

Pole Shed App Ver 01 2022

Job No.: EHB 294

Address: 557 West Plains Road, Invercargill, New Zealand

Date: 2/25/2025

Latitude: -46.372176

Longitude: 168.281713

Elevation: 4.5 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 | 1 | Ultimate wind & Earthquake ARI | 100 Years | Max Height | 4.2 m |
| Wind Region | NZ4 | Terrain Category | 2.05 | Design Wind Speed | 42.61 m/s |
| Wind Pressure | 1.09 KPa | Lee Zone | NO | Ultimate Snow ARI | 50 Years |
| Wind Category | 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 Open

For roof $C_{p,i} = 0.6472$

For roof $C_{p,e}$ from 0 m To 3.9 m $C_{p,e} = -0.9$ $p_e = -0.49$ KPa $p_{net} = -0.91$ KPa

For roof $C_{p,e}$ from 3.9 m To 7.8 m $C_{p,e} = -0.5$ $p_e = -0.27$ KPa $p_{net} = -0.69$ KPa

For wall Windward $C_{p,i} = 0.6472$ side Wall $C_{p,i} = -0.552$

For wall Windward and Leeward $C_{p,e}$ from 0 m To 9.6 m $C_{p,e} = 0.7$ $p_e = 0.69$ KPa $p_{net} = 1.27$ KPa

For side wall $C_{p,e}$ from 0 m To 3.9 m $C_{p,e} =$ $p_e = -0.64$ KPa $p_{net} = -0.06$ KPa

Maximum Upward pressure used in roof member Design = 0.91 KPa

Maximum Downward pressure used in roof member Design = 0.77 KPa

Maximum Wall pressure used in Design = 1.27 KPa

Maximum Racking pressure used in Design = 1.18 KPa

Design Summary

Intermediate Design Sides

Intermediate Spacing = 2400 mm Intermediate Span = 3900 mm Try Intermediate 2x200x50 SG8 Dry

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 =1.00

K8 Upward =1.00 S1 Downward =11.27 S1 Upward =0.74

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

Capacity Checks

| | | | | | |
|------------------------|-----------|----------|-----------|--------------------|------------------|
| M _{Wind+Snow} | 2.90 Kn-m | Capacity | 7.46 Kn-m | Passing Percentage | 257.24 % |
| V _{0.9D-WnUp} | 2.97 Kn | Capacity | 32.16 Kn | Passing Percentage | 1082.83 % |

Deflections

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

Deflection under Snow and Service Wind = 43.57 mm Limit by Woolcock et al, 1999 Span/100 = 39.00 mm

Reactions

Maximum = 2.97 kn

Girt Design Front and Back

Girt's Spacing = 700 mm Girt's Span = 2400 mm Try Girt 200x50 SG8 Dry

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 =1.00

K8 Upward =0.96 S1 Downward =11.27 S1 Upward =13.02

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

Capacity Checks

| | | | | | |
|------------------------|-----------|----------|-----------|--------------------|------------------|
| M _{Wind+Snow} | 0.64 Kn-m | Capacity | 3.60 Kn-m | Passing Percentage | 562.50 % |
| V _{0.9D-WnUp} | 1.07 Kn | Capacity | 16.08 Kn | Passing Percentage | 1502.80 % |

Deflections

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

Deflection under Snow and Service Wind = 2.57 mm Limit by Woolcock et al, 1999 Span/100 = 24.00 mm

Sag during installation = 2.01 mm

Reactions

Maximum = 1.07 kn

Girt Design Sides

Girt's Spacing = 1300 mm

Girt's Span = 2400 mm

Try Girt 200x50 SG8 Dry

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 =1.00

K8 Upward =0.75 S1 Downward =11.27 S1 Upward =18.41

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

Capacity Checks

| | | | | | |
|------------------------|-----------|----------|-----------|--------------------|-----------------|
| M _{Wind+Snow} | 1.19 Kn-m | Capacity | 2.79 Kn-m | Passing Percentage | 234.45 % |
| V _{0.9D-WnUp} | 1.98 Kn | Capacity | 16.08 Kn | Passing Percentage | 812.12 % |

Deflections

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

Deflection under Snow and Service Wind = 4.78 mm Limit by Woolcock et al. 1999 Span/100 = 24.00 mm
Sag during installation =2.01 mm

Reactions

Maximum = 1.98 kn

Uplift Check

Density of Concrete = 24 Kn/m³

Density of Timber Pole = 5 Kn/m³

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(1600) x Ks(1.5) x 0.5 x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(1600)

Skin Friction = 20.68 Kn

Weight of Pile + Pile Skin Friction = 24.83 Kn

Uplift on one Pile = 15.78 Kn

Uplift is ok