# STRUCTURAL CALCULATIONS

**For**

# 640 West Main Street
# Lake Geneva, Wisconsin

**by**

United Building Solutions


Date: May 2, 2017

**Index**

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JOB TITLE Lake Geneva - Vaction Rental

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# Code Search

**Code:** International Building Code 2009

## Occupancy:

Occupancy Group = R Residential

## Occupancy Category & Importance Factors:

| | |
|---|---|
| Occupancy Category = | II |
| Wind factor = | 1.00 |
| Snow factor = | 1.00 |
| Seismic factor = | 1.00 |

## Type of Construction:

Fire Rating:

| | |
|---|---|
| Roof = | 0.0 hr |
| Floor = | 0.0 hr |

## Building Geometry:

| | | |
|---|---|---|
| Roof angle (θ) | 6.00 / 12 | 26.6 deg |
| Building length (L) | 50.0 ft | |
| Least width (B) | 40.0 ft | |
| Mean Roof Ht (h) | 28.0 ft | |
| Parapet ht above grd | 0.0 ft | |
| Minimum parapet ht | 0.0 ft | |

## Live Loads:

**Roof**
0 to 200 sf: 18 psf
200 to 600 sf: 21.6 - 0.018Area, but not less than 12 psf
over 600 sf: 12 psf

**Floor:**

| | |
|---|---|
| Typical Floor | 40 psf |
| Partitions | 15 psf |
| Public rooms & corridors serving the | 100 psf |
| Corridors above first floor | 80 psf |
| Balconies (exterior) - same as occup | 40 psf |
| Storage warehouses: Light | 125 psf |

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## Wind Loads : ASCE 7 - 05

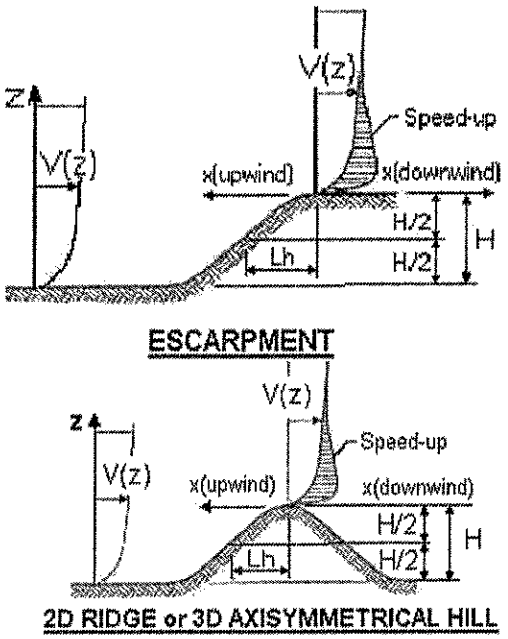
| | |
|---|---|
| Basic Wind Speed | 90 mph |
| Importance Factor | 1.00 |
| Occupancy Category | II |
| Exposure Category | C |
| Enclosure Classif. | Enclosed Building |
| Internal pressure | +/-0.18 |
| Directionality (Kd) | 0.85 |
| Kh case 1 | 0.968 |
| Kh case 2 | 0.968 |
| Type of roof | Gable |

Topographic Factor (Kzt)

| | | |
|---|---|---|
| Topography | | Flat |
| Hill Height | (H) | 80.0 ft |
| Half Hill Length (Lh) | | 100.0 ft |
| Actual H/Lh | = | 0.80 |
| Use H/Lh | = | 0.50 |
| Modified Lh | = | 160.0 ft |
| From top of crest: x = | | 50.0 ft |
| Bldg up/down wind? | | downwind |

H/Lh= 0.50 $K_1$ = 0.000
x/Lh = 0.31 $K_2$ = 0.792
z/Lh = 0.18 $K_3$ = 1.000

At Mean Roof Ht:
Kzt = $(1+K_1K_2K_3)^2$ = 1.00




## Gust Effect Factor

| | |
|---|---|
| h = | 28.0 ft |
| B = | 40.0 ft |
| /z (0.6h) = | 16.8 ft |

Flexible structure if natural frequency < 1 Hz (T > 1 second).
However, if building h/B < 4 then probably rigid structure (rule of thumb).
h/B = 0.70 Rigid structure

**G = 0.85** Using rigid structure default

**Rigid Structure**

| | | |
|---|---|---|
| $\bar{e}$ = | 0.20 | |
| $\ell$ = | 500 ft | |
| $z_{min}$ = | 15 ft | |
| c = | 0.20 | |
| $g_Q$, $g_v$ = | 3.4 | |
| $L_z$ = | 436.8 ft | |
| Q = | 0.91 | |
| $I_z$ = | 0.22 | |
| G = | 0.88 | use G = 0.85 |

**Flexible or Dynamically Sensitive Structure**

| | | | | |
|---|---|---|---|---|
| Natural Frequency ($\eta_1$) = | 0.0 Hz | | | |
| Damping ratio ($\beta$) = | 0 | | | |
| /b = | 0.65 | | | |
| /$\alpha$ = | 0.15 | | | |
| Vz = | 77.3 | | | |
| $N_1$ = | 0.00 | | | |
| $R_n$ = | 0.000 | | | |
| $R_h$ = | 28.282 | $\eta$ = | 0.000 | h = 28.0 ft |
| $R_B$ = | 28.282 | $\eta$ = | 0.000 | |
| $R_L$ = | 28.282 | $\eta$ = | 0.000 | |
| $g_R$ = | 0.000 | | | |
| R = | 0.000 | | | |
| G = | 0.000 | | | |

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## Enclosure Classification

**Test for Enclosed Building:** A building that does not qualify as open or partially enclosed.

**Test for Open Building:** All walls are at least 80% open.
Ao ≥ 0.8Ag

**Test for Partially Enclosed Building:**

| | Input | | | Test | |
|---|---|---|---|---|---|
| Ao | 100000.0 | sf | Ao ≥ 1.1Aoi | YES | |
| Ag | 0.0 | sf | Ao > 4' or 0.01Ag | YES | |
| Aoi | 0.0 | sf | Aoi / Agi ≤ 0.20 | NO | Building is NOT Partially Enclosed |
| Agi | 0.0 | sf | | | |

ERROR: Ag must be greater than Ao

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:
Ao ≥ 1.1Aoi
Ao > smaller of 4' or 0.01 Ag
Aoi / Agi ≤ 0.20

Where:
Ao = the total area of openings in a wall that receives positive external pressure.
Ag = the gross area of that wall in which Ao is identified.
Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.
Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

## Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog): 0 sf
Unpartitioned internal volume (Vi) : 0 cf
Ri = 1.00

## Altitude adjustment to constant 0.00256 (caution - see code) :

Altitude = 0 feet
Constant = 0.00256
Average Air Density = 0.0765 $lbm/ft^3$

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## Wind Loads - MWFRS h≤60' (Low-rise Buildings) Enclosed/partially enclosed only

Kz = Kh (case 1) = 0.97
Base pressure (qh) = **17.1 psf**
GCpi = +/-0.18

Edge Strip (a) = 4.0 ft
End Zone (2a) = 8.0 ft
Zone 2 length = 20.0 ft

### Wind Pressure Coefficients

| | Transverse Direction | | | Longitudinal Direction | | | |
|---|---|---|---|---|---|---|---|
| | Perpendicular θ = 26.6 deg | | | Parallel θ = 0.0 | | | |
| Surface | GCpf | w/-GCpi | w/+GCpi | GCpf | w/-Gcpi | w/+GCpi | |
| 1 | 0.55 | 0.73 | 0.37 | 0.40 | 0.58 | 0.22 | |
| 2 | -0.10 | 0.08 | -0.28 | -0.69 | -0.51 | -0.87 | |
| 3 | -0.45 | -0.27 | -0.63 | -0.37 | -0.19 | -0.55 | |
| 4 | -0.39 | -0.21 | -0.57 | -0.29 | -0.11 | -0.47 | |
| 5 | -0.45 | -0.27 | -0.63 | -0.45 | -0.27 | -0.63 | |
| 6 | -0.45 | -0.27 | -0.63 | -0.45 | -0.27 | -0.63 | |
| 1E | 0.73 | 0.91 | 0.55 | 0.61 | 0.79 | 0.43 | |
| 2E | -0.19 | -0.01 | -0.37 | -1.07 | -0.89 | -1.25 | |
| 3E | -0.58 | -0.40 | -0.76 | -0.53 | -0.35 | -0.71 | |
| 4E | -0.53 | -0.35 | -0.71 | -0.43 | -0.25 | -0.61 | |

### Nominal Wind Surface Pressures (psf)

| | | | | | |
|---|---|---|---|---|---|
| 1 | | 12.5 | 6.3 | 9.9 | 3.8 |
| 2 | | 1.4 | -4.8 | -8.7 | -14.8 |
| 3 | | -4.6 | -10.7 | -3.2 | -9.4 |
| 4 | | -3.6 | -9.7 | -1.9 | -8.0 |
| 5 | | -4.6 | -10.7 | -4.6 | -10.7 |
| 6 | | -4.6 | -10.7 | -4.6 | -10.7 |
| 1E | | 15.5 | 9.3 | 13.5 | 7.3 |
| 2E | | -0.2 | -6.3 | -15.2 | -21.3 |
| 3E | | -6.9 | -13.1 | -6.0 | -12.1 |
| 4E | | -6.1 | -12.2 | -4.3 | -10.4 |

### Parapet

Windward parapet = 0.0 psf (GCpn = +1.5)
Leeward parapet = 0.0 psf (GCpn = -1.0)

Windward roof overhangs = 11.6 psf (upward) add to windward roof pressure

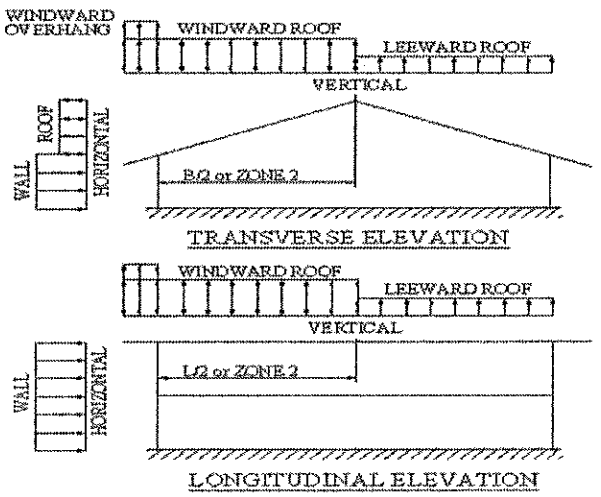
### Horizontal MWFRS Simple Diaphragm Pressures (psf)

**Transverse direction (normal to L)**

Interior Zone: Wall 16.0 psf
Roof 5.9 psf
End Zone: Wall 21.5 psf
Roof 6.7 psf

**Longitudinal direction (parallel to L)**

Interior Zone: Wall 11.8 psf
End Zone: Wall 17.7 psf



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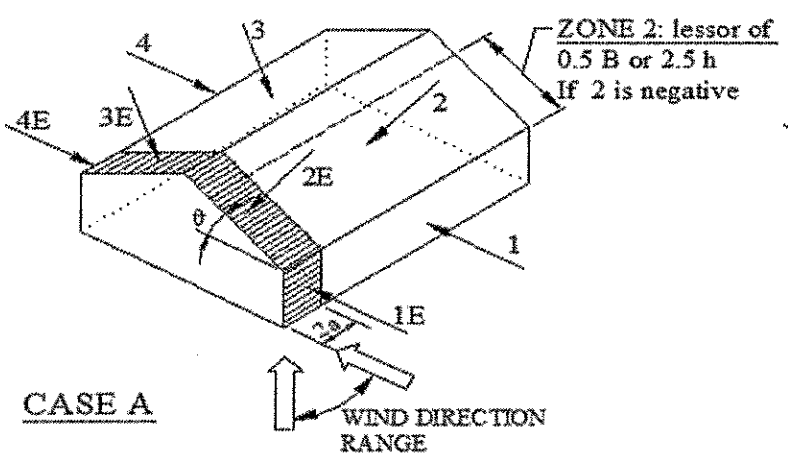
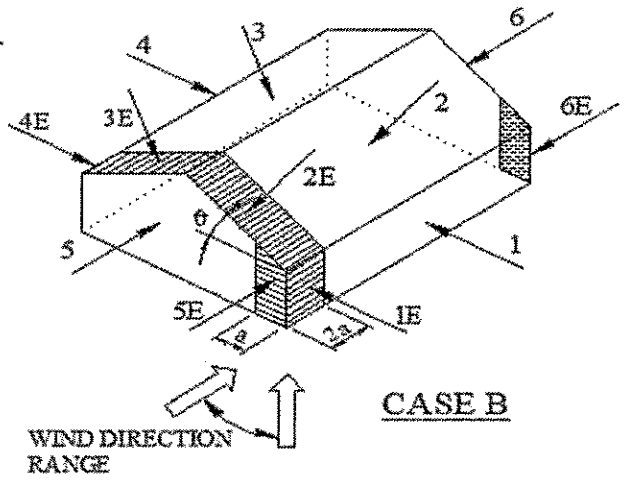
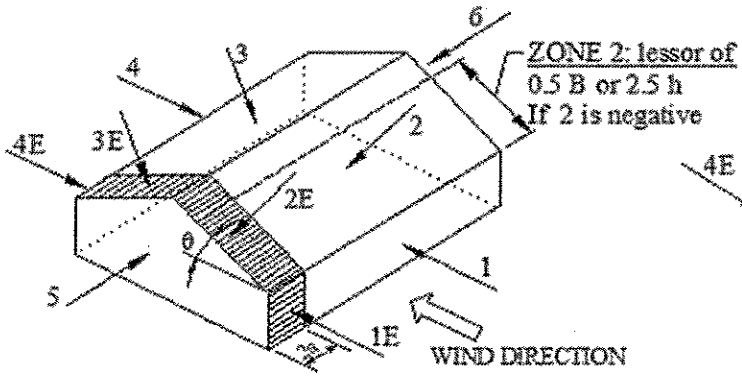
# Location of MWFRS Wind Pressure Zones

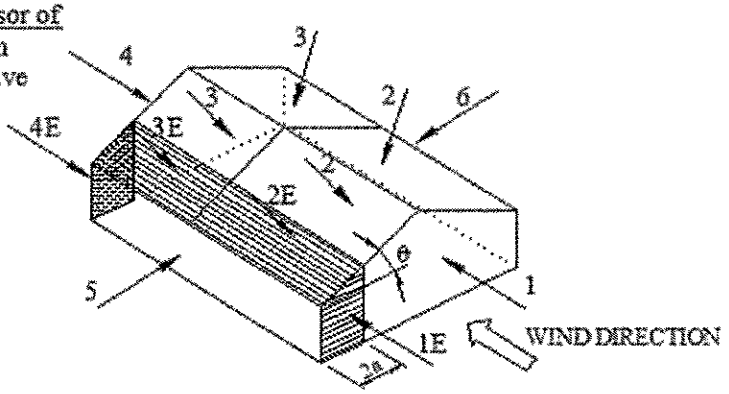



NOTE: Torsional loads are 25% of zones 1 - 6. See code for loading diagram.

## ~~ASCE 7 -99 and ASCE 7-10 (& later)~~




NOTE: Torsional loads are 25% of zones 1 - 4. See code for loading diagram.

## ASCE 7 -02 and ASCE 7-05

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Nominal Wind Pressures

## Wind Loads - Components & Cladding : h <= 60'

| | | | |
|---|---|---|---|
| Kh (case 1) = | 0.97 | h = | 28.0 ft |
| Base pressure (qh) = | **17.1 psf** | a = | 4.0 ft |
| Minimum parapet ht = | 0.0 ft | GCpi = | +/-0.18 |
| Roof Angle (θ) = | 26.6 deg | | |
| Type of roof = | Gable | | |

### Roof

| | GCp +/- GCpi | | | Surface Pressure (psf) | | | **User input** | |
|---|---|---|---|---|---|---|---|---|
| Area | 10 sf | 50 sf | 100 sf | 10 sf | 50 sf | 100 sf | 75 sf | 500 sf |
| Negative Zone 1 | -1.08 | -1.01 | -0.98 | -18.4 | -17.2 | -16.7 | -16.9 | -16.7 |
| Negative Zone 2 | -1.88 | -1.53 | -1.38 | -32.1 | -26.1 | -23.5 | -24.6 | -23.5 |
| Negative Zone 3 | -2.78 | -2.36 | -2.18 | -47.4 | -40.3 | -37.2 | -38.5 | -37.2 |
| Positive All Zones | 0.68 | 0.54 | 0.48 | 11.6 | 10.0 | 10.0 | 10.0 | 10.0 |
| Overhang Zone 2 | -2.20 | -2.20 | -2.20 | -37.5 | -37.5 | -37.5 | -37.5 | -37.5 |
| Overhang Zone 3 | -3.70 | -2.86 | -2.50 | -63.1 | -48.8 | -42.7 | -45.2 | -42.7 |

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0

### Parapet

qp = 0.0 psf

CASE A = pressure towards building (pos)
CASE B = pressure away from bldg (neg)

| | Surface Pressure (psf) | | | **User input** |
|---|---|---|---|---|
| Solid Parapet Pressure | 10 sf | 100 sf | 500 sf | 40 sf |
| CASE A : Interior zone: | 0.0 | 0.0 | 0.0 | 0.0 |
| Corner zone: | 0.0 | 0.0 | 0.0 | 0.0 |
| CASE B : Interior zone: | 0.0 | 0.0 | 0.0 | 0.0 |
| Corner zone: | 0.0 | 0.0 | 0.0 | 0.0 |

### Walls

| | GCp +/- GCpi | | | Surface Pressure (psf) | | | **User input** | |
|---|---|---|---|---|---|---|---|---|
| Area | 10 sf | 100 sf | 500 sf | 10 sf | 100 sf | 500 sf | 25 sf | 200 sf |
| Negative Zone 4 | -1.28 | -1.10 | -0.98 | -21.8 | -18.8 | -16.7 | -20.6 | -17.9 |
| Negative Zone 5 | -1.58 | -1.23 | -0.98 | -27.0 | -20.9 | -16.7 | -24.6 | -19.1 |
| Positive Zone 4 & 5 | 1.18 | 1.00 | 0.88 | 20.1 | 17.1 | 15.0 | 18.9 | 16.2 |

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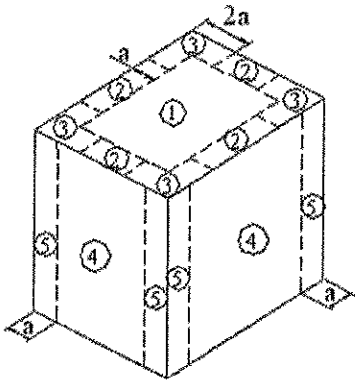
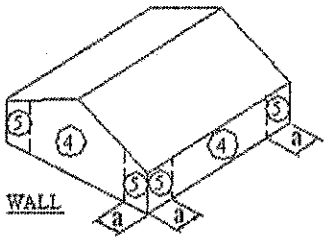
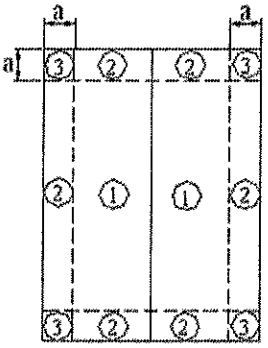
## Location of C&C Wind Pressure Zones



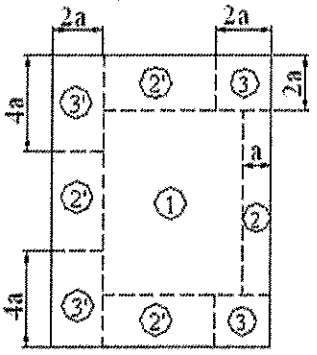

Roofs w/ $\theta \leq 10°$
and all walls
**h > 60'**



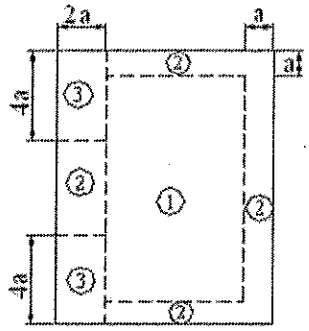

**Walls h ≤ 60'**
**& alt design h<90'**



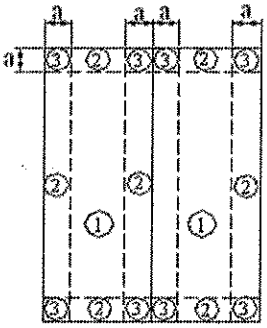

Gable, Sawtooth and
Multispan Gable $\theta \leq 7$ degrees &
Monoslope ≤ 3 degrees
**h ≤ 60' & alt design h<90'**



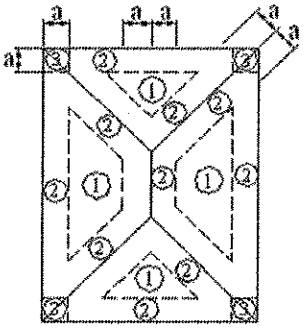

Monoslope roofs
$3° < \theta \leq 10°$
**h ≤ 60' & alt design h<90'**



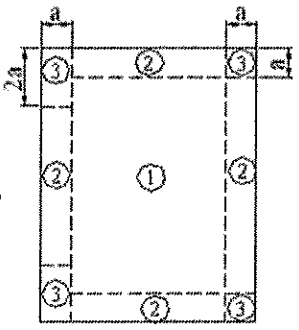

Monoslope roofs
$10° < \theta \leq 30°$
**h ≤ 60' & alt design h<90'**



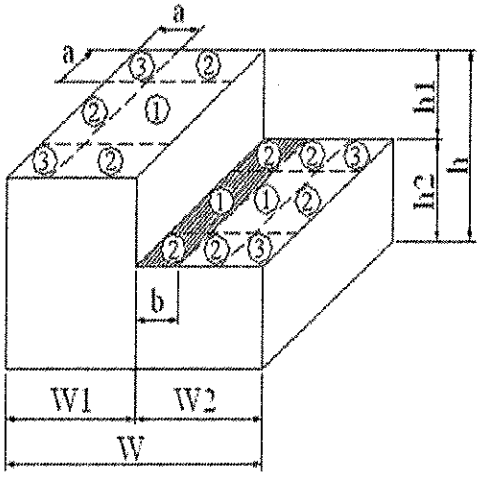

Multispan Gable &
Gable $7° < \theta \leq 45°$

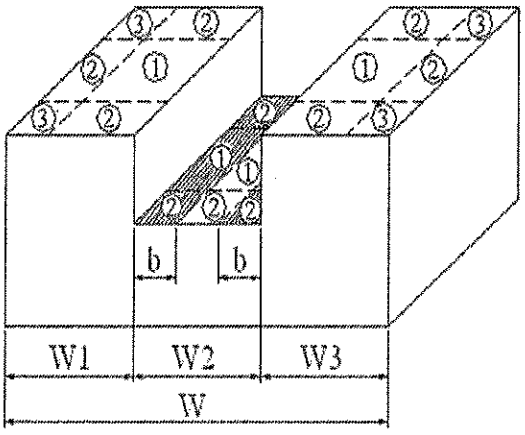



Hip $7° < \theta \leq 27°$


Sawtooth $10° < \theta \leq 45°$
**h ≤ 60' & alt design h<90'**




Stepped roofs $\theta \leq 3°$
**h ≤ 60' & alt design h<90'**

## Snow Loads : ASCE 7-05

Nominal Snow Forces

| | | |
|---|---|---|
| Roof slope | = | 26.6 deg |
| Horiz. eave to ridge dist (W) | = | 20.0 ft |
| Roof length parallel to ridge (L) | = | 50.0 ft |

| | | | |
|---|---|---|---|
| Type of Roof | | | Hip and gable w/ trussed systems |
| Ground Snow Load | Pg | = | 30.0 psf |
| Occupancy Category | | = | II |
| Importance Factor | I | = | 1.0 |
| Thermal Factor | Ct | = | 1.10 |
| Exposure Factor | Ce | = | 1.0 |
| Pf = 0.7*Ce*Ct*I*Pg | | = | 23.1 psf |
| Unobstructed Slippery Surface | | | no |
| Sloped-roof Factor | Cs | = | 1.00 |
| Balanced Snow Load | **Ps** | = | **23.1 psf** |
| Rain on Snow Surcharge Angle | | | 0.40 deg |
| Code Maximum Rain Surcharge | | | 5.0 psf |
| Rain on Snow Surcharge | | = | 0.0 psf |
| Ps plus rain surcharge | | = | 23.1 psf |
| Minimum Snow Load | Pfmin | = | 0.0 psf |
| Uniform Roof Design Snow Load | | = | **23.1 psf** |

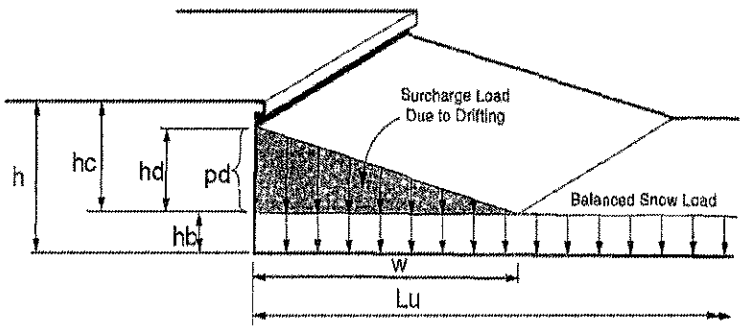
NOTE: Alternate spans of continuous beams and other areas shall be loaded with half the design roof snow load so as to produce the greatest possible effect - see code.

### Unbalanced Snow Loads - for Hip & Gable roofs only

| | | |
|---|---|---|
| Required if slope is between | 70.00 deg | |
| and larger of 2.38 degrees or 70/W + 0.5 = | 4.00 deg | **Unbalanced snow loads must be applied** |
| Windward snow load = | 6.9 psf | = 0.3Ps |
| Leeward snow load from ridge to 6.27' = | 44.1 psf | = hdγ / √S + Ps |
| Leeward snow load from 6.27' to the eave = | 23.1 psf | = Ps |

### Windward Snow Drifts 1 - Against walls, parapets, etc more than 15' long

| | | | |
|---|---|---|---|
| Upwind fetch | lu | = | 10.0 ft |
| Projection height | h | = | 12.0 ft |
| Snow density | g | = | 17.9 pcf |
| Balanced snow height | hb | = | 1.29 ft |
| | hd | = | 1.25 ft |
| | hc | = | 10.71 ft |
| hc/hb >0.2 = 8.3 | **Therefore, design for drift** | | |
| Drift height (hd) | | = | 1.25 ft |
| Drift width | w | = | 4.99 ft |
| Surcharge load: | pd = γ*hd | = | **22.3 psf** |
| Balanced Snow load: | | = | 23.1 psf |
| | | | 45.4 psf |




### Windward Snow Drifts 2 - Against walls, parapets, etc > 15'

| | | | |
|---|---|---|---|
| Upwind fetch | lu | = | 0.0 ft |
| Projection height | h | = | 0.0 ft |
| Snow density | g | = | 17.9 pcf |
| Balanced snow height | hb | = | 1.29 ft |
| | hd | = | 1.25 ft |
| | hc | = | -1.29 ft |
| hc/hb <0.2 = -1.0 | **Therefore, no drift** | | |
| Drift height (hc) | | = | 0.00 ft |
| Drift width | w | = | -10.32 ft |
| Surcharge load: | pd = γ*hd | = | **0.0 psf** |
| Balanced Snow load: | | = | 23.1 psf |
| | | | 23.1 psf |

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A Wall-tech Company

PROJECT LAK GENEVA - VACATION RENTAL
DESCR. _____ PROJ. NO. _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. _____

# DESIGN DATA SUMMARY

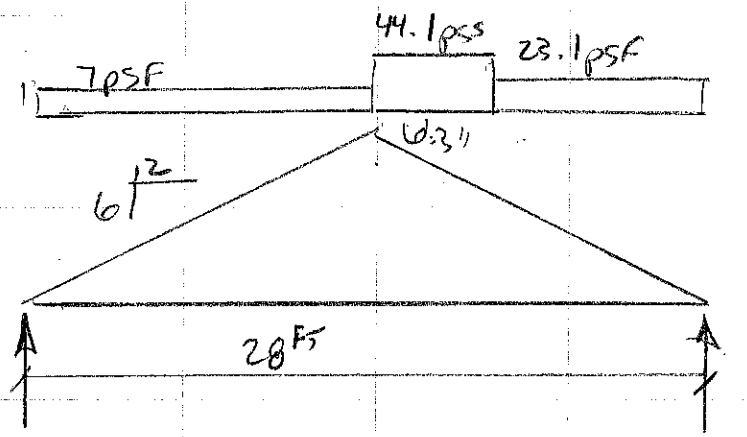
## GRAVITY LOADS

### ROOF

SNOW : 30PSF
+DRIFT AND/OR UNBALANCE LOAD

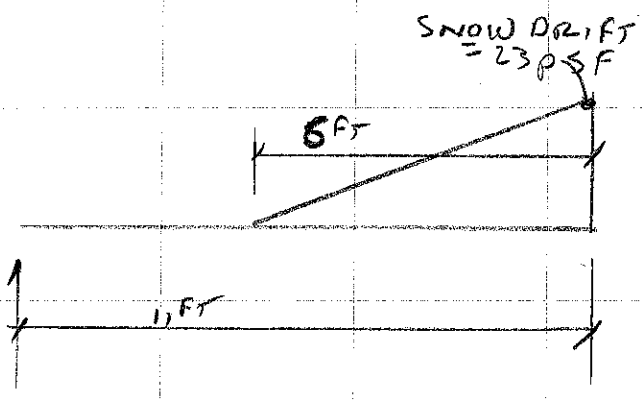
DEAD : 20psf

### UNBALANCE SNOW




NOTE: UNIFORM SNOW OF 30PSF GOVERNS OVER UNBALANCE

### SNOW DRIFT @ FLAT AREA




## FLOOR

LIVE LOAD = 40psf
DEAD LOAD = 15PSF
PARTITION = 15psf

### PATIO / DECKS

LIVE LOAD = 75psf
DEAD LOAD = 15 PSF

## WIND

MWFRS = 17.2psf

C&C = 22psf (ZONE 4)
= 27 psf (ZONE 5)

## FOUNDATION DESIGN

### EARTH PRESSURES

ACTIVE = 35psf/ft
AT REST = 55PSF/FT

ASSUMED ALLOWABLE SOIL BRG = 2000PSF

## SERVICEABILITY

### DEFLECTION LIMITS

ROOF
SNOW: $\Delta \leq L/360$
TOTAL $\Delta \leq L/240$

FLOOR

LIVE LOAD = $\Delta \leq L/480$
TOTAL LOAD = $\Delta \leq L/240$

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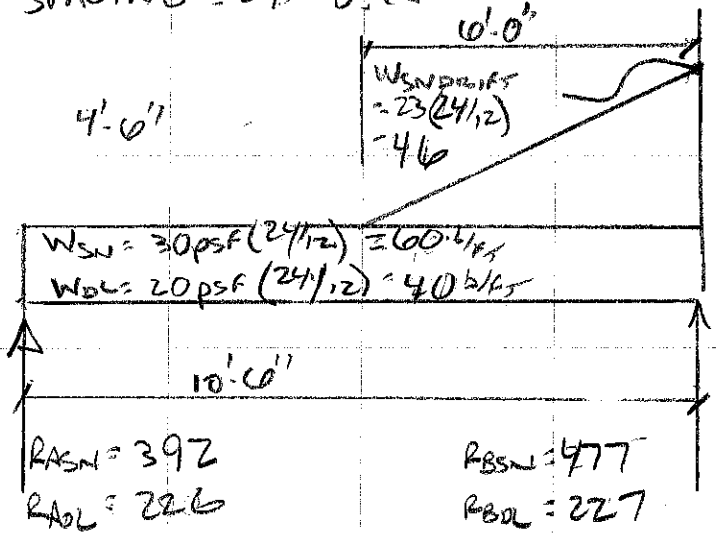
PROJECT LAKE GENEVA - VACATION RENTAL
DESCR. _____ PROJ. NO. _____
CALCULATED BY KJP DATE _____
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. _____

## NEW ROOF JOISTS

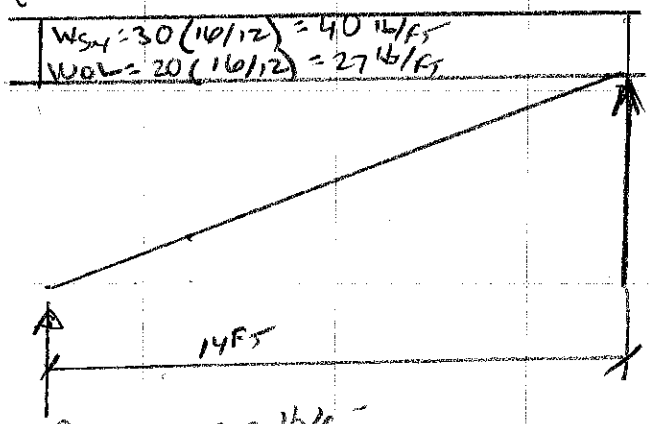
CRITICAL SPAN = 10'-0"
SPACING = 24" O.C.




USE 2x10's @ 24"

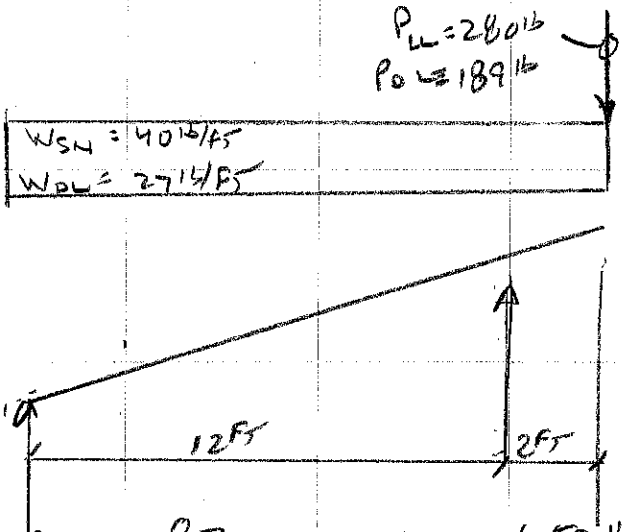
## EXISTING ROOF RAFTERS

(SPACING = 16" O.C.




$R_{ALL}$ = 280 lb/ft
$R_{ADL}$ = 189 lb/ft

## EXIST'G. ROOF JOIST - NEW CANTILEVER COND.




$R_{ALL}$ = 187
$R_{ADL}$ = 127 lb
$R_{BLL}$ = 653 lb
$R_{BDL}$ = 441 lb

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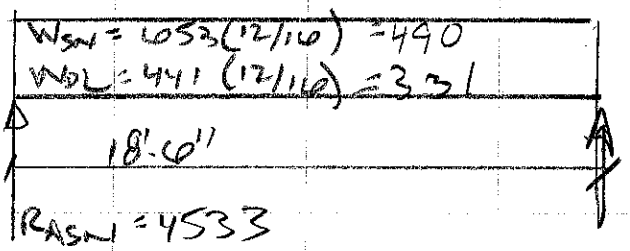
PROJECT LAKE GENEVA - VACATION RENTAL
DESCR. _____ PROJ. NO. _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. _____

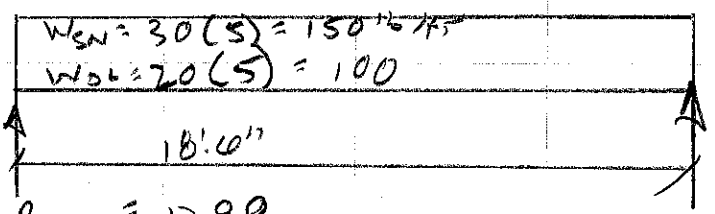
## NEW RIDGE BEAM (GRID LINE B)




$R_{ASN} = 4533$
$R_{ADL} = 3062$

USE 5½x15" GLULAM
DOUG FIR 24F. 1.8E
BALANCED

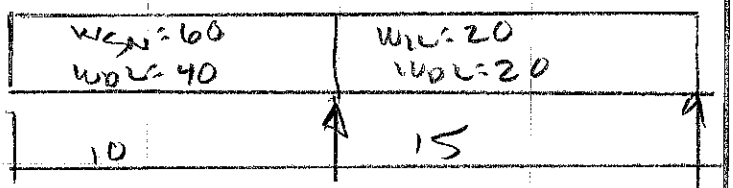
## NEW RIM BEAM - LINE E-2




$R_{ASN} = 1388$
$R_{ADL} = 925$

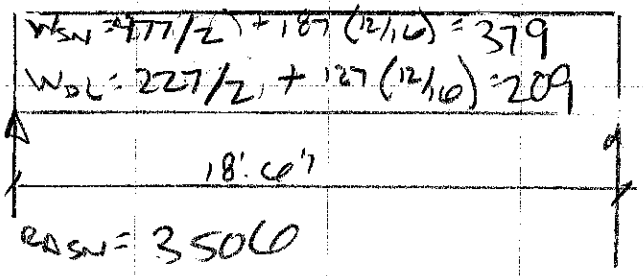
## NEW CANTILEVER ROOF BEAM

$P_{SN} = 2(1388) = 2776$
$P_{DL} = 925(2) = 1850$




$R_{ASN} = 5427$
$R_{ADL} = 4092$
$R_{BSN} = -2051$
$R_{BDL} = 95$

## NEW BEAM @ EXISTING WALL (LINE C-2)




$R_{ASN} = 3506$
$R_{ADL} = 1931$

USE 5½x13½ GLULAM
DOUG FIR 24f. 1.8E
BALANCED

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:26 | New Roof Joists over Deck Area |

## Design Check Calculation Sheet

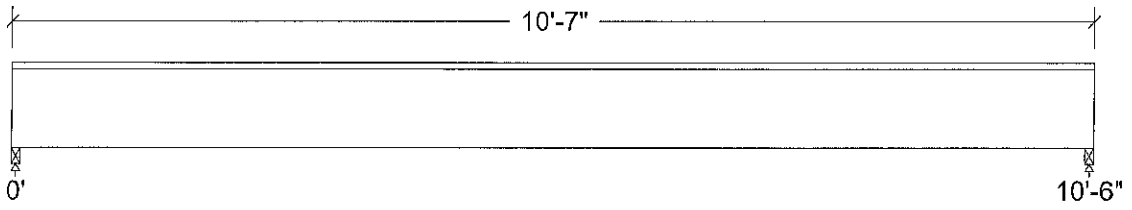
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Snow | Full UDL | | | | 69.0 | | plf |
| Load2 | Dead | Full UDL | | | | 40.0 | | plf |
| Load3 | Snow | Triangular | | 4.53 | 10.53 | 0.0 | 46.0 | plf |
| Self-weight | Dead | Full UDL | | | | 2.8 | | plf |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 226 | | 227 |
| Snow | 392 | | 477 |
| Factored: | | | |
| Total | 618 | | 703 |
| Bearing: | | | |
| Capacity | | | |
| Joist | 618 | | 703 |
| Support | 1136 | | 1293 |
| Anal/Des | | | |
| Joist | 1.00 | | 1.00 |
| Support | 0.54 | | 0.54 |
| Load comb | #2 | | #2 |
| Length | 0.97 | | 1.10 |
| Min req'd | 0.97 | | 1.10 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.25 | | 1.25 |
| Fcp sup | 625 | | 625 |

## Lake Geneva - Vacation Rental - New Roof Joists

**Lumber-soft, S-P-F, No.1/No.2, 2x10 (1-1/2"x9-1/4")**

Supports: All - Timber-soft Beam, D.Fir-L No.2

Roof joist spaced at 16.0" c/c; Total length: 10'-7.0"; volume = 1.0 cu.ft.;

Lateral support: top= full, bottom= at supports; Repetitive factor: applied where permitted (refer to online help);

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 62 | Fv' = 155 | psi | fv/Fv' = 0.40 |
| Bending(+) | fb = 943 | Fb' = 1273 | psi | fb/Fb' = 0.74 |
| Live Defl'n | 0.16 = L/802 | 0.53 = L/240 | in | 0.30 |
| Total Defl'n | 0.28 = L/443 | 0.70 = L/180 | in | 0.41 |

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## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | Cn | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 135 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 875 | 1.15 | 1.00 | 1.00 | 1.000 | 1.100 | 1.00 | 1.15 | 1.00 | 1.00 | - | 2 |
| Fcp' | 425 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | - |
| E' | 1.4 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | 2 |
| Emin' | 0.51 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D+S, V =    698, V design =    574 lbs
Bending(+): LC #2  = D+S, M =   1682 lbs-ft
Deflection: LC #2  = D+S  (live)
            LC #2  = D+S  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =    139e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
4. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

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|---|---|---|
| | May 1, 2017 03:26 | New Ridge Beam - Grid Line B |

## Design Check Calculation Sheet

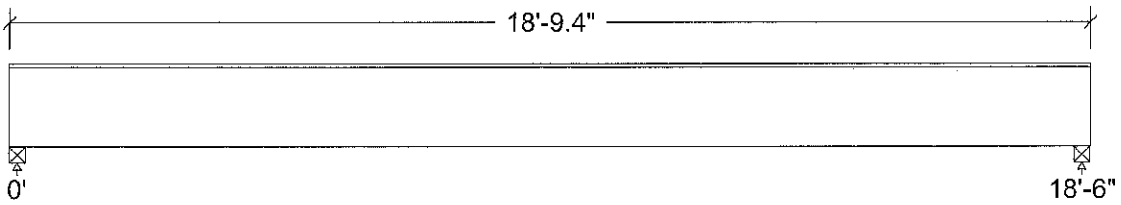
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Snow | Full UDL | | | | 490.0 | | plf |
| Load2 | Dead | Full UDL | | | | 331.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 13.3 | | plf |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 3232 | | 3232 |
| Snow | 4603 | | 4603 |
| Factored: | | | |
| Total | 7835 | | 7835 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 7835 | | 7835 |
| Support | 8341 | | 8341 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.94 | | 0.94 |
| Load comb | #2 | | #2 |
| Length | 3.44 | | 3.44 |
| Min req'd | 3.44 | | 3.44 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

**Lake Geneva - Vacation Rental - New Roof Joists**

**Glulam-Bal., West Species, 24F-1.8E WS, 3-1/2"x16-1/2"**

11 laminations, 3-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 18'-9.4"; volume = 7.5 cu.ft.;
Lateral support: top= full, bottom= at supports;

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 168 | Fv' = 305 | psi | fv/Fv' = 0.55 |
| Bending(+) | fb = 2697 | Fb' = 2760 | psi | fb/Fb' = 0.98 |
| Live Defl'n | 0.55 = L/405 | 0.62 = L/360 | in | 0.89 |
| Total Defl'n | 1.12 = L/197 | 1.23 = L/180 | in | 0.91 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.15 | 1.00 | 1.00 | 1.000 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 7717, V design = 6450 lbs
Bending(+): LC #2 = D+S, M = 35692 lbs-ft
Deflection: LC #2 = D+S (live)
LC #2 = D+S (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 2358e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:25 | New Beam @ Existing Wall - Grid Line C2 |

## Design Check Calculation Sheet

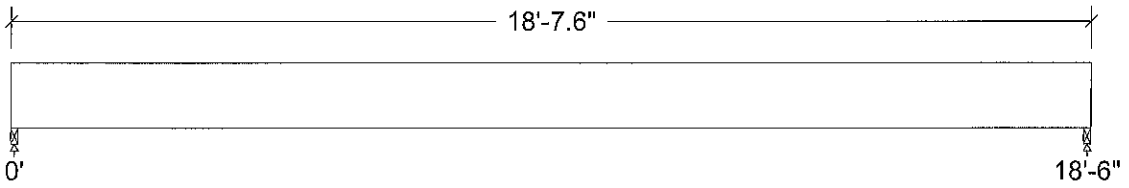
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Snow | Full UDL | | | | 379.0 | | plf |
| Load2 | Dead | Full UDL | | | | 209.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 17.1 | | plf |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 2105 | | 2105 |
| Snow | 3531 | | 3531 |
| Factored: | | | |
| Total | 5636 | | 5636 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 5636 | | 5636 |
| Support | 5788 | | 5788 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.97 | | 0.97 |
| Load comb | #2 | | #2 |
| Length | 1.58 | | 1.58 |
| Min req'd | 1.58 | | 1.58 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

**Lake Geneva - Vacation Rental - New Beam @ Existing Wall (Line C2)**

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x13-1/2"**

9 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 18'-7.6"; volume = 9.6 cu.ft.;
Lateral support: top= at supports, bottom= at supports;

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## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 99 | Fv' = 305 | psi | fv/Fv' = 0.32 |
| Bending(+) | fb = 1859 | Fb' = 2642 | psi | fb/Fb' = 0.70 |
| Live Defl'n | 0.49 = L/451 | 0.62 = L/360 | in | 0.80 |
| Total Defl'n | 0.93 = L/238 | 1.23 = L/180 | in | 0.76 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.15 | 1.00 | 1.00 | 0.957 | 0.994 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 5597, V design = 4877 lbs
Bending(+): LC #2 = D+S, M = 25887 lbs-ft
Deflection: LC #2 = D+S (live)
LC #2 = D+S (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 2030e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 18'-6.00" Le = 34'-0.50" RB = 13.50

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:25 | New Cantilever Roof Beam |

## Design Check Calculation Sheet

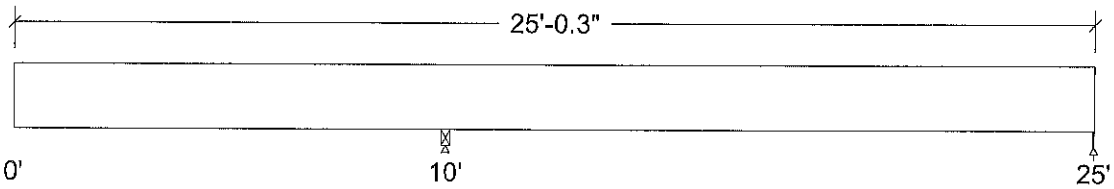
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Snow | Point | Yes | 0.00 | | 2776 | | lbs |
| Load2 | Dead | Point | No | 0.00 | | 1850 | | lbs |
| Load3 | Dead | Partial UDL | No | 0.00 | 10.00 | 40.0 | 40.0 | plf |
| Load4 | Snow | Partial UDL | Yes | 0.00 | 10.00 | 60.0 | 60.0 | plf |
| Self-weight | Dead | Full UDL | No | | | 22.8 | | plf |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | | | |
|---|---|---|---|---|---|
| Unfactored: | | | | | |
| Dead | | | 4092 | | 95 |
| Snow | | | 5427 | | -2051 |
| Factored: | | | | | |
| Uplift | | | | | 3322 |
| Total | | | 9518 | | 95 |
| Bearing: | | | | | |
| Capacity | | | | | |
| Beam | | | 10608 | | 1787 |
| Support | | | 9518 | | 1836 |
| Anal/Des | | | | | |
| Beam | | | 0.90 | | 0.05 |
| Support | | | 1.00 | | 0.05 |
| Load comb | | | #2 | | #1 |
| Length | | | 2.59 | | 0.50* |
| Min req'd | | | 2.59** | | 0.50* |
| Cb | | | 1.14 | | 1.00 |
| Cb min | | | 1.14 | | 1.00 |
| Cb support | | | 1.07 | | 1.07 |
| Fcp sup | | | 625 | | 625 |

*Minimum bearing length setting used: 1/2" for end supports

**Minimum bearing length governed by the required width of the supporting member.

Maximum reaction on at least one support is from a different load combination than the critical one for bearing design, shown here, due to Kd factor. See Analysis results for reaction from critical load combination.

### Lake Geneva - Vacation Rental - New Cantilever Roof Beam

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x18"**

12 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 25'-0.3"; volume = 17.2 cu.ft.;
Lateral support: top= at supports, bottom= at supports;

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## This section FAILS the design check

**WARNING: This section violates the following design criteria: Deflection**

## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 86 | Fv' = 305 | psi | fv/Fv' = 0.28 |
| Bending(-) | fb = 2117 | Fb' = 2586 | psi | fb/Fb' = 0.82 |
| Deflection: | | | | |
| Interior Live | -0.16 = <L/999 | 0.50 = L/360 | in | 0.32 |
| Total | -0.32 = L/562 | 1.00 = L/180 | in | 0.32 |
| Cantil. Live | 0.91 = L/131 | 0.67 = L/180 | in | 1.37 |
| Total | 1.85 = L/64 | 1.33 = L/90 | in | 1.39 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'- | 2400 | 1.15 | 1.00 | 1.00 | 0.974 | 0.937 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 5854, V design = 5669 lbs
Bending(-): LC #2 = D+S, M = 52400 lbs-ft
Deflection: LC #2 = D+S (live)
LC #2 = D+S (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load Patterns: s=S/2, X=L+S or L+Lr, _=no pattern load in this span
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 4811e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Lateral stability (-): Lu = 10' Le = 18'-8.38" RB = 11.56

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. Grades with equal bending capacity in the top and bottom edges of the beam cross-section are recommended for continuous beams.
5. GLULAM: bxd = actual breadth x actual depth.
6. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
7. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:26 | New Rim Beam - Line E.2 |

## Design Check Calculation Sheet

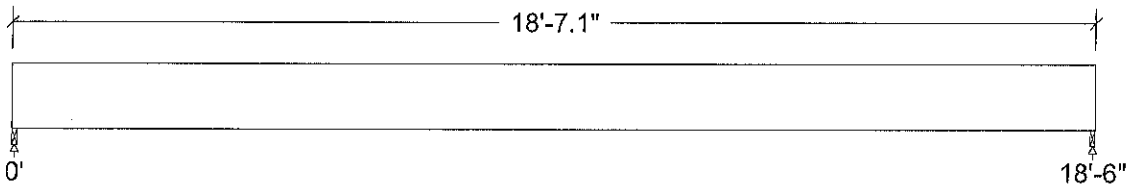
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Snow | Full UDL | | | | 150.0 | | plf |
| Load2 | Dead | Full UDL | | | | 100.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 10.9 | | plf |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 1030 | | 1030 |
| Snow | 1394 | | 1394 |
| Factored: | | | |
| Total | 2424 | | 2424 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 2424 | | 2424 |
| Support | 2581 | | 2581 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.94 | | 0.94 |
| Load comb | #2 | | #2 |
| Length | 1.07 | | 1.07 |
| Min req'd | 1.07 | | 1.07 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

### Lake Geneva - Vacation Rental - New Beam @ Existing Wall (Line C2)

**Glulam-Bal., West Species, 24F-1.8E WS, 3-1/2"x13-1/2"**

9 laminations, 3-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 18'-7.1"; volume = 6.1 cu.ft.;
Lateral support: top= at supports, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 67 | Fv' = 305 | psi | fv/Fv' = 0.22 |
| Bending(+) | fb = 1260 | Fb' = 2002 | psi | fb/Fb' = 0.63 |
| Live Defl'n | 0.31 = L/725 | 0.62 = L/360 | in | 0.50 |
| Total Defl'n | 0.65 = L/343 | 1.23 = L/180 | in | 0.52 |

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.15 | 1.00 | 1.00 | 0.725 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D+S, V =   2413, V design =   2108 lbs
Bending(+): LC #2  = D+S, M =  11161 lbs-ft
Deflection: LC #2  = D+S  (live)
            LC #2  = D+S  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =   1292e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 18'-6.00"  Le = 34'-0.50"  RB =   21.22
```

## Design Notes:

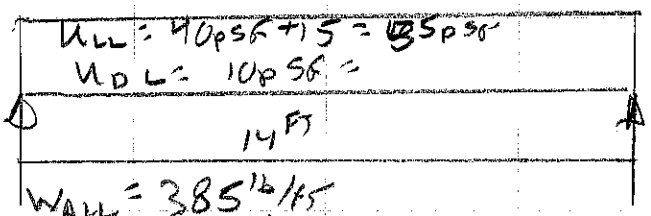
1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

United Building Solutions
A Wall-tech Company

PROJECT _____
DESCR. _____ PROJ. NO. _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. _____

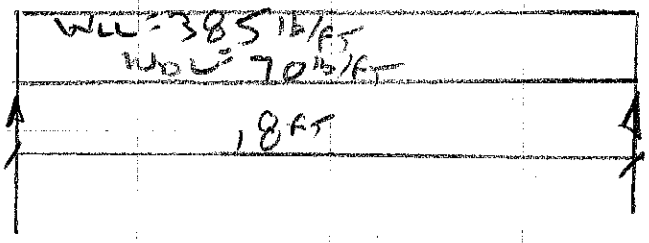
## 2ND & 1ST FLOOR JOIST REACTIONS

SPAN = 14'.0"




$W_{ALL} = 385^{lb}/_{FT}$
$W_{ADL} = 70^{lb}/_{FT}$

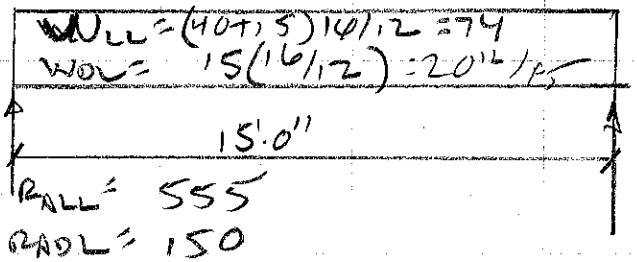
## BEAM - LINE C.2




USE 5 1/2 x 13 1/2" GLULAM

## NEW FLOOR JOISTS @ SCREEN PATIO

(SPACING = 16" o.c.

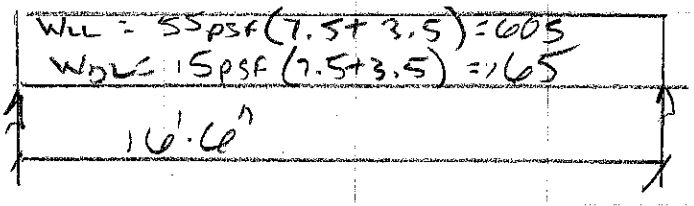



$R_{ALL}$ = 555
$R_{ADL}$ = 150

USE 2 x 12's @ 16" } N.G.

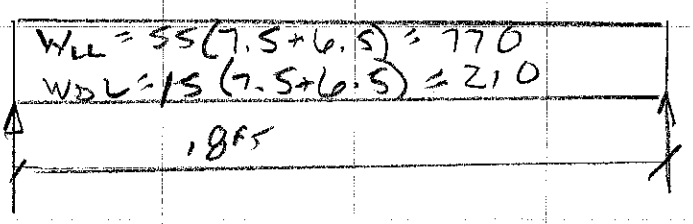
SPACE @ 12" o.c.

## BEAM - LINE C.2 (SCREEN PATIO)




5 1/2 x 13 1/2 GLULAM

## NEW GLULAM - LINE B




5 1/2 x 16 1/2 GLULAM

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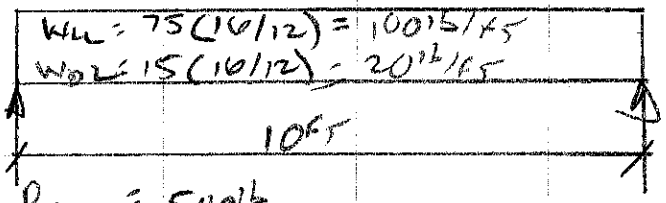
A Wall-tech Company

PROJECT _____
DESCR. _____ PROJ. NO. _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____ SHEET NO. _____

## SECOND FLOOR FRAMING

### NEW DECK JOISTS

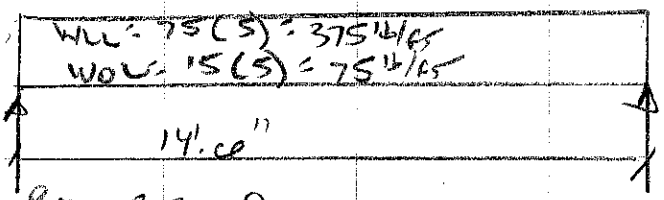
(SPACING = 16" O.C.)




$R_{ALL}$ = 500 #
$R_{ADL}$ = 100 #

TREATED 2x10's @ 16"

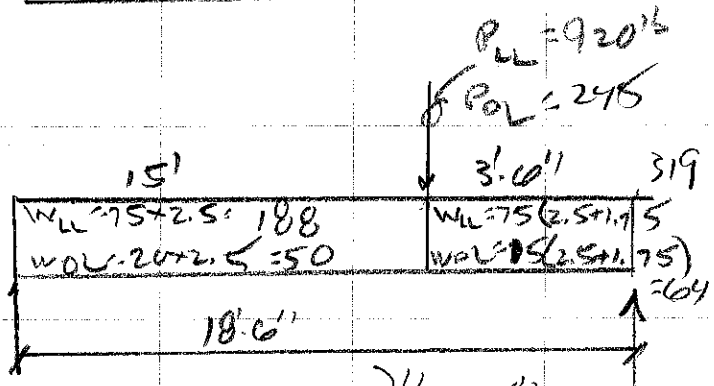
### NEW DECK RIM BEAM




$R_{ALL}$ = 2719
$R_{ADL}$ = 544 #

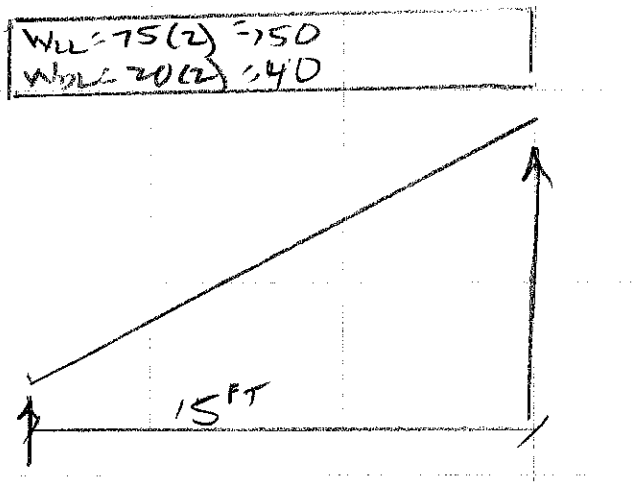
3 1/2" x 3 1/2" GLULAM

### BEAM ALONG STAIR



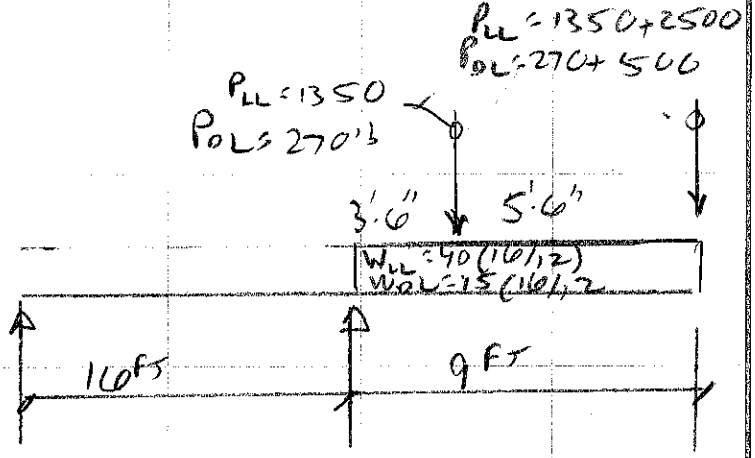

3 1/2" x 15" GLULAM

### NEW DECK STAIR STRINGER




3 1/8" x 12" GLULAM

### CANTILEVERED BM - LINE 2




8 3/4" x 19 1/2"

LINE 3 8 3/4" x 16 1/2"
LINE 1 8 3/4" x 19 1/2"
LINE 5 [illegible] 5 1/2" x 16 1/2"

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:28 | New Deck Joists |

## Design Check Calculation Sheet

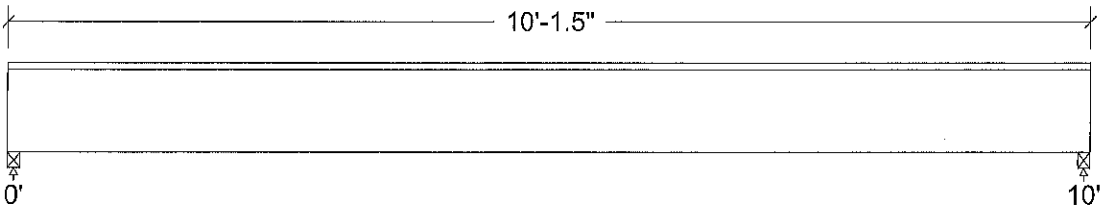
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Full UDL | | | | 20.0 | | plf |
| Load4 | Snow | Full UDL | | | | 100.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 2.8 | | plf |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 115 | | 115 |
| Snow | 506 | | 506 |
| Factored: | | | |
| Total | 621 | | 621 |
| Bearing: | | | |
| Capacity | | | |
| Joist | 621 | | 621 |
| Support | 1142 | | 1142 |
| Anal/Des | | | |
| Joist | 1.00 | | 1.00 |
| Support | 0.54 | | 0.54 |
| Load comb | #2 | | #2 |
| Length | 1.45 | | 1.45 |
| Min req'd | 1.45 | | 1.45 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.25 | | 1.25 |
| Fcp sup | 625 | | 625 |

### Lake Geneva - Vacation Rental - New Deck Joists

**Lumber-soft, S-P-F, No.1/No.2, 2x10 (1-1/2"x9-1/4")**

Supports: All - Timber-soft Beam, D.Fir-L No.2

Floor joist spaced at 16.0" c/c; Total length: 10'-1.5"; volume = 1.0 cu.ft.;

Service: wet; Lateral support: top= full, bottom= at supports; Repetitive factor: applied where permitted (refer to online help);

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 55 | Fv' = 151 | psi | fv/Fv' = 0.37 |
| Bending(+) | fb = 861 | Fb' = 1273 | psi | fb/Fb' = 0.68 |
| Live Defl'n | 0.18 = L/664 | 0.33 = L/360 | in | 0.54 |
| Total Defl'n | 0.26 = L/456 | 0.50 = L/240 | in | 0.53 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | Cn | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 135 | 1.15 | 0.97 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 875 | 1.15 | 1.00 | 1.00 | 1.000 | 1.100 | 1.00 | 1.15 | 1.00 | 1.00 | - | 2 |
| Fcp' | 425 | - | 0.67 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | - |
| E' | 1.4 million | | 0.90 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | 2 |
| Emin' | 0.51 million | | 0.90 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | 2 |

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 614, V design = 512 lbs
Bending(+): LC #2 = D+S, M = 1535 lbs-ft
Deflection: LC #2 = D+S (live)
LC #2 = D+S (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 139e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
4. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | | 2ND FLOOR |
| | May 1, 2017 03:29 | New Deck Rim Beam |

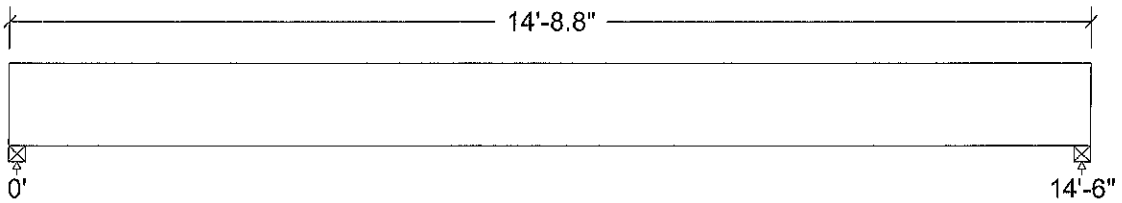
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Full UDL | | | | 75.0 | | plf |
| Load4 | Live | Full UDL | | | | 375.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 10.9 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 631 | | 631 |
| Live | 2763 | | 2763 |
| Factored: | | | |
| Total | 3394 | | 3394 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 3394 | | 3394 |
| Support | 4568 | | 4568 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.74 | | 0.74 |
| Load comb | #2 | | #2 |
| Length | 2.82 | | 2.82 |
| Min req'd | 2.82 | | 2.82 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

### Lake Geneva - Vacation Rental - New Deck Rim Beam

**Glulam-Bal., West Species, 24F-1.8E WS, 3-1/2"x13-1/2"**

9 laminations, 3-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 14'-8.8"; volume = 4.8 cu.ft.;
Service: wet; Lateral support: top= at supports, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 88 | Fv' = 232 | psi | fv/Fv' = 0.38 |
| Bending(+) | fb = 1367 | Fb' = 1705 | psi | fb/Fb' = 0.80 |
| Live Defl'n | 0.35 = L/501 | 0.48 = L/360 | in | 0.72 |
| Total Defl'n | 0.51 = L/344 | 0.72 = L/240 | in | 0.70 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 0.80 | 1.00 | 0.888 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D+L, V =   3341, V design =   2769 lbs
Bending(+): LC #2  = D+L, M =  12112 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =   1292e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 14'-6.00"  Le = 27'-0.13"  RB =   18.90
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

WoodWorks® SOFTWARE FOR WOOD DESIGN

| COMPANY | PROJECT |
|---|---|
| | 2ND FLOOR |
| May 1, 2017 03:28 | New Beam Along Stair |

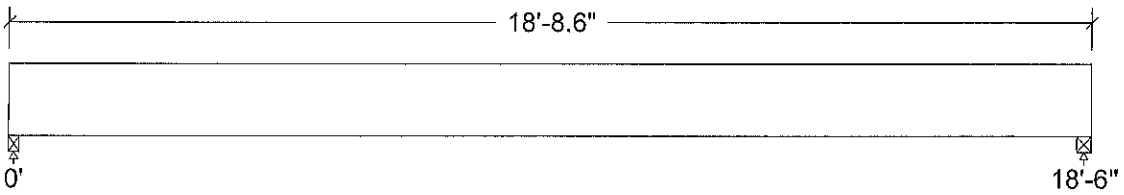
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Live | Partial UDL | | 0.00 | 15.00 | 188.0 | 188.0 | plf |
| Load4 | Dead | Partial UDL | | 0.00 | 15.00 | 50.0 | 50.0 | plf |
| Load5 | Live | Partial UDL | | 15.00 | 18.50 | 319.0 | 319.0 | plf |
| Load6 | Dead | Partial UDL | | 15.00 | 18.50 | 64.0 | 64.0 | plf |
| Load7 | Dead | Point | | 15.00 | | 245 | | lbs |
| Load8 | Live | Point | | 15.00 | | 920 | | lbs |
| Self-weight | Dead | Full UDL | | | | 12.1 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 631 | | 811 |
| Live | 1980 | | 2876 |
| Factored: | | | |
| Total | 2612 | | 3687 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 2612 | | 3687 |
| Support | 3515 | | 4962 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.74 | | 0.74 |
| Load comb | #2 | | #2 |
| Length | 2.17 | | 3.06 |
| Min req'd | 2.17 | | 3.06 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.11 | | 1.11 |
| Fcp sup | 625 | | 625 |

**Lake Geneva - Vacation Rental - New Deck Rim Beam**

**Glulam-Bal., West Species, 24F-1.8E WS, 3-1/2"x15"**

10 laminations, 3-1/2" maximum width,

Supports: All - Timber-soft Beam, D.Fir-L No.2

Total length: 18'-8.6"; volume = 6.8 cu.ft.;

Service: wet; Lateral support: top= at supports, bottom= at supports;

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 91 | Fv' = 232 | psi | fv/Fv' = 0.39 |
| Bending(+) | fb = 1226 | Fb' = 1464 | psi | fb/Fb' = 0.84 |
| Live Defl'n | 0.43 = L/510 | 0.62 = L/360 | in | 0.71 |
| Total Defl'n | 0.70 = L/315 | 0.93 = L/240 | in | 0.76 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 0.80 | 1.00 | 0.762 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D+L, V =   3687, V design =   3186 lbs
Bending(+): LC #2  = D+L, M =  13410 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =   1772e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 18'-6.00"  Le = 34'-0.50"  RB =   22.36
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

WoodWorks® SOFTWARE FOR WOOD DESIGN

| COMPANY | PROJECT |
|---|---|
| May 1, 2017 03:28 | New Beam Along Stair-1st Floor |

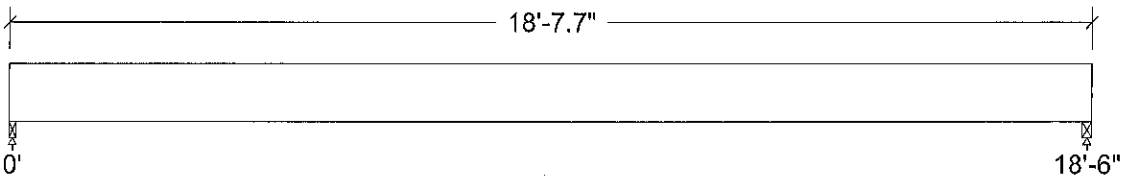
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Live | Partial UDL | | 0.00 | 15.00 | 188.0 | 188.0 | plf |
| Load4 | Dead | Partial UDL | | 0.00 | 15.00 | 50.0 | 50.0 | plf |
| Load5 | Live | Partial UDL | | 15.00 | 18.50 | 319.0 | 319.0 | plf |
| Load6 | Dead | Partial UDL | | 15.00 | 18.50 | 64.0 | 64.0 | plf |
| Load7 | Dead | Point | | 15.00 | | 245 | | lbs |
| Load8 | Live | Point | | 15.00 | | 920 | | lbs |
| Self-weight | Dead | Full UDL | | | | 15.2 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 658 | | 842 |
| Live | 1972 | | 2885 |
| Factored: | | | |
| Total | 2630 | | 3727 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 2630 | | 3727 |
| Support | 3415 | | 4839 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.77 | | 0.77 |
| Load comb | #2 | | #2 |
| Length | 1.39 | | 1.97 |
| Min req'd | 1.39 | | 1.97 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

**Lake Geneva - Vacation Rental - New Deck Rim Beam-1st Floor**

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x12"**

8 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 18'-7.7"; volume = 8.5 cu.ft.;
Service: wet; Lateral support: top= at supports, bottom= at supports;

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 76 | Fv' = 232 | psi | fv/Fv' = 0.33 |
| Bending(+) | fb = 1228 | Fb' = 1868 | psi | fb/Fb' = 0.66 |
| Live Defl'n | 0.54 = L/411 | 0.62 = L/360 | in | 0.87 |
| Total Defl'n | 0.89 = L/250 | 0.93 = L/240 | in | 0.96 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 0.80 | 1.00 | 0.973 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D+L, V =   3727, V design =   3323 lbs
Bending(+): LC #2  = D+L, M =  13510 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =   1426e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 18'-6.00"  Le = 34'-0.50"  RB =   12.73
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:29 | New Deck Rim Beam-1st Floor |

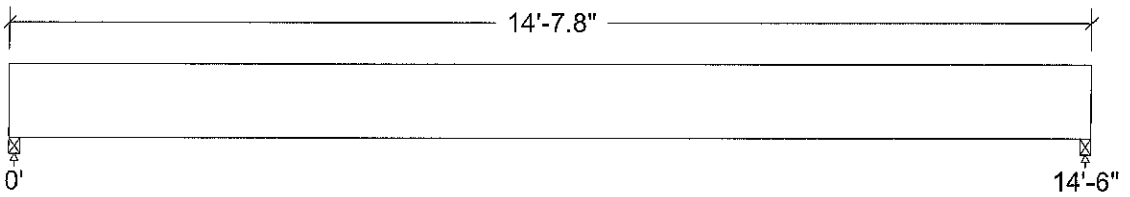
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Full UDL | | | | 75.0 | | plf |
| Load4 | Live | Full UDL | | | | 375.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 15.2 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 660 | | 660 |
| Live | 2747 | | 2747 |
| Factored: | | | |
| Total | 3406 | | 3406 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 3406 | | 3406 |
| Support | 4423 | | 4423 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.77 | | 0.77 |
| Load comb | #2 | | #2 |
| Length | 1.80 | | 1.80 |
| Min req'd | 1.80 | | 1.80 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

## Lake Geneva - Vacation Rental - New Deck Rim Beam-1st Floor

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x12"**

8 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 14'-7.8"; volume = 6.7 cu.ft.;
Service: wet; Lateral support: top= at supports, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 65 | Fv' = 232 | psi | fv/Fv' = 0.28 |
| Bending(+) | fb = 1111 | Fb' = 1883 | psi | fb/Fb' = 0.59 |
| Live Defl'n | 0.31 = L/553 | 0.48 = L/360 | in | 0.65 |
| Total Defl'n | 0.47 = L/374 | 0.72 = L/240 | in | 0.64 |

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 0.80 | 1.00 | 0.981 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 3373, V design = 2873 lbs
Bending(+): LC #2 = D+L, M = 12226 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 1426e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 14'-6.00" Le = 26'-8.19" RB = 11.27

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:29 | New Deck Stair Stringer Beam |

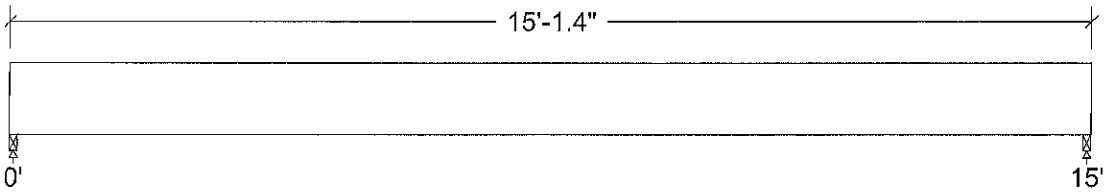
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Live | Full UDL | | | | 150.0 | | plf |
| Load2 | Dead | Full UDL | | | | 40.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 8.6 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 367 | | 367 |
| Live | 1134 | | 1134 |
| Factored: | | | |
| Total | 1501 | | 1501 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 1501 | | 1501 |
| Support | 2043 | | 2043 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.73 | | 0.73 |
| Load comb | #2 | | #2 |
| Length | 1.39 | | 1.39 |
| Min req'd | 1.39 | | 1.39 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.12 | | 1.12 |
| Fcp sup | 625 | | 625 |

## Lake Geneva - Vacation Rental - New Deck Stair Stringer

**Glulam-Bal., West Species, 24F-1.8E WS, 3-1/8"x12"**

8 laminations, 3-1/8" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 15'-1.4"; volume = 3.9 cu.ft.;
Service: wet; Lateral support: top= at supports, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 51 | Fv' = 232 | psi | fv/Fv' = 0.22 |
| Bending(+) | fb = 894 | Fb' = 1630 | psi | fb/Fb' = 0.55 |
| Live Defl'n | 0.25 = L/710 | 0.50 = L/360 | in | 0.51 |
| Total Defl'n | 0.42 = L/431 | 0.75 = L/240 | in | 0.56 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 0.80 | 1.00 | 0.849 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 1490, V design = 1280 lbs

Bending(+): LC #2 = D+L, M = 5587 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 810e06 lb-in2

"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)

Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.

Lateral stability (+): Lu = 15' Le = 27'-7.19" RB = 20.17

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:30 | New Floor Beam Line B |

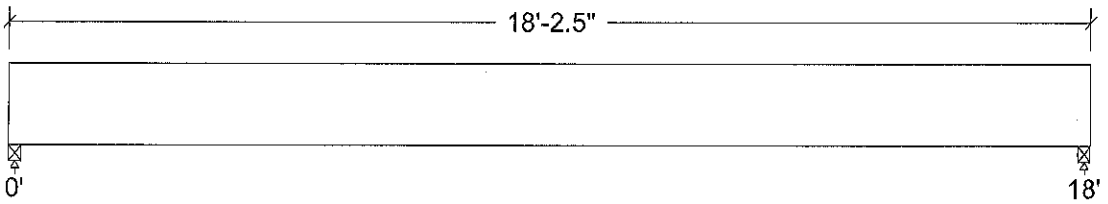
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Live | Full UDL | | | | 770.0 | | plf |
| Load2 | Dead | Full UDL | | | | 210.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 20.9 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 2100 | | 2100 |
| Live | 7012 | | 7012 |
| Factored: | | | |
| Total | 9112 | | 9112 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 9112 | | 9112 |
| Support | 9359 | | 9359 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.97 | | 0.97 |
| Load comb | #2 | | #2 |
| Length | 2.55 | | 2.55 |
| Min req'd | 2.55 | | 2.55 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

## Lake Geneva - Vacation Rental - New Beam Line B

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x16-1/2"**

11 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 18'-2.5"; volume = 11.5 cu.ft.;
Lateral support: top= at supports, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 124 | Fv' = 265 | psi | fv/Fv' = 0.47 |
| Bending(+) | fb = 1949 | Fb' = 2289 | psi | fb/Fb' = 0.85 |
| Live Defl'n | 0.49 = L/440 | 0.60 = L/360 | in | 0.82 |
| Total Defl'n | 0.71 = L/303 | 0.90 = L/240 | in | 0.79 |

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Additional Data:

| FACTORS: | F/E (psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 1.00 | 1.00 | 0.954 | 0.977 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 9008, V design = 7526 lbs
Bending(+): LC #2 = D+L, M = 40536 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 3706e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 18' Le = 33'-5.56" RB = 14.80

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

| WoodWorks® SOFTWARE FOR WOOD DESIGN | COMPANY | PROJECT |
|---|---|---|
| | May 1, 2017 03:30 | New Floor Beam - Line C.2 |

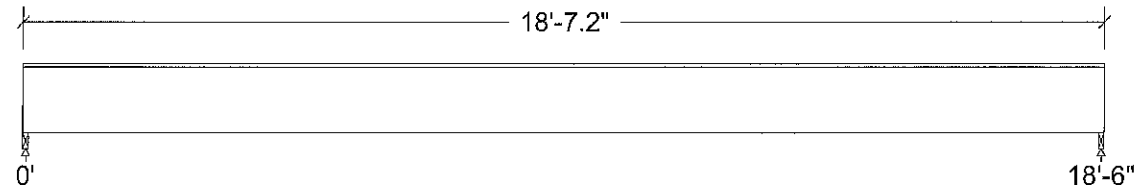
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Live | Full UDL | | | | 385.0 | | plf |
| Load2 | Dead | Full UDL | | | | 70.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 17.1 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 809 | | 809 |
| Live | 3581 | | 3581 |
| Factored: | | | |
| Total | 4390 | | 4390 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 4390 | | 4390 |
| Support | 4509 | | 4509 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.97 | | 0.97 |
| Load comb | #2 | | #2 |
| Length | 1.23 | | 1.23 |
| Min req'd | 1.23 | | 1.23 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

### Lake Geneva - Vacation Rental - New Floor Beam - Line C.2

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x13-1/2"**

9 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 18'-7.2"; volume = 9.6 cu.ft.;
Lateral support: top= full, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 77 | Fv' = 265 | psi | fv/Fv' = 0.29 |
| Bending(+) | fb = 1451 | Fb' = 2385 | psi | fb/Fb' = 0.61 |
| Live Defl'n | 0.50 = L/444 | 0.62 = L/360 | in | 0.81 |
| Total Defl'n | 0.67 = L/331 | 0.93 = L/240 | in | 0.72 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 1.00 | 1.00 | 1.000 | 0.994 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D+L, V =   4367, V design =   3812 lbs
Bending(+): LC #2  = D+L, M =  20197 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =   2030e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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|---|---|---|
| | May 1, 2017 03:30 | New Floor Joists Screen Patio (12 inches o.c.) |

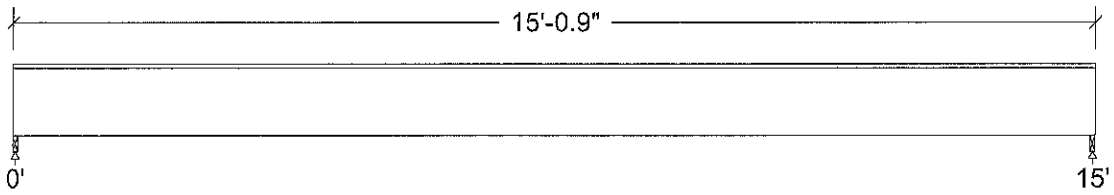
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Live | Full UDL | | | | 55.0 | | plf |
| Load2 | Dead | Full UDL | | | | 15.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 3.4 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 139 | | 139 |
| Live | 414 | | 414 |
| Factored: | | | |
| Total | 553 | | 553 |
| Bearing: | | | |
| Capacity | | | |
| Joist | 553 | | 553 |
| Support | 1017 | | 1017 |
| Anal/Des | | | |
| Joist | 1.00 | | 1.00 |
| Support | 0.54 | | 0.54 |
| Load comb | #2 | | #2 |
| Length | 0.87 | | 0.87 |
| Min req'd | 0.87 | | 0.87 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.25 | | 1.25 |
| Fcp sup | 625 | | 625 |

## Lake Geneva - Vacation Rental - New Floor Joists Screen Patio

**Lumber-soft, S-P-F, No.1/No.2, 2x12 (1-1/2"x11-1/4")**

Supports: All - Timber-soft Beam, D.Fir-L No.2

Floor joist spaced at 12.0" c/c; Total length: 15'-0.9"; volume = 1.8 cu.ft.;

Lateral support: top= full, bottom= at supports; Repetitive factor: applied where permitted (refer to online help);

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 43 | Fv' = 135 | psi | fv/Fv' = 0.32 |
| Bending(+) | fb = 783 | Fb' = 1006 | psi | fb/Fb' = 0.78 |
| Live Defl'n | 0.25 = L/715 | 0.50 = L/360 | in | 0.50 |
| Total Defl'n | 0.38 = L/476 | 0.75 = L/240 | in | 0.50 |

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CF | Cfu | Cr | Cfrt | Ci | Cn | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 135 | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 875 | 1.00 | 1.00 | 1.00 | 1.000 | 1.000 | 1.00 | 1.15 | 1.00 | 1.00 | - | 2 |
| Fcp' | 425 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | - |
| E' | 1.4 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | 2 |
| Emin' | 0.51 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D+L, V =    551, V design =    479 lbs
Bending(+): LC #2  = D+L, M =   2065 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =    249e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
4. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

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|---|---|---|
| | May 1, 2017 03:30 | New Floor Beam Line C.2 @ Screen Patio |

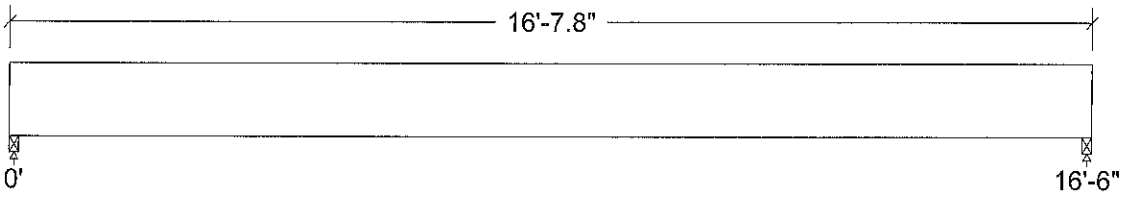
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Live | Full UDL | | | | 605.0 | | plf |
| Load2 | Dead | Full UDL | | | | 165.0 | | plf |
| Self-weight | Dead | Full UDL | | | | 17.1 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | |
|---|---|---|---|
| Unfactored: | | | |
| Dead | 1515 | | 1515 |
| Live | 5037 | | 5037 |
| Factored: | | | |
| Total | 6552 | | 6552 |
| Bearing: | | | |
| Capacity | | | |
| Beam | 6552 | | 6552 |
| Support | 6730 | | 6730 |
| Anal/Des | | | |
| Beam | 1.00 | | 1.00 |
| Support | 0.97 | | 0.97 |
| Load comb | #2 | | #2 |
| Length | 1.83 | | 1.83 |
| Min req'd | 1.83 | | 1.83 |
| Cb | 1.00 | | 1.00 |
| Cb min | 1.00 | | 1.00 |
| Cb support | 1.07 | | 1.07 |
| Fcp sup | 625 | | 625 |

### Lake Geneva - Vacation Rental - New Beam Line B

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x13-1/2"**

9 laminations, 5-1/2" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 16'-7.8"; volume = 8.6 cu.ft.;
Lateral support: top= at supports, bottom= at supports;

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 112 | Fv' = 265 | psi | fv/Fv' = 0.42 |
| Bending(+) | fb = 1924 | Fb' = 2331 | psi | fb/Fb' = 0.83 |
| Live Defl'n | 0.50 = L/398 | 0.55 = L/360 | in | 0.90 |
| Total Defl'n | 0.72 = L/274 | 0.82 = L/240 | in | 0.87 |

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## Additional Data:

| FACTORS: | F/E (psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 1.00 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 1.00 | 1.00 | 0.971 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 1.00 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D+L, V =   6494, V design =   5548 lbs
Bending(+): LC #2  = D+L, M =  26786 lbs-ft
Deflection: LC #2  = D+L  (live)
            LC #2  = D+L  (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012
```

CALCULATIONS:

```
Deflection:  EI =   2030e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 16'-6.00"  Le = 30'-4.31"  RB =   12.75
```

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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|---|---|---|
| | May 1, 2017 03:27 | Cantilever Beam - Line 1 |

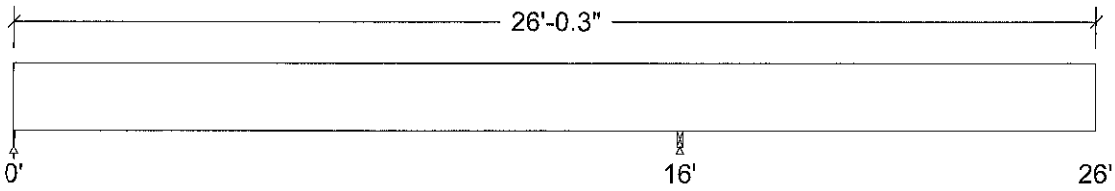
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Partial UDL | No | 16.00 | 23.00 | 10.0 | 10.0 | plf |
| Load5 | Live | Partial UDL | Yes | 16.00 | 26.00 | 50.0 | 50.0 | plf |
| Load7 | Live | Point | No | 26.00 | | 2531 | | lbs |
| Load8 | Dead | Point | No | 26.00 | | 506 | | lbs |
| Self-weight | Dead | Full UDL | No | | | 39.3 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | | | |
|---|---|---|---|---|---|
| Unfactored: | | | | | |
| Dead | 192 | | 1737 | | |
| Live | -1734 | | 4765 | | |
| Factored: | | | | | |
| Uplift | 1873 | | | | |
| Total | 192 | | 6502 | | |
| Bearing: | | | | | |
| Capacity | | | | | |
| Beam | 1507 | | 6502 | | |
| Support | 1832 | | 6529 | | |
| Anal/Des | | | | | |
| Beam | 0.13 | | 1.00 | | |
| Support | 0.10 | | 1.00 | | |
| Load comb | #1 | | #2 | | |
| Length | 0.50* | | 1.78 | | |
| Min req'd | 0.50* | | 1.78 | | |
| Cb | 1.00 | | 1.21 | | |
| Cb min | 1.00 | | 1.21 | | |
| Cb support | 1.00 | | 1.00 | | |
| Fcp sup | 625 | | 625 | | |

*Minimum bearing length setting used: 1/2" for end supports

Maximum reaction on at least one support is from a different load combination than the critical one for bearing design, shown here, due to Kd factor. See Analysis results for reaction from critical load combination.

**Lake Geneva - Vacation Rental - Cantievered Beam Line 1**

**Glulam-Bal., West Species, 24F-1.8E WS, 8-3/4"x19-1/2"**

13 laminations, 8-3/4" maximum width,

Supports: All - Timber-soft Beam, D.Fir-L No.2

Total length: 26'-0.3"; volume = 30.8 cu.ft.;

Service: wet; Lateral support: top= at supports, bottom= at supports;

## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 34 | Fv' = 232 | psi | fv/Fv' = 0.15 |
| Bending(-) | fb = 757 | Fb' = 1697 | psi | fb/Fb' = 0.45 |
| Deflection: | | | | |
| Interior Live | -0.10 = <L/999 | 0.53 = L/360 | in | 0.18 |
| Total | -0.13 = <L/999 | 0.80 = L/240 | in | 0.17 |
| Cantil. Live | 0.51 = L/236 | 0.67 = L/180 | in | 0.76 |
| Total | 0.74 = L/162 | 1.00 = L/120 | in | 0.74 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'- | 2400 | 1.00 | 0.80 | 1.00 | 0.988 | 0.884 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 3999, V design = 3839 lbs
Bending(-): LC #2 = D+L, M = 34995 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load Patterns: s=S/2, X=L+S or L+Lr, _=no pattern load in this span
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 9732e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (-): Lu = 16' Le = 27'-11.00" RB = 9.24

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. Grades with equal bending capacity in the top and bottom edges of the beam cross-section are recommended for continuous beams.
5. GLULAM: bxd = actual breadth x actual depth.
6. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
7. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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|---|---|
| May 1, 2017 03:27 | Cantilever Beam - Line 2- with added column |

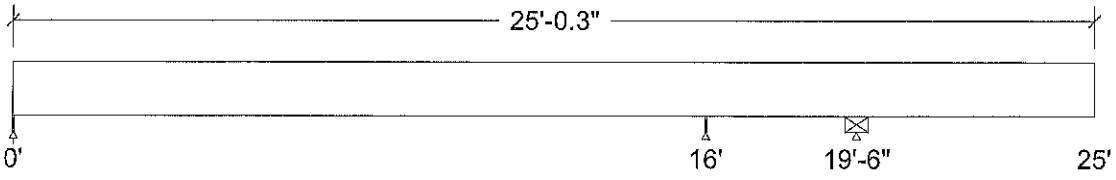
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Partial UDL | No | 16.02 | 25.02 | 20.0 | 20.0 | plf |
| Load5 | Live | Partial UDL | Yes | 16.02 | 25.02 | 75.0 | 75.0 | plf |
| Load4 | Dead | Point | No | 19.52 | | 270 | | lbs |
| Load6 | Live | Point | Yes | 19.52 | | 1350 | | lbs |
| Load7 | Live | Point | No | 25.02 | | 3850 | | lbs |
| Load8 | Dead | Point | No | 25.02 | | 770 | | lbs |
| Self-weight | Dead | Full UDL | No | | | 23.3 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Unfactored: | | | | | | | |
| Dead | 175 | | 331 | | 2698 | | |
| Live | 125 | | -7071 | | 12684 | | |
| Factored: | | | | | | | |
| Uplift | | | 8142 | | | | |
| Total | 300 | | 331 | | 15382 | | |
| Bearing: | | | | | | | |
| Capacity | | | | | | | |
| Beam | 1163 | | 2035 | | 15382 | | |
| Support | 1413 | | 1413 | | 18698 | | |
| Anal/Des | | | | | | | |
| Beam | 0.26 | | 0.16 | | 1.00 | | |
| Support | 0.21 | | 0.23 | | 0.82 | | |
| Load comb | #6 | | #1 | | #2 | | |
| Length | 0.50* | | 0.50* | | 6.62 | | |
| Min req'd | 0.50* | | 0.50* | | 6.62 | | |
| Cb | 1.00 | | 1.75 | | 1.00 | | |
| Cb min | 1.00 | | 1.75 | | 1.00 | | |
| Cb support | 1.00 | | 1.00 | | 1.00 | | |
| Fcp sup | 625 | | 625 | | 625 | | |

*Minimum bearing length setting used: 1/2" for end supports and 1/2" for interior supports
Maximum reaction on at least one support is from a different load combination than the critical one for bearing design, shown here, due to Kd factor. See Analysis results for reaction from critical load combination.

**Lake Geneva - Vacation Rental - Cantievered Beam Line 2**

**Glulam-Bal., West Species, 24F-1.8E WS, 6-3/4"x15"**

10 laminations, 6-3/4" maximum width,
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 25'-0.3"; volume = 17.6 cu.ft.;
Service: wet; Lateral support: top= at supports, bottom= at supports;

**WoodWorks® Sizer** SOFTWARE FOR WOOD DESIGN



## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 125 | Fv' = 232 | psi | fv/Fv' = 0.54 |
| Bending(+) | fb = 92 | Fb' = 1874 | psi | fb/Fb' = 0.05 |
| Bending(-) | fb = 1289 | Fb' = 1910 | psi | fb/Fb' = 0.67 |
| Deflection: | | | | |
| Interior Live | -0.01 = <L/999 | 0.12 = L/360 | in | 0.08 |
| Total | -0.01 = <L/999 | 0.17 = L/240 | in | 0.08 |
| Cantil. Live | 0.22 = L/302 | 0.37 = L/180 | in | 0.59 |
| Total | 0.31 = L/210 | 0.55 = L/120 | in | 0.57 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'+ | 2400 | 1.00 | 0.80 | 1.00 | 0.985 | 0.976 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fb'- | 2400 | 1.00 | 0.80 | 1.00 | 0.995 | 1.000 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 6 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 6 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 8492, V design = 8414 lbs
Bending(+): LC #2 = D+L, M = 1940 lbs-ft
Bending(-): LC #2 = D+L, M = 27199 lbs-ft
Deflection: LC #6 = (live)
LC #6 = (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load Patterns: s=S/2, X=L+S or L+Lr, _=no pattern load in this span
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 3417e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (+): Lu = 16' Le = 26'-9.50" RB = 10.29
Lateral stability (-): Lu = 5'-6.00" Le = 10'-3.44" RB = 6.37

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. Grades with equal bending capacity in the top and bottom edges of the beam cross-section are recommended for continuous beams.
5. GLULAM: bxd = actual breadth x actual depth.
6. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
7. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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|---|---|---|
| | May 1, 2017 03:27 | Cantilever Beam - Line 3 |

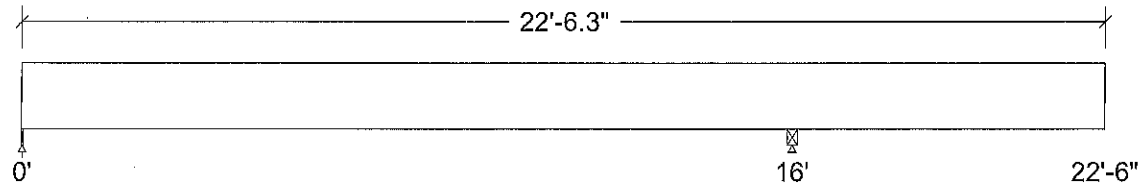
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Partial UDL | No | 16.00 | 22.52 | 20.0 | 20.0 | plf |
| Load5 | Live | Partial UDL | Yes | 16.00 | 22.52 | 75.0 | 75.0 | plf |
| Load4 | Dead | Point | No | 19.50 | | 270 | | lbs |
| Load6 | Live | Point | Yes | 19.50 | | 1350 | | lbs |
| Load7 | Live | Point | No | 22.52 | | 3263 | | lbs |
| Load8 | Dead | Point | No | 22.52 | | 770 | | lbs |
| Self-weight | Dead | Full UDL | No | | | 33.2 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | | | |
|---|---|---|---|---|---|
| Unfactored: | | | | | |
| Dead | 222 | | 2094 | | |
| Live | -1718 | | 6820 | | |
| Factored: | | | | | |
| Uplift | 1894 | | | | |
| Total | 222 | | 8914 | | |
| Bearing: | | | | | |
| Capacity | | | | | |
| Beam | 1507 | | 8914 | | |
| Support | 1832 | | 9462 | | |
| Anal/Des | | | | | |
| Beam | 0.15 | | 1.00 | | |
| Support | 0.12 | | 0.94 | | |
| Load comb | #1 | | #2 | | |
| Length | 0.50* | | 2.58 | | |
| Min req'd | 0.50* | | 2.58 | | |
| Cb | 1.00 | | 1.15 | | |
| Cb min | 1.00 | | 1.15 | | |
| Cb support | 1.00 | | 1.00 | | |
| Fcp sup | 625 | | 625 | | |

*Minimum bearing length setting used: 1/2" for end supports

Maximum reaction on at least one support is from a different load combination than the critical one for bearing design, shown here, due to Kd factor. See Analysis results for reaction from critical load combination.

**Lake Geneva - Vacation Rental - Cantievered Beam Line 3**

**Glulam-Bal., West Species, 24F-1.8E WS, 8-3/4"x16-1/2"**

11 laminations, 8-3/4" maximum width,

Supports: All - Timber-soft Beam, D.Fir-L No.2

Total length: 22'-6.3"; volume = 22.6 cu.ft.;

Service: wet; Lateral support: top= at supports, bottom= at supports;

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## This section FAILS the design check

**WARNING: This section violates the following design criteria: Deflection**

## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 66 | Fv' = 232 | psi | fv/Fv' = 0.28 |
| Bending(-) | fb = 1044 | Fb' = 1751 | psi | fb/Fb' = 0.60 |
| Deflection: | | | | |
| Interior Live | -0.16 = <L/999 | 0.53 = L/360 | in | 0.30 |
| Total | -0.22 = L/868 | 0.80 = L/240 | in | 0.28 |
| Cantil. Live | 0.46 = L/168 | 0.43 = L/180 | in | 1.07 |
| Total | 0.67 = L/116 | 0.65 = L/120 | in | 1.03 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'- | 2400 | 1.00 | 0.80 | 1.00 | 0.991 | 0.912 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 6487, V design = 6312 lbs
Bending(-): LC #2 = D+L, M = 34553 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load Patterns: s=S/2, X=L+S or L+Lr, _=no pattern load in this span
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 5896e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (-): Lu = 16' Le = 27'-2.00" RB = 8.38

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. Grades with equal bending capacity in the top and bottom edges of the beam cross-section are recommended for continuous beams.
5. GLULAM: bxd = actual breadth x actual depth.
6. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
7. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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|---|---|---|
| | May 1, 2017 03:28 | Cantilever Beam - Line 5 |

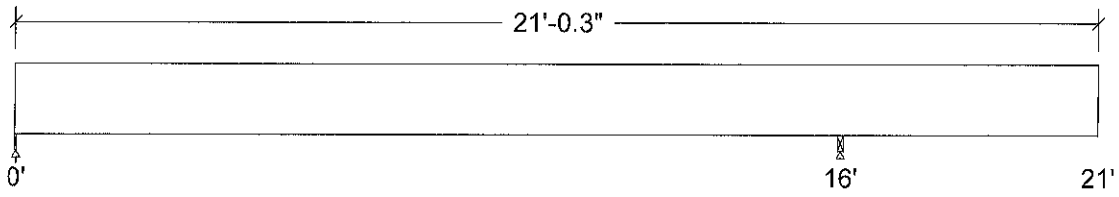
## Design Check Calculation Sheet

WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load3 | Dead | Partial UDL | No | 16.00 | 21.00 | 10.0 | 10.0 | plf |
| Load5 | Live | Point | Yes | 21.00 | | 1913 | | lbs |
| Load4 | Dead | Point | No | 21.00 | | 383 | | lbs |
| Load6 | Live | Partial UDL | Yes | 16.00 | 21.00 | 50.0 | 50.0 | plf |
| Self-weight | Dead | Full UDL | No | | | 20.9 | | plf |

### Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :




| | | | | | |
|---|---|---|---|---|---|
| Unfactored: | | | | | |
| Dead | 151 | | 848 | | |
| Live | 0 | | 2797 | | |
| Factored: | | | | | |
| Uplift | 610 | | | | |
| Total | 151 | | 3645 | | |
| Bearing: | | | | | |
| Capacity | | | | | |
| Beam | 947 | | 3645 | | |
| Support | 1230 | | 3810 | | |
| Anal/Des | | | | | |
| Beam | 0.16 | | 1.00 | | |
| Support | 0.12 | | 0.96 | | |
| Load comb | #1 | | #2 | | |
| Length | 0.50* | | 1.55 | | |
| Min req'd | 0.50* | | 1.55 | | |
| Cb | 1.00 | | 1.24 | | |
| Cb min | 1.00 | | 1.24 | | |
| Cb support | 1.07 | | 1.07 | | |
| Fcp sup | 625 | | 625 | | |

*Minimum bearing length setting used: 1/2" for end supports

Maximum reaction on at least one support is from a different load combination than the critical one for bearing design, shown here, due to Kd factor. See Analysis results for reaction from critical load combination.

**Lake Geneva - Vacation Rental - Cantievered Beam Line 1**

**Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x16-1/2"**

11 laminations, 5-1/2" maximum width,

Supports: All - Timber-soft Beam, D.Fir-L No.2

Total length: 21'-0.3"; volume = 13.2 cu.ft.;

Service: wet; Lateral support: top= at supports, bottom= at supports;

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## Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Shear | fv = 43 | Fv' = 232 | psi | fv/Fv' = 0.18 |
| Bending(-) | fb = 598 | Fb' = 1847 | psi | fb/Fb' = 0.32 |
| Deflection: | | | | |
| Interior Live | -0.09 = <L/999 | 0.53 = L/360 | in | 0.17 |
| Total | -0.12 = <L/999 | 0.80 = L/240 | in | 0.15 |
| Cantil. Live | 0.20 = L/303 | 0.33 = L/180 | in | 0.59 |
| Total | 0.27 = L/224 | 0.50 = L/120 | in | 0.53 |

## Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL | CV | Cfu | Cr | Cfrt | Notes | Cn*Cvr | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Fv' | 265 | 1.00 | 0.88 | 1.00 | - | - | - | - | 1.00 | 1.00 | 1.00 | 2 |
| Fb'- | 2400 | 1.00 | 0.80 | 1.00 | 0.969 | 0.962 | 1.00 | 1.00 | 1.00 | 1.00 | - | 2 |
| Fcp' | 650 | - | 0.53 | 1.00 | - | - | - | - | 1.00 | - | - | - |
| E' | 1.8 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |
| Eminy' | 0.85 million | | 0.83 | 1.00 | - | - | - | - | 1.00 | - | - | 2 |

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 2699, V design = 2595 lbs
Bending(-): LC #2 = D+L, M = 12433 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load Patterns: s=S/2, X=L+S or L+Lr, _=no pattern load in this span
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 3706e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 2.00(Dead Load Deflection) + Live Load Deflection.
Lateral stability (-): Lu = 16' Le = 27'-2.00" RB = 13.33

## Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. Grades with equal bending capacity in the top and bottom edges of the beam cross-section are recommended for continuous beams.
5. GLULAM: bxd = actual breadth x actual depth.
6. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
7. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

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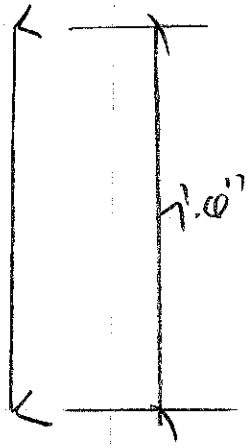
## NEW POST - LINE C2

$P_{SN} = 2(5427) + 2(3506)$
$= 17866$
$P_{OL} = 2(4092) + 2(1931)$
$= 12046$

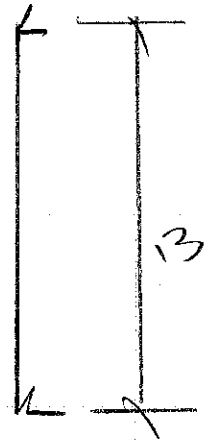



IGNORE UP LIFT SNOW LOAD

USE 5 1/8 x 6"
DOUG FIR L2

## NEW POST - RIDGE BEAM

$P_{SN} = 2(4533) = 9066$
$P_{OL} = 2(3062) = 6124$



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|---|---|---|
| | May 1, 2017 03:31 | New Post - Line C2 |

## Design Check Calculation Sheet

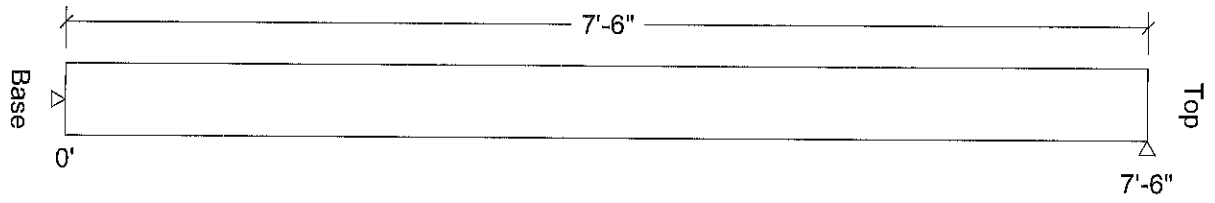
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Dead | Axial | | (Ecc. = 0.00") | | 12046 | | lbs |
| Load2 | Snow | Axial | | (Ecc. = 0.00") | | 17866 | | lbs |
| Self-weight | Dead | Axial | | | | 53 | | lbs |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Lateral Reactions (lbs):




## New Post - Line C2

**Glulam-Axial, West Species, 2 (DF L2), 5-1/8"x6"**

4 laminations, 5-1/8" maximum width,
Support: Non-wood
Total length: 7'-6.0"; volume = 1.6 cu.ft.;
Pinned base; Load face = width(b); Ke x Lb: 1.0 x 7.5 = 7.5 [ft]; Ke x Ld: 1.0 x 7.5 = 7.5 [ft];

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Axial | fc = 974 | Fc' = 1712 | psi | fc/Fc' = 0.57 |
| Axial Bearing | fc = 974 | Fc* = 2242 | psi | fc/Fc* = 0.43 |

### Additional Data:

| FACTORS: | F/E(psi) | CD | CM | Ct | CL/CP | CV | Cfu | Cr | Cfrt | Notes | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fc' | 1950 | 1.15 | 1.00 | 1.00 | 0.764 | - | - | - | 1.00 | - | 2 |
| Fc* | 1950 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | - | 2 |

CRITICAL LOAD COMBINATIONS:

Axial : LC #2 = D+S, P = 29965 lbs

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2012

### Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.

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|---|---|---|
| | May 1, 2017 03:31 | New Post @ Ridge Beam Line B |

## Design Check Calculation Sheet

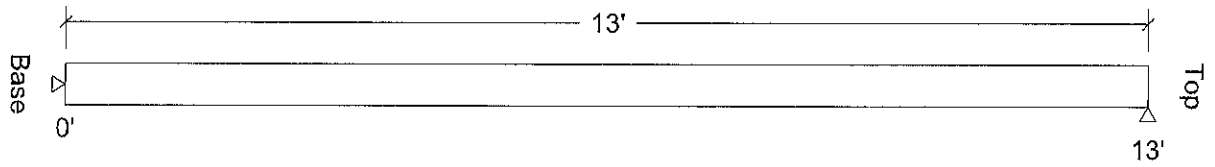
WoodWorks Sizer 10.4

### Loads:

| Load | Type | Distribution | Pat-tern | Location [ft] Start | End | Magnitude Start | End | Unit |
|---|---|---|---|---|---|---|---|---|
| Load1 | Dead | Axial | | (Ecc. = 0.00") | | 6124 | | lbs |
| Load2 | Snow | Axial | | (Ecc. = 0.00") | | 9066 | | lbs |
| Self-weight | Dead | Axial | | | | 92 | | lbs |

Load magnitude does not include Normal Importance factor from Table 4.2.3.2, which is applied during analysis.

### Lateral Reactions (lbs):




### New Post - Ridge Beam

**Glulam-Axial, West Species, 2 (DF L2), 5-1/8"x6"**

4 laminations, 5-1/8" maximum width,
Support: Non-wood
Total length: 13'; volume = 2.8 cu.ft.;
Pinned base; Load face = width(b); Ke x Lb: 1.0 x 13.0 = 13.0 [ft]; Ke x Ld: 1.0 x 13.0 = 13.0 [ft];

### Analysis vs. Allowable Stress and Deflection using NDS 2012 :

| Criterion | Analysis Value | Design Value | Unit | Analysis/Design |
|---|---|---|---|---|
| Axial | fc = 497 | Fc' = 720 | psi | fc/Fc' = 0.69 |
| Axial Bearing | fc = 497 | Fc* = 2242 | psi | fc/Fc* = 0.22 |

### Additional Data:

| FACTORS: | F/E (psi) | CD | CM | Ct | CL/CP | CV | Cfu | Cr | Cfrt | Notes | LC# |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Fc' | 1950 | 1.15 | 1.00 | 1.00 | 0.321 | - | - | - | 1.00 | - | 2 |
| Fc* | 1950 | 1.15 | 1.00 | 1.00 | - | - | - | - | 1.00 | - | 2 |

CRITICAL LOAD COMBINATIONS:

Axial : LC #2 = D+S, P = 15282 lbs

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2012

### Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
4. GLULAM: bxd = actual breadth x actual depth.

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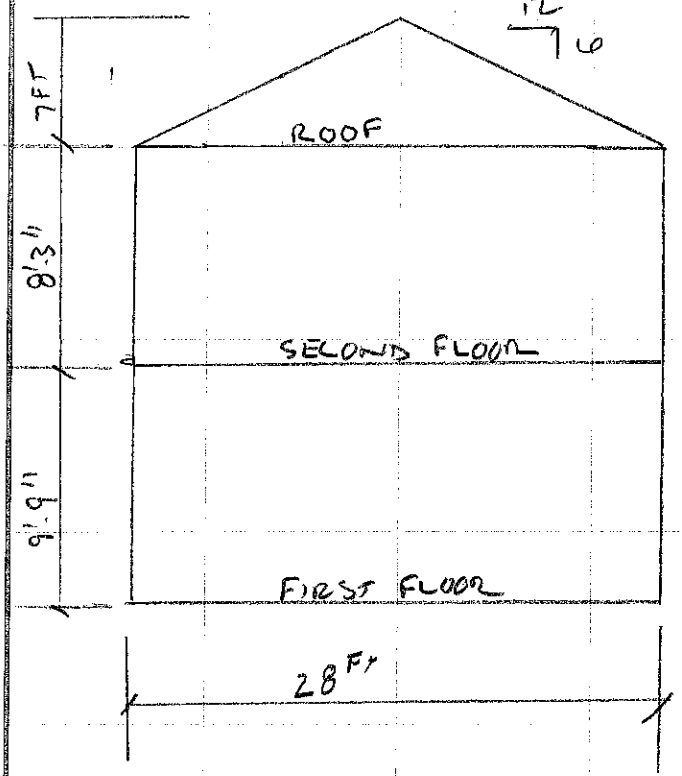
## LATERAL BRACING

### NEW WALL BRACING @ LINE C

MWFRS BASE PRESSURE = 17.1 psf

### END WALL WIND PRESSURE

GABLE END ROOF
PROJECTION AREA = $\frac{1}{2}(28^{FT} \times 7^{FT})$
$= 98^{FT^2}$




### END WALL WIND LOAD

ROOF LEVEL

$$P_{W_R} = \frac{17.1psf(98FT^2) + 17.1psf(8.25/2)(28^{FT})}{2}$$

$P_{W_R} = 1825^{lb}$

USE $2000^{lb}$

SECOND FLOOR

$$P_{W_{2ND}} = \frac{17.1psf(8.25/2 + 9.75/2)28^{FT}}{2}$$

$P_{W_{2ND}} = 2155psf$

USE $2500^{lb}$

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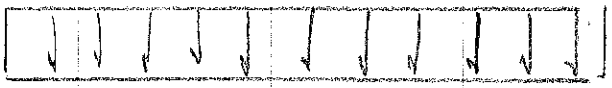
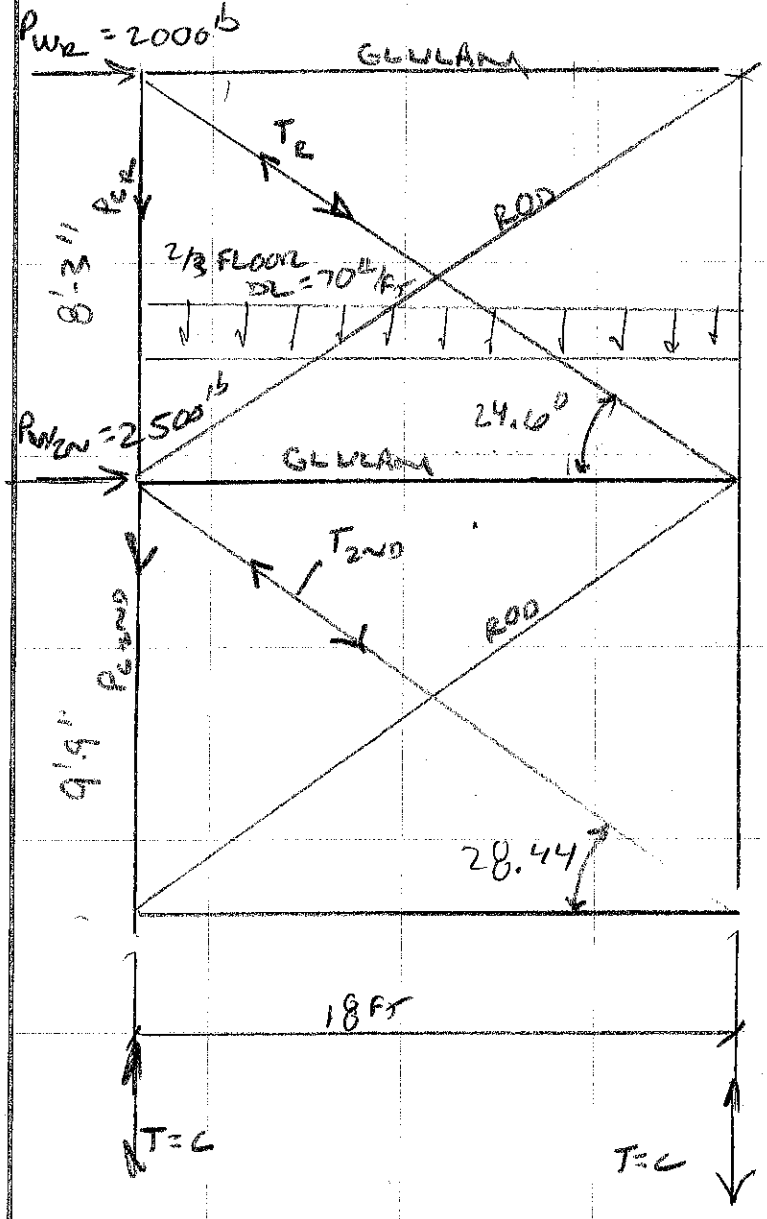
## LATERAL BRACING LOADING DIAGRAM

$2/3$ ROOF DL $= 15 psf (2/3)(14^{ft})/2 = 70^{lb/ft}$






ROD $F_y = 36,000$ psi

ALLOW TEN $= 0.6(36,000) = 21,600^{lb}$

### 2ND FLOOR BRACE

$P_{WR} = 2000^{lb}$

$T_R = \dfrac{2000^{lb}}{\cos 24.6^\circ} = 2200^{lb}$

$A_{ROD} = \dfrac{2200^{lb}}{21,600} = 0.101^{in^2}$ $\quad A = \pi d^2/4$

MIN $d = 0.36"$

USE 1/2" ϕ ROD

$P_{CR} = 2200^{lb}(\sin 24.6^\circ) = 916^{lb}$

### 1ST FLOOR

$P_{W1ST} = 2000^{lb} + 2500^{lb} = 4500^{lb}$

$T_{2ND} = \dfrac{4500^{lb}}{\cos 28.44} = 5118^{lb}$

$A_{ROD} = \dfrac{5118}{21,600} = 0.24^{in^2}$

MIN $d = 0.55"$

USE 3/4" ϕ ROD

$P_{C2ND} = 5118(\sin 28.44^\circ) = 2438^{lb}$

### NET UPLIFT @ COLUMN BASE

$$T=C = \frac{2000^{lb}(18^{ft}) + 2500(9.75) - 70(2)(18^2/2)}{18^{ft}}$$

$$T = C = 2094^{lb}$$