

(The Code clause and table references given below apply to Part 2 and Part 3 unless specifically noted)

Background

Figure 1.1 and Clause 1.6.6 in AS 1684 Parts 2 and 3 require a maximum external wall height (floor to ceiling) of 3000 mm. The span table supplements to the code, on the other hand, provide stud sizes for heights up to 4800 mm where permitted for the relevant size and grade of stud.

The overriding 3000 mm height limitation was included in the Code to ensure that other design assumptions and requirements inherent in the Code would not be compromised. These included the basis for determination of the racking and overturning forces and the resistance of nominal connections and bracing materials including uplift at ends of bracing walls and the magnitude of shear forces.

It was recognised that if the Code could be extended to cater for wall heights up to 3600 mm (the old 12 ft ceilings), that this would increase its value particularly with respect to renovations and extensions to older housing stock.

Sensitivity Checks

Prior to determining the "rules" that would permit the Code to be applied to 3600 mm high walls, a sensitivity check was carried out to determine the effect these higher walls would have on the remainder of the code.

The parameters that were investigated included the following:-

- **Clause 8.3.4** Total racking force is a function of area of elevation and racking pressures (the maximum wall height assumed to generate the pressures given in Tables 8.1 to 8.5 was 2700 mm even though it was permitted to be used for walls up to 3000 mm high). The pressures in Tables 8.1 to 8.5 are a function of the building geometry such as height to width ratio.

It was found that increasing the assumed external wall heights from 2700 mm to 3600 mm increased a significant percentage of the pressures on the projected areas of elevation.

- **Clause 8.3.6.4** - Wall capacity and height modification. An increase from 4200 mm to 4800 mm was considered appropriate as the span table output extends to this height to cater for internal walls in houses with cathedral ceilings.

Note: The modified (reduced) bracing capacity (kN/m) should be used in conjunction with Table 8.23 (Table 8.24 in Part 3) when determining the uplift force at the end of bracing walls.

- **Clause 8.3.6.10** Fixing of bottom of bracing walls requires consideration of the uplift at ends of bracing walls which in turn is a function of wall height. Table 8.23 (Table 8.24 in Part 3) therefore requires extension to cater for walls up to 4800 mm high.

Note: This extension was also required irrespective of the information in this guide note for walls to 3600 mm.

- **Clause 9.6.4** The net wind uplift pressures in Table 9.5 and the uplift forces in Tables 9.6 to 9.11 (Tables 9.6 to 9.10 in Part 3) may be influenced by the overturning forces on the building (see note to Table 9.5). The overturning forces are caused by a combination of both direct uplift and the lateral forces on the building. The taller the building, then the higher the overturning forces will be.

An investigation of the overturning forces indicated that the equivalent net uplift pressures were significantly higher for taller buildings (3600 mm high external walls).

- **Clause 9.7 and Table 9.26** Shear Forces. No change is required to this clause as the method for calculating the shear force requires the force obtained from Table 9.26 to be multiplied by the projected height of the building which will automatically take into account greater wall heights.
- **Clause 9.7.6 and Table 9.29** Shear forces on external non-load-bearing walls. Additional notes to Table 9.29 are required to cater for external wall heights of 3300 mm and 3600 mm.
- **Appendix G** The bracing force values given in the tables in this Appendix are only applicable to wall heights of 2700mm. It is not appropriate to apply a simple % increase to cater for wall heights from 3000 mm to 3600 mm, therefore this Appendix should not be used for walls higher than 3000mm.

Recommended Procedure for Wall Heights 3000 mm to 3600 mm

1. Member Sizes

Single or Upper Storey Construction

The size of studs, plates and lintels in external load-bearing walls can be determined directly from the relevant span tables in the supplements to AS 1684 Part 2 and Part 3.

Lower Storey of Two Storey Construction

The span tables in the supplements to AS 1684 Part 2 and Part 3 only extend to a maximum wall height of 3000 mm. Stud sizes for wall heights greater than 3000 mm will therefore need to be specifically engineered. This can be easily achieved using published computer software such as "Timber Solutions".

2. Racking Force

The total racking force shall be determined from **Clause 8.3.4** but for external wall heights above 3000 mm up to 3600 mm, the lateral pressures determined from **Tables 8.2 to 8.5** for roof pitches 5° to 20° shall be increased by 10%.

Note:- Pressures for other roof pitches or for vertical surface elevations (Table 8.1) do not require to be increased.

Determine the capacity of bracing walls greater than 2700 mm high from **Table 8.19**. For 4800 mm high walls, the bracing wall capacity/height multiplier is 0.56.

3. Fixing of Bottom of Bracing Walls

Include the following additional lines in **Table 8.23 of Part 2** and **Table 8.24 of Part 3**:-

Wall Height (mm)	Uplift force at ends of bracing walls (kN)												
	For modified bracing wall capacity rated at (kN/m)												
	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	8.0
3300	1.7	3.3	5.0	6.6	8.3	9.9	12	13	15	17	18	20	26
3600	1.8	3.6	5.4	7.2	9.0	11	13	14	16	18	20	22	29
3900	2.0	3.9	5.9	7.8	9.8	12	14	16	18	20	21	23	31
4200	2.1	4.2	6.3	8.4	11	13	15	17	19	21	23	25	34
4800	2.4	4.8	7.2	9.6	12	14	17	19	23	24	26	29	38

4. Wind Uplift Forces

In **Clause 9.6.4**, the wind uplift forces calculated by multiplying the net uplift pressure by the area of roof contributing to tie-down, shall be determined from **Table 9.5** using the following net uplift pressures for the tie-down positions described:-

Part 2 Non-cyclonic

Connection/tie-down position	Net uplift pressure (kPa)							
	Wind classification							
	N1		N2		N3		N4	
	Sheet Roof	Tile roof	Sheet roof	Tile roof	Sheet roof	Tile roof	Sheet roof	Tile roof
Single or upper storey floor frame to supports	-	-	0.25	-	1.2	0.8	2.4	2.0
Lower storey wall frame to floor Frame or slab	-	-	0.25	-	1.2	0.8	2.4	2.0
Lower storey floor frame to supports	-	-	-	-	-	-	1.4	1.0

Part 3 Cyclonic

Connection/tie-down position	Net uplift pressure (kPa)					
	Wind classification					
	C1		C2		C3	
	Sheet roof	Tile roof	Sheet roof	Tile roof	Sheet roof	Tile roof
Single or upper storey floor frame to supports	1.5	1.3	2.93	2.7	4.3	4.3
Lower storey wall frame to floor frame or slab	1.5	1.3	2.93	2.7	4.3	4.3
Lower storey floor frame to supports	0.6	0.5	2.0	1.8	4.3	4.3

Note:- The uplift forces given in Tables 9.6 to 9.10 shall not be used for determination of uplift forces however, they could be recalculated using the net uplift pressures given above.

5. Shear Forces on External Non-load-bearing Walls

Add the following NOTES to Table 9.29 to cater for 3300 mm and 3600 mm high walls:-

NOTES:

For 3300 mm high external walls, multiply the above values by 1.2.

for 3600 mm high external walls, multiply the above values by 1.3.

6. Appendix G

Appendix G shall **not** be used to determine racking forces for wall heights from 3000 to 3600 mm.



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