



Pole Shed App Ver 01 2022

**Job No.:** 509-100271C

**Address:** 10 Arkles Way, Taipa, New Zealand

**Date:** 21/04/2025

**Latitude:** -34.997823

**Longitude:** 173.444011

**Elevation:** 51.5 m

**General Input**

|                  |           |                                |           |                      |           |
|------------------|-----------|--------------------------------|-----------|----------------------|-----------|
| Roof Live Load   | 0.25 KPa  | Roof Dead Load                 | 0.25 KPa  | Roof Live Point Load | 1.1 Kn    |
| Snow Zone        | N0        | Ground Snow Load               | 0 KPa     | Roof Snow Load       | 0 KPa     |
| Earthquake Zone  | 1         | Subsoil Category               | D         | Exposure Zone        | C         |
| Importance Level | 1         | Ultimate wind & Earthquake ARI | 100 Years | Max Height           | 3.98 m    |
| Wind Region      | NZ1       | Terrain Category               | 2.09      | Design Wind Speed    | 47.33 m/s |
| Wind Pressure    | 1.34 KPa  | Lee Zone                       | NO        | Ultimate Snow ARI    | 50 Years  |
| Wind Category    | Very High | Earthquake ARI                 | 100       |                      |           |

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

**Pressure Coefficients and Pressures**

Shed Type = Mono Enclosed

For roof  $C_{p,i} = -0.3$

For roof  $C_{p,e}$  from 0 m To 3.49 m  $C_{p,e} = -0.9$   $p_e = -1.09$  KPa  $p_{net} = -1.09$  KPa

For roof  $C_{p,e}$  from 3.49 m To 6.98 m  $C_{p,e} = -0.5$   $p_e = -0.60$  KPa  $p_{net} = -0.60$  KPa

For wall Windward  $C_{p,i} = -0.3$  side Wall  $C_{p,i} = -0.3$

For wall Windward and Leeward  $C_{p,e}$  from 0 m To 12 m  $C_{p,e} = 0.7$   $p_e = 0.85$  KPa  $p_{net} = 1.25$  KPa

For side wall  $C_{p,e}$  from 0 m To 3.49 m  $C_{p,e} =$   $p_e = -0.79$  KPa  $p_{net} = -0.79$  KPa

Maximum Upward pressure used in roof member Design = 1.09 KPa

Maximum Downward pressure used in roof member Design = 0.64 KPa

Maximum Wall pressure used in Design = 1.25 KPa

Maximum Racking pressure used in Design = 1.45 KPa

**Design Summary**

**Intermediate Design Front and Back**

Intermediate Spacing = 3000 mm      Intermediate Span = 2850 mm      Try Intermediate 2x190x45 SG8

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

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K1 Short term = 1    K4 =1    K5 =1    K8 Downward =0.98

K8 Upward =1.00    S1 Downward =12.23    S1 Upward =0.69

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> | 3.81 Kn-m | Capacity | 6.06 Kn-m | Passing Percentage | <b>159.06 %</b> |
| V <sub>0.9D-WnUp</sub> | 5.34 Kn   | Capacity | -27.5 Kn  | Passing Percentage | <b>514.98 %</b> |

#### **Deflections**

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

Deflection under Snow and Service Wind = 11.595 mm    Limit by Woolcock et al, 1999 Span/100 = 28.50 mm

#### **Reactions**

Maximum = 5.34 kn

#### **Girt Design Front and Back**

Girt's Spacing = 1100 mm

Girt's Span = 3000 mm

Try Girt 190x45 SG8

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

K1 Short term = 1    K4 =1    K5 =1    K8 Downward =0.98

K8 Upward =0.56    S1 Downward =12.23    S1 Upward =22.32

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> | 1.55 Kn-m | Capacity | 1.70 Kn-m | Passing Percentage | <b>109.68 %</b> |
| V <sub>0.9D-WnUp</sub> | 2.06 Kn   | Capacity | 13.75 Kn  | Passing Percentage | <b>667.48 %</b> |

#### **Deflections**

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

Deflection under Snow and Service Wind = 8.42 mm    Limit by Woolcock et al, 1999 Span/100 = 30.00 mm

Sag during installation = 6.06 mm

#### **Reactions**

Maximum = 2.06 kn

### **Girt Design Sides**

Girt's Spacing = 1100 mm

Girt's Span = 3500 mm

Try Girt 190x45 SG8

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

K1 Short term = 1    K4 =1    K5 =1    K8 Downward =0.98

K8 Upward =0.81    S1 Downward =12.23    S1 Upward =17.05

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> | 2.11 Kn-m | Capacity | 2.46 Kn-m | Passing Percentage | <b>116.59 %</b> |
| V <sub>0.9D-WnUp</sub> | 2.41 Kn   | Capacity | 13.75 Kn  | Passing Percentage | <b>570.54 %</b> |

### **Deflections**

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

Deflection under Snow and Service Wind = 15.59 mm    Limit by Woolcock et al. 1999 Span/100 = 35.00 mm  
Sag during installation =11.23 mm

### **Reactions**

Maximum = 2.41 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(2100) x Ks(1.5) x 0.5 x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(2100)

Skin Friction = 35.62 Kn

Weight of Pile + Pile Skin Friction = 39.84 Kn

Uplift on one Pile = 18.17 Kn

Uplift is ok