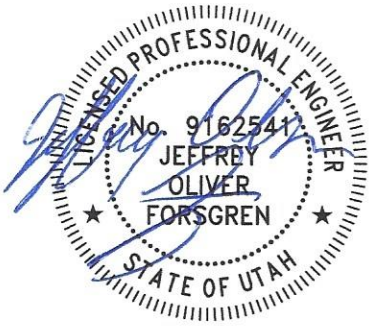
LYONEL GAMMON POLE BUILDING
DETAILS & CALCULATIONS

for

BarnWerx
1678 South 1900 West
Ogden, Utah 84401



Date: 5 JUNE 2022

F3 Engineering

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Project: Lyonel Gammon Pole Building		Project No.:
Design: J. Forsgren		
Date: *6/5/2022*	*Sheet:*	*of*

DESIGN CRITERIA

Structure Type: Wood, Concrete

Design Codes: 2018 IBC, Risk Category I

Dead Loads:

3	psf for	Roof Structure
N/A	psf for	Floor Structure
3	psf for	Walls
N/A	psf for	Brick Veneer
N/A	psf for	Deck/Porch

Snow Loads:

Pg: 43 Ce: 0.9 Ct: 1.1 I: 0.8
Cs: 0.85

Ps=> (Pg*Cs*Ce*Ct*I*0.7)
Ps*= 30 psf

Seismic Loads:

Sd: 81.0% Dsgn Cat: D I: 1 Site Class: D
R: 7 (SW) Bldg Height (ft): 26.75 ft.
R: 1.5 (Cant Col.)

Wind Loads:

Exposure: C I: 0.87 Wind (3 sec. Gust): 120 mph

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FOUNDATION CRITERIA

Soil Report:	Not Available
By:	Not Available
Date of Report:	Not Available
Proj No. of Report:	Not Available
Foundation Type:	Conc. Piers
Bearing Pressure:	Qa = 1500 psf (Assumed)
Minium Depth: Below:	See Plans Exterior Finished Grade
Lateral Design Pressure:	Yp = 533 pcf (Assumed, 200 psf x 2 for allowable movement + 33% wind/siesmic)
Coeff. of Friction:	0.4 alone 0.3 with passive
Active Pressure:	Ya = 35 pcf (Assumed)

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MATERIAL SPECIFICATIONS FOR
REINFORCING STEEL, CONCRETE AND MASONRY

Reinforcing Steel: ASTM A615, Grade 60
ASTM A706, Grade 60 Weldable Rebar

Welded Wire Fabric: ASTM A185

Concrete Strengths: (Strength)

Footings:	3000	psi
Grade Beams:	n/a	psi
Piles:	n/a	psi
Caissons:	n/a	psi
Slabs on Grade:	3500	psi
Structural Slabs:	n/a	psi
Columns:	n/a	psi
Walls:	n/a	psi

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MATERIAL SPECIFICATIONS FOR WOOD FRAMING

Sawn Lumber: Douglas Fir Larch (North)

2 x 6 studs up to 12' 0" long:	Stud Grade
Other Studs:	Grade #2
Posts:	Grade #2
Joists:	Grade #2
Beams:	Grade #2
Headers:	Grade #2
Subpurlins:	Grade #2
Purlins:	Grade #2

Framing Hardware: Simpson Strong-Tie Connectors

Structural Nails: Common Wire Type or Galvanized Box

Bolts in Wood: ASTM A307 or better

Prefabricated Wood Joists: RE: Plan

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Bending Capacities of Douglas Fir Larch (North):

2 X 10's					
Headers			Joists		
Snow Loads	1075	psi	Snow Loads	1237	psi
Normal Loads	935	psi	Normal Loads	1075	psi
2 X 12's					
Headers			Joists		
Snow Loads	978	psi	Snow Loads	1124	psi
Normal Loads	850	psi	Normal Loads	978	psi
Glu Laminated Members					
24F-V4, 24F-V8					
Snow Loads	2760	psi			
Normal Loads	2400	psi			

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Tables & Load Sumations

110	Design Wind Pressures							
	A	B	C	D	E	F	G	H
15	24.1	-8	16	-4.6	-23.1	-15.1	-16	-11.5
20	26.6	-7	17.1	-3.9	-23.1	-16	-16	-12.2
25	24.1	3.9	17.4	4	-10.7	-14.6	-7.7	-11.7
30	21.6	14.8	17.2	11.8	8.3	-6.5	7.2	-4.6

120	Design Wind Pressures							
	A	B	C	D	E	F	G	H
15	28.7	-9.5	19.1	-5.4	-27.4	-17.9	-19.1	-13.7
20	31.6	-8.3	21.1	-4.6	-27.4	-19.1	-19.1	-14.5
25	28.6	4.6	20.7	4.7	-12.7	-17.3	-9.2	-13.9
30	25.7	17.6	20.4	14	9.9	-15.6	8.6	-13.4

150	Design Wind Pressures							
	A	B	C	D	E	F	G	H
15	44.8	-14.9	29.8	-8.5	-42.9	-28	-29.8	-21.4
20	49.4	-13	32.9	-7.2	-42.9	-29.8	-29.8	-22.6
25	44.8	7.2	32.4	7.4	-19.9	-27.1	-14.4	-21.8
30	40.1	27.4	31.9	22	15.4	-24.4	13.4	-20.9

110	24.10	-8.00	16.00	-4.60	-23.10	-15.10	-16.00	-11.50
120	28.70	-9.50	19.10	-5.40	-27.40	-17.90	-19.10	-13.70
150	44.80	-14.90	29.80	-8.50	-42.90	-28.00	-29.80	-21.40

Applic. Press. For 120 mph gust

	28.70	-9.50	19.10	-5.40	-27.40	-17.90	-19.10	-13.70
Ps'=	22.47	-7.44	14.96	-4.23	-21.45	-14.02	-14.96	-10.73

Calc'd Zone Areas (sf)

	A	B	C	D	E	F	G	H
Transverse	186	93	742	371	209	209	835	835
Longitudinal	115	-	490	-	209	209	835	835

Calc'd Zone Loads (lbs)

	A	B	C	D	E	F	G	H
Transverse	4171	-690	11103	-1570	-4480	-2926	-12491	-8959
Longitudinal	2589	-	7322	-	-4480	-2926	-12491	-8959

Project:	Lyonel Gammon Pole Building
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Location: 267 South 7900 West Warren, Utah

Building Size: 70' X 120' Pole Barn

Traverse Length	70	Feet
Long Length	120	Feet
Eave Height	15	Feet
Space Between Columns	12	Feet
Ridge Height	26.75	Feet
Roof Pitch	4	
Column Spacing	12	Feet
Column Count	34	
Column Width	6	inches
Column Depth	8	inches

Wind:

Wind Speed Requirement	120
Wind Exposure	C

Siesmic:

Sms	1.22
Sm1	0.64
Sds	0.81
Sdc	D

Snow Load:

Ground	43
Roof	30

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Earthquake Loading Calculations

V=	**(SDS)(Fa)(W)(2/3)/R**	*Seismic Base Shear*
SDS=	(2/3)SMS	*Design Spectral Responce Acceleration*
SMS=	Fa(SS)	*Max Considered Spectral Responce Acceleration*
SS=	0.810	*Short Period Spectral Acceleration*
S1=	0.64	*1 Second Period Spectral Acceleration*
Fa=	1.00	*Site Coefficient for Short Period Acceleration*
	D	*Site Class (Assumed if no Soils Report)*
	D	*Seismic Design Category*
	No	*Soils Investigation Required?*

Diaphram Description **70' X 120' Pole Barn**

Wall DL	3	*psf*	
Floor DL	0	*psf*	
Roof DL	3	*psf*	
Roof SL	0	*psf*	*(Applicable Portion)*

Cantilever System

Traverse Dimension (w)	70	*ft*	
Long. dimension (L)	120	*ft*	
Eave Height	15	*ft*	
R=	1.5	*RMC*	
V=	0.3600	*(W)*	
E*.07=	0.252	*(W)*	
V=	**10660**	*lbs. @ base Total*	
V=	**8505**	*lbs. @ top Total*	

Shear Wall System

Traverse Dimension (w)	70	*ft*
Long. dimension (L)	120	*ft*
Eave Height	15	*ft*
R=	7.0	*RMC*
V=	0.0771	*(W)*
E*0.7=	0.054	*(W)*
V=	**1142**	*lbs. @ base*
V=	**911**	*lbs. @ top*

Basic Load Combinations
(Engineer may compare w/ NDS factors)

Ea.Col		
Col Trib	12	ft
Col Trip Roof	420	sq ft
Roof Snow	30	psf

	Axial	Moment
D+S	13860	0
D+.7E	1260	3752
D+.75(.7E)+.75S	10710	2814

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Seismic Cantilever System

No. Columns	34	
Col Ht	15	ft (Eave Ht. - 1 ft)
Col Depth	8	in
Col. Width	6	in
Col Area	48	si
Col. F'b	960	*psi*
Col 'E	1280000	*psi*
Col F'c	800	psi
Col Sx	64	

Mom Ea Col	3752	*lb*ft*
Axial Load	1260	lbs, Ea Column

fb	704	psi	
fc	26	psi	
c	0.8		
Fce	2078	psi	
Cp	0.904		
F'c	723	psi	
ratio	0.744		
Check	OK	*See Shear Wall*	

Allowable Lat. Load	533	psf	
S3	1844	psf	
S	1844	psf	(match S3)
Provide	2.5	ft Wide Pier	
Provide	3.5	*ft Deep Pier*	

Seismic Shear Wall System

Width Total	70	ft
Length Total	120.0	*ft*
Allowable Shear	100	plf
Width Allow Total	*7000*	lbs
Length Allowable Total	*12000*	*lbs*
Check Width	OK	
Check Length	OK	

Column Uplift

Column Ht	15	ft
Shear Wall Width	12.0	*ft*
Design Shear	911	lbs.
Total Uplift	*1139.06*	lbs
Pier Diameter	*2.5*	*ft*
Requ'd Pier Depth	1.5	ft

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Diaphram Description **70' X 120' Pole Barn**

Wind Loading Calculations

Wind Speed	120	*mph, 3 sec. gust*
Exposure	C	
Risk	0.87	
Kz	0.90	
Topo Factor (Kzt)	1.00	

Traverse Dimension (w)	70	*ft*
Long. dimension (L)	120	*ft*
Ridge Hieght	27	*ft*
Eave Hieght	15	*ft*
Roof Rise	4	*ft*
Roof Run	12	*ft*
Roof Slope	18.4	degrees

	Long.	Gable	
sum Ps=	**6,507**	**4,955**	Base Ea Wall
sum Ps=	**2,689**	**2,180**	Top Ea Wall
	Uplift	**-24**	plf

Basic Load Combonations
(Engineer may compare w/ NDS factors)

Roof DL	3	psf
Col Trib (Spacing)	12	ft
Col Trib Roof	420	sq ft
Roof Snow	30	psf

	Axial	Moment
D+S	13860	0
D+0.6*W	1260	664
D+(0.6*).75W+.75S	10710	498

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Wind Cantilever System

No. Columns	34	
Col Ht	14	ft (Eave Ht. - 1 ft.)
Col Depth	8	in
Col. Width	6	in
Col Area	48	si
Col. F'b	960	*psi*
Col 'E	1280000	*psi*
Col F'c	800	psi

Mom Ea Col Trav	4205	*lb*ft wind only*
Mom Ea Col Long	2897	*lb*ft wind only*

Col Sx/y Trav	48
Req'd Sx/y Trav	53
Col Sx/y Long	64
Req'd Sx/y Long	36

Axial Load	1260	lbs, Ea Column
Moment	664	lb*ft Ea Column

fb	125	psi
fc	26	psi
c	0.8	
Fce	2386	psi
Cp	0.918	
F'c	735	psi

ratio	0.132
check	OK

Wind Shear Wall System

Shear Walls		
Width Total	70	ft
Length Total	120.0	*ft*
Allowable Shear	100	plf
Wind Factor	1.4	
Width Allow Total	*9800*	lbs
Length Allowable Total	*16800*	*lbs*
Check Width	OK	
Check Length	OK	

Column Uplift

Column Ht	14	ft
Shear Wall Width	12.0	*ft*
Design Shear	2689	lbs.
Total Uplift	*269*	lbs
Pier Diameter	*2.5*	*ft*
Requ'd Pier Depth	0.4	ft

(See Cantilever System)

Allowable Lat. Load	533	psf
S3	776	psf
S	776	psf
Provide	2.5	ft Wide Pier
Provide	1.5	*ft Deep Pier*

Assumed Allow. Bearing Press	1500	psf
Depth	3	ft
Soil Density	120	pcf
Allow. End Bearing @ Depth	1860	psf
Controlling Axial Load	13,860	*lbs*
Pier Dia Req'd	3.1	*ft*

* Footing depth must meet local area frost requirements refer to drawing for depth.

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BEAM #2, ROOF PERLINS

INPUT

BEAM PARAMETERS

BEAM TABLE NO.	2
QUANTITY	1
SPAN (FT)	11.5

ADJUSTMENT FACTORS

CD	1.00
CM*CT*CI	1.00
CL	1.00
CF*CV	1.00
CFU*CR	1.00

LOADING

	LL	DL	LOAD DIST.
W (PLF)	70	6	FROM LEFT
W FROM LEFT (LBS)	0	0	WA, RIGHT WC,
W FROM RIGHT (LBS)	0	0	TO START WB)
W @ MID (LBS)	0	0	(FT.)
PL 1 (LBS)	0	0	0.0
PL 2 (LBS)	0	0	0.0
PL 3 (LBS)	0	0	0.0

DEFLECTION LIMITS

LL, L/	240
TL, L/	180

RESULTS

BEAM DESCRIPTION 1 2" X 6" DF#2 LAPPED

BEAM PROPERTIES

SX (IN3)	11.34
AREA (IN2)	8.25
IX (IN4)	21
E' (PSI)	1600000
F' B (PSI)	1350
F' V (PSI)	180

REQ'D PROPERTIES

SX (IN3)	11.17
AREA (IN2)	2.43

CALC'D LOADS & STRESSES

MAX MOMENT (LB*FT)	1,256
REACTION L (LBS)	437
REACTION R (LBS)	437

PROPERTIES ADEQUATE?*

YES
YES

MAX. DEFLECTION

LL (IN.)	0.58
TL (IN.)	0.77

CALC'D DEFLECTION

LL (IN.)	0.83
TL (IN.)	0.90

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2x6 DF Wall Girts @ 24" o.c.
WALLS ARE CONSIDERED FLEXIBLABLE FOR DEFLECTION CALC CRITERIA

BEAM 2x6 WALL GIRTS

INPUT

BEAM PARAMETERS

BEAM TABLE NO.	2
QUANTITY	1
SPAN (FT)	11.5

ADJUSTMENT FACTORS

CD	1.60
CM*CT*CI	1.00
CL	1.00
CF*CV	1.00
CFU*CR	1.15

W/ METAL SIDING

LOADING

	LL	DL	LOAD DIST.
W (PLF)	18	3.1	FROM LEFT
W FROM LEFT (LBS)	0	0	WA, RIGHT WC,
W FROM RIGHT (LBS)	0	0	TO START WB)
W @ MID (LBS)	0	0	(FT.)
PL 1 (LBS)	0	0	0.0
WIND PL 2 (LBS)	0	0	0.0
PL 3 (LBS)	0	0	0.0

DEFLECTION LIMITS

LL, L/	120
TL, L/	120

RESULTS

BEAM DESCRIPTION 1 2" x 6" DF#2 FLAT

BEAM PROPERTIES

SX (IN3)	2.06
AREA (IN2)	8.25
IX (IN4)	2
E' (PSI)	1600000
F' B (PSI)	2116
F' V (PSI)	288

REQ'D PROPERTIES

SX (IN3)	1.98
AREA (IN2)	0.42

PROPERTIES ADEQUATE?*

YES
YES

CALC'D LOADS & STRESSES

MAX MOMENT (LB*FT)	349
REACTION L (LBS)	121
REACTION R (LBS)	121

MAX. DEFLECTION

LL (IN.)	1.15
TL (IN.)	1.15

CALC'D DEFLECTION

LL (IN.)	2.87
TL (IN.)	3.37

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Post Calculations W/ Bending
2008 NDS

Input | Results | **COLUMN** BEARING POST

Axial

Fc=	925.00	*psi*			
Cd=	1.00				
Cm=	1.00		*F'c=*	740.00	*psi*
Ct=	1.00			*(Cd*Cm*Ct*Cf*Ci*Cp)*	
CF=	1.00	*(built up col)*			
Ci=	0.80		*Cp=*	0.77	
				*((1+(Fce/Fc))/2*C) - (((1+(Fce/Fc))/(2*C))^2 - ((Fce/Fc)/c))^.5*	
load=	5,727	*lbs*			
Area=	48	*in2*	*Fce=*	948	*psi*
				*(Kce*E')/(Le/d)^2*	
Kce=	0.30				
E'=	1,600,000	*psi*		569	*psi*
L=	180.0	*in*		119	*psi*
K=	1.0	*in*			
Le=	180.0	*in*	*check*	OK	
d=	8.00	*in*			
b=	6.00	*in*			
c=	0.80		*F'b=*	1536	
				759	

Bending

Fb=	1200.00	*psi*	tress Ratio	0.61	
CD	1.60		*check*	OK	
CL	1.00				
Cv=	1.00				
Cfu=	1.00				
Cr=	1.00				
Ci=	0.80				
	1.00				
load=	144	*plf*			
Sx=	64.0	*in3*			

Provide **1** **6x8 DF#1 Treated**
Maximum Height: 15.0 ft
Weak Axis Braced at 2.0 ft

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Post Calculations W/ Bending
2008 NDS

Input | Results | **COLUMN** BEARING POST

Axial
Fc= 925.00 *psi*

Cd=	1.00			
Cm=	1.00		*F'c=*	740.00 *psi*
Ct=	1.00			*(Cd*Cm*Ct*Cf*Ci*Cp)*
CF=	1.00	*(built up col)*		
Ci=	0.80		*Cp=*	0.57
				*((1+(Fce/Fc))/2*C) - (((1+(Fce/Fc))/(2*C))^2 - ((Fce/Fc)/c))^.5*
load=	1,909	*lbs*		
Area=	36	*in2*	*Fce=*	533 *psi*
				*(Kce*E')/(Le/d)^2*
Kce=	0.30			
E'=	1,600,000	*psi*		422 *psi*
L=	180.0	*in*		53 *psi*
K=	1.0	*in*		
Le=	180.0	*in*	*check*	OK
d=	6.00	*in*		
b=	6.00	*in*		
c=	0.80		*F'b=*	1536
				1350

Bending
Fb= 1200.00 *psi* tress Ratio 0.99

CD	1.60	*check*	OK
CL	1.00		
Cv=	1.00		
Cfu=	1.00		
Cr=	1.00		
Ci=	0.80		
	1.00		

load= 144 *plf*
Sx= 36.0 *in3*

Provide **1** **6x6 DF#1 Treated**
Maximum Height: 15.0 ft
Weak Axis Braced at 2.0 ft