Job Number:	<b>BWhite</b>
Issue:	BWhite Consulting Ltd
PRODUCER STATEMENT-PS1-DESIGN	
ISSUED BY: BWhite Consulting Ltd (Design Engineer: Bevan White)	
TO BE SUPPLIED TO: Waikato District Council IN RESPECT OF: Proposed NEW Farm Shed	
AT: 1574 Whaanga Road, Raglan, New Zealand	
LEGAL DESCRIPTION	
We have been engaged by <b>Ezequote Pty Ltd</b> to provide <b>Specific Structural Engineering Design</b> se requirements of Clause(s) <b>B1</b> of the Building Code for part only (as specified in the attachment to the building work.	
☐ ALL ☑ Part only as specified: Purlins, Rafters, Girts, Poles, Columns, Pole embedment and all	connections
The design has been prepared in accordance with compliance documents to NZ Building Code issue Innovation & Employment Clauses B1/VM1 and B1/VM4	ed by Ministry of Business,
The proposed building work covered by the producer statement is described on <b>Ezequote</b> drawings <b>Road Raglan</b> and numbered <b>A101-A01 REV-2</b> dated <b>11/13/2023</b> together with the following specific out in the schedule attached to this statement: <b>Design Featured Report Dated 11/16/2023 and num</b>	cation, and other documents so
On behalf of BWhite Consulting Ltd, and subject to:	
<ol> <li>Site verification of the following design assumptions: an Ultimate foundation bearing pressor with NZS3604:2011</li> <li>The building has a design life of 50 years and am Importance Level 1</li> <li>Unless specifically noted, compliance of the drawings to None-Specific codes such as NZS3 been checked by this practice</li> <li>This Certificate does not cover any other building code clause including weather tightness</li> <li>Inspections of the building to be completed by Waikato District Council. As BWhite Consuins pections, we cannot issue a producer Statement-PS4- Construction Review.</li> <li>This Producer Statement- Design is valid for a building consent issued within 1 year from</li> <li>All proprietary products meeting their performance specification requirements</li> </ol>	604 and NZS4229 have not lting Ltd are not undertaking
<b>I believe on reasonable grounds</b> that a) the building, if constructed in accordance with the drawings documents provided or listed in the attached schedule, will comply with the relevant provisions of the presons who have undertaken the design have the necessary competency to do so. I also reconconstruction monitoring/observation:	he Building Code and that b),
☑ CM1 ☐ CM2 ☐ CM3 ☐ CM4 ☐ CM5 or as per agreement with owner/developer (stated above	e)
I, Bevan White am CPEng 108276 I am Member of Engineering New Zealand and hold the following	qualification: BE.Civil
BWhite Consulting Ltd holds a current policy of Professional Indemnity Insurance no less than \$20	0,000.
Signed by <b>Bevan White</b> on behalf of <b>BWhite Consulting Ltd</b> Dated: 11/16/2023	
Email: bwhitecpeng@gmail.com Phone: 0211-979786	

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.

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

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

Date: 11/16/2023

BWhite

18B Jules Crescent,

Consulting Ltd

Bell Block New Plymouth 4312

New Zealand File No:

# DESIGN FEATURES SUMMARY FOR PROPOSED NEW FARM SHED 1574 WHAANGA ROAD, RAGLAN, 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	C
Importance Level	1	Ultimate wind & EQ ARI	100 Years	Max Height	4 m
Wind Region	NZ1	Terrain Category	2.31	Design Wind Speed	42.74 m/s
Wind Pressure	1.1 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

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Job No.: Kings - 1574 Address: 1574 Whaanga Road, Raglan, New Zealand Date: 11/16/2023

Whaanga Road Raglan

**Latitude:** -37.892689 **Longitude:** 174.775022 **Elevation:** 65.5 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	C
Importance Level	1	Ultimate wind & Earthquake ARI	100 Years	Max Height	4 m
Wind Region	NZ1	Terrain Category	2.31	Design Wind Speed	42.74 m/s
Wind Pressure	1.1 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 Open

For roof Cp, i = 0.4852

For roof CP,e from 0 m To 3.80 m Cpe = -0.9 pe = -0.75 KPa pnet = -1.20 KPa

For roof CP,e from 3.80 m To 7.60 m Cpe = -0.5 pe = -0.42 KPa pnet = -0.87 KPa

For wall Windward Cp, i = 0.4852 side Wall Cp, i = -0.6373

For wall Windward and Leeward CP,e from 0 m To 7.20 m Cpe = 0.7 pe = 0.69 KPa pnet = 1.39 KPa

For side wall CP,e from 0 m To 3.80 m Cpe = pe = -0.64 KPa pnet = 0.06 KPa

Maximum Upward pressure used in roof member Design = 1.20 KPa

Maximum Downward pressure used in roof member Design = 0.68 KPa

Maximum Wall pressure used in Design = 1.39 KPa

Maximum Racking pressure used in Design = 1.18 KPa

### **Design Summary**

### **Purlin Design**

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

K8 Upward =0.82 S1 Downward =9.63 S1 Upward =16.99

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

### **Capacity Checks**

$M_{1.35D}$	0.31 Kn-m	Capacity	1.26 Kn-m	Passing Percentage	406.45 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	1.06 Kn-m	Capacity	1.68 Kn-m	Passing Percentage	158.49 %
$M_{0.9D\text{-W}n\text{Up}}$	-0.89 Kn-m	Capacity	-1.71 Kn-m	Passing Percentage	192.13 %
$V_{1.35D}$	0.43 Kn	Capacity	7.24 Kn	Passing Percentage	1683.72 %
$V_{1.2D+1.5L\ 1.2D+Sn\ 1.2D+WnDn}$	1.26 Kn	Capacity	9.65 Kn	Passing Percentage	765.87 %
$ m V_{0.9D ext{-}WnUp}$	-1.25 Kn	Capacity	-12.06 Kn	Passing Percentage	964.80 %

#### **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 = 4.59 mm Limit by Woolcock et al, 1999 Span/240 = 11.67 mm Deflection under Dead and Service Wind = 6.42 mm Limit by Woolcock et al, 1999 Span/100 = 28.00 mm

### Reactions

Maximum downward = 1.26 kn Maximum upward = -1.25 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 = 3450 mm Try Rafter 2x200x50 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 = 5.33 S1 Upward = 5.33

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

### **Capacity Checks**

 M1.35D
 1.51 Kn-m
 Capacity
 4.48 Kn-m
 Passing Percentage
 296.69 %

 M1.2D+1.5L 1.2D+Sn 1.2D+WnDn
 4.37 Kn-m
 Capacity
 5.98 Kn-m
 Passing Percentage
 136.84 %

$M_{0.9D\text{-W}nUp}$	-4.35 Kn-m	Capacity	-7.46 Kn-m	Passing Percentage	171.49 %
V <sub>1.35D</sub>	1.75 Kn	Capacity	19.3 Kn	Passing Percentage	1102.86 %
V1.2D+1.5L 1.2D+Sn 1.2D+WnDn	5.07 Kn	Capacity	25.72 Kn	Passing Percentage	507.30 %
V <sub>0.9D-WnUp</sub>	-5.05 Kn	Capacity	-32.16 Kn	Passing Percentage	636.83 %

#### **Deflections**

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 4.92 mm Limit by Woolcock et al, 1999 Span/240 = 15.00 mm Deflection under Dead and Service Wind = 7.655 mm Limit by Woolcock et al, 1999 Span/100 = 36.00 mm

#### Reactions

Maximum downward = 5.07 kn Maximum upward = -5.05 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 > -5.05 Kn

### Rafter Design External

External Rafter Load Width = 1500 mm External Rafter Span = 3406 mm Try Rafter 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 = 1.00 S1 Downward = 11.27 S1 Upward = 11.27

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

### **Capacity Checks**

M1.35D	0.73 Kn-m	Capacity	2.23 Kn-m	Passing Percentage	305.48 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	2.13 Kn-m	Capacity	2.97 Kn-m	Passing Percentage	139.44 %
$M_{0.9D\text{-W}nUp}$	-2.12 Kn-m	Capacity	-3.72 Kn-m	Passing Percentage	175.47 %
V <sub>1.35D</sub>	0.86 Kn	Capacity	9.65 Kn	Passing Percentage	1122.09 %
V <sub>1.2D+1.5L</sub> 1.2D+Sn 1.2D+WnDn	2.50 Kn	Capacity	12.86 Kn	Passing Percentage	514.40 %
$ m V_{0.9D ext{-}WnUp}$	-2.49 Kn	Capacity	-16.08 Kn	Passing Percentage	645.78 %

#### **Deflections**

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 5.47 mm

Limit by Woolcock et al, 1999 Span/240= 15.00 mm

Deflection under Dead and Service Wind = 7.65 mm

Limit by Woolcock et al, 1999 Span/100 = 36.00 mm

#### Reactions

Maximum downward = 2.50 kn Maximum upward = -2.49 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) = -14.70 kn > -2.49 Kn

Single Shear Capacity under short term loads = -10.84 Kn > -2.49 Kn

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### **Girt Design Front and Back**

Girt's Spacing = 800 mm Girt's Span = 3000 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 =0.79 S1 Downward =9.63 S1 Upward =17.59

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

#### **Capacity Checks**

Mwind+Snow 1.25 Kn-m Capacity 1.65 Kn-m Passing Percentage 132.00 % V<sub>0.9D-WnUp</sub> 1.67 Kn-m Capacity 12.06 Kn-m Passing Percentage 722.16 %

#### **Deflections**

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

Deflection under Snow and Service Wind = 12.45 mm Limit by Woolcock et al, 1999 Span/100 = 30.00 mm Sag during installation = 4.91 mm

#### Reactions

Maximum = 1.67 kn

### **Girt Design Sides**

Girt's Spacing = 800 mm Girt's Span = 3600 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 =0.95 S1 Downward =9.63 S1 Upward =13.62

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

#### **Capacity Checks**

Mwind+Snow 1.80 Kn-m Capacity 1.99 Kn-m Passing Percentage 110.56 % V<sub>0.9D-WnUp</sub> 2.00 Kn-m Capacity 12.06 Kn-m Passing Percentage 603.00 %

#### **Deflections**

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

Deflection under Snow and Service Wind = 25.81 mm Limit by Woolcock et al. 1999 Span/100 = 36.00 mm Sag during installation = 10.18 mm

#### Reactions

Maximum = 2.00 kn

### Middle Pole Design

### 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	1300 mm c/c		

#### Loads

Total Area over Pole =  $10.8 \text{ m}^2$ 

Dead	2.70 Kn	Live	2.70 Kn
Wind Down	7.34 Kn	Snow	0.00 Kn
Moment wind	7.06 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) = 0.41 < 1 OK

 $(Mx/PhiMnx)^2 + (N/phiNcx) = 0.17 < 1 OK$ 

Deflection at top under service lateral loads = 26.87 mm < 38.00 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

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

#### 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

Moment Wind = 7.06 Kn-m Shear Wind = 2.35 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 = 0.88 < 1 OK

### **End Pole Design**

### **Geometry For End Bay Pole**

#### Geometry

150 SED H5 (Minimum 175 dia. at Floor Level) Dry Use Height 3800 mm

Area	20729 mm2	As	15546.6796875 mm2
Ix	34210793 mm4	Zx	421056 mm3
Iy	34210793 mm4	Zx	421056 mm3
Lateral Restraint	mm c/c		

#### Loads

Total Area over Pole =  $5.4 \text{ m}^2$ 

Dead	1.35 Kn	Live	1.35 Kn
Wind Down	3.67 Kn	Snow	0.00 Kn
Moment Wind	3.53 Kn-m		
Phi	0.8	K8	0.52
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

PhiNex Wind	154.24 Kn	PhiMnx Wind	6.32 Kn-m	PhiVnx Wind	36.81 Kn
PhiNcx Dead	92.55 Kn	PhiMnx Dead	3.79 Kn-m	PhiVnx Dead	22.09 Kn

#### Checks

(Mx/PhiMnx)+(N/phiNcx) = 0.60 < 1 OK

 $(Mx/PhiMnx)^2+(N/phiNcx) = 0.35 < 1 \text{ OK}$ 

Deflection at top under service lateral loads = 25.00 mm < 39.90 mm

$D_S =$	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 =  $5.4 \text{ m}^2$ 

Moment Wind = 3.53 Kn-m Shear Wind = 1.18 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 = 0.44 < 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

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

### **Geometry For End Bay Pole**

 $D_S = 0.6 \text{ mm}$  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 = 3.53 Kn-m Shear Wind = 1.18 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 = 0.44 < 1 OK

# **Uplift Check**

Density of Concrete = 24 Kn/m<sup>3</sup>

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 = 10.53 Kn

Uplift is ok