75 MM E-METRIX® PANEL WALL

REINFORCED AAC PANEL

Internal Party Wall System for Low-rise Building Applications

Technical Manual



GHS Compliance

Product Name: E-METRIX® Reinforced AAC Panel
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Prepared For: E-METRIX® AAC Panels / Helix Buildtech Pty Ltd

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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-METRIX® brand of reinforced autoclaved aerated concrete (AAC) panels is 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 considered.

E-METRIX® reinforced AAC panels are produced by a Hass German engineered modern manufacturing plant located in Vietnam. The finished panels are packaged and shipped to Australia. ISO 9001: ISO14001

SCOPE

This E-Metrix® Panel reinforced AAC internal party wall technical Manual, for low-rise building applications, is intended for use by qualified and experienced architects, engineers, builders and licensed Contractors for the design, specification and construction of internal party walls for low-rise residential buildings. These buildings are assumed to be Class 1 buildings as defined in the National Construction Code – Building Code of Australia (NCC) and include the following which are not located above or below another dwelling or another Class of building other than a private garage:

- Two or more attached dwellings, separated by a fire-resisting wall e.g. a row house, terrace house, town house or villa unit.
- A boarding house, guest house or hostel with <300m^2 floor area and <12 residents; or
- 4 or more single dwellings located on one allotment and used for short-term holiday accommodation

The technical manual is strictly for use with the 75mm E-Metrix® Panel Wall reinforced AAC panel 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 (e.g. engineers & architects) to specify project specific information, and it is their responsibility to confirm the suitability of using E-Metrix® Panel Wall reinforced AAC products for a particular project. E-Metrix® Panel Wall 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 sand, cement, lime, water and an expanding agent. These are mixed 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).

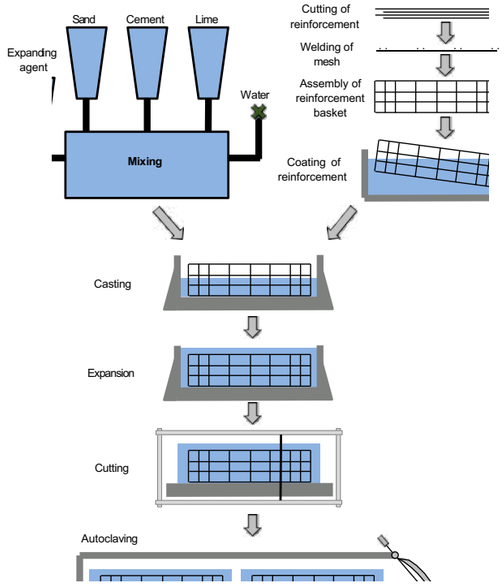


Figure 1 - Reinforced AAC manufacturing process

MATERIAL PROPERTIES

For internal party walls in low-rise residential buildings, the 75mm E-Metrix® Panel Wall 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 - 75mm E-Metrix® Panel Wall properties

Property		*Value*	
Reinforced panel			
Panel thickness	D	75	mm
Panel Length	L	2.4 - 3.0	m
Ult. bending capacity	φM_k	0.6	kNm/ m
Thermal resistance		0.51	R-Value
Density for design	$\rho_{d,sup}$	700	kg/ m^3
Density for transport	ρ_{trans}	580	kg/ m^3
AAC Material			
Dry density	$\rho_{m,g}$	520	kg/ m^3
Compressive strength	f_{ck}	5.5	MPa
Thermal expansion coefficient		8.0	x10^{-6}/ °C
Reinforcement			
Ba r size	φ_{sl}	5	mm Ø
No. of longitudinal bars	n	4	
Bar corrosion protection		Sand -loaded viscous paint	

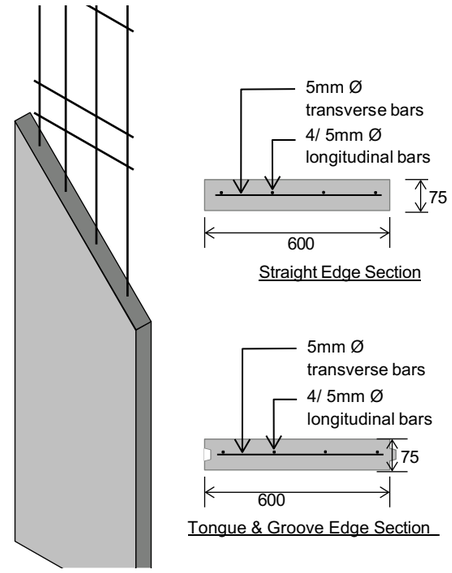
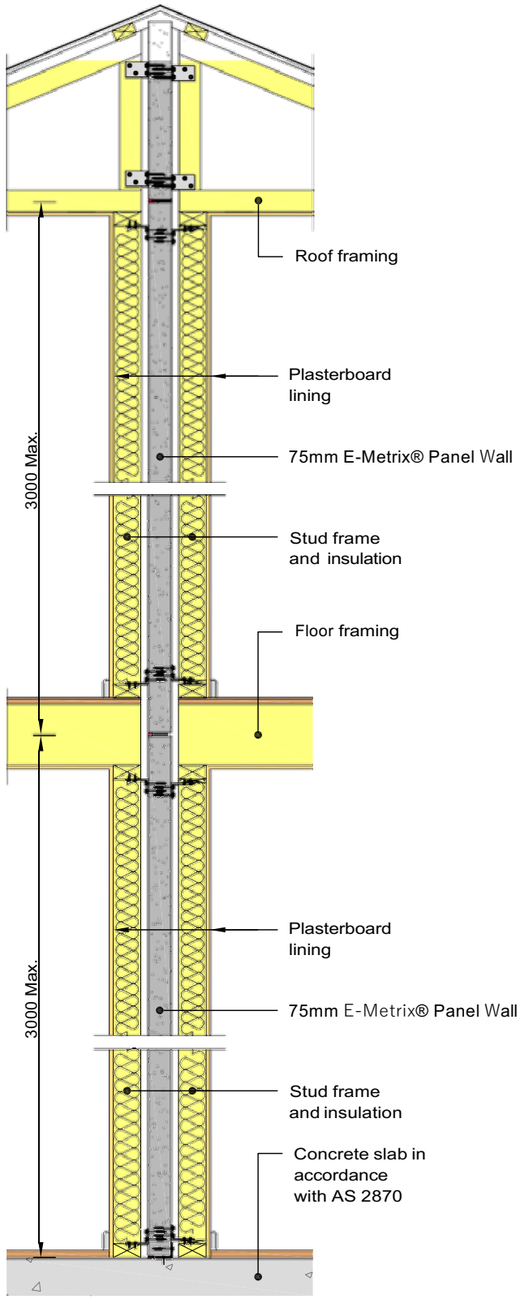


Figure 2 - 75mm E-Metrix® Panel Wall Diagrams

SYSTEM OVERVIEW

The 75-mm E-Metrix® Panel Wall internal low-rise party wall system consists of a single 75-mm E-Metrix® Panel Wall with a plasterboard lined stud framed wall on either side. A 20mm gap exists between the face of the E-Metrix® Panel Wall and the edge of the stud frames. The E-Metrix® Pane Wall is fixed in place with light gauge aluminium brackets on both sides at the floor and ceiling level on each floor as well as in the roof cavity, as shown in Figure 3 below. This system provides the necessary airborne and impact generated sound attenuation required by the NCC for walls separating dwellings. It also provides sufficient fire resistance in the event of a fire in one of the dwellings.

Figure 3 – Internal low-rise party wall section overview



SYSTEM PERFORMANCE

National Construction Code

The National Construction Code – Building Code of Australia (NCC) sets out the requirements for building construction work in Australia. For internal party walls in low-rise residential buildings, Volume II of the NCC applies. The 75mm E-Metrix® Panel Wall systems detailed in this manual comply with the following performance requirements of the NCC Volume II.

Table 2 - NCC compliance

NCC Vol. II Section	*Performance requirement*
Structural	P2.1.1
Fire Resistance	P2.3.1
Acoustic	P2.4.6

Fire Resistance

In the event of a fire, separating walls in class 1 buildings are required to resist the fire for a specified period of one hour which is stated as a fire resistance level (FRL) of 60/ 60/ 60 in part 3.7.1.8 of the NCC Volume II. The 75mm E-Metrix® Panel Wall reinforced AAC panel is the main fire resistance element in the party wall system detailed in this technical manual. However, the plasterboard linings and fire rated sealed joints are integral to the overall fire performance. The 75mm E-Metrix® Panel Wall has been tested by NATA accredited Ignis Labs and assessed to provide an FRL performance of - / 90/ 90 which exceeds the NCC requirements.

Acoustic

The acoustic performance of a separating wall must be considered to safeguard the occupants of a part of a building from illness or loss of comfort. The two main aspects of consideration about acoustic performance are airborne sound and impact generated sound. Airborne sound is commonly stated in terms of a weighted sounding ex, R_w, and for some walls a low frequency noise correction factor, C_{tr}, must be applied to the index. For example, an R_w of 53 with a C_{tr} of -6 gives an $R_w + C_{tr}$ of 47.

Table 3.8.6.1 of the NCC Volume II specifies the acoustic insulation requirements for party walls. In summary, these are:

1. Walls separating a habitable room in one dwelling from a wet room (bathroom, sanitary compartment, laundry or kitchen) in the other must have:
   a. $R_w + C_{tr} \geq 50$; and
   b. Be of discontinuous construction.
2. Walls separating all other cases to those above must have an $R_w + C_{tr} \geq 50$.

The acoustic performance of the 75mm E-Metrix® party wall system has been calculated by Resonate Acoustics:

- $R_w + C_{tr}$ of 56
- 13mm Fire plasterboard
- 90mm timber studs 600mm with 75mm Insulation -11kgm3
- 20mm air cavity,
- 75mm E-Metrix AAC panel 520kgm3
- 90 timber stud 600mm with 75mm insulation -11kg/m3
- 13mm Fire rated Plasterboard.

Structural

The 75mm E-Metrix® Panel Wall component of the internal party wall system for low-rise residential buildings is a non-load bearing component. That is, it does not resist vertical loads other than their self-weight. However, it is required to resist lateral (out-of-plane) loading which can be caused by internal pressures. The various mechanical properties of the 75mm E-Metrix® Panel Wall reinforced AAC panel have been independently tested by a NATA accredited laboratory in accordance with AS 5146.2-2015.

The lateral wind load capacity for the 75m m E-Metrix® Panel Wall for ultimate and serviceability limit states is illustrated in Figure 4. The serviceability limit capacity is calculated based on a maximum deflection limit of L/ 250.

The timber stud framing component of the wall system is the load bearing component. It shall be designed and installed in accordance with AS 1684 series of standards.

The plasterboard lining and fixings shall be designed and installed in accordance with the relevant manufacturer.

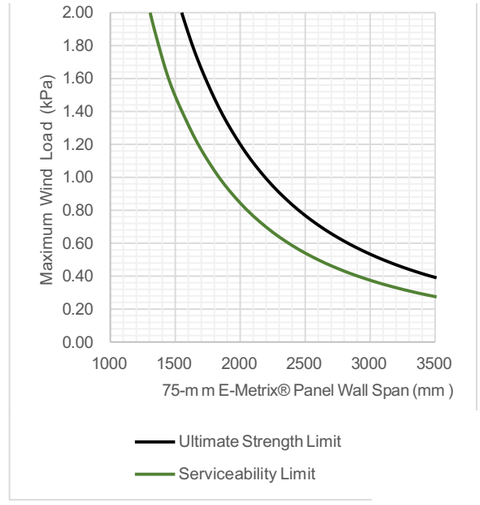
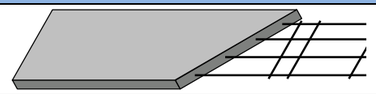
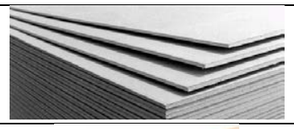
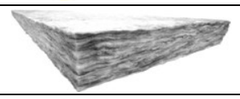


Figure 4 - Lateral load capacity of 75mm E-Metrix® Panel Wall

Wall System Components

Product	*Description*	
E-Metrix® Panel Wall	75mm thick reinforced AAC panel available in lengths from 1200-mm to 3300mm in 5mm increments.	
Aluminium bracket	For securing the 75mm E-Metrix® Panel wall to the stud frames use 76mm x 43 mm x 1.6mm aluminium angle x 50 mm long, using 5005 grade aluminium	
Base angle	As an alternative to the base fixing of the 75m m E-Metrix® Panel use 75x50x1.15 BMT G2 grade steel slotted angle. It is recommended to use Rondo HB75.	
AAC panel fixing screw	For fixing the 75mm E-Metrix® Panel to the bracket & base angle use • 14-10x65 Type 17 hex head screws at 600 centres with class III corrosion resistance in accordance with AS 3566 p arts 1 & 2. • 2 per aluminium bracket. • Spaced at 600 cts. for the base angle	
Stud frame fixings	For fixing the angles to the stud framing use: • 14-10x39 Type 17 hex head screws for timber • 10-16x16 self-drilling hex head screws for steel	
Base angle fixing fastener	For fixing the base angle to the concrete slab, use either of the following a t 600-mm centres: • 3.7mm Ø x 25m m powder actuated fastener • M10 concrete mechanical anchor	
Plasterboard	Plasterboard shall be 13mm Standard grade with aluminium density of 8.4 kg / m 2. It is recommended to use Gyprock, Knauf or USG Boral brands.	
Stud framing	The load bearing timber stud framing shall be either 70-mm or 90-mm in accordance with AS 1684 series.	
Insulation	Glasswool wall insulation shall be 75mm thick with a minimum density of 14 kg / m3 minimum. It is recommended to use fletcher, Bradford or Knauf brands.	
Mineral fibre	Fire resistant mineral fibre between top of 75mm E-Metrix® Panel Wall and roof covering. It is recommended to use fletcher, Bradford or Knauf brands.	
Panel Adhesive	Cement based tile adhesive for all 75-mm E-Metrix® 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	
Fire Rated Sealant	A fire rated sealant must be used at all control joints throughout the fire rated wall. 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 for the joint thickness.	

DETAILING

Control Joints

Vertical control joints must be installed through the 75mm E-Metrix® Panel Wall internal wall systems to minimise the risk of damage occurring due to movement of the supporting structure. This ensures the FRL of the internal wall system remains valid for the life of the wall. Movement in structures can occur due to various causes including:

- movement of the foundation material
- shrinkage/ expansion of the building materials
- long term deflection of suspended members (e.g. concrete slabs)

All control joint requirements should be project specific and prepared by the project structural engineer prior to any E-Metrix® Panel Wall installation.

Vertical Control Joints

It is recommended that vertical control joints should be located:

1. At the following maximum spacing for straight walls:

AS2870-2011 Site Class	*Ma x. horizontal spacing*
M / M-D	6.0 m
H1 / H1-D	5.5 m
H2 / H2-D	5.0 m

2. Within 2.0m of all corner intersections.
3. All changes in wall height.
4. At changes in wall thickness or material types.
5. At the location of movement control joints in the supporting structure (e.g. slab joints).

Horizontal Control Joints

It is recommended that horizontal control joints are located at the level of each floor or ceiling level, this includes:

1. Between the underside and the finished level of the ground floor framing.
2. Between the ceiling and finished level of any upper floor.
3. At the level of the ceiling below the roof.

Fixing

The following fixing specifications shall be used on all 75mm E-Metrix® Panel Wall Internal party wall systems unless noted otherwise by the design engineer or manufacturers specification.

Table 2 - Fixing specifications

Components	*Fixing specification*
Alum. bracket to E-Metrix® Panel W	2/ 14-10x65 type 17 hex head screw at 600 centers with class III corrosion protection in accordance with AS 3566.
Alum. bracket to Stud framing	14-10x39 Type 17 hex head screws for timber 10-16x16 self-drilling hex head screws for steel
Base angle to Conc. slab	3.7-mm Ø x 25-mm powder actuated fastener at 900 centers or M10 concrete mechanical anchors 900 centers in accordance with the manufacturer's specification.
Stud framing to Conc. slab	In accordance with relevant standards or structural engineer.
Plasterboard to Stud framing	In accordance with plasterboard manufacturer's specification.

INSTALLATION GUIDE

Prior to any construction

1. Ensure the work area is clean and tidy prior to commencing work.
2. Confirm that all system components obtained for the installation are those listed in the technical manual specification.
3. Ensure that the stud spacing and wall location will meet the requirements for the required FRL and acoustic rating of the party wall in accordance with the relevant sections in this manual.

Preparing for panel installation

4. Ensure the stud frame has been completed to the point of being ready for installation of the panels. This includes checking that the frame is plumb and straight, with special attention to corners of framing.
5. Plan the panel installation, starting from one end allowing for control joints as per the Detailing section of this manual or as specified by the design engineer.
6. Install base angle to the concrete slabs as per the Fixing section of this manual.

Installing the first panel

7. Starting from a location as chosen in the planning stage, cut the panel to the required height to match floor joists or roofing levels. For any reinforcement that has been exposed, apply a suitable protective treatment as listed in the Wall System Components.
8. Place the first E-Metrix® Panel Wall reinforced into position by pushing it against the base angle. Ensure that the panel is level and plumb, then screw fix the aluminium bracket to the stud frame and E-Metrix® Panel Wall in accordance with the fixing section of this manual. Then screw fix through the base angle into the AAC panel in accordance with the fixing section of this manual. Each screw should be installed so that the hex head washer is flush with the aluminium bracket surface. Care should be taken to not overtighten.

Installing subsequent panels

9. Cut the next panel to the height required. For any reinforcement that has been exposed, apply a suitable protective treatment as listed in the System Components.
10. Prepare the panel adhesive in accordance with the manufacturer's details. Do not use adhesive that has passed its use by date.
11. Apply panel adhesive, approximately 2 mm thick, along the full edge to be joined. Where the panel joint is a control joint, instead leave the edges of the E-Metrix® Panel Wall reinforced AAC panels clean and leave a 10 mm nominal gap.
12. Lift the next panel into position as per point 6 above and then slide it hard against the adhesive coated edge. The base angle should keep the panels aligned but still ensure the new panel is level and plumb. Ensure adhesive is fully coating the joining edges of the panels, then remove excess adhesive that has been squeezed out of the joint. Repeat the fixing method outlined in step 8.
13. Repeat the above steps for all further panels.
14. Install the fire and acoustic rated sealant at the control joints as shown in the details for each wall type of this technical manual. All joints shall be a minimum 10mm thickness. Use backing rod to assist in achieving joint size.

Wall finishing

15. Install the remaining side of the stud frame in accordance with AS 1684 series and install the aluminium brackets to the E-Metrix® Panel Wall and stud frame in accordance with the fixing of this manual.
16. Install the glass wool insulation and plasterboard asper the manufacturer' s details.
17. Ensure that the mineral fibre is installed at the top and ends of the wall.

Plumbing and Electrical services

Penetration or chasing of the party wall for services is strictly prohibited as it is likely to reduce the fire resistance level. Any penetration or chasing in the wall shall only be undertaken under the strict guidance of the relevant fire engineering and acoustic consultants.

DELIVERY, STORAGE & HANDLING

Delivery

Before delivery of E-Metrix® Panel Wall reinforced AAC panels on site, an appropriate unloading area should be designated.

The unloading area should be

- Capable of supporting the weight of the E-Metrix® Panel Wall reinforced panel packs. Consult the project's structural engineer if required.
- On level support and elevated off any surface that may have water run across it (e.g. outside ground, interiors without roofing).
- Keep dry either by storing inside or protected from the rain (e.g. by using plastic wrapping).
- Large enough to contain all E-Metrix® Panel Wall reinforced panels for the construction stage without stacking packs on top of each other.
- As close as possible to the installation area, to minimise the additional lifting required. This may mean designating additional unloading areas depending on the project size.

Storage and Handling

Wherever possible, E-Metrix® Panel Wall reinforced AAC panels should have the faces, corners and edges protected from damage. Whenever moving panels, the following precautions should be taken:

- Before lifting packs, ensure that the panels are securely strapped.
- Personnel operating lifting machinery (e.g. forklifts, cranes, trolleys) must use the appropriate techniques and equipment.
- When opening packs, appropriate measures should be taken to prevent panels from falling.
- Any opened packs are protected from the weather and secured while not in use.
- All workers have appropriate personal protection equipment (PPE) for the worksite conditions. Recom mended PPE includes but is not limited to:
  - Hearing & eye protection
  - Safety clothing (e.g. safety boots, well-fitting clothing)
  - Respiratory protective equipment
  - Sun protection (hats, long sleeves, trousers, sunscreen)
- All workers are trained in an appropriate manner for the tasks undertaken. For example, proper equipment maintenance and usage, material safety and good lifting techniques would fall into this category.
- The sequence of installation should be planned to minimise panel movements and ensure installers will have appropriate room to lift the panels.
- Whenever manually lifting single panels, a minimum of two people should carry each panel and the panel should be carried on its side (not flat). Good lifting techniques (detailed below) and a clean worksite should be maintained to minimise injuries.

Good lifting techniques

There is no proven' best' way of lifting, as it will vary with the weight and shape of the object being lifted. The better options available are a 'deep squat' and 'semi squat' lift. The deep squat is done by bending the knees and hips to their maximums, while keeping the upper body approximately vertically. The semi squat is done by leaning the upper body forwards (while keeping the spine straight) and bending the legs to a lesser degree than the deep squat. The basic principles of good lifting are:

- Minimise the distance between the load and the body
- Bend the knees, allowing for use of the leg muscles
- Keep the back as straight as possible

For more details refer to the relevant state-based safety regulation documentation (e.g. Work Cover).

HEALTH & SAFETY

E-Metrix® Panel Wall reinforced AAC panels, like all concrete members, contain crystalline silica (also known as silica dust). Prolonged exposure via inhalation can cause silicosis in the long term, among other possible conditions. As such, proper PPE usage during construction is necessary to create a safe work environment.

While E-Metrix® Panel Wall reinforced AAC panels are left undamaged and intact, there is no potential health risk. As such, touching the material with bare skin is not an immediate problem. Protection may be suitable, however, to prevent abrasion from skin contact.

However, when the material has been broken down by any process such as cutting, drilling, chasing or sanding silica dust is generated. As such, this generates an increased risk of health problems. Long term exposure increases this risk, so it is advised that precautionary measures are taken.

Either protective masks or dust extraction are recommended for usage as a preventative measure during any process that breaks down the E-Metrix® Panel Wall reinforced panels. Wet cutting of the panels is not recommended. Protective respirators should be of class P1 or P2 (to AS/ NZS 1715 and AS/ NZS 1716) and recommended for dust, at a minimum. Dust extraction systems should be appropriately filtered as required by local council regulations. The site should also be cleaned at regular intervals (e.g. daily) to prevent dust accumulation. Other preventative measures not related to the inhalation of silica dust may include:

- Eye protection in accordance with AS 1336.
- Protective footwear in accordance with AS 2210.
- Ear plugs/ earmuffs to an appropriate rating for the tools being used, in accordance with AS 1270.
- Protective clothing such as long sleeve shirts and trousers, or overalls to prevent possible skin irritation. This will also have the added benefit of protecting outside workers from the sun.

CONSTRUCTION DETAILS

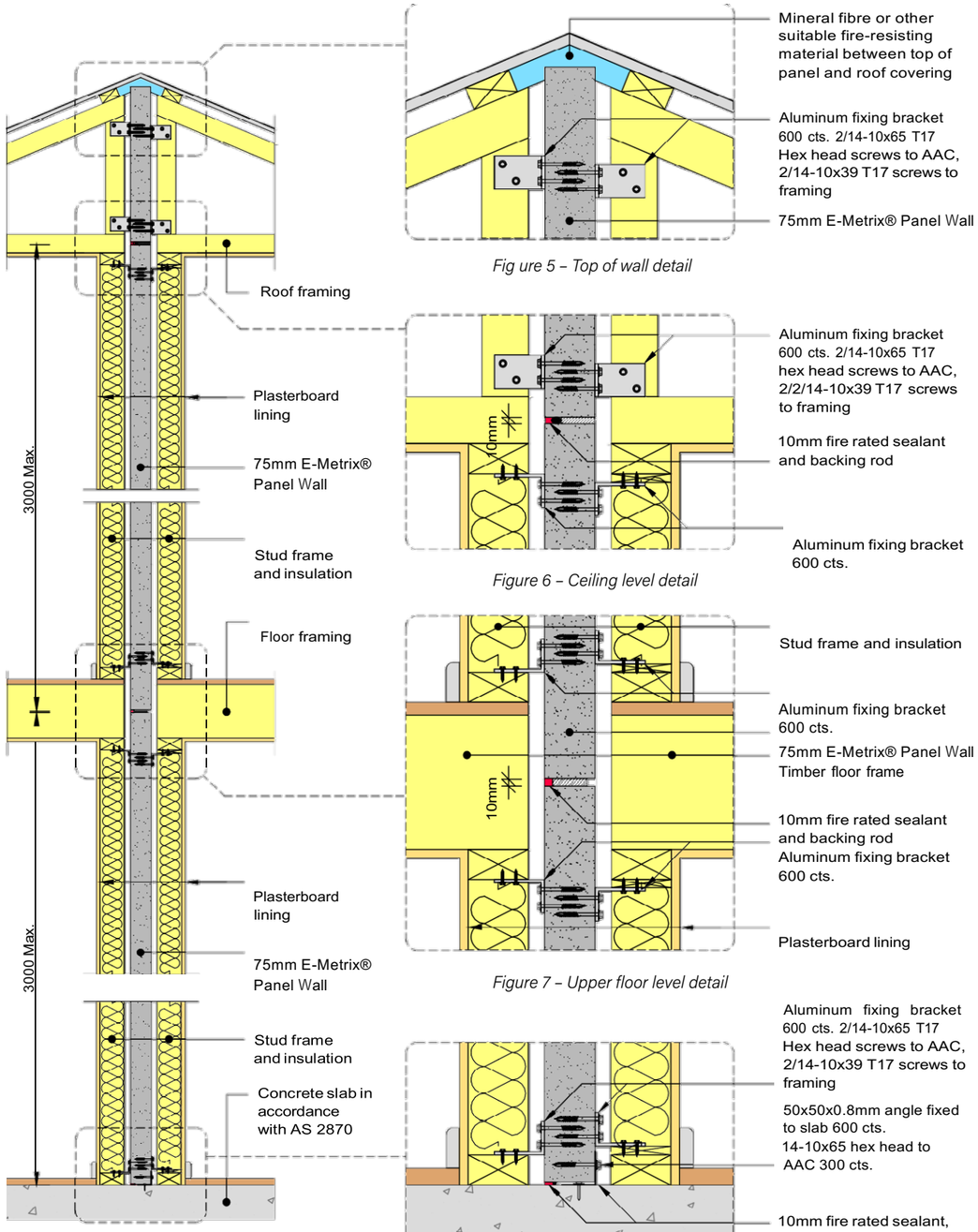


Figure 8 – Internal Party Wall Section

Fig ure 5 – Top of wall detail

Figure 6 – Ceiling level detail

Figure 7 – Upper floor level detail

Figure 9 – Base of wall detail

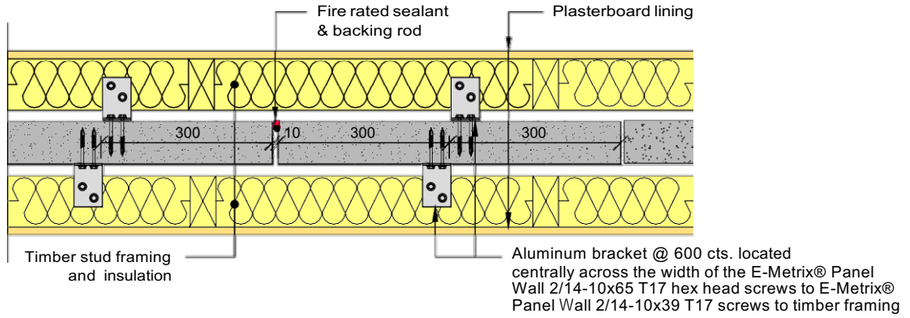


Figure 10 – Vertical control joint detail (plan view)

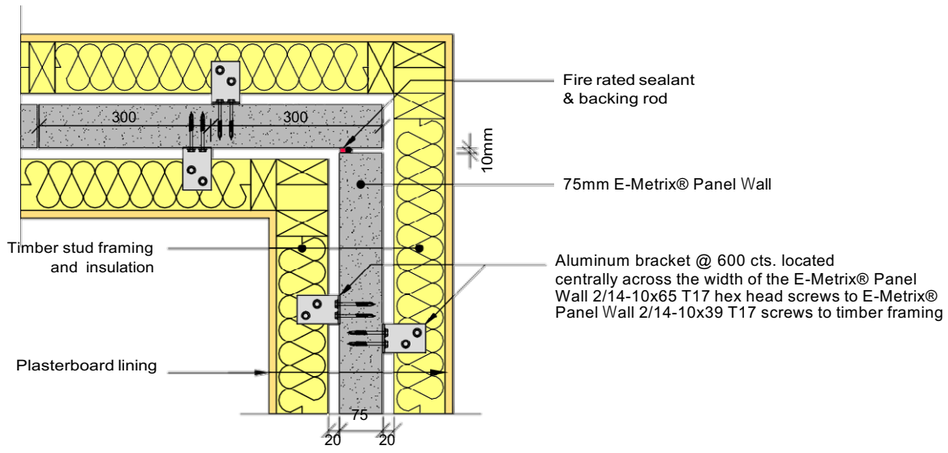


Figure 11 – Corner control joint detail (plan view)

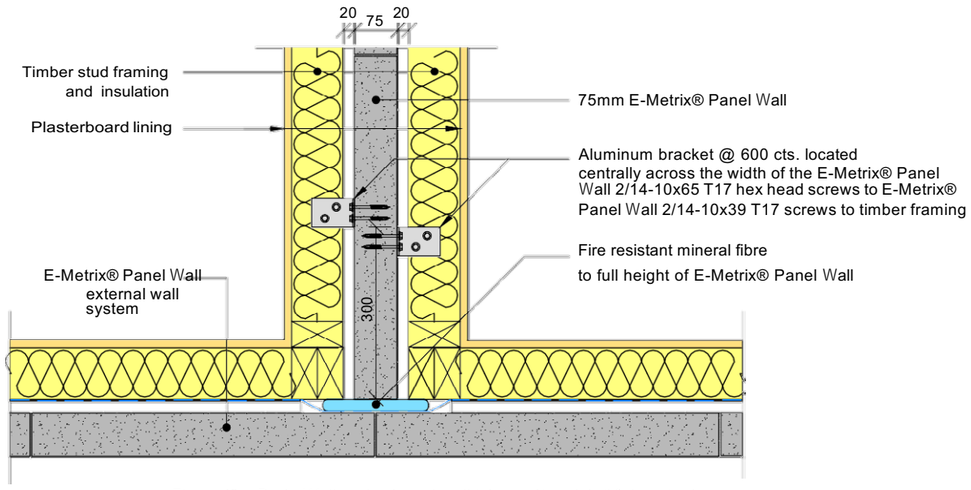


Figure 12 – Party Wall and external wall intersection detail (plan view)





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