Pole Shed App Ver 01 2022 by RnH Consulting Engineers

Job Number:

Issue:

PRODUCER STATEMENT-PS1-DESIGN

ISSUED BY: **R&H CONSULTING Engineers Pty Ltd**

DESIGN ENGINEER: **Rizwan Qadeer**

TO BE SUPPLIED TO: **District Council**

IN RESPECT OF: **Proposed NEW Farm Shed**

AT: **Section 10 Clark Road, Orari Gorge, Geraldine, New Zealand**

We have been engaged by **Ezequote Pty Ltd** to provide **Structural Engineering Design** services in respect of the requirements of Clause(s) **B1** of the Building Code for part only (as specified in the attachment to this statement), of the proposed building work.

The design out by us has been prepared in accordance with compliance documents issued by Ministry of Business, Innovation & Employment **B1/VM1 and B1/VM4**

The proposed building work covered by the producer statement is described on **ITM** drawings title **5115014035** and numbered dated together with the following specfication, and other documents set out in the schedule attached to this statement: **Design Featured Report Dated 8/17/2022 and numbered**

On behalf of R&H Consulting Engineers Pty Ltd, and subject to:

1. Site verification of the following design assumptions: **an ultimate foundation bearing pressure of 300 Kpa in accordance with NZS 3604:2011**
2. **These works have been designed for a working life of 50 years**
3. **Unless specifically noted, compliance of the drawings to None-Specific codes such as NZS3604 and NZS4229 have not been checked by this practice**
4. **This Certificate does not cover weather-tightness.**
5. **Inspections of the building to be completed by District Council. As R&H Consulting Engineers Pty Ltd are not undertaking inspections, we cannot issue a producer Statement-PS4- Construction Review.**
6. **This Producer Statement- Design is valid for a building consent issued within 1 year from the date of issue**
7. All proprietary products meeting their performance specification requirements

I believe on reasonable grounds that a) the building, if constructed in accordance with the drawings, specifications, and other documents provided or listed in the attached schedule, will comply with the relevant provisions of the Building Code and that b), the presons who have undertaken the design have the necessary competency to do so. I also recommend the follow level of construction monitoring/observation:

☐ CM1 ☐ CM2 ☐ CM3 ☐ CM4 ☐ CM5 or as per agreement with owner/developer **(stated above)**

I, **Rizwan Qadeer** am CPEng **1022844** I am Member of Engineering New Zealand and hold the following qualification: **BE.Civil**

R&H Consulting Engineers Pty Ltd holds a current policy of Professional Indemnity Insurance no less than $200,000.

Signed by **Rizwan Qadeer** on behalf of **R&H Consulting Engineers Pty Ltd** Dated: **8/17/2022**

Note: This statement shall only be relied upon by the Building Consent Authority named above. Liability under this statement accrues to the Design Firm only. The total maximum amount of damages payable arising from this statement and all other statements provided to the Building Consent Authority in relation to this building work, whether in contract, tort or otherwise(including negligence), is limited to the sum of $200,000.

This form is to accompany Form 2 of the Building(Forms) Regulations 2004 for the application of a Building Consent

Pole Shed App Ver 01 2022 by RnH Consulting Engineers

Date: 8/17/2022

418A Elizabeth Street,

Surry Hills NSW

Australia File No:

DESIGN FEATURES SUMMARY FOR PROPOSED NEW FARM SHED SECTION 10 CLARK ROAD, ORARI GORGE, GERALDINE, NEW ZEALAND

Site Specific Loads

Roof Live Load	0.25 KPa	Roof Dead Load	0.25 KPa	Roof Live Point Load	1.1 Kn
Snow Zone	N4	Ground Snow Load	1.32 KPa	Roof Snow Load	0.92 KPa
Earthquake Zone	2	Subsoil Category	C	Exposure Zone	B
Importance Level	1	Ultimate wind ARI	100 Years	Max Height	4 m
Wind Region	NZ2	Terrain Category	2.12	Design Wind Speed	39.4 m/s
Wind Pressure	0.93 KPa	Lee Zone	NO	Ultimate ARI	100 Years

Timber

Sawn Timber to be graded to the properties of SG6 and SG8 or better as mentioned on plans, with moisture content of 18% or less for dry and 25% or less for wet.

The following standards have been used in the design of this structure

- NZS 3603:1993 Timber Structures Standard
- NZS 3604:2011 Timber Framed Buildings. Standards New Zealand, 2011
- NZS 3404:1997 Steel Structures
- NZS 1170:2003 Structural Design Actions
- NZS 1170:2021 Structural Design Actions-Wind Action
- Branz. "Engineering Basis of NZS 3604". April 2013

Yours Faithfully

R&H CONSULTING ENGINEERS PTY LTD

RIZWAN QADEER

Director | BE Civil . CMengNZ Cpeng

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Mobile: 04 49 529 551

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Date: **8/17/2022**

Council: **District Council**

Subject: B2 compliance in respect of Proposed shed atSection 10 Clark Road, Orari Gorge, Geraldine, New Zealand

District Council typically requests a Producer Statement/Other means of compliance for Design for Clause B2 of the Building Code-Durability

We are not able to provide a Producer Statement for durability because compliance needs to be shown on material-by-material basis using a variety of compliance methods, and not all materials used have a clear compliance path.

We can confirm that for the structural elements shown in our documentation under Clause B1:

Timber

Timber treatment has been selected to meet or exceed the requirements of table 1A of B2/AS1 and NZS3602

Steel fixing

Steel fixings are protected against weather as per table 4.1 and 4.2 of NZS3604-2011

Yours Faithfully

R&H CONSULTING ENGINEERS PTY LTD

RIZWAN QADEER

Director | BE Civil . CMengNZ Cpeng

Email: rizwan@rnhconsult.com.au

Mobile: 04 49 529 551

Job No.: 5115014035 **Address:** Section 10 Clark Road, Orari Gorge, Geraldine, New Zealand **Date:** 8/17/2022

Latitude: -43.995803 **Longitude:** 171.189866 **Elevation:** 265.5 m

General Input

Roof Live Load	0.25 KPa	Roof Dead Load	0.25 KPa	Roof Live Point Load	1.1 Kn
Snow Zone	N4	Ground Snow Load	1.32 KPa	Roof Snow Load	0.92 KPa
Earthquake Zone	2	Subsoil Category	D	Exposure Zone	B
Importance Level	1	Ultimate wind & Earthquake ARI	100 Years	Max Height	4 m
Wind Region	NZ2	Terrain Category	2.12	Design Wind Speed	39.4 m/s
Wind Pressure	0.93 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 = -0.57

For roof CP,e from 0 m To 3.80 m Cpe = -0.9 pe = -0.67 KPa pnet = -1.26 KPa

For roof CP,e from 3.80 m To 7.60 m Cpe = -0.5 pe = -0.37 KPa pnet = -0.96 KPa

For wall Windward Cp,i = 0.65 side Wall Cp,i = -0.56

For wall Windward and Leeward CP,e from 0 m To 13.50 m Cpe = 0.7 pe = 0.59 KPa pnet = 1.16 KPa

For side wall CP,e from 0 m To 3.80 m Cpe = pe = -0.54 KPa pnet = 0.40 KPa

Maximum Upward pressure used in roof member Design = 1.26 KPa

Maximum Downward pressure used in roof member Design = 0.74 KPa

Maximum Wall pressure used in Design = 1.16 KPa

Maximum Racking pressure used in Design = 1 KPa

Design Summary

Purlin Design

Purlin Spacing = 900 mm Purlin Span = 4300 mm Try Purlin 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 K1 Medium term = 0.8 K1 Long term = 0.6 K4 =1 K5 =1 K8 Downward =1.00

K8 Upward =0.80 S1 Downward =11.27 S1 Upward =17.42

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

Capacity Checks

$M_{1.35D}$	0.7 Kn-m	Capacity	2.39 Kn-m	Passing Percentage	**341.43 %**
$M_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	2.54 Kn-m	Capacity	3.18 Kn-m	Passing Percentage	**125.20 %**
$M_{0.9D-WnUp}$	-2.15 Kn-m	Capacity	-3.18 Kn-m	Passing Percentage	**147.91 %**
$V_{1.35D}$	0.65 Kn	Capacity	9.65 Kn	Passing Percentage	**1484.62 %**
$V_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	2.36 Kn	Capacity	12.86 Kn	Passing Percentage	**544.92 %**
$V_{0.9D-WnUp}$	-2.00 Kn	Capacity	-16.08 Kn	Passing Percentage	**804.00 %**

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 = 9.01 mm	Limit by AS1170.0 Table C1 Span/250 = 17.20 mm
Deflection under Dead and Service Wind = 13.07 mm	Limit by AS1170.0 Table C1 Span/120 = 35.83 mm

Reactions

Maximum downward =2.36 kn Maximum upward = -2.00 kn

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

Rafter Design Internal

Internal Rafter Load Width = 4500 mm Internal Rafter Span = 3850 mm Try Rafter 2x300x50 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 K1 Medium term = 0.8 K1 Long term = 0.6 K4 =1 K5 =1 K8 Downward =1.00

K8 Upward =1.00 S1 Downward =6.81 S1 Upward =6.81

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

Capacity Checks

$M_{1.35D}$	2.81 Kn-m	Capacity	11.32 Kn-m	Passing Percentage	**402.85 %**
$M_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	10.17 Kn-m	Capacity	15.08 Kn-m	Passing Percentage	**148.28 %**
$M_{0.9D-WnUp}$	-8.63 Kn-m	Capacity	-18.86 Kn-m	Passing Percentage	**218.54 %**
$V_{1.35D}$	2.92 Kn	Capacity	28.94 Kn	Passing Percentage	**991.10 %**
$V_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	10.57 Kn	Capacity	38.6 Kn	Passing Percentage	**365.18 %**
$V_{0.9D-WnUp}$	-8.97 Kn	Capacity	-48.24 Kn	Passing Percentage	**537.79 %**

Deflections

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 3.335 mm	Limit by AS1170.0 Table C1 Span/250 = 16.00 mm
Deflection under Dead and Service Wind = 5.37 mm	Limit by AS1170.0 Table C1 Span/120 = 33.33 mm

Reactions

Maximum downward =10.57 kn Maximum upward = -8.97 kn

Rafter to Pole Connection check

Bolt Size = M12 Number of Bolts = 2

Calculations as per NZS 3603:1993 Amend 2005 clause 4.4

Joint Group for Rafters =J5 Joint Group for Pole = J5

Minimum Bolt edge, end and spacing for Load perpendicular to grains = 60 mm

Factor of Safety = 0.7

For Perpendicular to grain loading

K11 = 14.9 fpj = 12.9 Mpa for Rafter with effective thickness = 100 mm

For Parallel to grain loading

K11 = 2.0 fcj = 36.1 Mpa for Pole with effective thickness = 100 mm

Capacity under short term loads = 21.67 Kn > -8.97 Kn

Rafter Design External

External Rafter Load Width = 2250 mm External Rafter Span = 3805 mm Try Rafter 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 K1 Medium term = 0.8 K1 Long term = 0.6 K4 =1 K5 =1 K8 Downward =0.94

K8 Upward =0.94 S1 Downward =13.93 S1 Upward =13.93

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

Capacity Checks

$M_{1.35D}$	1.37 Kn-m	Capacity	4.72 Kn-m	Passing Percentage	**344.53 %**
$M_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	4.97 Kn-m	Capacity	6.30 Kn-m	Passing Percentage	**126.76 %**
$M_{0.9D-WnUp}$	-4.21 Kn-m	Capacity	-7.87 Kn-m	Passing Percentage	**186.94 %**
$V_{1.35D}$	1.44 Kn	Capacity	14.47 Kn	Passing Percentage	**1004.86 %**
$V_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	5.22 Kn	Capacity	19.30 Kn	Passing Percentage	**369.73 %**
$V_{0.9D-WnUp}$	-4.43 Kn	Capacity	-24.12 Kn	Passing Percentage	**544.47 %**

Deflections

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 3.70 mm	Limit by AS1170.0 Table C1 Span/250 = 16.00 mm
Deflection under Dead and Service Wind = 5.37 mm	Limit by AS1170.0 Table C1 Span/120 = 33.33 mm

Reactions

Maximum downward =5.22 kn Maximum upward = -4.43 kn

Rafter to Pole Connection check

Bolt Size = M12 Number of Bolts = 2

Calculations as per NZS 3603:1993 Amend 2005 clause 4.4

Joint Group for Rafters =J5 Joint Group for Pole = J5

Factor of Safety = 0.7

For Perpendicular to grain loading

K11 = 14.9 fpj = 12.9 Mpa for Rafter with effective thickness = 50 mm

For Parallel to grain loading

K11 = 2.0 fcj = 36.1 Mpa for Pole with effective thickness = 100 mm

Eccentric Load check

V = phi x k1 x k4 x k5 x fs x b x ds ..... (Eq 4.12) = -25.20 kn > -4.43 Kn

Single Shear Capacity under short term loads = -10.84 Kn > -4.43 Kn

Girt Design Front and Back

Girt's Spacing = 900 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

$M_{Wind+Snow}$	1.32 Kn-m	Capacity	1.41 Kn-m	Passing Percentage	**106.82 %**
$V_{0.9D-WnUp}$	1.17 Kn-m	Capacity	12.06 Kn-m	Passing Percentage	**1030.77 %**

Deflections

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

Deflection under Snow and Service Wind = 44.42 mm Limit by AS1170.0 Table C1 Span/120 = 37.50 mm

Sag during installation = 20.82 mm

Reactions

Maximum = 1.17 kn

Girt Design Sides

Girt's Spacing = 1300 mm Girt's Span = 4000 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 =0.65 S1 Downward =9.63 S1 Upward =20.31

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	1.54 Kn-m	Passing Percentage	**101.99 %**

$V_{0.9D-WnUp}$	1.51 Kn-m	Capacity	12.06 Kn-m	Passing Percentage	**798.68 %**

Deflections

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

Deflection under Snow and Service Wind = 40.06 mm Limit by AS1170.0 Table C1 Span/120 = 33.33 mm
Sag during installation =13.00 mm

Reactions

Maximum = 1.51 kn

Middle Pole Design

Geometry

150 SED H5 (Minimum 200 dia. at Floor Level)	Dry Use	Height	3500 mm
Area	31400 mm2	As	23550 mm2
Ix	78500000 mm4	Zx	785000 mm3
Iy	78500000 mm4	Zx	785000 mm3
Lateral Restraint	3500 mm c/c		

Loads

Total Area over Pole = 18 m2

Dead	4.50 Kn	Live	4.50 Kn
Wind	13.32 Kn	Snow	16.56 Kn
Moment wind	Kn-m	Moment snow	3.95 Kn-m
Phi	0.8	K8	0.79
K1 snow	0.8	K1 Dead	0.6
K1wind	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	358.05 Kn	PhiMnx Wind	18.05 Kn-m	PhiVnx Wind	55.77 Kn

PhiNcx Dead	214.83 Kn	PhiMnx Dead	10.83 Kn-m	PhiVnx Dead	33.46 Kn
PhiNcx Snow	286.44 Kn	PhiMnx Snow	14.44 Kn-m	PhiVnx Snow	44.61 Kn

Checks

(Mx/PhiMnx)+(N/phiNcx) = 0.58 < 1 OK

(Mx/PhiMnx)^2+(N/phiNcx) = 0.33 < 1 OK

Deflection at top under service lateral loads = 24.30 mm < 46.67 mm

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

Soil Properties

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

Geometry For Middle Bay Pole

Ds =	600 mm	Pile Diameter
L =	1400 mm	Pile embedment length
f1 =	3000 mm	Distance at which the shear force is applied
f2 =	0 mm	Distance of top soil at rest pressure

Loads

Moment Wind =	8.98 Kn-m	Moment Snow =	Kn-m
Shear Wind =	2.99 Kn	Shear Snow =	3.95 Kn

Pile Properties

Safety Factory	0.55	
Hu =	5.56 Kn	Ultimate Lateral Strength of the Pile, Short pile
Mu =	9.86 Kn-m	Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.91 < 1 OK

End Pole Design

Geometry For End Bay Pole

Ds =	600 mm	Pile Diameter
L =	1400 mm	Pile embedment length
f1 =	3000 mm	Distance at which the shear force is applied
f2 =	0 mm	Distance of top soil at rest pressure

Loads

Total Area over Pole = 4.5 m2

Moment Wind =	4.49 Kn-m	Moment Snow =	1.98 Kn-m
Shear Wind =	1.50 Kn	Shear Snow =	1.98 Kn

Pile Properties

Safety Factory	0.55	
Hu =	5.56 Kn	Ultimate Lateral Strength of the Pile, Short pile
Mu =	9.86 Kn-m	Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.46 < 1 OK

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

Soil Properties

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

Geometry For End Bay Pole

Ds =	600 mm	Pile Diameter
L =	1400 mm	Pile embedment length
f1 =	3000 mm	Distance at which the shear force is applied
f2 =	0 mm	Distance of top soil at rest pressure

Loads

Moment Wind =	4.49 Kn-m	Moment Snow =	1.98 Kn-m
Shear Wind =	1.50 Kn	Shear Snow =	1.98 Kn

Pile Properties

Safety Factory	0.55	
Hu =	5.56 Kn	Ultimate Lateral Strength of the Pile, Short pile
Mu =	9.86 Kn-m	Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.46 < 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

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(1400) x Ks(1.5) x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(1400)

Skin Friction = 15.83 Kn

Weight of Pile + Pile Skin Friction = 19.69 Kn

Uplift on one Pile = 18.63 Kn

Uplift is ok