STRUCTURAL CALCULATIONS

for

Xiaolong / Burgoine Garage

5037 SE Ellis Street
Portland, OR 97206

Project No. 1330

July 9, 2013

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REGISTERED PROFESSIONAL ENGINEER
56352
OREGON
July 9, 2002
DARLA J. WALL

EXPIRES: 6/30/2014

13-180759-125

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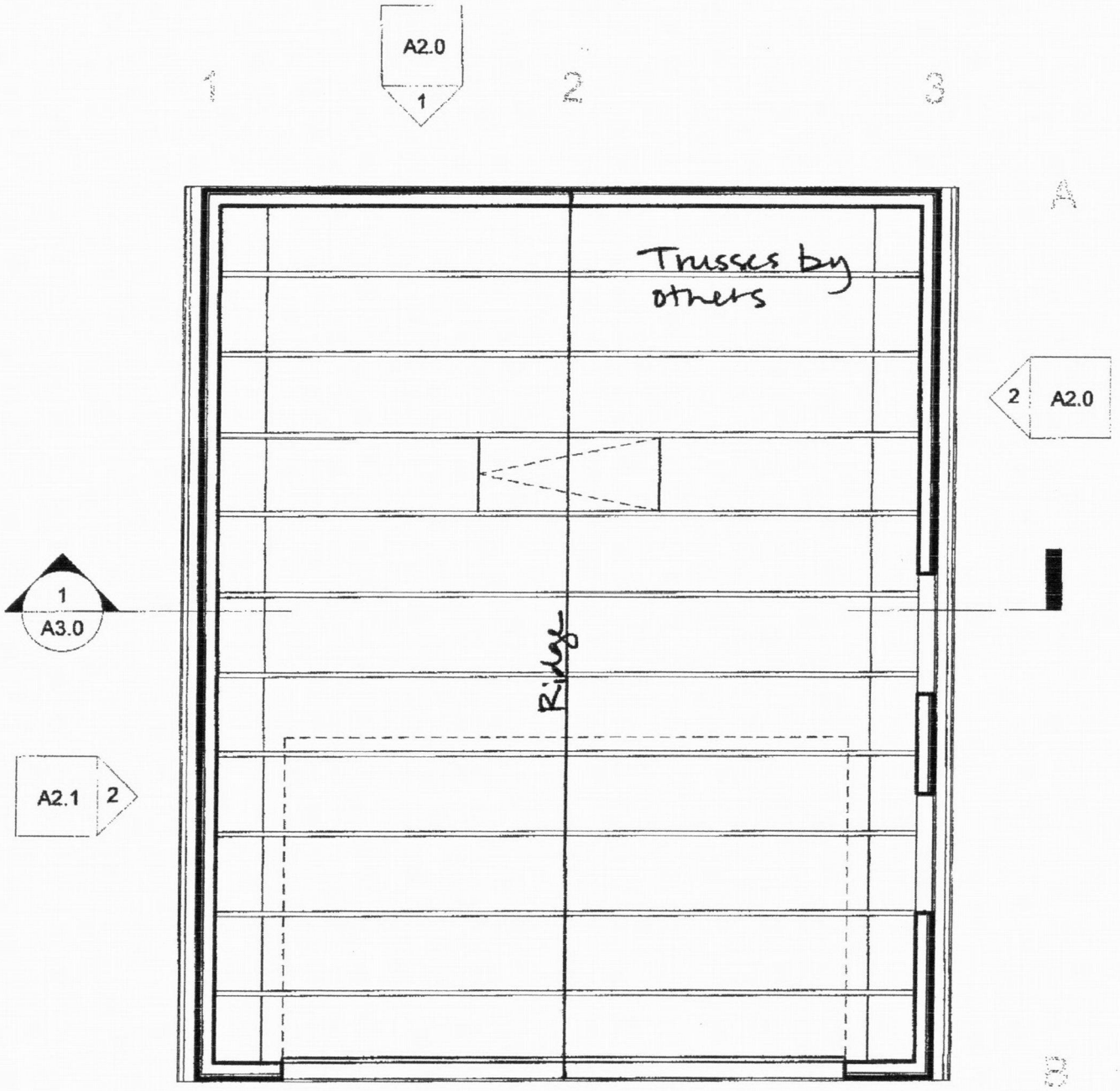
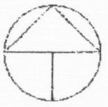
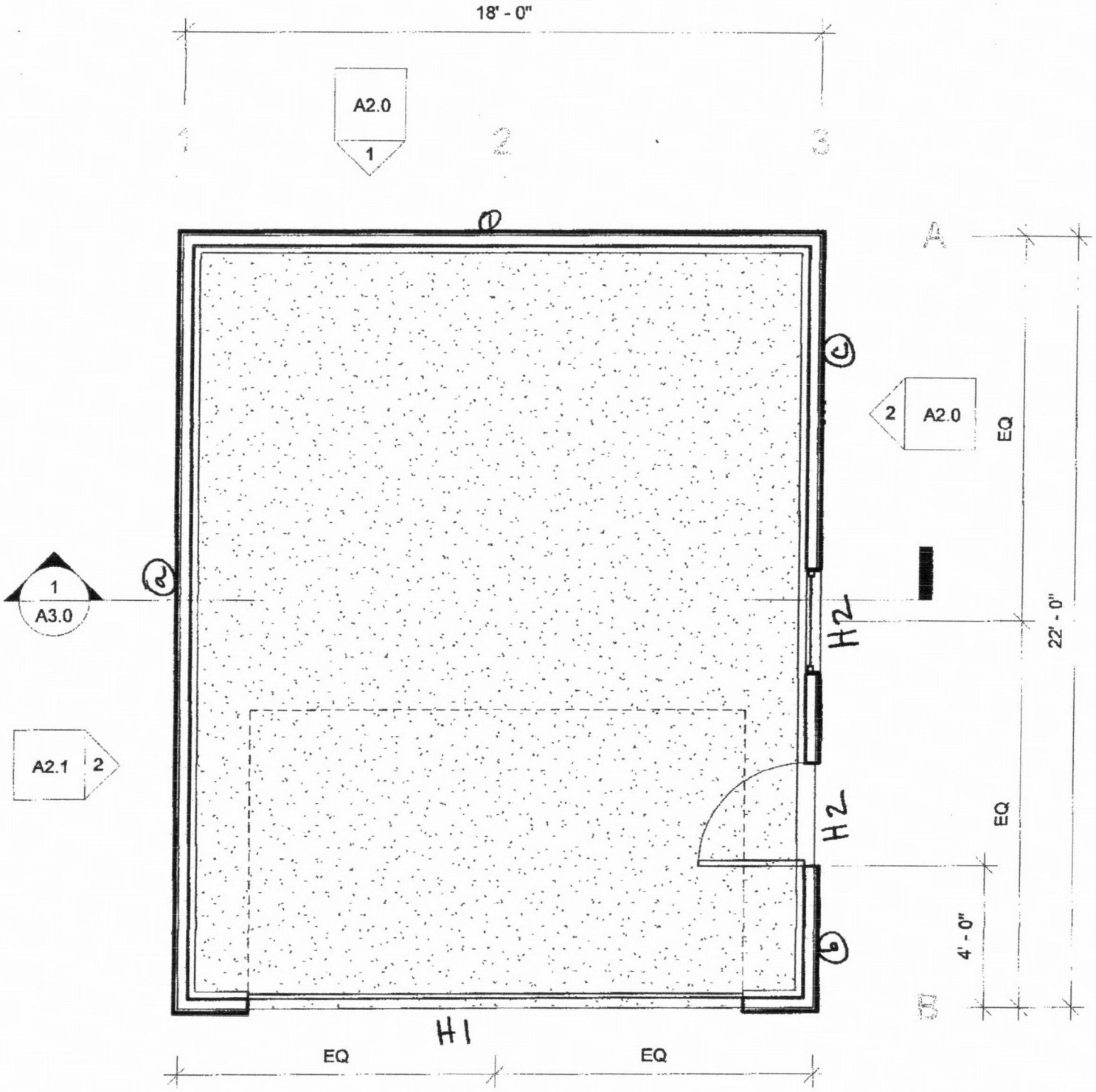
7310 SW Florence Lane
Portland, OR 97223
phone 503.246.2960



2 ROOF FRAMING PLAN
1/4" = 1'-0"



SH1

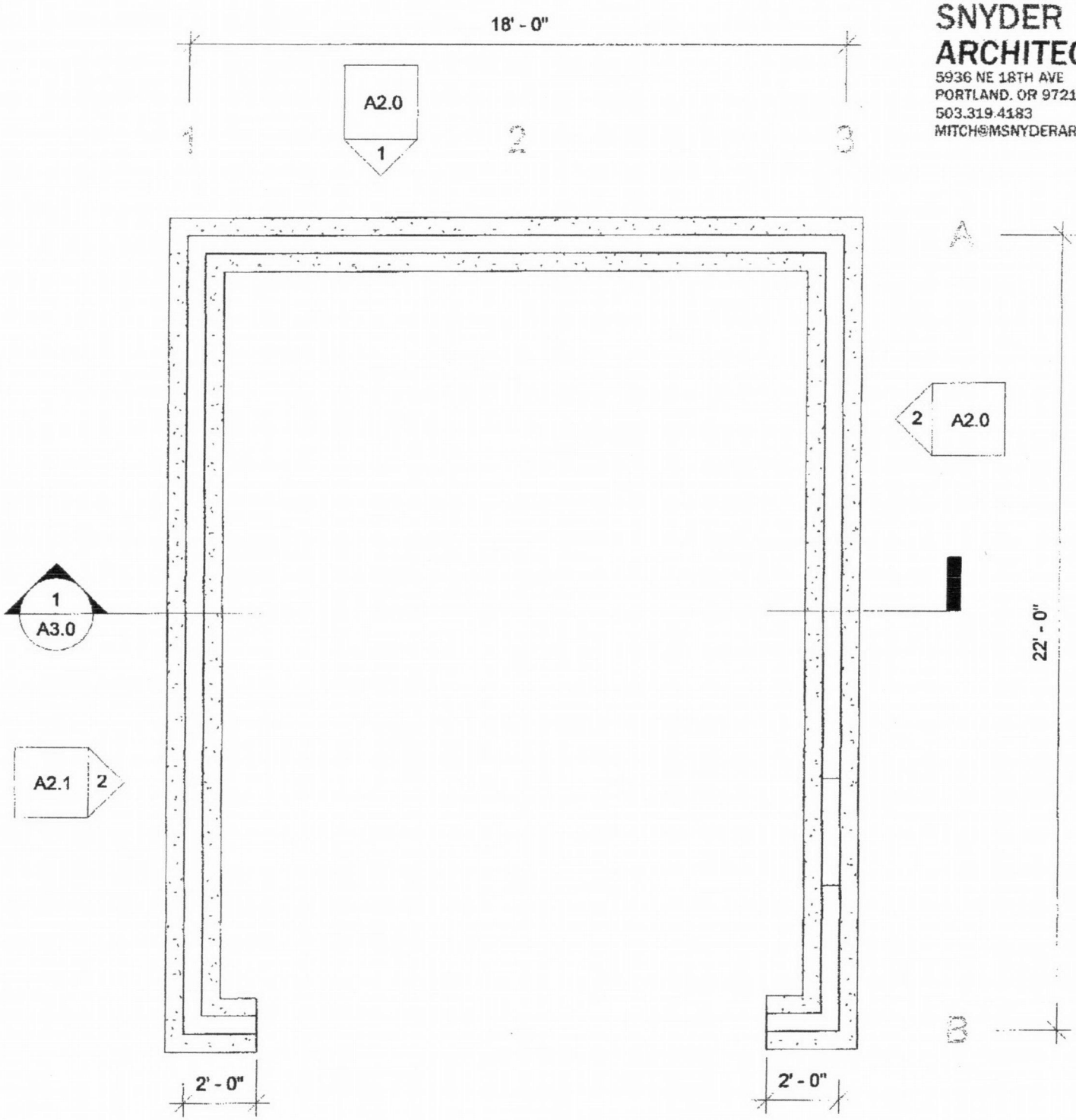


1 FLOOR PLAN
1/4" = 1'-0"

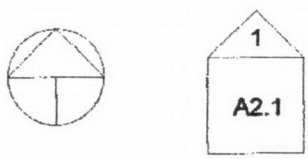
1
A2.1

SH 2

MITCHELL
SNYDER
ARCHITECTI
5936 NE 18TH AVE
PORTLAND, OR 97211
503.319.4183
MITCH@MSNYDERARCH.C



2 FOUNDATION PLAN
1/4" = 1'-0"



SH3

DESIGN CRITERIA

Provide structural engineering for new garage
Plans provided by Mitchell Snyder Architecture

LOADS

DL_{roof} =	17 psf	
LL_{roof} =	25 psf	
LL_{ceil} =	40 psf	storage area above

Seismic Design Category D_1, Soil Type S_D
Wind: V_{3s} = 95 mph, Exposure B

Max. Allowable Soil Bearing: 1500 psf (assumed)

NEW STRUCTURE

	hdr 1	hdr 2		
trib =	2.00	9.00 ft		tributary width
Roof				
ω_{DL} =	34	153 plf		= DL * trib
ω_{LL} =	50	225 plf		= LL * trib
Storage				
ω_{LL} =	80	360 plf		= LL * trib
L =	14.00	3.00 ft		length
Δ_{LL} =	0.169	0.016 in		LL deflection
--> L /	994	2250	>	360
Δ_{TL} =	0.213	0.020 in		TL deflection
--> L /	789	1800	>	240
R_{DL} =	238	230 lbs		
R_{LL} =	910	877 lbs		
R_{TL} =	1148	1107 lbs		

Header 1: 4x12 DF#2
Header 2: (2) 2x6 DF#2 } (C-1)

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by: DJW
date: 7/9/2013
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LATERAL ANALYSIS

Seismic

Seismic Design Category D_1 Soil Type S_D

Structure qualifies for Simplified Analysis Procedure			ASCE 7 Section 12.14
S_s =	0.99	mapped spectral accelerations	http://earthquake.usgs.gov/hazards/d
F_a =	1.1	site coefficient	ASCE 7 Section 11.4.3
S_{MS} =	1.09	= $F_a * S_s$	
S_{DS} =	0.7	= (2/3) S_{MS}	
R =	6.5	response modification coefficient	ASCE 7 Table 12.14-1
V =	0.135 * W	= $(1.2 * S_{DS}) / R$	ASCE 7 Equation (12.14-11)
V_{ASD} =	0.096 * W	= V / 1.4	

Wind

95 mph, Exposure B

Story Height:		Σ =
Grade to Main =	2.0 ft	2.0 ft
Main to Roof =	9.0 ft	11.0 ft
Roof =	6.0 ft	17.0 ft
Roof Slope =	8:12	33.5 degrees

$P_{net} = q_s * K_z * C_{net} * I * K_{zt}$ OSSC Equation 16-34

V_{3s} =	95	mph	OSSC Fig. 1609
q_s =	23.2	psf	OSSC Table 1609.6.2(1)
K_z =	0.70	0-30'	ASCE 7 Table 6-3
C_{net} =	0.94	walls	OSSC Table 1609.6.2(2)
C_{net} =	1.09	roof, wind parallel to ridge	OSSC Table 1609.6.2(2)
C_{net} =	0.32	roof, wind perpendicular to ridge	OSSC Table 1609.6.2(2)
I =	1.0		ASCE 7 Table 6-1
K_{zt} =	1.0		ASCE 7 6.5.7.2

P_{walls} =	15.3	psf
P_{roof} =	17.7	psf, gable end
P_{roof} =	5.2	psf

Wind governs by observation

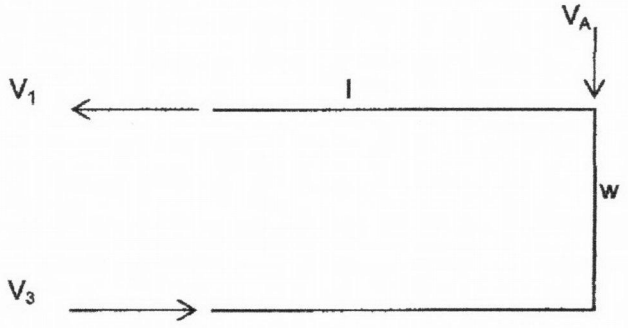
Wind

V_2	Reaction (plf)	* Trib = (ft)	R (lbs)
R_{roof} =	100	22	2197
R_{main} =	69	22	1511
		Σ =	3709 lbs

$V_{A\&B}$	Reaction (plf)	* Trib = (ft)	R (lbs)
R_{roof} =	122	9	1096
R_{main} =	69	9	618
		Σ =	1714 lbs

Analyze as an open front structure per NDS SDPWS 4.2.5.1.1

l =	22 ft	< 25 ft	
w =	18 ft		
l/w =	1.22	< 1.5	for 1 story structure when sheathed in conformance with 4.2.7.1



V_A = 2197 lbs

$V_{1\&3}$ = 2686 lbs = $(V_2 * l) / w$

governs

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sh: 6

SHEAR WALL ANALYSIS

Transverse Direction

Grid A

V =	2.20 kips	$roof_{DL}$ =	17 psf	$wall_{DL}$ =	12 psf
h =	9 ft	trib =	2 ft	height =	9 ft
L =	18 ft	$w_{DL\text{-}roof}$ =	34 plf	$w_{DL\text{-}wall}$ =	108 plf
v_r =	122 plf	factor =	0.67	factor =	0.67

	length (ft)	v_w (plf)	W_{DL} (k)	M_{OT} (k-ft)	M_{RES} (k-ft)	R_1 (k)	R_2 (k)
1	18.00	122	1.71	19.8	15.4	-0.24	1.95
Σ	18.00	1					

sill force = 122 plf

HTT4

Longitudinal Direction

Grid 1

V =	2.69 kips	$roof_{DL}$ =	17 psf	$wall_{DL}$ =	12 psf
h =	9 ft	trib =	9 ft	height =	9 ft
L =	22 ft	$w_{DL\text{-}roof}$ =	153 plf	$w_{DL\text{-}wall}$ =	108 plf
v_r =	122 plf	factor =	0.67	factor =	0.67

	length (ft)	v_w (plf)	W_{DL} (k)	M_{OT} (k-ft)	M_{RES} (k-ft)	R_1 (k)	R_2 (k)
a	22.00	122	3.85	24.2	42.3	0.82	3.02
Σ	22.00	1					

sill force = 122 plf

OK

Grid 3

V =	2.69 kips	$roof_{DL}$ =	17 psf	$wall_{DL}$ =	12 psf
h =	9 ft	trib =	9 ft	height =	9 ft
L =	22 ft	$w_{DL\text{-}roof}$ =	153 plf	$w_{DL\text{-}wall}$ =	108 plf
v_r =	122 plf	factor =	0.67	factor =	0.67

	length (ft)	v_w (plf)	W_{DL} (k)	M_{OT} (k-ft)	M_{RES} (k-ft)	R_1 (k)	R_2 (k)
b	4.00	199	0.70	7.2	1.4	-1.44	2.14
c	9.50	199	1.66	17.0	7.9	-0.96	2.62
Σ	13.50	1					

sill force = 141 plf

HTT4

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sh: 7

LATERAL DESIGN

Sheathing

Roof:

5/8" plywood w/ 8d nails @ 6" oc at edges and @ 12" oc in field

v_{allow} = 215 plf

v_{max} = 122 plf

Walls:

Structural I Sheathing

1. 7/16" plywood w/ 8d nails @ 6" oc at edges and @ 12" oc in field

v_{allow} = 255 plf

v_{max} = 199 plf

Sill Bolting

1/2" ϕ bolts in 2x PT sill plate

V =	590 lbs / bolt	per NDS
C_d =	1.33	short term increase
V_{allow} =	785 lbs / bolt	= V * C_d

bolt spacing (ft)	v_{allow}
4.00	196 plf

Holdowns

T =	1441 lbs	maximum uplift
T_{allow} =	4235 lbs	Simpson 'HTT4'
T_{allow} =	3610 lbs	Simpson 'SSTB16'

WBS
7310 SW Florence Lane
Portland, OR 97223
503.246.2960

Title : Xialong / Burgoine Garage Job # 1330
Dsgnr: Date: 3:59PM, 9 JUL 13
Description :

Scope :

Rev: 580000
User: KW-0605678, Ver 5.8.0, 1-Dec-2003
(c)1983-2003 ENERCALC Engineering Software

Multi-Span Timber Beam

Description New Structure - sawn

General Information

Code Ref: 2001 NDS, 2003 IBC, 2003 NFPA 5000. Base allowables are user defined

Douglas Fir - Larch, No.2		Fb : Basic Allow	900.0 psi	Elastic Modulus	1,600.0 ksi
All Spans Considered as Individual Beams		Fv : Basic Allow	180.0 psi	Load Duration Factor	1.150

Timber Member Information

Description		hdr 1	hdr 2
Span	ft	14.00	3.00
Timber Section		4x12	2-2x6
Beam Width	in	3.500	3.000
Beam Depth	in	11.250	5.500
End Fixity		Pin - Pin	Pin - Pin
Le: Unbraced Length	ft	0.00	0.00
Member Type		Sawn	Sawn

Loads

Live Load Used This Span ?		Yes	Yes
Dead Load	#/ft	34.00	153.00
Live Load	#/ft	50.00	225.00
Dead Load	#/ft		
Live Load	#/ft	80.00	360.00
Start	ft		
End	ft	14.000	3.000

Results

Mmax @ Cntr	in-k	48.2	10.0
@ X =	ft	7.00	1.50
Max @ Left End	in-k	0.0	0.0
Max @ Right End	in-k	0.0	0.0
fb : Actual	psi	653.1	658.7
Fb : Allowable	psi	1,138.5	1,345.5
		Bending OK	Bending OK
Shear @ Left	k	1.15	1.11
Shear @ Right	k	1.15	1.11
fv : Actual	psi	37.9	71.1
Fv : Allowable	psi	207.0	207.0
		Shear OK	Shear OK

Reactions & Deflection

DL @ Left	k	0.24	0.23
LL @ Left	k	0.91	0.88
Total @ Left	k	**1.15**	**1.11**
DL @ Right	k	0.24	0.23
LL @ Right	k	0.91	0.88
Total @ Right	k	**1.15**	**1.11**
Max. Deflection	in	-0.213	-0.020
@ X =	ft	7.00	1.50

C-1

Job	Truss	Truss Type	Qty	Ply	Mitchell Snyder Architecture,
MM-10675	A2	STORAGE	10	1	Job Reference (optional)

PRECISION TRUSS & LUMBER, INC., CLACKAMAS,OR. 97015, mike

7.410 s Mar 11 2013 MiTek Industries, Inc. Thu Jul 11 08:43:17 2013 Page 1
ID:aWfvQBGskrLWXGzkBwiwbryz9qD-FG7H2cGLtY75qd4SL49cneUkBpV3cxHiSkn2I_yz9ne

0-8-0 | 2-6-0 | 9-0-0 | 15-6-0 | 18-0-0 | 18-8-0
0-8-0 | 2-6-0 | 6-6-0 | 6-6-0 | 2-6-0 | 0-8-0

Scale = 1:31.0

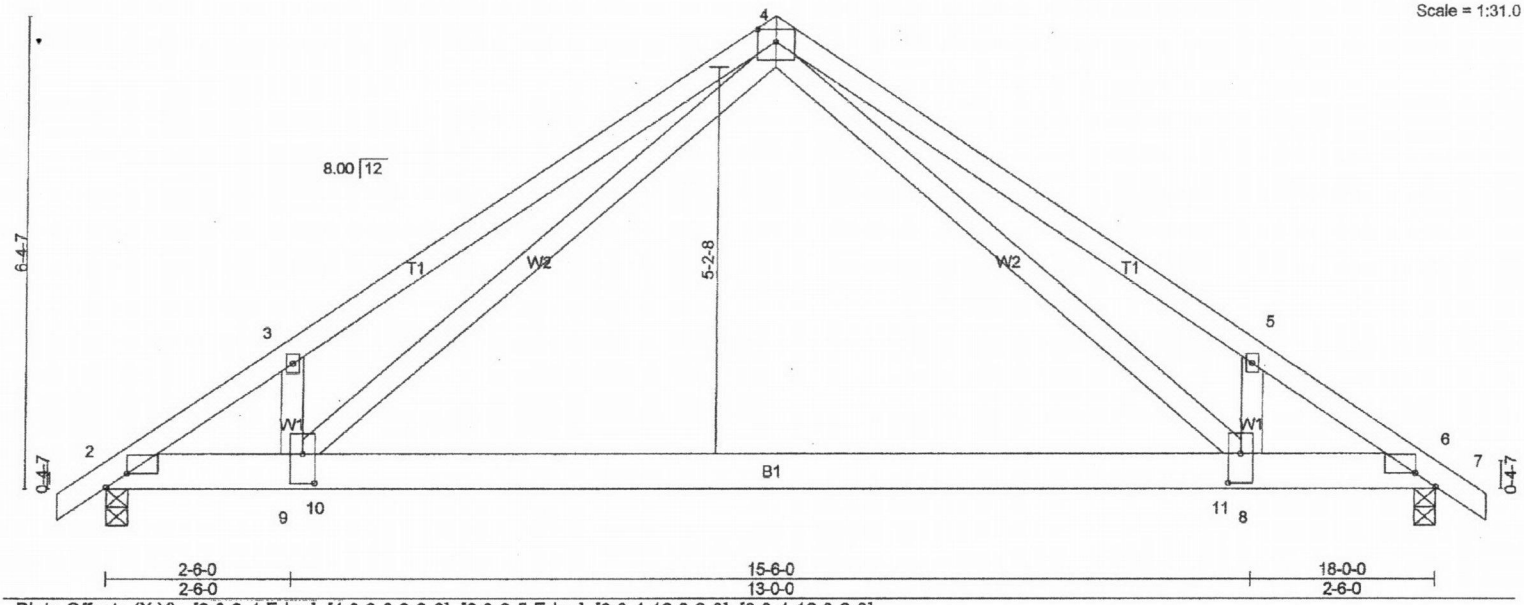

Plate Offsets (X,Y): [2:0-3-4,Edge], [4:0-3-0,0-2-0], [6:0-3-5,Edge], [8:0-4-12,0-2-0], [9:0-4-12,0-2-0]

LOADING (psf)		SPACING 2-0-0		CSI		DEFL	in	(loc)	l/defl	L/d	PLATES	GRIP
TCLL	25.0	Plates Increase	1.15	TC	0.45	Vert(LL)	-0.44	8-9	>484	240	MT20	220/195
TCDL	7.0	Lumber Increase	1.15	BC	0.60	Vert(TL)	-0.73	8-9	>290	180		
BCLL	0.0 *	Rep Stress Incr	YES	WB	0.74	Horz(TL)	0.02	6	n/a	n/a		
BCDL	10.0	Code IRC2009/TPI2007		(Matrix)							Weight: 98 lb	FT = 0%

LUMBER
TOP CHORD 2x4 DF No.1&Btr G
BOT CHORD 2x6 DF SS G
WEBS 2x4 DF Std G

BRACING
TOP CHORD Structural wood sheathing directly applied or 3-9-7 oc purlins.
BOT CHORD Rigid ceiling directly applied or 10-0-0 oc bracing.

MiTek recommends that Stabilizers and required cross bracing be installed during truss erection, in accordance with Stabilizer Installation guide.

REACTIONS (lb/size) 2=1164/0-3-8 (min. 0-1-8), 6=1164/0-3-8 (min. 0-1-8)
Max Horz 2=166(LC 4)
Max Uplift2=-103(LC 5), 6=-103(LC 6)

FORCES (lb) - Max. Comp./Max. Ten. - All forces 250 (lb) or less except when shown.
TOP CHORD 2-3=-2510/9, 3-4=-2526/169, 4-5=-2526/169, 5-6=-2510/10
BOT CHORD 2-9=-70/2025, 9-10=-24/824, 10-11=-24/824, 8-11=-24/824, 6-8=0/2025
WEBS 4-8=-63/1673, 4-9=-63/1673

NOTES
1) Unbalanced roof live loads have been considered for this design.
2) Wind: ASCE 7-05; 95mph; TCDL=4.2psf; BCDL=6.0psf; h=25ft; Cat. II; Exp C; enclosed; MWFRS (low-rise); cantilever left and right exposed ; end vertical left and right exposed; Lumber DOL=1.33 plate grip DOL=1.33
3) This truss has been designed for a 10.0 psf bottom chord live load nonconcurrent with any other live loads.
4) * This truss has been designed for a live load of 30.0psf on the bottom chord in all areas with a clearance greater than 3-6-0 between the bottom chord and any other members, with BCDL = 10.0psf.
5) A plate rating reduction of 20% has been applied for the green lumber members.
6) Provide mechanical connection (by others) of truss to bearing plate capable of withstanding 100 lb uplift at joint(s) except (jt=lb) 2=103, 6=103.
7) This truss is designed in accordance with the 2009 International Residential Code sections R502.11.1 and R802.10.2 and referenced standard ANSI/TPI 1.

LOAD CASE(S) Standard