

September 2018 Edition

# Design Manual for FastForm<sup>®</sup> Wall System

Think FASTER | Think STRONGER | Think INSULATED

## **Design Manual Editions**

### **Current:**

September 2017 Edition - FastForm System

### **Superseded:**

August 2015 Edition - Vertical System

August 2014 Edition - Vertical System

June 2014 Edition

March 2014 Edition

2013 Edition

Release N - Issued 1/3/2013

Release M - Issued 1/6/2011

Older Editions

Please check [www.formcraft.com.au](http://www.formcraft.com.au) regularly to ensure that you are using the most up-to-date edition.

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# INTRODUCTION



# INTRODUCTION

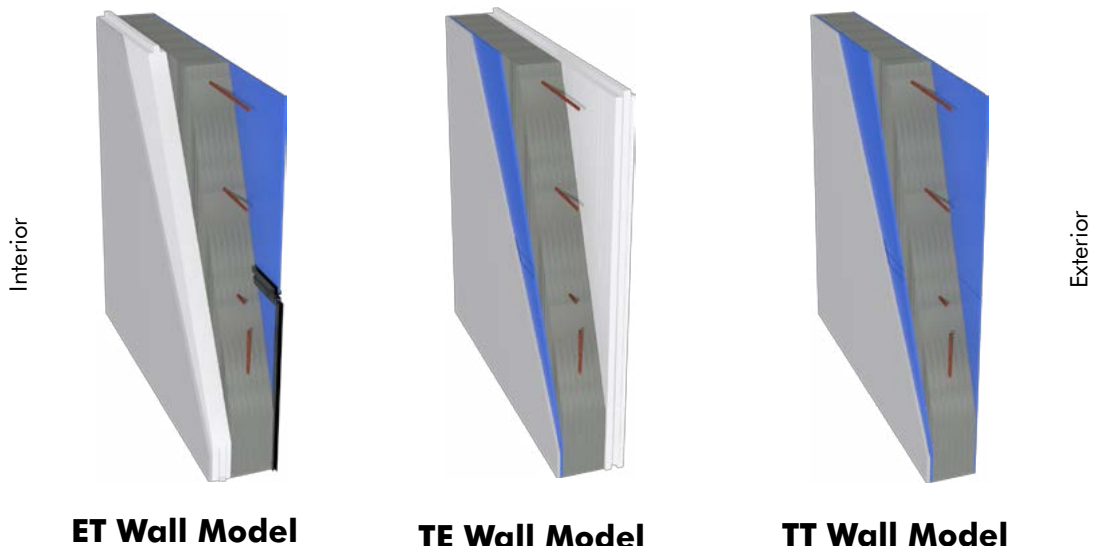
The FastForm® wall system is a permanent formwork system for insitu reinforced concrete structures that are fast, pre-finished, insulated and economical. FormPro® walls meet fire, acoustic, thermal and structural code requirements, while also offering a range of stylish finishes.

The structural capability of the product when filled with concrete makes it an ideal solution for the construction of buildings such as: Commercial offices, Mixed-use developments, Multi-unit apartments, Schools, Shopping centres, Prisons and Hotels.

The permanent wall panels arrive to site flat-packed and are connected together with a plastic connection system. The connectors can vary in width depending on the structural requirements for the project. The panels are stood in place, both vertical and horizontal reinforcement is placed as required and the wall is completed by filling the panels with concrete. Once complete, the walls act as reinforced concrete walls that comply with AS 3600 Concrete structures.

The FastForm® wall system can utilise the following panel options on one or both sides of the forms:

1. 60mm Expanded Polystyrene (EPS) panels (product code "E")
2. 6mm Rebated Fibre Cement (FC) panels (product code "T")
3. 6mm Pre-painted Fibre Cement (FC) panels with Aluminium Joint Detail (product code "P")
4. 4mm Aluminium Composite panels with Joint Detail (product code "A").



## FastForm® Panel Combinations

These permanent and interchangeable formwork panels enable construction of walls with a range of R values, sound transmission coefficients, fire ratings, finishes and concrete thicknesses for different structural applications.

This manual has been prepared to assist in the detailing of the FastForm® walling system. It provides a basis from which to work, but does not replace the services of professional consultants on specific projects.

Formcraft provides technical support throughout the design and construction process to ensure quality project outcomes.

## Advantages

FastForm® is a sustainable wall system that is fast to construct, provides cyclonic resistance, delivers high energy efficiency and creates a quiet, comfortable interior environment.

## Speed/Cost Savings

Formcraft's advanced concrete forming technology also delivers proven savings in labour costs through its rapid construction technique. The pre-finished panels offer substantial savings in terms of scaffolding and also negate the need for additional finishing trades. Additional cost savings are derived from earlier occupancy and low maintenance environments.

The lightweight and flat packed design enables convenient on-site assembly and the panels are less expensive to transport, making them ideal for use in remote locations.

## Strength

Nothing rivals steel-reinforced concrete for strength and stability. Reinforced concrete walls are known to withstand much stronger weather conditions than other construction systems. Use of the FormPro® wall system results in a solid, stable and durable structure.

## Sustainable/Green Building

FastForm® walls allow architects and designers to create buildings that use fewer natural resources and provide ongoing energy savings for the project. FormPro® walls:

- Provide substantial reductions in heating and cooling costs because of the effective R-value (thermal resistance level) of up to R3.6
- Allow any waste produced to be 100% recyclable
- Are manufactured using no HCFCs or CFCs during the manufacturing process
- Create structures that last longer and require less maintenance.

When the FastForm® wall system is incorporated into a project, its energy efficiency and material properties can help a project qualify for superior performance under the new Section J requirements of the BCA.

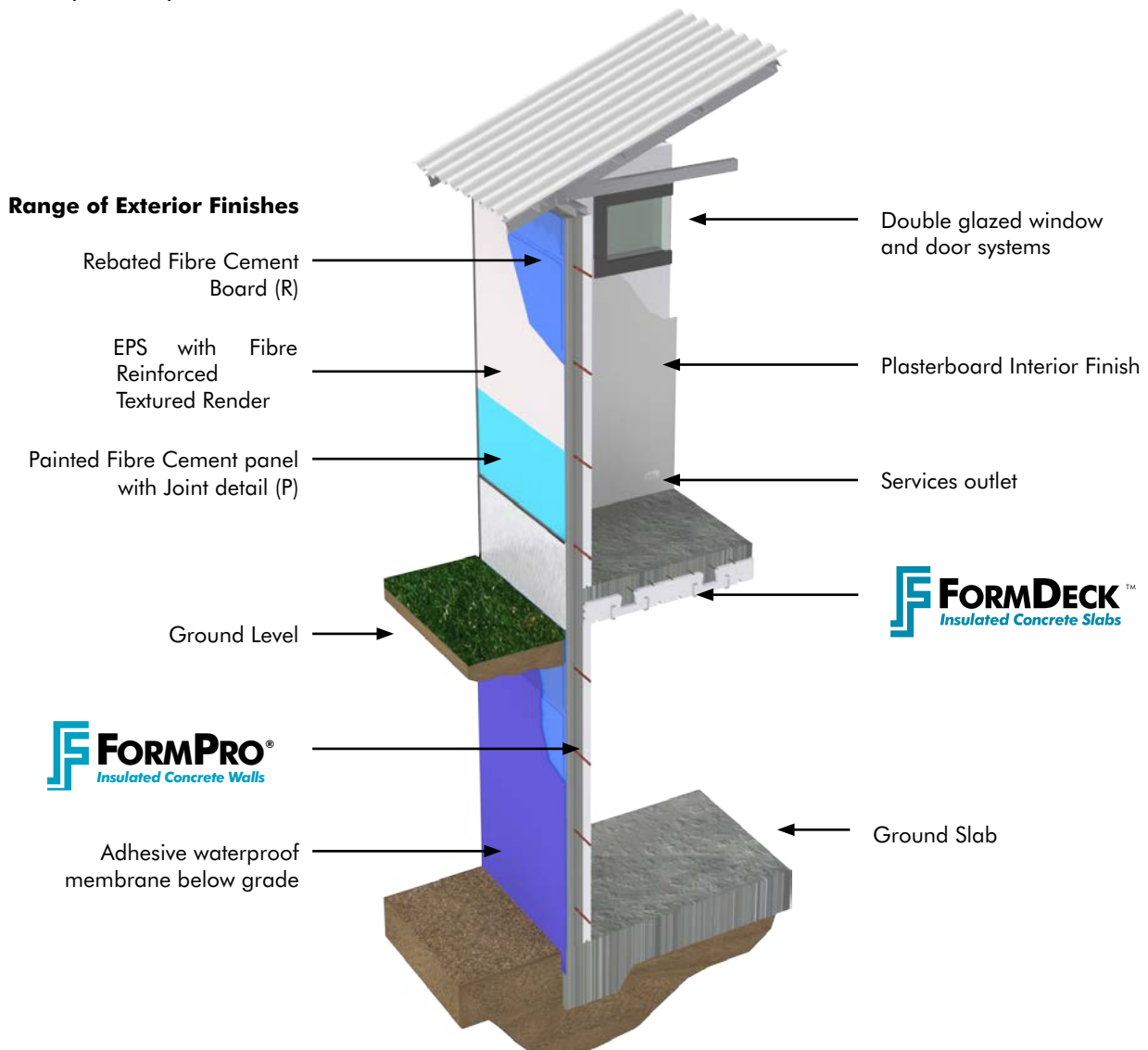
# FastForm® CHARACTERISTICS

The FastForm® panels are designed to function as the formwork for concrete walls. The formwork stays in place on the exterior and interior face of the wall assembly, and also serves as the substrate for exterior and interior finishing systems. When concrete is poured into the cavity between the formwork, a solid, flat, cast-in-place and steel-reinforced concrete wall is formed.

The concrete cavity thickness can be easily varied by using panel connectors of different widths to provide for different structural requirements.

FastForm® walls are used in commercial and residential construction for external and internal, load bearing, above grade and below grade walls. Specific applications include basement and under-croft walls, insulated exterior walls, inter-tenancy walls, sheer walls, stem walls and lift shaft and stairwell applications.

Product literature, technical information, CAD/BIM details, specifications and product samples are available upon request.





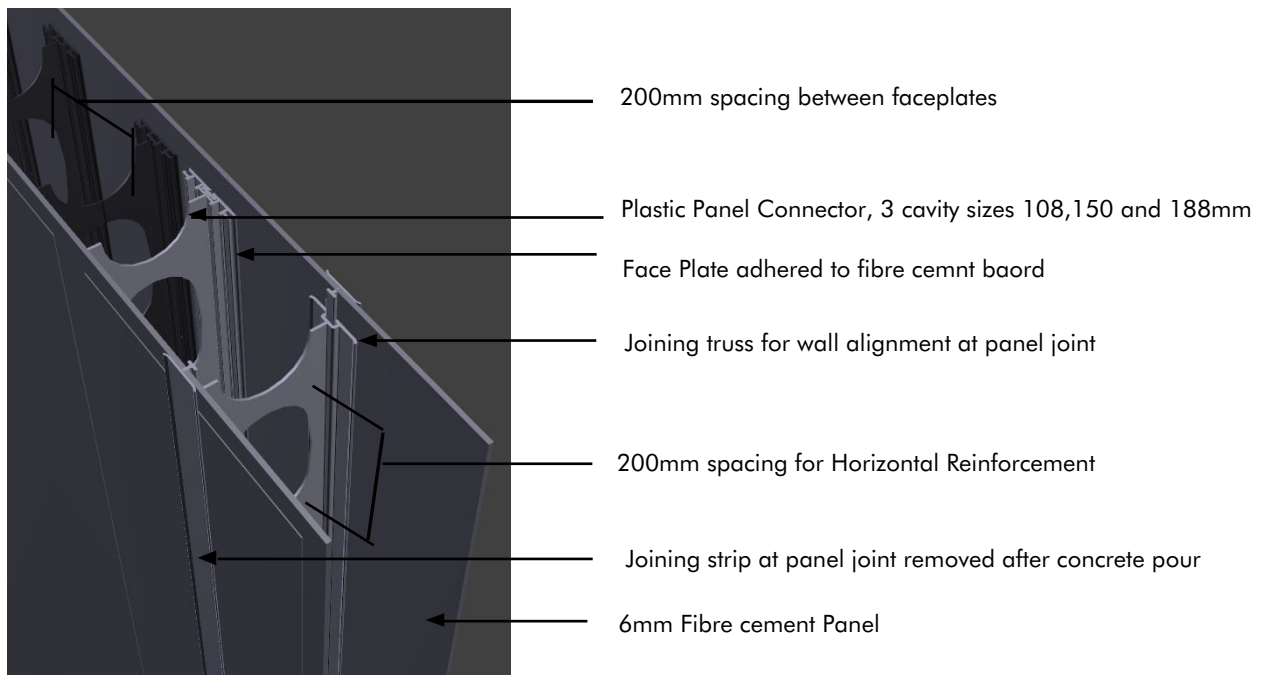
All FastForm® panels are delivered flat packed to site ready to assemble. The type and size of panels and connection system is determined by structural requirements, thermal, fire and sound rating requirements and the aesthetic preference of the designer or end client.

FastForm is a modular form that comprises 2 opposing panels. The EPS panels are designed with tongue and groove joints for ease of assembly. Panel options include 60mm EPS, 6mm Fibre Cement or 4mm Aluminium Composite panel. These panels are interchangeable and are held together by vertical plastic connectors spaced at 200mm centres.

The flat panels are easily assembled into forms by inserting of connector profile between panels. The connectors also provide loose fit horizontal rebar chairs at different positions to allow for multiple rebar positions to achieve the most efficient structural design. Vertical rebar spacing should be designed in increments of 200mm on centre. Horizontal rebar should be designed in increments of 200mm on centre to coincide with the height of the chairs.

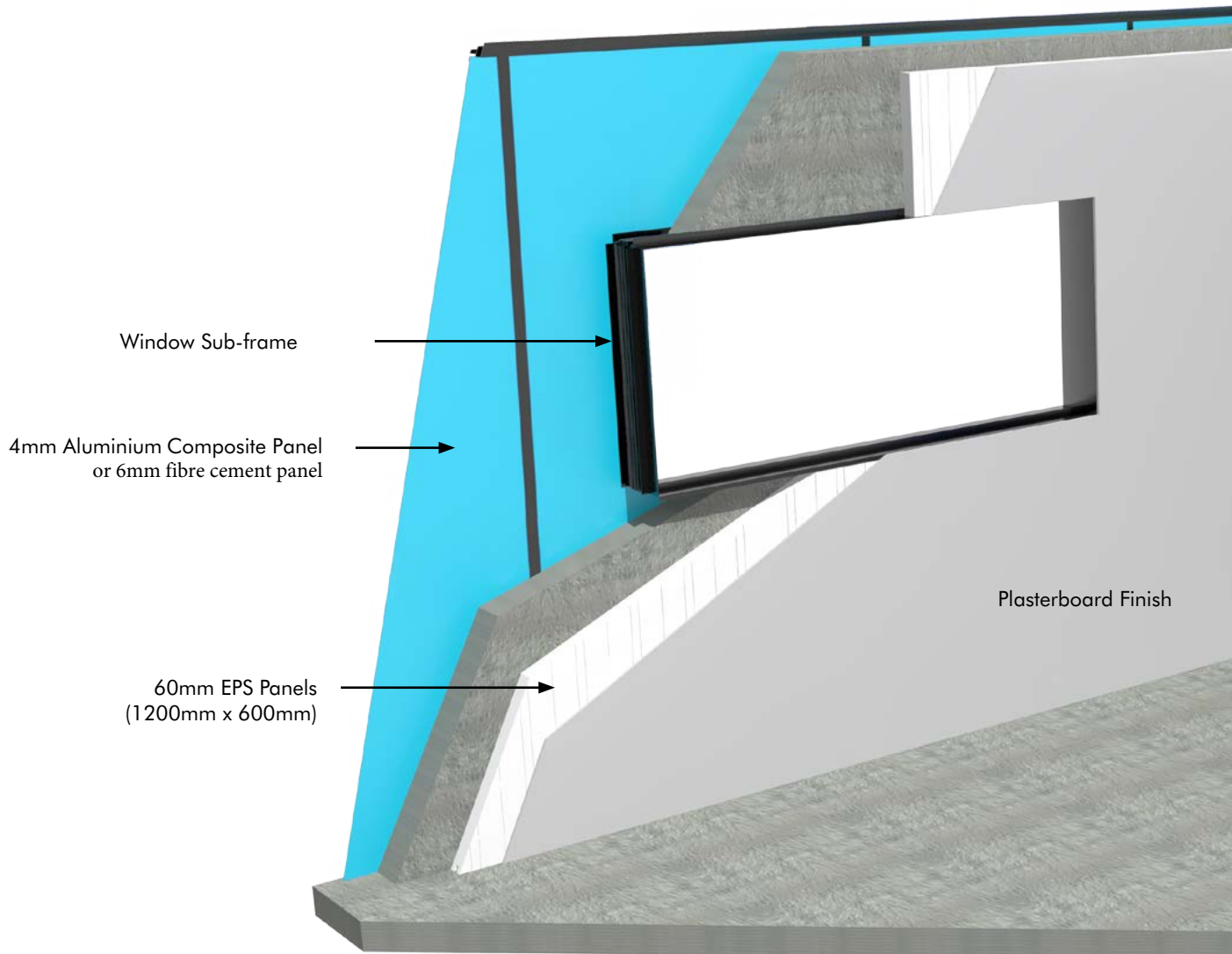
Formcraft provides window and door sub-frames that have been designed and manufactured by to integrate into their FormPro® wall system and provide a waterproof universal sub-frame into which a range of window and door types can be fitted.

The sub-frames can be pre-cut to size and pre-assembled, then installed into the formwork for the wall prior to the concrete pour. Angled sections of the sub-frame slot into the cavity and become embedded into the concrete, ensuring a secure fixing.

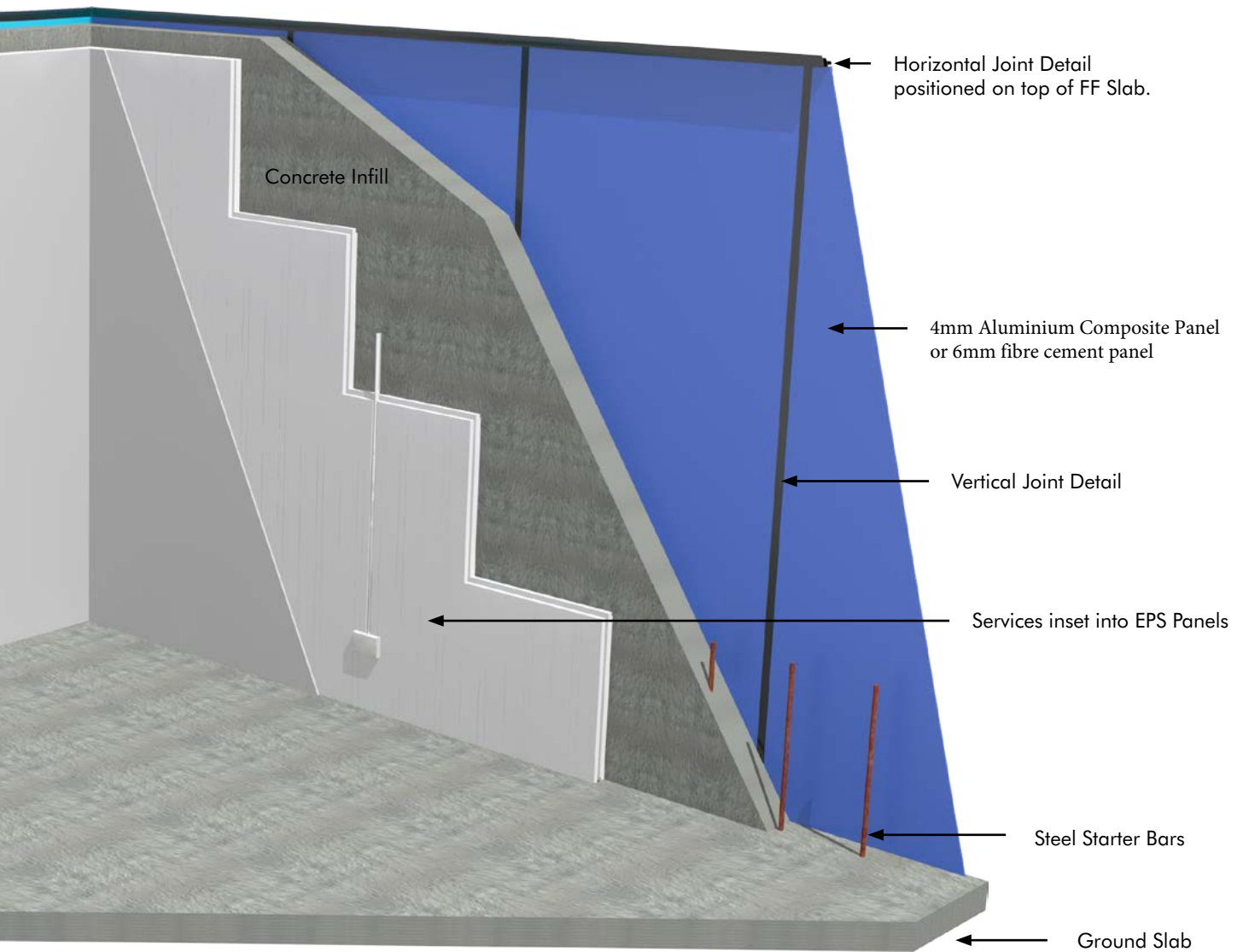


**TT Wall**

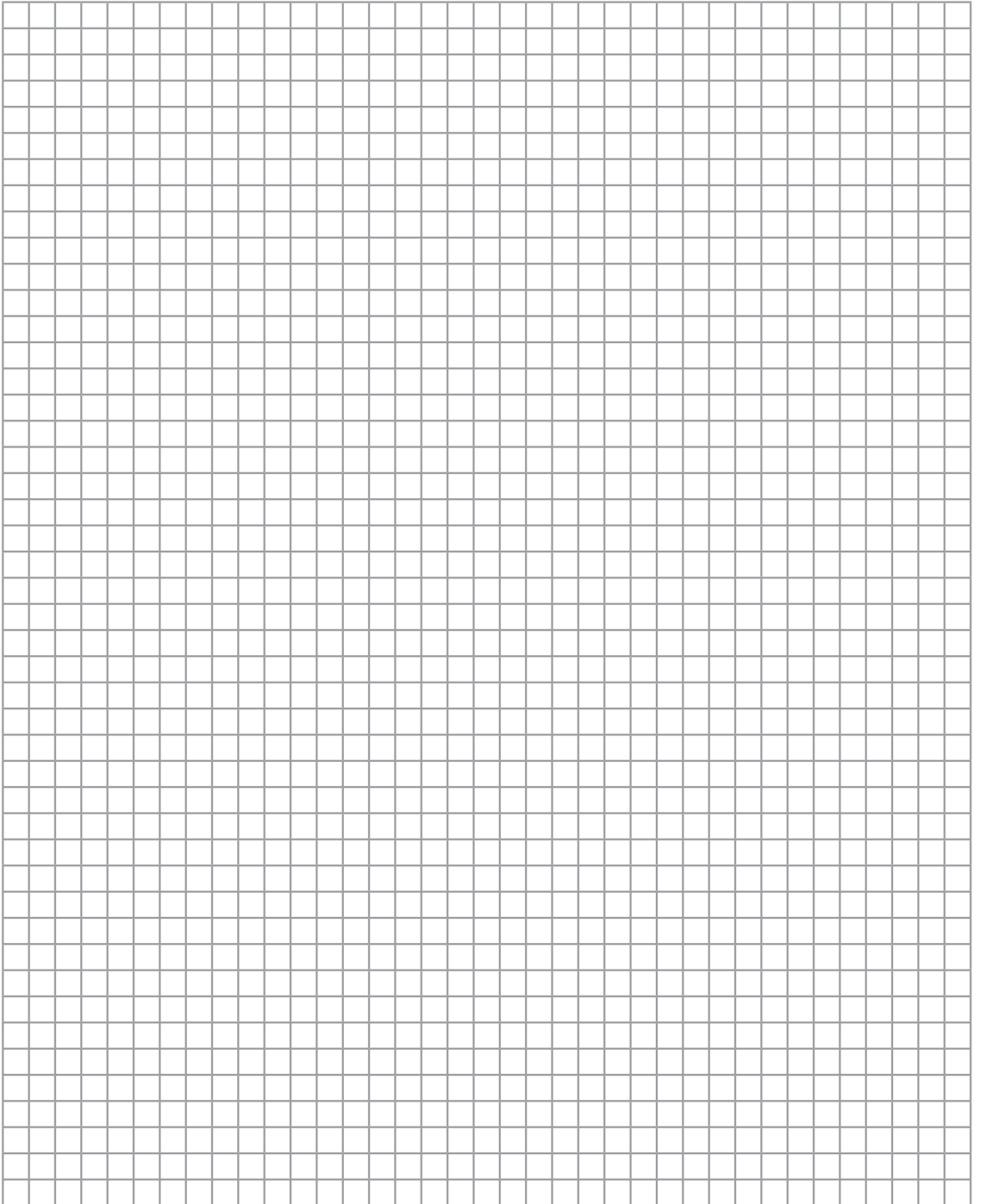
## Illustrative Features of the FastForm® Wall System



# FastForm® TYPICAL LAYOUT



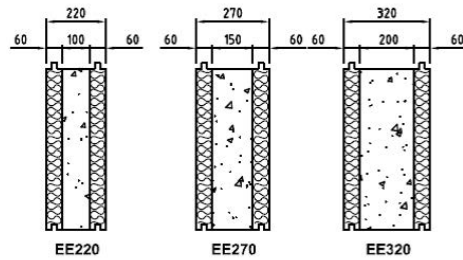
# NOTES



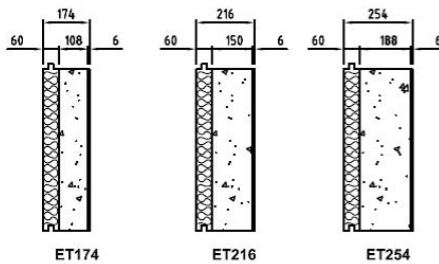
The background of the page features a light gray grid pattern overlaid on a faint, sketchy landscape of hills. A prominent red banner with rounded corners is positioned horizontally across the upper portion of the page.

# APPLICATIONS

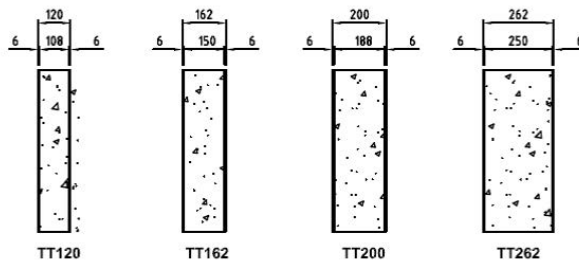
## EE MODEL



## TE/ET MODEL



## TT MODEL

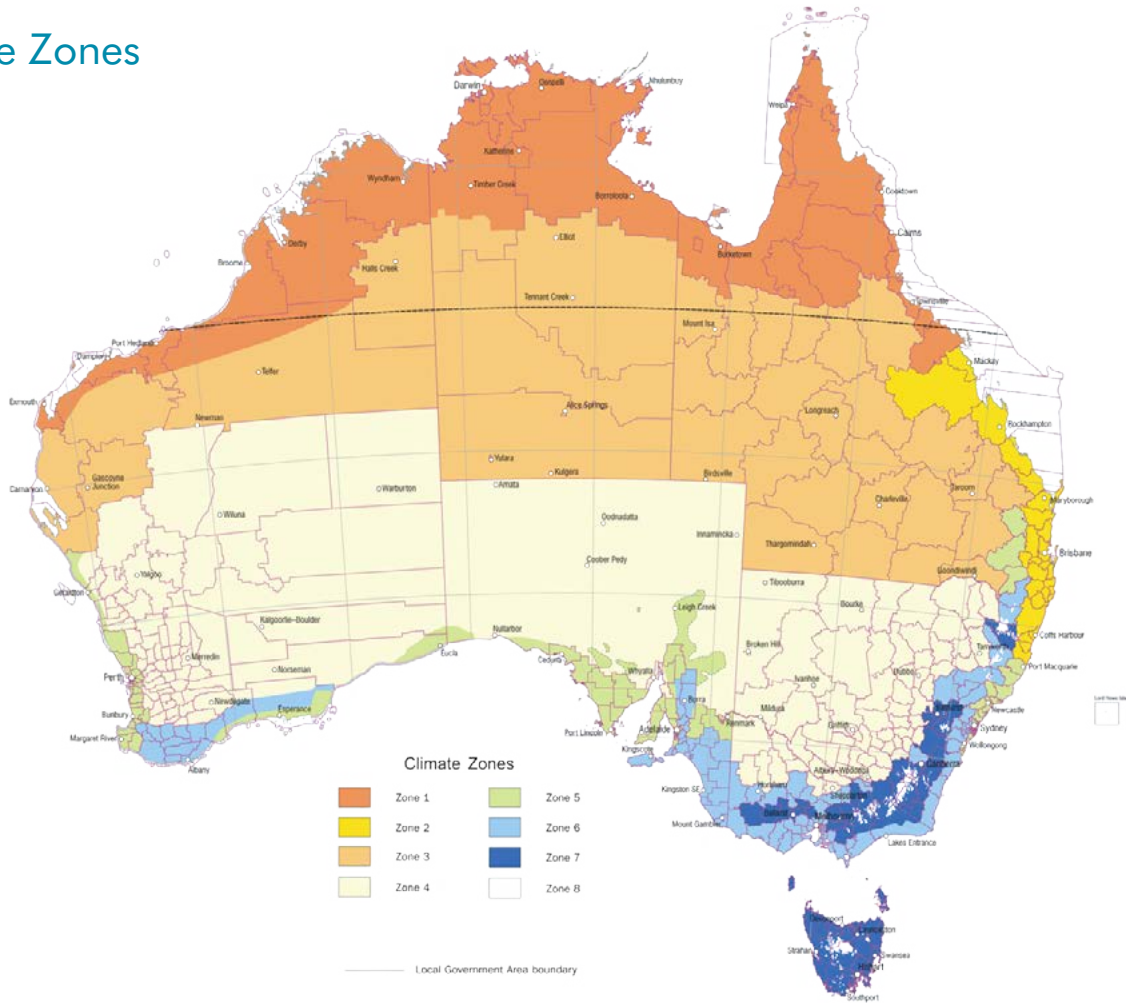


Model no.	Wall thickness	Material	Fire	Acoustics		Thermal
			FRL	$R_w + C_{tr}$	$D_{nTw} + C_{tr}$	R-Value
EE220	220mm	60mm EPS / 100mm Conc. / 60mm EPS	90/90/90	46	55	3.5m <sup>2</sup> .K/W
EE270	270mm	60mm EPS / 150mm Conc. / 60mm EPS	180/180/180	59	50	3.6m <sup>2</sup> .K/W
EE320	320mm	60mm EPS / 200mm Conc. / 60mm EPS	240/240/240	62	45	3.6m <sup>2</sup> .K/W

Model no.	Wall thickness	Material	Fire	Acoustics		Thermal
			FRL	$R_w + C_{tr}$	$D_{nTw} + C_{tr}$	R-Value
ET174	174mm	60mm EPS / 108mm Conc. / 6mm CFC Board	90/90/90	47	52	1.86m <sup>2</sup> .K/W
ET216	216mm	60mm EPS / 150mm Conc. / 6mm CFC Board	180/180/180	53	46	1.86m <sup>2</sup> .K/W
ET254	254mm	60mm EPS / 188mm Conc. / 6mm CFC Board	240/240/240	58	43	1.87m <sup>2</sup> .K/W

Model no.	Wall thickness	Material	Fire	Acoustics		Thermal
			FRL	$R_w + C_{tr}$	$D_{nTw} + C_{tr}$	R-Value
TT120	120mm	6mm CFC Board / 108mm Conc. / 6mm CFC Board	90/90/90	46	51	0.25m <sup>2</sup> .K/W
TT162	162mm	6mm CFC Board / 150mm Conc. / 6mm CFC Board	180/180/180	51	47	0.25m <sup>2</sup> .K/W
TT200	200mm	6mm CFC Board / 188mm Conc. / 6mm CFC Board	240/240/240	57	43	0.26m <sup>2</sup> .K/W
TT262	262mm	6mm CFC Board / 250mm Conc. / 6mm CFC Board	240/240/240	64	38	0.26m <sup>2</sup> .K/W

## Climate Zones



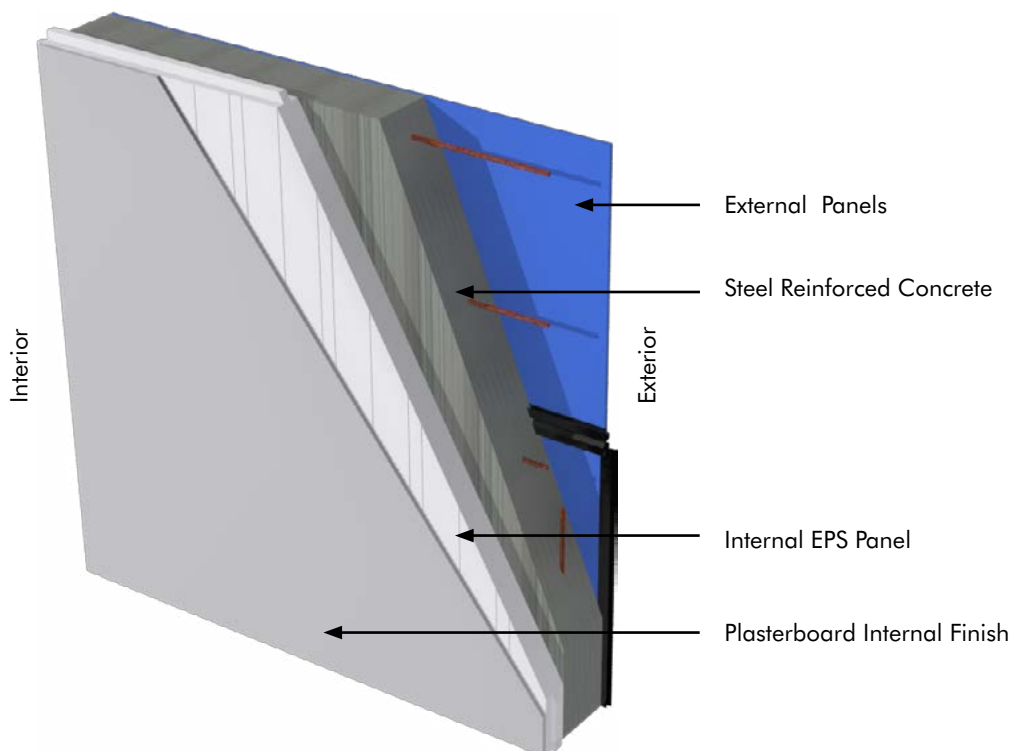
- |                                  |                  |
|----------------------------------|------------------|
| 1 High humid summer, warm winter | 5 Warm temperate |
| 2 Warm humid summer, mild winter | 6 Mild temperate |
| 3 Hot dry summer, warm winter    | 7 Cool temperate |
| 4 Hot dry summer, cool winter    | 8 Alpine         |

## Building Classes

- Class 1 Single or Small Dwellings.
- Class 2 Residential Building containing 2 or more sole occupancies.
- Class 3 Residential Building for longterm/transient stays excluding classes 1 & 2 eg, Motel, Boarding House.
- Class 4 Dwelling within a building included in classes 5,6,7,8 & 9.
- Class 5 Commercial Building excluding classes 6,7,8 & 9.
- Class 6 Retail Building for the sale of goods or supply of services.
- Class 7a Carpark.
- Class 7b Building for Storage/Display of goods for wholesale.
- Class 8 Laboratory/Building for production or assembly of goods.
- Class 9 Building of a Public Nature eg Healthcare, Assembly or Aged-care etc.

## External Walls

BCA REQUIREMENTS	CLASS OF BUILDING	REQUIRED FRL	BUILDING'S CLIMATE ZONE	REQUIRED R-VALUE	RECOMMENDED PRODUCT TO MEET REQUIREMENTS
	1	N/A	1, 2, 3 & 5 4 & 6 7 & 8	1.4 1.7 2.3	EE220 EE220 EE220
	2	90/90/90	1, 2, 3 & 5 4 & 6 7 & 8	1.4 1.7 2.3	ET178 ET178 EE220
	5,7a & 9	120/120/120	1, 2, 3 & 5 4 & 6 7 & 8	1.4 1.7 2.3	ET202 ET202 EE270
	6	180/180/180	1, 2, 3 & 5 4 & 6 7 & 8	1.4 1.7 2.3	ET226 ET226 EE270
	7b & 8	240/240/240	1, 2, 3 & 5 4 & 6 7 & 8	1.4 1.7 2.3	ET278 ET278 EE320

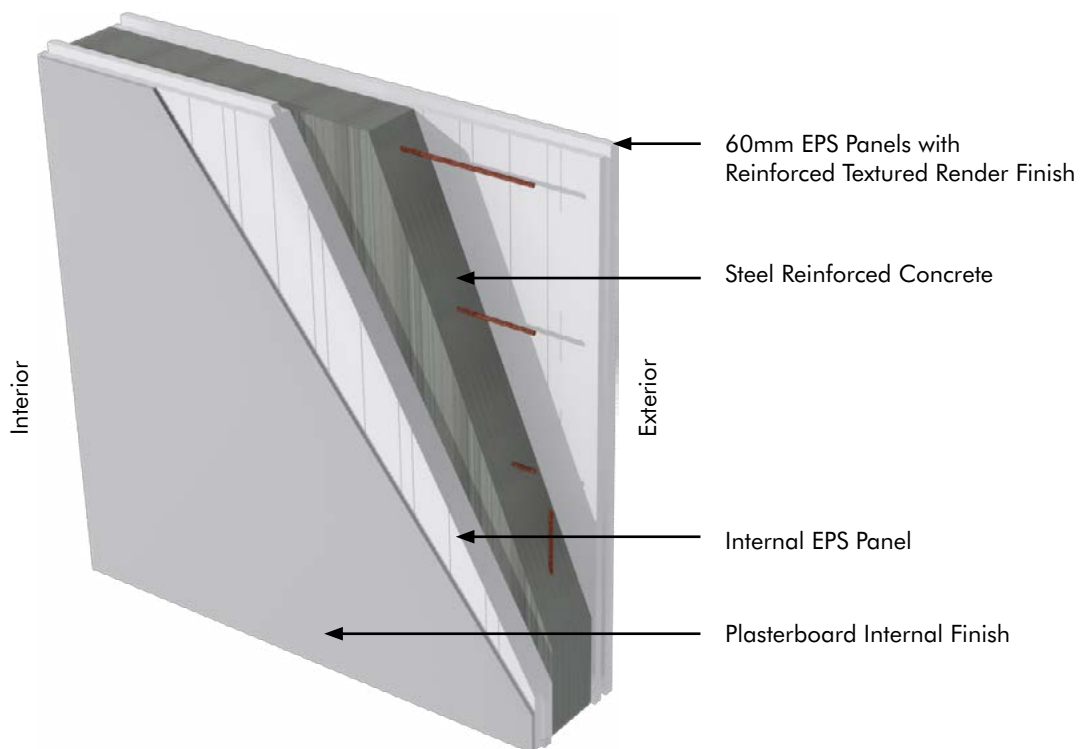


**ET216 Wall Model**

**(Pre-finished external panels typically used for Zero Lot commercial applications)**



## External Walls (continued)

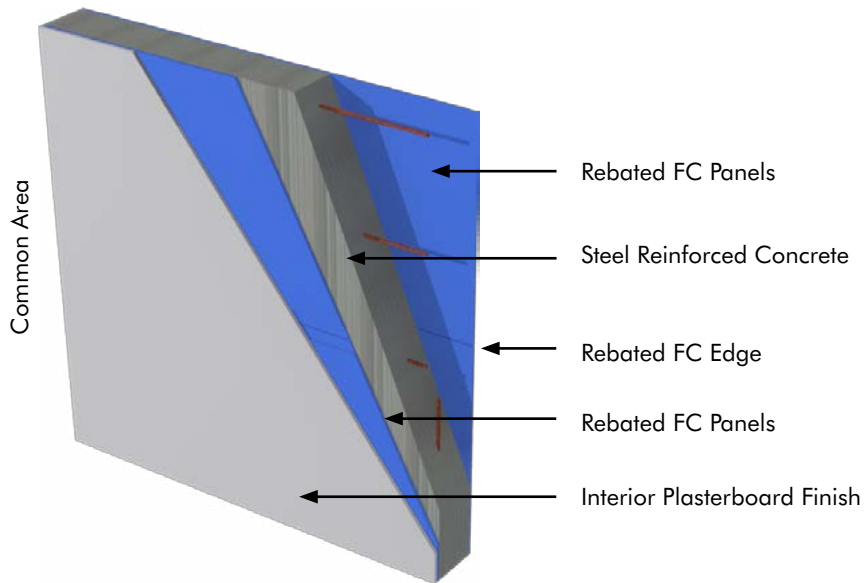


**EE220 Wall Model**  
(Typically used for colder climates or residential applications up to 2 storeys)

## Inter-Tenancy Walls

Description: Walls separating sole occupancy units.

BCA REQUIREMENTS	WALL USE	REQUIRED FRL	REQUIRED $R_w + C_{tr}$	REQUIRED $D_{n,T,w} + C_{tr}$	RECOMMENDED PRODUCT
	Habitable to Habitable	90/90/90	50	N/A	TT162
	Habitable to Wet Area	90/90/90	50	45	TT162
	Wet Area to Wet Area	90/90/90	50	45	TT162

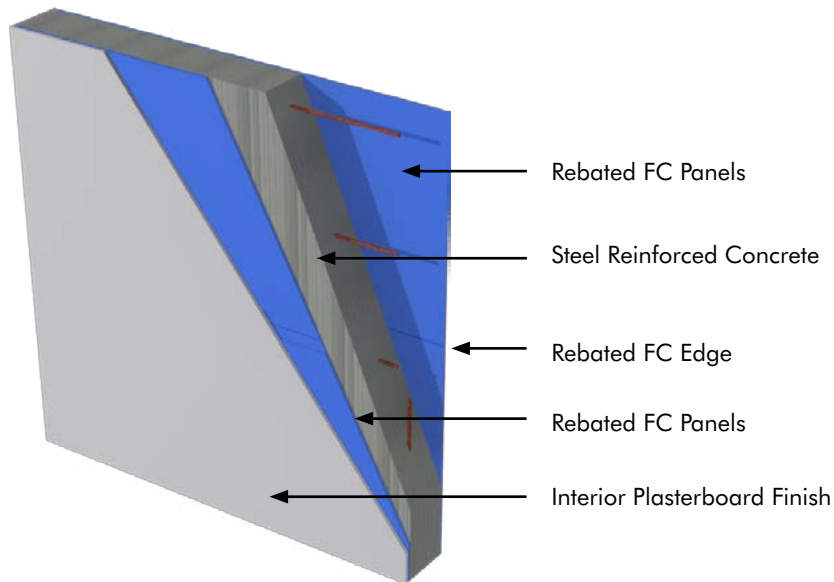


**TT162 Wall Model**

## Lift, Stairwell & Service Shafts

Description: Walls separating shafts from common areas or sole occupancy units.

BCA REQUIREMENTS	WALL USE	REQUIRED FRL	REQUIRED $R_w + C_{tr}$	REQUIRED $D_{n,T,w} + C_{tr}$	RECOMMENDED PRODUCT
	Lift Shaft	90/90/90	N/A	N/A	TT200
	Stairwell Shaft	90/90/90	N/A	N/A	TT200
	Service Shaft	90/90/90	25/40	N/A	TT200

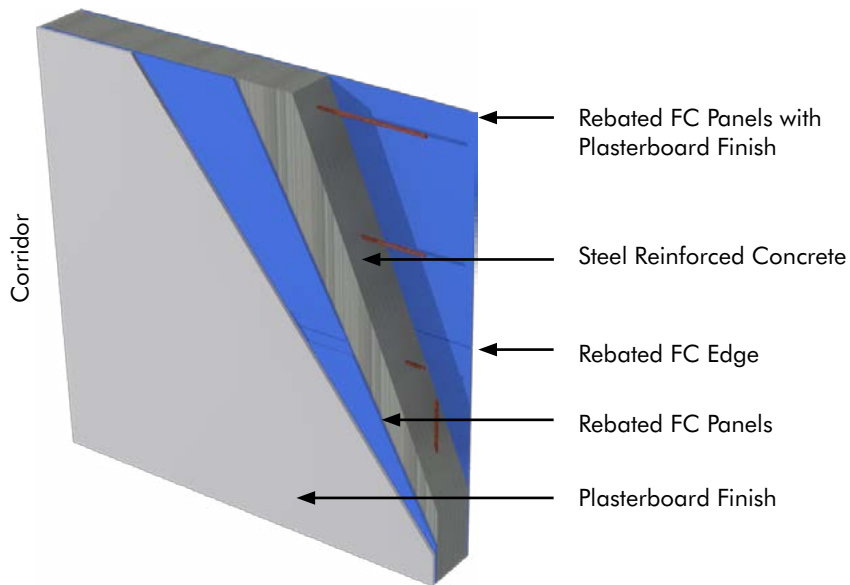


**TT200 Wall Model**

## Corridor Walls

Description: Walls separating sole occupancy units from common areas and stair shafts.

BCA REQUIREMENTS	WALL USE	REQUIRED FRL	REQUIRED $R_w + C_{tr}$	REQUIRED $D_{n,T,w} + C_{tr}$	RECOMMENDED PRODUCT
	Common Area Separation	90/90/90	N/A	N/A	TT120
	Stair Shaft Separation	90/90/90	N/A	N/A	TT120

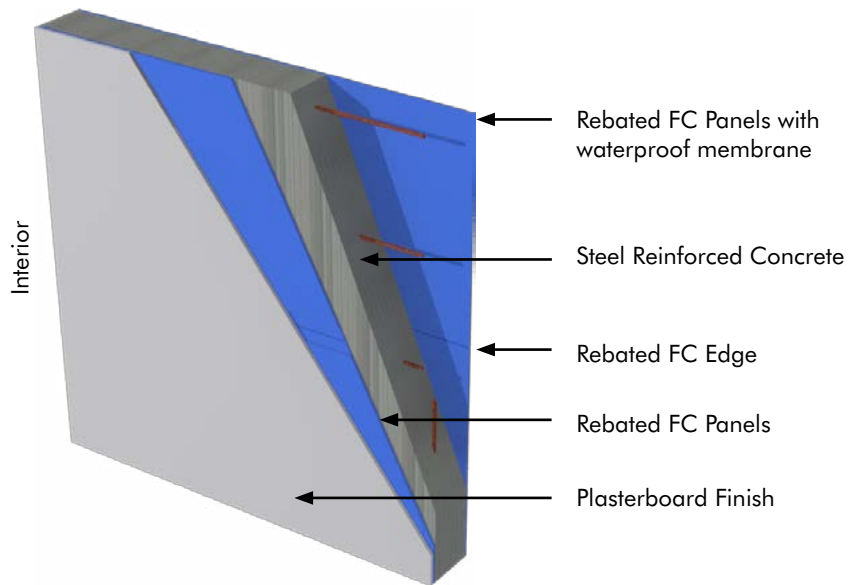


**TT120 Wall Model**

## Retaining & Basement Walls

Description: Walls to retain earth or similar. eg Basements, etc.

BCA REQUIREMENTS	WALL USE	REQUIRED FRL	REQUIRED $R_w + C_{fr}$	REQUIRED $D_{n,T,w} + C_{fr}$	RECOMMENDED PRODUCT
		Retaining Wall	Varied according to application	N/A	N/A

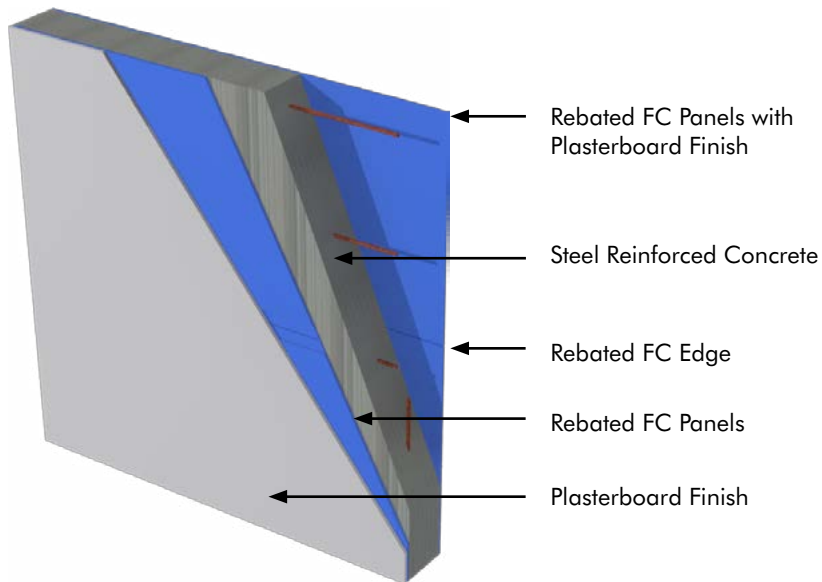


**TT200 Wall Model**

## Blade Walls

Description: Independant wall typically of achitectural or structural significance.

BCA REQUIREMENTS	WALL USE	REQUIRED FRL	REQUIRED $R_{w} + C_{tr}$	REQUIRED $D_{n,T,w} + C_{tr}$	RECOMMENDED PRODUCT
		Blade Wall	Varied according to application	N/A	N/A

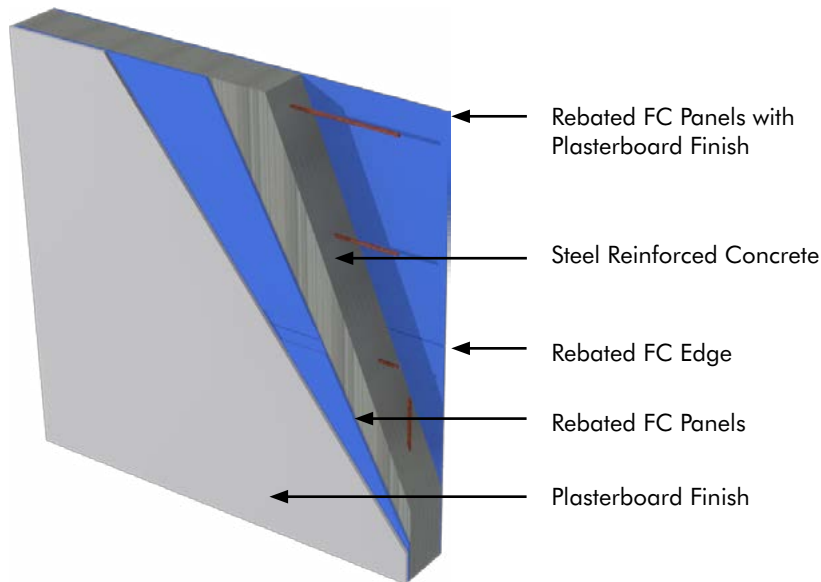


**TT162 Wall Model**

## Internal Walls

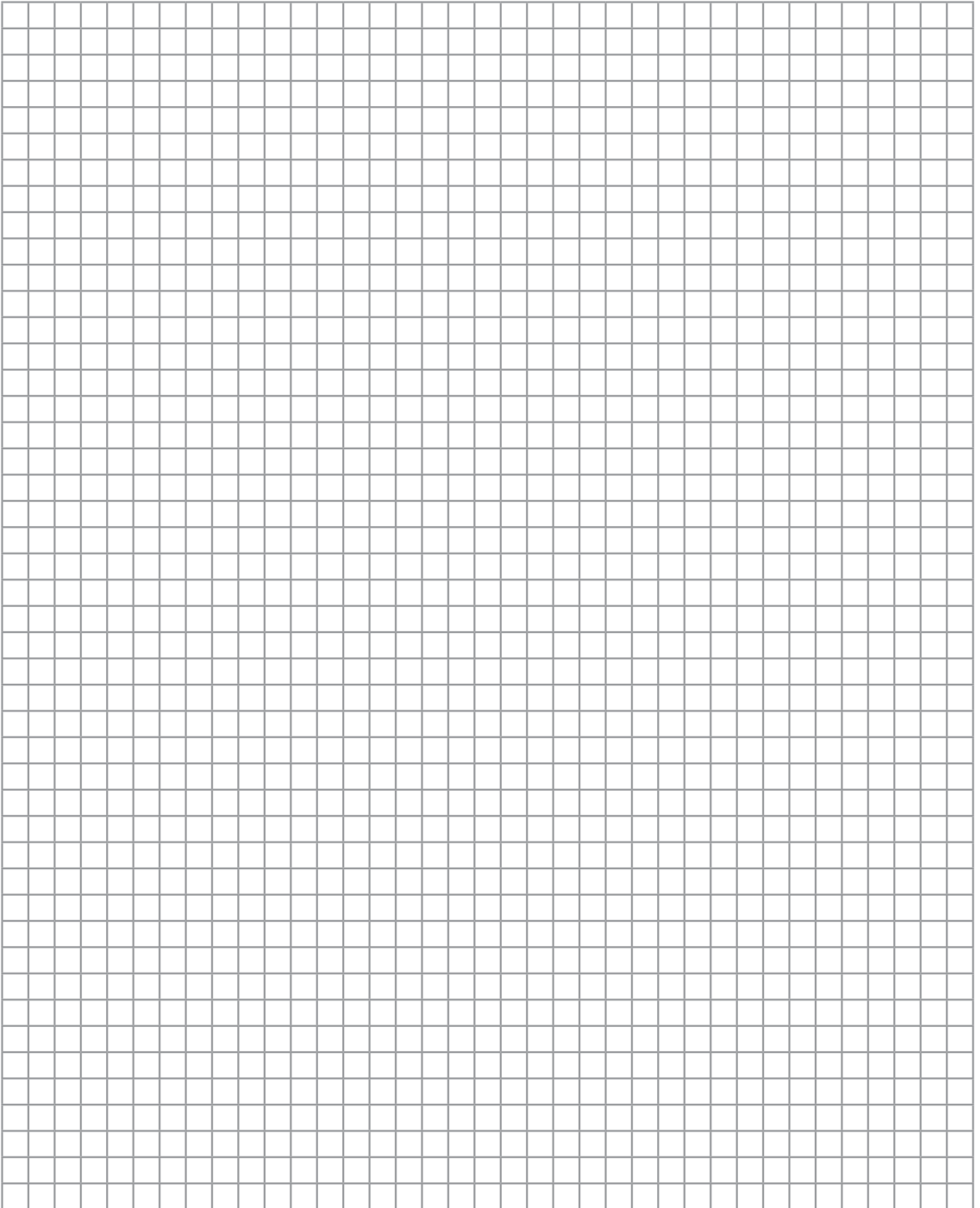
Description: Structural walls within sole occupancy units.

BCA REQUIREMENTS	WALL USE	REQUIRED FRL	REQUIRED $R_w + C_{fr}$	REQUIRED $D_{n,T,w} + C_{fr}$	RECOMMENDED PRODUCT
		Internal Wall	90/-/-	N/A	N/A



**TT162 Wall Model**

# NOTES





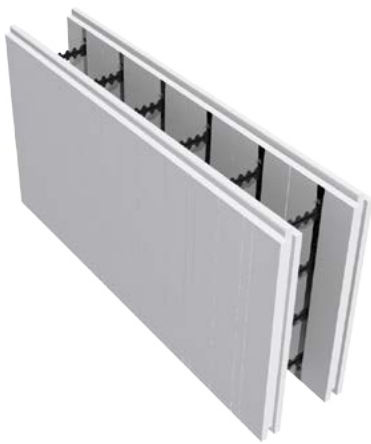
# ARCHITECTURAL



# FORMPRO® PANEL TYPES & FINISHES

## FormPro® EPS panels for residential construction

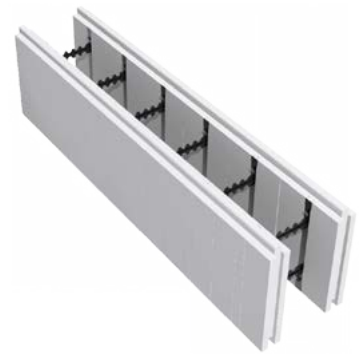
The insulated FormPro system is typically used for residential applications. EPS panels also come as half panels (300mm tall) and corner panels. Furring strips are embedded within the EPS panels 10mm below the surface to assist with the fixing of bracing and finishes. The position of each furring strip is marked on the exterior of each panel (double vertical groove). The long corner panel contains a vertical 30mm square hole that can receive a plastic insert to aid corner alignment.



**EE Full Panel Block**



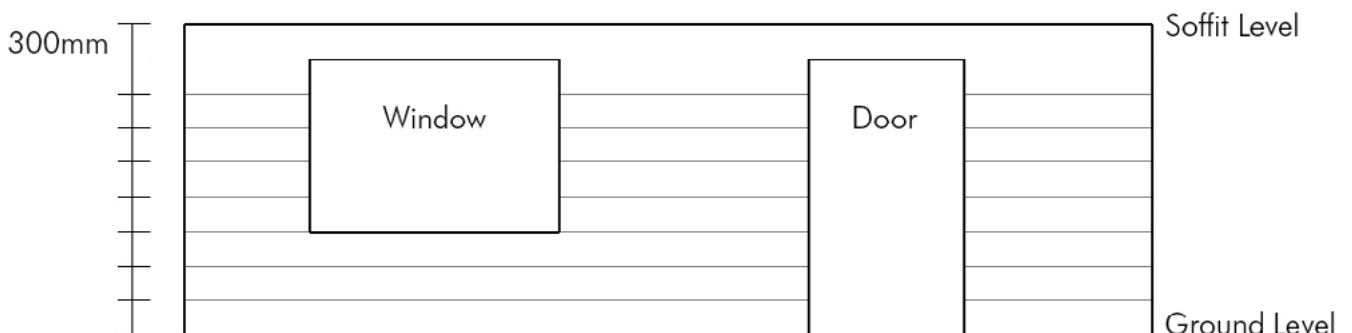
**EE Corner Panel Block**



**EE Half Panel Block**

## FormPro® Courses & Dimensioning

The most critical aspect of designing with FormPro® is that all vertical coursing heights for window sills, top of doors, top of windows and wall plate heights should be designed in 300mm increments. This coincides with minimum module heights of the EPS half block and connectors. An example is shown in the diagram below:

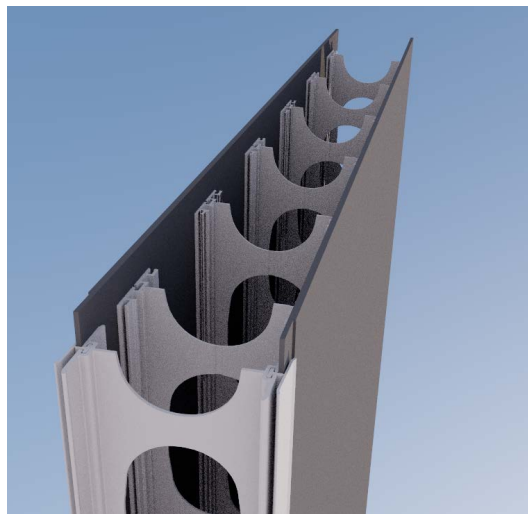


**Typical coursing heights**

## FastForm®

### THE NEXT GENERATION SYSTEM FOR COMMERCIAL CONSTRUCTION

FormPro thin panels are 6mm thick and are 3600mm x 1200mm. Face-plates are adhered inside the 6mm panels at 200mm horizontal centres and joined via a plastic connector. Corner joins are supported by a propriety corner brace during pouring. The FormPro® system also uses an additional inter-panel connector to connect adjacent panels, prevent concrete leakage and reducing the amount of screw fixing required during panel installation.



## Exterior Finishes

Typical exterior finishes are:

1. Rebated FC panels with flushed joints and textured render (product code R)
2. Cladding systems able to be fixed to FormPro® walls.
3. Exterior EPS panels with acrylic textured render system. (product code E)



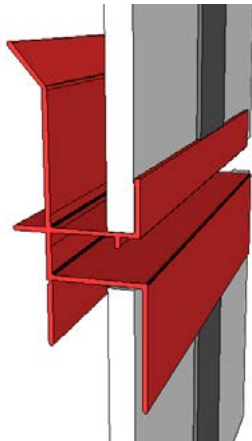
**Rebated FC flushed and beaded ready for rendering**



**Acrylic render system applied to panels**

## Panel joint detail between floors

Powder coated aluminium extrusions provide an aesthetically pleasing joint detail (shadow line) between floors.



**Cross Section of Joint Detail**

## Interior Finishes

The most common and cost effective interior finishing material used is plasterboard. Plasterboard can be applied directly to FormPro® walls using conventional drywall screws that are fixed into the furring strips, or with drywall screws and EPS compatible adhesives.

It is recommended that plasterboard is applied to internal FormPro® fibre cement walls to give a high level of internal finish.



**Interior EPS Panels with screw fixed plasterboard**

This can be achieved by one of three methods;

1. Discontinuous stud wall – used when impact sound abatement is required for inter-tenancy walls.
2. Plasterboard on battens – is used when there is a high level of service reticulation required in that section of walling.
3. Direct stick plasterboard – is used internally to achieve a high level of finish.

## Level of Finish

The quality of the finish on walls depends on the straightness of walls, and the quality of the finishing system and the amount of glancing light projected on the wall surface. It is essential for designers and builders to determine the level of finish required before construction commences, otherwise it may not be possible to attain the desired finish level without extensive corrective measures. Generally FormPro® walls achieve Level 4 finish (as determined by AS2589.1) which is +/- 6mm tolerance across an 1800mm plane.

### Glancing light

Glancing light is where the light from an artificial or natural source is nearly parallel to the surface. This condition exaggerates vertical joints and other imperfections making them more obvious. It is recommended designers give consideration to the level of finish required and eliminate potential problems due to glancing light.

### Internal finishing for rebated FC panels

It is recommended that internal walls are over-sheeted by one of 3 methods - Direct stick plasterboard, Batten and Sheet or Discontinuous Stud Wall. It is important that the procedure from the chosen manufacturer must be followed.

### External coating for Rebated FC panels

It is recommended for external walls that an external textured render system be applied. It is important that the procedure from the chosen manufacturer must be followed. Good preparation of the panels using a skim coat over the entire wall surface by applicator is critical to achieving quality finishes.

The procedure is as follows;

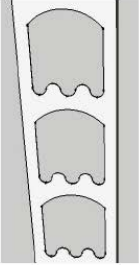

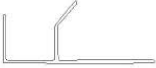
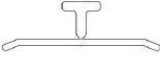

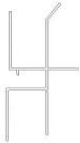


1. Screw holes or any other high points in the wall should be sanded or grinded back to provide a flat surface.
2. Panel joints should be primed and taped with a fibre glass mesh.
3. Jointing compound is applied by trowel to the panel joints.
4. Complete panel surface should be rendered with one or more coats to a thickness of 4-10mm to provide a flat surface.
5. The top coat should be a minimum be 2–3 mm thick trowel-on system and be designed to perform as a water resistant membrane.

### Suppliers

The main suppliers of texture coating materials are;

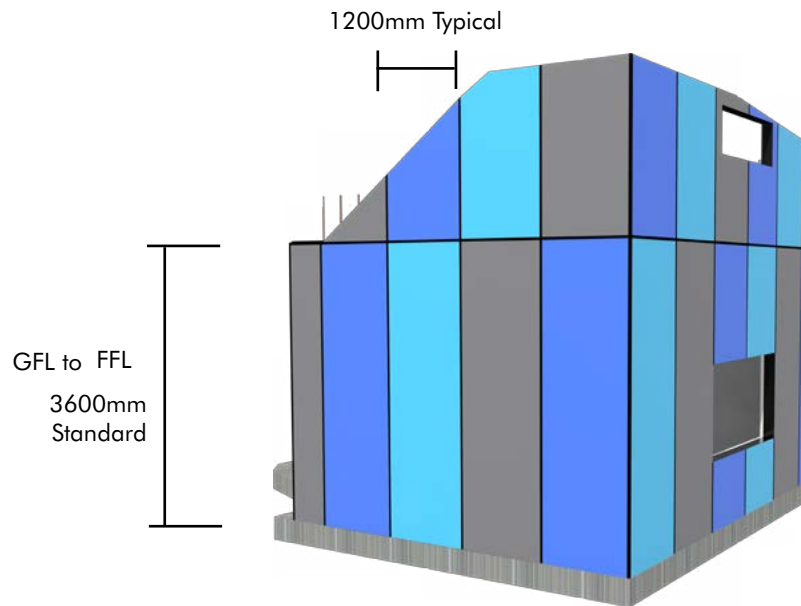
Rockcote	Ph. 1800 267 737
Wattyl	Ph. 13 21 01
Dulux	Ph. 13 23 77
Taubmans	Ph. 13 16 86

## Product Components

 <p><b>Truss</b></p> <p>TR108 TR150 TR188 TR250</p> <p>Material - PVC</p>	 <p><b>Joining Truss</b></p> <p>JT108 JT150 JT188 JT250</p>
 <p><b>Bottom Track</b></p> <p>BT</p> <p>Material - Aluminium</p>	 <p><b>Fibre Cement Joining Strip</b></p> <p>FCJS</p> <p>Material - PVC</p>
 <p><b>Prefinished Joining Profile Vertical</b></p> <p>PJPV</p> <p>Material - Aluminium</p>	 <p><b>Prefinished Joining Profile Horizontal</b></p> <p>PJPH</p> <p>Material - Aluminium</p>
 <p><b>Prefinished Panel Joining Profile</b></p> <p>PPJP</p> <p>Material - Aluminium</p>	 <p><b>Prefinished Panel Joining Profile</b></p> <p>PPJP</p> <p>Material - Aluminium</p>

## FastForm Courses & Dimensioning

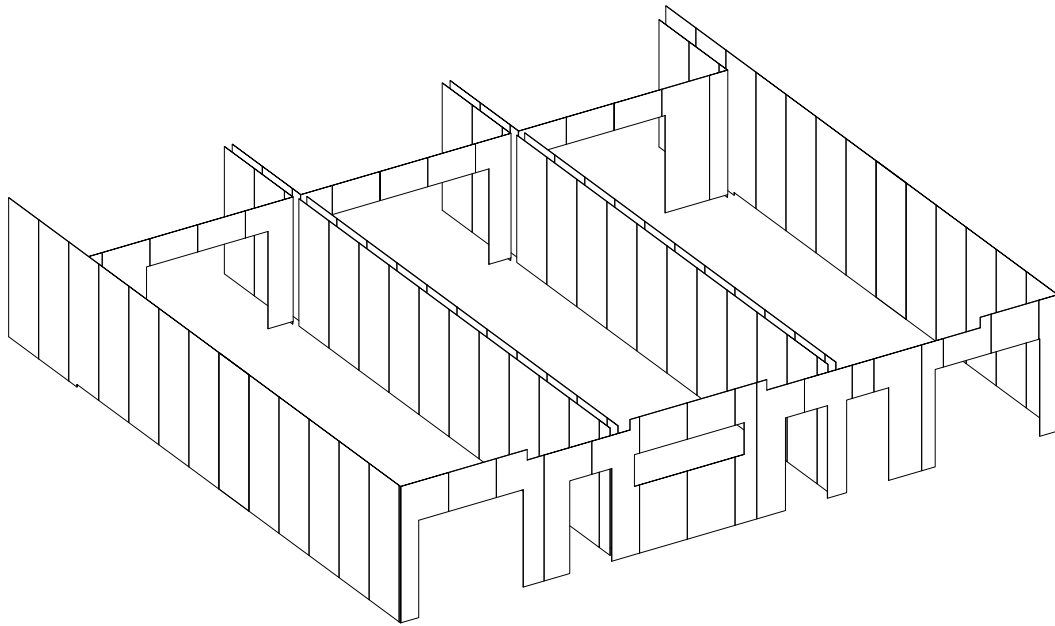
It is also preferable that the dimension from top of floor slab to the soffit level above is less than 3.6m to maximise to utilise maximum sheet length. Panels up to 5.8m in height can be manufactured by special order.



**Typical coursing heights for FastForm panels**

## Panelisation for the FastForm® Wall System

A major feature of the FormPro® system is the ability to pre-cut panels fibre cement panels to dramatically reduce installation times. Each panel is shop drawn and labelled for easy onsite identification to assist installation.



**Panelised Floor of Example Development**

Formcraft produces detailed shop drawings for each project before customising each wall so that it is precisely prepared ready for assembly before it arrives on site. Because of this on-site waste is dramatically reduced.



**Shopdrawing example ready for production**



## Doors and Windows

Formcraft recommends, where possible to place the tops of doors and the heads and sills of windows at the top of course heights (i.e. in 300mm vertical increments), to save both labour and materials by eliminating the necessity of cutting the forms horizontally.

Door and window frames may be placed as close to a corner as needed as long as the wall is structurally adequate. A 400mm offset works best. It is necessary to allow enough wall space for proper functioning of the door or window. The spacing between two or more doors or windows is determined by the need for the structural design to allow for adequate steel reinforcement placement.

Windows are detailed at the rear, here; | [EE\(p61\)](#) [ET\(p81\)](#) [TE\(p99\)](#) [TT\(p117\)](#)

Formcraft manufactures a fibre cement stop end solution that provides for an easy means of fixing doors and windows. Formcraft recommends FormView® double glazed windows and doors to maintain optimal energy efficiency.



**Stop Ends can be used to exclude concrete from door and window openings**

Most windows and door frames can be installed into the openings according to the design by utilising the FastForm® stop end system to line the opening. The door and window frames are then trim fitted to the stopend which has concrete directly behind the 6mm fibre cement panel

With hinged doors, the orientation of the hinge must be considered due to the thickness of the wall in comparison to the door. Exterior hinged doors that are hung to the FastForm® wall should be installed so that the hinge is flush with the inside wall.

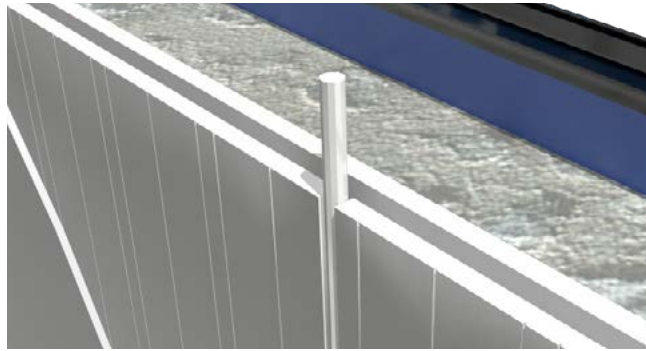
Various fire door options are detailed here; [EE\(p60\)](#) [ET\(p80\)](#) [TE\(p98\)](#) [TT\(p116\)](#)

# DESIGN CONSIDERATIONS

## Electrical, Mechanical and Plumbing

Since the FastForm® wall ultimately becomes a solid concrete wall, the electrical, mechanical and plumbing penetrations through the wall must be carefully pre-planned. Penetrations are easily accommodated before the concrete is placed by installing conduits through the wall. Examples of items that would need penetrations include exterior lighting, vents, and the main utility box.

If EPS panels are used internally, electrical boxes, conduits and plumbing pipes are installed after the concrete is placed by using an electric hot knife to chase channels into the 60mm thick EPS panels. If thin panels are used, electrical boxes, conduits and pipes should either be placed in the concrete cavity prior to the pour or inserted through the connection profile in the case of the Vertical System.



**Services can be reticulated in the internal EPS panel.**

## Sizing Air Conditioning Systems

A major benefit of using the FormPro® system is its inbuilt insulation and low air infiltration which creates a very efficient exterior building envelope. These capabilities translate into lower heat transfer and the ability to downsize air-conditioning requirements lowering procurement and maintenance costs. The high R-value, thermal mass and very low air infiltration must all be considered in sizing the mechanical Air Conditioning system.

## Waterproofing and Termite Protection

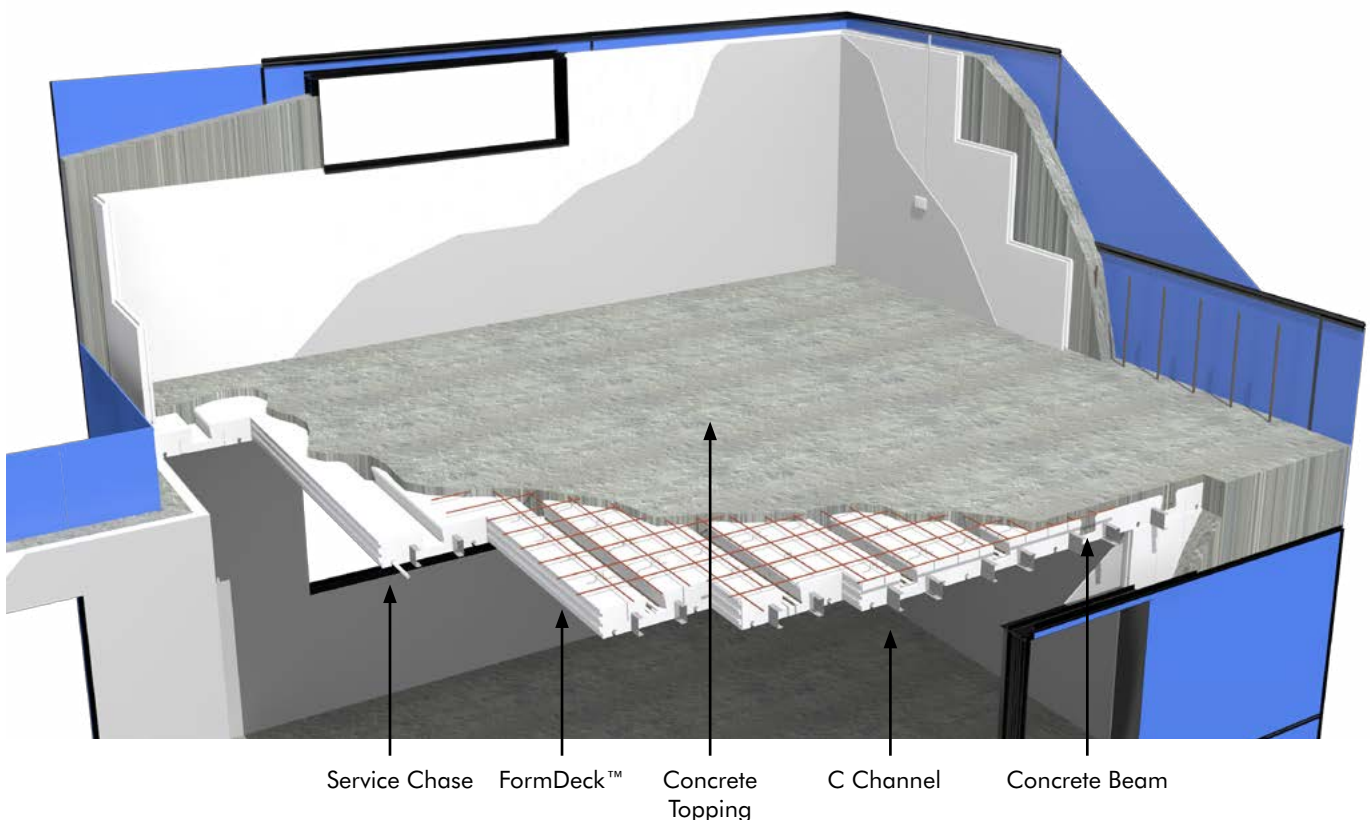
We recommend the use of adhesive waterproofing blankets for best results. In areas vulnerable to termite infestation, Formcraft recommends the use of a peel and stick waterproofing membrane below grade. This product has been approved for termite protection and waterproofing.

Formcraft recommends that irrigated termite management systems be used in conjunction with its construction system. Recharging the system with appropriate chemicals is relatively easy. Formcraft's construction system complies with AS 3660.1 by implementing an exposed slab edge of at least 100mm on monolithic concrete slabs.

## FormDeck™ Floor Systems

Formcraft manufactures the FormDeck™ insulated suspended slab system to integrate with the FormPro® wall system. FormDeck™ is a lightweight permanent formwork system used to create insulated suspended slab construction. The EPS profile forms structural concrete T beams integrated with a thinner flat concrete slab. This reduces concrete usage and weight significantly without compromising strength. FormDeck™ works particularly well when one directional spans can be utilised.

The EPS remains mechanically locked to the underside of the concrete slab when erected. FormDeck™ is capable of providing forms with continuous metal furring strips and plaster board can be attached directly to the C furring strips. The FormDeck™ forms also contain two service chases to place utilities such as electrical conduits. The FormDeck™ system is cut to custom made lengths for each order. Please see FormDeck™ Design Guide for further information.



### FormDeck™ Suspended Slab Integrated with FormPro® Walls

## Other Floor Systems

FormPro® walls are versatile and are fully capable of being integrated with a variety of other floor systems including the following;

Please follow the below links to see technical details of the following floor systems integrated with FormPro®.

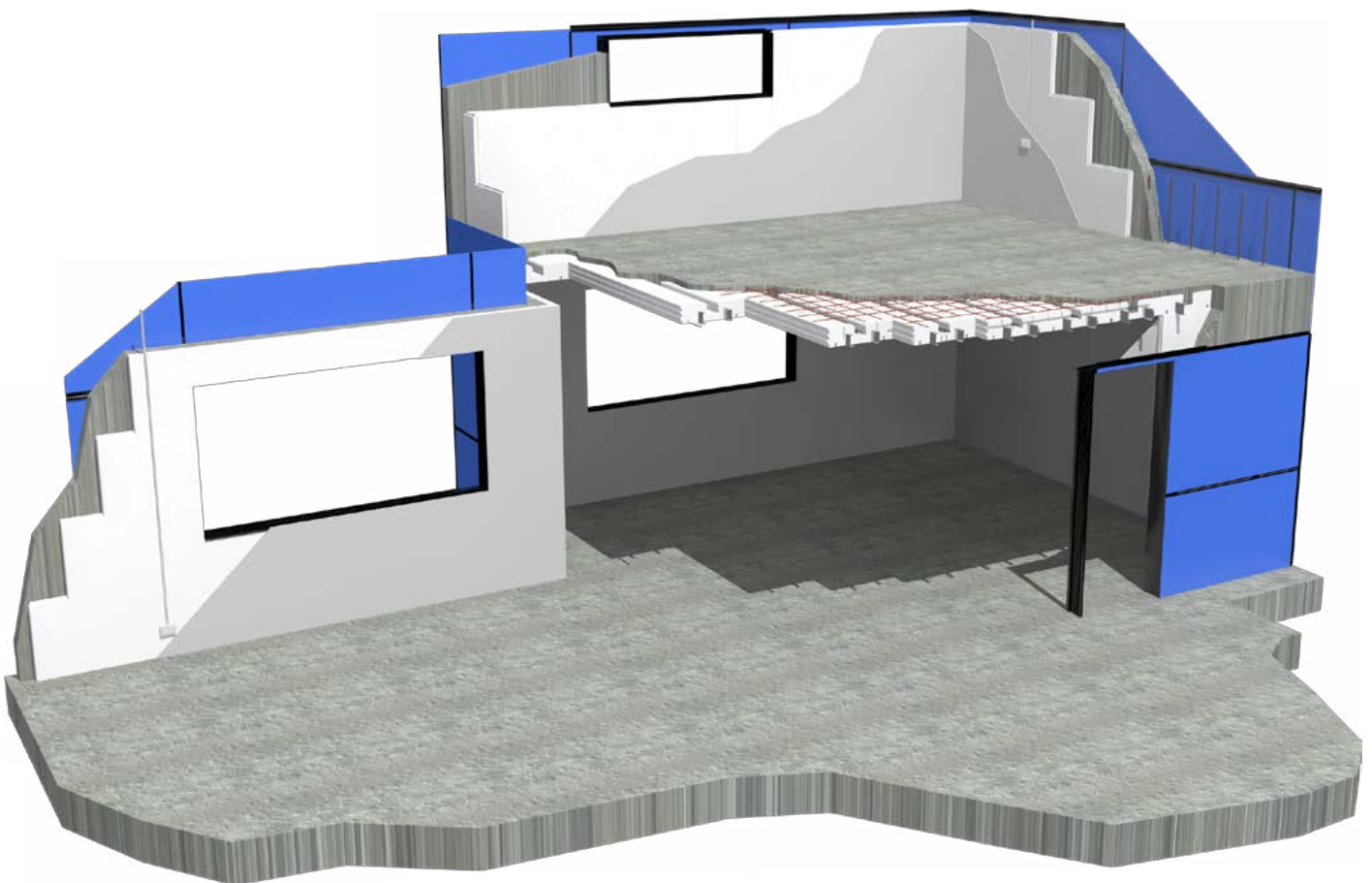
- Conventional Slab | [EE\(p63\)](#) [ET\(p83\)](#) [TE\(p101\)](#) [TT\(p119\)](#)
- Bondek Slab | [EE\(p68\)](#) [ET\(p88\)](#) [TE\(p106\)](#) [TT\(p124\)](#)
- Post Tension Slab | [EE\(p69\)](#) [ET\(p89\)](#) [TE\(p107\)](#) [TT\(p125\)](#)
- Light Frame Floor | [EE\(p65\)](#) [ET\(p85\)](#) [TE\(p103\)](#) [TT\(p121\)](#)

If you would like to enquire whether your preferred floor system can be integrated with our FormPro® system, our sales and technical consultant can provide assistance.

## BIM Software

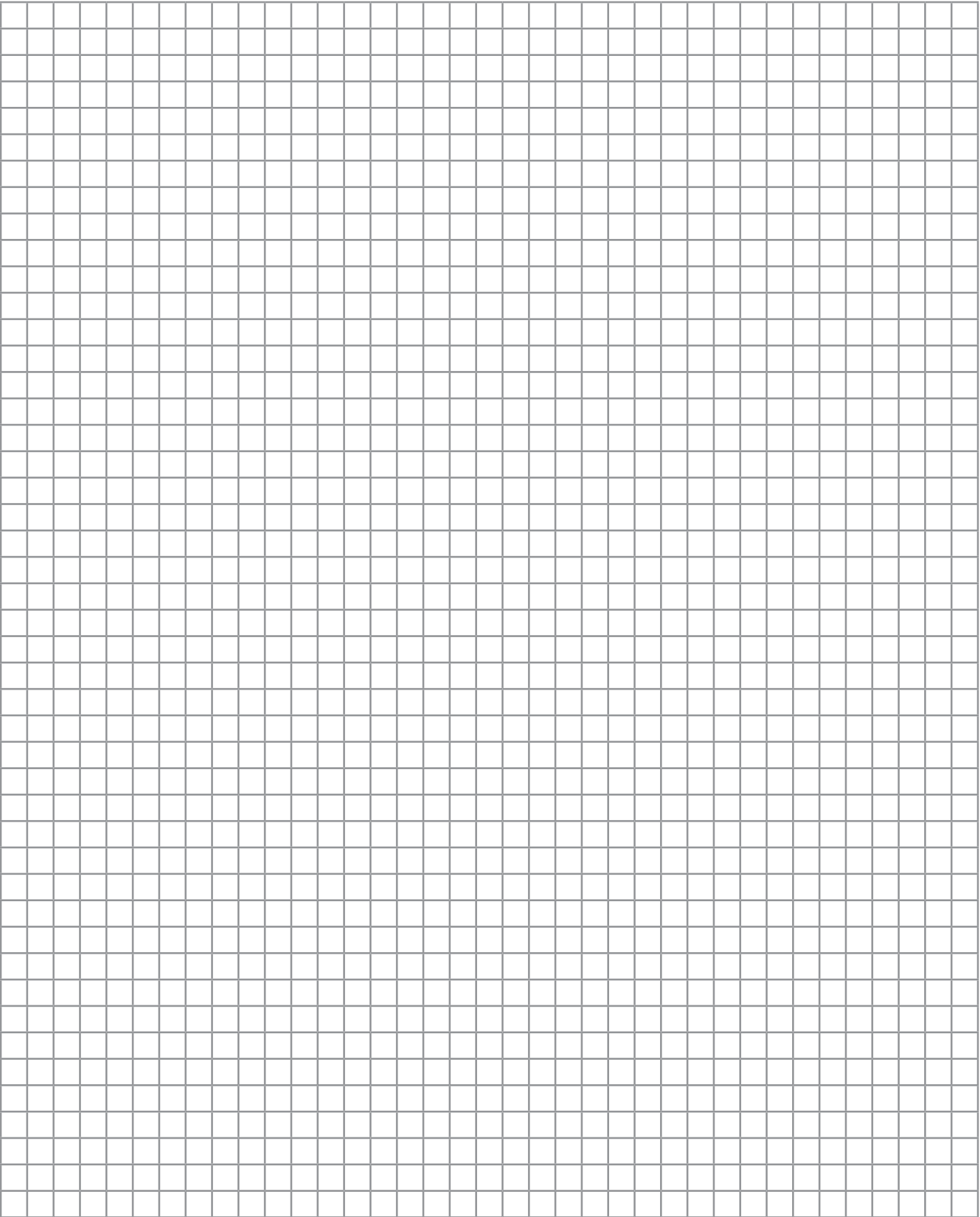
Formcraft realises the importance of software in the design of buildings and so can provide product details and models in the following formats;

- AutoCAD
- DWG
- Revit
- PDF

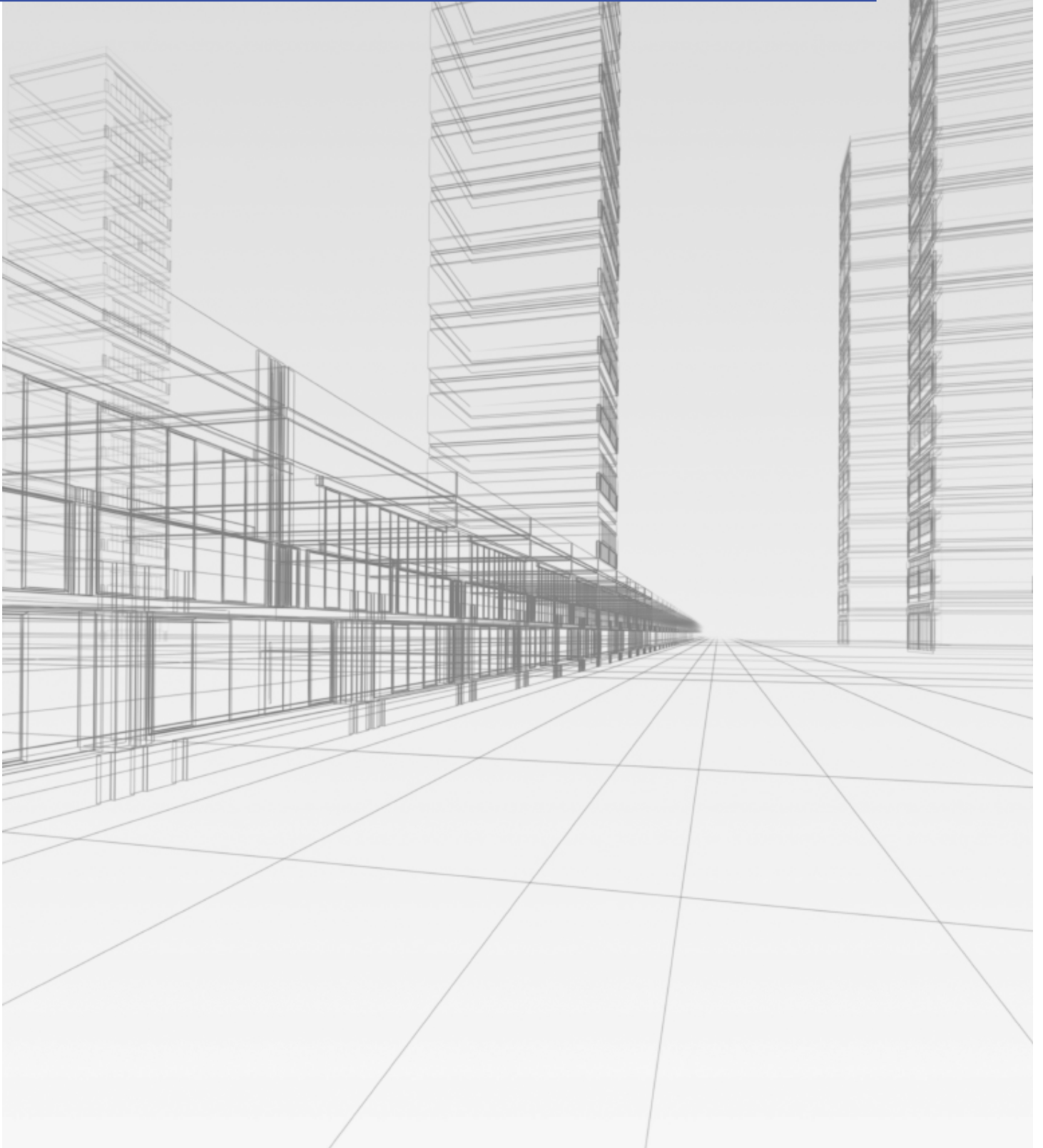


**3D BIM Model using FormPro® Products**

# NOTES



# STRUCTURAL



# VERTICAL LOAD CAPACITY

## Vertical Load Capacity

The vertical load design capacity ( $\phi N_u$ ) for the various wall thicknesses, wall heights and support conditions are shown in the following Charts.

The design capacities have been calculated in accordance with AS 3600 Clause 11.4 SIMPLIFIED DESIGN METHOD FOR BRACED WALLS SUBJECT TO VERTICAL FORCES ONLY, as follows:

Design axial compressive strength =  $\phi N_u$  (kN/m)

### where:

$\phi = 0.6$

$N_u =$  the ultimate strength (kN/m)  
 $= (t_w - 1.2e - 2e_a) 0.6 f'_c 10^3$

$t_w =$  Wall concrete thickness (m)  
 $=$  overall thickness – 0.012

$e =$  the eccentricity of the load (m)  
 $= 0$  for continuous floor slab  
 (adopt  $0.05 t_w$  as minimum)  
 $= 0.166 t_w$  for discontinuous floor slab

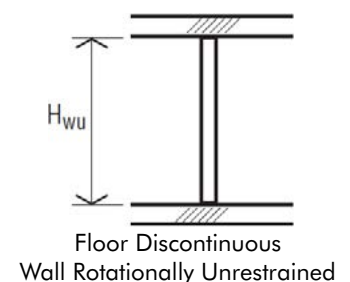
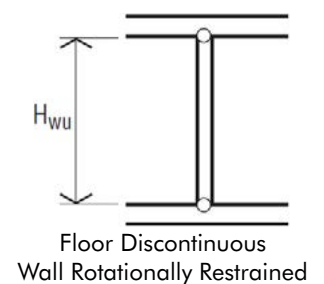
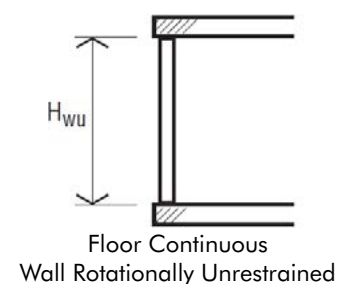
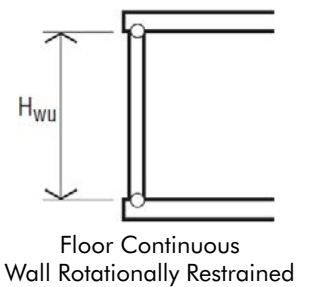
$e_a =$  additional eccentricity (m)  
 $= H_{we}^2 / (2500 t_w)$

$H_{we} =$  the effective height of wall (m)  
 $= 0.75 H_{wu}$  where wall restrained against rotation top and bottom by floors  
 $= 1.0 H_{wu}$  where wall not rotationally restrained top and bottom

$H_{we}/t_w = 30$  max. when  $N^* > 0.03 f'_c A_g$   
 $= 50$  max. when  $N^* \leq 0.03 f'_c A_g$

$H_{wu} =$  Unsupported height of wall (m)

$f'_c =$  Concrete compressive strength (MPa)



NOTE: Charts have been calculated for infill concrete strengths of 25 MPa and 32 MPa. Where other concrete strengths are used, the capacities will change proportionally.



## Lateral Load Capacity

The capacity of a wall subjected to a lateral load (wind or earthquake) is given in the chart on the following page.

It has been calculated on the basis of a simply-supported beam spanning vertically between floor supports, with central reinforcement @ 400 mm centres and concrete strength 25 MPa, refer chart on following page. Capacities are given for N12 and N16 vertical reinforcement. Higher capacities can be achieved by increasing the size of the vertical reinforcement.

The capacity is given by the formula:

$$\text{Design Capacity, } w = 8\phi M_u / L^2 \quad (\text{kPa})$$

**where:**

$$M_u = f_{sy} d A_{st} \left[ 1 - \frac{0.6 A_{st} f_{sy} 10^{-6}}{f'_c b d} \right] 10^{-3} \quad (\text{kN.m/m})$$

$$\phi = 0.8$$

$$L = \begin{aligned} &= \text{Design span for bending} && (\text{m}) \\ &= \text{Height between floors} \end{aligned}$$

$$b = \begin{aligned} &= \text{Design width} && (\text{m}) \\ &= 1.0 \end{aligned}$$

$$d = \begin{aligned} &= \text{Depth to tensile reinforcement} && (\text{m}) \\ &= t_w / 2 \end{aligned}$$

$$t_w = \begin{aligned} &= \text{Wall concrete thickness} && (\text{m}) \\ &= \text{Overall wall thickness} - 0.012 \end{aligned}$$

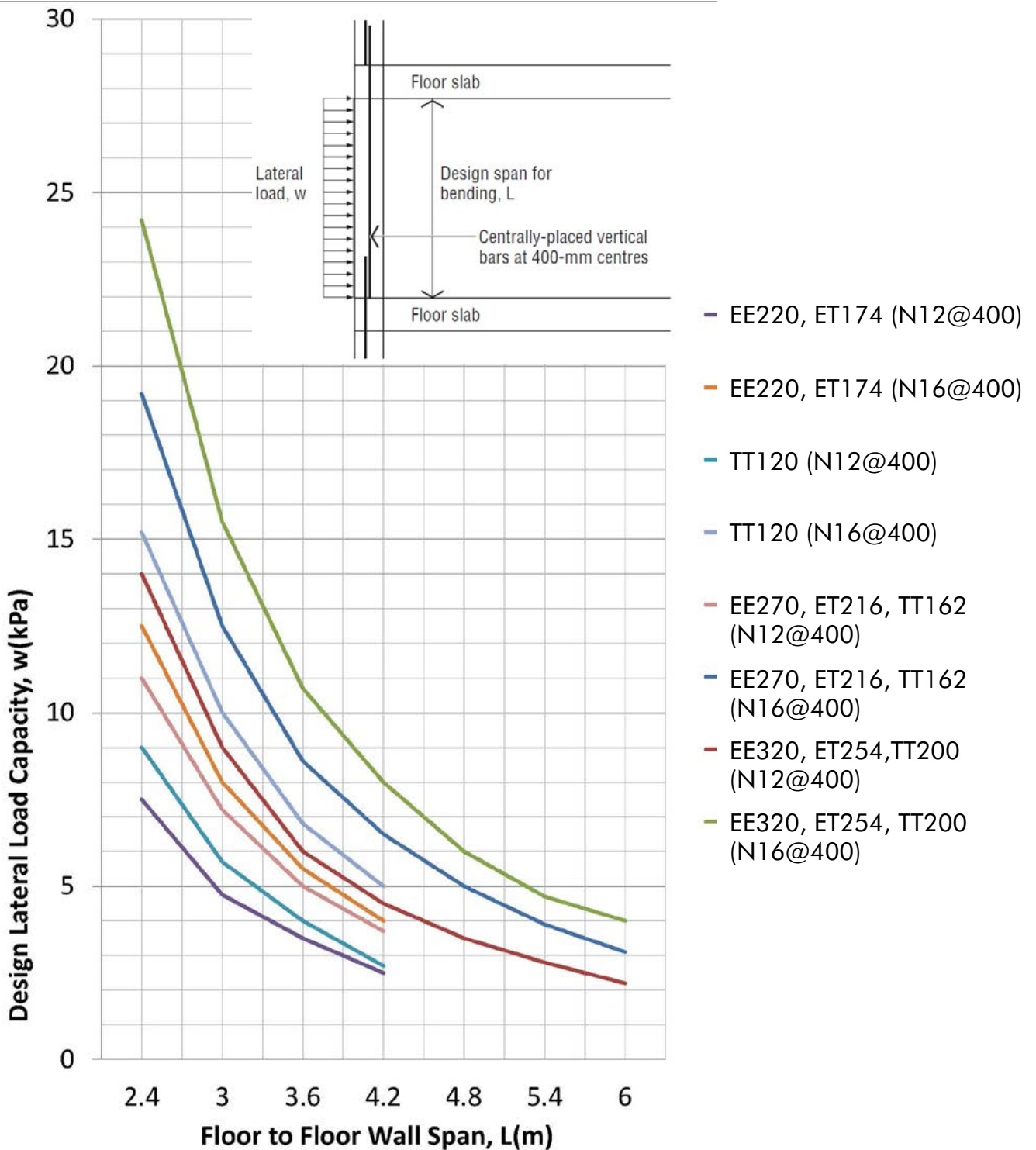
$$A_{st} = \text{Area of vertical reinforcement} \quad (\text{mm}^2)$$

$$f'_c = \text{Concrete compressive strength} \quad (\text{MPa})$$

$$f_{sy} = \text{Yield strength of reinforcement} \quad (\text{MPa})$$

# LATERAL LOAD CAPACITY

## Design Lateral Load Capacity Vertical Reinforcement



## Racking Resistance

When a wall is subjected to racking forces, it can fail by either overturning of the wall or shear through the length of the wall. The wall capacity is therefore limited by the lesser value of overturning or shear.

### Wall Overturning

The resistance to overturning of the wall is controlled by wall thickness and length, concrete strength and the amount and strength of tiedown reinforcement. In addition, weight of the wall as well as any other applied loads will help to resist overturning. The overturning is calculated in accordance with the assumptions contained in AS 3600 Clause 8.1.2.1 Combined bending and axial force. The following formula has been used:

$$V = \phi \left[ \frac{(f_{sy} A_{st} 10^{-3} + w L_w) d \left\{ 1 - \frac{0.6(f_{sy} A_{st} 10^{-3} + w L_w)}{t_w d f'_c 10^3} \right\} - w L_w \left\{ d - \frac{L_w}{2} \right\}}{H_w} \right]$$

#### where:

V	= Design overturning resistance	(kN)
φ	= Strength reduction factor for shear = 0.7 (adopt shear value)	
f <sub>sy</sub>	= Yield strength of reinforcement	(MPa)
f' <sub>c</sub>	= Concrete compressive strength	(MPa)
A <sub>st</sub>	= Area of tiedown reinf. in tension = Reinf. area over half wall length	(mm <sup>2</sup> )
w	= Total Vertical load on wall = w <sub>s</sub> + w <sub>sw</sub>	(kN/m)
w <sub>s</sub>	= Superimposed permanent load (PL)	(kN/m)
w <sub>sw</sub>	= Self-weight of wall (SW)	(kN/m)
d	= Distance from the compression face (end of wall) to the centroid of tensile reinforcement	(m)
H <sub>w</sub>	= Wall height	(m)
L <sub>w</sub>	= Wall length	(m)
t <sub>w</sub>	= Concrete thickness = Overall wall thickness – 0.012	(m)

The overturning capacities shown in the Racking Resistance chart have been calculated for the ET178 walls with concrete strength 25 MPa and tiedown rods N12@ 400 mm centres. Two sets of design curves are given covering two load cases. One set of curves is for a UPL of 0 kN/m and the second set is for a UPL of 100 kN/m. Where a UPL is between these values, the overturning capacity can be obtained by interpolation. Increases in wall size or concrete strength will only give marginally higher strength.

# RACKING RESISTANCE

## Wall Shear

The shear strength through the wall is controlled by wall thickness and length, concrete strength and amount and strength of reinforcement. The shear capacity is calculated in accordance with AS 3600 Clause 11.5.3. Strength in shear, as follows:

$$V_u = \phi(V_{uc} + V_{us})$$

**When**  $H_w/L_w < 1.3$

$$V_{uc} = \left[ 0.66 \sqrt{f'_c} - 0.21 \frac{H_w}{L_w} \sqrt{f'_c} \right] 0.8 L_w t_w 10^3$$

**When**  $1.3 \leq H_w/L_w < 1.83$

$$V_{uc} = \left[ 0.05 \sqrt{f'_c} + \frac{0.1 \sqrt{f'_c}}{\left[ \frac{H_w}{L_w} - 1 \right]} \right] 0.8 L_w t_w 10^3$$

**When**  $H_w/L_w \geq 1.83$

$$V_{uc} = [0.17 \sqrt{f'_c}] 0.8 L_w t_w 10^3$$

$$V_{us} = \frac{A_s}{s} f_{sy} 0.8 L_w 10^3$$

**where:**

$V_u$	= Design strength in shear	(kN)
$V_{uc}$	= Shear strength without reinf.	(kN)
$V_{us}$	= Contribution to shear strength by reinforcement	(kN)
$\phi$	= Strength reduction factor for shear	
	= 0.7	
$f'_c$	= Concrete compressive strength	(MPa)
$f_{sy}$	= Yield strength of reinforcement	(MPa)
$A_s$	= Area of vertical and horizontal reinforcing bars	(mm <sup>2</sup> )
$s$	= Spacing of vertical and horizontal reinforcing bars	(mm)
$H_w$	= Wall height	(m)
$L_w$	= Wall length	(m)
$t_w$	= Wall concrete thickness	(m)
	= Overall thickness – 0.012	

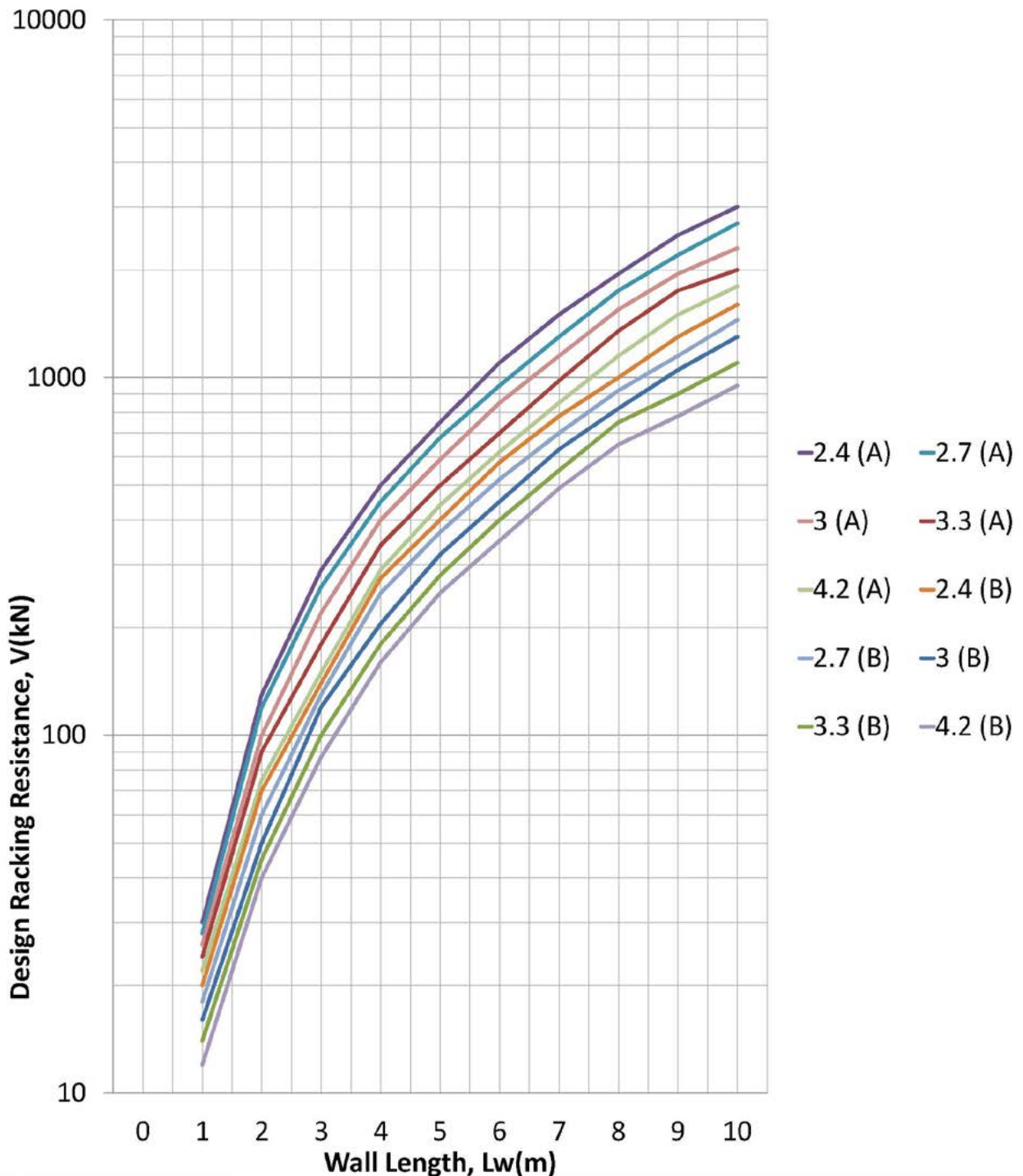
The shear capacity given in the following chart have been calculated for the ET178 wall with concrete strength 25 MPa and N12 bars @ 400 mm centres. Increases in wall size, concrete strength or reinforcement will give proportionally higher shear strength.

## Racking Resistance

The racking resistance given in the following chart is the lesser of the shear and overturning values. Except for long and heavily-loaded walls, the value of racking resistance is limited by overturning.

Wall Overturning use AS3600 clause 8.1.2.1 - Combined Bending and Axial Force

Wall Shear use AS3600 clause 11.5.3 - Strength in Shear



## Lintel Capacity

The design lintel capacity is the lesser of the strength in flexure or in shear. Deflection must also be checked to ensure that serviceability limits are not exceeded.

The design capacities given have been calculated on the basis of simply supported beams using concrete strength of 25 MPa and the details shown in the image below.

### Flexural Capacity

The capacity in flexure is calculated for a simply-supported beam using the following formula:

$$\text{Design Capacity, } w = 8 \phi M_u / L^2 \quad (\text{kN/m})$$

where:

$$M_u = f_{sy} d A_{st} \left[ 1 - \frac{0.6 A_{st} f_{sy} 10^{-6}}{f'_c b d} \right] 10^{-3} \quad (\text{kN.m})$$

$$\phi = 0.8$$

$$L = \text{Design span for flexure} \quad (\text{m})$$

$$= L_o + 0.35$$

$$L_o = \text{Opening width} \quad (\text{m})$$

$$b = \text{Thickness} \quad (\text{m})$$

$$= \text{Overall wall thickness} - 0.012$$

$$d = \text{Depth to tensile reinforcement} \quad (\text{m})$$

$$A_{st} = \text{Area of tensile reinforcement} \quad (\text{mm}^2)$$

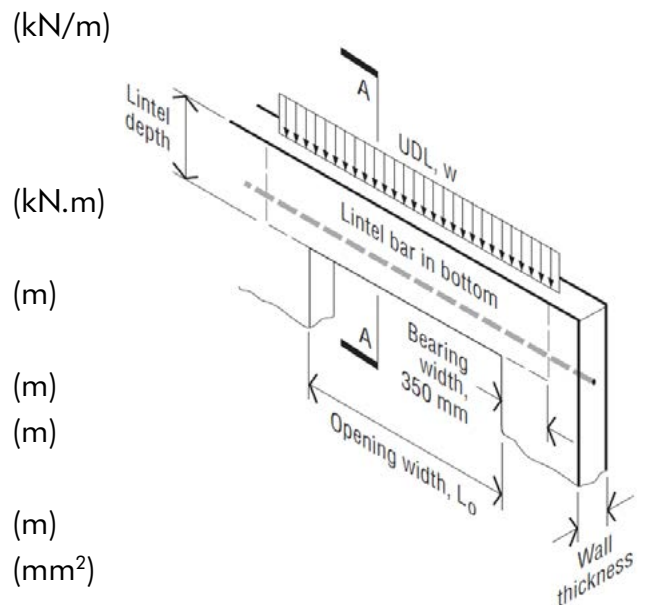
$$\geq 0.22 b d \left[ \frac{d + 50}{d} \right]^2 \frac{f'_{ct}}{f_{sy}}$$

$$f'_c = \text{Concrete compressive strength} \quad (\text{MPa})$$

$$f'_{ct} = \text{Concrete flexural tensile strength} \quad (\text{MPa})$$

$$= 0.6 \sqrt{f'_c}$$

$$f_{sy} = \text{Yield strength of reinforcement} \quad (\text{MPa})$$

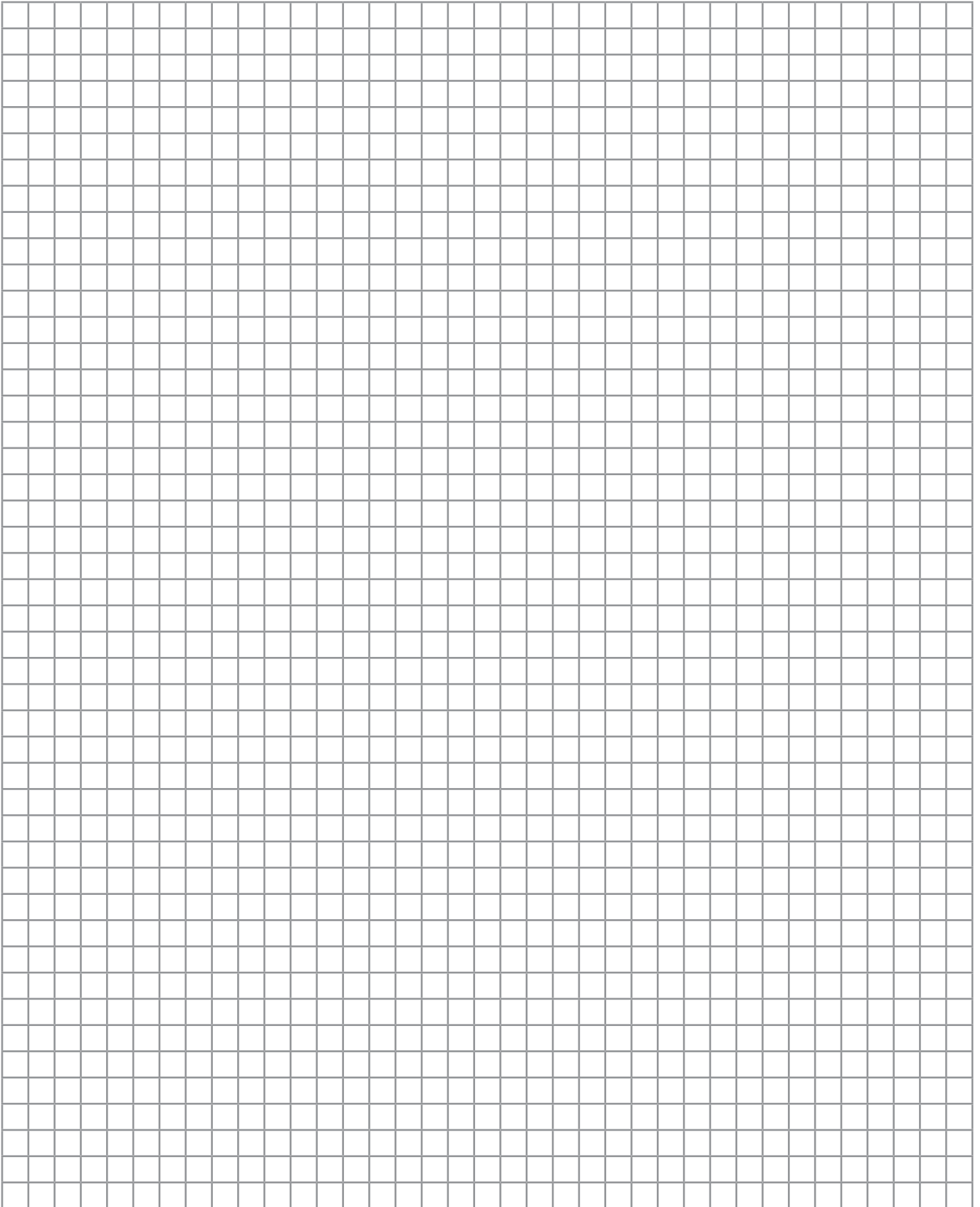


### Assumptions

- Simply-supported beam
- Bearing width = 350mm
- Design span for flexure,  
 $L = \text{Opening width} + 0.35 \text{ (m)}$
- Design span for shear,  
 $L = \text{Opening width} - 2d \text{ (m)}$
- No vertical shear reinforcement

A large grid of graph paper for taking notes, consisting of 30 columns and 40 rows of small squares.

# NOTES





# PERFORMANCE



FormPro® walls have been evaluated for compliance with the following Australian Standards and BCA codes

## Australian Standards

- AS.3600 Concrete structures
- AS.1366 EPS
- AS.3610 Formwork for concrete
- AS.3700 Masonry structures

## BCA Requirements

- Volume 1 - Class 2 to 9 Buildings
- Volume 2 - Class 1 & Class 10 Buildings - Housing Provisions
- Part 1.1.1.2 Alpine Areas
- Part 3.1.3 Termite Risk Management
- Part 3.3.2 Reinforced Masonry
- Part 3.3.4 Weatherproofing of Masonry
- Part 3.6.2 Glazing Sizes & Installation
- Part 3.7 Fire Safety
- Part 3.8.1.5 Protection of walls in wet areas
- Part 3.8.6 Sound Insulation
- Part 3.10.1 Cyclonic Areas
- Part 3.10.1 High Wind Areas

## Tests Conducted on FC Material as per AS2908

Test Description	Value
Water Absorption	16.22%
Flexural Strength	16Mp
Dimensional Stability – Thermal & Humid Aging	0.52%
Density	1613kg/m <sup>3</sup>
Dimensions	+ - 2mm
Flame Test to AS1530.2	Pass
Flame Test to AS1530.3	
- Structural Adequacy	219 minutes
- Integrity	219 minutes
- Insulation	149 minutes

## Tests Conducted on EPS Material

Test Description	Value
Water Absorption	0.18%
Water Vapour Permeance	94.0ng/Pa-s-m <sup>2</sup>
Compressive Strength	165kPa
Flexural Strength	365kPa
Dimensional Stability – Thermal & Humid Aging	0.5%
Density	27.5kg/m <sup>3</sup>
Dimensions	+ - 3mm
Limiting Oxygen Index	29.1%
Formaldehyde Emission	No formaldehyde detected
Fungi Resistance	No fungal growth detected
Flame Spread Rating	< 25
Smoke Developed Rating	< 450

## Tests Conducted on Polypropylene Web

Test Description	Value
Flammability	Flame Front Distance = 100mm Avg. Linear Burn Rate = 17.9mm/min
Average Lateral Fastener Resistance	1.63kN
Average Withdrawal Fastener Resistance	0.75kN
Shear Strength	26.1MPa
Average Tensile Strength	3.75kN

## Fire Resistance Rating - BRANZ Fire Test FAR3116

Wall type	FRR rating
EE220 model	90/90/90
EE270 model	180/180/180
EE320 model	240/240/240

## Fire Assessment Report - BRANZ Fire Test FAR4359

Assessment report on FormPro® walls to AS: 3600:2001. Walls were found to be compliant.

Model	Wall Thickness	Concrete	External Material	FRL
EE220	220mm	100mm	0.144	90/90/90
EE270	270mm	150mm	0.216	180/180/180
EE320	320mm	200mm	0.288	240/240/240
ET178	178mm	112mm	0.078	90/90/90
ET202	202mm	136mm	0.096	120/120/120
ET226	228mm	162mm	0.113	180/180/180
ET278	278mm	212mm	0.147	240/240/240
TT98	98mm	86mm	0.059	60/60/60
TT134	134mm	122mm	0.086	120/120/120
TT162	158mm	146mm	0.104	180/180/180
TT184	184mm	172mm	0.120	240/240/240
TT234	234mm	222mm	0.155	240/240/240

## BRANZ Fire Test FI 3672 to ISO 9705

BCA 2006 Specification C1.10a Clause 3 and Specification A2.4 Clause 4

Plasterboard lined Formcraft wall system

### Result:

Group 1 classification – Does not reach flash over during Test

## Determination of the Airborne Sound Insulation

VIPAC Technical report W-09-0084-TNT-840103-0

Wall Type	$R_w + C_{tr}$
EE220 model	46
EE270 model	59
EE320 model	62

## Determination of the Wall Impact Sound Rating

VIPAC Technical report W-09-0084-TNT-840103-0

Wall Type	$L_{n,w}$
EE220 model	48
EE270 model	51
EE320 model	54

## Field Sound Transmission Loss Performance

Wall Type	$D_{nT,w} + C_{tr}$
ET228	47

## Thermal Performance Calculations (R-Value)

### General assumptions:

- Thermal conductivity for Concrete at density 2850 Kg/m<sup>3</sup> = 1.44 W/mK
- Thermal Conductivity for EPS at density of 26 Kg/m<sup>3</sup> and 23°C = 0.0376 W/mK
- Thermal conductivity of Plasterboard = 0.173 W/mK
- 3.4m/s wind and surface emittance = 0.9

### Non-Concrete R-value contribution - (thickness (m)/k)

Outside air		= 0.044
60mm EPS	= 0.060 / 0.0376	= 1.596
6mm Fibre Cement	= 0.006 / 0.173	= 0.034
10mm Plasterboard	= 0.010 / 0.173	= 0.057
Inside air		= 0.12
EE Wall Non-Concrete Contribution (Total)		= 3.413
ET Wall Non-Concrete Contribution (Total)		= 1.863
TT Wall Non-Concrete Contribution (Total)		= 0.260

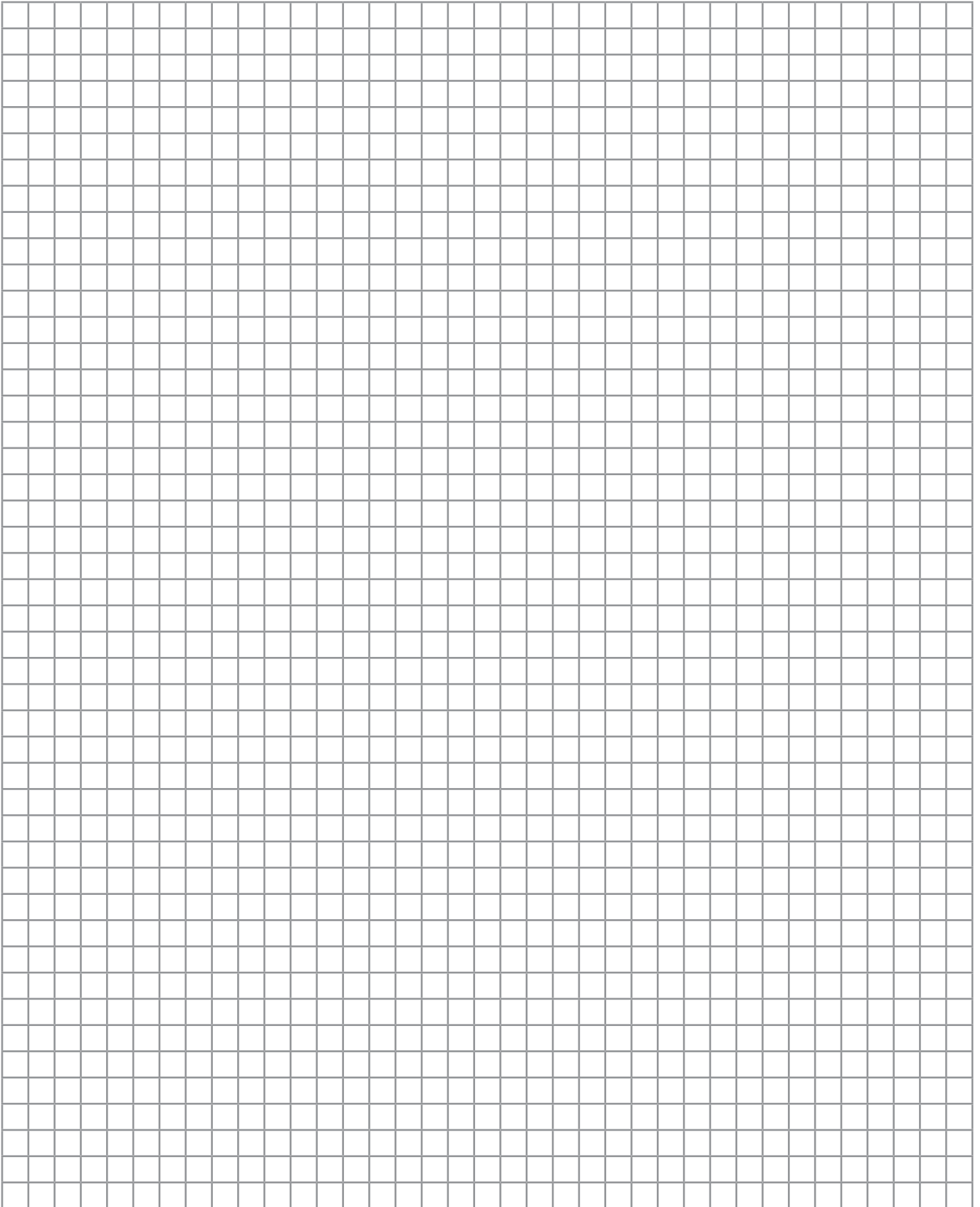
### Concrete R-value contribution - (thickness (m)/k)

EE220 (100mm conc.)	= 0.100 / 1.44	= 0.144
EE270 (150mm conc.)	= 0.150 / 1.44	= 0.216
EE320 (200mm conc.)	= 0.200 / 1.44	= 0.288
ET174 (108mm conc.)	= 0.108 / 1.44	= 0.078
ET216(150mm conc.)	= 0.150 / 1.44	= 0.094
ET254(188mm conc.)	= 0.188 / 1.44	= 0.111
ET278 (212mm conc.)	= 0.212 / 1.44	= 0.147
TT120 (108mm conc.)	= 0.108 / 1.44	= 0.059
TT162 (150mm conc.)	= 0.150 / 1.44	= 0.085
TT200 (188mm conc.)	= 0.188 / 1.44	= 0.104

## Thermal Performance Values

<b>Product Line</b>	<b>Wall Model</b>	<b>Total Wall Thickness</b>	<b>Concrete Thickness</b>	<b>Concrete R-value</b>	<b>Total R-Value</b>
FormPro®	EE220	220mm	100mm	0.144	3.557
FormPro®	EE270	270mm	150mm	0.216	3.629
FormPro®	EE320	320mm	200mm	0.288	3.701
FastForm®	ET174	174mm	108mm	0.078	1.941
FastForm®	ET216	216mm	150mm	0.096	1.959
FastForm®	ET254	254mm	188mm	0.113	1.976
FastForm®	TT120	120mm	108mm	0.086	0.342
FastForm®	TT162	162mm	150mm	0.104	0.360
FastForm®	TT200	200mm	188mm	0.120	0.376

# NOTES





# FAQ



# FREQUENTLY ASKED QUESTIONS

## What is the Formcraft Construction System?

The Formcraft construction system is a permanent concrete forming system that can be used for load bearing concrete walls and suspended slabs for above or below ground applications.

## What can I build with FormPro®?

FormPro® is a permanent formwork for walls. Typical applications are residential buildings, commercial buildings, factories, warehouses, shopping centres, basement walls, party walls and retaining walls.

## Does FormPro® comply with the requirements of the BCA?

Yes. The system complies with all structural engineering, fire rating, acoustic and energy efficiency requirements and has been tested by NATA accredited laboratories

## What are the standard module dimensions ?

FormPro® forms are available in a variety of wall thicknesses and configurations. Please refer to product selection guide.

## Why would I use FastForm® rather than other walling systems?

- The best walling system for below ground conditions.
- Lighter (10 kg/m<sup>2</sup>), no craneage required, ideal for constructions with access difficulties.
- Easier and faster to install even by non-skilled labour.
- Incorporates insulation and ability to easily chase for service reticulation and for easy plasterboard screw fixing.
- Can be used as deep beams and footings to eliminate costly transfer structures.

## How can I maximise the benefits of FastForm®?

FormPro® is a modular system and its benefits can be maximised by dimensioning wall lengths and heights to suit FormPro® modules, which will achieve significant cost savings. See FormPro® Design Guide

## Is FastForm® safer to build with than other wall systems?

### FastForm® System Safety Benefits

- Lighter- Minimise risk of back injury.
- Quicker- Reduce the time exposed to an activity or risk.
- No stripping of formwork- Eliminates a high risk activity.
- No sharp edges- Reduce risk of cuts.
- Installed by hand and rechargeable power tools- Eliminates the risk of electrocution by using 240V leads.

## Is FastForm® faster to build with than other wall systems ?

Yes. Significantly, due to the following:

- 5 kg for each 1200 x 600mm module, lightweight, easier and faster to handle.
- Reduces the number of trades normally required.
- Eliminates the need for masonry trades.
- Service trades can easily chase into EPS panel with hot knife
- FastForm® eliminates floor slab edge boards.
- FastForm® is not affected by wet weather conditions.
- Significantly reduces the time possibly lost at construction sites due to accidents, access and crange related issues.
- All of the above benefits equate to fewer workers and amenities on site, which means less time and lower cost.

## How do I brace the FastForm® walls?

The base of the forms are restrained by C channel which also establish the location of the walls. We recommend using a proprietary Formcraft bracing system which are screw fixed into the embedded face plates at min 1200mm centers. See FormPro® Construction Manual

## What is the concrete mix used?

The minimum 20 MPa for normal grade concrete with compressive strength at 28 days is recommended with 120mm slump and 10mm aggregate sizes. Higher MPa concrete is sometimes specified for high strength applications.

# FREQUENTLY ASKED QUESTIONS

## What kind of concrete pump should be used?

The use of boom pump with a reduction to a 50mm hose is especially recommended.

## How are electrical and plumbing services installed?

FastForm® usually has a 60mm internal EPS panel and service chase can be easily and neatly cut into the EPS with a hotknife which can accommodate electrical, hydraulic and communication needs.

## How are windows installed?

Any type of window system can be installed into the proprietary subframe. The subframe is used to exclude concrete from the openings and provides a waterproofing fin within the opening to prevent wind driven water penetration to the interior of the building.

## What are the advantages of the system in multi-level construction?

- The formwork system doubles as the insulating element of the walls.
- The only difference is that all or some exterior, party and corridor walls are employed as load bearing elements. Internal partition walls of sole occupancy units are the only lightweight walls.
- FastForm® walls can be employed as deep beams thus resulting in substantially cheaper transfer slabs than in conventional frame systems.
- FastForm® walls support slabs rather than being supported by slabs, thus resulting in lower cost floor slabs.
- The walls and slabs are all made from the same material, i.e. concrete. This homogeneity achieves similar behaviour of both slabs and walls.
- FastForm® walls constructed with concrete slabs require one trade only.

## Does Formcraft provide technical assistance?

Yes. Comprehensive technical backup is available for architects, engineers, and construction workers. Please see Support.

- This Design Manual has been prepared to assist Architects & Engineers designing with the FormPro® wall system. Although every care has been taken in developing this manual, it is the responsibility of the user to ensure that its use is appropriate and exercise their own judgement in applying the information.
- The engineering of the structure of any building using FastForm® walls should only be undertaken by suitably qualified and experienced engineers/consultants. The full responsibility for the engineering and structural design, Certification of Compliance with all relevant Australian Standards, BCA and any other statutory requirements at Local, State and Federal levels rest with the project engineer/project consultants.
- Similarly, provisions and detail for installation of, including but not limited to; services; waterproofing; glazing; flashing; fixings or other, are to the builder's specification and/or relative project consultant. Formcraft has provided generic detail throughout this manual for illustrative purposes only. Formcraft does not warrant the adequacy of this detail or accept liability for any loss incurred should the user adopt these details without review or consultation with a appropriate industry consultant.
- Please check with Formcraft that you have the latest version as the manual may be updated from time to time and certain details may change.
- Formcraft reserves the right to change specifications without notice.
- Design Manual is a guide only. The project Engineer must be consulted for all final requirements.

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