requirements (ie. for External Walls, Clause 6.4).

Section 9 (BAL FZ - Extreme) Clause 9.4 allows external walls that achieve an FRL of 30/30/30 to be used.

Are you able to make an assessment endorsing its compliance in bush fire zone?

I have attached the following for your reference-

1. Exova Fire Resistance Report

2. Fenco Technical and Installation Manual

3. Fenco Certificate of compliance

Should you require any further information do not hesitate to contact me directly.

Regards,

Kim Chan

Architect

0490374799

3

11.2 Wind Load Tables

2/03/2021 Acronem Consulting Australia Designed: CGC
Checked: CGC

Screw Pull out/through

Test Load	4.4 kPa	2018-116-S2
Vsc=	15 %	connection strength
kt	1.34	many screws tested
Design	3.28 kPa	
3 fixings per 600mm width	200 mm	each
Average batten spacing	450 mm	
Screw Trib Area	0.09 m2	
Screw design strength	**0.296 kN**	

Panel Bending Strength by test (not to failure) 2018-116-S2

Fixed end moment span	550 mm	
Test Load	4.4 kPa	2018-116-S2
Vsc=	10 %	member strength
kt	1.46	single test
Design (w)	3.01 kPa	
Mmax. = wl2/12	0.076 kNm / m-width	

INTERMEDIATE DESIGN LIMITATIONS BASED ON STRENGTH

Wind Class	N1		N2		N3		N4	
	Away From Corners	Within 1200mm of Corners	Away From Corners	Within 1200mm of Corners	Away From Corners	Within 1200mm of Corners	Away From Corners	Within 1200mm of Corners
Design pressure (kPa)	0.62	0.94	0.86	1.3	1.35	2.03	2.01	3.01
Max.Tophat spacing (mm)	1213	985	1030	837	822	670	673	550
No. Screws/top-hat	3	3	3	3	3	3	3	4
Min. No. top-hats/panel	3	3	3	4	4	4	4	5
Note: Panels up to 950mm length may be supported by min. 2 top-hats per panel, with max. top-hat spacing 450mm.								

shear load per 14G screw through the panel =5kg (2.4x0.6x80mmx380kg/m3 = 44kg), min 9 screws/panel

Min. 2 top hats per panel for panels shorter than 800mm
Mmax. = wl2/8 0.07597
Max spacing = 449 mm
Therefore, max. panel length for 2 top-hats is 250+450+250 = 950mm limited by bending only
PRACTICAL DESIGN LIMITATIONS, accounting for panel length and panel overhang

AS 4055 Wind Class	**N1**		**N2**		**N3**		**N4**	
	Away From Corners	Within 1200mm of Corners	Away From Corners	Within 1200mm of Corners	Away From Corners	Within 1200mm of Corners	Away From Corners	Within 1200mm of Corners
Design pressure (kPa)	0.62	-0.94	0.86	-1.3	1.35	-2.03	2.01	-3.01
Max.Tophat spacing (mm)	1100	950	1000	750	750	650	650	550
No. Screws/top-hat	3	3	3	3	3	3	3	4
Min. No. top-hats/panel	3	3	3	4	4	4	4	5
Note: Panels up to 800mm length may be supported by min. 2 top-hats per panel, with max. top-hat spacing 450mm.								

Top Hat and fixing spacing for Wind Classifications 2018-116-S2 201005Fenco Panel Wind Table

11.3 Total R-value Calculations

OVERALL "TOTAL R" (THERMALLY BRIDGED) THERMAL PERFORMANCE CALCULATIONS TO AS/NZS 4859 Parts 1 & 2:2018

The following calculations by James M Fricker Pty Ltd are based upon:

a) AS/NZS 4859.1:2018 "Thermal insulation materials for buildings. Part 1: General criteria and technical provisions",

b) AS/NZS 4859.2:2018 "Thermal insulation materials for buildings. Part 2: Design",

c) the Australian Institute of Refrigeration Air-conditioning & Heating (AIRAH) Handbook (Edition 5, 2013), and (if necessary) the ASHRAE Fundamentals Handbook.

Initial results report Total R for each thermal path. These results are combined by area weighting and isothermal planes method to deduce **Overall Surface Total R**. This is per AS/NZS 4859.2:2018 Clause 4.3 – *"A total resistance associated with a construction of materials, computed or measured over an area sufficient to be fully representative of the element of construction, and specified as a Total R-value, including surface film resistances and thermal bridging."*

Total R-values are based on product in-service conditions in accordance with AS/NZS 4859.2:2018 including the alteration of insulation Material R for temperature, and Air Space R for temperature and infrared emittance.

Each calculation result is subject to any specific notes and assumptions listed on the calculation.

If a construction differs from the described system, the thermal resistance may be different.

All calculations were done by James M Fricker, F.AIRAH F.IEAust CPEng NER APEC Engineer IntPE(Aus)

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THERMAL INSULATION EVALUATION BY CALCULATION

JMF Calc Ref: 367w05

80MM FENCO TOCO PANEL SYSTEM with horizontal tophats, permeable wrap, 90mm R2.70 bulk insulation, and pine studs at 600mm centres (10mm plasterboard)

(i) Insulation/gap path:- 4mm render, 80mm FENCO TOCO PANEL, 24mm unreflective still air space, permeable single-sided reflective wrap, 90mm R2.70 bulk insulation, 10mm plasterboard

	Wall section elements	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
	Outside air film	0.040	**12.00**	12.07	12.03	0.07	0.040	**36.00**	35.86	35.93	0.14	cavity		
	4mm render	0.013	12.07	12.09	12.08	0.02	0.013	35.86	35.82	35.84	0.05			4
(a)	80mm FENCO TOCO PANEL	0.440	12.09	12.81	12.45	0.72	0.440	35.82	34.29	35.05	1.53			80
	24mm unreflective still air space	*0.187*	12.81	**13.12**	12.97	0.31	*0.158*	34.29	33.74	34.01	0.55	0.87	0.87	24
	permeable single-sided reflective wrap	0.000	13.12	13.12	13.12	0.00	0.000	33.74	33.74	33.74	0.00			0
(b)	90mm R2.70 bulk insulation	2.789	13.12	17.71	15.41	4.59	2.629	33.74	24.62	29.18	9.12			90
	10mm plasterboard	0.059	17.71	17.80	17.75	0.10	0.059	24.62	24.42	24.52	0.20			10
	Indoor still air film	0.120	17.80	**18.00**	17.90	0.20	0.120	24.42	**24.00**	24.21	0.42	0.87		208
	(i) Insulation/gap path (82.7%), Total R, R_{Ti} =	**3.65**	winter				**3.46**	summer		**3.55**	AVG			

(ii) Insulation/tophat path:- 4mm render, 80mm FENCO TOCO PANEL, steel tophat (38mm x 24mm, 0.42mm BMT), permeable single-sided reflective wrap, 90mm R2.70 bulk insulation, 10mm plasterboard

	Wall section elements	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
	Outside air film	0.040	**12.00**	12.07	12.03	0.07	0.040	**36.00**	35.86	35.93	0.14	cavity		
	4mm render	0.013	12.07	12.09	12.08	0.02	0.013	35.86	35.81	35.83	0.05			4
(a)	80mm FENCO TOCO PANEL	0.440	12.09	12.84	12.47	0.75	0.440	35.81	34.23	35.02	1.58			80
	steel tophat (38mm x 24mm, 0.42mm BMT)	0.044	12.84	**12.92**	12.88	0.07	0.044	34.23	34.07	34.15	0.16			24
	permeable single-sided reflective wrap	0.000	12.92	12.92	12.92	0.00	0.000	34.07	34.07	34.07	0.00			0
	90mm R2.70 bulk insulation	2.791	12.92	17.69	15.31	4.77	2.627	34.07	24.64	29.36	9.43			90
	10mm plasterboard	0.059	17.69	17.79	17.74	0.10	0.059	24.64	24.43	24.54	0.21			10
	Indoor still air film	0.120	17.79	**18.00**	17.90	0.21	0.120	24.43	**24.00**	24.22	0.43	0.87		208
	(ii) Insulation/tophat path 5.2%), Total R, R_{Tii} =	**3.51**	winter				**3.34**	summer		**3.43**	AVG			

(iii) Frame/tophat path:- 4mm render, 80mm FENCO TOCO PANEL, steel tophat (38mm x 24mm, 0.42mm BMT), permeable single-sided reflective wrap, pine frame (90mm x 45mm), 10mm plasterboard

	Wall section elements	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
	Outside air film	0.040	**12.00**	12.15	12.07	0.15	0.040	**36.00**	35.70	35.85	0.30	cavity		
	4mm render	0.013	12.15	12.20	12.17	0.05	0.013	35.70	35.60	35.65	0.10			4
(a)	80mm FENCO TOCO PANEL	0.440	12.20	13.83	13.01	1.63	0.440	35.60	32.34	33.97	3.27			80
	steel tophat (38mm x 24mm, 0.42mm BMT)	0.044	13.83	**13.99**	13.91	0.16	0.044	32.34	32.01	32.17	0.32			24
	permeable single-sided reflective wrap	0.000	13.99	13.99	13.99	0.00	0.000	32.01	32.01	32.01	0.00			0
(b)	pine frame (90mm x 45mm)	0.900	13.99	17.34	15.66	3.34	0.900	32.01	25.33	28.67	6.68			90
	10mm plasterboard	0.059	17.34	17.55	17.44	0.22	0.059	25.33	24.89	25.11	0.44			10
	Indoor still air film	0.120	17.55	**18.00**	17.78	0.45	0.120	24.89	**24.00**	24.45	0.89	0.87		208
	(iii) Frame/tophat path (0.4%), Total R, R_{Tiii} =	**1.62**	winter				**1.62**	summer		**1.62**	AVG			

(iv) Frame/gap path:- 4mm render, 80mm FENCO TOCO PANEL, 24mm unreflective still air space, permeable single-sided reflective wrap, pine frame (90mm x 45mm), 10mm plasterboard

	Wall section elements	m².K/W	°C out	°C in	°C avg	Δt	m².K/W	°C out	°C in	°C avg	Δt	e1	e2	mm
	Outside air film	0.040	**12.00**	12.14	12.07	0.14	0.040	**36.00**	35.72	35.86	0.28	cavity		
	4mm render	0.013	12.14	12.18	12.16	0.05	0.013	35.72	35.63	35.68	0.09			4
(a)	80mm FENCO TOCO PANEL	0.440	12.18	13.68	12.93	1.50	0.440	35.63	32.58	34.11	3.05			80
	24mm unreflective still air space	*0.186*	13.68	**14.32**	14.00	0.63	*0.161*	32.58	31.47	32.03	1.11	0.87	0.87	24
	permeable single-sided reflective wrap	0.000	14.32	14.32	14.32	0.00	0.000	31.47	31.47	31.47	0.00			0
	pine frame (90mm x 45mm)	0.900	14.32	17.39	15.85	3.07	0.900	31.47	25.24	28.35	6.23			90
	10mm plasterboard	0.059	17.39	17.59	17.49	0.20	0.059	25.24	24.83	25.04	0.41			10
	Indoor still air film	0.120	17.59	**18.00**	17.80	0.41	0.120	24.83	**24.00**	24.42	0.83	0.87		208
	(iv) Frame/gap path (11.7%), Total R, R_{Tiv} =	**1.76**	winter				**1.73**	summer		**1.75**	AVG			

OVERALL TOTAL R with pine framing at 600mm centres

Overall Total Thermal Resistance, R_T =	3.20 winter	3.07 summer	3.13	AVERAGE
Overall Total Conductance*, U_T =	0.312 winter	0.326 summer	0.319	AVERAGE

NOTES: **Determinations based upon AS/NZS 4859 Parts 1&2:2018, Thermal insulation materials for buildings.**
The above estimates the resulting (overall) Total R for the whole wall surface (excluding glazing) from the parallel heat paths.
The results are believed representative at the date of calculation, however the author reserves the right to revise calculations.
Overall resulting Total R per AS/NZS 4859.2:2018 Clause 4.3. Total Conductance (U) calculated by U=1/R. Total R & U values include indoor and outdoor air films.
Insulation R adjusted for its mean temperatures for 18°C indoors and 12°C outdoors winter, or 24°C indoors and 36°C outdoors summer, Australia.
Above indoor & outdoor air temperatures per AS/NZS 4859.2:2018, Clause 5.1 Assumes each tophat contact resistance is 0.01m².K/W.

(a) **80mm FENCO TOCO PANEL assumed to have R0.44 thermal resistance at 23°C. It is a ceramic foam panel of 427kg/m3 density.**
(b) **90mm R2.70 bulk insulation assumed to be R2.70 at 23°C and filling 90mm cavity.**

Calculation date 15/10/2019
367A.xls

Calculated by James Fricker, F.AIRAH F.EngAust CPEng NER APEC Engineer IntPE(Aus)

Signed: James Fricker

ENGINEERS AUSTRALIA Chartered Professional Engineer MEMBER 1179647

	Path	Area sqm	
I	insul & gap	1.3392	82.7%
II	insul & tophat	0.0844	5.2%
III	frame & tophat	0.0068	0.4%
IV	frame & gap	0.1896	11.7%
		1.6200	100%