



75 mm E-PANEL

Reinforced AAC panel

External Wall System
for
High-rise building applications

Technical Manual

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Introduction

The use of reinforced autoclaved aerated concrete (AAC) in buildings has been widely accepted throughout Europe for over 70 years. It was first introduced into Australia over 30 years ago and has gained significant popularity and acceptance in the building industry due to its unique set of benefits.

The E-PANEL brand of reinforced autoclaved aerated concrete (AAC) panels are suitable for many different building applications including external or internal walls for low-rise and high-rise construction. The superior performance of the reinforced AAC panels with regards to fire resistance, thermal efficiency and sound reduction make it an appealing choice for builders, developers and the like. This is especially so when the increase in speed of construction that the panel provides is taken in account.

The E-PANEL reinforced AAC panels are produced by New Era Block Tile Joint Stock Company in a modern manufacturing plant located in Vietnam. The finished panels are packaged and shipped to Australia.

Scope

This E-PANEL reinforced AAC external wall Technical Manual for high-rise building applications is intended for use by qualified and experienced architects, engineers and builders for the design, specification and construction of external walls for high-rise residential and commercial buildings. These buildings are assumed to be Class 2 to 6 buildings as defined in the National Construction Code – Building Code of Australia (NCC) and include residential apartment buildings, hotels, health-care buildings, office buildings, shops and restaurants etc.

The technical manual is strictly for use with the 75mm E-PANEL reinforced AAC panel (Model EPL-550/30075) and shall not be used with any other product or manufacturer. Any variation of the system/components outlined in this manual is considered outside the scope and must be evaluated by the relevant professional consultant.

Limitation

The technical manual does not replace the need for qualified designers (eg. engineers & architects) to specify project specific information and it is their responsibility to confirm the suitability of using E-PANEL reinforced AAC products for a particular project. E-PANEL accepts no liability for errors or omissions in this technical manual and it is the user's responsibility to ensure that the current edition of the manual is being used.

What is reinforced AAC?

Reinforced AAC is a precast building element, usually in the form of panels, consisting of cured AAC material and welded steel reinforcing mesh.

The raw ingredients of AAC are fine sands, cement, lime, water and an expanding agent. These are mixed together to and placed into a casting bed along with sheets of welded reinforcing mesh that have been coated in a film to reduce corrosion. While in the casting bed, the AAC mix expands due to a chemical reaction with the expanding agent that forms very small air voids throughout the material. The expansion causes the material to rise and cover the reinforcing mesh. The forms of the casting bed are then removed and the reinforced AAC block is sliced into numerous panels as required. Finally, the sliced reinforced AAC block is placed into large chambers at high pressure and heat to allow the curing to take place (autoclaving).

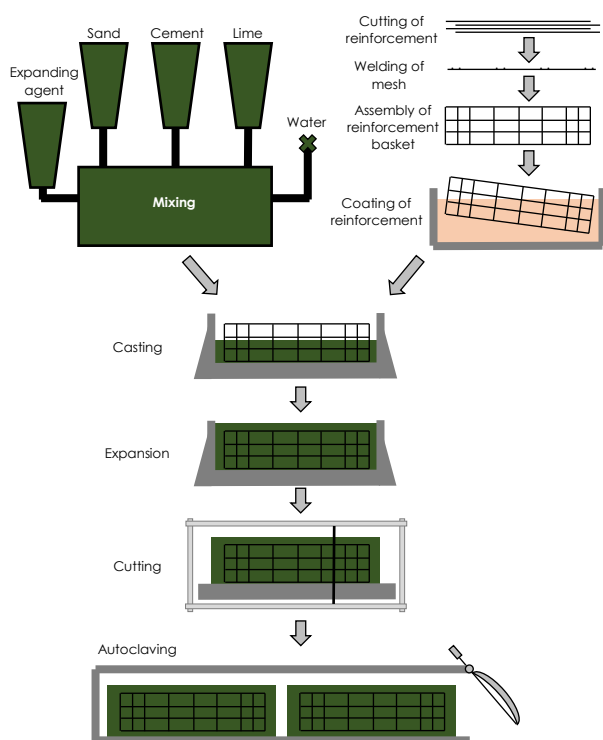


Figure 1 - Reinforced AAC manufacturing process

Material Properties

For external walls in low-rise residential buildings, the 75mm E-PANEL reinforced AAC panel is recommended. This panel contains a single layer of reinforcement that is located centrally in the panel depth. The various properties of the panel are outlined below.

Table 1 - 75-mm E-PANEL properties

Property		Value
Reinforced Panel		
Panel thickness	D	75 mm
Panel Length	L	1.2 - 3.0 m
Ult. bending capacity	ϕM_k	1.18 kNm/m
Thermal resistance		0.51 R-Value
Density for design	$\rho_{d,sup}$	634 kg/m ³
	$\rho_{d,inf}$	521 kg/m ³
Density for transport	ρ_{trans}	782 kg/m ³
AAC Material		
Dry density	$\rho_{m,g}$	530 kg/m ³
Compressive strength	f_{ck}	2.5 MPa
Thermal expansion coefficient		8.0 x10 ⁻⁶ /°C
Reinforcement		
Bar size	ϕ_{sl}	5 mm ϕ
No. of longitudinal bars	n	4
Bar corrosion protection		Sand-loaded viscous paint

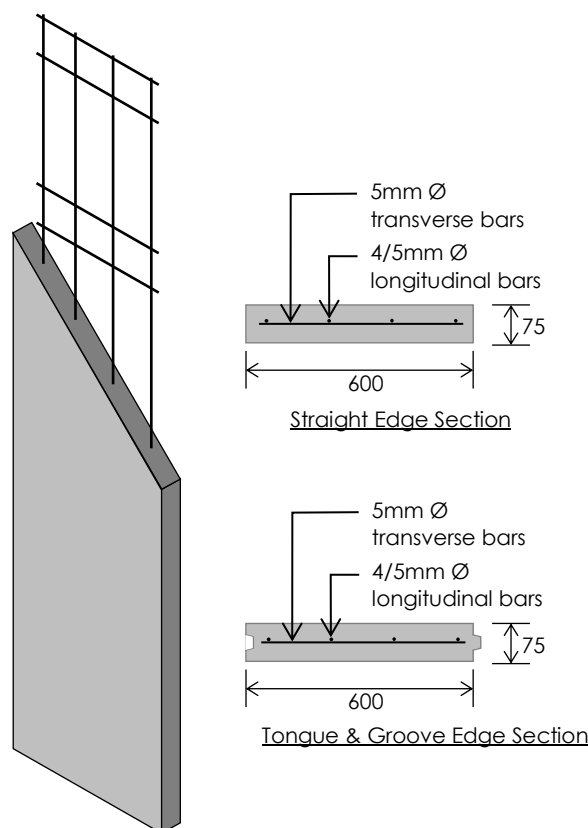


Figure 2 - 75mm E-PANEL Diagrams

Fire Resistance

Specification C1.1 of the NCC Volume One states the fire resistance level (FRL) requirements for various situations of a building.

The 75mm E-PANEL reinforced AAC panel is the main fire resisting element in the low-rise external wall system detailed in this technical manual. However, the internal plasterboard lining and fire rated sealed joints are integral to the overall fire performance. The 75mm E-PANEL has been tested by CSIRO in accordance with AS 1530.4 and the high-rise external wall system assessed to provide an FRL performance of 90/90/90 which exceeds the NCC requirements.

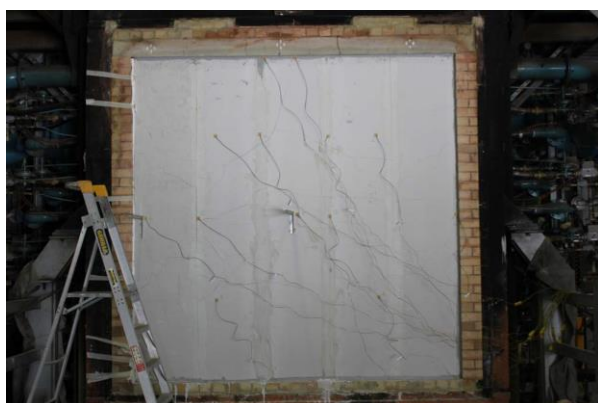


Figure 7 - Fire testing of 75-mm E-PANEL

Thermal

The 75-mm E-PANEL provides significant thermal performance resulting in comfortable internal spaces for high-rise buildings and lowering the dependence on conditioning of the spaces. The thermal resistance of the wall system using various types of insulation is outlined in Table 3 below.

Table 3 - Thermal performance

Membrane	Wall insulation	R-Value	
		Summer	Winter
Semi-reflective	R1.5 (70-mm)	2.60	2.81
Semi-reflective	R2.0 (90-mm)	3.09	3.34
Reflective	R1.5 (70-mm)	2.76	3.00
Reflective	R2.0 (90-mm)	3.26	3.53

Acoustic

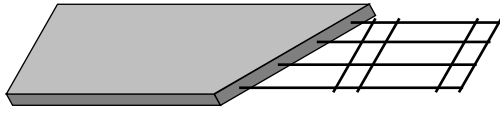





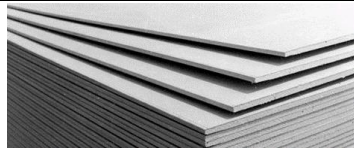

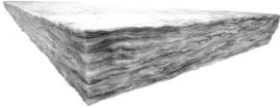




Where a building is constructed close to a road or rail corridor, the acoustic performance of the external wall should be an important consideration.

The 75mm E-PANEL has been tested by CSIRO in accordance with AS/NZS 1276.1 and the high-rise external wall system assessed by a leading Australian acoustic firm. If the insulation and internal wall lining components of the high-rise external wall system are changed slightly a significant increase in acoustic performance can be achieved as shown in Table 4 below.

Table 4 - Acoustic performance

Insulation	Internal wall lining	Acoustic Performance
75-mm glasswool insulation (14 kg/m ³)	10-mm standard grade plasterboard (6.4 kg/m ²)	R _w = 38
	13-mm fire-rated plasterboard (min. 10.4 kg/m ²)	R _w = 45
	2 x 13-mm fire-rated plasterboard (min. 20.8kg/m ² total)	R _w = 52

Wall System Components

Product	Description	
75mm E-PANEL	75-mm thick reinforced AAC panel available in the lengths from 1200-mm to 3000-mm in 5-mm increments.	
Tophat batten	24-mm deep steel tophat batten of grade G550 with AZ150 coating. It is recommended to use Rondo 303 or Studco M303	
AAC panel fixing screw	For fixing the 75mm E-PANEL to the tophat batten use 14-10x65 Type 17 hex head screws in accordance with AS 3566.1. Corrosion class shall be in accordance with AS 3566.2 as follows: <ul style="list-style-type: none"> • Class 3 for moderate & mild environments • Class 4 for marine, severe marine & industrial environments. 	
Stud frame fixings	For fixing the steel tophat battens to the steel stud framing use 10-16x16 self-drilling hex head screws in accordance with AS 3566 parts 1 & 2.	
Pliable membrane	Pliable membrane fixed to the stud framing to be in accordance with AS/NZS 4200.1 with water barrier classification.	
Sealing tapes	For sealing the wall membrane to other materials like concrete, steel or aluminium, use a flexible butyl rubber tape. For sealing wall membrane laps, use a tape compatible with the membrane as per the membrane manufacturer's details.	
Plasterboard	Plasterboard shall be either 10-mm standard grade (min. 8.4 kg/m ²) or 13-mm fire-rated grade (min. 10.4 kg/m ²). Refer to acoustic performance section. It is recommended to use Gyprock, Knauf or USG Boral brands.	
Stud framing	Steel stud framing shall be a minimum of 92-mm deep x 0.75 BMT (for acoustic performance) and designed in accordance with AS/NZS 4600:2005.	
Insulation	75 or 90-mm glasswool wall insulation consisting of an R-Value that is suitable for the required thermal performance. For acoustic performance use 75mm thick with a minimum density of 14 kg/m ³ minimum. It is recommended to use fletcher, Bradford or Knauf brands.	
Panel Adhesive	Cement based tile adhesive for all 75-mm E-PANEL joints excluding control joints. Approved product is Dunlop AAC concrete block adhesive.	
Anti-corrosion paint	When panels are cut the exposed ends of the reinforcement must be treated with corrosion protection paint. It is recommended to use a zinc rich paint, e.g. Dy-Mark Zinc Guard	
Sealant	An external grade sealant shall be used for all control joints. For walls that require fire resistance, use a fire-rated sealant. Approved product is Selley's Flame Flex.	
Backing rod	To maintain the correct thickness of sealant in joints use backing rod. The thickness of the backing rod is to be suitable to the joint thickness.	

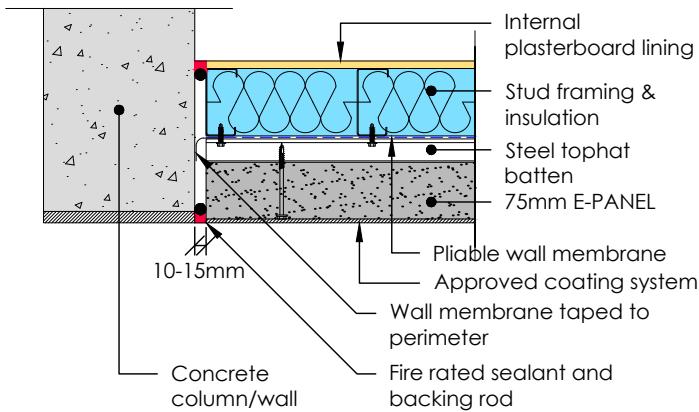


Figure 14 – Wall termination detail (plan view)

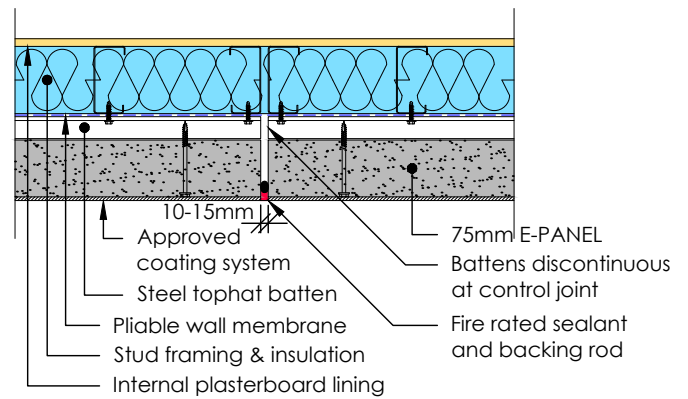


Figure 15 – Vertical control joint detail (plan view)

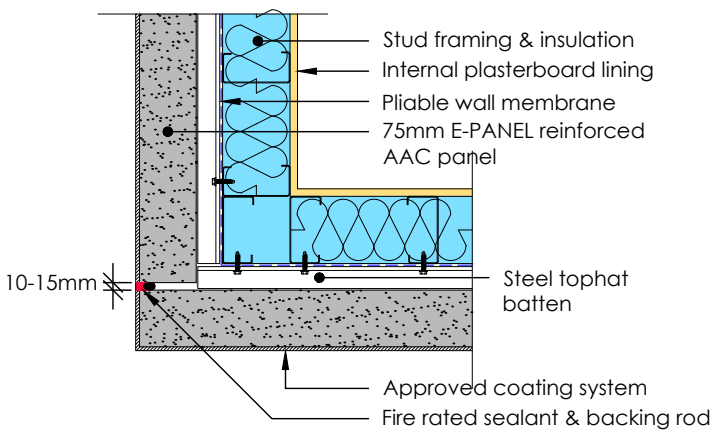


Figure 16 – External corner control joint detail (plan view)

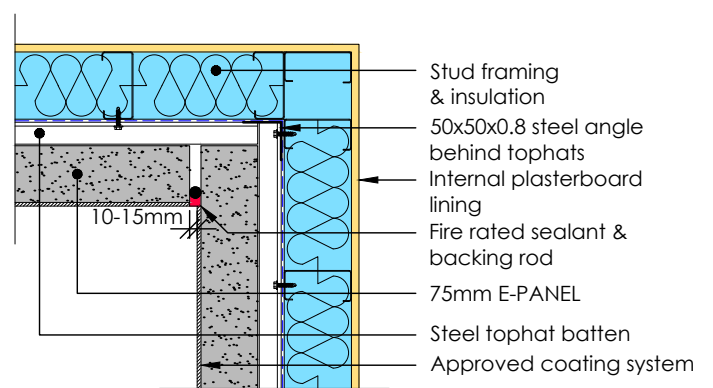


Figure 17 – Internal corner control joint detail (plan view)

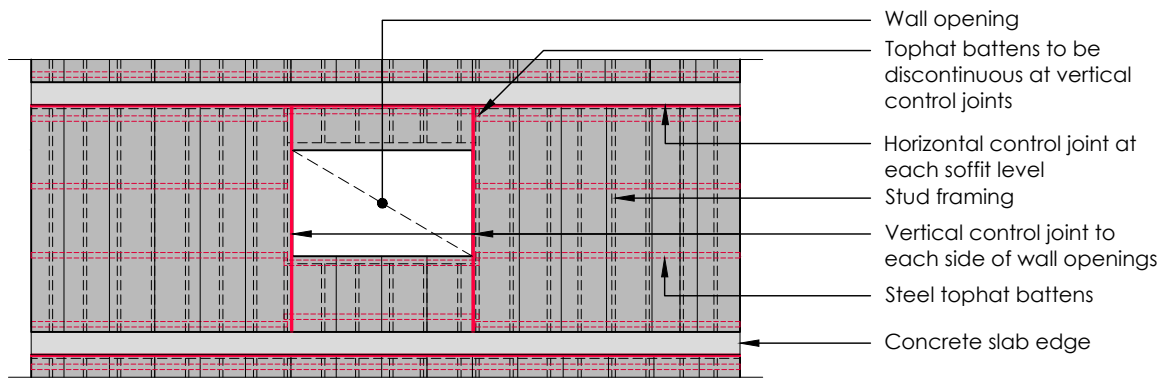


Figure 18 – Wall set out elevation

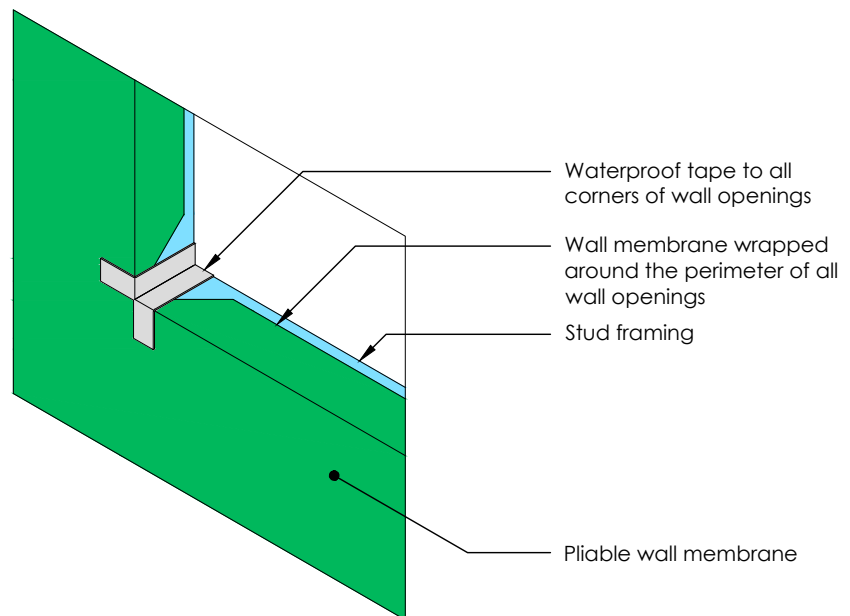


Figure 19 – Wall opening membrane wrapping detail

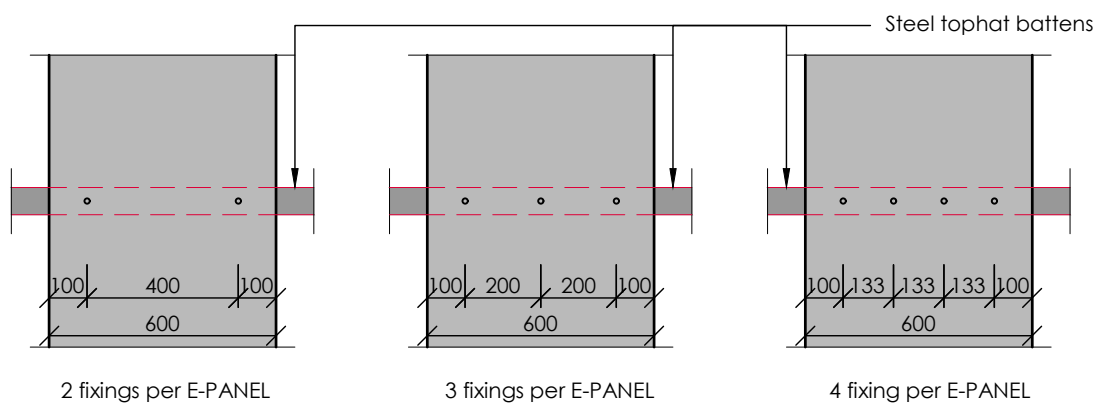


Figure 20 – Fixing spacing detail