

Pole Shed App Ver 01 2022

Job No.: Renouf0325

Address: 354b Hetherington Road, Rotongaro, New Zealand

Date: 12/05/2025

Latitude: -37.537378

Longitude: 175.124466

Elevation: 58.5 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	B
Importance Level	1	Ultimate wind & Earthquake ARI	100 Years	Max Height	4.2 m
Wind Region	NZ1	Terrain Category	1.54	Design Wind Speed	46.72 m/s
Wind Pressure	1.31 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 4.20 m $C_{p,e} = -0.9$ $p_e = -1.06$ KPa $p_{net} = -1.06$ KPa

For roof $C_{p,e}$ from 4.20 m To 8.40 m $C_{p,e} = -0.5$ $p_e = -0.59$ KPa $p_{net} = -0.59$ 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 $C_{p,e} = 0.7$ $p_e = 0.83$ KPa $p_{net} = 1.22$ KPa

For side wall $C_{p,e}$ from 0 m To 4.20 m $C_{p,e} =$ $p_e = -0.77$ KPa $p_{net} = -0.77$ KPa

Maximum Upward pressure used in roof member Design = 1.06 KPa

Maximum Downward pressure used in roof member Design = 0.51 KPa

Maximum Wall pressure used in Design = 1.22 KPa

Maximum Racking pressure used in Design = 1.42 KPa

Design Summary

Girt Design Front and Back

Girt's Spacing = 800 mm

Girt's Span = 4000 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)

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

K8 Upward =0.99 S1 Downward =9.63 S1 Upward =11.72

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

Capacity Checks

M _{Wind+Snow}	1.95 Kn-m	Capacity	2.08 Kn-m	Passing Percentage	106.67 %
V _{0.9D-WnUp}	1.95 Kn	Capacity	12.06 Kn	Passing Percentage	618.46 %

Deflections

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

Deflection under Snow and Service Wind = 34.53 mm Limit by Woolcock et al, 1999 Span/100 = 40.00 mm

Sag during installation = 15.52 mm

Reactions

Maximum = 1.95 kn

Girt Design Sides

Girt's Spacing = 1200 mm Girt's Span = 2750 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 =0.82 S1 Downward =9.63 S1 Upward =16.84

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

Capacity Checks

M _{Wind+Snow}	1.38 Kn-m	Capacity	1.73 Kn-m	Passing Percentage	125.36 %
V _{0.9D-WnUp}	2.01 Kn	Capacity	12.06 Kn	Passing Percentage	600.00 %

Deflections

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

Deflection under Snow and Service Wind = 11.57 mm Limit by Woolcock et al. 1999 Span/100 = 27.50 mm

Sag during installation =3.47 mm

Reactions

Maximum = 2.01 kn

Middle Pole Design

Geometry

200 SED H5 (Minimum 225 dia. at Floor Level)	Dry Use	Height	4200 mm
Area	35448 mm ²	As	26585.7421875 mm ²
Ix	100042702 mm ⁴	Zx	941578 mm ³
Iy	100042702 mm ⁴	Zx	941578 mm ³
Lateral Restraint	4200 mm c/c		

Loads

Total Area over Pole = 22 m²

Dead	5.50 Kn	Live	5.50 Kn
Wind Down	11.22 Kn	Snow	0.00 Kn
Moment wind	12.49 Kn-m		
Phi	0.8	K8	0.68
K1 snow	0.8	K1 Dead	0.6
K1 wind	1		

Material

Peeling	Steaming	Normal	Dry Use
fb =	36.3 MPa	fs =	2.96 MPa
fc =	18 MPa	fp =	7.2 MPa
ft =	22 MPa	E =	9257 MPa

Capacities

PhiNcx Wind	347.89 Kn	PhiMnx Wind	18.64 Kn-m	PhiVnx Wind	62.96 Kn
PhiNcx Dead	208.74 Kn	PhiMnx Dead	11.18 Kn-m	PhiVnx Dead	37.77 Kn

Checks

$$(M_x/\Phi M_{nx}) + (N/\Phi N_{cx}) = 0.73 < 1 \text{ OK}$$

$$(M_x/\Phi M_{nx})^2 + (N/\Phi N_{cx}) = 0.51 < 1 \text{ OK}$$

Deflection at top under service lateral loads = 33.44 mm < 42.00 mm

Drained Lateral Strength of Middle pile in cohesionless soils Free Head short pile

Assumed Soil Properties

Gamma 18 Kn/m³ Friction angle 30 deg Cohesion 0 Kn/m³
K₀ = $(1 - \sin(30)) / (1 + \sin(30))$
K_p = $(1 + \sin(30)) / (1 - \sin(30))$

Geometry For Middle Bay Pole

D_s = 0.6 mm Pile Diameter
L = 1700 mm Pile embedment length
f₁ = 3150 mm Distance at which the shear force is applied
f₂ = 0 mm Distance of top soil at rest pressure

Loads

Moment Wind = 12.49 Kn-m
Shear Wind = 3.97 Kn

Pile Properties

Safety Factory 0.55
H_u = 9.03 Kn Ultimate Lateral Strength of the Pile, Short pile
M_u = 17.07 Kn-m Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.73 < 1 OK

End Pole Design

Geometry For End Bay Pole

Geometry

175 SED H5 (Minimum 200 dia. at Floor Level)	Dry Use	Height	3900 mm
Area	27598 mm ²	As	20698.2421875 mm ²
I _x	60639381 mm ⁴	Z _x	646820 mm ³
I _y	60639381 mm ⁴	Z _y	646820 mm ³
Lateral Restraint	mm c/c		

Loads

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Total Area over Pole = 11 m²

Dead	2.75 Kn	Live	2.75 Kn
Wind Down	5.61 Kn	Snow	0.00 Kn
Moment Wind	6.25 Kn-m		
Phi	0.8	K8	0.63
K1 snow	0.8	K1 Dead	0.6
K1 wind	1		

Material

Peeling	Steaming	Normal	Dry Use
fb =	36.3 MPa	fs =	2.96 MPa
fc =	18 MPa	fp =	7.2 MPa
ft =	22 MPa	E =	9257 MPa

Capacities

PhiNcx Wind	250.93 Kn	PhiMnx Wind	11.86 Kn-m	PhiVnx Wind	49.01 Kn
PhiNcx Dead	150.56 Kn	PhiMnx Dead	7.12 Kn-m	PhiVnx Dead	29.41 Kn

Checks

$$(M_x/\Phi M_{nx}) + (N/\Phi N_{cx}) = 0.57 < 1 \text{ OK}$$

$$(M_x/\Phi M_{nx})^2 + (N/\Phi N_{cx}) = 0.32 < 1 \text{ OK}$$

$$\text{Deflection at top under service lateral loads} = 27.51 \text{ mm} < 41.90 \text{ mm}$$

Ds =	0.6 mm	Pile Diameter
L =	1300 mm	Pile embedment length
f1 =	3150 mm	Distance at which the shear force is applied
f2 =	0 mm	Distance of top soil at rest pressure

Loads

Total Area over Pole = 11 m²

Moment Wind =	6.25 Kn-m
Shear Wind =	1.98 Kn

Pile Properties

Safety Factory	0.55
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Hu =	4.40 Kn	Ultimate Lateral Strength of the Pile, Short pile
Mu =	8.11 Kn-m	Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = $0.77 < 1$ OK

Drained Lateral Strength of End pile in cohesionless soils Free Head short pile

Assumed Soil Properties

Gamma	18 Kn/m ³	Friction angle	30 deg	Cohesion	0 Kn/m ³
K ₀ =	$(1 - \sin(30)) / (1 + \sin(30))$				
K _p =	$(1 + \sin(30)) / (1 - \sin(30))$				

Geometry For End Bay Pole

Ds =	0.6 mm	Pile Diameter
L =	1300 mm	Pile embedment length
f ₁ =	3150 mm	Distance at which the shear force is applied
f ₂ =	0 mm	Distance of top soil at rest pressure

Loads

Moment Wind =	6.25 Kn-m
Shear Wind =	1.98 Kn

Pile Properties

Safety Factory	0.55	
Hu =	4.40 Kn	Ultimate Lateral Strength of the Pile, Short pile
Mu =	8.11 Kn-m	Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = $0.77 < 1$ OK

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

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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(1700) x Ks(1.5) x $0.5 \times \tan(30)$ x π x Dia of Pile(0.6) x Height of Pile(1700)

Skin Friction = 23.34 Kn

Weight of Pile + Pile Skin Friction = 27.76 Kn

Uplift on one Pile = 18.37 Kn

Uplift is ok