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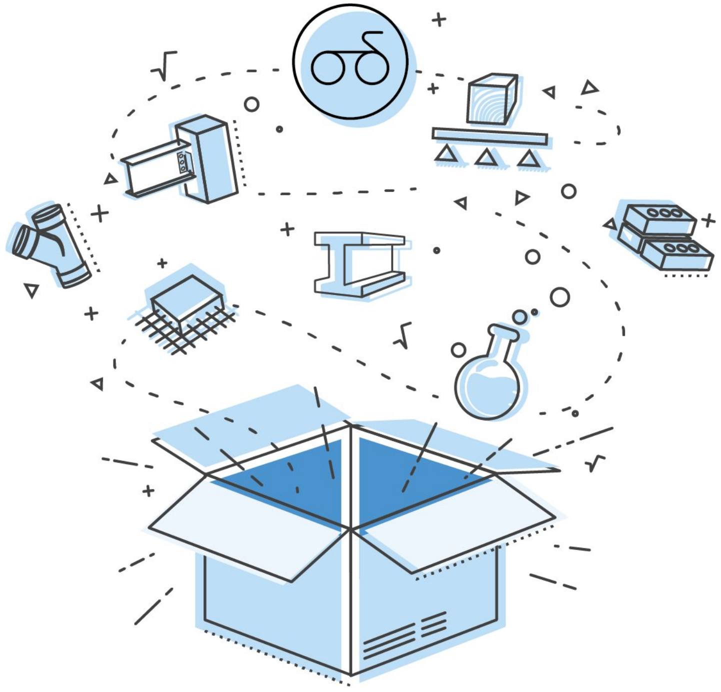
AS 4055:2021
AS 1684.2:2021

Wind Assessment for Residential Projects (Part 2)



Qiming Liu
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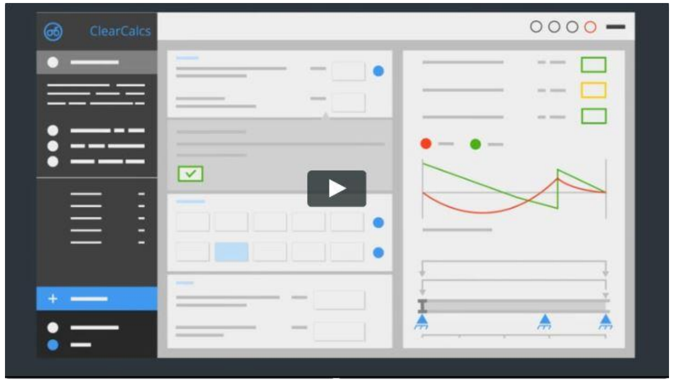
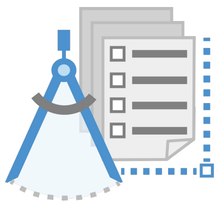


Intro Video Hyperlink



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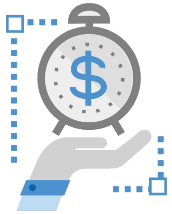

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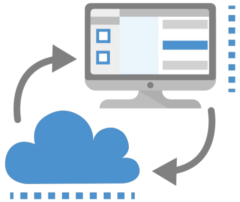

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Meet the Presenters

- **Qiming Liu, Structural Engineer**
  - PhD in Structural Engineering
    - PhD from Swinburne University of Technology
    - MSc and BEng in Civil Engineering
  - 4 years of academic research experience in:
    - Topology Optimisation
  - 1 year now with ClearCalcs
    - Content Development
    - Customer Success

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- **Type your questions in the Chat tab on your Zoom control panel and click Send**
  - Please send your questions to “everyone”
  - We will address all questions in the second half of the webinar during the 15-minute Q&A session
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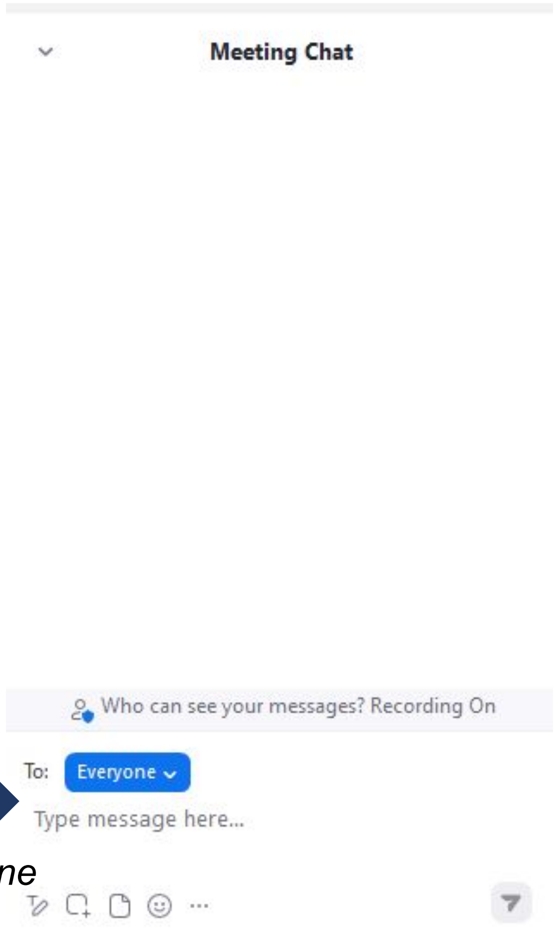

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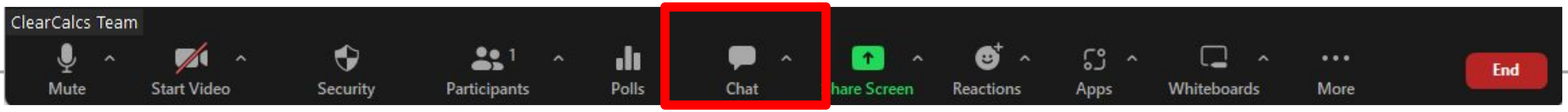


Agenda – Today's Goals

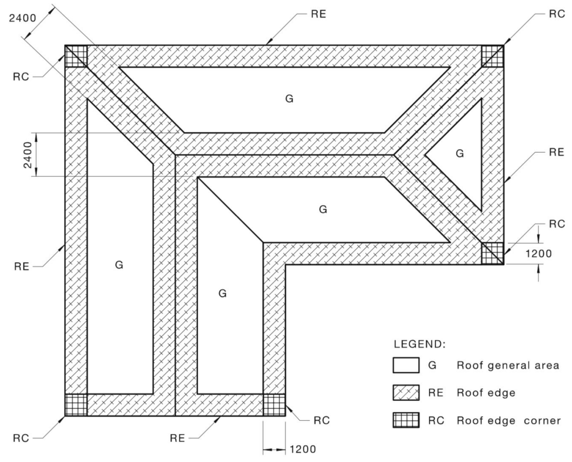
- **Overview of AS 4055 and AS1684.2**
    - Scope and limitation
- **Wind Bracing for Residential Houses**
    - Definitions and design procedure
    - Wind classification and racking force
    - Design bracing systems
- **Worked Examples**
    - Using ClearCalcs Wind Bracing Calculator

Overview of AS 4055 and AS 1684.2

- AS 4055 vs AS1170.2
- AS 1684.2

AS 4055:2021

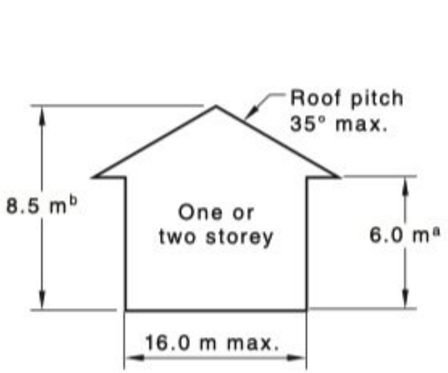
- AS 4055 “Wind Loads for Housing”, a simplified version of AS 1170.2.
- Scope: NCC Class 1 and 10a buildings with geometric limits.
- Simplifying assumptions and results in simple table lookup.
- Simplified coefficients & factors.
- Total Uplift/Racking – independent section with its own table lookups.



NOTE: Indicated plan width varies to suit roof pitch.

DIMENSIONS IN MILLIMETRES

FIGURE 3.1 PRESSURE ZONES ON HOUSING—ROOFS (PLAN VIEW)



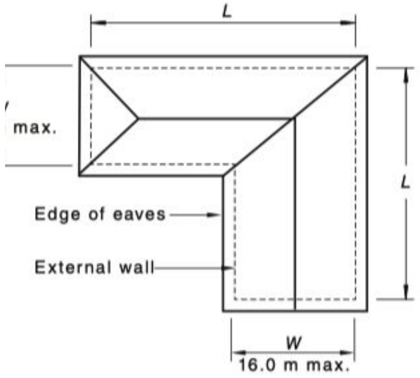
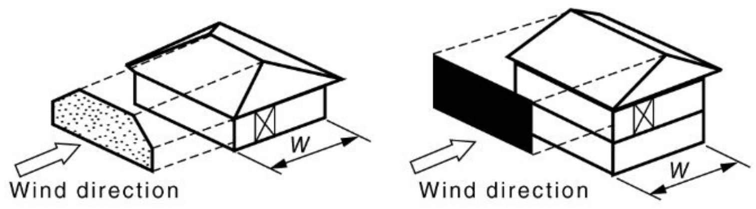


Table
Site wind classification from w

Wind region	TC	Topogra T0 FS	T0 PS	T0 NS	T1 FS	T1 PS	T1 NS
A	3	N1	N1	N1	N1	N2	N2
	2.5	N1	N1	N2	N1	N2	N2
	2	N1	N2	N2	N2	N2	N3
	1	N2	N2	N3	N2	N3	N3
B	3	N2	N2	N3	N2	N3	N3
	2.5	N2	N3	N3	N3	N3	N3
	2	N2	N3	N3	N3	N3	N4

Table 5.2(B)
Hip roofs and side wind on gable roofs — Pressure (kPa) on area of elevation — Single storey or upper floor of two storeys

Single storey or upper floor of two storeys — 2.4 m storey, 0.3 m floor								
Width (m)	Roof pitch (degrees) 0	5	10	15	20	25	30	35

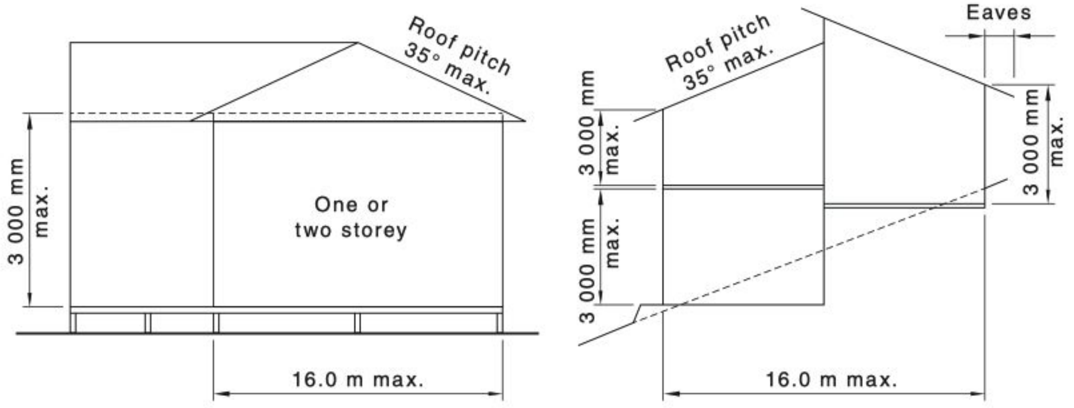


N1: Wind on side								
4	0.58	0.51	0.46	0.43	0.47	0.53	0.53	0.54
5	0.58	0.49	0.44	0.42	0.47	0.53	0.52	0.54
6	0.58	0.48	0.41	0.42	0.48	0.53	0.52	0.55
7	0.58	0.46	0.39	0.42	0.48	0.53	0.52	0.55
8	0.58	0.45	0.37	0.42	0.48	0.53	0.52	0.55

AS 4055:2021, fig 1.2, table 2.2, fig 3.1

AS 1684.2:2021

- AS 1684.1, Design Criteria (AS 1720.3 – *Timber structures design criteria for timber-framed residential buildings*)
- AS 1684.2, Prescriptive Non-cyclonic areas
- AS 1684.3, Prescriptive Cyclonic areas
- AS 1684.4, Simplified part 2
- Class 1 or 10a buildings, Single or two-storey construction.
- Building shapes: shall be essentially rectangular, square, L-shape or a combination of rectangular elements including splayed-end and boomerang-shaped buildings.
- Geometric limits:
    - Max width: 16 m
    - Max roof pitch: 35 deg
    - Max wall height: 3.0 m (** 3.6m)
- Wind Classification applicable to AS 4055
- Spacing of bracing walls:
    - 9.0 m max (ceiling diaphragm)
    - 14.0 m max (floor diaphragm)



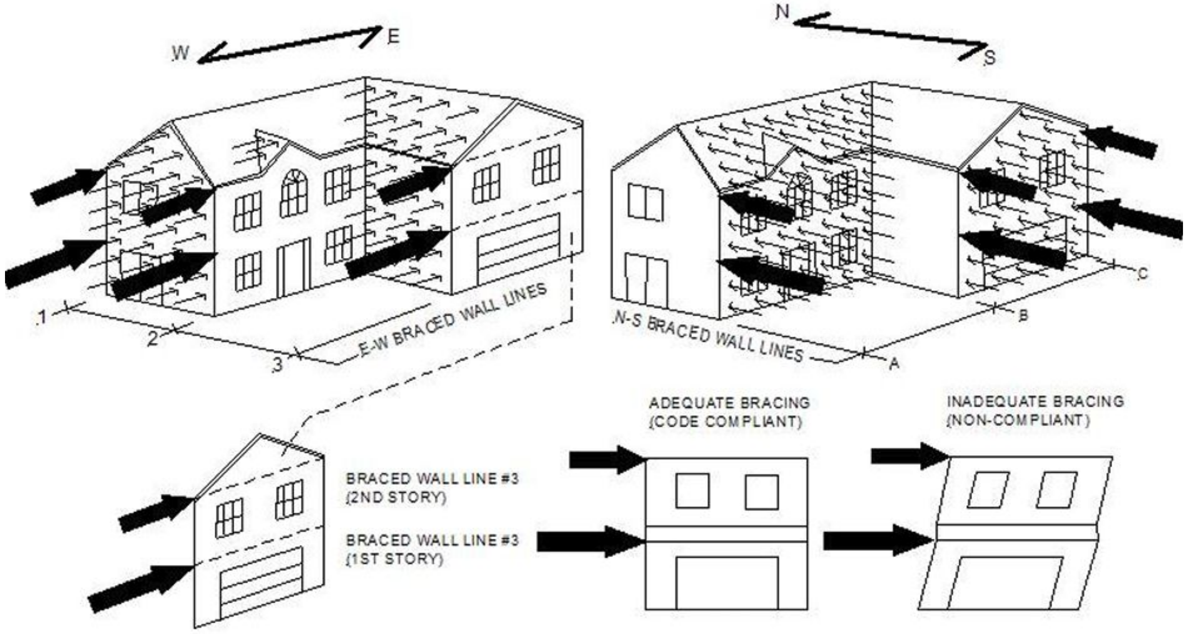
(a) Sections

Wind Bracing of Residential Houses

Definitions and design procedure
Wind classification and racking force
Design bracing systems

Bracing in AS 1684.2

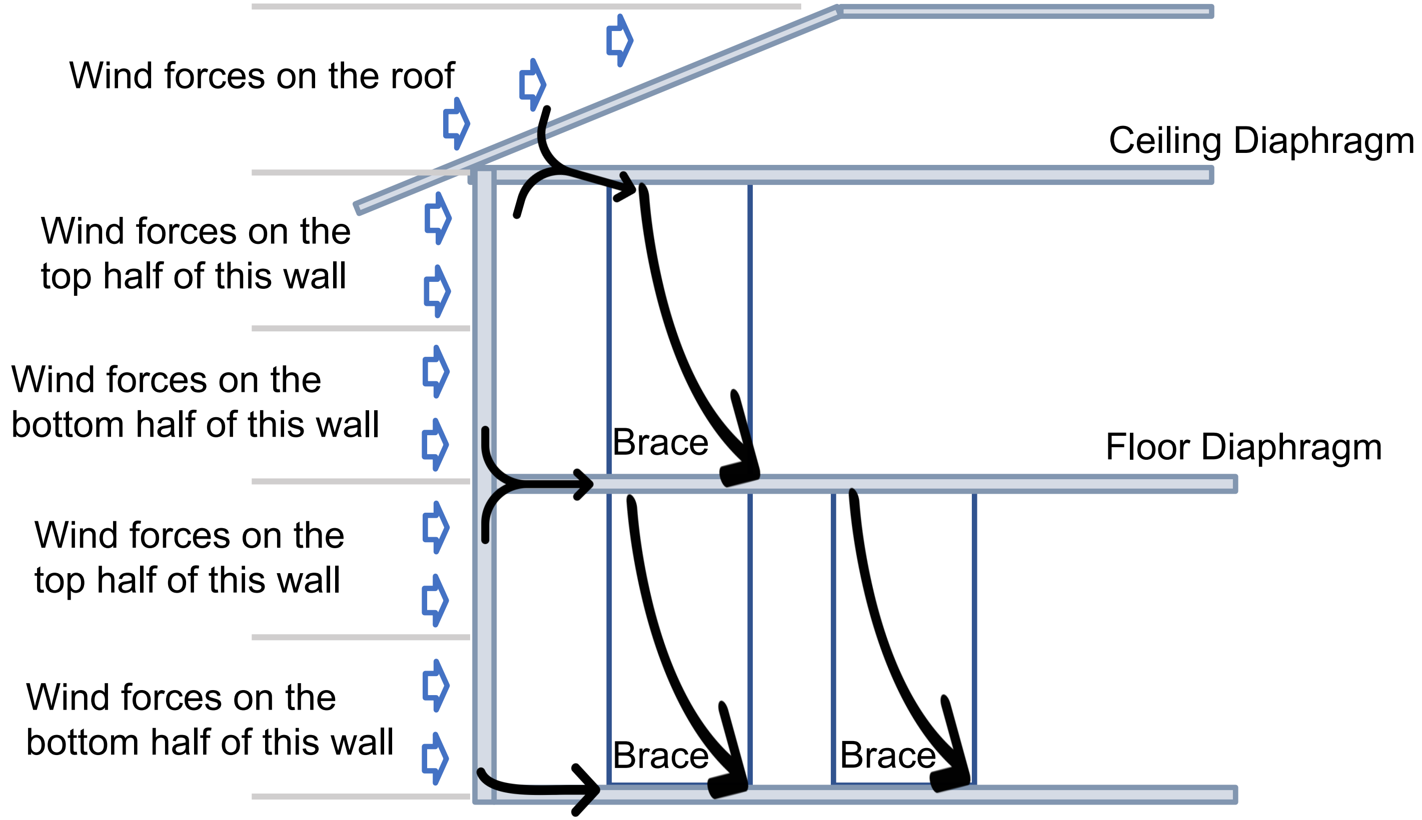
- Cl 6.1.3: *"**Temporary and permanent bracing** shall be provided to stud walls to resist horizontal forces applied to the building."*
- Cl 8.1: *"**Permanent bracing** shall be provided to enable the roof, wall and floor framework to resist horizontal forces applied to the building (racking forces). Appropriate **connection** shall also be provided to transfer these forces through the framework and subfloor structure to the building's foundation."*
- *Temporary bracing shall be equivalent to at least 60% of the permanent bracing required.*
- *Temporary bracing may from part of the installed permanent bracing.*



IRC Wall Bracing, fig 1

Bracing in AS 1684.2

- **Load Path**



Bracing in AS 1684.2

❖ Cl 8.3.1 – Wall and Subfloor Bracing

(a) Determine wind classification – Cl 1,5, or (AS 4055 or AS 1170.2 applicable)

(b) Determine the wind pressure – Cl 8.3.2, or (AS 4055 or AS 1170.2 applicable)

(c) Determine the area of elevation – Cl 8.3.3, Fig 8.2(A-C), or Cl 5.2 of AS 4055

(d) Calculate the racking force – Cl 8.3.4,

(e) Design bracing systems for:

(i) subfloors – Cl 8.3.5

(ii) walls – Cl 8.3.6

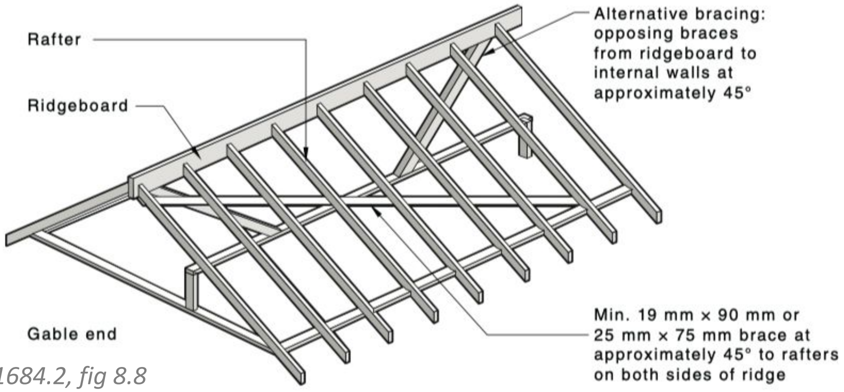
(f) Check even distribution and spacing – Cl 8.3.6.6, 8.3.6.7, Table 8.20 and Table 8.21

(g) Check connection of bracing to roof/ceiling and floors – Cl 8.3.6.9 and 8.3.6.10

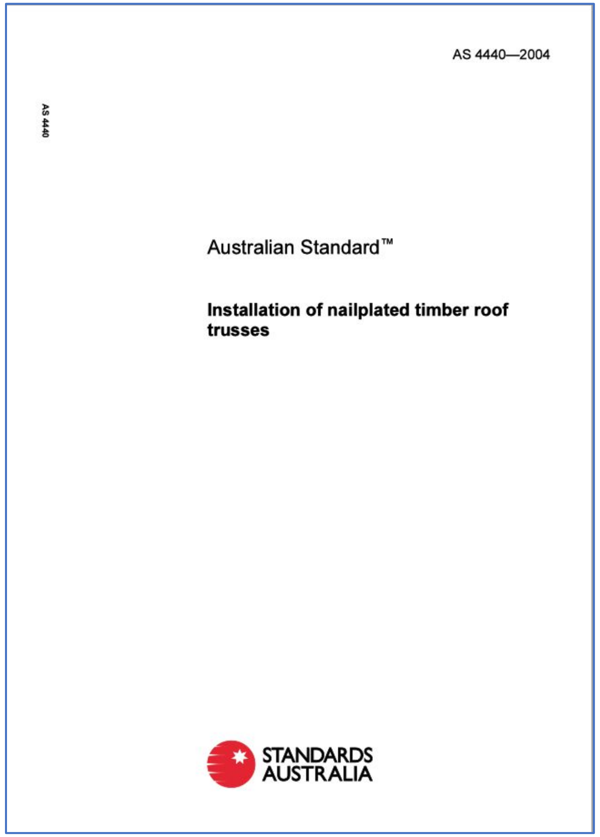
Bracing in AS 1684.2

❖ Cl 8.3.7 – Roof Bracing

- Cl 8.3.7.1 – Pitched Roofs and Cl 8.3.7.2 – Gable Roofs:
- Provides specifications and basic requirements only
- Diagonal metal bracing/sheet bracings to be designed and installed in accordance with engineering principles.
- Cl 8.3.7.3 – Trussed Roofs
- In accordance with AS 4440 – installation of nail plated timber roof trusses



AS 1684.2, fig 8.8



AS 4440—2004

AS 4440

Australian Standard™

Installation of nailplated timber roof trusses

STANDARDS AUSTRALIA

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Determine Wind Classification

❖ Cl 1.4.2, AS 1684.2:2021

1.4.2 Wind classification

For wind loads, the simplified wind classifications for non-cyclonic areas N1 to N4, as described by AS 4055, shall be used with the corresponding maximum design gust wind speeds given in Table 1.1.

Either AS 4055 or AS/NZS 1170.2 shall be used to determine the wind classification necessary for the use of this Standard.

The wind classifications covered by this Standard shall be determined as follows:

(a) Where the wind classification is determined from AS 4055, the maximum building height limitation of 8.5 m, as given in AS 4055, shall apply to this Standard. The maximum building width is specified in Clause 1.4.5.

(b) Where AS/NZS 1170.2 is used to determine the maximum design gust wind speed, a wind classification shall be adopted in accordance with Table 1.1. The ultimate limit state design gust wind speed determined from AS/NZS 1170.2 shall be not more than 5 % greater than the ultimate limit state wind speed given in Table 1.1 for the corresponding wind classification adopted.

NOTE 1 The determination of the design gust wind speed and wind classification should take into account the building height, terrain category, topographic classification and shielding classification given in AS/NZS 1170.2 or AS 4055.

NOTE 2 Some relevant authorities provide wind classification maps or wind classifications for designated sites within their jurisdiction.

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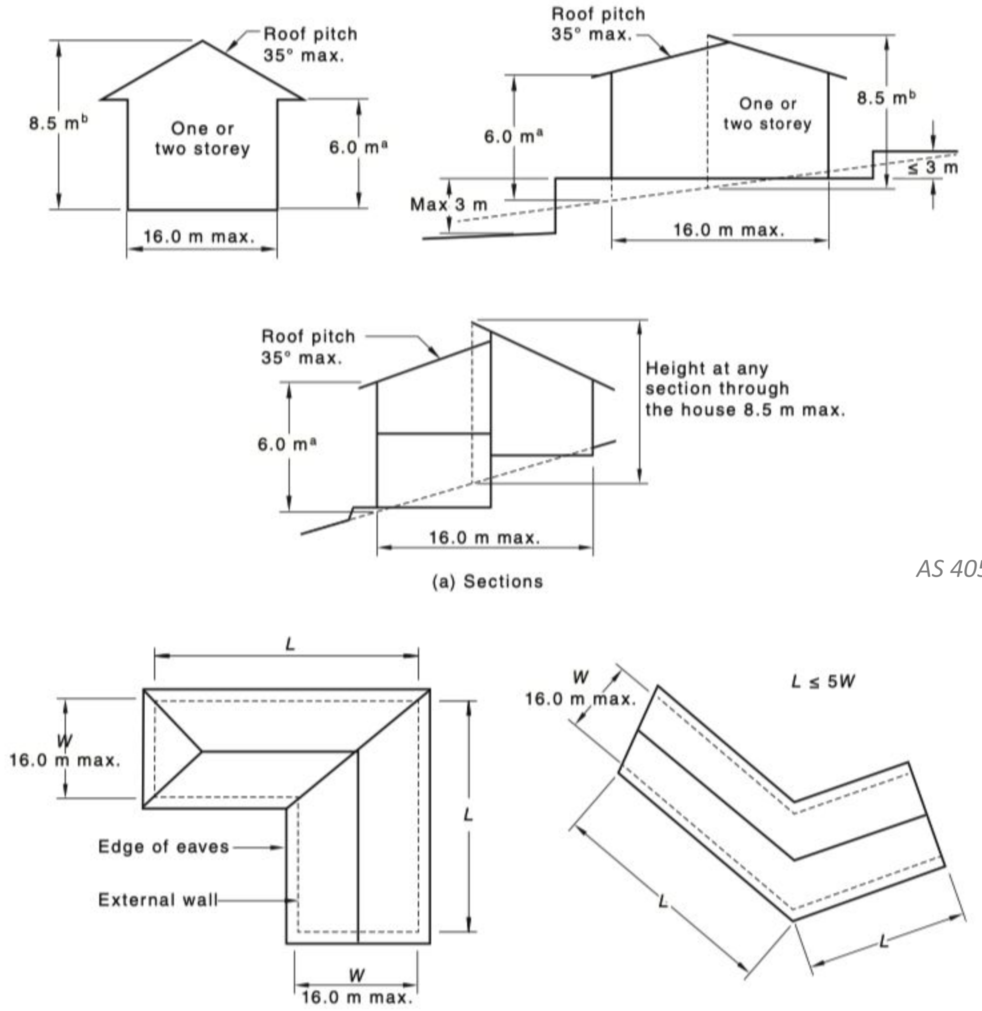
Determine Wind Classification

❖ AS 4055:2021

- *Geometric Limitations:*
  - $W \leq 16m$
  - $L \leq 5W$
  - $H \leq 8.5\ m$
  - $h \leq 6m$
  - $\alpha \leq 35°$



AS 4055, fig 1.2

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Determine Wind Classification

- **AS 4055:2021**
  - **Design gust wind speed and wind classification assessment**
  - **Cl 2.2 - Wind Region (A, B, C & D)**
  - **Cl 2.3 - Terrain Category (1, 2, 2.5 & 3)**
  - **Cl 2.4 - Topographic Classification (T0-T5)**
  - **Cl 2.5 - Shielding Classification (FS, PS, NS)**

Table 2.2 — Site wind classification from wind region and site conditions

Wind region	TC	Topographic classification												
		T0	T0	T0	T1	T1	T1	T2	T2	T2	T3	T3	T4	T5
		FS	PS	NS	FS	PS	NS	FS	PS	NS	PS	NS	NS	NS
A	3	N1	N1	N1	N1	N2	N2	N2	N2	N2	N3	N3	N3	N4
	2.5	N1	N1	N2	N1	N2	N2	N2	N3	N3	N3	N3	N4	N4
	2	N1	N2	N2	N2	N2	N3	N2	N3	N3	N3	N3	N4	N4
	1	N2	N2	N3	N2	N3	N3	N3	N3	N3	N4	N4	N4	N5
B	3	N2	N2	N3	N2	N3	N3	N3	N3	N4	N4	N4	N4	N5
	2.5	N2	N3	N3	N3	N3	N3	N3	N4	N4	N4	N4	N5	N5
	2	N2	N3	N3	N3	N3	N4	N3	N4	N4	N4	N5	N5	N6
	1	N3	N3	N4	N3	N4	N4	N4	N4	N5	N5	N5	N6	N6
C	3	C1 (0-50)	C2 (0-10) C1 (10-50)	C2 (0-20) C1 (20-50)	C2 (0-5) C1 (5-50)	C2 (0-30) C1 (30-50)	C2 (0-40) C1 (40-50)	C2 (0-25) C1 (25-50)	C3 (0-5) C2 (5-50)	C3 (0-20) C2 (20-50)	C3 (0-25) C2 (25-50)	C3 (0-30) C2 (30-50)	C4 (0-10) C3 (10-50)	C4 (0-35) C3 (35-50)
	2.5	C1 (0-50)	C2 (0-25) C1 (25-50)	C2 (0-35) C1 (35-50)	C2 (0-20) C1 (20-50)	C2 (0-40) C1 (40-50)	C3 (0-10) C2 (10-50)	C2 (0-35) C1 (35-50)	C3 (0-20) C2 (20-50)	C3 (0-30) C2 (30-50)	C3 (0-35) C2 (35-50)	C4 (0-5) C3 (5-50)	C4 (0-25) C3 (25-50)	NA (0-15) C4 (15-50)
	2	C2 (0-10) C1 (10-50)	C2 (0-35) C1 (35-50)	C2 (0-45) C1 (45-50)	C2 (0-30) C1 (30-50)	C3 (0-10) C2 (10-50)	C3 (0-25) C2 (25-50)	C3 (0-10) C2 (10-50)	C3 (0-30) C2 (30-50)	C3 (0-40) C2 (40-50)	C4 (0-10) C3 (10-50)	C4 (0-20) C3 (20-50)	NA (0-5) C4 (5-50)	NA (0-25) C4 (25-50)
	1	C2 (0-30) C1 (30-50)	C3 (0-10) C2 (10-50)	C3 (0-25) C2 (25-50)	C3 (0-10) C2 (10-50)	C3 (0-30) C2 (30-50)	C4 (0-5) C3 (5-50)	C3 (0-25) C2 (25-50)	C4 (0-10) C3 (10-50)	C4 (0-20) C3 (20-50)	C4 (0-30) C3 (30-50)	NA (0-5) C4 (5-50)	NA (0-25) C4 (25-50)	NA (0-45) C4 (45-50)

AS 4055, table 2.2 - D is on the 2nd part of this table

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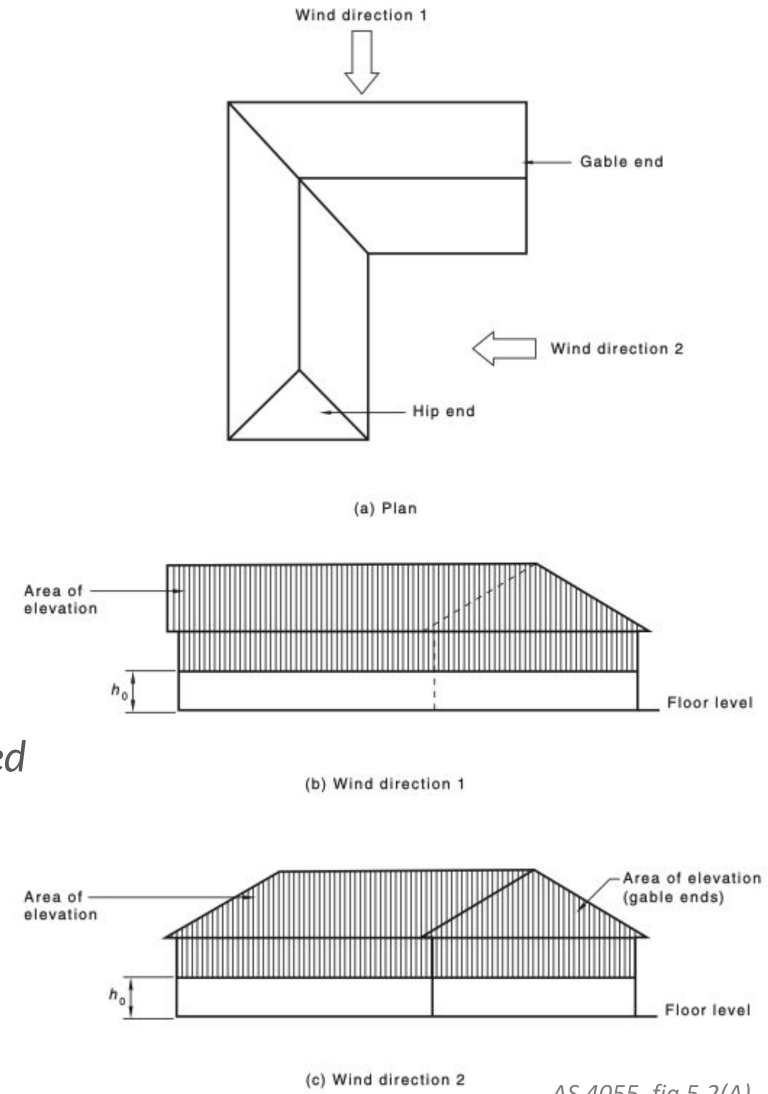
Determine the Racking Force

Racking force

- Cl 5.1 of AS 4055 and Cl 8.3.4 of AS 1684.2
- Total racking force = Area of elevation (m 2) × Lateral wind pressure (kPa).

Area of Elevation

- Cl 5.2 of AS 4055, and Cl 8.3.3 of AS 1684.2
- *Should be calculated for both directions (long & short sides) of the building*
- *"The wind direction used shall be that resulting in the greatest load for the length and width of the building, respectively. As wind can blow from any direction, the elevation used shall be that for the worst direction."*



AS 4055, fig 5.2(A)

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Determine the Racking Force

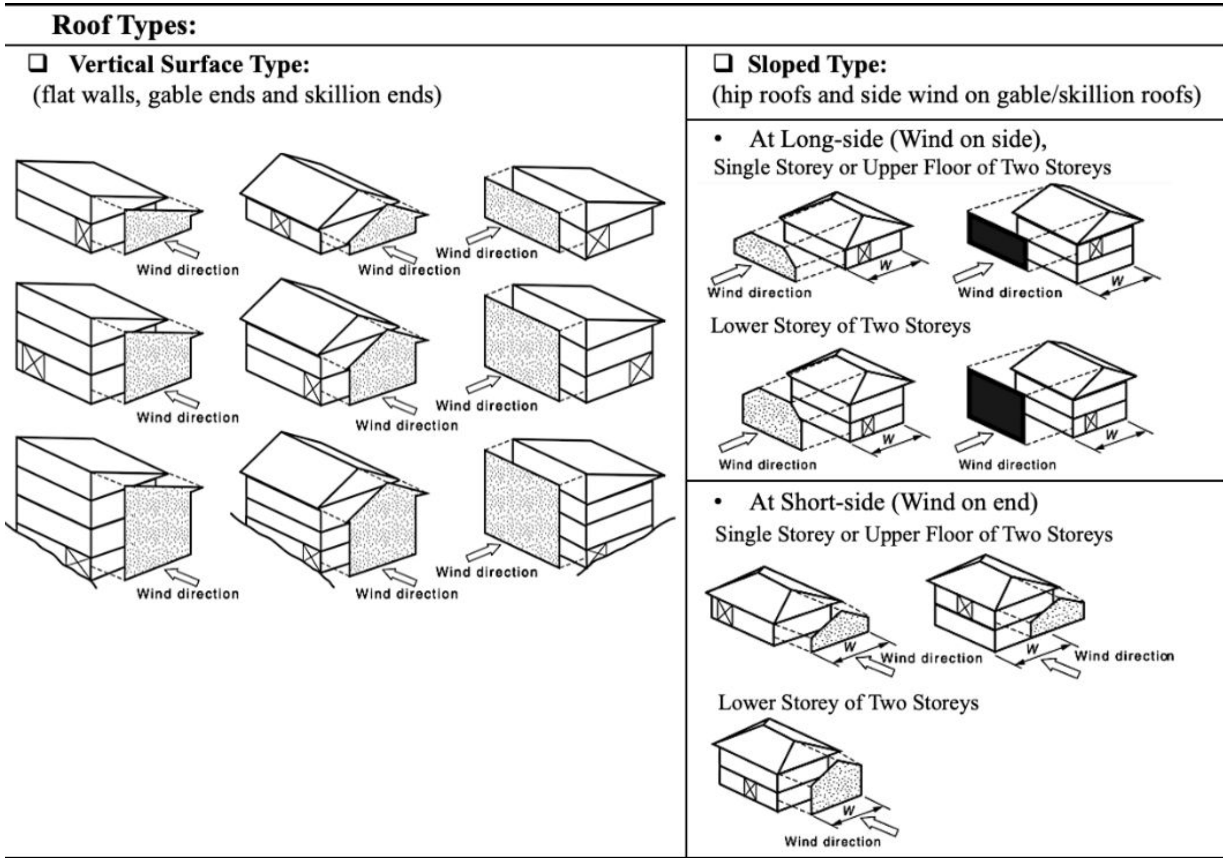
Total racking force = Area of elevation (m 2) × **Lateral wind pressure (kPa).**

❖ Determine the Wind Pressure

- **Surface type:**
  - **Vertical Surfaces**
    - *Table 5.2(A) of AS 4055, Table 8.1 of AS 1684.2*
  - **Sloped Roofs**

(hip roofs or side wind on gable/skillion roofs)

- *Table 5.2 (B-M) and Table 8.2-8.5 of AS 1684.2*



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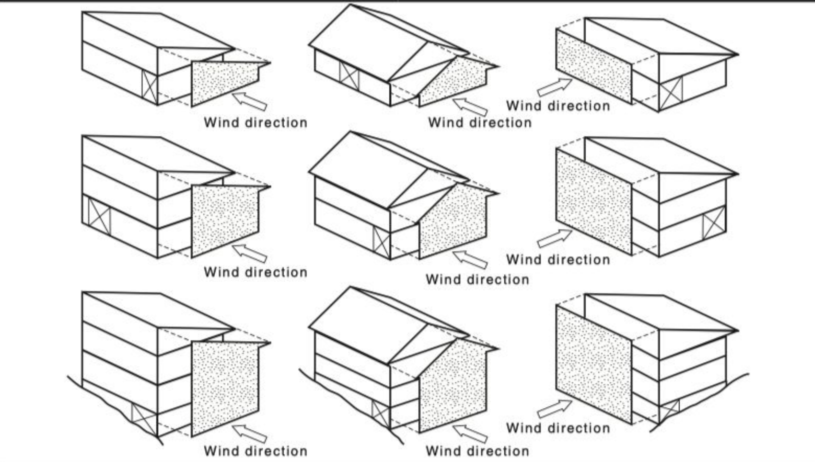
Determine the Racking Force

Total racking force = Area of elevation (m 2) × **Lateral wind pressure (kPa).**

❖ Determine the Wind Pressure

- Wind Class, Roof pitch (α) and Width of the building (W)

Table 5.2(A) — Vertical surfaces (flat walls, gable ends and skillion ends) — Pressure on area of elevation

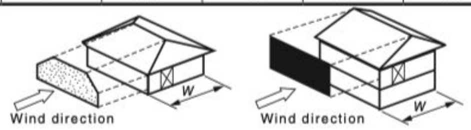


Wind class	Pressure kPa
N1	0.66
N2	0.92
N3	1.44
N4	2.14
N5	3.16
N6	4.26
C1	1.44
C2	2.14
C3	3.16
C4	4.26

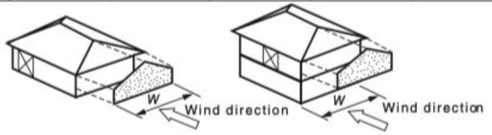
AS 4055, Table 5.2(A)

Table 5.2(B) — Hip roofs and side wind on gable roofs — Pressure (kPa) on area of elevation — Single storey or upper floor of two storeys

Single storey or upper floor of two storeys — 2.4 m storey, 0.3 m floor								
Width (m)	Roof pitch (degrees)							
	0	5	10	15	20	25	30	35



N1: Wind on side								
4	0.58	0.51	0.46	0.43	0.47	0.53	0.53	0.54
5	0.58	0.49	0.44	0.42	0.47	0.53	0.52	0.54
6	0.58	0.48	0.41	0.42	0.48	0.53	0.52	0.55
7	0.58	0.46	0.39	0.42	0.48	0.53	0.52	0.55
8	0.58	0.45	0.37	0.42	0.48	0.53	0.52	0.55
9	0.58	0.44	0.35	0.42	0.49	0.53	0.52	0.55
10	0.58	0.43	0.33	0.41	0.49	0.53	0.52	0.55
11	0.58	0.41	0.32	0.41	0.48	0.53	0.52	0.55
12	0.58	0.40	0.31	0.40	0.48	0.52	0.52	0.55
13	0.58	0.39	0.30	0.39	0.48	0.52	0.51	0.55
14	0.58	0.38	0.29	0.39	0.47	0.52	0.51	0.55
15	0.58	0.38	0.28	0.38	0.47	0.52	0.51	0.55
16	0.58	0.37	0.27	0.38	0.47	0.51	0.51	0.55



N1: Wind on end								
4	0.63	0.59	0.56	0.54	0.55	0.57	0.56	0.57
5	0.63	0.58	0.54	0.52	0.55	0.57	0.56	0.57
6	0.63	0.57	0.52	0.52	0.55	0.56	0.55	0.57
7	0.63	0.56	0.51	0.51	0.55	0.56	0.55	0.57
8	0.63	0.55	0.49	0.51	0.55	0.56	0.55	0.57

AS 4055, Table 5.2(B)

Bracing Systems

❖ Nominal Wall Bracing – Cl 8.3.6.2

- “the racking force is resisted by a combination of “*Structural Wall Bracings" and also “Nominal Wall Bracings”…”*
- *Internal linings of the building (e.g. gyprock, villaboard)*
- *The maximum allowance for nominal bracing is 50% (both direction)*
- *Nominal bracing should be evenly distributed throughou*
- *Minimum length for nominal bracing is 450mm*

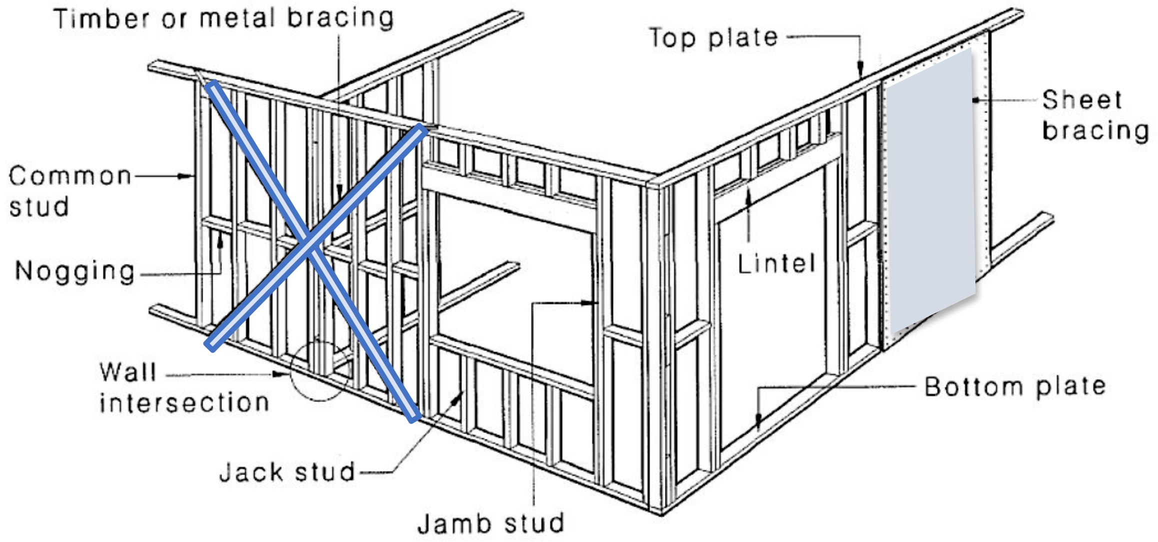
Method	Bracing Capacity (kN/m)
Sheeted one side only	0.45
Sheeted two sides	0.75

AS 1684.2, Table 8.17

❖ Structural Wall Bracing– Cl 8.3.6.3

- *Purpose-fitted bracing*
- *Sheet or cross-timber or steel bracing*
- *14 commonly used bracing types are provided*

in Table 8.18 (type a, b, c, …, n)



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Bracing Systems

❖ Metal or Timber Diagonal Bracings

- Type (a)-(d), Maximum capacity of 3.0 kN/m, Maximum Wall height: 2700mm,
- Wall length: 1800 mm Min. to 2700 mm Max.
- Fixed bottom plate to floor frame or slab with nominal fixing only (Table 9.4)

Type	Description	Material and thickness (mm)	Capacity, (kN/m)	Requirements
(a)	Two diagonally opposed timber or metal angle braces	Timber: 45x19 or 70x19 hardwood, Steel: 18x16x1.2	0.8	
(b)	Metal straps – tensioned		1.5	
(c)	Timber & metal angle braces	Timber: 75x15 F8 or Steel: 20x18x1.2	1.5	Length: 1800 mm min. to 2700 mm max
(d)	Metal straps – tensioned – with stud straps		3.0	

AS 1684.2: 2021, Table 8.18 (a)-(d)

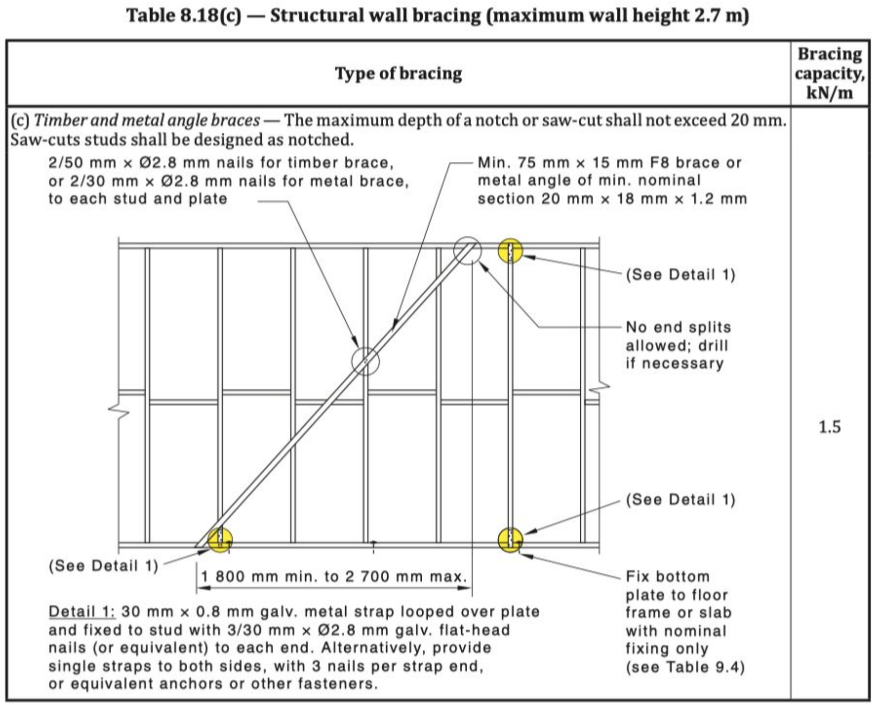


Table 8.18(c) — Structural wall bracing (maximum wall height 2.7 m)

Type of bracing	Bracing capacity, kN/m
(c) *Timber and metal angle braces* — The maximum depth of a notch or saw-cut shall not exceed 20 mm. Saw-cuts studs shall be designed as notched.	1.5

AS 1684.2, Table 8.18(c)

Step (e) Determine bracing systems

Bracing Systems

❖ Plywood Sheet Bracings, type (g)-(k):

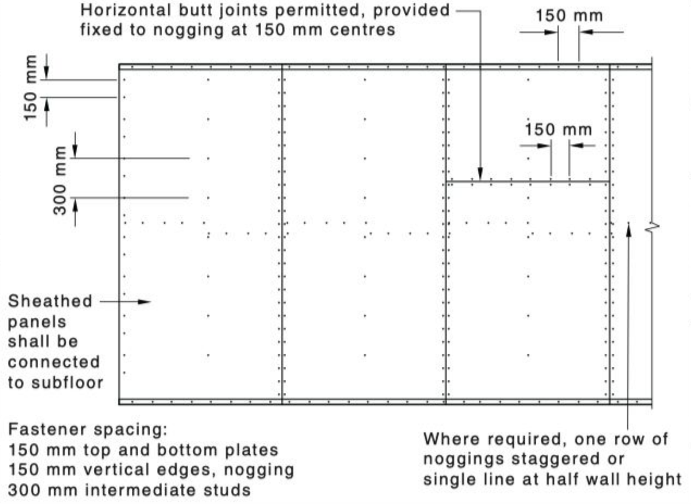
- *Maximum wall height: 2700 mm*
- *Capacities are JD5, which reduced from 2010 version (JD4)*
- *Minimum length of (g)-(i) is 900 mm, except Method A of (h) – 600mm*
- *Detail (g) – half (1.5 kN/m) for unit length 600mm*

Type	Brief Description	Capacity (kN/m)	Requirement Length (mm)
(g)	Plywood, various grade and thicknesses	3.0	900
(h)	Plywood, various grade and thicknesses Method A	5.6	600
	Plywood, various grade and thicknesses Method B	5.2	900
(i)	Plywood, 4.5mm F11	6.6	600
	Plywood, 7 mm F11	7.6	600
(j)	Plywood, F11 (decorative)	1.8	900
(k)	Plywood, F11 (decorative)	4.6	900

AS 1684.2: 2021, Table 8.18 (g)-(k)

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.	3.0



Minimum plywood thickness, mm		
Stress grade	Stud spacing, mm 450	Stud spacing, mm 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		
F8	7	7
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.

AS 1684.2, Table 8.18(g)

Bracing Systems

❖ Hardboard Sheet Bracings

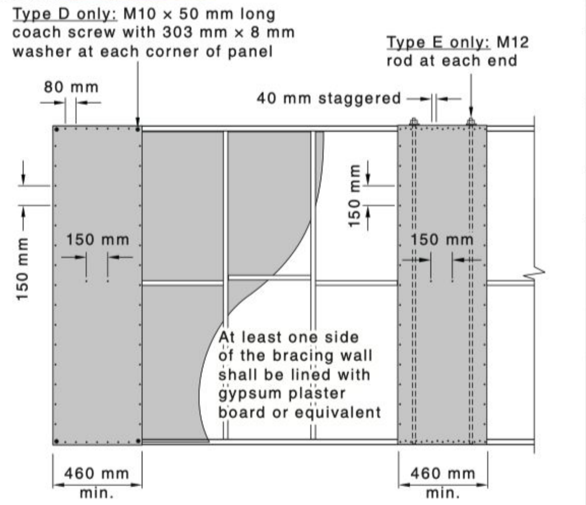
- Not so commonly available
- *Capacities are JD5, which reduced from 2010 version (JD4)*
- Maximum wall height: 2700 mm
- Minimum thickness of hardboard: 4.8 mm
- One-side of the wall to be lined with plasterboard or equivalent

Type	Brief Description	Capacity (kN/m)	Requirement Length (mm)
(l)	Hardboard, Type A	2.9	900
(m)	Hardboard, Type B	5.0	900
	Hardboard, Type C	7.6	900
(n)	Hardboard, Type D	2.9	460
	Hardboard, Type E	5.0	460

AS 1684.2: 2021, Table 8.18 (l)-(n)

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

Type of bracing			Bracing capacity, kN/m
(n) *Hardboard Types D and E — Short wall bracing systems* — Hardboard shall conform to AS/NZS 1859.4. Hardboard shall be nailed to frame using min. 30 mm × 2.8 mm ⌀ galvanized flat-head nails or equivalent. Nails shall be located a min. of 10 mm from the vertical edges and 15 mm from the top and bottom edges. Maximum stud spacing shall be 600 mm. Bracing panel min. width shall be 460 mm.	Minimum hardboard thickness, 4.8 mm		Type D 2.9 Type E 5.0
	Fastener spacing, mm		
	Top and bottom plates	Type D: 80 Type E: 40	
	Vertical edges and nogging	150	
	Fixing of bottom plate to floor frame or slab		
	Type D: Fix bottom plate to floor frame or slab with nominal fixing only (see Table 9.4) Type E: M12 rods at each end		



NOTE Bolt/rod washer sizes are set out in Table 9.1.

AS 1684.2, Table 8.18(n)

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Bracing Systems

❖ Height Modification – Cl 8.3.6.4

- In Table 8.18 (a) – (n), the wall heights is up to 2700 mm
- For walls greater than 2700mm, the capacity shall be reduced by multiplying by the height accordingly
- For example: Wall height of 3900 mm, 10m of plywood bracing type (g), 3.0 kN/m capacity

Bracing resistance provided: = 3.0 kN/m x 10 m x 2700/3900 = 20.77 kN (30 kN without reduction)

❖ JD5 to JD4 framing – Cl 8.3.6.3

- In Table 8.18 (g) – (n), based on minimum JD5 or J5
- Information of Joint Groups refer to *Cl 9.6.5* and *Appendix G*
- If JD4 is used:

Plywood (g) – (k): increase capacity by 12.5%

Hardboard (l) – (n): increase capacity by 16.0%

Wall Height (mm)	Multiplier
3000	0.9
3300	0.8
3600	0.75
3900	0.7
4200	0.64

AS 1684.2, Table 8.19

❖ Alternate Bracings:

e.g. Portal Frames (Cl 8.3.6.7) and Masonry Walls (Cl 8.3.6.8), OSB Sheet Braces, Wall Trusses.

Refer to capacities provided by the manufacturers

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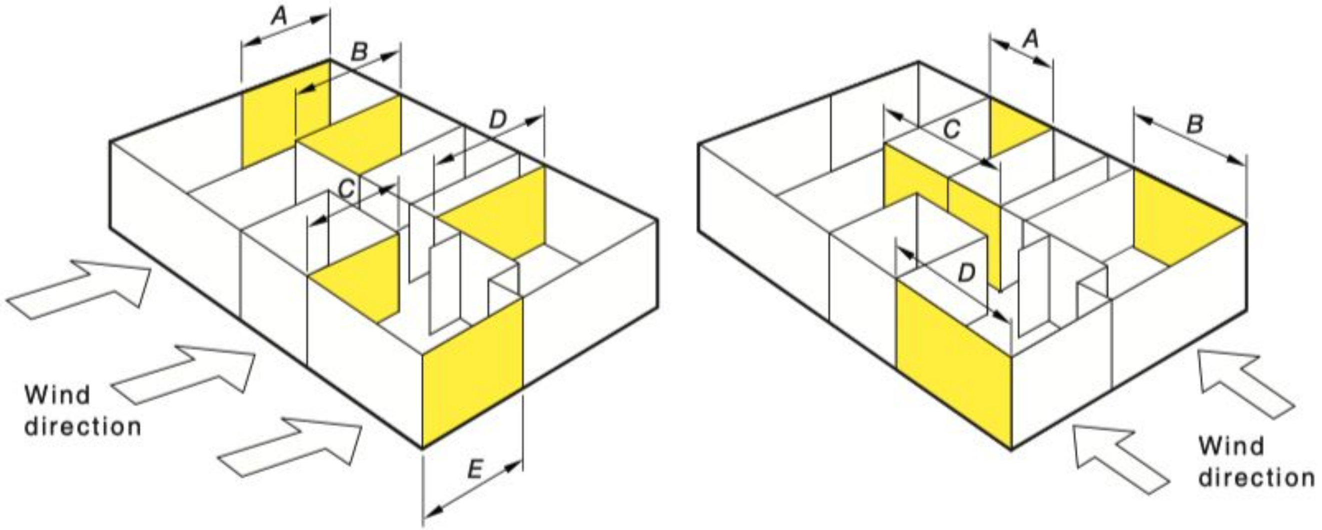
Bracing Systems

❖ Location and Distribution – Cl 8.3.6.6

"Bracing shall be approximately evenly distributed and provided in both directions, and shall initially be placed in external walls and if possible, at corners of the building"



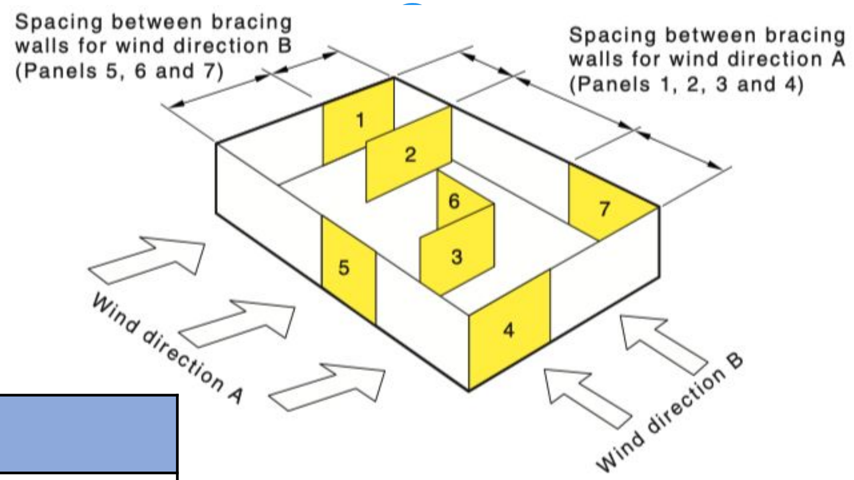
(a) Right angles to long side **(b) Right angles to short side**

AS 1684.2, fig 8.5

Step (f) Check even distribution and spacings

Bracing Systems

❖ Spacing – Cl 8.3.6.7 and Cl 8.3.5.9



Wind Class N1 and N2	Spacing of Bracing		
Single or Upper Floor of two Storey Building	9,000 mm		
Lower of Two Storey Building	9,000 mm		
	14,000 mm		
Wind Class N3 and N4	**Spacing of Bracing by Roof Pitch**		
Single or Upper Floor of two Storey Building	Read from Table 8.20 and 8.21		
	9,000 mm		
Lower of Two Storey Building	Read from Table 8.20 and 8.21		
	14,000 mm		

Step (g) Check Connections

Bracing Systems

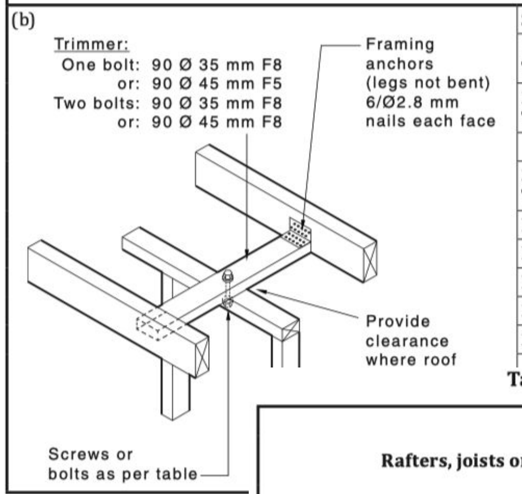
❖ Fixings of top of bracings – Cl 8.3.6.9

"All internal bracing walls shall be fixed to the floor of lower storey bracing walls, the ceiling or roof frame, and/or the external wall frame, with structural connections of equivalent shear capacity to the bracing capacity of that particular bracing wall."

"Nominal and other bracing walls with bracing capacity up to 1.5 kN/m require nominal fixing only, i.e. no additional fixing requirements.

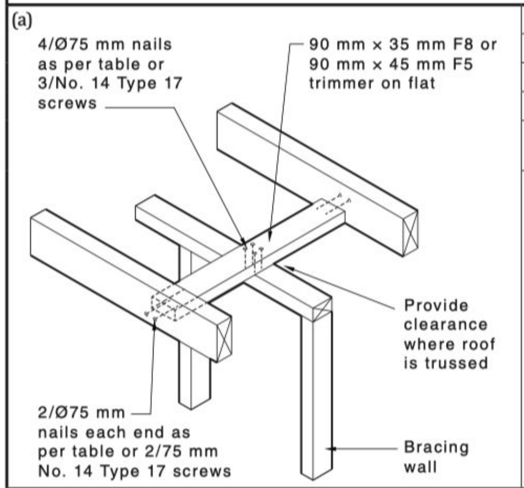
Table 8.22 (a) to (i) outlines the requirements for the bracing wall to ceiling connections

Table 8.22(b) — Fixing of top of bracing walls



Rafters, joists or trusses to bracing wall	Shear capacity, kN					
	Unseasoned timber			Seasoned timber		
	J2	J3	J4	JD4	JD5	JD6
Screws						
1/No.14 Type 17	4.8	3.5	2.5	3.5	2.5	1.8
2/No.14 Type 17	9.7	6.9	4.9	6.9	4.9	3.6
3/No.14 Type 17	13	9.3	6.6	9.8	7.4	5.4
Bolts						
M10	6.4	4.1	2.6	4.3	3.0	2.0
M12	7.6	4.9	3.1	5.1	3.6	2.5
2/M10	12	8.0	5.1	8.4	5.9	4.0
2/M12	13	9.3	6.1	9.8	7.0	4.9

Table 8.22(a) — Fixing of top of bracing walls



Rafters, joists or trusses to bracing wall	Shear capacity, kN					
	Unseasoned timber			Seasoned timber		
	J2	J3	J4	JD4	JD5	JD6
Nails						
3.05	3.0	2.1	1.5	2.1	1.8	1.3
3.33	3.3	2.4	1.7	2.4	2.0	1.5
Screws						
No.14 Type 17	12	8.3	5.9	8.3	5.9	4.3

AS 1684.2, Table 8.22

Step (g) Check Connections

Bracing Systems

❖ Fixings of bottom of bracings – Cl 8.3.6.10

"The bottom plate of timber-framed bracing walls shall be fixed at the ends of the bracing panel and, if required, intermediately to the floor frame or concrete slab with connections determined from Table 8.18."

- Connections in Table 8.18 is for capacity up to 3.4 kN/m
- Otherwise, need to refer to Table 8.23 and Table 8.24

Table 8.23 — Uplift force at ends of bracing walls

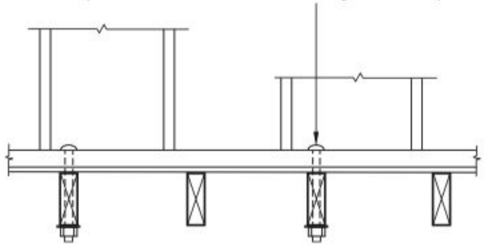
Wall height, mm	Uplift force at ends of bracing walls, kN												
	For bracing walls rated at (kN/m) capacity												
	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	8	10
2 400	2.4	3.6	4.8	6.0	7.2	8.4	10	11	12	13	14	19	24
2 700	2.7	4.1	5.4	6.8	8.1	9.5	11	12	14	15	16	22	27
3 000	3.0	4.5	6.0	7.5	9.0	11	12	14	15	17	18	24	30

NOTE 1 Some bracing wall systems require fixings to be full-length anchor rods, i.e. from the top plate to the floor frame or concrete slab.

NOTE 2 The maximum tension load of 8.5 kN given in the Notes to Span Tables for studs in the Supplements is not applicable when considering the uplift force at the ends of bracing walls.

NOTE 3 Where provided, the bottom plate tie-down details given in Table 8.18 may be used in lieu of the details determined from Tables 8.23 and 8.24.

Table 8.24(a) — Fixing of bottom of bracing walls

Fixing details		Uplift capacity, kN					
		Unseasoned timber			Seasoned timber		
		J2	J3	J4	JD4	JD5	JD6
(a) M10 cup-head bolts or No. 14 Type 17 batten screws as per table, with min. 38 mm penetration into flooring and/or joist 	M10 cuo-head	16	14	10	10	7	5
	2/No.14 Type17 screws	11	8.4	4.8	9.0	7.2	5.4

AS 1684.2, Table 8.23 and 8.24

Worked Examples

How does the workflow look like in ClearCalcs Wind Bracing Calculator

❖ **Covered By ClearCalcs**

(a) Determine wind classification

(b) (b) Determine the wind pressure

(c) Determine the area of elevation

(d) Calculate the racking force

(e) Design bracing systems for:
- (i) subfloors
- **(ii) walls**

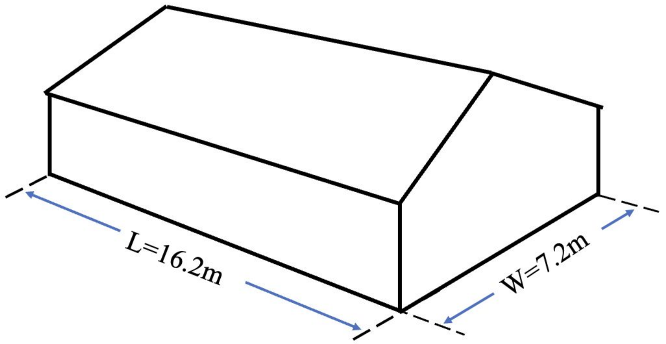
(f) Check even distribution and spacing

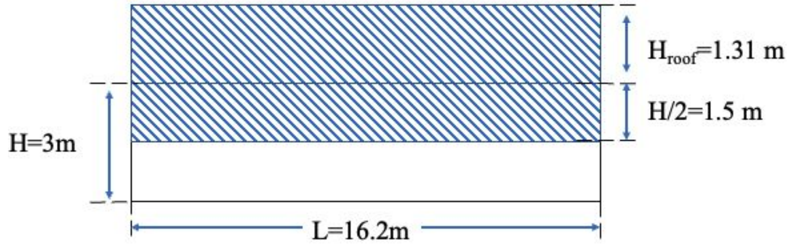
(g) Check connections

Worked Example

❖ Design a simple wall bracing for a residential building

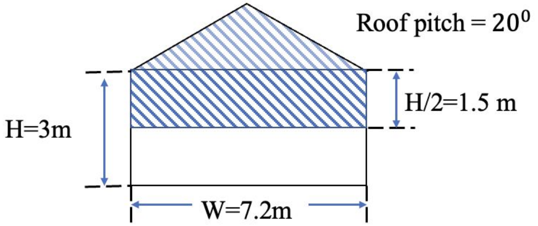
- **Single storey rectangular house:**
  - L = 16.2m, W = 7.2m, H=3.0m, Roof pitch = 20^0
  - Wind Class on site: N2
- **Nominal bracings (calculated on site):**
- Long-side: two-sheeted 9.5 m
- Short-side: one-sheeted 5 m
- **Design structural wall bracings:**
- Long-side:
  - two diagonally opposed timber/metal angle braces, type (a)
  - Cycled bracing (metal bracing) with a unit capacity of 1.7 kN/m, 10m in total.
- Short-side:
  - plywood type braces, type (g)





Area of Elevation on Long-side (wind on Side):

$$L\cdot\frac{1}{2}\cdot H+\left(\frac{1}{2}\cdot W\right)\cdot\tan 20^0\left(L-\frac{1}{2}\cdot W\right)=40.8\,m^2$$



Area of Elevation on Short-side (wind on end):

$$W\cdot\frac{1}{2}\cdot H+\left(\frac{1}{2}\cdot W\right)^2\cdot\tan 20^0=15.52m^2$$

Questions?

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THANK YOU!

- We will send you a recording of the webinar by email.

- There will be a survey at the end of this webinar, we would appreciate your feedback on how we can improve.

- If you have further questions, send an email to help@clearcalcs.com or use the Help button in ClearCalcs

- Stay tuned for webinar [Webinar Title] next month!

Appendix

About ClearCalcs

ClearCalcs

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Foundation Engineering Specialists, LLC

"Why didn't you just use ClearCalcs for that?"

Helen W. via Landon R.
Criterium Engineers

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Jason M.
J. Michael Engineering, PLLC

The ClearCalcs Team

A growing team of passionate engineers, programmers, customer success specialists, product managers, marketers, and more!



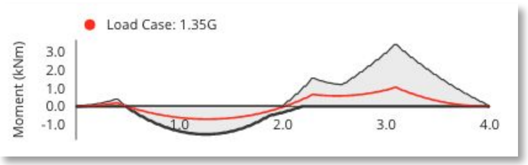


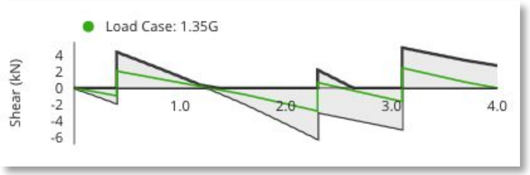




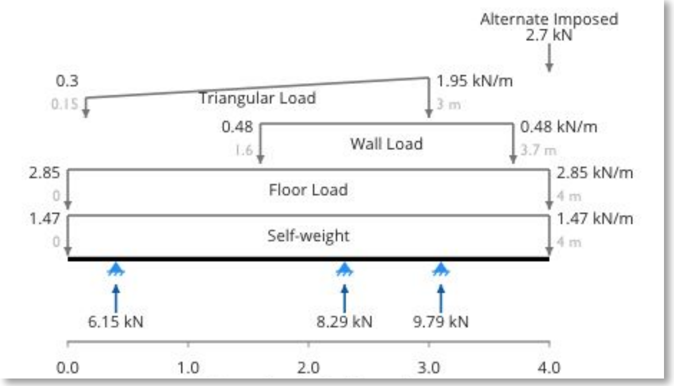
What Sets Our Calculations Apart

- **Live solutions**
  - *Instantly see how every change you make affects the design, in all load cases*

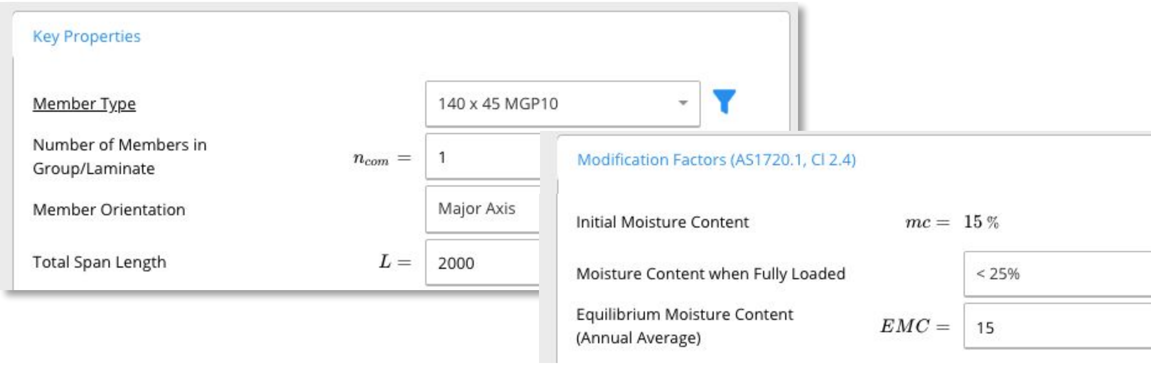




- **Finite Element Analysis**
  - *Get the most accurate results no matter what your configuration*

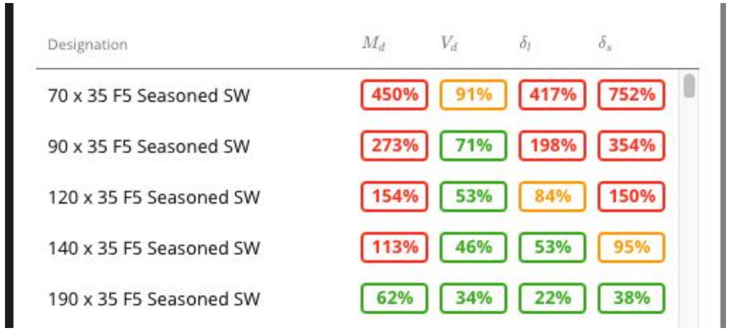


- **As simple or complex as you want**
  - *Safely enter in only a few properties, or tune every parameter – it's up to you*

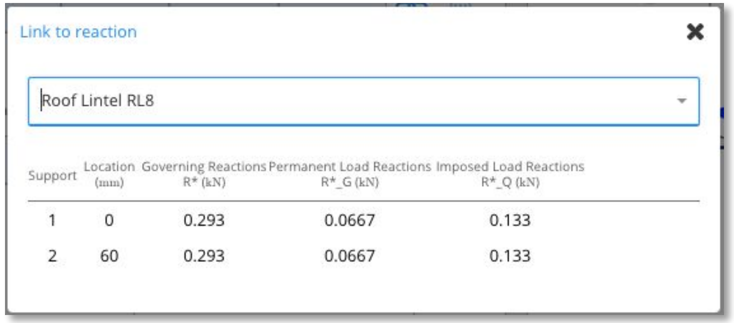


What Sets Our Design Process Apart

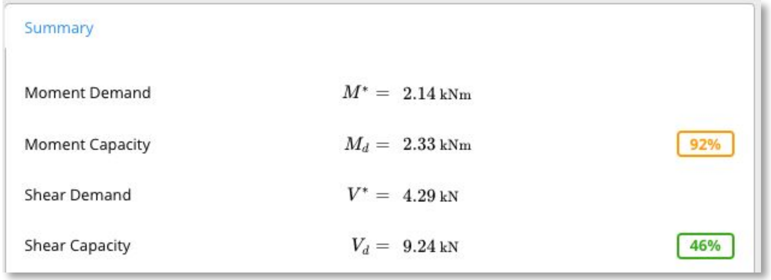
- **Member selector**
  - *Check every possible member in seconds*



- **Link your loads**
  - *No need to manually copy reactions into the next sheet – just create a link*



- **Simple traffic light indicators**
  - *See at a glance how close your design is to perfection*



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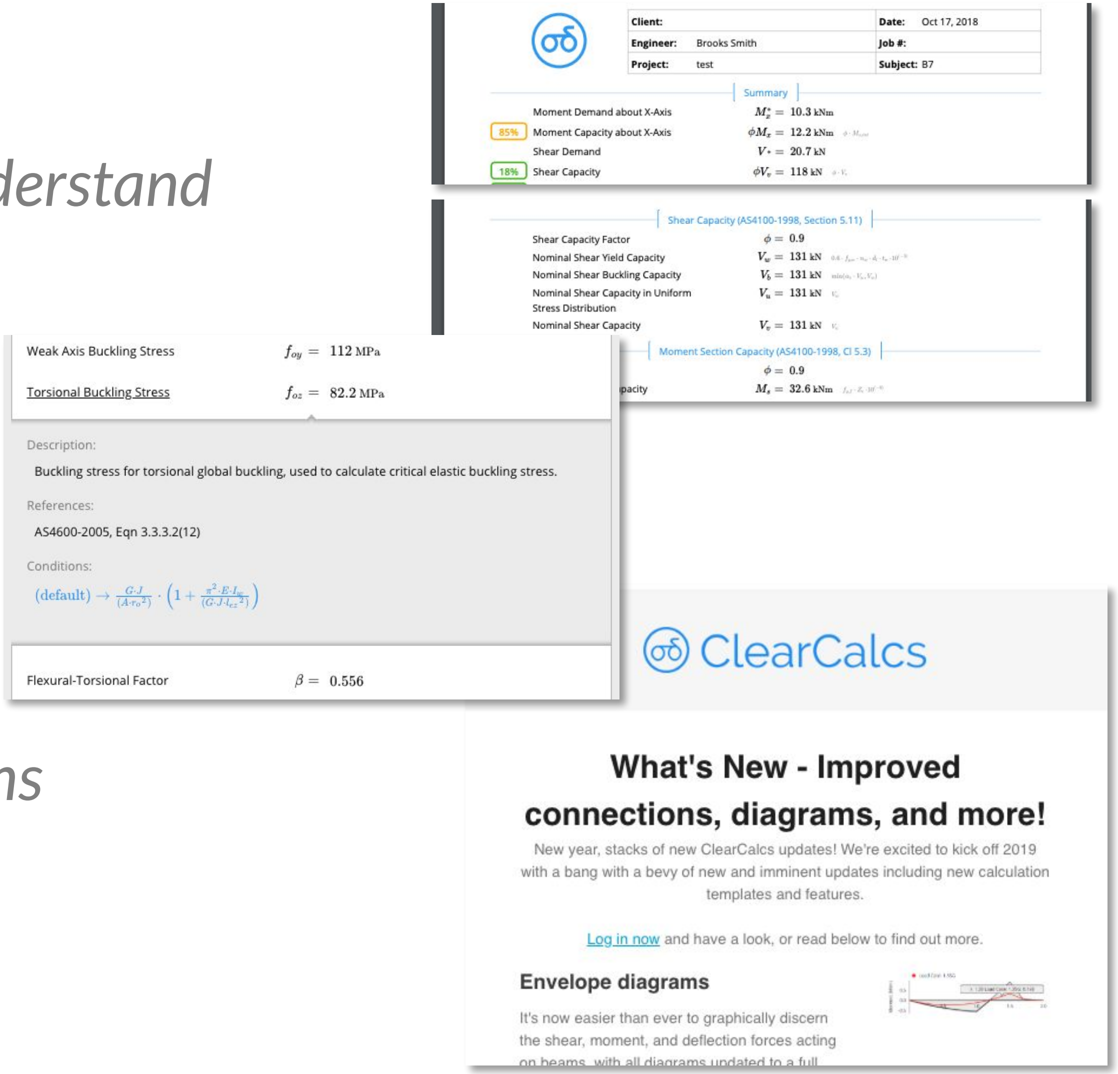
  - *References, equations, and more*
- **Rapid product updates**
  - *Receive new features and calculations within days, not years*



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