Deck Structural Calculations

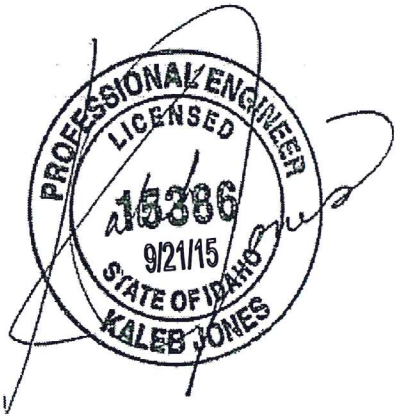
For

SMC – Blackhawk On The River Lot 78

Valley County Idaho

Prepared by

PERFORMANCE
ENGINEERS
1102 N Franklin Nampa, Idaho 83687
(208) 475-0040 Fax (208) 475-0044



2015-02475
September 21, 2015

PERFORMANCE ENGINEERS

Design Criteria

Project Name: SMC - Blackhawk On The River Lot 78
Job Number: 2015-02475
Location: McCall, Idaho

Governing Code: *2012 IBC*

Snow Criteria

Roof Snow Load (P_f)	150 psf
Ground Snow Load (P_g)	150 psf
Snow Exposure (C_e)	1.0
Thermal Factor (C_t)	1.0
Snow Importance (I_s)	1.0

Wind Criteria

Wind Speed (V_3)	115 mph
Wind Exposure	C
Wind Importance (I_w)	1.0
Building Category	II

Seismic Criteria

Site Class	D
S_s	0.47
S_1	0.14
S_{DS}	0.45
S_{D1}	0.21

Seismic Use Group (SUG)	I
Seismic Importance (I_E)	1.0
Seismic Design Category (SDC)	D
Seismic Response Coefficient, R	6.5
Design Base Shear	.08Wp

Live Loads

Typical	40 psf
Corridor	n/a
Storage	n/a

Soil Bearing

Typical	1500 psf

Roof Dead Loads:

Deck	*1.5*
Insulation	*2.0*
Roofing	*3.0*
Joist	*2.5*
Ceiling	*3.0*
Misc	*4.5*
TOTAL	**17 psf**

Floor Dead Loads:

Deck	2.3
Joist	2.0
Ceiling	0.0
Flooring	1.0
Misc	5.0
TOTAL	**10 psf**

Project # : *2015-02475*
Project: *SMC - Blackhawk On The River Lot 78*

Seismic Loading

S_s =	*0.4720*	C_T =	*0.020*	
S_1 =	*0.1420*	h_n =	*22.33*	ft
F_a =	*1.4*			
F_v =	*2.2*			
R =	*6.5*			
I_E =	*1.0*			

		Seismic Design Category
$S_{MS} = F_a S_s$ =	0.6712	
$S_{M1} = F_v S_1$ =	0.3172	
$S_{DS} = 2/3\ S_{MS}$ =	0.4475	*C*
$S_{D1} = 2/3\ S_{M1}$ =	0.2115	*D*
$C_s = 1.2*S_{DS}/(R/I_E)$ =	0.0826	**Controls**
$T_a = C_T h_n^{3/4}$ =	0.2054	
$C_s < S_{D1}/[(R/I_E)T]$ =	0.1584	
$C_s > 0.044 S_{DS} I_E$ =	0.0197	
$C_s > 0.5 S_1/(R/I_E)$ =	0.0109	

$V = C_s W$ = **0.0826** W

Project # : *2015-02475*
Project: *SMC - Blackhawk On The River Lot 78*

Seismic Component Loading

w_p =	*1*	psf	weight of element
V_{px} =	*0*	plf	Portion of seismic shear load at the level of the diaphragm, required to be transferred to the components of the vertical seismic-force-resisting system beacause of the offsets or changes in the stiffness of the vertical components above of below the diaphragm.
w_w =	*1*	psf	weight of wall

NOTE: Use 1 for unit weight to achieve an answer per element unit weight

Connections

$F_p = 0.133\ S_{DS}\ w_p$ =	**0.06**	psf		
or				
$F_p = 0.05\ w_p$ =	**0.05**	psf		

Diaphragm

$F_p = 0.2\ I_E\ S_{DS}\ w_p + V_{px}$ =	**0.09**	psf		

Bearing Walls & Shear Walls

Out of Plane Forces

$F_p = 0.40\ I_E\ S_{DS}\ w_w$ =	**0.18**	psf	**Controls**	*12.11.1*
$F_p = 0.10\ w_w$ =	**0.10**	psf		*12.11.1*

Anchorage

Rigid Diaphragm (Greater Of)

F_p =	**0.2**	psf		*12.11.2a*
$F_p = 400\ I_E\ S_{DS}$ =	**179**	plf		*12.11.2b*
F_p =	**280**	plf	(multiply by 0.7 for service loads)	*12.11.2c*

Flexible Diaphragm (Greater Of)

$F_p = 0.80\ I_E\ S_{DS}\ w_w$ =	**0.4**	psf		*12.11-1*

Note: *12.11.2.2.2* The strength design forces for steelelements of the structural wall anchorage system, with exception of anchor bolts and reinforcing steel, shall be increased by 1.4 times the forces otherwise noted above.

PERFORMANCE ENGINEERS

Project # : 2015-02475
Project: SMC - Blackhawk On The River Lot 78

Point Load Footing Design

Square Concrete Footing Pads for Soil Bearing =1500 psf				
size (")	max magnitude (kip)	number of #4 Rebar	Thickness (")	min column size (")
18	3.00	2	10	3.5
24	5.50	2	10	3.5
30	8.75	2	10	3.5
36	12.50	3	10	3.5
42	16.75	4	10	3.5
48	22.00	4	10	3.5
54	27.75	5	10	3.5
60	33.75	6	12	3.5
66	40.75	7	12	5.5
72	44.50	8	12	5.5

Bars to be 3 1/2" from bottom of pad. Evenly space in both directions.

PERFORMANCE ENGINEERS

Unbraced Wood Column Allowable Loads, kips

Project Name: SMC - Blackhawk On The River
Job Number: 2015-02475
Location: Valley County, Idaho

Governing Code: *2012 IBC*
Load Duration Factor: *1.0*
Eccentricity *0"*

	Unbraced Height									
Column Type	***8'***	***10'***	***12'***	***14'***	***16'***	***18'***	***20'***	***Allowable Compression Perp.***	***Simpson CC Capacity***	***Cost Factor***
(2) 2x4 DF #2	4.50	3.00	2.10	SR	SR	SR	SR	6.50	NA	
(3) 2x4 DF #2	8.80	5.90	4.20	3.20	SR	SR	SR	9.80	NA	
4x4 DF #2	7.00	4.60	3.30	2.40	SR	SR	SR	7.60	15.30	
(2) 2x6 DF #2	7.20	4.70	3.30	SR	SR	SR	SR	10.30	NA	
(3) 2x6 DF #2	20.40	14.70	10.70	8.00	6.20	4.90	SR	15.40	NA	
6x6 DF #2	18.00	15.70	13.00	10.50	8.50	6.90	5.70	18.90	30.20	
6x8 DF #2	24.50	21.40	17.80	14.30	11.60	9.40	7.80	25.70	30.20	
6x10 DF #2	31.40	27.10	22.50	18.20	14.70	12.00	9.90	32.60	30.20	
8x8 DF #2	36.60	34.60	31.90	28.50	24.90	21.30	18.20	35.20	37.80	
8x10 DF #2	46.30	43.90	40.40	36.20	31.50	27.00	23.10	44.50	37.80	
8x12 DF #2	56.20	53.10	49.00	43.80	38.10	32.70	28.00	53.40	37.80	
10x10 DF #2	60.50	58.80	56.50	53.40	49.60	45.20	40.50	56.40	NA	

SR = Slenderness Ratio Failure

Member Data

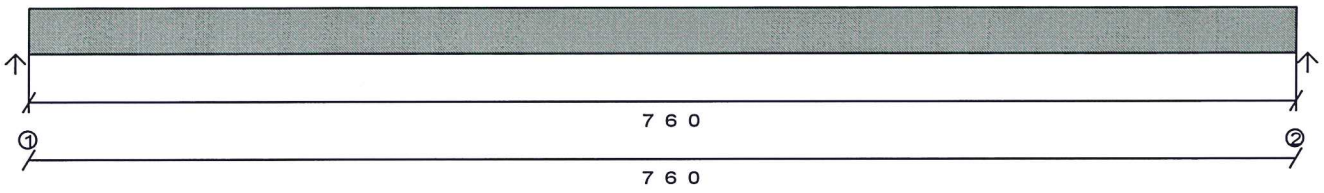
Description:

Standard Load:
Snow Load: 100 PSF
Dead Load: 10 PSF

Member Type: Joist
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/360 live, L/240 total
Deck Connection: Glued & Nailed
Filename: DJ.KYB

Application: Floor

Building Code: IBC/IRC



Bearings and Reactions

	Location	Type	Material	Input Length	Min Required	Gravity Reaction	Gravity Uplift
1	0' 0.000"	Wall	DFL Plate (625psi)	N/A	1.500"	561#	--
2	7' 6.000"	Wall	DFL Plate (625psi)	N/A	1.500"	561#	--

Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

	Snow	Dead
1	510#(382plf)	51#(38plf)
2	510#(382plf)	51#(38plf)

Design spans
7' 7.750"

Product: Douglas Fir-Larch #2 2 x 10 16.0" O.C. **PASSES DESIGN CHECKS**

Minimum 1.50" bearing required at bearing # 1
Minimum 1.50" bearing required at bearing # 2
Design assumes continuous lateral bracing along the top chord.
Design assumes continuous lateral bracing along the bottom chord.

Allowable Stress Design

	Actual	Allowable	Capacity	Location	Loading
Positive Moment	1072.#	2334.#	45%	3.75'	Total Load D+S
Shear	448.#	1915.#	23%	-0.06'	Total Load D+S
LL Deflection	0.0648"	0.2549"	L/999+	3.75'	Total Load S
TL Deflection	0.0712"	0.3823"	L/999+	3.75'	Total Load D+S

Control: Positive Moment
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
Design assumes a repetitive member use increase in bending stress: 15 %
This member has been designed in accordance with NDS 2005

Rick Baer
Performance Engineers
1102 N Franklin Blvd.
Nampa, Idaho 83687

Member Data

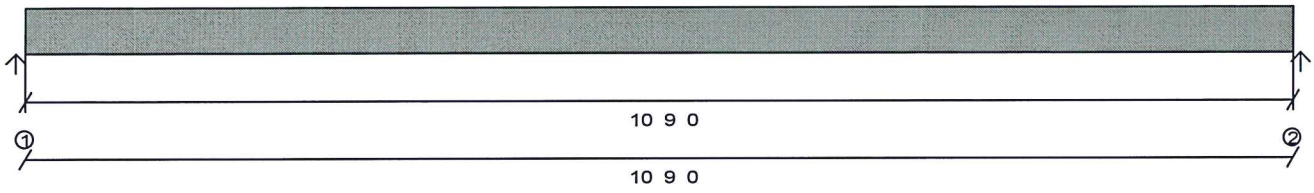
Description:

Standard Load:
Snow Load: 150 PSF
Dead Load: 10 PSF

Member Type: Joist
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/360 live, L/240 total
Deck Connection: Glued & Nailed
Filename: DJ1.KYB

Application: Floor

Building Code: IBC/IRC



Bearings and Reactions

	Location	Type	Material	Input Length	Min Required	Gravity Reaction	Gravity Uplift
1	0' 0.000"	Wall	DFL Plate (625psi)	N/A	1.500"	581#	--
2	10' 9.000"	Wall	DFL Plate (625psi)	N/A	1.500"	581#	--

Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

	Snow	Dead
1	545#(817plf)	36#(54plf)
2	545#(817plf)	36#(54plf)

Design spans
10' 10.750"

Product: Douglas Fir-Larch #2 2 x 10 8.0" O.C. PASSES DESIGN CHECKS

Minimum 1.50" bearing required at bearing # 1
Minimum 1.50" bearing required at bearing # 2
Design assumes continuous lateral bracing along the top chord.
Design assumes continuous lateral bracing along the bottom chord.

or 2@16" o.c.

Allowable Stress Design

	Actual	Allowable	Capacity	Location	Loading
Positive Moment	1583.#	2334.#	67%	5.38'	Total Load D+S
Shear	499.#	1915.#	26%	10.28'	Total Load D+S
LL Deflection	0.2003"	0.3632"	L/652	5.38'	Total Load S
TL Deflection	0.2137"	0.5448"	L/611	5.38'	Total Load D+S

Control: Positive Moment
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
Design assumes a repetitive member use increase in bending stress: 15 %
This member has been designed in accordance with NDS 2005

Rick Baer
Performance Engineers
1102 N Franklin Blvd.
Nampa, Idaho 83687

CS Beam 4.15.0.3
kmBeamEngine 4.12.5.1
Materials Database 1527

Member Data

Description:

Standard Load:
Snow Load: 150 PLF
Dead Load: 17 PLF

Member Type: Beam
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/240 live, L/180 total
Deck Connection: Nailed
Filename: A Beam.KYB

Application: Roof
Slope: 0.00 / 12

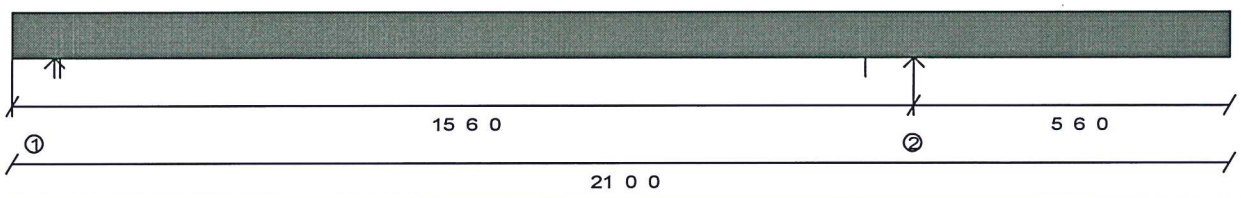
Building Code: IBC/IRC

Member Weight: 43.1 PLF

Other Loads

Type (Description)	Side	Begin	End	Trib. Width	Other Start	Other End	Dead Start	Dead End	Category
Replacement Uniform (PLF)	Top	0' 0.00"	21' 0.00"		1794		203		Snow

Span carried: 23' 0.08" simple span



Bearings and Reactions

	Location	Type	Material	Input Length	Min Required	Gravity Reaction	Gravity Uplift
1	0' 0.000"	Wall	DFL Plate (625psi)	10.000"	1.926"	12942#	-277#
2	15' 6.000"	Wall	DFL Plate (625psi)	10.000"	4.219"	28350#	--

Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

	Snow	Dead
1	11379#	1563#
2	24926#	3424#

Design spans
14' 8.875" 5' 6.000" (right cant)

Product: 24F-V4* DF/DF 10.750 x 16.500 PASSES DESIGN CHECKS

Design assumes continuous lateral bracing along the top chord.
Design assumes continuous lateral bracing along the bottom chord.
Review gravity uplift reaction force of 277lbs at bearing 1 and ensure that the structure can resist appropriately.

Allowable Stress Design

	Actual	Allowable	Capacity	Location	Loading
Positive Moment	40964.#	106135.#	38%	7.39'	Total Load D+S
Negative Moment	30857.#	50641.#	60%	15.5'	Cants Only D+S
Shear	14324.#	36037.#	39%	14.76'	Total Load D+S
Max. Reaction	28350.#	67188.#	42%	15.5'	Total Load D+S
LL Deflection	0.1757"	0.7370"	L/999+	7.39'	Total Load S
TL Deflection	0.1999"	0.9826"	L/884	7.39'	Total Load D+S
LL Defl., Rt.	0.2238"	0.5500"	2L/589	21'	Cants Only S
TL Defl., Rt.	0.2115"	0.7333"	2L/624	21'	Cants Only D+S

Control: Negative Moment
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
This member has been designed in accordance with NDS 2005

Rick Baer
Performance Engineers
1102 N Franklin Blvd.
Nampa, Idaho 83687

Member Data

Description:

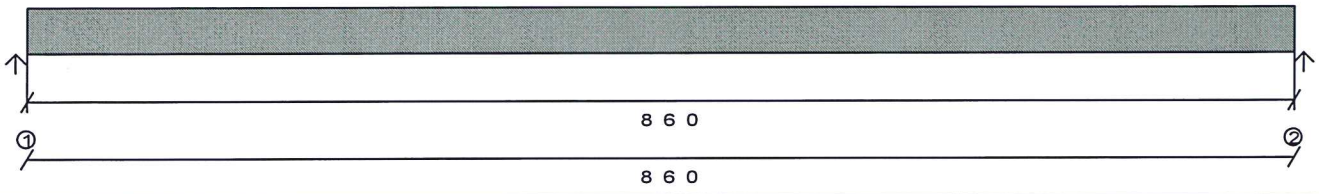
Standard Load:
Snow Load: 764 PLF
Dead Load: 76 PLF

Member Type: Beam
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/360 live, L/240 total
Deck Connection: Nailed
Filename: B Beam.KYB

Application: Floor

Building Code: IBC/IRC

Member Weight: 16.9 PLF



Bearings and Reactions

	Location	Type	Material	Input Length	Min Required	Gravity Reaction	Gravity Uplift
1	0' 0.000"	Wall	DFL Plate (625psi)	N/A	1.500"	3704#	--
2	8' 6.000"	Wall	DFL Plate (625psi)	N/A	1.500"	3704#	--

Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

	Snow	Dead
1	3303#	402#
2	3303#	402#

Design spans
8' 7.750"

Product: Douglas Fir-Larch #2 8 x 10 1 ply

PASSES DESIGN CHECKS

Minimum 1.50" bearing required at bearing # 1
Minimum 1.50" bearing required at bearing # 2
Design assumes continuous lateral bracing along the top chord.
Design assumes continuous lateral bracing along the bottom chord.

Allowable Stress Design

	Actual	Allowable	Capacity	Location	Loading
Positive Moment	8007.#	9460.#	84%	4.25'	Total Load D+S
Shear	3026.#	9286.#	32%	8.14'	Total Load D+S
LL Deflection	0.1379"	0.2882"	L/752	4.25'	Total Load S
TL Deflection	0.1546"	0.4323"	L/670	4.25'	Total Load D+S

Control: Positive Moment
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
This member has been designed in accordance with NDS 2005

Rick Baer
Performance Engineers
1102 N Franklin Blvd.
Nampa, Idaho 83687

Member Data

Description:

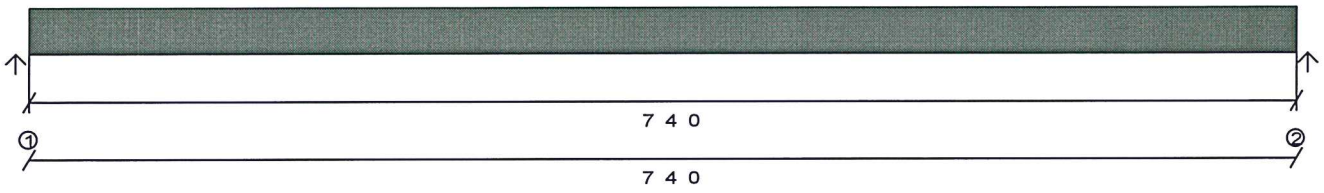
Standard Load:
Snow Load: 1199 PLF
Dead Load: 92 PLF

Member Type: Beam
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/360 live, L/240 total
Deck Connection: Nailed
Filename: C Beam.KYB

Application: Floor

Building Code: IBC/IRC

Member Weight: 17.2 PLF



Bearings and Reactions

	Location	Type	Material	Input Length	Min Required	Gravity Reaction	Gravity Uplift
1	0' 0.000"	Wall	DFL Plate (625psi)	N/A	1.500"	4892#	--
2	7' 4.000"	Wall	DFL Plate (625psi)	N/A	1.500"	4892#	--

Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

	Snow	Dead
1	4484#	408#
2	4484#	408#

Design spans
7' 5.750"

Product: 24F-V4* DF/DF 6.750 x 10.500 **PASSES DESIGN CHECKS**

Minimum 1.50" bearing required at bearing # 1
Minimum 1.50" bearing required at bearing # 2
Design assumes continuous lateral bracing along the top chord.
Design assumes continuous lateral bracing along the bottom chord.

Allowable Stress Design

	Actual	Allowable	Capacity	Location	Loading
Positive Moment	9147.#	28527.#	32%	3.67'	Total Load D+S
Shear	3747.#	14399.#	26%	6.66'	Total Load D+S
LL Deflection	0.0720"	0.2493"	L/999+	3.67'	Total Load S
TL Deflection	0.0786"	0.3740"	L/999+	3.67'	Total Load D+S

Control: Positive Moment
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
This member has been designed in accordance with NDS 2005

Rick Baer
Performance Engineers
1102 N Franklin Blvd.
Nampa, Idaho 83687

Member Data

Description:

Standard Load:
Snow Load: 150 PLF
Dead Load: 10 PLF

Member Type: Beam
Top Lateral Bracing: Continuous
Bottom Lateral Bracing: Continuous
Moisture Condition: Dry
Deflection Criteria: L/360 live, L/240 total
Deck Connection: Nailed
Filename: C Beam.KYB

Application: Floor

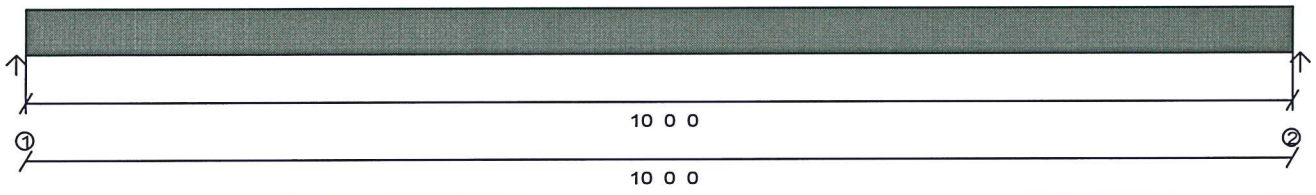
Building Code: IBC/IRC

Member Weight: 17.2 PLF

Other Loads

Type (Description)	Side	Begin	End	Trib. Width	Other Start	Other End	Dead Start	Dead End	Category
Replacement Uniform (PLF)	Top	0' 0.00"	10' 0.00"		806		54		Snow

Span carried: 10' 0.06" simple span



Bearings and Reactions

	Location	Type	Material	Input Length	Min Required	Gravity Reaction	Gravity Uplift
1	0' 0.000"	Wall	DFL Plate (625psi)	N/A	1.500"	4450#	--
2	10' 0.000"	Wall	DFL Plate (625psi)	N/A	1.500"	4450#	--

Maximum Load Case Reactions

Used for applying point loads (or line loads) to carrying members

	Snow	Dead
1	4090#	360#
2	4090#	360#

Design spans
10' 1.750"

Product: 24F-V4* DF/DF 6.750 x 10.500 **PASSES DESIGN CHECKS**

Minimum 1.50" bearing required at bearing # 1
Minimum 1.50" bearing required at bearing # 2
Design assumes continuous lateral bracing along the top chord.
Design assumes continuous lateral bracing along the bottom chord.

Allowable Stress Design

	Actual	Allowable	Capacity	Location	Loading
Positive Moment	11287.#	28527.#	39%	5'	Total Load D+S
Shear	3682.#	14399.#	25%	9.57'	Total Load D+S
LL Deflection	0.1640"	0.3382"	L/742	5'	Total Load S
TL Deflection	0.1784"	0.5073"	L/682	5'	Total Load D+S

Control: LL Deflection
DOLs: Live=100% Snow=115% Roof=125% Wind=160%
This member has been designed in accordance with NDS 2005

Rick Baer
Performance Engineers
1102 N Franklin Blvd.
Nampa, Idaho 83687