

ECOPANEL

AUTOCLAVED AERATED CONCRETE BY **CHAD**

AAC WALL PANEL TECHNICAL MANUAL




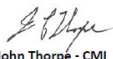
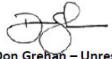


February 2020



Building better and smarter starts with 50mm, 75mm or 100mm Eco Panel. CHAD Group Australia P/L Aerated Autoclaved Concrete (AAC) Eco Panel provides ultra-high integrated insulation and facilitates building a home quicker. Being clad much faster than conventional bricks, the speed of construction reaches key stages quickly. Eco Panel is as solid and as durable as traditional masonry, yet its lightweight properties get any project to "Lockup" quicker. Eco Panel adds to a safer and cleaner worksite with less "cleanup" at the conclusion of the project. In comparison to traditional rendered masonry products, Eco Panel saves time and money. The inherent

Thermal Mass and Thermal Resistance properties of Eco Panel showcases its energy efficiency properties. Eco Panel also brings to the total package further benefits of higher fire resistance. Eco Panel does not combust in the event of fire and will not omit toxic gases. 75mm Eco Panel provides a Load Bearing FRL of 240/240/240. 50mm Eco Panel provides a Load Bearing FRL of 120/120/120. Eco Panel also has sound acoustic reducing qualities equivalent and better than traditional masonry products.

AAC Eco Panel is an environmentally friendly product. It is pollution free, emits no harmful emissions and has an excellent environmental performance. It has fantastic design flexibility and it's aesthetic appeal gives designers the range and flexibility of using a masonry product where previously non-masonry products could be used.

 Certificate of Conformity	
<div style="display: flex; justify-content: space-between;"> <div> <p>Certification Body:</p> <p> ABN: 80 111 217 568 JAS-ANZ Accreditation No. Z4450210AK PO Box 7144, Sippy Downs Qld 4556 +61 (07) 5445 2199 www.CertMark.org</p> </div> <div> <p>Certificate Holder:</p> <p> Chad Group Australia Pty Ltd ABN: 62 084 149 206 1366 North Rd, Oakleigh South Vic 3167 Ph: (03) 9544 8899 www.chadgroup.com.au</p> </div> <div> <p>Certificate number: CM40046</p> </div> </div>	
<p>THIS TO CERTIFY THAT</p> <p>ECO Wall & Floor Panels</p>	
<p>Type and/or use of product:</p> <p>Autoclaved Aerated Concrete (AAC) reinforced wall panels.</p>	<p>Description of product:</p> <p>Eco Wall & Floor Panels are reinforced AAC panels designed for Floors and walls in multi-residential, commercial, residential and industrial construction.</p>
<p>COMPLIES WITH THE FOLLOWING BCA PROVISIONS AND STATE OR TERRITORY VARIATION(S) BCA 2016</p>	
<p>Performance Requirement(s):</p> <p>BP1.1 (a) Structural reliability (i) to (iv)</p> <p>FP1.4 Weatherproofing</p>	<p>Volume One</p> <p>Volume Two</p> <p>P2.1.1 Structural stability and resistance to actions (a) & (b) (i) (ii) (iii)</p> <p>P2.2.2 Weatherproofing</p>
<p>Deemed-to-Satisfy Provision(s):</p> <p>Part C Fire resistance- subject to Condition and limitation 2.</p>	<p>3.7.1 Fire Separation- subject to Condition and limitation 2.</p>
<p>State or territory variation(s):</p> <p>Not applicable for this product</p>	<p>Not applicable for this product</p>
<p>SUBJECT TO THE FOLLOWING LIMITATIONS AND CONDITIONS AND THE PRODUCT TECHNICAL DATA IN APPENDIX A AND EVALUATION STATEMENTS IN APPENDIX B</p>	
<p>Limitations and conditions:</p> <ol style="list-style-type: none"> Only to be installed in accordance with the ECO Panels Design & Installation Guide October 2017. FRL's limited to external walls not requiring an FRL exceeding -/180/180. This Certificate is issued based on the evidence of compliance as detailed herein. Any deviation from the specifications contained in this Certificate is outside of the document's scope and the installation of the certified product/system will not be covered by the CodeMark Certification. This may result in the product being classified as a non-conforming building product/system. 	<p>Building classification/s:</p> <p>1,2,3,4,5,6,7,8,9&10</p>
<p> John Thorpe - CMI</p>	<p> Don Grehan - Unrestricted Building Certifier</p>
<p>Date of issue: 16/11/2017</p> <p>Date of expiry: 16/11/2020</p>	<p> </p>
<p>Certificate number: CM40046 This certificate is only valid when reproduced in its entirety. Page 1 of 13</p>	

Certificate of Test

Quote No.: NC7953

REPORT No.: FNC12168

COMBUSTIBILITY TEST FOR MATERIALS IN ACCORDANCE WITH AS 1530.1-1994

TRADE NAME: Eco Panel

SPONSOR: Chad Group Australia Pty Ltd.
1366 North Road
OAKLEIGH SOUTH VIC 3167
AUSTRALIA

**DESCRIPTION OF
TEST SAMPLE:**

The sponsor described the tested specimen as an aerated autoclaved concrete (AAC) comprised of quartz sand, cement, limestone and gypsum. The AAC contained a single horizontal steel reinforcement with a 5-mm diameter at the centre.

Nominal thickness: 50 mm
Nominal density: 520 kg/m³
Colour: white

TEST PROCEDURE:

Five (5) samples were tested in accordance with Australian Standard 1530 Methods for fire tests on building materials, components and structures, Part 1- 1994: Combustibility Test for Materials.

An alternative suitable insulating material was used to fill the annular space between the furnace tubes, as specified in Clause 4.2 of ISO 1182:2010.

RESULTS:

Mean furnace thermocouple temperature rise.....0.6°C
Mean specimen centre thermocouple temperature rise.....0.4°C
Mean specimen surface thermocouple temperature rise0.6°C
Mean duration of sustained flaming... 0 seconds
Mean mass loss.....9.93%

DESIGNATION: The material is NOT deemed COMBUSTIBLE according to the test criteria specified in Clause 3.4 of AS 1530.1-1994.

These test results relate only to the behaviour of the test specimens of the material under the particular conditions of the test and they are not intended to be the sole criterion for assessing the potential fire hazard of the material in use.

DATE OF TEST: 14 May 2018

Issued on the 3rd day of July 2018 without alterations or additions.



Faustin Molina
Testing Officer



Brett Roddy
Team Leader, Fire Testing and Assessments

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NATA Accredited Laboratory
Number: 165
Corporate Site No 3625

Accredited for compliance with ISO/IEC 17025 - Testing.

CSIRO INFRASTRUCTURE TECHNOLOGIES

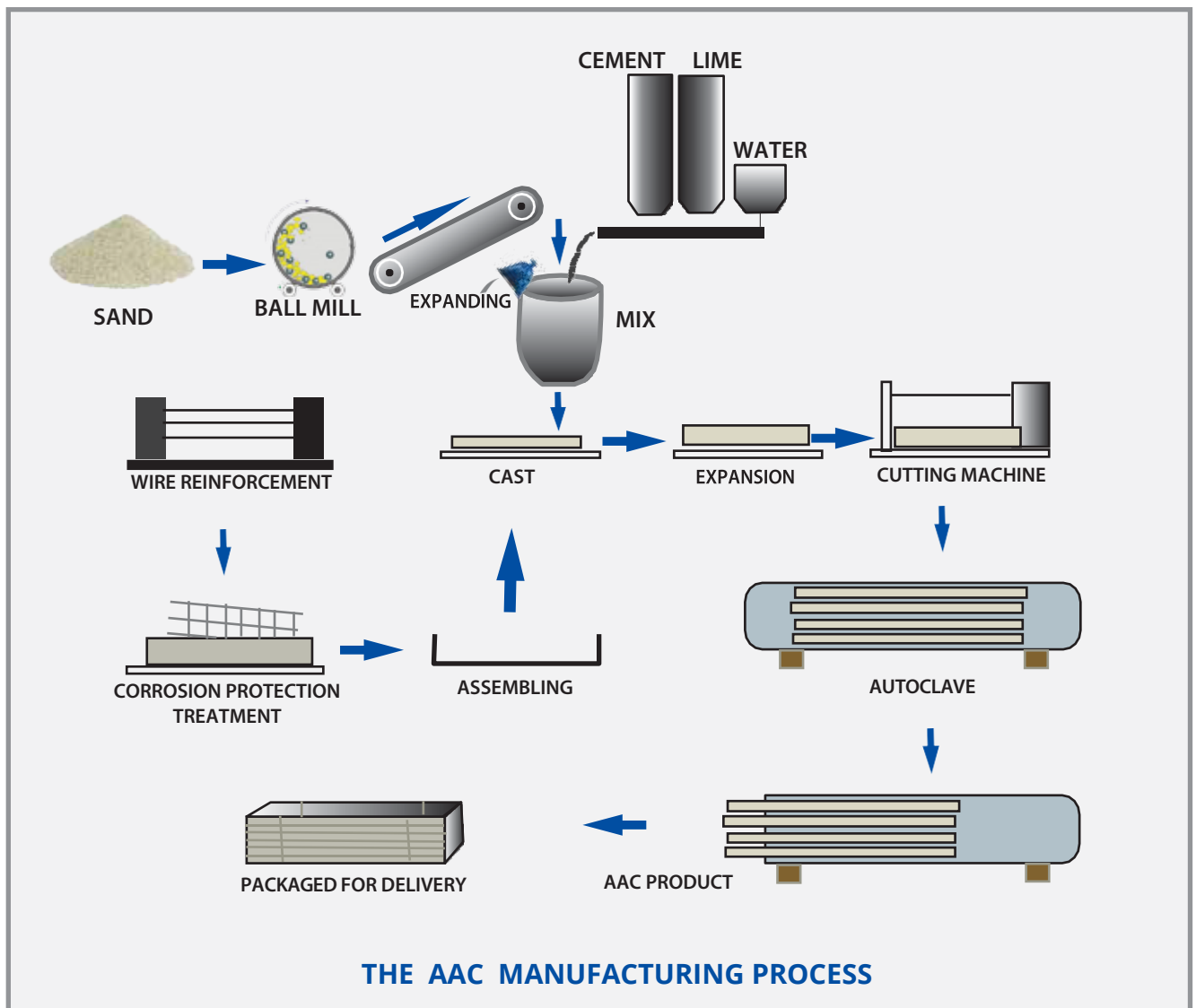
14 Julius Avenue, Riverside Corporate Park, North Ryde NSW 2113 AUSTRALIA
Telephone: 61 2 9490 5444 Facsimile: 61 2 9490 5555 www.csiro.au



Introduction

ECO Panel (AAC) is manufactured via a combination of lime and/or cement, combined with finely divided sand and other filler materials. This mix is poured into a mould, an expanding agent reacts with the other elements, and the mix begins to rise in the mould while the reaction with the expanding agent creates finely dispersed air bubbles. This is cured under high pressure and temperature to provide a relatively strong, lightweight cellular structure, incorporating small uniformly distributed bubbles.

After the semi solid material is pre-cured, the block out of the mould is cut and sliced into the required sizes. Once appropriately sized, the panels are steam pressure cured in auto-clave ovens. This manufacturing process is central to what gives AAC panel its excellent



ECO Panel Aerated Autoclaved Concrete (AAC)

The ECO PANEL (AAC) system is an innovative Autoclaved Aerated Concrete light-weight cement-based material, incorporating small uniformly distributed bubbles that result in its unique properties of lightness, high thermal resistance, workability and strength. ECO PANEL (AAC) are also steel reinforced AAC wall or floor panels.

This manual is available in hardcopy, softcopy or electronic form and is intended for use by qualified and experienced architects, engineers and builders. The authors, publishers and distributors of this manual, sample specification and the associated drawings do not accept any responsibility for incorrect, inappropriate or incomplete use of this information. It is the express intention that designers will edit them to suit the particular requirements of specific construction projects.

This manual has been prepared in the context of the National Construction Code of Australia. Architects, engineers and builders should make themselves aware of any recent changes to these documents, to any Standards referred to therein, or to local variations or requirements. The authors, publishers and distributors of this specification and the associated drawings do not accept any responsibility for failure to do so.

There are many factors to be considered when designing building solutions from Eco Panel Autoclaved Aerated Concrete (AAC) panels, and CHAD Group Australia P/L provides design tables and charts to assist the designer. The Eco Panels are grouped into two basic types relating to application. These types being:-

- Floor panels;
- Wall panels;

Applications

AAC Panels are reinforced, and are designed for floors and walls in multi-residential, commercial, residential (domestic) and industrial construction.

MULTI-RESIDENTIAL CONSTRUCTION

- Non-loadbearing external wall panels, generally panels are fixed to a reinforced concrete structural frame.
- Internal wall panels – party walls / risers / shaft walls.

COMMERCIAL CONSTRUCTION

- Non-loadbearing external wall panels.

RESIDENTIAL (DOMESTIC) CONSTRUCTION

- External cladding for loadbearing wall panels, limited to 2 storey construction;
- Roof panels;
- Floor panels

INDUSTRIAL CONSTRUCTION

- Non-loadbearing wall panels, larger panels spanning vertically can be successfully incorporated into industrial wall applications.
- Mezzanine doors
- Ceiling panels – fire exits.



Design Actions

CODES AND REGULATIONS

Design procedures for the verification of members and structures consisting of AAC panels generally follow the design principles outlined in Australian Standard AS3600-2009 – Concrete Structures, with the exception of cover requirements for durability and development length for reinforcement.

The loadings on the panel products are to be determined in accordance with the Australian Standard AS1170 “Design Actions” series of codes. These codes cover typical loadings, such as dead load, live load, wind load, earthquake load, as well as others.

GUARANTEE AND CERTIFICATION

CHAD Group Australia is a supplier of AAC products. CHAD Group Australia guarantee the products and the products used in the systems described in CHAD Group Australia literature, subject to the terms and conditions of CHAD Group Australia Guarantee. We do not however guarantee the components, products or services, such as installation and specialist advice, supplied by others.

CHAD Group Australia conducts appropriate testing of its products and systems, and sources opinions to determine performance levels. These include structural, fire and acoustic. CHAD Group Australia can provide copies of test results and opinions presenting the performance characteristics of its products and systems.

When using Eco Panel systems in specific projects, CHAD Group suggest specialists be consulted to ensure compliance with the National Construction Code of Australia and relevant Australian Standards. CHAD Group Australia can provide a certification for its panel products. For a specific project, an appropriate specialist can provide the certification for the relevant performance criteria of the systems and supporting structure.

Summary of Properties of the PANEL AAC Products

Application	Wall Panels 50mm			Wall Panels 75mm			Wall Panels 100mm			Floor Panels 75mm		
Panel thickness, T, mm	50			75			100			75		
Panel width, W, mm	600			600			450			600		
Panel length, L, mm	2200			Varies			Varies			1,800		
Wet density kg/m ³ (wout reo weight)	720-820			720 - 820			720 - 820			720 - 820		
Oven-dry density, kg/m ³	520-620			520 - 620			520 - 620			520 - 620		
compressive strength average Mpa	5.0			5.0			5.0			5.0		
Number of layers of Reinforcement	1			1			2			1		
Main reinforcement diameter, mm	5			5			5			5		
No of reinforcement strands	5			5			3			5		
Reinforcement centres	25/25			37/37			18/64/18			37/37		
Characteristic uncond compressive	1.1			1.1			1.1			1.1		
Characteristic oven dry compressive	1.9			1.9			1.9			1.9		
Mean elastic modulus E Mpa	1800			1800			1800			1800		
Panel Kg weight per m ² approx	28			55			70			55		
Acoustic Performance dBA ¹	28			32			36			32		
With Insulation	R2.0	R2.5	R3.0	R1.5	R2.0	R2.5	R1.5	R2.0	R3.5	R1.5	R2.0	R2.5
Thermal Resistance	2.5	3.0	3.5	2.32	2.82	3.32	2.46	2.96	3.46	2.32	2.32	3.32

1. S. Aroni, G de Groot, M Robinson, G Svanholm, F Wittman, Rilem Recommended Practice Autoclaved Accelerated Concrete Properties Testing and Design.

Simple Spans - Capacity Kpa

Im	Wall Panels 50mm	Wall Panels 75mm	Wall Panels 100mm
0.3	4.66	32	
0.45	6.51	14.22	
0.600	3.66	8.00	
0.750	2.35	5.12	
0.9	1.63	3.56	15.71
1.2	0.92	2	8.84
1.5		1.28	5.66
1.8		0.89	3.93
2.1		0.65	2.89
2.4		0.5	2.21
2.7			1.75
3			1.41
3.3			1.17

ECO AAC Steel Reinforced Autoclaved Aerated Panels

ECO Panels AAC Steel Reinforced Autoclaved Aerated Panels have the following properties: Characteristic compressive strength, $f_{ck} = 5.0 \text{ MPa}$

Characteristic flexural strength, $f_f = 1.0 \text{ MPa}$ Characteristic elastic modulus, $E = 1,800 \text{ MPa}$

Panel thickness, $T = 75 \text{ mm}$ Panel width, $B = 600 \text{ mm}$

Panel lengths (standard sizes), $L = 2,400 \text{ mm}, 2,550 \text{ mm}, 2,700 \text{ mm}, 2,850 \text{ mm}, 3,000 \text{ mm}$

Reinforcement yield strength, $f_{sk} = 235 \text{ MPa}$ Reinforcement diameter, $R = 5 \text{ mm}$

Number of reinforcing strands, $N = 5$ (over a 600 mm width) $N_s = 8$ (Over 2,700 to 3,000 mm panel length)

Depth of Reinforcement, $d = 45 \text{ mm}$ (30 mm from opposite face)

Moment capacity (medium reinforcement, $0.286 < s < 0.375$), $\Phi M_u = 0.685 \text{ kN.m}$

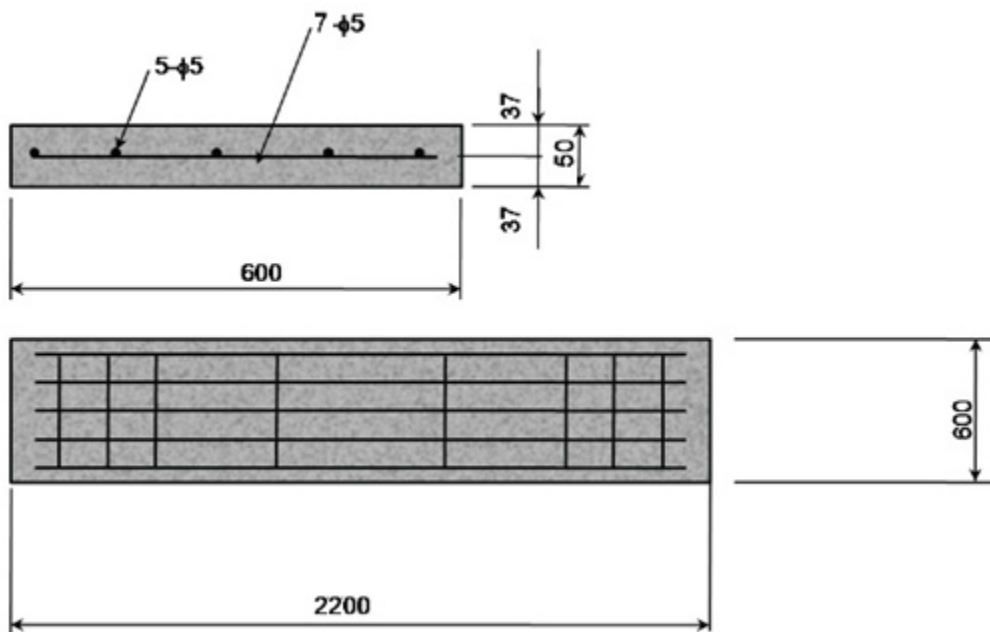
Using this data, the ultimate bending capacities (expressed in terms of uniform pressure) for various spans of ECO Panels AAC Steel Reinforced Autoclaved Aerated Panels are identified in the following table.

75 mm ECO Reinforced AAC Panels Factored ultimate bending capacities (expressed as uniform pressures (kPa))		
Span, m	$d = 45 \text{ mm}$	$d = 30 \text{ mm}$
2,400	0.94	0.58
2,550	0.84	0.52
2,700	0.74	0.46
2,850	0.67	0.41
3,000	0.60	0.37

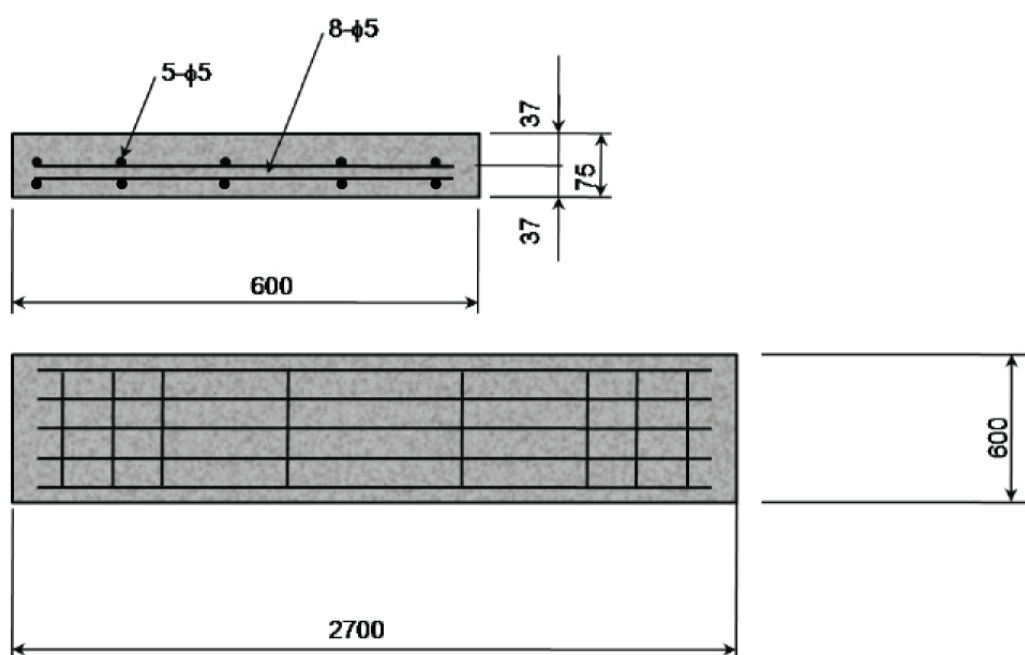
Notes:

1. This table is based on the assumption that the maximum span corresponds to the panel length. For shorter spans, the capacities will be higher.
2. In a 75 mm thick panel, the main reinforcement is 45 mm from one face and 30 mm from the other face.

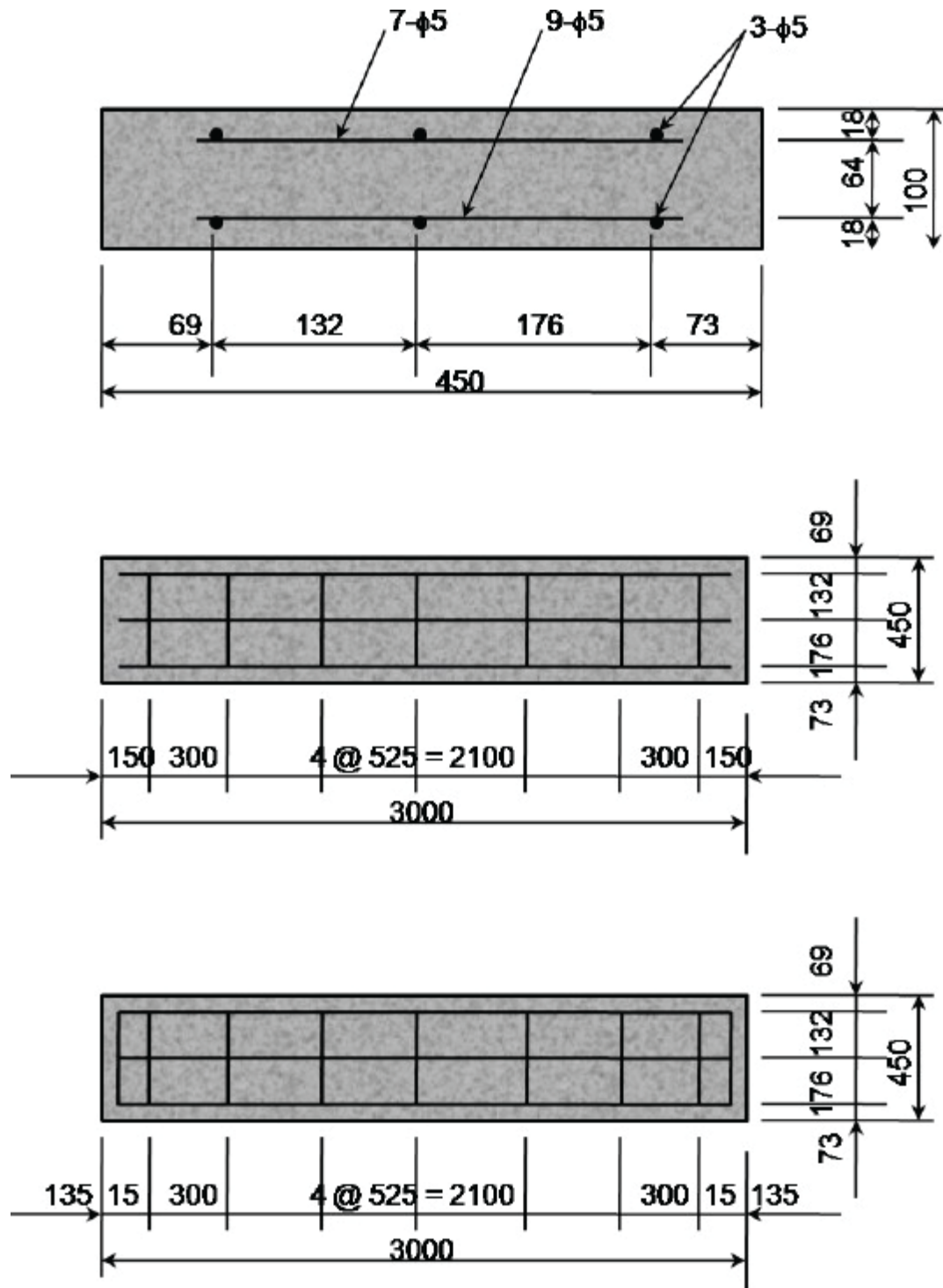
50 mm ECO PANEL (AAC) Steel Reinforced Autoclaved Aerated Wall Panels with reinforcement in centre



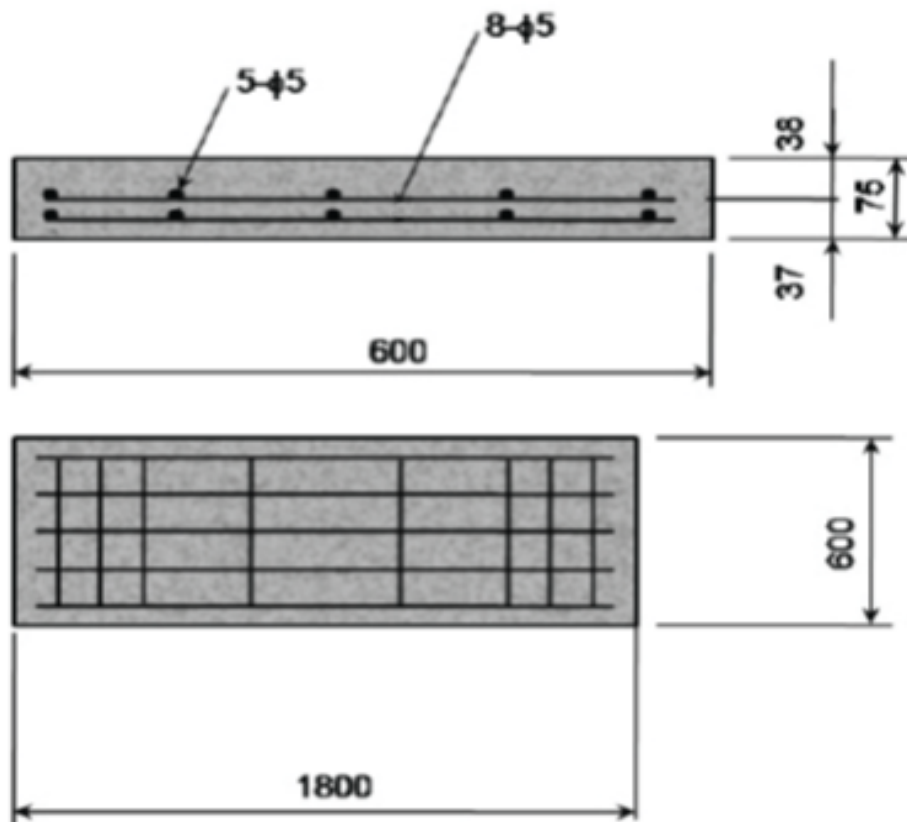
75 mm ECO PANEL (AAC) Steel Reinforced Autoclaved Aerated Wall Panels with reinforcement in centre



100 mm ECO PANEL (AAC) Steel Reinforced Autoclaved Aerated Wall Panels



75 mm ECO PANEL (AAC) Steel Reinforced Autoclave Aerated Floor Panels



- Spanning joists at 450 mm centres, are suitable for the support of 3.0 kPa distributed or a 1.8 kN point load over an area of 350 mm² (located at least 100 mm from the panel edge). This corresponds to balcony loads for domestic housing.
- Spanning joists at 600 mm centres, are suitable for the support of 1.5 kPa distributed or a 1.8 kN point load over an area of 350 mm² (located at least 100 mm from the panel edge). This corresponds to the internal loads for domestic housing.
- The specifier and builder must ensure that there is provision to prevent and/or control cracking of any brittle floor coverings, such as tiles, particularly at 600 mm joist spacing. In the case of 600 mm joist spacing, ductile surfaces are more appropriate.

Structural Design Procedure

This section covers the structural design of ECO PANEL (AAC) for compliance with the structural requirements of the National Construction Code of Australia.

DESIGN AND CONSTRUCTION STANDARDS

The National Construction Code of Australia provides the overall regulatory framework for the design and construction of buildings in Australia.

- Eco Panels AAC, provided as steel reinforced autoclaved aerated panels, are designed in accordance with the recommendations of "RILEM Recommended Practice – Autoclaved Aerated Concrete – Properties, Testing and Design". Because this system is outside the scope of the most relevant National Construction Code of Australia referenced document, AS3700, its use must be treated, under the National Construction Code of Australia, as an Alternative Solution in a deemed to satisfy capacity.
- Eco Panels AAC, provided as autoclaved aerated blocks set in thin-bed adhesive, are designed in accordance with AS 3700-2001 Masonry Structures.

LOADS

Eco Panels AAC walls should be designed to withstand the loads set out in the National Construction Code of Australia and Standards, as listed below:

- AS/NZS 1170.0 Structural design actions Part 0: General principles
- AS/NZS 1170.1 Structural design actions Part 1: Permanent, imposed and other actions
- AS/NZS 1170.2 Structural design actions Part 2: Wind actions
- AS/NZS 1170.3 Structural design actions Part 3: Snow and ice actions
- AS 1170.4 Structural design actions Part 4: Earthquake actions in Australia
- AS 4055 Wind loads for housing

Fire Design

Autoclaved Aerated Concrete (AAC) is one of the most effective building materials for providing a barrier to fire. AAC has shown itself to be non-combustible and very stable under fire loading, resulting in structural systems that have high fire resistance level (FRL) ratings. The properties that highlight the high level performance of AAC under fire loading are following:-

NATIONAL CONSTRUCTION CODE OF AUSTRALIA AND AUSTRALIAN STANDARDS

The NCC Volume 1 Part C defines the fire resistance requirements for Class 2 to 9 buildings. The NCC Volume 2 Part 3.7.1 defines the fire resistance requirements for Class 1 and 10a buildings. Various Australian Standards, including AS 3700 set out the means of determining the fire resistance of masonry, including AAC, for the three limit states described in the NCC. It requires designers to check three separate fire performance limit states:

- Structural adequacy (resistance to collapse)
- Integrity (resistance to cracking)
- Insulation (resistance to the passage of heat).

FIRE DESIGN AND FIRE RESISTANCE LEVEL (FRL) RATINGS

The National Construction Code of Australia regulations express the fire performance of a wall with the rating system called the 'Fire Resistance Level' (FRL). The FRL ratings in the CHAD Group Technical Manual have been determined by testing in accordance with AS1530.4 – Fire Resisting Tests of Elements of Building Construction – EXOVA.

The fire FRL rating consists of three performance criteria:

- a) resistance to collapse
- b) resistance to cracking
- c) resistance to the passage of heat

For non-load bearing walls, there is no requirement to express the 'structural adequacy' criteria.

FIRE CERTIFICATE AND REPORTS

Copies of the test reports for fire testing performed on the CHAD Group blocks are available by contacting CHAD Group.

ADDITIONAL DESIGN CONSIDERATIONS

Fire-rated block walls should comply with both strength and robustness requirements and minimum slenderness ratios outlined in AS3700 – Masonry Structures code.

Fire Tests

Load Bearing Vertical Load Applied	50mm EcoPanel	FRL 120/120/120
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Fire Tests to AS1530.4 for 75mm Reinforced AAC Eco Panel as per Exova Warrington (Australia) P/L report 30864500.1 gave the following results. This information can be used to check the fire performance of a proposed structure.

Wall Structure Tested: AAC Eco Panel with R1.5 fiberglass batts, fixed to steel framing and 10mm standard plasterboard.

Wall Dimensions

Height	3000mm
Width	3000mm
Panel Thickness	50mm
Insulation	R1.5 fiberglass
Plasterboard	Standard 10mm Recessed Edge Plasterboard
Framing	90x45 MGP10 Timber Framing
	16mm – P301 Rondo Metal Batten

Time to Failure

Structural Adequacy Result	156 mins
Integrity	156 mins
Insulation	156 mins

Load Bearing Vertical Load Applied	75mm EcoPanel	FRL 240/240/240
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Fire Tests to AS1530.4 for 75mm Reinforced AAC Eco Panel as per Exova Warrington (Australia) P/L report 30908400 gave the following results. This information can be used to check the fire performance of a proposed structure.

Wall Structure Tested: AAC Eco Panel with R1.5 fiberglass batts, fixed to steel framing and 10mm standard plasterboard.

Wall Dimensions

Height	3000mm
Width	3000mm
Panel Thickness	75mm
Insulation	R1.5 fiberglass
Plasterboard	Standard 10mm Recessed Edge Plasterboard
Framing	90x45 MGP10 Timber Framing
Channel	Rondo P303 Top Bat Channel

Time to Failure

Structural Adequacy Result	241 mins
Integrity	241 mins
Insulation	241 mins

50mm AAC ECO Wall Panels



Acoustic Properties & Performance

SOUND

Sound will have two basic characteristics – amplitude and frequency (or pitch) of the sound. The amplitude of the sound is a measure of the magnitude of the oscillation. The frequency of the sound is a measure of how quickly the vibrating surface is moving back and forth.

ACOUSTIC MATERIALS - SOUND BARRIERS AND SOUND ABSORBERS

There are materials that absorb sound and prevent it reflecting around a room for example, echo. These materials are sound absorbers and are usually soft to touch for example Glasswool insulation, carpets, curtains and mineral fibres.

The second categories of materials are those that reduce transmission of sound through the material from one room to another. These materials are referred to as sound barriers for example Eco Panel Wall and Floor Panels.

Both types of materials are necessary for providing a satisfactory acoustic environment in a building.

The careful combination of acoustic barriers and sound absorbent materials can provide a very cost effective and space efficient solution.

STC & RW ACOUSTIC RATING SYSTEMS

The National Construction Code of Australia (NCC) presents the Performance Requirements for sound insulation ratings. The sound insulation ratings set minimum values to consider for two types of sound: airborne sound and impact generated sound.

The R_w rating curve (similar to the STC curve) was basically derived from sound insulation requirements for speech. Modern living with its use of large television sets, home entertainment units for music and the home cinema with its surround sound had increased the requirement for low frequency sound insulation. In this regard, the R_w spectrum is inadequate. The ISO rating system has a correction factor for traffic noise for external walls, roofs and windows. This correction factor C_{tr} when applied to the R_w curve also provides better relationship of sound insulation for the low frequencies of the various home entertainment systems. The term $R_w + C_{tr}$ has been adopted in the Australian NCC and the Association of Australian Acoustical Consultants Star Rating System for Apartments and Townhouses.

NCC VOLUME 1 CLAUSE F5.5 REQUIREMENTS

NCC Vol 1 Clause F5.5 Requirements	Walls that separate sole occupancy units in a Class 2 or 3 building or between two Class 1 buildings	Rw + Ctr (airborne) not less than 50,	Impact sound resistance, if the wall separates a habitable room in one sole occupancy unit from a bathroom, sanitary compartment, laundry or kitchen of another unit or plant room or lift shaft).
	Walls that separate a sole occupancy unit from a plant room, lift shaft, stairway, public corridor, public lobby or the like in a Class 2 or 3 building	Rw (airborne) not less than 50	Impact sound resistance, if the wall separates a habitable room in one sole occupancy unit from a plant room, or lift shaft
	Walls that separate two sole occupancy units or separates a sole occupancy unit from a kitchen, bathroom, sanitary compartment (not en-suite), laundry, plant room or utilities room in a Class 9c aged-care building	Rw (airborne) not less than 45,	Impact sound resistance if the wall separates a habitable room in one sole occupancy unit from a kitchen or laundry.
	A door incorporated in a wall that separates a sole occupancy unit from stairway, public corridor, public lobby or the like in Class 2 or 3 building and a door incorporated in a wall that separates a sole occupancy unit from a kitchen or laundry in a Class 9c aged care building.	Rw (airborne) not less than 30	Walls requiring impact sound resistance shall consist of two leaves separated by a gap of at least 20 mm (and in Class 2 or 3 where required, connected by resilient ties).

NCC VOL 2 CLAUSES 3.8.6.1 TO 3.8.6.4 REQUIREMENTS

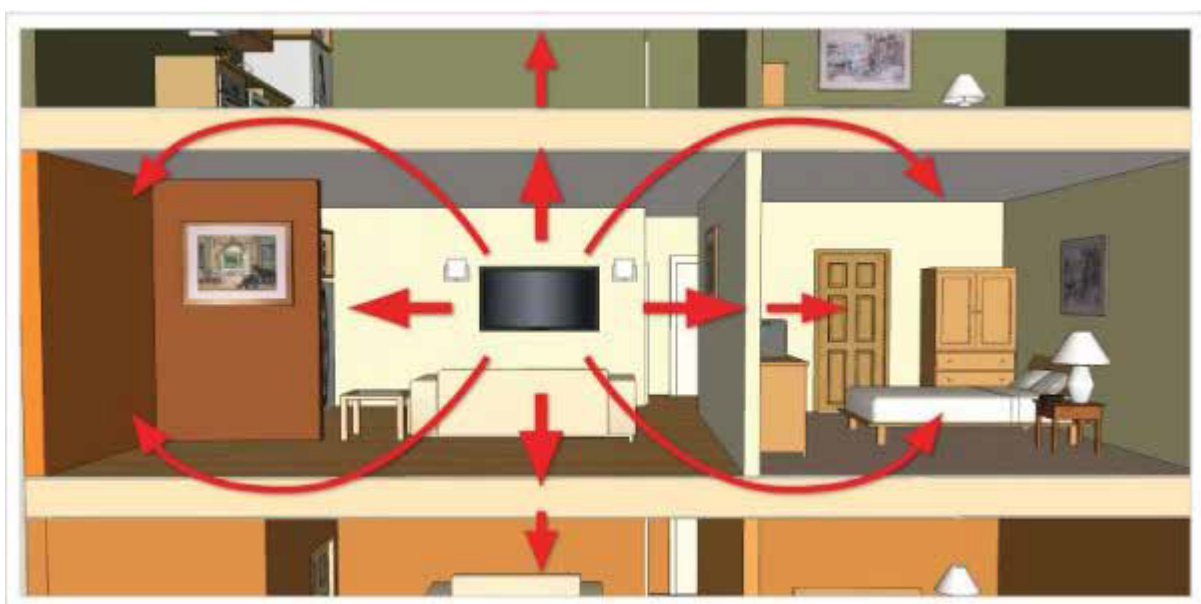
<p>NCC Vol 2 Clauses 3.8.6.1 to 3.8.6.4 Requirements</p>	<p>Walls that separate a bathroom, sanitary compartment, laundry or kitchen of one Class 1 building from a habitable room (other than a kitchen) in an adjoining Class 1 building (dwelling) shall have:</p>	<p>Rw + Ctr (airborne) not less than 50</p>	<p>Discontinuous construction. For cavity walls, a minimum of 20 mm cavity between two separate leaves, which may be connected, if required for structural purposes, with resilient ties. Northern Territory, Queensland and Western Australia have varied this requirement to Rw not less than 50 and Impact Sound Resistance</p>
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Walls are required to be detailed in accordance with NCC Vol 2 Clause 3.8.6.3, which make provision for the sealing of sound insulated walls at junctions with perimeter wall and roof cladding. This clause also requires that masonry joints be filled and provides for sound insulated articulation joints. NCC Vol 2 Clause 3.8.6.4 makes provision for services in sound insulated walls.

Walls required to have a sound insulation shall be constructed to the underside of:

- A floor above
- A ceiling with the same acoustic rating
- A roof above.

Flanking and Indirect Sound Leaks



Acoustic Performance of AAC ECO Panels

Weighted sound index,

$$R_w = 27.7 \log_{10}(M) - 11.6 \text{ dB}$$

Where M = the surface mass of the wall in kg/m²

Based on a bulk density of 520 kg/m³ and a panel thickness of 75 mm, the resulting predicted weighted sound index would be 32 dBA

Weighted sound index data, used to support designs to NCC Volume 1 Part F5 or NCC Volume 2 Clause 3.8.6, should be determined in accordance with AS/NZS 1276.1.

EFFECT OF JOINTS AND GAPS ON SOUND ATTENUATION

Gaps reduce the sound attenuation of a wall. Laboratory tested walls have full joints. Site construction must also have full joints to ensure similar sound attenuation. Gaps around the vertical edges of a wall and at the ceiling will diminish the sound resistance of a wall. A gap 0.1% of wall area (corresponding to a 3 mm gap along the length of a 3 m high wall) can reduce the sound transmission resistance by typically 10-20 dB. Gaps around the periphery of walls should be sealed using a high-density acoustically-rated mastic or similar sealant. Sealants should have a typical density of 1600 kg/m³.

Sealants should be applied to both faces of the wall and should be applied to a depth equal to the width of the gap. Typical penetrations in walls include mechanical services ducts, refrigerant pipes, hydraulic reticulation lines, waste pipes, fire sprinklers, and electrical cables. It is essential to provide an acoustically rated seal around the penetration.

EFFECT OF CHASES ON SOUND ATTENUATION

Chases in walls diminish the sound attenuation. Chases should not extend deeper than 25mm into the wall. All chases should be rendered over after the pipes or cables are installed.

Water services should not be chased whatsoever into Eco Panel.

Energy Efficiency and Thermal Performance

THERMAL DESIGN

Energy savings in the operation of buildings are of particular importance as the cost of energy for heating and air conditioning in most cases represent the major cost factor in the operating cost of a building. The energy retention or loss characteristics of a building are directly related to the thermal performance of the building components.

The entrained air in the cellular structure of CHAD Group EcoPanel AAC gives the product excellent thermal insulation properties, as well as good heat retention characteristics. These characteristics contribute significantly to the energy saving performance of the building.

Thermal performance is concerned with the energy retention or loss characteristics of a building system and the consequential reduction of greenhouse gas emissions.

The thermal performance of buildings is affected by a relationship between all components of the structure, and the environment. Some elements of this relationship include:

Windows which occupy a large percentage of the perimeter of the building

The materials of which the walls are constructed affect not only steady state heat transfer, but also the transient response of the internal environment to daily external temperature changes.

Internal temperatures which vary throughout the day and from room to room; and

During the day, solar radiation produces external temperatures which are higher than ambient shade air temperature, and which vary around the building envelop in accordance with orientation and exposure to the sun.

DYNAMICS OF THERMAL MASS

If a building with high thermal mass experiences a heating and cooling cycle which crosses the comfort zone, the roof, walls and floor will store the heat energy for an extended period, gradually releasing it over time. In winter, high thermal mass buildings will remain relatively warm, while in summer, they will remain relatively cool.

In winter, heat trying to pass through the wall will become trapped in the wall and part will slowly pass back into the room. In summer the reverse occurs. Heat trying to pass through the wall from the outside will become trapped in the wall and part will slowly pass back out of the building. The thermal mass of the member (wall, roof/ceiling, floor etc) is the combination of the properties of each of the components (e.g. AAC, insulation, foil etc) and is a function of the mass and specific heat.

THERMAL RESISTANCE OF ECO PANELS AAC EXTERNAL WALLS

Thermal Properties 50 mm

Material	External Thickness mm	Thermal Resistance RM2.K/W
External Air Film		0.04
AAC 50mm ECO Panel	50mm	0.15
Internal Air Film		0.12
Total		0.31
External Air Film		0.04
AAC 50mm ECO Panel	50mm	0.15
Air Space	39mm	0.17
Internal Plasterboard	10mm	0.06
Internal Air Film		0.12
Sub Total		0.54
With Insulation	<u>R2.0</u> <u>R2.5</u> <u>R3.0</u>	<u>R2.0</u> <u>R2.5</u> <u>R3.0</u>
TOTAL WITH INSULATION		2.5 3.0 3.5

THERMAL RESISTANCE OF ECO PANELS AAC EXTERNAL SINGLE WALLS

Thermal Properties 75 mm

Material	External Thickness mm	Thermal Resistance RM2.K/W
External Air Film		0.04
AAC 75mm ECO Panel	75mm	0.43
Internal Air Film		0.12
Total		0.59
External Air Film		0.04
AAC 75mm ECO Panel	75mm	0.43
Air Space	39mm	0.17
Internal Plasterboard	10mm	0.06
Internal Air Film		0.12
Sub Total		0.82
With Insulation	<u>R1.5</u> <u>R2.0</u> <u>R2.5</u>	<u>R1.5</u> <u>R2.0</u> <u>R2.5</u>
TOTAL WITH INSULATION		2.32 2.82 3.32

Thermal Properties 100mm

Material	External Thickness mm	Thermal Resistance RM2.K/W
External Air Film		0.04
AAC 100mm ECO Panel	100mm	0.57
Internal Air Film		0.12
Total		0.73
External Air Film		0.04
AAC 100mm ECO Panel	100mm	0.57
Air Space	39mm	0.17
Internal Plasterboard	10mm	0.06
Internal Air Film		0.12
Sub Total		0.96
With Insulation	<u>R1.5</u> <u>R2.0</u> <u>R2.5</u>	<u>R1.5</u> <u>R2.0</u> <u>R2.5</u>
	TOTAL WITH INSULATION	2.46 2.96 3.46

- The Thermal resistance for 50, 75 and 100 AAC ECO Panel is based on 0.336 W/m.k
- The Stud wall is to incorporate a vapor barrier or thermal break

CONDENSATION CONTROL

VAPOUR BARRIER / SARKING OR SISLATION MUST BE INCORPORATED IN CONSTRUCTION

Atmospheric water vapour will condense when it, or air containing it, comes into contact with a surface that is at or below the dew point temperature. Condensation of vapour within the building system should be considered by the designer.

Condensation is a complex problem, and can occur under a variety of conditions, not just cold conditions – hence the appropriate designer should check and approve the building solution for the particular conditions of the project.

To control condensation, an appropriate vapor barrier or thermal break should be incorporated into the wall system.

Foundations

For residential application, the selection of the foundation type for use is based on AS2870, "Residential Slabs and Footings".

This standard covers the selection of footing designs for the usual range of site conditions, ie soil types and slopes. Where unusual site or load conditions are encountered, advice should be obtained from a practicing Structural Engineer. It is recommended that a practicing Structural Engineer is consulted concerning the application of AS2870 to any particular building construction or site.

The approach to foundation design using AS2870 is to first classify the foundation soil, then assess the topography and select the appropriate footing design to be used. Following is a guide to this foundation design approach. The Structural Engineer should approve this approach before adopting.

For other applications of AAC panels, the foundation or supporting structure should be designed by the project structural engineer to satisfy the masonry.

Cracking in Masonry

As a result of the low tensile strength and negligible ductility, all forms of masonry construction behave as a brittle material and are therefore prone to cracking. Similar to other forms of masonry, careful consideration at design stage and attention to detail during construction of AAC masonry can minimize such adverse effects.

It is important to note that the National Construction Code of Australia is performance based. The performance based approach acknowledges the possibility of cracking and does not consider it to be a defect so long as the structural resistance and other design requirements are maintained.

Cracks up to 1mm, whilst not considered a defect in these documents, may allow water ingress in single skin masonry construction and therefore could be considered a defect under the NCC. This highlights the importance of good coating systems. Coating systems should be able to bridge minor cracking.

CRACKING CAN BE DUE TO EXTERNAL EFFECTS:-

- Foundation and support movement
- Deformation (shortening, shrinkage, creep, bridging control joints in structure, etc) in adjacent materials.
- Workmanship.

AAC differs slightly from clay brick and concrete block masonry so in addition to general behaviour of masonry, the effect of the following differences must be considered"

- Lower compression capacity.
- Lower tensile strength.
- Lower modules of rupture.
- Lower coefficients of thermal expansion and contraction and drying shrinkage.
- Larger unit size.
- Laid in thin bed mortar which typically has higher compression capacity than units.
- Units are autoclaved.
- Dissipates and absorbs moisture from atmosphere with associated volume change.

Considerations for Design and Detailing

- Elements of masonry blockwork must be isolated from movement.
- Control joints
- Wall restraints
- The compressive strength of render coatings must not exceed that of the blockwork.
- Use plasterboard linings internally
- Use flexible coating systems that are able to bridge hairline cracks.
- Apply mesh within the render over areas of high stress.

Movement Joints

The backing rod should be placed into the AAC at a depth which permits a finish of the control joints to finish the mortar joints.

Where a 'movement joint is adjacent to a door or window frame, a 10mm gap should be provided between the edge of the frame and AAC panel to allow for movement.

During the life cycle of a building, the building and the materials that it is constructed from will move. These movements are due to many factors working together or individually, such as foundation movement (shrink- age and swelling), thermal expansion and contraction, differential movements between materials, climate and soil condition. This movement, unless relieved or accommodated for, will induce stress in the materials, which may be relieved in the form of cracking. To accommodate these movements and relieve and induced stresses, which could potentially crack the wall, movement joints (vertical gaps) shall be installed. There are two categories of joints:

- Articulation joints are provided to relieve induced stresses due to foundation movement. The joints make the walls more flexible by breaking the wall into a series of small panels, which is especially required on reactive ground conditions (clay, peat). Differential movement between the AAC blockwork and adjacent structural elements need to be accommodated with articulation joints, such as blockwork infill between the structural frames.
- Control Joints (for example an expansion joint), are provided to relieve the induced stresses resulting from thermal expansion or contraction of the AAC, or differential movement between the AAC and another material or structure, such as abutting walls or columns of concrete or brickwork. Control joints can delineate coating shrinkage breaks. A joint may perform the function

- of either an articulation joint or control joint or both.
- 6 metres maximum for continuous runs of walls
- When measuring the 6 metre run of wall, the measurement continues around corners till the end of the wall or a movement joint.
- For horizontal panels, a vertical movement joint shall be provided at the ends of the panels.

Additionally, the NCC presents the following requirements for articulation joints in unreinforced masonry walls, which is applicable for AAC masonry construction:

Articulation joints must have a width not less than 10mm and be provided:

- in straight, continuous walls having no openings, at not more than 6m centres and not closer than the height of the wall away from corners; and
- where the height of the wall changes by more than 20% at the position of change in height; and
- where openings more than 900 x 900mm occur, at more than 5m centres, and positioned in line with one edge of the opening; and
- at control or construction joints in the footing slabs; and
- at junctions of walls constructed of different masonry materials; and
- at deep chases (rebates) for service pipes."

The project architect and engineer shall be responsible for determining the optimum location of movement joints, as their location is dependent on a variety of factors including most importantly the structural stability and bracing requirements of the building.

Areas to be considered but not limited to, include:

- At corners and supports
- Adjacent to openings
- Adjacent to small openings in long walls
- Walls built in different substrates or different materials
- Geometrical change in wall height ie two story to single story walls
- Locations or junctions of different foundation types and steps in foundations
- Change in thickness or junction of load bearing and non load bearing walls

Attention should be given to ensure that these joints are kept free of all debris and that the connectors are installed as per the manufacturers recommendations. It is most important that under no circumstances should a movement joint be rendered across.

Reinforced AAC ECO Panel Wall Cladding for Domestic Construction

The following specification and details are generally suitable for Reinforced AAC wall cladding for domestic dwellings, subject to confirmation by the Design Engineer. A suitable support framing system must also be provided. Reinforced AAC Panels shall be screw fixed to horizontal light-gauge steel battens, which are fixed to vertical steel studs. There shall be not less than four horizontal battens per panel, with this number increasing for higher wind loads and for panels within 1,200 mm of the building corners. Panels within 1,200 mm of each end of each external wall of a building (i.e. the two 600 mm wide panels closest to the corners) are subject to higher local wind pressures and suctions, and therefore require more battens and more screw fixing than other panels.

Cold-formed sections and accessories shall be manufactured from Z350 galvanised steel (Grade G550) complying with AS 1397, with a zinc coating not less than 350 g/m² and shall comply with AS4600. All battens shall be 24 x 30 x 0.55 BMT Top Hat, Grade G550) or equivalent. We recommend Rondo P303 24mm Cyclonic Batten and Rondo P310 35mm Cyclonic Batten.

All screws shall be No 14 x 100 mm Bugle Batten self drilling galvanised steel screws, fixed from the outside of the building through the AAC panels into the horizontal steel light gauge battens behind.

General Notes:

1. All wind classifications and ultimate pressure calculations are based AS 4055-2006.
2. If AAC Panels are required to provide racking resistance, the screws and supports shall be determined by the structural engineer, taking into account the wind classification and the overall building dimensions.
3. Top and bottom battens shall be positioned within 150 mm of the ends of the panels.
4. Aerosol penetration to an extent depending on distance from the coast:
RO – Nil
R1 – 10 g/m²/day
R2 – 20 g/m²/day
R3 – 60 g/m²/day
R4 – 300 g/m²/day

Reinforcement

Unlike conventional masonry, AAC incorporates thin-bed adhesive in lieu of relatively permeable cement-based mortar joints. This feature, together with impermeable blocks, means that the risk of corrosion of both horizontal and vertical reinforcement is significantly reduced.

Reinforced ECO Panel (ACC) Wall Cladding for Domestic Dwellings

The following specification and details are generally suitable for Reinforced AAC wall cladding for domestic dwellings, subject to confirmation by the Design Engineer. A suitable support framing system must also be provided.

Reinforced AAC Panels shall be screw fixed to horizontal light-gauge steel battens, which are fixed to vertical steel studs. There shall be not less than four horizontal battens per panel, with this number increasing for higher wind loads and for panels within 1,200 mm of the building corners

Panels within 1,200 mm of each end of each external wall of a building (i.e. the two 600 mm wide panels closest to the corners) are subject to higher local wind pressures and suctions, and therefore require more battens and more screw fixing than other panels.

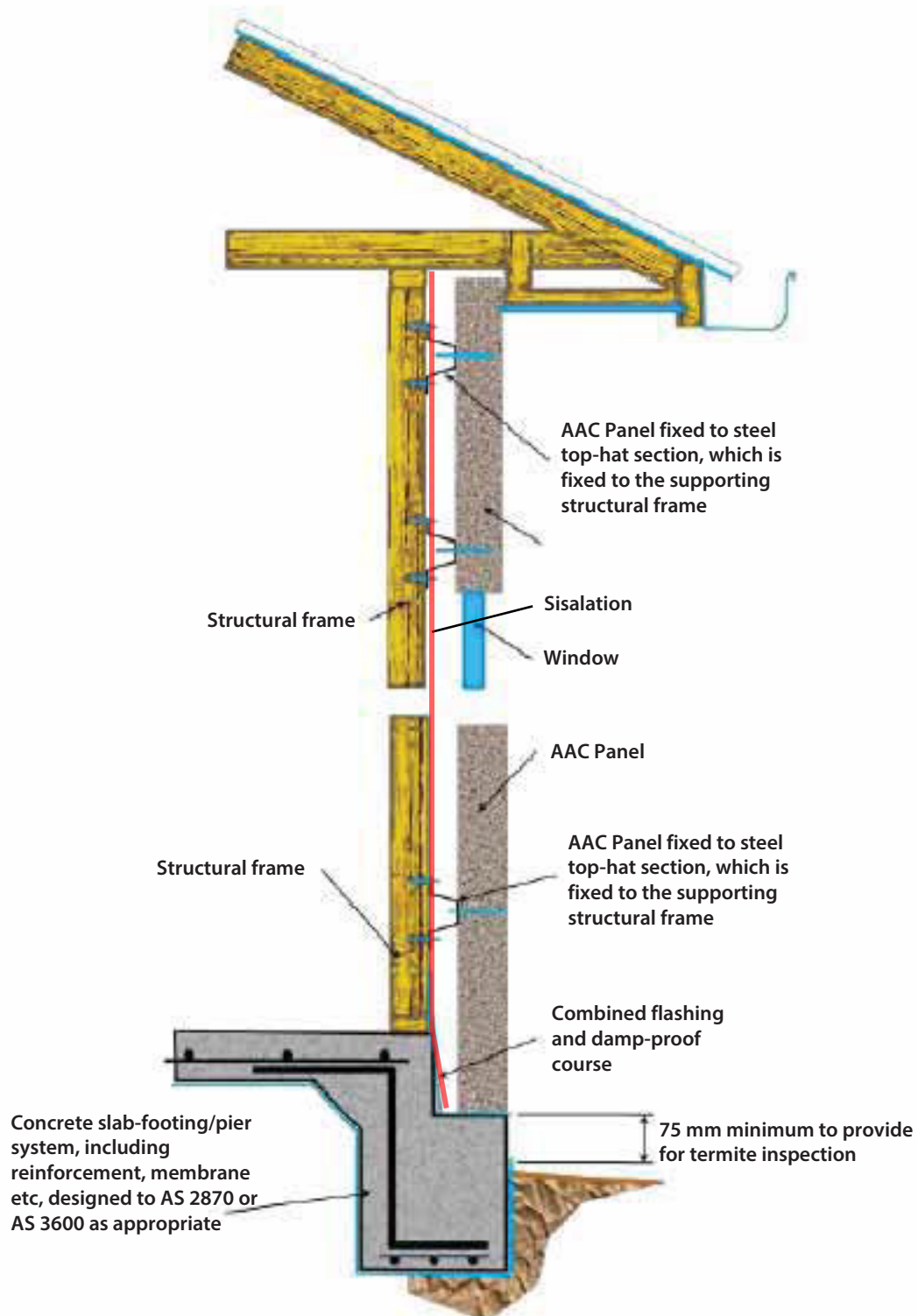
Unless specified otherwise by the engineer, the following details and tables shall be used for the cladding of domestic dwellings with 75 mm thick or 100 mm thick Reinforced AAC Panels.

Light gauge steel battens shall comply with the Drawings, Building Regulations and relevant Standards (AS/NZS 4600, AS 3623). Cold-formed sections and accessories shall be manufactured from Z350 galvanised steel (Grade G550) complying with AS 1397, with a zinc coating not less than 350 g/m² and shall comply with AS4600. All battens shall be Rondo P303 24mm Cyclonic Batten or P310 35mm Cyclonic Batten. The surfaces of Zinalume battens that are in contact with the AAC panel shall be painted with a suitable high build paint to guard against adverse chemical reaction.

All screws shall be No 14 x 100 mm Bugle-headed self drilling galvanised steel screws, fixed from the outside of the building through the AAC panels into the horizontal steel light gauge battens behind.

General Notes:

1. All wind classifications and ultimate pressure calculations are based AS 4055-2006
2. If AAC Panels are required to provide racking resistance, the screws and supports shall be determined by the structural engineer, taking into account the wind classification and the overall building dimensions.
3. Top and bottom battens shall be positioned within 150 mm of the ends of the panels.



Vertical Fixing Details 75mm / 100mm

Screw Fixing of External Reinforced AAC Panels to Steel Channels					
Wind Classification	Ultimate Suction kPa	Number of horizontal top hat supports	Number of screws on top and bottom supports	Number of screws on internal supports	Max. spacing of supports
N1	1.0	3	2	2	900
N2	1.4	3	2	2	900
N3 / C1	2.3	4	2	2	900
N4, C2	3.3	4	2	3	900
N5, C3	4.9	5	2	3	450
N6, C4	6.7	6	2	4	450
<p>Notes:</p> <p>This table applies for a distance of 1,200 mm from each end of each external wall of a building ie it applies to the two 600mm wide panels closest to the corners, and not required to provide racking resistance.</p> <p>All screws shall be No 14 x 100 mm Bugle-headed self drilling galvanised steel screws (100 mm long for 75 mm thick panels, 125 mm long for 100 mm thick panels), fixed from the outside of the building through the ECO PANELS (AAC) into the horizontal steel light gauge battens behind.</p>					

Vertical Fixing Details 50mm

Vertical Screw Fixing of Steel Battens to Steel Studs 75mm / 100mm					
Wind Classification	Ultimate Pressure or Suction kPa	Number of horizontal top hat supports	Number of screws on top and bottom supports	Number of screws on internal supports	Stud Spacing, mm
N1	1.0	3	2	2	600
N2	1.4	3	2	2	600
N3	2.3	4	2	2	600
N4, C1	3.3	4	2	3	450
N5, C2	4.9	5	2	3	450
N6, C3	6.7	6	2	3	450
<p>Notes This table applies for a distance of 1,200 mm from each end of each external wall of a building. It applies to the two 600 mm wide panels closest to the corners, and not required to provide racking resistance.</p> <p>All battens shall be (22.5 x 63 x 0.55 BMT, Grade G550) or equivalent. The surfaces of zincalume battens that are in contact with the ECO Panel (AAC) panel shall be painted with a suitable high build paint to guard against adverse chemical reaction.</p> <p>All screws shall be No 14g x 100mm Type No 17 self drilling class 3 galvanized screws (or as required by the engineer), fixed to the horizontal steel light gauge battens to the stud.</p>					

50mm Eco Panel Floor Systems Design and Installation

Floor systems at Eco Panel are designed to be used in every residential or commercial construction project. With qualities like rigidity, lightweight composition, high fire resistance, and acoustic dampening, Eco Panel performs very well. For fast and clean construction procedures our Floor Systems are available in standard sizes of 2200mm in length and 600mm in width. A high level of quality is maintained in the project from start to finish.

Eco Panel reinforced AAC floor systems are the preferred system in residential construction over timber or steel framed floor joist systems. The 50mm thick, steel reinforced Eco Panel floor panels are manufactured from autoclaved aerated concrete with an average density of 560kg/m³.

The Eco Panel floor panels are supplied in standard sizes of 2200mm in length and 600mm width and have an average weight of approximately 36 kg/panel. Eco Panel floor systems are delivered in packs to site. We take all care to avoid damage to the faces, ends and edges of the panels. Manual handling of floor panels is kept to a minimum; we use trolleys and/or other mechanical devices for delivery of panels.

Health & safety MUST be maintained with respect to Eco Panel floor systems. However when cutting, drilling, sawing, routing, chasing, sanding and in any way breaking up the material there is the potential for health problems to occur. Standard precautionary measures are to be taken by the installer, as per the occupational health and safety act.

In essence the method of installation is the same as laying chipboard flooring except that joists have to be laid out at 440mm centres to match the length of the standard panels. You can combine Eco Panel 50mm Floor Panels with Compressed Sheet flooring to achieve the desired step down for wet areas.

Normal AAC panel tools and sundries are required such as a grinder fitted with a masonry cutting blade, impact drill, bugle batten screws, construction adhesive and a straight edge (to get the first row of panels straight) are a minimum requirement.

PLEASE NOTE: Joists MUST be set out at 440mm centres

- Minimum joist width of 45mm required, but joist width of 63mm or greater is preferred
- Apply construction adhesive to joist.
- Position panel over construction adhesive
- Fix panel to joist with 14gx75mm bugle batten screws (2 screws per joist)
- Min 50mm from panel edges
- •Apply construction adhesive on the edge of the panel previously laid where the new panel will come into contact, and to the sections of joist the next panel length will sit on.
- Butt panels end to end
- Ensure panels are aligned by using a straightedge or a laser.
- On the 600mm butt joint, screw into the centre of the joint straight into the joist. The screws should hold both panels down.
- Continue the process while maintaining a 440mm stagger in each new row.

75mm AAC ECO Panel Flooring

Reinforced Eco Panel AAC Flooring for Domestic Dwellings 450 centres

The following specification and details are generally suitable for Reinforced ECO FLOOR PANEL (AAC) for domestic dwellings, subject to confirmation by the Design Engineer. A suitable supporting joist system must be provided.

Reinforced ECO FLOOR PANEL (AAC) Panels shall be screw and adhesive fixed to timber or light-1 gauge steel joists, at centres not greater than 450 mm centres. Joists and bearers shall comply with the Drawings, Building Regulations and relevant Standards.

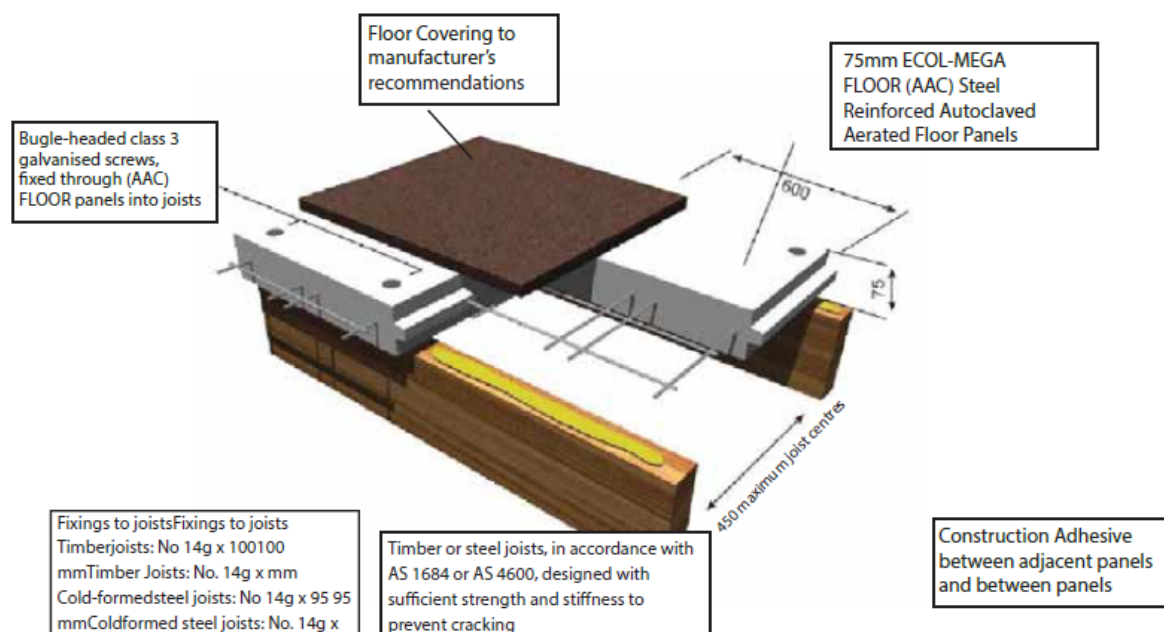
Timber joists and bearers shall comply with AS1684.

Light gauge steel joists and bearers shall comply with (AS/NZS4600, AS3623). Cold-formed sections and accessories shall be manufactured from Z350 galvanized steel (Grade G550) complying with AS1397, with a zinc coating not less than 350 g/m and shall comply with AS4600. The surfaces of zincalume battens are in contact with the Eco Panel AAC shall be painted with a suitable high paint to guard against adverse chemical reaction.

Screws shall be bugle-headed Class 3 or Class 4 galvanized steel screws, fixed through AAC panels into the joists. Timber joists: No 14 x 100 mm galvanized bugle headed screws

Cold-formed steel joists: No 14 x 95 mm hex head self drilling screws.

Construction Adhesive shall be applied between adjacent panels and between panels and joists, in accordance with the manufacturer's recommendations.



Note 1

75 mm floor panels spanning joists at 600 mm centres are suitable for the support of 1.5 kPa distributed or a 1.8 kN point load over an area of 350 mm (located at least 100 mm from the panel edge). This corresponds to the internal loads for domestic housing. The designer and builder must ensure that there is provision to prevent and/or control cracking of any brittle floor coverings, such as tiles, particularly at 600mm joist spacing. In the case of 600mm joist spacing, ductile surfaces are more appropriate.

75mm Reinforced Eco Panel AAC Flooring for Domestic Dwellings 600 centres

The following specification and details are generally suitable for Reinforced ECO FLOOR PANEL (AAC) for domestic dwellings, subject to confirmation by the Design Engineer. A suitable supporting joist system must be provided.

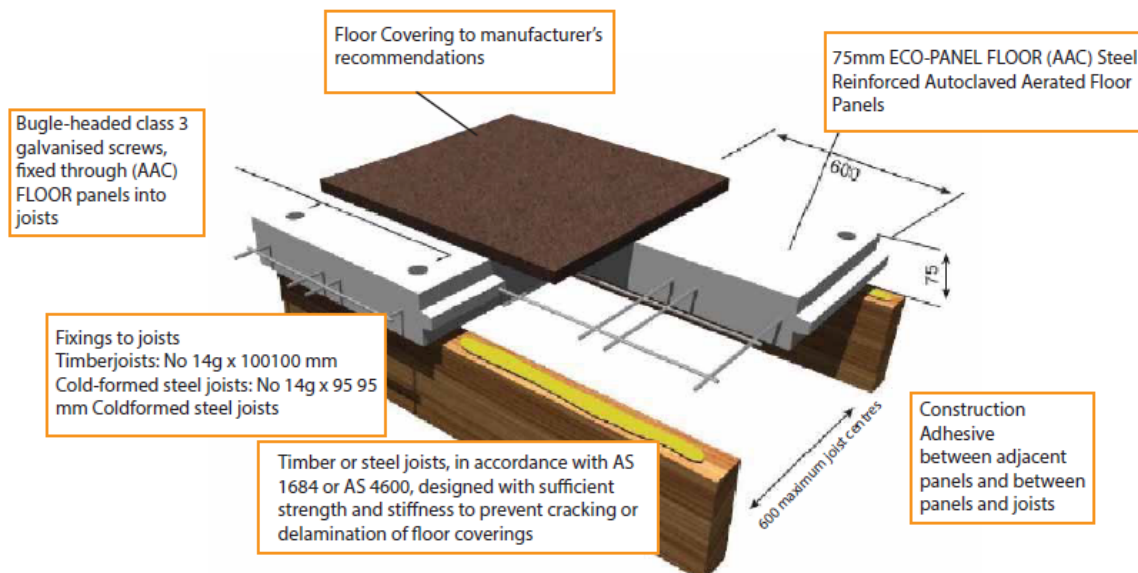
Reinforced ECO FLOOR PANEL (AAC) Panels shall be screw and adhesive fixed to timber or light gauge steel joists, at centres not greater than 600mm centres. Joists and bearers shall comply with the Drawings, Building Regulations and relevant Standards.

- Timber joists and bearers shall comply with AS1684.
- Light gauge steel joists and bearers shall comply with (AS/NZS4600, AS3623). Cold-formed sections and accessories shall be manufactured from Z350 galvanised steel (Grade G550) complying with AS1397, with a zinc coating not less than 350 g/m and shall comply with AS4600.

Screws shall be bugle-headed Class 3 or Class 4 galvanised steel screws, fixed through AAC panels into the joists.

- Timber joists: No 14 x 100 mm galvanized bugle headed screws
- Cold-formed steel joists: No 14 x 95 mm hex head self drilling screws.

Construction Adhesive shall be applied between adjacent panels and between panels and joists, in accordance with the manufacturer's recommendations.



Note 1

75 mm floor panels spanning joists at 600 mm centres are suitable for the support of 1.5 kPa distributed or a 1.8 kN point load over an area of 350 mm (located at least 100 mm from the panel edge). This corresponds to the internal loads for domestic housing. The designer and builder must ensure that there is provision to prevent and/or control cracking of any brittle floor coverings, such as tiles, particularly at 600mm joist spacing. In the case of 600 mm joist spacing, ductile surfaces are more appropriate

Fixing AAC ECO Panels to Existing Brickwork Party walls

1. Apply 'Seal N Flex' Bostick adhesive in dabs onto the panel to glue it directly onto the existing brickwork wall.
2. Prop the panel overnight to cure. Do not remove props until the panel is properly secured by the permanent framing supports.
3. When the flexible sealant is cured, fix the wall frame (including the steel top-hat sections) to the panel, using screws inserted from the inside of the building (rather than the normal method of fixing from the outside of the building). The number of screw fixings should be doubled from normal requirements.

Note

Because the screws are inserted 72mm and the head is not on the outside of the panel, the lateral load capacity could be approximately half of that of the fixing from the outside. This should be provided for by doubling the number of screws. Notwithstanding the reduced capacity, there will be virtually no lateral load on the panel, provided the existing brickwork wall remains in place. If the existing brickwork wall is removed, the wall could be subject to full external wind suction.

Structural Design Example

The purpose of the following worked examples is to provide guidance to structural engineers on the structural design considerations and methodology for ECO PANEL (AAC) reinforced walls, reinforced floors and unreinforced masonry.

- Eco Panel AAC provided as steel reinforced wall panels, are designed in accordance with the recommendations of RILEM Recommended Practice – AAC Properties, Testing and Design. Because this system is outside the scope of the most relevant National Construction Code of Australia reinforced document, AS3700, its use must be treated, under the National Construction Code of Australia, as an Alternative Solution.
- Eco Panel AAC provided as steel reinforced floor panels, are designed in accordance with the recommendations of RILEM Recommended Practice – AAC Properties, Testing and Design.
- Eco Panel AAC provided as autoclaved aerated blocks set in this-bed adhesive, are designed in accordance with AS 3700-2001 Masonry Structures.

Notes

1. Because these systems are outside the scope of the most relevant National Construction Code of Australia referenced documents, AS3700 and AS3600, their use must be treated, under the National Construction Code of Australia, as an Alternative Solution.
2. The designs in this manual are consistent with the requirements of AS3700-2011. The designs are also generally consistent with AS3700-2001. The main difference between the two versions of AS3700 is in the determination of robustness, AS3700-2011 being generally more conservative.

Occupational Health and Safety

The following table sets out the principal considerations of occupational health and safety for the construction of ECO PANEL (AAC) panels.

Activities Covered by these Procedures

1. Receive all materials required for ECO PANEL (AAC) panels onto the site and store off the ground in a safe, secure location.
2. Move the materials to the work site, taking care to avoid back or muscle injury. Use mechanical aids, such as trolleys forklifts, cranes and multiple able bodied people to lift and move panels. Plan the sequence of installation to minimize panel movements and avoid awkward lifts. Keep the panels dry
3. Lift & Support Panels. Where appropriate, use appropriate cranes and slings, lift the panels into position and immediately brace with supports designed and specified by the Structural Engineer.
4. Permanent Fixings - As soon as practical, complete all permanent fixing of the panels to the structure. All such fixings must be designed and specified by the Structural Engineer. Do not remove temporary supports until permanent fixings are secured.
5. Flashing & Weatherproofing - Apply all flashings, renders, weatherproof coatings, and other finishing, as specified in the Drawings and/or Specification.
6. Clean-up - Remove rubbish through out the installation process, to reduce the risk of slips trips and falls, which can cause injury, carry out final check, hand over the project.

ECO Panel Products are cement based which may irritate the skin resulting in itching and a rash may appear. The wearing of gloves and suitable clothing to reduce abrasion and irritation of the skin is recommended when handling ECO panel Products

Limitations:

The worker is not authorized to:

- Use electrical equipment, welding equipment and the like
- Use motorized equipment, except cranes. Separate procedures for the safe use of cranes must be prepared and used.

Risks	Precaution
Impact by mobile equipment	Wear brightly colored shirt or vest
Impact from falling items	Wear a safety helmet near elevated work
Back injury or muscle injury	Each 2,700 x 600 x 75 mm AAC panel weighs approximately 90 kg. Do not lift heavy items without assistance. Bend knees and keep back straight when lifting. Avoid strenuous activity if unfit or suffering back or muscle strain
Foot injury	Wear strong boots, preferably with steel caps
Heat exhaustion	Drink plenty of fluids, Rest in shaded areas
Sun damage to skin	Wear a hat, shirt & sunscreen
Fall from ladder	Ensure top of ladder is secured & protruding at least 1.0m above the floor
Electrocution	Ensure electrical equipment is safe & tagged Do not use electric power in wet conditions Wear insulated footwear Avoid overhead & hidden power cables
Fall from scaffold, roofs or elevated floors	Ensure all handrails are installed Do not lean on
Chemical attack to skin by cement in concrete grout, in some cases leading to dermatitis	Wear gloves and other protective clothing to avoid rash and itchiness.
Inhalation of dust, particularly while cutting AAC	Wear respirators complying with AS/NZS1715 and AS/NZ1716, and eye protection, complying with AS1336, when cutting and chasing AAC. Refer to Eco Panel Material Safety Data Sheets.
Collapse of structure	Ensure structure is correctly braced. In particular, ensure that unfinished AAC not tied to permanent supports is braced.

Reinforced ECO Panel AAC Panels

Reinforced AAC Wall Panels and AAC Blocks shall be ECO PANEL (AAC) complying with the following:

- Architectural and Engineering Drawings
- National Construction Code of Australia
- Requirements of "RILEM Recommended Practice – AAC – Properties, Testing and Design"
- Relevant Australian Standard listed previously in this specification. Reinforced AAC wall panels are generally in accordance with the RILEM Recommended Practice, while AAC Blocks are in accordance with AS 3700.

Important Design and Construction Checks

These properties are based on advice from the suppliers.

- The designer must check the availability of the particular products and design accordingly, selecting the appropriate properties.
- In the case of wall panels, the designer must consider loading from both sides of the wall. The required construction detail must be indicated clearly on the drawings.
- The builder must check compliance of the product supplied to site. See also the checklist that forms part of the specification.
- Where the reinforcement is not in the centre of the panel, the designer must indicate clearly on the drawings which sides of the wall it must be placed, and the builder must install it correctly.
- The designer must correctly detail the required connections, and the builder must ensure that they are correctly installed, properly fixing the AAC panels into the building.

Definitions

- Dimensional Category DW0 - No Requirements
- Dimensional Category DW1 - Average deviation of a sample of 20 units; +/- 2.5 mm (dimensions under 150 mm); +/- 4.5 mm (dimensions 150 to 250 mm); +/- 5.0 mm (dimensions over 250 mm)
- Dimensional Category DW4 - For a sample of 20 units, the standard deviation of work sizes shall be not more than 2 mm, and the difference between the mean and the work size shall be not more than 3 mm. For split faces, the dimensional deviations shall not apply to the width of the unit, provided the average width is not less than 90% of the work size.
- General Purpose Salt Attack Resistance Grade - Performance such that it is possible to demonstrate that the product has a history of surviving under non-saline environmental conditions similar to those existing at the site considered, but not expected to meet the mass loss criterion for Exposure Grade Salt Attack Resistance Grade
- Exposure Grade Salt Attack Resistance Grade - Performance such that it is possible to demonstrate that the product has a history of surviving under saline environmental conditions similar to those existing at the site considered; and less than 0.2 grams mass loss in 40 cycles in AS/NZS 4456.10, Method B test.

Thin Bed Adhesive

Thin Bed Adhesive shall be mixed and applied in accordance with the manufacturer's instructions. Most important, the adhesive should not be re-tempered as this will have a detrimental effect on the bond strength on the panel adhesive.

Thin Bed Adhesive is used for gluing the panels together at all joints. Typically, panel joints are 2-3mm thick. Sufficient pressure is to be applied to the joint to ensure full coverage of adhesive in the joint.

Provision for Timber Shrinkage

In AAC veneer construction, a gap in accordance with schedule below shall be left between the timber frame and the top of the AAC, and at window sills, to accommodate timber shrinkage.

Location in timber framed buildings	Minimum Clearances (mm)	
	Unseasoned hardwood frame	Other timber frame
Sills of lower or single storey windows	10 mm	5 mm
Roof overhangs of single storey buildings	16 mm	8 mm
Sills of second storey windows	20 mm	10 mm
Roof overhangs of two storey buildings	24 mm	12 mm

Extending Panels

ECO PANEL (AAC) panels may be extended up to 200mm by gluing additional pieces to them using thin-bed adhesive; provided both parts are supported by timber or steel battens (or similar) and the overall length between control or articulation joints does not exceed the values specified above.

Render and Paint Schedule

The following render and paint system shall be applied to AAC walls. Refer to Render and Paint Specification for suitable products as tested by Ian Bennie & Associates Test Report No 2017-096-S1(A1) 50mm AAC ECO PANEL wind load test to AS4040 and Test Report No. 2018-044-S1 Eco Panel (AAC) Wall Cladding System Specimen tests to NCC-2016 Verification methods FVI and V2.2.1

Substrate :	Autoclaved Aerated Concrete (AAC)
Finish :	Acrylic render with Texture Coating.
Performance:	Water-resistant and vapor-permeable decorative coating, capable of bridging up to a 1 mm substrate crack.
Surface Preparation:	Clean, patch and remove any dags. Ensure that the surface is free of all incompatible materials, such as silicone sealants. If subject to sea spray or within 1 km of a surf coast, wash with clean fresh water to remove all traces of salt.
First Coat:	Skim coat 3 to 4 mm thick CHAD Surface Coatings Pro Render acrylic render, hawk and steel trowel to level small irregularities. Do not render over control joints.
Second Coat:	Skim coat 3 to 4mm thick CHAD Trade Render acrylic render, hawk and steel trowel to level small irregularities do not render over control joints
Third Coat:	Trowel-on or roll-on Chad Surface texture acrylic coating. Dry for 24 hours before applying further coat.

Associated Materials Schedule

Renders and Paints		
<p>Renders and paints shall comply with the following::</p> <p>First Coat: Skim coat 2 to 4 mm thick acrylic render, hawk or steel trowel to level small irregularities.</p> <p>Second Coat: Primer suitable for acrylic overcoats. Third Coat:</p> <p>Trowel-on or roll-on texture acrylic coating.</p> <p>Fourth Coat: Roller, airless spray or brushed 100% acrylic heavy duty durable coating.</p>		
Specified Requirements	Complying product reference	Contact for further details
Acrylic Render – First Coat	CHAD Surface Coatings Pro Render	<p>CHAD Group Pty Ltd (03) 9544 8899 1366 North Road Oakleigh South</p>
Acrylic Render – Second Coat	Trade Render	
Textured acrylic coating – Third Coat	Texture Coatings: CHAD Surface Coatings Trowel-on Marble Texture medium or coarse	
Acrylic heavy duty durable coating if requested.	Chad Surface Coatings Membrane Coating	

Joint Material

Joint material shall comply with the Drawings, National Construction Code of Australia and relevant Standard

(AS 3700). Unless stated otherwise:

- Backing rod for control joints, expansion joints and articulation joints shall be expanded polystyrene tube or bead or, rigid steel backing profile with closed cell foam adhered to the metal profile face.
- Joint sealant shall be gun grade multi-purpose polyurethane sealant.
- Control joints and articulation joints shall incorporate de-bonding tape.

Intumescent seals shall be one-part, water-borne, urethane polymer blended with acrylic co-polymer to give a tough and gunnable sealant capable of providing the requisite fire performance as specified in the Drawings and/or National Construction Code of Australia as appropriate.

Damp Proof Course

Damp-proof courses (DPCs) shall comply with the Drawings, National Construction Code of Australia and relevant Standard (AS 3700, AS/NZS 2904). Unless stated otherwise damp-proof courses (DPCs) shall consist of one of the following options.

- A material complying with the Standard AS/NZS 2904;
- Embossed black polyethylene film of high impact resistance and low slip, with a nominal thickness of 0.5 mm prior to embossing, and meeting the requirements of the relevant Standard (Clause 7.6 of AS/NZS 2904);
- Polyethylene coated metal damp proof courses with an aluminium core not less than 0.1mm thick, shall be coated both sides with bitumen adhesive enclosed in polyethylene film not less than 0.1 mm thick on each face, and has a nominal total thickness of not less than 0.5 mm prior to embossing;
- Bitumen impregnated materials of not less than 2.5 mm thickness, that meet the requirements of the relevant Standard (Clause 7.5 of AS/NZS 2904), when used in walls that are not higher than 7.8 m above the level of the DPC;

Termite shields (with no penetrations) continuous throughout the wall or pier.

Notes: Metal and metal-cored damp-proof courses and termite shields shall not be used in locations with saline ground water or subject to rising salt damp

Flashings

Flashings shall comply with the Drawings, National Construction Code of Australia and relevant Standard (AS3700, AS/NZS 2904).

- Metal and metal-cored flashings shall not be used in locations that expose them to saline ground water or rising salt damp.
- Metal flashings shall be compatible with the materials with which they are in contact, and shall not give rise to electrolytic action. If there is potential for electrolytic action to occur, flashings shall be isolated by inert materials.
- Flashings intended to hold their shape shall be manufactured from rigid material. (e.g. metal cored material)

Unless stated otherwise flashings shall consist of one of the following options: Flashing in Concealed Locations (e.g. cavity flashings) shall be one of the following:

- Uncoated annealed lead having a mass not less than 10 kg/m in lengths not exceeding 1.5 m, shall not be used on any roof that is used to catch potable water;
- Uncoated copper having a mass not less than 2.8 kg/m and having a thickness of 0.3 to 0.5 mm;
- Bitumen coated metal (normally aluminium) with a total coated thickness of 0.6 mm to 1.0 mm;
- Zinc coated steel with a thickness not less than 0.6 mm;
- Embossed/quilted polyethylene sheet with an average thickness not less than 0.5 mm Flashings in Exposed Locations (e.g. flashings from the roof to wall) shall be one of the following:
- Uncoated annealed lead having a mass not less than 20 kg/m in lengths not exceeding 1.5 m, but shall not be used on any roof that is used to catch potable water;
- Uncoated copper having a mass not less than 2.8 kg/m and having a thickness of 0.3 to 0.5 mm;
- Bitumen coated metal (normally aluminium) with a total coated thickness of 0.6 mm to 1.0 mm;
- Zinc coated steel of thickness not less than 0.6 mm.

Wall Wrap (Breathable)

Breathable Wall Wrap must meet the requirements of the AS/NZS 4200.1 and shall achieve a minimum Medium Duty (MD) classification in accordance with this standard.

Flashing Tape

Butyl Flashing Tape (Aluminium / Butyl self-adhesive) 48 mm wide x 1.5 mm self-adhesive for weatherproofing around all around the openings, penetrations and connections.

Cladding of a Domestic Dwelling

The following specification and details are generally suitable for Reinforced AAC wall cladding for domestic dwellings, subject to confirmation by the Design Engineer. A suitable support framing system must also be provided.

Reinforced AAC Panels shall be screw fixed to horizontal light-gauge steel battens, which are fixed to vertical steel studs. There shall be not less than four horizontal battens per panel, with this number increasing for higher wind loads and for panels within 1,200 mm of the building corners.

Panels within 1,200 mm of each end of each external wall of a building (i.e. the two 600 mm wide panels closest to the corners) are subject to higher local wind pressures and suctions, and therefore require more battens and more screw fixing than other panels.

Unless specified otherwise by the engineer, the following details and tables shall be used for the cladding of domestic dwellings with 75 mm thick or 100 mm thick Reinforced AAC Panels.

Light gauge steel battens shall comply with the Drawings, Building Regulations and relevant Standards (AS/NZS 4600, AS 3623). Cold-formed sections and accessories shall be manufactured from Z350 galvanised steel (Grade G550) complying with AS 1397, with a zinc coating not less than 350 g/m² and shall comply with AS4600. All battens shall be 24 x 30 x 0.55 BMT Top Hat, Grade G550) or equivalent.

All screws shall be No 14 x 100 mm Bugle-headed batten self-drilling galvanised steel screws, fixed from outside of the building through the AAC panels into the horizontal steel light gauge battens behind General Notes:

1. All wind classifications and ultimate pressure calculations are based AS 4055-2006.
2. If AAC Panels are required to provide racking resistance, the screws and supports shall be determined
 1. by the structural engineer, taking into account the wind classification and the overall building dimensions.
 2. Top and bottom battens shall be positioned within 150 mm of the ends of the panels

AAC ECO WALL & FLOOR PANEL & BLOCK PRODUCT RANGE WARRANTY

Warrants that this product will be free from defects in material and workmanship for a period of 7 years from the date of purchase.

This warranty will not apply if, in the opinion of CHAD GROUP P/L the product has been:

- installed and maintained other than in compliance with the manufacturer's specifications and technical manual;
- handled in a manner which contravenes CHAD GROUP P/L warnings or Material Safety Data Sheet;
- misused, abused, altered or damaged by you in any way;
- attached to materials of poor quality, workmanship, design or detailing or which are subject to movement whether structural or otherwise;
- attached or used in a project that has not been designed and constructed in strict compliance with current, National Construction Code regulations and standards; or
- damaged through normal wear and tear including exposure to the elements (on both exposed and unexposed surfaces) resulting in the growth of any organism including but not limited to mildew, mould, bacteria or other growth on the Product.
- CHAD GROUP P/L reserves the right at its sole discretion to determine whether to repair or replace any faulty product free of charge for parts and labour or to give a refund in respect of the faulty product.

The benefits conferred by this warranty are in addition to all other non-excludable rights and remedies in respect of the product which the you may have under the Trade Practices Act and any similar laws in Australia or elsewhere. To the maximum extent permitted by law, CHAD GROUP P/L liability for any non-excludable condition or warranty is limited, at CHAD GROUP P/L discretion to the replacement of the relevant product or supply of equivalent product; the repair of the relevant product, the payment of the cost of having the relevant product replaced or acquiring equivalent product, or paying the costs of any necessary repair.

To the maximum extent permitted by law, CHAD GROUP P/L excludes all other conditions and warranties implied by custom, the general law or statute. CHAD GROUP P/L also excludes the provisions of the United Nations Convention on Contracts for the International Sale of Goods. Proof of purchase must be provided when making any claim under this warranty, and should be retained by the purchaser at all times.