Pole Shed App Ver 01 2022 by RnH Consulting Engineers

Job No.: 22 Maewa Road-Large bay **Address:** 22 Maewa Road, Feilding, New Zealand **Date:** 9/2/2022

Latitude: -40.190989 **Longitude:** 175.551289 **Elevation:** 118.5 m

General Input

Roof Live Load	0.25 KPa	Roof Dead Load	0.25 KPa	Roof Live Point Load	1.1 Kn
Snow Zone	N1	Ground Snow Load	0 KPa	Roof Snow Load	0 KPa
Earthquake Zone	3	Subsoil Category	D	Exposure Zone	B
Importance Level	1	Ultimate wind & Earthquake ARI	100 Years	Max Height	4.5 m
Wind Region	NZ2	Terrain Category	2.12	Design Wind Speed	39.64 m/s
Wind Pressure	0.94 KPa	Lee Zone	NO	Ultimate Snow ARI	50 Years
Wind Category	High				

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

Pressure Coefficients and Pressues

Shed Type = Mono Open

For roof Cp,i = -0.52

For roof CP,e from 0 m To 4.20 m Cpe = -0.9 pe = -0.55 KPa pnet = -1.02 KPa

For roof CP,e from 4.20 m To 8.40 m Cpe = -0.5 pe = -0.31 KPa pnet = -0.78 KPa

For wall Windward Cp,i = 0.63 side Wall Cp,i = -0.52

For wall Windward and Leeward CP,e from 0 m To 24.15 m Cpe = 0.7 pe = 0.54 KPa pnet = 1.03 KPa

For side wall CP,e from 0 m To 4.20 m Cpe = pe = -0.50 KPa pnet = 0.34 KPa

Maximum Upward pressure used in roof member Design = 1.02 KPa

Maximum Downward pressure used in roof member Design = 0.64 KPa

Maximum Wall pressure used in Design = 1.03 KPa

Maximum Racking pressure used in Design = 1 KPa

Design Summary

Purlin Design

Purlin Spacing = 900 mm Purlin Span = 6700 mm Try Purlin 150x50 SG8 Dry

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

K1 Short term = 1 K1 Medium term = 0.8 K1 Long term = 0.6 K4 =1 K5 =1 K8 Downward =1.00

K8 Upward =0.89 S1 Downward =9.63 S1 Upward =15.17

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

Capacity Checks

$M_{1.35D}$	1.7 Kn-m	Capacity	1.41 Kn-m	Passing Percentage	**82.94 %**
$M_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	4.75 Kn-m	Capacity	1.89 Kn-m	Passing Percentage	**39.79 %**
$M_{0.9D-WnUp}$	-4.01 Kn-m	Capacity	-2.11 Kn-m	Passing Percentage	**52.62 %**
$V_{1.35D}$	1.02 Kn	Capacity	7.24 Kn	Passing Percentage	**709.80 %**
$V_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	2.83 Kn	Capacity	9.65 Kn	Passing Percentage	**340.99 %**
$V_{0.9D-WnUp}$	-2.40 Kn	Capacity	-12.06 Kn	Passing Percentage	**502.50 %**

Deflections

Modulus of Elasticity = 8000 MPa NZS3603 Amt 4, Table 2.3 considering at least 4 members acting together

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 125.94 mm	Limit by AS1170.0 Table C1 Span/250 = 26.80 mm
Deflection under Dead and Service Wind = 172.12 mm	Limit by AS1170.0 Table C1 Span/120 = 55.83 mm

Reactions

Maximum downward =2.83 kn Maximum upward = -2.40 kn

Number of Blocking = 2 if 0 then no blocking required, if 1 then one midspan blocking required

Girt Design Front and Back

Girt's Spacing = 1000 mm Girt's Span = 6900 mm Try Intermediate 300x50 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 =0.94

K8 Upward =0.39 S1 Downward =13.93 S1 Upward =27.28

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

Capacity Checks

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$M_{Wind+Snow}$	3.06 Kn-m	Capacity	3.27 Kn-m	Passing Percentage	**106.86 %**
$V_{0.9D-WnUp}$	1.78 Kn-m	Capacity	24.12 Kn-m	Passing Percentage	**1355.06 %**

Deflections

Modulus of Elasticity = 8000 MPa NZS3603 Amt 4, Table 2.3

Deflection under Snow and Service Wind = 16.89 mm Limit by AS1170.0 Table C1 Span/120 = 57.50 mm
Sag during installation = 115.11 mm

Reactions

Maximum = 1.78 kn

Girt Design Sides

Girt's Spacing = 1000 mm Girt's Span = 4500 mm Try Intermediate 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 =0.60 S1 Downward =9.63 S1 Upward =21.54

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

Capacity Checks

$M_{Wind+Snow}$	1.30 Kn-m	Capacity	1.41 Kn-m	Passing Percentage	**108.46 %**
$V_{0.9D-WnUp}$	1.16 Kn-m	Capacity	12.06 Kn-m	Passing Percentage	**1039.66 %**

Deflections

Modulus of Elasticity = 8000 MPa NZS3603 Amt 4, Table 2.3

Deflection under Snow and Service Wind = 24.44 mm Limit by AS1170.0 Table C1 Span/120 = 37.50 mm
Sag during installation =20.82 mm

Reactions

Maximum = 1.16 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(1800) x Ks(1.5) x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(1800)

Skin Friction = 26.17 Kn

Weight of Pile + Pile Skin Friction = 30.03 Kn

Uplift on one Pile = 12.34 Kn

Uplift is ok