Project:	MH228 retractable louvre roof, all NZ wind zones	Doc no: MH-EN-01	Rev A
Client:	MOTE Home Ltd	Date: 13/11/2026	Sheet: 1

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Preliminary design calculations

MH228 retractable louvre roof: roof blade and side beam spans for NZS 3604 wind zones Low to Extra High.

Status

These calculations are prepared by MOTE Home as a design aid. They are not a producer statement and must not be relied on for a building consent until reviewed, completed and signed by a Chartered Professional Engineer (CPEng).

Standards

AS/NZS 1170.0:2002	Structural design actions, general principles
AS/NZS 1170.1:2002	Permanent, imposed and other actions
AS/NZS 1170.2:2021	Wind actions
NZS 3604:2011	Timber-framed buildings (wind zones, engineering basis)
AS/NZS 1664.1:1997	Aluminium structures, limit state design

Building information

Importance level / design life	IL2, 50 years (AS/NZS 1170.0)
Wind zone	Low to Extra High (NZS 3604)
Roof	Louvre blades at 0° pitch, lightweight
Imposed roof load Q	0.25 kPa (non-trafficable roof)
Blade tributary width	0.228 m (blade pitch)
Material	Aluminium alloy 6063-T6, Fty = 170 MPa, E = 70000 MPa (alloy to be confirmed by mill certificate)
Capacity reduction factor	φ = 0.85
Profiles	Supplier shop drawing MH228, 9 Dec 2025

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1–2. Scope and wind loads

Specific design of the MH228 roof blade and side beam for the NZS 3604 wind zones. Posts, connections, fixings to the house and footings are outside this calculation and need site-specific design.

Design wind pressure

Design wind pressures from the engineering basis of NZS 3604. Net pressure coefficients for a free-standing or attached canopy roof at 0° (AS/NZS 1170.2): worst case uplift Cp,n = −1.2, downward Cp,n = +0.4. SLS wind taken as 0.75 × ULS.

Wind zone	V des (m/s)	q des (kPa)	W up (kPa)	W down (kPa)
Low	32	0.62	-0.74	0.25
Medium	37	0.82	-0.98	0.33
High	44	1.16	-1.39	0.46
Very High	50	1.50	-1.80	0.60
Extra High	55	1.82	-2.18	0.73

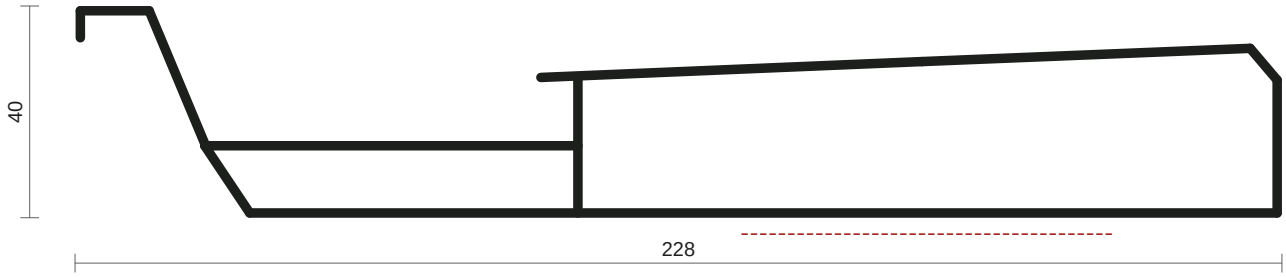
Load combinations (AS/NZS 1170.0)

ULS: 1.2G + 1.5Q; 0.9G + W(up); 1.2G + W(down). SLS: G + W(up)s.

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3. Section properties

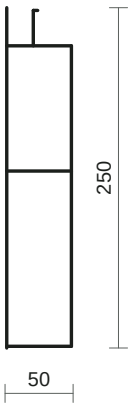
Profiles traced from the supplier shop drawing and modelled as thin-walled centre-line sections. Effective widths of slender compression skins by the Winter method (plate supported on both edges, k = 4).



Louvre blade 228 × 40 × 1.8, scale 1:1.4. Red dashed: ineffective part of the bottom skin under uplift.

Blade	Gross	Effective (uplift)	Effective (down)
Area A (mm²)	932	806	808
Neutral axis from base (mm)	14.5	16.6	12.2
Ixx (×10³ mm⁴)	156.4	129.4	124.4
Z (mm³)		7784	6285
Mass (kg/m)	2.52		

Bottom skin b = 132 mm, t = 1.8 mm: σcr = 48.0 MPa, λ = 1.88, ρ = 0.47. Top skin b = 127 mm: ρ = 0.49.



Side beam 250 × 50 × 2.5, scale 1:5.5

Side beam (major axis)	Value
Area A (mm²)	1606
Ixx (×10⁶ mm⁴)	9.45
Z (mm³)	76250
Top flange b/t = 19: ρ	1.00 (fully effective)
Web in bending σcr (MPa)	1140 > Fty, fully effective

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4. Roof blade design: Low wind zone

q des = 0.62 kPa (V des = 32 m/s). Simply supported blade, tributary width 0.228 m.

Blade self-weight G	0.025 kN/m (0.11 kPa)
Imposed Q	0.25 kPa
W up / W down	-0.74 / 0.25 kPa

Ultimate limit state

1.2G + 1.5Q	0.116 kN/m
0.9G + W up	-0.147 kN/m governs uplift
1.2G + W down	0.087 kN/m
φMs uplift = φ Fty Z	0.85 × 170 × 7784 = 1.125 kNm
φMs downward	0.908 kNm
Max span for bending, uplift	L = √(8 φMs / w) = 7.82 m
Max span for bending, downward	7.92 m

Serviceability

G + W up,s	-0.102 kN/m
Limit	L/100
Max span for deflection	L = (384 E I / (5 × 100 × w))^⅓ = 4.35 m

Maximum blade span, Low wind zone: 4.3 m (governed by deflection l/100)

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4. Roof blade design: Medium wind zone

q des = 0.82 kPa (V des = 37 m/s). Simply supported blade, tributary width 0.228 m.

Blade self-weight G	0.025 kN/m (0.11 kPa)
Imposed Q	0.25 kPa
W up / W down	-0.98 / 0.33 kPa

Ultimate limit state

1.2G + 1.5Q	0.116 kN/m
0.9G + W up	-0.202 kN/m governs uplift
1.2G + W down	0.105 kN/m
φMs uplift = φ Fty Z	0.85 × 170 × 7784 = 1.125 kNm
φMs downward	0.908 kNm
Max span for bending, uplift	L = √(8 φMs / w) = 6.68 m
Max span for bending, downward	7.92 m

Serviceability

G + W up,s	-0.143 kN/m
Limit	L/100
Max span for deflection	L = (384 E I / (5 × 100 × w))^⅓ = 3.89 m

Maximum blade span, Medium wind zone: 3.8 m (governed by deflection l/100)

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4. Roof blade design: High wind zone

q des = 1.16 kPa (V des = 44 m/s). Simply supported blade, tributary width 0.228 m.

Blade self-weight G	0.025 kN/m (0.11 kPa)
Imposed Q	0.25 kPa
W up / W down	-1.39 / 0.46 kPa

Ultimate limit state

1.2G + 1.5Q	0.116 kN/m
0.9G + W up	-0.295 kN/m governs uplift
1.2G + W down	0.136 kN/m
φMs uplift = φ Fty Z	0.85 × 170 × 7784 = 1.125 kNm
φMs downward	0.908 kNm
Max span for bending, uplift	L = √(8 φMs / w) = 5.53 m
Max span for bending, downward	7.31 m

Serviceability

G + W up,s	-0.213 kN/m
Limit	L/100
Max span for deflection	L = (384 E I / (5 × 100 × w))^⅓ = 3.41 m

Maximum blade span, High wind zone: 3.4 m (governed by deflection l/100)

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4. Roof blade design: Very High wind zone

q des = 1.50 kPa (V des = 50 m/s). Simply supported blade, tributary width 0.228 m.

Blade self-weight G	0.025 kN/m (0.11 kPa)
Imposed Q	0.25 kPa
W up / W down	-1.80 / 0.60 kPa

Ultimate limit state

1.2G + 1.5Q	0.116 kN/m
0.9G + W up	-0.388 kN/m governs uplift
1.2G + W down	0.167 kN/m
φMs uplift = φ Fty Z	0.85 × 170 × 7784 = 1.125 kNm
φMs downward	0.908 kNm
Max span for bending, uplift	L = √(8 φMs / w) = 4.82 m
Max span for bending, downward	6.60 m

Serviceability

G + W up,s	-0.283 kN/m
Limit	L/100
Max span for deflection	L = (384 E I / (5 × 100 × w))^⅓ = 3.10 m

Maximum blade span, Very High wind zone: 3.0 m (governed by deflection l/100)

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4. Roof blade design: Extra High wind zone

q des = 1.82 kPa (V des = 55 m/s). Simply supported blade, tributary width 0.228 m.

Blade self-weight G	0.025 kN/m (0.11 kPa)
Imposed Q	0.25 kPa
W up / W down	-2.18 / 0.73 kPa

Ultimate limit state

1.2G + 1.5Q	0.116 kN/m
0.9G + W up	-0.475 kN/m governs uplift
1.2G + W down	0.196 kN/m
φMs uplift = φ Fty Z	0.85 × 170 × 7784 = 1.125 kNm
φMs downward	0.908 kNm
Max span for bending, uplift	L = √(8 φMs / w) = 4.35 m
Max span for bending, downward	6.09 m

Serviceability

G + W up,s	-0.348 kN/m
Limit	L/100
Max span for deflection	L = (384 E I / (5 × 100 × w))^⅓ = 2.89 m

Maximum blade span, Extra High wind zone: 2.8 m (governed by deflection l/100)

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9. Side beam design

Side beam spanning between posts, simply supported, carrying half the adjacent module (blade ends), its own weight, gutter and slideway. Where a side beam is fixed to the house along its length it is continuously supported and this check does not apply.

Trib. (m)	Wind zone	w* (kN/m)	φMs (kNm)	L bending	L defl. L/150	Max span (m)
1.41	Low	0.83	11.02	10.28	8.51	8.5
1.41	Medium	1.17	11.02	8.67	7.50	7.5
1.41	High	1.75	11.02	7.10	6.50	6.4
1.41	Very High	2.32	11.02	6.16	5.88	5.8
1.41	Extra High	2.86	11.02	5.55	5.47	5.4
2.10	Low	1.28	11.02	8.30	7.34	7.3
2.10	Medium	1.78	11.02	7.03	6.50	6.4
2.10	High	2.64	11.02	5.78	5.65	5.6
2.10	Very High	3.50	11.02	5.02	5.12	5.0
2.10	Extra High	4.30	11.02	4.53	4.77	4.5

Tributary 1.41 m = half of a 2.815 m module. 2.10 m = half of a 4.2 m module. Two side beams back to back between modules each carry their own half module.

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10. Summary span tables

Wind zone	V des (m/s)	q des (kPa)	Max blade span (module width)	Max beam span, 2.8 m module	Max beam span, 4.2 m module
Low	32	0.62	4.3 m	8.5 m	7.3 m
Medium	37	0.82	3.8 m	7.5 m	6.4 m
High	44	1.16	3.4 m	6.4 m	5.6 m
Very High	50	1.50	3.0 m	5.8 m	5.0 m
Extra High	55	1.82	2.8 m	5.4 m	4.5 m

- Blade span = module width (blade length between side beams).
- Beam span = distance between posts on an open edge.
- Valid for 0° roof, roof height to width ratio not greater than 1.5, blades closed. Open or retracted blades carry less wind load.
- Posts, connections, wall fixings and footings require site-specific design.
- Alloy grade and temper to be confirmed by the supplier's mill certificate.