Pole Shed App Ver 01 2022	
Job Number:	BWhite
Issue:	Consulting Ltd
PRODUCER STATEMENT-PS1-DESIGN	
ISSUED BY: BWhite Consulting Ltd (Design Engineer: Bevan White)	
TO BE SUPPLIED TO: Kaipara District Council IN RESPECT OF: Proposed NEW Farm S	hed
AT: 159 Redhill Cemetery Road, Te Kopuru 0371, New Zealand	
LEGAL DESCRIPTION	
We have been engaged by Ezequote Pty Ltd to provide Specific Structural Engineering Design the requirements of Clause(s) B1 of the Building Code for part only (as specified in the attachment the proposed building work.	-
☐ ALL	nd all connections
The design has been prepared in accordance with compliance documents to NZ Building Code iss Business, Innovation & Employment Clauses B1/VM1 and B1/VM4	ued by Ministry of
The proposed building work covered by the producer statement is described on Ezequote drawing MX & ATV CLUB and numbered A101-A110 Rev-1 dated 04/07/2024 together with the follow other documents set out in the schedule attached to this statement: Design Featured Report Date numbered "Second Page"	ing specfication, and
On behalf of BWhite Consulting Ltd, and subject to:	
 Site verification of the following design assumptions: an Ultimate foundation bearing presaccordance with NZS3604:2011 The building has a design life of 50 years and am Importance Level 1 Unless specifically noted, compliance of the drawings to None-Specific codes such as have not been checked by this practice This Certificate does not cover any other building code clause including weather tight Inspections of the building to be completed by Kaipara District Council. As BWhite Cundertaking inspections, we cannot issue a producer Statement-PS4- Construction Re This Producer Statement- Design is valid for a building consent issued within 1 year for All proprietary products meeting their performance specification requirements 	NZS3604 and NZS4229 ness Consulting Ltd are not view.
I believe on reasonable grounds that a) the building, if constructed in accordance with the draw other documents provided or listed in the attached schedule, will comply with the relevant provision and that b), the presons who have undertaken the design have the necessary competency to do so follow level of construction monitoring/observation:	ons of the Building Code
CM1 ☐ CM2 ☐ CM3 ☐ CM4 ☐ CM5 or as per agreement with owner/developer (stated)	above)
I, Bevan White am CPEng 108276 I am Member of Engineering New Zealand and hold the follo BE.Civil and holds a current policy of Professional Indemnity Insurance no less than \$200,000	wing qualification:
Signed by Bevan White on behalf of BWhite Consulting Ltd Dated: 04/07/2024	
Email: bwhitecpeng@gmail.com Phone: 0211-979786	

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.

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

Date: 04/07/2024 BWhite
Consulting Ltd

18B Jules Crescent,

Bell Block New Plymouth 4312

New Zealand File No:

DESIGN FEATURES SUMMARY FOR PROPOSED NEW FARM SHED 159 REDHILL CEMETERY ROAD, TE KOPURU 0371, 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	N0	Ground Snow Load	0 KPa	Roof Snow Load	0 KPa
Earthquake Zone	1	Subsoil Category	D	Exposure Zone	D
Importance Level	1	Ultimate wind & EQ ARI	100 Years	Max Height	4 m
Wind Region	NZ1	Terrain Category	2.0	Design Wind Speed	41.72 m/s
Wind Pressure	1.04 KPa	Lee Zone	NO	Ultimate Snow ARI	50 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
- AS/NZS 1170 2003 Structural Design Actions
- AS/NZS 1170.2 2021 Structural Design Actions-Wind Action
- Branz. "Engineering Basis of NZS 3604". April 2013

Yours Faithfully

BWhite CONSULTING LTD

Bevan White

Director | BE Civil . CMengNZ CPEng

Email: bwhitecpeng@gmail.com Contact: 0211 979 786

Job No.: DARGAVILLE MX & ATV Address: 159 Redhill Cemetery Road, Te Kopuru 0371, New Date: 04/07/2024

CLUB Zealand

Latitude: -36.069958 **Longitude:** 173.886787 **Elevation:** 69.5 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	D
Importance Level	1	Ultimate wind & Earthquake ARI	100 Years	Max Height	4 m
Wind Region	NZ1	Terrain Category	2.0	Design Wind Speed	41.72 m/s
Wind Pressure	1.04 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 Pressues

Shed Type = Mono Free

For roof Cp,i = -0.3

For roof CP,e from 0 m To 1.85 m Cpe = -0.9933 pe = -0.93 KPa pnet = -0.93 KPa

For roof CP,e from 1.85 m To 3.7 m Cpe = -0.8533 pe = -0.42 KPa pnet = -0.42 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 9 m $\,$ Cpe = 0.7 $\,$ pe = 0.66 KPa $\,$ pnet = 0.97 KPa

For side wall CP,e from 0 m To 3.70 m Cpe = pe = -0.61 KPa pnet = 0.61 KPa

Maximum Upward pressure used in roof member Design = $0.93~\mathrm{KPa}$

Maximum Downward pressure used in roof member Design = 0.40 KPa

Maximum Wall pressure used in Design = 0.97 KPa

Maximum Racking pressure used in Design = 0.565 KPa

Design Summary

Purlin Design

Purlin Spacing = 900 mm Purlin Span = 2850 mm Try Purlin 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 K1 Medium term = 0.8 K1 Long term = 0.6 K4 = 1 K5 = 1 K8 Downward = 1.00

K8 Upward =0.75 S1 Downward =10.36 S1 Upward =18.28

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

Capacity Checks

M0.9D-WnUp	-0.64 Kn-m	Capacity	-1.24 Kn-m	Passing Percentage	193.75 %
V _{1.35D}	0.43 Kn	Capacity	6.08 Kn	Passing Percentage	1413.95 %
V1.2D+1.5L 1.2D+Sn 1.2D+WnDn	0.90 Kn	Capacity	8.10 Kn	Passing Percentage	900.00 %
$V_{0.9 \mathrm{D-WnUp}}$	-0.90 Kn	Capacity	-10.13 Kn	Passing Percentage	1125.56 %

Deflections

Modulus of Elasticity = 6700 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 = 6.27 mm

Deflection under Dead and Service Wind = 7.31 mm

Limit by Woolcock et al, 1999 Span/240 = 11.67 mm Limit by Woolcock et al, 1999 Span/100 = 28.00 mm

Reactions

Maximum downward = 0.90 kn Maximum upward = -0.90 kn

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

Rafter Design Internal

Internal Rafter Load Width = 3000 mm

Internal Rafter Span = 5850 mm

Try Rafter 2x290x45 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 = 7.47 S1 Upward = 7.47

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

Capacity Checks

M1.35D	4.33 Kn-m	Capacity	8.48 Kn-m	Passing Percentage	195.84 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	8.98 Kn-m	Capacity	11.3 Kn-m	Passing Percentage	125.84 %
$M_{0.9D\text{-W}nUp}$	-9.05 Kn-m	Capacity	-14.12 Kn-m	Passing Percentage	156.02 %
$V_{1.35D}$	2.96 Kn	Capacity	25.18 Kn	Passing Percentage	850.68 %
$V_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	6.14 Kn	Capacity	33.58 Kn	Passing Percentage	546.91 %
$V_{0.9D\text{-W}nUp}$	-6.19 Kn	Capacity	-41.96 Kn	Passing Percentage	677.87 %

Deflections

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 13.84 mm

Deflection under Dead and Service Wind = 17.94 mm

Limit by Woolcock et al, 1999 Span/240 = 25.00 mm Limit by Woolcock et al, 1999 Span/100 = 60.00 mm

Reactions

Maximum downward = 6.14 kn Maximum upward = -6.19 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 = 90 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 = 19.50 Kn > -6.19 Kn

Rafter Design External

External Rafter Load Width = 1500 mm

External Rafter Span = 5830 mm

Try Rafter 290x45 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 = 0.89

K8 Upward =0.89 S1 Downward =15.23 S1 Upward =15.23

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

Capacity Checks

M1.35D	2.15 Kn-m	Capacity	3.78 Kn-m	Passing Percentage	175.81 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	4.46 Kn-m	Capacity	5.04 Kn-m	Passing Percentage	113.00 %
$M_{0.9D\text{-W}nUp}$	-4.49 Kn-m	Capacity	-6.29 Kn-m	Passing Percentage	140.09 %
V _{1.35D}	1.48 Kn	Capacity	12.59 Kn	Passing Percentage	850.68 %
V1.2D+1.5L 1.2D+Sn 1.2D+WnDn	3.06 Kn	Capacity	16.79 Kn	Passing Percentage	548.69 %
$ m V_{0.9D ext{-}WnUp}$	-3.08 Kn	Capacity	-20.98 Kn	Passing Percentage	681.17 %

Deflections

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 15.38 mm

Deflection under Dead and Service Wind = 17.94 mm

Limit by Woolcock et al, 1999 Span/240= 25.00 mm Limit by Woolcock et al, 1999 Span/100 = 60.00 mm

Reactions

Maximum downward = 3.06 kn Maximum upward = -3.08 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 = 45 mm

For Parallel to grain loading

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

Eccentric Load check

 $V = phi \times k1 \times k4 \times k5 \times fs \times b \times ds \dots (Eq 4.12) = -21.73 \text{ kn} > -3.08 \text{ Kn}$

Single Shear Capacity under short term loads = -9.75 Kn > -3.08 Kn

Girt Design Front and Back

Girt's Spacing = 0 mm Girt's Span = 1500 mm Try Girt SG8 Dry

Moisture Condition = Wet (Moisture in timber is less than 18% and timber does not remain in continuous wet condition after installation)

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

K8 Upward =NaN S1 Downward =NaN S1 Upward =NaN

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

Capacity Checks

$M_{Wind+Snow}$	0.00 Kn-m	Capacity	NaN Kn-m	Passing Percentage	NaN %
$ m V_{0.9D ext{-}WnUp}$	0.00 Kn	Capacity	0.00 Kn	Passing Percentage	NaN %

Deflections

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

Deflection under Snow and Service Wind = NaN mm

Limit by Woolcock et al, 1999 Span/100 = 15.00 mm

Sag during installation = NaN mm

Reactions

Maximum = 0.00 kn

Girt Design Sides

Girt's Spacing = 0 mm Girt's Span = 3000 mm Try Girt SG8 Dry

Moisture Condition = Wet (Moisture in timber is less than 18% and timber does not remain in continuous wet condition after installation)

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

K8 Upward =NaN S1 Downward =NaN S1 Upward =NaN

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

Capacity Checks

$M_{Wind+Snow}$	0.00 Kn-m	Capacity	NaN Kn-m	Passing Percentage	NaN %
$ m V_{0.9D ext{-}WnUp}$	0.00 Kn	Capacity	0.00 Kn	Passing Percentage	NaN %

Deflections

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

Deflection under Snow and Service Wind = NaN mm

Limit by Woolcock et al. 1999 Span/100 = 30.00 mm

Sag during installation = NaN mm

Reactions

Maximum = 0.00 kn

Middle Pole Design

Geometry

175 SED H5 (Minimum 200 dia. at Floor Level)	Dry Use	Height	3700 mm
Area	27598 mm2	As	20698.2421875 mm2
Ix	60639381 mm4	Zx	646820 mm3
Iy	60639381 mm4	Zx	646820 mm3
Lateral Restraint	1300 mm c/c		

Loads

Total Area over Pole = 9 m2

Dead	2.25 Kn	Live	2.25 Kn
Wind Down	3.60 Kn	Snow	0.00 Kn
Moment wind	5.07 Kn-m		
Phi	0.8	K8	1.00
K1 snow	0.8	K1 Dead	0.6
K1wind	1		

Material

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

Capacities

PhiNcx Wind	397.41 Kn	PhiMnx Wind	18.78 Kn-m	PhiVnx Wind	49.01 Kn
PhiNcx Dead	238.44 Kn	PhiMnx Dead	11.27 Kn-m	PhiVnx Dead	29.41 Kn

Checks

(Mx/PhiMnx)+(N/phiNcx) = 0.29 < 1 OK

 $(Mx/PhiMnx)^2+(N/phiNcx) = 0.09 < 1 OK$

Deflection at top under service lateral loads = 18.79 mm < 37.00 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 =	$(1-\sin(30)) / (1+\sin(30))$				

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 $Kp = \frac{(1+\sin(30))}{(1-\sin(30))}$

Geometry For Middle Bay Pole

Ds = 0.6 mm Pile Diameter

L = 1300 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

Pile Properties

Safety Factory 0.55

Hu = 4.55 Kn Ultimate Lateral Strength of the Pile, Short pile

Mu = 8.02 Kn-m Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.63 < 1 OK

End Pole Design

Geometry For End Bay Pole

Geometry

175 SED H5 (Minimum 200 dia. at Floor Level)	Dry Use	Height	3800 mm
Area	27598 mm2	As	20698.2421875 mm2
Ix	60639381 mm4	Zx	646820 mm3
Iy	60639381 mm4	Zx	646820 mm3

Lateral Restraint mm c/c

Loads

Total Area over Pole = 9 m^2

Dead	2.25 Kn	Live	2.25 Kn
Wind Down	3.60 Kn Snow		0.00 Kn
Moment Wind	2.54 Kn-m		
Phi	0.8	K8	0.66
K1 snow	0.8	K1 Dead	0.6
K1wind	1		

Material

Peeling	Steaming	Normal	Dry Use
fb =	36.3 MPa	$f_S =$	2.96 MPa
fc =	18 MPa	fip =	7.2 MPa
ft =	22 MPa	$\mathbf{E} =$	9257 MPa

Capacities

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PhiNex Wind	261.19 Kn	PhiMnx Wind	12.35 Kn-m	PhiVnx Wind	49.01 Kn
PhiNcx Dead	156.71 Kn	PhiMnx Dead	7.41 Kn-m	PhiVnx Dead	29.41 Kn

Checks

(Mx/PhiMnx)+(N/phiNcx) = 0.24 < 1 OK

 $(Mx/PhiMnx)^2+(N/phiNcx) = 0.07 < 1 \text{ OK}$

Deflection at top under service lateral loads = 10.13 mm < 39.90 mm

Ds = 0.6 mm Pile Diameter

L= 1300 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 = 9 m^2

Moment Wind = 2.54 Kn-m Shear Wind = 0.85 Kn

Pile Properties

Safety Factory 0.55

Hu = 4.55 Kn Ultimate Lateral Strength of the Pile, Short pile

Mu = 8.02 Kn-m Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.32 < 1 OK

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

Assumed Soil Properties

Gamma 18 Kn/m3 Friction angle 30 deg Cohesion 0 Kn/m3

 $K0 = \frac{(1-\sin(30)) / (1+\sin(30))}{Kp} = \frac{(1+\sin(30)) / (1-\sin(30))}{(1-\sin(30))}$

Geometry For End Bay Pole

Ds = 0.6 mm Pile Diameter

L= 1300 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 = 2.54 Kn-m Shear Wind = 0.85 Kn

Pile Properties

0.55

Safety Factory

Hu = 4.55 Kn Ultimate Lateral Strength of the Pile, Short pile

Mu = 8.02 Kn-m Ultimate Moment Capacity of Pile

Checks

Applied Forces/Capacities = 0.32 < 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(1300) x Ks(1.5) x 0.5 x tan(30) x Pi x Dia of Pile(0.6) x Height of Pile(1300)

Skin Friction = 13.65 Kn

Weight of Pile + Pile Skin Friction = 17.45 Kn

Uplift on one Pile = 6.35 Kn

Uplift is ok