Job Number:	BWhite
Issue:	Consulting Ltd
PRODUCER STATEMENT-PS1-DESIGN	
ISSUED BY: BWhite Consulting Ltd (Design Engineer: Bevan White)	
TO BE SUPPLIED TO: Selwyn District Council IN RESPECT OF: Proposed NEW Farm Shed	
AT: 184 Adams Road, West Melton, New Zealand	
LEGAL DES CRIPTION	
We have been engaged by <b>Ezequote Pty Ltd</b> to provide <b>Specific Structural Engineering Design</b> s requirements of Clause(s) <b>B1</b> of the Building Code for part only (as specified in the attachment to t building work.	
☐ ALL ☑ Part only as specified: Purlins, Rafters, Girts, Poles, Columns, Pole embedment and a	ll connections
The design has been prepared in accordance with compliance documents to NZ Building Code is sufficient to SZ Building Code is sufficient to S	ued by Ministry of Business,
The proposed building work covered by the producer statement is described on <b>Ezequote</b> drawing: A101-A112 REV-1 dated 10/31/2023 together with the following specification, and other documen attached to this statement: <b>Design Featured Report Dated 11/7/2023 and numbered "Second Page</b> "	nts set out in the schedule
On behalf of BWhite Consulting Ltd, and subject to:	
<ol> <li>Site verification of the following design assumptions: an Ultimate foundation bearing press 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 NZS been checked by this practice</li> <li>This Certificate does not cover any other building code clause including weather tightnes</li> <li>Inspections of the building to be completed by Selwyn District Council. As BWhite Consu inspections, 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 fron</li> <li>All proprietary products meeting their performance specification requirements</li> </ol>	33604 and NZS4229 have not s lting Ltd are not undertaking
<b>I believe on reasonable grounds</b> that a) the building, if constructed in accordance with the drawing 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 reco construction monitoring/observation:	the Building Code and that b),
☑ CM1 ☐ CM2 ☐ CM3 ☐ CM4 ☐ CM5 or as per agreement with owner/developer (stated abo	ove)
I, Bevan White am CPEng 108276 I am Member of Engineering New Zealand and hold the following	ng qualification: BECivil
BWhite Consulting Ltd holds a current policy of Professional Indemnity Insurance no less than \$2	00,000.
Signed by Bevan White on behalf of BWhite Consulting Ltd Dated: 11/7/2023	
Email: bwhitecneng@gmail.com Phone: 0211-979786	

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 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,

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

Date: 11/7/2023

BWhite

18B Jules Crescent,

Consulting Ltd

Bell Block New Plymouth 4312

New Zealand File No:

# DESIGN FEATURES SUMMARY FOR PROPOSED NEW FARM SHED 184 ADAMS ROAD, WEST MELTON, 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	0.9 KPa	Roof Snow Load	0.63 KPa
Earthquake Zone	2	Subsoil Category	D	Exposure Zone	В
Importance Level	1	Ultimate wind & EQ ARI	100 Years	Max Height	4.163 m
Wind Region	NZ2	Terrain Category	2.0	Design Wind Speed	38.22 m/s
Wind Pressure	0.88 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.: West Melton Address: 184 Adams Road, West Melton, New Date: 11/7/2023

Zealand

**Latitude:** -43.503675 **Longitude:** 172.396426 **Elevation:** 85 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	0.9 KPa	Roof Snow Load	0.63 KPa
Earthquake Zone	2	Subsoil Category	D	Exposure Zone	В
Importance Level	1	Ultimate wind & Earthquake ARI	100 Years	Max Height	4.163 m
Wind Region	NZ2	Terrain Category	2.0	Design Wind Speed	38.22 m/s
Wind Pressure	0.88 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 Enclosed

For roof Cp, i = -0.3

For roof CP,e from 0 m To 4.16 m Cpe = -0.9 pe = -0.71 KPa pnet = -0.71 KPa

For roof CP,e from 4.16 m To 8.33 m Cpe = -0.5 pe = -0.39 KPa pnet = -0.39 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 8.40 m Cpe = 0.7 pe = 0.55 KPa pnet = 0.81 KPa

For side wall CP,e from 0 m To 4.16 m Cpe = pe = -0.51 KPa pnet = -0.51 KPa

Maximum Upward pressure used in roof member Design = 0.71 KPa

Maximum Downward pressure used in roof member Design = 0.42 KPa

Maximum Wall pressure used in Design = 0.81 KPa

Maximum Racking pressure used in Design = 0.79 KPa

### **Design Summary**

# **Purlin Design**

Purlin Spacing = 900 mm Purlin Span = 4050 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 =0.50 S1 Downward =11.27 S1 Upward =23.76

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

# **Capacity Checks**

M1.35D	0.62 Kn-m	Capacity	2.23 Kn-m	Passing Percentage	359.68 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	1.72 Kn-m	Capacity	2.97 Kn-m	Passing Percentage	172.67 %
$M_{0.9D\text{-W}nUp}$	-0.89 Kn-m	Capacity	-1.87 Kn-m	Passing Percentage	210.11 %
V <sub>1.35D</sub>	0.62 Kn	Capacity	9.65 Kn	Passing Percentage	1556.45 %
V <sub>1.2D+1.5L</sub> 1.2D+Sn 1.2D+WnDn	1.69 Kn	Capacity	12.86 Kn	Passing Percentage	760.95 %
$ m V_{0.9D ext{-}WnUp}$	-0.88 Kn	Capacity	-16.08 Kn	Passing Percentage	1827.27 %

#### **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 = 8.06 mm Limit by Woolcock et al, 1999 Span/240 = 16.67 mm Deflection under Dead and Service Wind = 9.54 mm Limit by Woolcock et al, 1999 Span/100 = 40.00 mm

# Reactions

Maximum downward = 1.69 kn Maximum upward = -0.88 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 = 4200 mm Internal Rafter Span = 4050 mm Try Rafter 2x250x50 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 = 6.13 S1 Upward = 6.13

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

### **Capacity Checks**

M1.35D	2.91 Kn-m	Capacity	7 Kn-m	Passing Percentage	240.55 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	8.01 Kn-m	Capacity	9.34 Kn-m	Passing Percentage	116.60 %

$M_{0.9D ext{-W}nUp}$	-4.18 Kn-m	Capacity	-11.66 Kn-m	Passing Percentage	278.95 %
V <sub>1.35D</sub>	2.87 Kn	Capacity	24.12 Kn	Passing Percentage	840.42 %
V1.2D+1.5L 1.2D+Sn 1.2D+WnDn	7.91 Kn	Capacity	32.16 Kn	Passing Percentage	406.57 %
$ m V_{0.9D ext{-}WnUp}$	-4.12 Kn	Capacity	-40.2 Kn	Passing Percentage	975.73 %

### **Deflections**

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 6.535 mm Limit by Woolcock et al, 1999 Span/240 = 17.50 mm Deflection under Dead and Service Wind = 8.59 mm Limit by Woolcock et al, 1999 Span/100 = 42.00 mm

#### Reactions

Maximum downward = 7.91 kn Maximum upward = -4.12 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 > -4.12 Kn

# Rafter Design External

External Rafter Load Width = 2100 mm External Rafter Span = 4148 mm Try Rafter 250x50 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 = 0.97

K8 Upward =0.97 S1 Downward =12.68 S1 Upward =12.68

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

### **Capacity Checks**

M <sub>1.35D</sub>	1.52 Kn-m	Capacity	3.40 Kn-m	Passing Percentage	223.68 %
M1.2D+1.5L 1.2D+Sn 1.2D+WnDn	4.20 Kn-m	Capacity	4.53 Kn-m	Passing Percentage	107.86 %
$M_{0.9D\text{-W}nUp}$	-2.19 Kn-m	Capacity	-5.67 Kn-m	Passing Percentage	258.90 %
V <sub>1.35D</sub>	1.47 Kn	Capacity	12.06 Kn	Passing Percentage	820.41 %
V1.2D+1.5L 1.2D+Sn 1.2D+WnDn	4.05 Kn	Capacity	16.08 Kn	Passing Percentage	397.04 %
$ m V_{0.9D ext{-}WnUp}$	-2.11 Kn	Capacity	-20.10 Kn	Passing Percentage	952.61 %

### **Deflections**

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

k2 for Long Term Loads = 2

Deflection under Dead and Live Load = 7.26 mm

Limit by Woolcock et al, 1999 Span/240= 17.50 mm

Deflection under Dead and Service Wind = 8.59 mm

Limit by Woolcock et al, 1999 Span/100 = 42.00 mm

### Reactions

Maximum downward = 4.05 kn Maximum upward = -2.11 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) = -19.95 kn > -2.11 Kn

Single Shear Capacity under short term loads = -10.84 Kn > -2.11 Kn

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# **Girt Design Front and Back**

Girt's Spacing = 650 mm Girt's Span = 4200 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 =0.63 S1 Downward =9.63 S1 Upward =20.81

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

### **Capacity Checks**

Mwind+snow 1.16 Kn-m Capacity 1.32 Kn-m Passing Percentage 113.79 % V<sub>0.9D-WnUp</sub> 1.11 Kn-m Capacity 12.06 Kn-m Passing Percentage 1086.49 %

#### **Deflections**

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

Deflection under Snow and Service Wind = 40.25 mm Limit by Woolcock et al, 1999 Span/100 = 42.00 mm Sag during installation = 18.87 mm

### Reactions

Maximum = 1.11 kn

# **Girt Design Sides**

Girt's Spacing = 650 mm Girt's Span = 4200 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 = 0.63 S1 Downward = 9.63 S1 Upward = 20.81

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

### **Capacity Checks**

Mwind+Snow 1.16 Kn-m Capacity 1.32 Kn-m Passing Percentage 113.79 % Vo.9D-WnUp 1.11 Kn-m Capacity 12.06 Kn-m Passing Percentage 1086.49 %

#### **Deflections**

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

Deflection under Snow and Service Wind = 40.25 mm Limit by Woolcock et al. 1999 Span/100 = 42.00 mm Sag during installation = 18.87 mm

### Reactions

Maximum = 1.11 kn

# Middle Pole Design

# Geometry

175 SED H5 (Minimum 200 dia. at Floor Level	Dry Use	Height	4475 mm
Area	27598 mm2	As	20698.2421875 mm2
Ix	60639381 mm4	Zx	646820 mm3
Iy	60639381 mm4	Zx	646820 mm3
Lateral Restraint	3400 mm c/c		

# Loads

Total Area over Pole =  $17.64 \text{ m}^2$ 

Dead	4.41 Kn	Live	4.41 Kn
Wind Down	7.41 Kn	Snow	11.11 Kn
Moment wind	7.17 Kn-m	Moment snow	2.62 Kn-m
Phi	0.8	K8	0.76
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	302.65 Kn	PhiMnx Wind	14.30 Kn-m	PhiVnx Wind	49.01 Kn
PhiNex Dead	181.59 Kn	PhiMnx Dead	8.58 Kn-m	PhiVnx Dead	29.41 Kn
PhiNcx Snow	242.12 Kn	PhiMnx Snow	11.44 Kn-m	PhiVnx Snow	39.21 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 = 33.43 mm < 44.75 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

fl = 3122 mm Distance at which the shear force is applied

f2 = 0 mm Distance of top soil at rest pressure

### Loads

Moment Wind = 7.17 Kn-m Moment Snow = Kn-m Shear Wind = 2.30 Kn Shear Snow = 2.62 Kn

#### Pile Properties

Safety Factory 0.55

Hu = 4.43 Kn Ultimate Lateral Strength of the Pile, Short pile

Mu = 8.09 Kn-m Ultimate Moment Capacity of Pile

# Checks

Applied Forces/Capacities = 0.89 < 1 OK

# **End Pole Design**

# **Geometry For End Bay Pole**

### Geometry

150 SED H5 (Minimum 175 dia. at Floor Level) Dry Use Height 3913 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 =  $8.82 \text{ m}^2$ 

Dead	2.21 Kn	Live	2.21 Kn
Wind Down	3.70 Kn	Snow	5.56 Kn
Moment Wind	3.58 Kn-m	Moment snow	1.31 Kn-m
Phi	0.8	K8	0.49
K1 snow	0.8	K1 Dead	0.6
K1 wind	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	146.43 Kn	PhiMnx Wind	6.00 Kn-m	PhiVnx Wind	36.81 Kn
PhiNex Dead	87.86 Kn	PhiMnx Dead	3.60 Kn-m	PhiVnx Dead	22.09 Kn
PhiNcx Snow	117.14 Kn	PhiMnx Snow	4.80 Kn-m	PhiVnx Snow	29.45 Kn

# Checks

(Mx/PhiMnx)+(N/phiNcx) = 0.68 < 1 OK

 $(Mx/PhiMnx)^2+(N/phiNcx) = 0.43 < 1 \text{ OK}$ 

Deflection at top under service lateral loads = 27.50 mm < 41.53 mm

Ds =	0.6 mm	Pile Diameter
L=	1300 mm	Pile embedment length
f1 =	3122 mm	Distance at which the shear force is applied
f2 =	0 mm	Distance of top soil at rest pressure

### Loads

Total Area over Pole =  $8.82 \text{ m}^2$ 

Moment Wind = 3.58 Kn-m Moment Snow = 1.31 Kn-m Shear Wind = 1.15 Kn Shear Snow = 1.31 Kn

### **Pile Properties**

Safety Factory 0.55

Hu = 4.43 Kn Ultimate Lateral Strength of the Pile, Short pile

Mu = 8.09 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**

Ds = 0.6 mm Pile Diameter

L= 1300 mm Pile embedment length

f1 = 3122 mm Distance at which the shear force is applied

f2 = 0 mm Distance of top soil at rest pressure

### Loads

Moment Wind = 3.58 Kn-m Moment Snow = 1.31 Kn-m Shear Wind = 1.15 Kn Shear Snow = 1.31 Kn

### **Pile Properties**

Safety Factory 0.55

Hu = 4.43 Kn Ultimate Lateral Strength of the Pile, Short pile

Mu = 8.09 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 = 8.56 Kn

Uplift is ok