



**Job No.:** EHB 248-1  
**Latitude:** -46.374119

**Address:** 94 Brookdale Road, Kaka Point 9271, New Zealand  
**Longitude:** 169.76568

**Date:** 03/09/2024  
**Elevation:** 12.5 m

### General Input

|                  |          |                                |           |                      |           |
|------------------|----------|--------------------------------|-----------|----------------------|-----------|
| Roof Live Load   | 0.25 KPa | Roof Dead Load                 | 0.25 KPa  | Roof Live Point Load | 1.1 Kn    |
| Snow Zone        | N5       | Ground Snow Load               | 0.9 KPa   | Roof Snow Load       | 0.63 KPa  |
| Earthquake Zone  | 1        | Subsoil Category               | D         | Exposure Zone        | C         |
| Importance Level | 2        | Ultimate wind & Earthquake ARI | 500 Years | Max Height           | 5 m       |
| Wind Region      | NZ2      | Terrain Category               | 2.0       | Design Wind Speed    | 41.82 m/s |
| Wind Pressure    | 1.05 KPa | Lee Zone                       | NO        | Ultimate Snow ARI    | 150 Years |
| Wind Category    | High     | Earthquake ARI                 | 500       |                      |           |

Note: Wind lateral loads are governing over Earthquake loads, So only wind loads are considered in calculations

### Pressure Coefficients and Pressures

Shed Type = Gable Open

For roof  $C_{p,i} = 0.5616$

For roof  $C_{p,e}$  from 0 m To 3.47 m  $C_{p,e} = -0.9$   $p_e = -0.73$  KPa  $p_{net} = -1.23$  KPa

For roof  $C_{p,e}$  from 3.47 m To 6.94 m  $C_{p,e} = -0.5$   $p_e = -0.41$  KPa  $p_{net} = -0.90$  KPa

For wall Windward  $C_{p,i} = 0.5616$  side Wall  $C_{p,i} = -0.5771$

For wall Windward and Leeward  $C_{p,e}$  from 0 m To 12 m  $C_{p,e} = 0.7$   $p_e = 0.66$  KPa  $p_{net} = 1.27$  KPa

For side wall  $C_{p,e}$  from 0 m To 3.47 m  $C_{p,e} =$   $p_e = -0.61$  KPa  $p_{net} = 0.00$  KPa

Maximum Upward pressure used in roof member Design = 1.23 KPa

Maximum Downward pressure used in roof member Design = 0.80 KPa

Maximum Wall pressure used in Design = 1.27 KPa

Maximum Racking pressure used in Design = 1.07 KPa

### Design Summary

#### Intermediate Design Front and Back

Intermediate Spacing = 3000 mm Intermediate Span = 2959 mm Try Intermediate 2x150x50 SG8 Dry

Moisture Condition = Dry (Moisture in timber is less than 16% and does not remain in continuous wet condition after installation)

K1 Short term = 1 K4 = 1 K5 = 1 K8 Downward = 1.00

K8 Upward = 1.00 S1 Downward = 9.63 S1 Upward = 0.55

Shear Capacity of timber = 3 MPa Bending Capacity of timber = 14 MPa NZS3603 Amt 4, table 2.3

#### Capacity Checks

|                 |           |          |           |                    |          |
|-----------------|-----------|----------|-----------|--------------------|----------|
| $M_{Wind+Snow}$ | 4.17 Kn-m | Capacity | 4.2 Kn-m  | Passing Percentage | 100.72 % |
| $V_{0.9D-WnUp}$ | 5.64 Kn   | Capacity | -24.12 Kn | Passing Percentage | 427.66 % |

#### Deflections

Modulus of Elasticity = 5400 MPa NZS3603 Amt 4, Table 2.3

Deflection under Snow and Service Wind = 42.785 mm

Limit by Woolcock et al, 1999 Span/250 = 11.84 mm

#### Reactions

Maximum = 5.64 kn

#### Girt Design Front and Back

Girt's Spacing = 600 mm

Girt's Span = 3000 mm

Try Girt 150x50 SG8 Dry

Moisture Condition = Dry (Moisture in timber is less than 16% and does not remain in continuous wet condition after installation)

K1 Short term = 1    K4 = 1    K5 = 1    K8 Downward = 1.00

K8 Upward = 0.79    S1 Downward = 9.63    S1 Upward = 17.59

Shear Capacity of timber = 3 MPa    Bending Capacity of timber = 14 MPa NZS3603 Amt 4, table 2.3

#### Capacity Checks

|                        |           |          |           |                    |                  |
|------------------------|-----------|----------|-----------|--------------------|------------------|
| M <sub>Wind+Snow</sub> | 0.86 Kn-m | Capacity | 1.65 Kn-m | Passing Percentage | <b>191.86 %</b>  |
| V <sub>0.9D-WnUp</sub> | 1.14 Kn   | Capacity | 12.06 Kn  | Passing Percentage | <b>1057.89 %</b> |

#### Deflections

Modulus of Elasticity = 6700 MPa NZS3603 Amt 4, Table 2.3

Deflection under Snow and Service Wind = 12.76 mm

Limit by Woolcock et al, 1999 Span/250 = 12.00 mm

Sag during installation = 4.91 mm

#### Reactions

Maximum = 1.14 kn

#### Girt Design Sides

Girt's Spacing = 600 mm

Girt's Span = 2325 mm

Try Girt 150x50 SG8 Dry

Moisture Condition = Dry (Moisture in timber is less than 16% and does not remain in continuous wet condition after installation)

K1 Short term = 1    K4 = 1    K5 = 1    K8 Downward = 1.00

K8 Upward = 0.88    S1 Downward = 9.63    S1 Upward = 15.48

Shear Capacity of timber = 3 MPa    Bending Capacity of timber = 14 MPa NZS3603 Amt 4, table 2.3

#### Capacity Checks

|                        |           |          |           |                    |                  |
|------------------------|-----------|----------|-----------|--------------------|------------------|
| M <sub>Wind+Snow</sub> | 0.51 Kn-m | Capacity | 1.85 Kn-m | Passing Percentage | <b>362.75 %</b>  |
| V <sub>0.9D-WnUp</sub> | 0.89 Kn   | Capacity | 12.06 Kn  | Passing Percentage | <b>1355.06 %</b> |

#### Deflections

Modulus of Elasticity = 6700 MPa NZS3603 Amt 4, Table 2.3

Deflection under Snow and Service Wind = 4.60 mm

Limit by Woolcock et al. 1999 Span/100 = 9.30 mm

Sag during installation = 1.77 mm

**Reactions**

Maximum = 0.89 kn

**Uplift Check**

Density of Concrete = 24 Kn/m<sup>3</sup>

Density of Timber Pole = 5 Kn/m<sup>3</sup>

Due to cast in place pile, the surface interaction between soil and pile will be rough thus angle of friction between both is taken equal to soil angle of internal friction

Ks (Lateral Earth Pressure Coefficient) for cast into place concrete piles = 1.5

Formula to calculate Skin Friction = Safety factor (0.55) x Density of Soil(18) x Height of Pile(2000) x Ks(1.5) x 0.5 x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(2000)

Skin Friction = 32.31 Kn

Weight of Pile + Pile Skin Friction = 35.33 Kn

Uplift on one Pile = 28.04 Kn

Uplift is ok