Pole Shed App Ver 01 2022

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**Job No.:** SB 048 Shed House **Address:** 164 Birchwood Road, Ohai, New Zealand **Date:** 3/6/2025

**Latitude:** -45.934481 **Longitude:** 167.946016 **Elevation:** 206 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 | 1.1 KPa | Roof Snow Load | 0.77 KPa |
| Earthquake Zone | 2 | Subsoil Category | D | Exposure Zone | B |
| Importance Level | 2 | Ultimate wind & Earthquake ARI | 500 Years | Max Height | 3.72 m |
| Wind Region | NZ2 | Terrain Category | 1.77 | Design Wind Speed | 43.72 m/s |
| Wind Pressure | 1.15 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 Pressues**

Shed Type = Mono Enclosed

For roof Cp,i = -0.3

For roof CP,e from 0 m To 3.57 m Cpe = -0.9 pe = -0.93 KPa pnet = -0.93 KPa

For roof CP,e from 3.57 m To 7.13 m Cpe = -0.5 pe = -0.52 KPa pnet = -0.52 KPa

For wall Windward Cp,i = -0.3 side Wall Cp,i = -0.3

For wall Windward and Leeward CP,e from 0 m To 10.53 m Cpe = 0.7 pe = 0.72 KPa pnet = 1.06 KPa

For side wall CP,e from 0 m To 3.57 m Cpe = pe = -0.67 KPa pnet = -0.67 KPa

Maximum Upward pressure used in roof member Design = 0.93 KPa

Maximum Downward pressure used in roof member Design = 0.44 KPa

Maximum Wall pressure used in Design = 1.06 KPa

Maximum Racking pressure used in Design = 1.20 KPa

**Design Summary**

**Intermediate Design Front and Back**

Intermediate Spacing = 1735.5 mm Intermediate Span = 3255 mm Try Intermediate 2x240x45 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 =0.94

K8 Upward =1.00 S1 Downward =13.82 S1 Upward =0.83

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

**Capacity Checks**

| | | | | | |
|---|---|---|---|---|---|
| $M_{Wind+Snow}$ | 2.53 Kn-m | Capacity | 9.68 Kn-m | Passing Percentage | **382.61 %** |
| $V_{0.9D-WnUp}$ | 3.11 Kn | Capacity | -34.74 Kn | Passing Percentage | **1117.04 %** |

**Deflections**

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

Deflection under Snow and Service Wind = 9.79 mm Limit byWoolcock et al, 1999 Span/250 = 13.02 mm

**Reactions**

Maximum = 3.11 kn

## Intermediate Design Sides

| | | |
|---|---|---|
| Intermediate Spacing = 1760.5633802816903 mm | Intermediate Span = 3531 mm | Try Intermediate 2x240x45 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 =0.94

K8 Upward =1.00 S1 Downward =13.82 S1 Upward =0.87

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

**Capacity Checks**

| | | | | | |
|---|---|---|---|---|---|
| $M_{Wind+Snow}$ | 1.51 Kn-m | Capacity | 9.68 Kn-m | Passing Percentage | **641.06 %** |
| $V_{0.9D-WnUp}$ | 1.71 Kn | Capacity | 34.74 Kn | Passing Percentage | **2031.58 %** |

**Deflections**

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

Deflection under Snow and Service Wind = 13.745 mm Limit by Woolcock et al, 1999 Span/250 = 14.12 mm

**Reactions**

Maximum = 1.71 kn

## Girt Design Front and Back

Girt's Spacing = 600 mm  Girt's Span = 1736 mm  Try Girt 140x45 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 =1.00

K8 Upward =0.92  S1 Downward =10.36  S1 Upward =14.39

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

#### Capacity Checks

| | | | | | |
|---|---|---|---|---|---|
| $M_{Wind+Snow}$ | 0.24 Kn-m | Capacity | 1.52 Kn-m | Passing Percentage | **633.33 %** |
| $V_{0.9D-WnUp}$ | 0.55 Kn | Capacity | 10.13 Kn | Passing Percentage | **1841.82 %** |

#### Deflections

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

Deflection under Snow and Service Wind = 1.88 mm  Limit by Woolcock et al, 1999 Span/250 = 6.94 mm

Sag during installation = 0.68 mm

#### Reactions

Maximum = 0.55 kn

## Girt Design Sides

Girt's Spacing = 600 mm  Girt's Span = 1761 mm  Try Girt 140x45 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 =1.00

K8 Upward =0.92  S1 Downward =10.36  S1 Upward =14.49

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

#### Capacity Checks

| | | | | | |
|---|---|---|---|---|---|
| $M_{Wind+Snow}$ | 0.25 Kn-m | Capacity | 1.51 Kn-m | Passing Percentage | **604.00 %** |

| | | | | | |
|---|---|---|---|---|---|
| $V_{0.9D-WnUp}$ | 0.56 Kn | Capacity | 10.13 Kn | Passing Percentage | **1808.93 %** |

**Deflections**

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

Deflection under Snow and Service Wind = 1.99 mm Limit by Woolcock et al. 1999 Span/100 = 7.04 mm

Sag during installation =0.72 mm

**Reactions**

Maximum = 0.56 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 = Safecty factor (0.55) x Density of Soil(18) x Height of Pile(1500) x Ks(1.5) x 0.5 x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(1500)

Skin Friction = 18.17 Kn

Weight of Pile + Pile Skin Friction = 21.61 Kn

Uplift on one Pile = 6.12 Kn

Uplift is ok