FTMA TECH TALK

JANUARY 2024 - ED.59 Siu Kong Fox - Multinail Australia's NSW - State Engineer

WALL BRACING DESIGN SHOULD BE INCLUDED IN STRUCTURAL DESIGN AND LISTED IN EACH STATE REGULATIONS

One of the daily responsibilities at Multinail Engineering involves reviewing wall bracing for fabricators. Many "simple" residential bracing works in NSW, VIC, SA, and TAS are traditionally handled by timber frame and truss fabricators and detailers because the structural design drawings often lack specific wall bracing details. Engineers from engineering consultancy commonly assume that frame and truss fabricators or on-site carpenters can manage these aspects. While this assumption often holds true due to the well-trained carpenters and detailers proficient in engineering works, there are cases where this approach falls short. Consider the unconventional layout in Photo 1 as an example, diverging from the typical rectangular house shape. In this scenario, QLD stands out as an exemplary case. Due to their exposure to strong winds, engineering design drawings in QLD consistently incorporate detailed wall bracing designs.

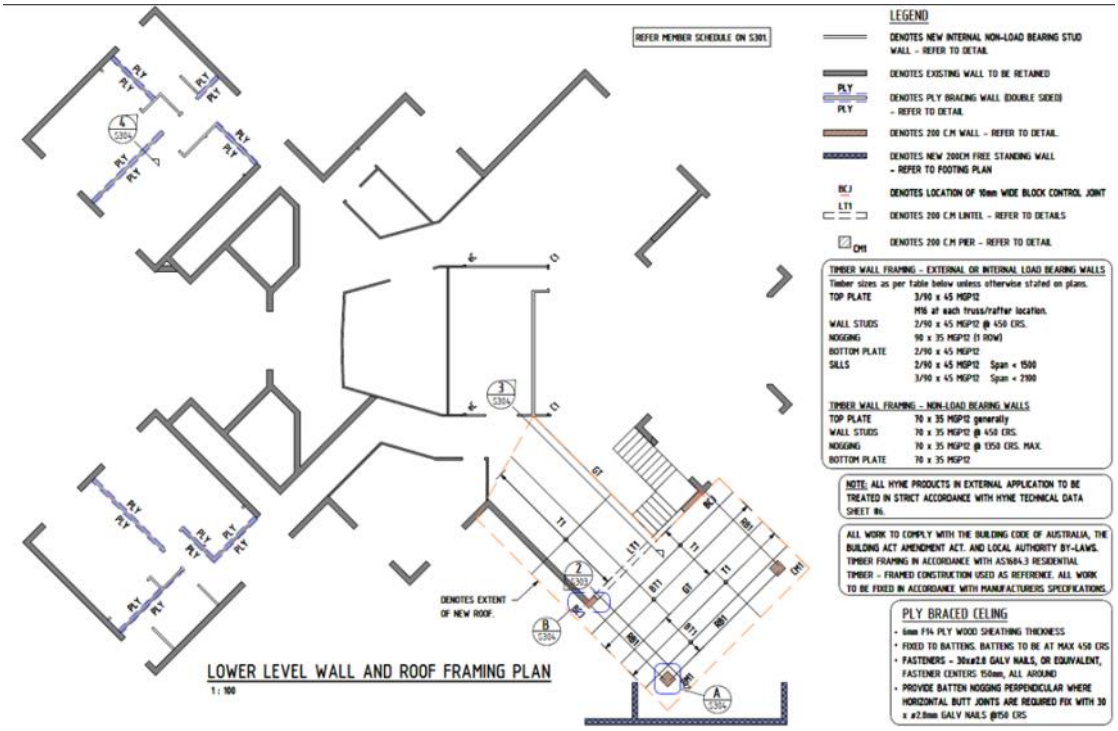

Photo 1 - Special geometry shape of a residential house

Indeed, this topic has been a recurring point of discussion within the industry. The emergence of the National Construction Code (NCC 2022), coupled with the implementation of the AS1684 Residential Timber Framed Construction-2021 version, has prompted a renewed focus on this matter. Notably, the plywood brace capacities have undergone a reduction when contrasted with the earlier versions of AS 1684. For a visual reference, please consult the attached screenshots from the latest AS1684, where figures highlighted in red represent capacities from the previous version. This adjustment in capacities necessitates a closer examination, as it has implications for the industry and increased the difficulties for fabricators to conduct wall bracing designs.

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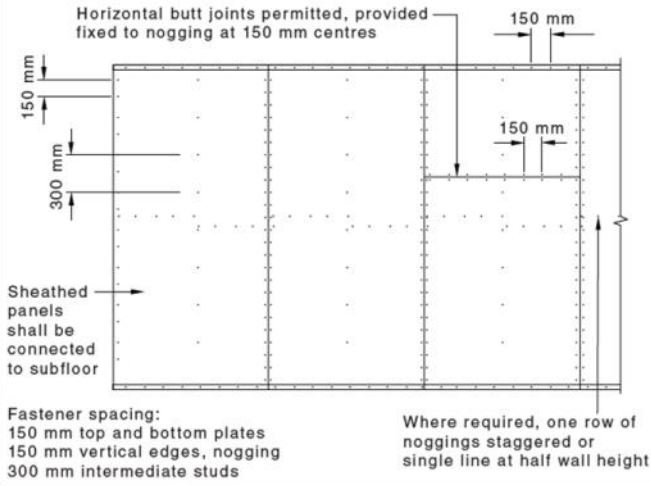
Table 8.18(g) — Structural wall bracing (maximum wall height 2.7 m)

Type of bracing				Bracing capacity, kN/m
(g) *Plywood* — Plywood shall be nailed to the frame using 30 mm × 2.8 mm ⌀ galvanized flat-head nails or equivalent. Minimum bracing panel length shall be 900 mm.	Minimum plywood thickness, mm			
	Stress grade	Stud spacing, mm		
		450	600	
	No nogging (except horizontal butt joints)			
	F8	7	9	
	F11	4.5	7	
	F14	4	6	
	F27	3	4.5	
	One row of nogging			3.0
	F8	7	7	3.4
	F11	4.5	4.5	
	F14	4	4	
	F27	3	3	



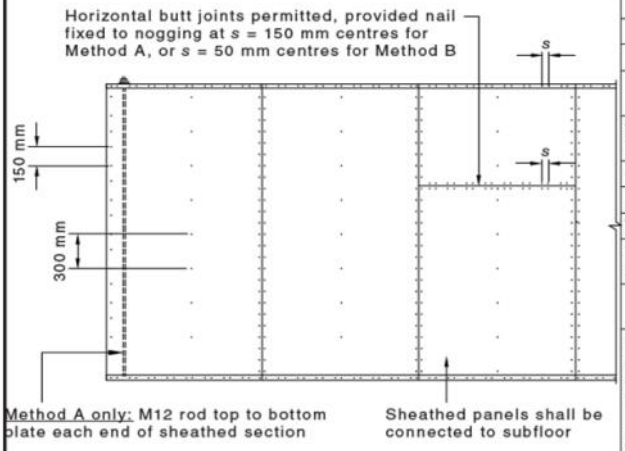
NOTE 1 For plywood fixed to both sides of the wall, see Clauses 8.3.6.5 and 8.3.6.10.

NOTE 2 No other rods or straps are needed between the top or bottom plate.

NOTE 3 Fix bottom plate to floor frame or slab with nominal fixing only, see Table 9.4 except that for double sided walls as per Table 8.18(h) Method A.

Detail g of plywood fixing with capacities from 3.4KN/m reduce to 3.0KN/m

Type of bracing			Bracing capacity, kN/m
(h) *Plywood* — Plywood shall be nailed to frame using 30 mm × 2.8 mm ⌀ galvanized flat head nails or equivalent. For Method A only the minimum bracing panel length shall be 600 mm. For Method A, M12 rods shall be used at each end of sheathed section top plate to bottom plate/floor frame, not greater than 150 mm from end. Method B has no rods but sheathing shall be nailed to top and bottom plates and any horizontal joints at 50 mm centres.	Minimum plywood thickness, mm		
	Stress grade	Stud spacing, mm	
		450	600
	F8	7	9
	F11	6	7
	F14	4	6
	F27	4	4.5
	Fastener spacing (s), mm		
	Top and bottom plate:		Method A 5.6
	— Method A	150	Method B 5.2
	— Method B	50	
	Vertical edges	150	6.4 and 6.0
	Intermediate studs	300	
	Fixing of bottom plate to floor frame or slab		
	Method A: M12 rods as shown plus a 13 kN capacity connection at max. 1 200 mm centres		
	Method B: A 13 kN capacity connection at each end and intermediately at max. 1 200 mm centres		



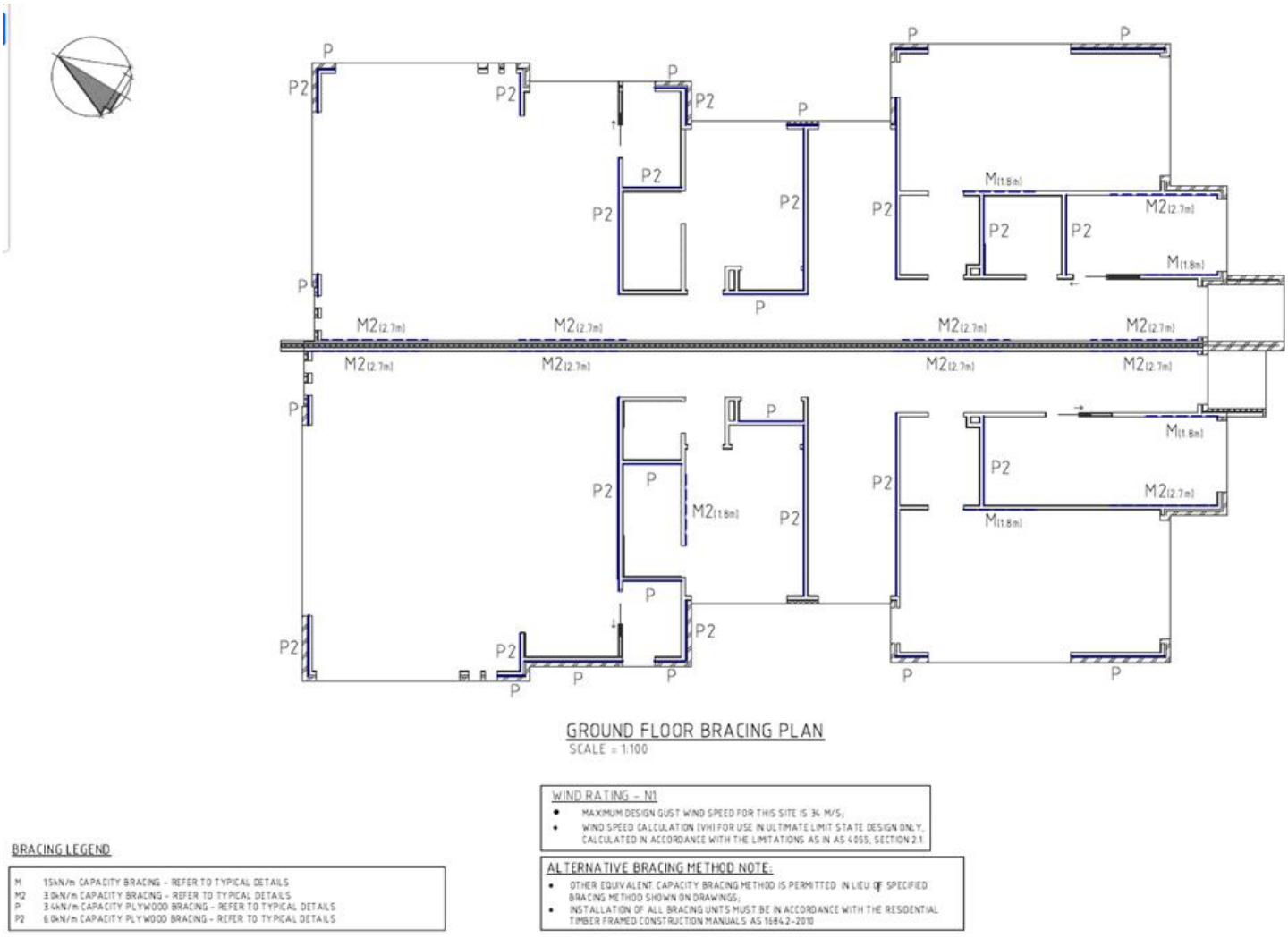
NOTE For plywood fixed to both sides of the wall, see Clauses 8.3.6.5 and 8.3.6.10.

Detail h of plywood fixing with capacities from 6.4KN/m method A, 6.0KN/m method B reduce to 5.6KN/m and 6.0KN/m respectively

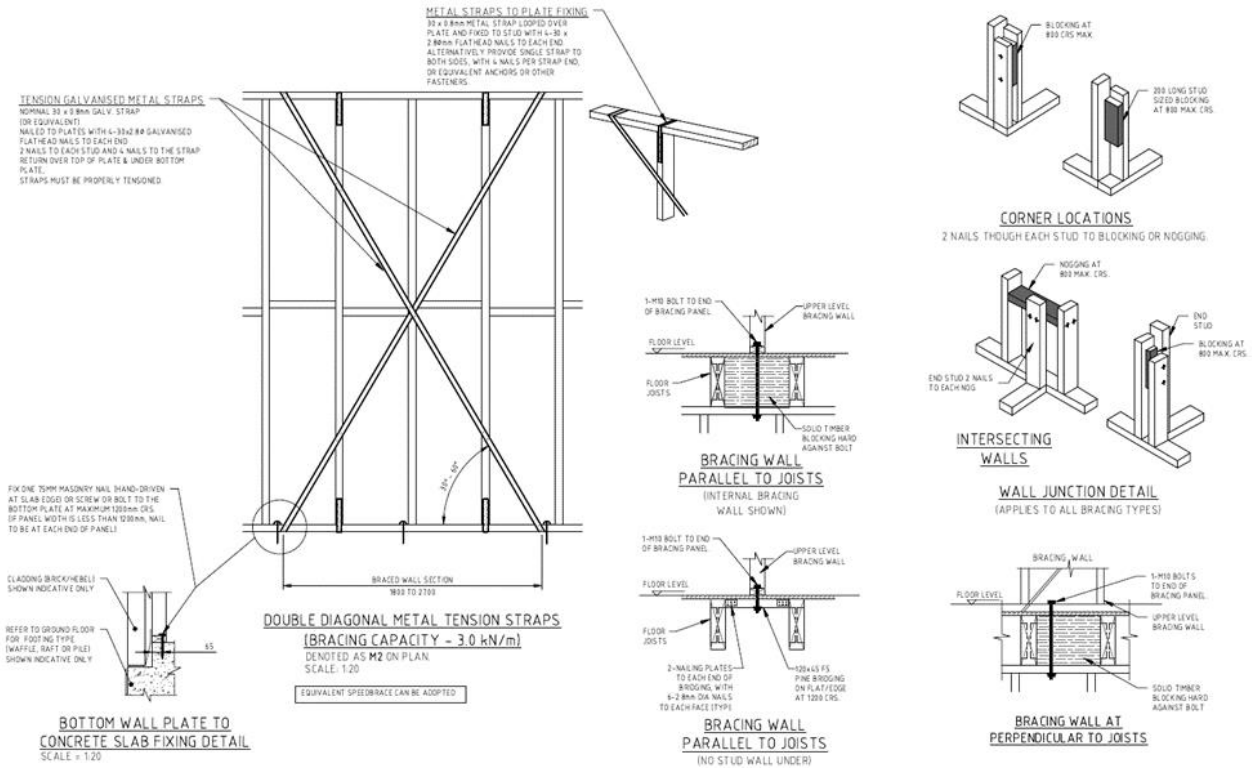
So, what is wall bracing?

Wall bracing refers to the structural elements or systems incorporated into a building's design to provide lateral support and resist horizontal forces such as wind loads or seismic forces. These forces can cause a building to sway or deform horizontally, and wall bracing helps to counteract these movements, ensuring the stability and integrity of the structure. The primary purpose of wall bracing is to prevent excessive lateral deflection and maintain the structural performance and safety of the building.

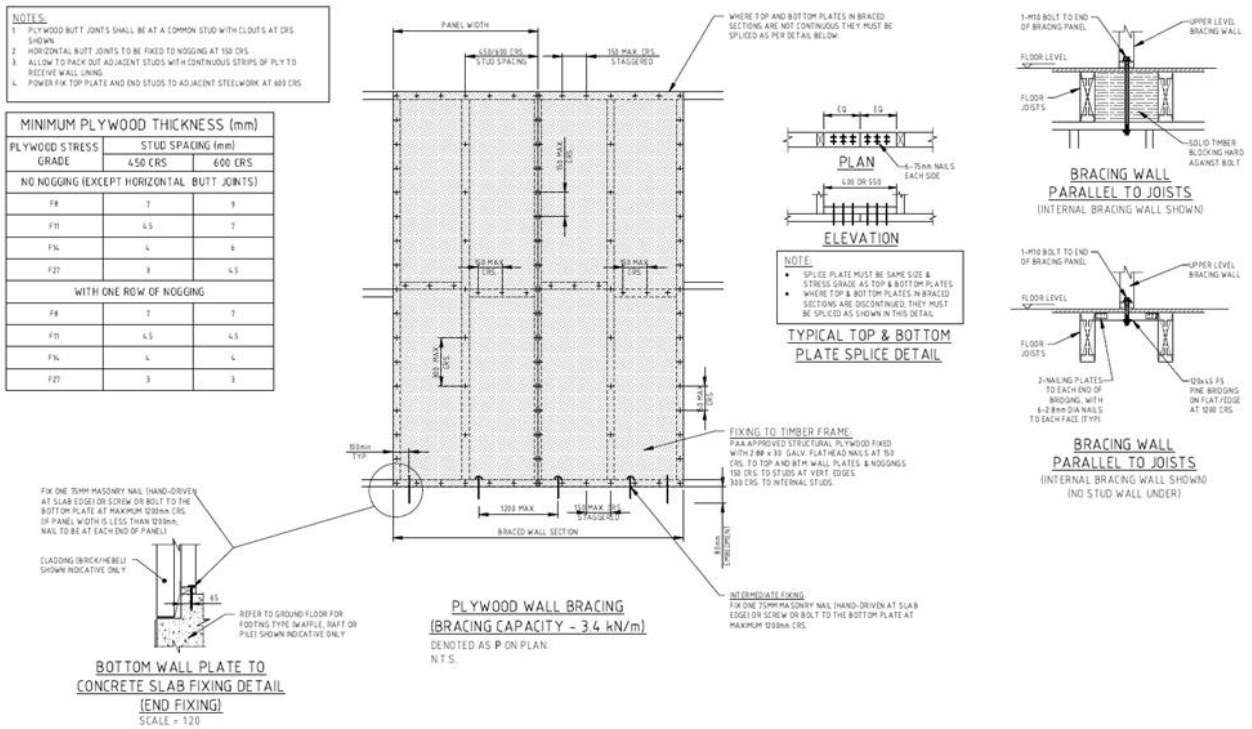
There are various types of wall bracing systems, and the specific choice depends on factors such as building design, local building codes, and the potential risks from environmental forces. The specific design and placement of wall bracing unit depend on the building's characteristics, such as height, shape, wind speed, materials used. Engineers consider these factors to ensure that the building can withstand lateral forces and meet safety standards. A well-crafted structural design drawing should cover all aspects of wall bracing, including the layout, design wind speed, legend of bracing systems, overall bracing values, and connection details for each method. Refer to the example right for a clear illustration.



Bracing layout with the wind speed and bracing legend



Connection detail of strap bracing



Connection detail of plywood bracing

The inclusion of wall bracing design in the overall structural design and its explicit listing in state regulations is a sensible and crucial recommendation. Ensuring that wall bracing design is an integral part of the structural planning process contributes significantly to the safety and stability of buildings. This practice not only addresses potential oversights but also provides a standardized and comprehensive approach to structural engineering.

By incorporating wall bracing design directly into the structural planning phase, it becomes a well-considered component rather than an assumed or neglected aspect. This proactive approach aids in avoiding potential issues during construction and helps guarantee compliance with safety standards.

Additionally, listing wall bracing design requirements in state regulations provides clarity and consistency across the construction industry. It sets a clear standard that architects, engineers, and builders can adhere to, promoting uniformity in design practices. This, in turn, enhances building safety and resilience, aligning with broader objectives of constructing structures that can withstand various environmental forces.

Finally, there is an expectation that FTMA and other organizations in this industry could assist and have a meaningful impact on this matter.

PS. Our esteemed Business Development Manager, Mr. Danny Fleetwood, distinguished by a lengthy and varied service record, demonstrates an unwavering commitment to seizing opportunities to redress such exigencies.

This FTMA Tech Talk was written by Siu Kong Fox, NSW State Engineer of our Principal Partner, Multinail.

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