

## Structural Calculations

For

MEDVED RESIDENCE  
4752 89<sup>TH</sup> AVE SE  
MERCER ISLAND, WA 98040

BE Project # 19125  
January 28, 2020

2015 International Building Code  
Wind: 110 MPH, Exposure B, Kzt= 1.0  
Seismic: Design Category D



**PROJECT NAME** Medved Residence  
**ADDRESS** 4752 89th AVE SE Mercer island WA 98040  
**PROJECT #** 19125  
**DATE** 1/10/2020

**BUILDING CODE** 2015 International Residential Code  
2015 International Building Code

**WIND DESIGN**  
Vult = 110 MPH  
Vasd = 85 MPH  
Exposure = B  
KzT = 1.6  
Importance Factor = 1.0

**SEISMIC DESIGN**  
Ss(g) = 1.43      S<sub>M5</sub>(g) = 1.43      S<sub>D5</sub>(g) = 0.953  
S<sub>1</sub>(g) = 0.549      S<sub>M1</sub>(g) = 0.823      S<sub>D1</sub>(g) = 0.549  
Seismic Design Category = D  
Site Class = D  
Importance Factor = 1.0

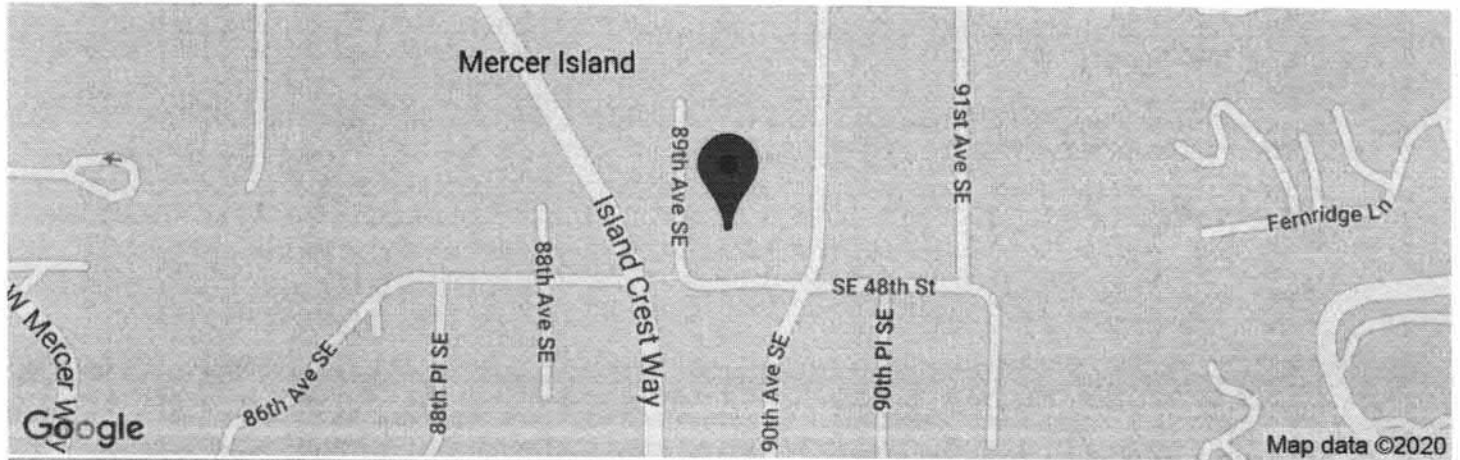
**DESIGN LOADING**  
Roof Snow Load = 25 PSF  
  
Floor Live Load = 40 PSF  
Bedroom Live Load = 30 PSF  
Deck & Balcony Live Load = 60 PSF  
  
Roof Dead Load = 15 PSF  
Floor Dead Load = 15 PSF (For framing gravity design)  
Exterior Wall Dead Load = 10 PSF  
  
Partition Wall Seismic Weight = 10 PSF  
Floor Seismic Weight = 10 PSF  
  
Allowable Soil Pressure = 1500 PSF  
Lateral Earth (Restrained) Pressure = 50 PCF  
Passive Pressure = 300 PCF  
Coefficient of Friction = 0.4

**SCOPE OF WORK** Existing residence remodel design



## 4752 89th Ave SE, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5604164, -122.2197983



|                                       |                       |
|---------------------------------------|-----------------------|
| <b>Date</b>                           | 1/13/2020, 1:45:11 AM |
| <b>Design Code Reference Document</b> | ASCE7-10              |
| <b>Risk Category</b>                  | II                    |
| <b>Site Class</b>                     | D - Stiff Soil        |

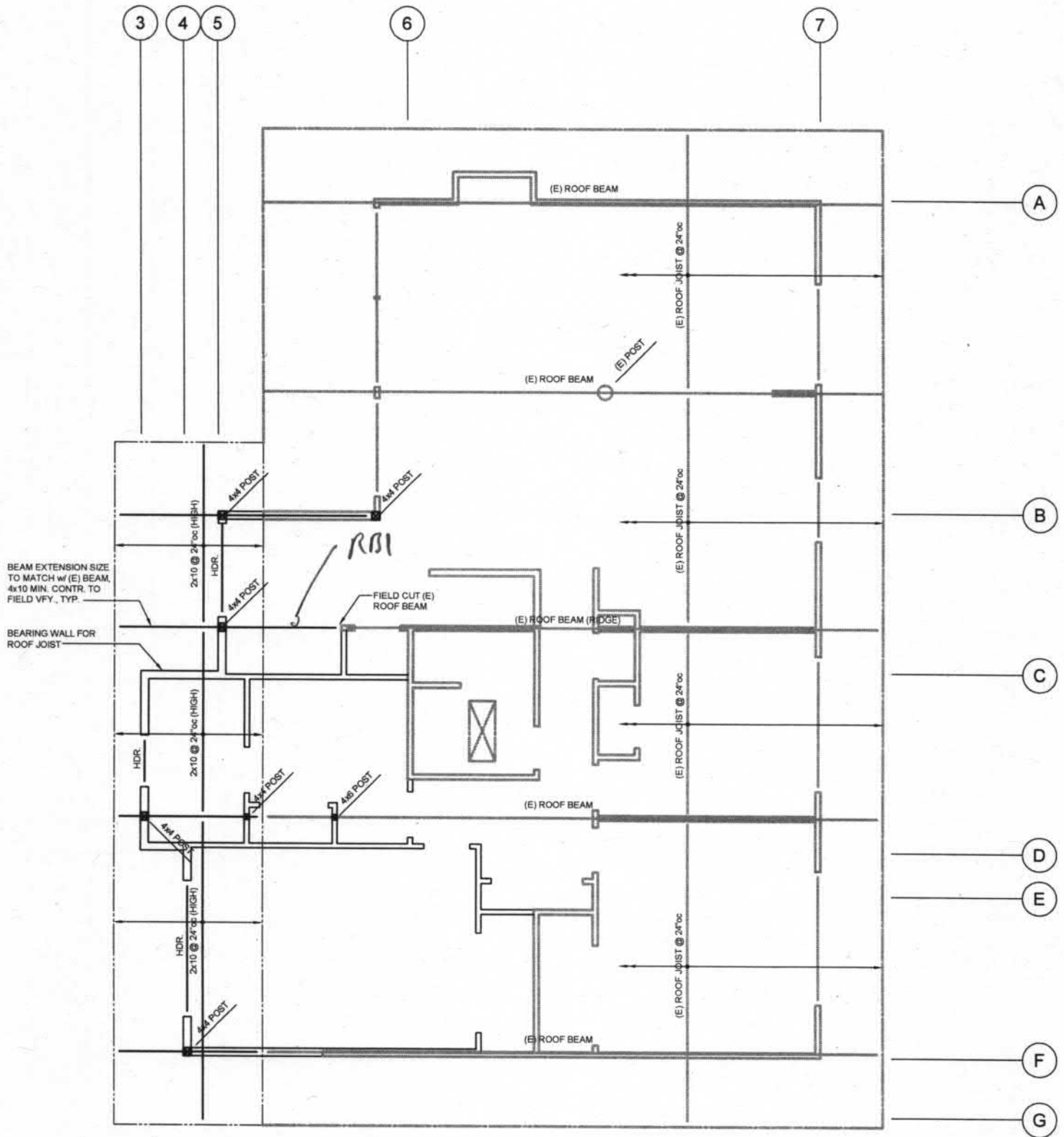
| Type     | Value | Description                                    |
|----------|-------|--|
| $S_s$    | 1.43  | $MCE_R$ ground motion. (for 0.2 second period) |
| $S_1$    | 0.549 | $MCE_R$ ground motion. (for 1.0s period)       |
| $S_{MS}$ | 1.43  | Site-modified spectral acceleration value      |
| $S_{M1}$ | 0.823 | Site-modified spectral acceleration value      |
| $S_{DS}$ | 0.953 | Numeric seismic design value at 0.2 second SA  |
| $S_{D1}$ | 0.549 | Numeric seismic design value at 1.0 second SA  |

| Type      | Value | Description   |
|-----------|-------|---|
| SDC       | D     | Seismic design category   |
| $F_a$     | 1     | Site amplification factor at 0.2 second   |
| $F_v$     | 1.5   | Site amplification factor at 1.0 second   |
| PGA       | 0.592 | $MCE_G$ peak ground acceleration  |
| $F_{PGA}$ | 1     | Site amplification factor at PGA  |
| $PGA_M$   | 0.592 | Site modified peak ground acceleration  |
| $T_L$     | 6     | Long-period transition period in seconds  |
| $S_sRT$   | 1.43  | Probabilistic risk-targeted ground motion. (0.2 second)                                   |
| $S_sUH$   | 1.501 | Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration  |
| $S_sD$    | 3.441 | Factored deterministic acceleration value. (0.2 second)                                   |
| $S_1RT$   | 0.549 | Probabilistic risk-targeted ground motion. (1.0 second)                                   |
| $S_1UH$   | 0.59  | Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration. |
| $S_1D$    | 1.305 | Factored deterministic acceleration value. (1.0 second)                                   |
| $PGA_d$   | 1.333 | Factored deterministic acceleration value. (Peak Ground Acceleration)                     |
| $C_{RS}$  | 0.952 | Mapped value of the risk coefficient at short periods                                     |
| $C_{R1}$  | 0.93  | Mapped value of the risk coefficient at a period of 1 s                                   |

## DISCLAIMER

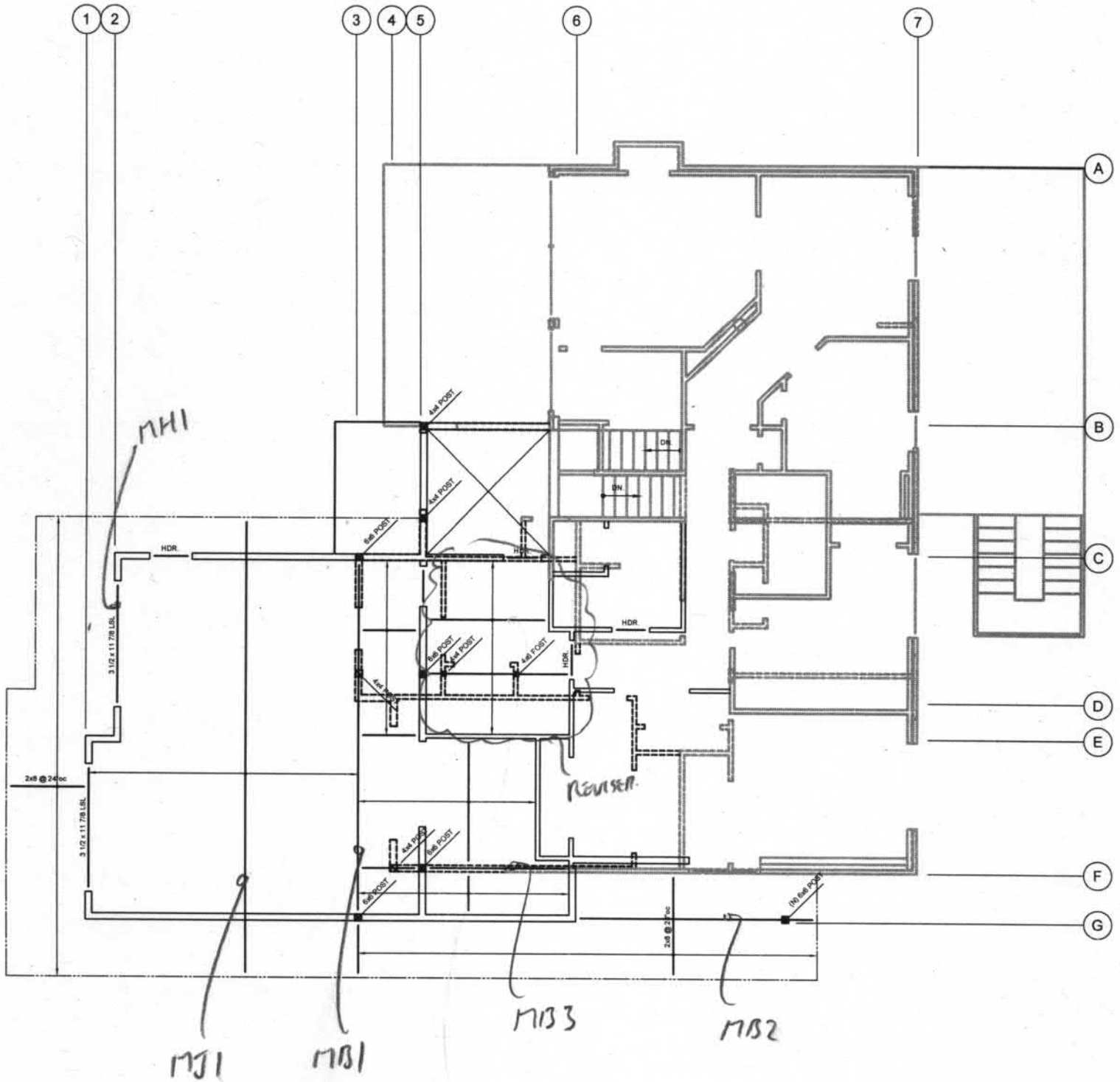
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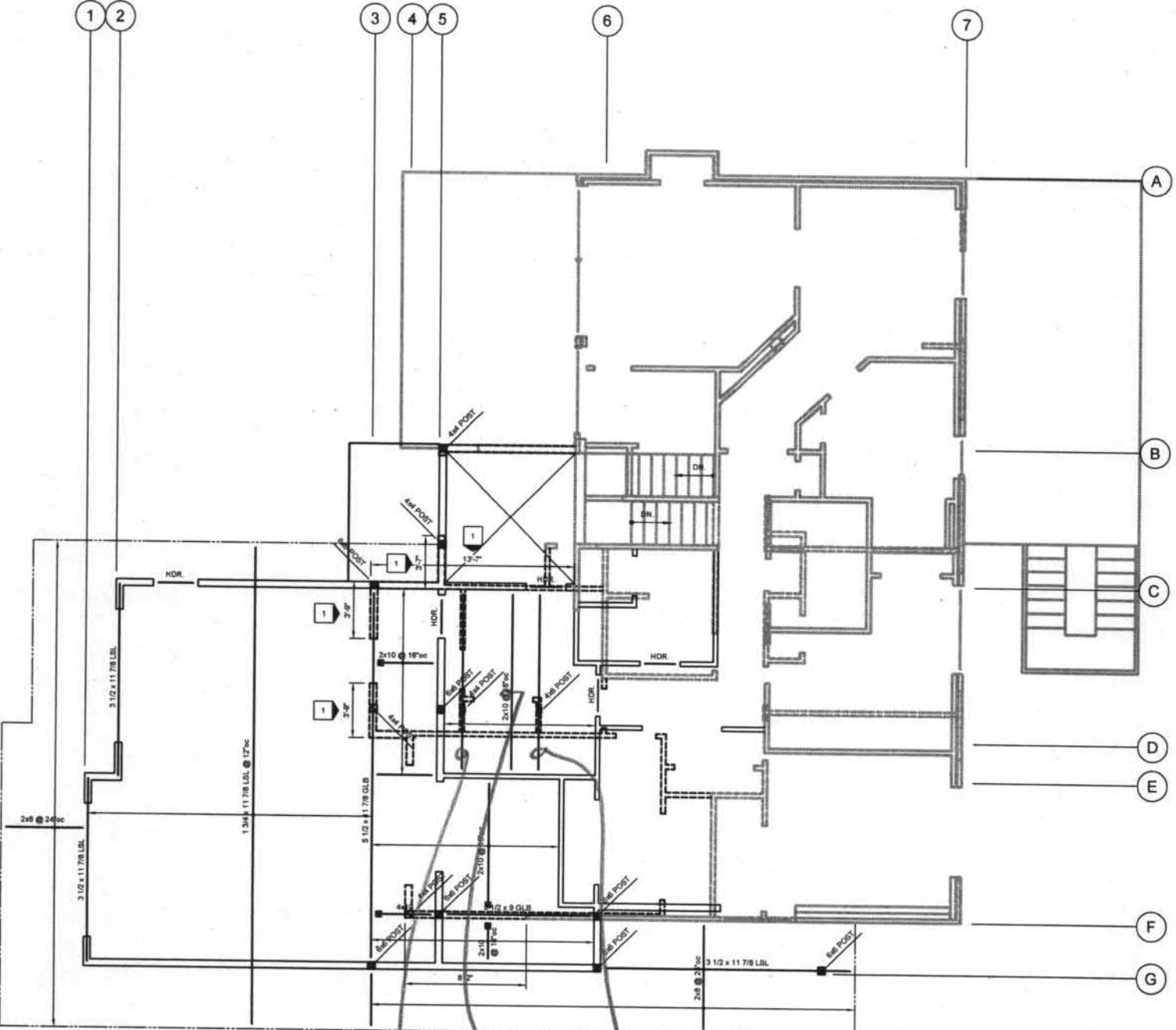
ROOF FRAMING PLAN.



RBI, L = 7', 6' CANT., TRIDL: 5' USE 4x10

MAIN FLOOR INITIAL





1772  
17B4

17B5

MAIN FLOOR FRAMING

MH1, L: 9'0", TRIM L: 5'10" USE 3 1/2 x 11 7/8 LSL

M31, L: 25'1", TRIM L: 2' FLOOR  
POINT L = DL 0.5  
SL 0.8 @ 8'

PL 0.35  
SL 0.6 @ 21'9"

M32, L: 14'9", 2'2" CANT. TRIM L: 5.875' USE 3 1/2 x 11 7/8 LSL

M33, L: 10'1" TRIM L: 10.79' ROOF  
6'6" FLOOR USE 3 1/2 x 9 LSL

M31, L: 25'1" ROOF USE 1 3/4 x 11 7/8 LSL @ 12" oc.

M32, L: 12'4" FLOOR. USE 2x10 @ 16" oc.

M34, L: 12'7" TRIM L = 1.33' FLOOR  
PL = 0.55 DL  
0.93 SL @ 8' USE 6x10

M33, L: 12'7" TRIM L = 1.33' FLOOR  
DL = 20' 1/2 · 24.58' 1/2 · 15 PL = 1.8k  
25 SL = 3.0k @ 8'  
USE 3 1/2 x 9 LSL





# Wood Beam

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BURT ENGINEERING PLLC

DESCRIPTION: RB1

| Load Combination           | Segment Length | Span # | Max Stress Ratios |       |                |                  |                |                |                |                | Moment Values  |      |                | Shear Values   |      |                |                |
|----------------------------|----------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|------|----------------|----------------|------|----------------|----------------|
|                            |                |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M    | f <sub>b</sub> | F <sub>b</sub> | V    | f <sub>v</sub> | F <sub>v</sub> |
| Length = 7.0 ft            | 1              |        | 0.721             | 0.339 | 1.15           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.73 | 895.90         | 1242.00        | 1.52 | 70.27          | 207.00         |
| Length = 6.0 ft            | 2              |        | 0.721             | 0.339 | 1.15           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.73 | 895.90         | 1242.00        | 1.09 | 70.27          | 207.00         |
| +D+0.750Lr+0.750L+H        |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.263             | 0.122 | 1.25           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1350.00        | 0.59 | 27.43          | 225.00         |
| Length = 6.0 ft            | 2              |        | 0.263             | 0.122 | 1.25           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1350.00        | 0.43 | 27.43          | 225.00         |
| +D+0.750L+0.750S+H         |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.612             | 0.288 | 1.15           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.16 | 760.66         | 1242.00        | 1.29 | 59.56          | 207.00         |
| Length = 6.0 ft            | 2              |        | 0.612             | 0.288 | 1.15           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.16 | 760.66         | 1242.00        | 0.92 | 59.56          | 207.00         |
| +D+0.60W+H                 |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.205             | 0.095 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1728.00        | 0.59 | 27.43          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.205             | 0.095 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1728.00        | 0.43 | 27.43          | 288.00         |
| +D+0.750Lr+0.750L+0.450W+H |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.205             | 0.095 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1728.00        | 0.59 | 27.43          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.205             | 0.095 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1728.00        | 0.43 | 27.43          | 288.00         |
| +D+0.750L+0.750S+0.450W+H  |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.440             | 0.207 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.16 | 760.66         | 1728.00        | 1.29 | 59.56          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.440             | 0.207 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.16 | 760.66         | 1728.00        | 0.92 | 59.56          | 288.00         |
| +0.60D+0.60W+0.60H         |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.123             | 0.057 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.89 | 212.96         | 1728.00        | 0.36 | 16.46          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.123             | 0.057 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.89 | 212.96         | 1728.00        | 0.26 | 16.46          | 288.00         |
| +D+0.70E+0.60H             |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.205             | 0.095 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1728.00        | 0.59 | 27.43          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.205             | 0.095 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.48 | 354.94         | 1728.00        | 0.43 | 27.43          | 288.00         |
| +D+0.750L+0.750S+0.5250E+H |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.440             | 0.207 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.16 | 760.66         | 1728.00        | 1.29 | 59.56          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.440             | 0.207 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.16 | 760.66         | 1728.00        | 0.92 | 59.56          | 288.00         |
| +0.60D+0.70E+H             |                |        |                   |       |                | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |                | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 7.0 ft            | 1              |        | 0.123             | 0.057 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.89 | 212.96         | 1728.00        | 0.36 | 16.46          | 288.00         |
| Length = 6.0 ft            | 2              |        | 0.123             | 0.057 | 1.60           | 1.200            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.89 | 212.96         | 1728.00        | 0.26 | 16.46          | 288.00         |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+S+H           | 1    | 0.0039        | 1.721            | +D+S+H           | -0.0099       | 5.631            |
| +D+S+H           | 2    | 0.2572        | 6.000            |                  | 0.0000        | 5.631            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 | Support 3 |
|----------------------------|-----------|-----------|-----------|
| Overall MAXimum            | 0.717     | 3.024     |           |
| Overall MINimum            | 0.444     | 1.837     |           |
| +D+H                       | 0.273     | 1.187     |           |
| +D+L+H                     | 0.273     | 1.187     |           |
| +D+Lr+H                    | 0.273     | 1.187     |           |
| +D+S+H                     | 0.717     | 3.024     |           |
| +D+0.750Lr+0.750L+H        | 0.273     | 1.187     |           |
| +D+0.750L+0.750S+H         | 0.606     | 2.565     |           |
| +D+0.60W+H                 | 0.273     | 1.187     |           |
| +D+0.750Lr+0.750L+0.450W+H | 0.273     | 1.187     |           |
| +D+0.750L+0.750S+0.450W+H  | 0.606     | 2.565     |           |
| +0.60D+0.60W+0.60H         | 0.164     | 0.712     |           |
| +D+0.70E+0.60H             | 0.273     | 1.187     |           |
| +D+0.750L+0.750S+0.5250E+H | 0.606     | 2.565     |           |
| +0.60D+0.70E+H             | 0.164     | 0.712     |           |
| D Only                     | 0.273     | 1.187     |           |
| Lr Only                    |           |           |           |
| L Only                     |           |           |           |
| S Only                     | 0.444     | 1.837     |           |
| W Only                     |           |           |           |
| E Only                     |           |           |           |
| H Only                     |           |           |           |



# Wood Beam

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BURT ENGINEERING PLLC

DESCRIPTION: MH1

| Load Combination           | Segment Length | Span # | Max Stress Ratios |      |                |                  |                |                |                |                | Moment Values  |      |        | Shear Values |      |       |        |
|----------------------------|----------------|--------|-------------------|------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|------|--------|--------------|------|-------|--------|
|                            |                |        | M                 | V    | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M    | fb     | F'b          | V    | fv    | F'v    |
| Length = 9.0 ft            | 1              | 0.040  | 0.026             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.02 | 148.36 | 3720.00      | 0.35 | 12.74 | 496.00 |
| +D+0.750Lr+0.750L+0.450W+H |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 9.0 ft            | 1              | 0.040  | 0.026             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.02 | 148.36 | 3720.00      | 0.35 | 12.74 | 496.00 |
| +D+0.750L+0.750S+0.450W+H  |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 9.0 ft            | 1              | 0.083  | 0.054             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 2.12 | 309.81 | 3720.00      | 0.74 | 26.61 | 496.00 |
| +0.60D+0.60W+0.60H         |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 9.0 ft            | 1              | 0.024  | 0.015             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.61 | 89.01  | 3720.00      | 0.21 | 7.64  | 496.00 |
| +D+0.70E+0.60H             |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 9.0 ft            | 1              | 0.040  | 0.026             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.02 | 148.36 | 3720.00      | 0.35 | 12.74 | 496.00 |
| +D+0.750L+0.750S+0.5250E+H |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 9.0 ft            | 1              | 0.083  | 0.054             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 2.12 | 309.81 | 3720.00      | 0.74 | 26.61 | 496.00 |
| +0.60D+0.70E+H             |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 9.0 ft            | 1              | 0.024  | 0.015             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.61 | 89.01  | 3720.00      | 0.21 | 7.64  | 496.00 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+S+H           | 1    | 0.0483        | 4.533            |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 1.108     | 1.108     |
| Overall MINimum            | 0.656     | 0.656     |
| +D+H                       | 0.452     | 0.452     |
| +D+L+H                     | 0.452     | 0.452     |
| +D+Lr+H                    | 0.452     | 0.452     |
| +D+S+H                     | 1.108     | 1.108     |
| +D+0.750Lr+0.750L+H        | 0.452     | 0.452     |
| +D+0.750L+0.750S+H         | 0.944     | 0.944     |
| +D+0.60W+H                 | 0.452     | 0.452     |
| +D+0.750Lr+0.750L+0.450W+H | 0.452     | 0.452     |
| +D+0.750L+0.750S+0.450W+H  | 0.944     | 0.944     |
| +0.60D+0.60W+0.60H         | 0.271     | 0.271     |
| +D+0.70E+0.60H             | 0.452     | 0.452     |
| +D+0.750L+0.750S+0.5250E+H | 0.944     | 0.944     |
| +0.60D+0.70E+H             | 0.271     | 0.271     |
| D Only                     | 0.452     | 0.452     |
| Lr Only                    |           |           |
| L Only                     |           |           |
| S Only                     | 0.656     | 0.656     |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |



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BURT ENGINEERING PLLC

DESCRIPTION: MB1

| Load Combination           | Segment Length | Span # | Max Stress Ratios |       |                |                  |                |                |                |                | Moment Values  |       |                | Shear Values   |      |                |                |
|----------------------------|----------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|-------|----------------|----------------|------|----------------|----------------|
|                            |                |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M     | f <sub>b</sub> | F <sub>b</sub> | V    | f <sub>v</sub> | F <sub>v</sub> |
| Length = 25.080 ft         | 1              |        | 0.489             | 0.170 | 1.15           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 14.21 | 1,319.03       | 2695.17        | 2.26 | 51.80          | 304.75         |
| +D+0.60W+H                 |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.153             | 0.053 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 6.20  | 575.49         | 3749.80        | 0.98 | 22.42          | 424.00         |
| +D+0.750Lr+0.750L+0.450W+H |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.268             | 0.091 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 10.83 | 1,005.70       | 3749.80        | 1.67 | 38.44          | 424.00         |
| +D+0.750L+0.750S+0.450W+H  |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.352             | 0.122 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 14.21 | 1,319.03       | 3749.80        | 2.26 | 51.80          | 424.00         |
| +0.60D+0.60W+0.60H         |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.092             | 0.032 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.72  | 345.29         | 3749.80        | 0.59 | 13.45          | 424.00         |
| +D+0.70E+0.60H             |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.153             | 0.053 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 6.20  | 575.49         | 3749.80        | 0.98 | 22.42          | 424.00         |
| +D+0.750L+0.750S+0.5250E+H |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.352             | 0.122 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 14.21 | 1,319.03       | 3749.80        | 2.26 | 51.80          | 424.00         |
| +0.60D+0.70E+H             |                |        |                   |       |                | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           |                |       | 0.00           | 0.00           | 0.00 | 0.00           | 0.00           |
| Length = 25.080 ft         | 1              |        | 0.092             | 0.032 | 1.60           | 0.977            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.72  | 345.29         | 3749.80        | 0.59 | 13.45          | 424.00         |

## Overall Maximum Deflections

| Load Combination           | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|----------------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+0.750L+0.750S+0.5250E+H | 1    | 1.1804        | 12.357           |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 2.161     | 2.351     |
| Overall MINimum            | 0.624     | 0.776     |
| +D+H                       | 0.941     | 1.017     |
| +D+L+H                     | 1.944     | 2.020     |
| +D+Lr+H                    | 0.941     | 1.017     |
| +D+S+H                     | 1.565     | 1.792     |
| +D+0.750Lr+0.750L+H        | 1.693     | 1.769     |
| +D+0.750L+0.750S+H         | 2.161     | 2.351     |
| +D+0.60W+H                 | 0.941     | 1.017     |
| +D+0.750Lr+0.750L+0.450W+H | 1.693     | 1.769     |
| +D+0.750L+0.750S+0.450W+H  | 2.161     | 2.351     |
| +0.60D+0.60W+0.60H         | 0.564     | 0.610     |
| +D+0.70E+0.60H             | 0.941     | 1.017     |
| +D+0.750L+0.750S+0.5250E+H | 2.161     | 2.351     |
| +0.60D+0.70E+H             | 0.564     | 0.610     |
| D Only                     | 0.941     | 1.017     |
| Lr Only                    |           |           |
| L Only                     | 1.003     | 1.003     |
| S Only                     | 0.624     | 0.776     |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |



# Wood Beam

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BURT ENGINEERING PLLC

DESCRIPTION: MB2

| Load Combination           | Segment Length | Span # | Max Stress Ratios |       |                |                  |                |                |                |                | Moment Values  |      |          | Shear Values |      |       |        |
|----------------------------|----------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|------|----------|--------------|------|-------|--------|
|                            |                |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M    | fb       | F'b          | V    | fv    | F'v    |
| Length = 17.750 ft         | 1              |        | 0.517             | 0.204 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 9.48 | 1,382.48 | 2673.75      | 2.01 | 72.63 | 356.50 |
| Length = 2.170 ft          | 2              |        | 0.032             | 0.204 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.58 | 85.18    | 2673.75      | 0.29 | 72.63 | 356.50 |
| +D+0.750Lr+0.750L+H        |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.194             | 0.076 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.86 | 563.69   | 2906.25      | 0.82 | 29.61 | 387.50 |
| Length = 2.170 ft          | 2              |        | 0.012             | 0.076 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.24 | 34.73    | 2906.25      | 0.12 | 29.61 | 387.50 |
| +D+0.750L+0.750S+H         |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.440             | 0.174 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 8.07 | 1,177.78 | 2673.75      | 1.71 | 61.88 | 356.50 |
| Length = 2.170 ft          | 2              |        | 0.027             | 0.174 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.50 | 72.57    | 2673.75      | 0.25 | 61.88 | 356.50 |
| +D+0.60W+H                 |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.152             | 0.060 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.86 | 563.69   | 3720.00      | 0.82 | 29.61 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.009             | 0.060 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.24 | 34.73    | 3720.00      | 0.12 | 29.61 | 496.00 |
| +D+0.750Lr+0.750L+0.450W+H |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.152             | 0.060 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.86 | 563.69   | 3720.00      | 0.82 | 29.61 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.009             | 0.060 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.24 | 34.73    | 3720.00      | 0.12 | 29.61 | 496.00 |
| +D+0.750L+0.750S+0.450W+H  |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.317             | 0.125 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 8.07 | 1,177.78 | 3720.00      | 1.71 | 61.88 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.020             | 0.125 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.50 | 72.57    | 3720.00      | 0.25 | 61.88 | 496.00 |
| +0.60D+0.60W+0.60H         |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.091             | 0.036 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 2.32 | 338.22   | 3720.00      | 0.49 | 17.77 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.006             | 0.036 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.14 | 20.84    | 3720.00      | 0.07 | 17.77 | 496.00 |
| +D+0.70E+0.60H             |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.152             | 0.060 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 3.86 | 563.69   | 3720.00      | 0.82 | 29.61 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.009             | 0.060 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.24 | 34.73    | 3720.00      | 0.12 | 29.61 | 496.00 |
| +D+0.750L+0.750S+0.5250E+H |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.317             | 0.125 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 8.07 | 1,177.78 | 3720.00      | 1.71 | 61.88 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.020             | 0.125 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.50 | 72.57    | 3720.00      | 0.25 | 61.88 | 496.00 |
| +0.60D+0.70E+H             |                |        |                   |       |                | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |          | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 17.750 ft         | 1              |        | 0.091             | 0.036 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 2.32 | 338.22   | 3720.00      | 0.49 | 17.77 | 496.00 |
| Length = 2.170 ft          | 2              |        | 0.006             | 0.036 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.14 | 20.84    | 3720.00      | 0.07 | 17.77 | 496.00 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+S+H           | 1    | 0.7118        | 8.925            |                  | 0.0000        | 0.000            |
|                  | 2    | 0.0000        | 8.925            | +D+S+H           | -0.2675       | 2.170            |

## Vertical Reactions

| Load Combination           | Support notation : Far left is #1 |           |           | Values in KIPS |
|----------------------------|-----------------------------------|-----------|-----------|----------------|
|                            | Support 1                         | Support 2 | Support 3 |                |
| Overall MAXimum            | 2.168                             | 2.772     |           |                |
| Overall MINimum            | 1.284                             | 1.642     |           |                |
| +D+H                       | 0.884                             | 1.130     |           |                |
| +D+L+H                     | 0.884                             | 1.130     |           |                |
| +D+Lr+H                    | 0.884                             | 1.130     |           |                |
| +D+S+H                     | 2.168                             | 2.772     |           |                |
| +D+0.750Lr+0.750L+H        | 0.884                             | 1.130     |           |                |
| +D+0.750L+0.750S+H         | 1.847                             | 2.362     |           |                |
| +D+0.60W+H                 | 0.884                             | 1.130     |           |                |
| +D+0.750Lr+0.750L+0.450W+H | 0.884                             | 1.130     |           |                |
| +D+0.750L+0.750S+0.450W+H  | 1.847                             | 2.362     |           |                |
| +0.60D+0.60W+0.60H         | 0.530                             | 0.678     |           |                |
| +D+0.70E+0.60H             | 0.884                             | 1.130     |           |                |
| +D+0.750L+0.750S+0.5250E+H | 1.847                             | 2.362     |           |                |
| +0.60D+0.70E+H             | 0.530                             | 0.678     |           |                |
| D Only                     | 0.884                             | 1.130     |           |                |
| Lr Only                    |                                   |           |           |                |
| L Only                     |                                   |           |           |                |
| S Only                     | 1.284                             | 1.642     |           |                |
| W Only                     |                                   |           |           |                |
| E Only                     |                                   |           |           |                |
| H Only                     |                                   |           |           |                |



# Wood Beam

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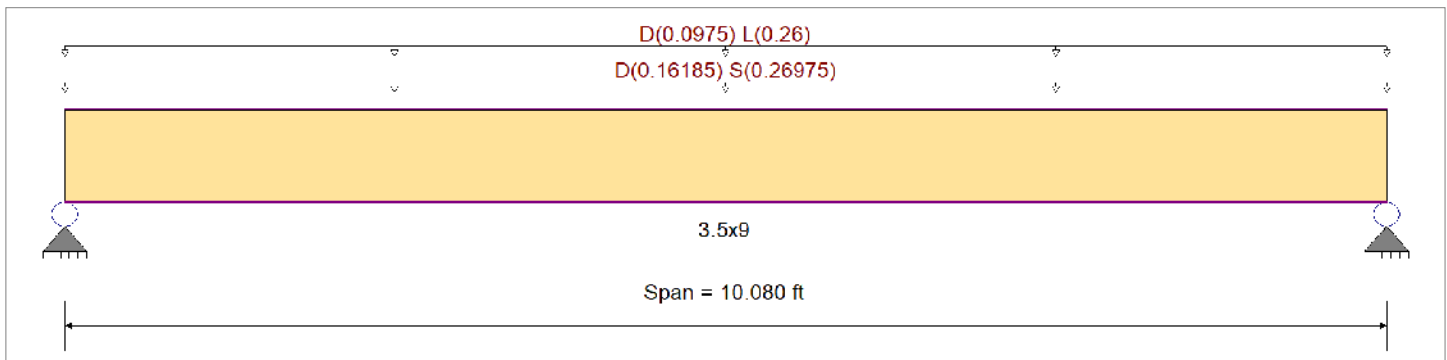
DESCRIPTION: MB3

## CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16  
Load Combination Set : ASCE 7-16

## Material Properties

|  |           |          |                           |
|--|-----------|----------|---------------------------|
| Analysis Method : Allowable Stress Design                              | Fb +      | 2400 psi | E : Modulus of Elasticity |
| Load Combination ASCE 7-16   | Fb -      | 1850 psi | Ebend- xx                 |
|  | Fc - Prll | 1650 psi | Eminbend - xx             |
| Wood Species : DF/DF   | Fc - Perp | 650 psi  | Ebend- yy                 |
| Wood Grade : 24F - V4  | Fv        | 265 psi  | Eminbend - yy             |
|  | Ft        | 1100 psi | Density                   |
| Beam Bracing : Beam is Fully Braced against lateral-torsional buckling |           |          | 31.21 pcf                 |



## Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads

Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 10.790 ft

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 6.50 ft

## DESIGN SUMMARY

**Design OK**

|                                   |   |                    |                             |   |                    |
|-----------------------------------|---|--------------------|-----------------------------|---|--------------------|
| Maximum Bending Stress Ratio      | = | <b>0.775</b> : 1   | Maximum Shear Stress Ratio  | = | <b>0.446</b> : 1   |
| Section used for this span        | = | <b>3.5x9</b>       | Section used for this span  | = | <b>3.5x9</b>       |
|                                   | = | 2,140.15psi        |                             | = | 135.99 psi         |
|                                   | = | 2,760.00psi        |                             | = | 304.75 psi         |
| Load Combination                  | = | +D+0.750L+0.750S+H | Load Combination            | = | +D+0.750L+0.750S+H |
| Location of maximum on span       | = | 5.040ft            | Location of maximum on span | = | 0.000ft            |
| Span # where maximum occurs       | = | Span # 1           | Span # where maximum occurs | = | Span # 1           |
| <b>Maximum Deflection</b>         |   |                    |                             |   |                    |
| Max Downward Transient Deflection |   | 0.165 in           | Ratio =                     |   | 734 >=360          |
| Max Upward Transient Deflection   |   | 0.000 in           | Ratio =                     |   | 0 <360             |
| Max Downward Total Deflection     |   | 0.405 in           | Ratio =                     |   | 298 >=240          |
| Max Upward Total Deflection       |   | 0.000 in           | Ratio =                     |   | 0 <240             |

## Maximum Forces & Stresses for Load Combinations

| Load Combination    | Segment Length     | Span # | Max Stress Ratios |       |                |                  |                |                |                |                |                | Moment Values |      |          | Shear Values |      |      |      |      |        |        |
|---------------------|--------------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|---------------|------|----------|--------------|------|------|------|------|--------|--------|
|                     |                    |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M             | fb   | F'b      | V            | fv   | F'v  |      |      |        |        |
| +D+H                | Length = 10.080 ft | 1      | 0.397             | 0.229 | 0.90           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00          | 3.38 | 858.58   | 2160.00      | 0.00 | 0.00 | 0.00 | 1.15 | 54.56  | 238.50 |
| +D+L+H              | Length = 10.080 ft | 1      | 0.707             | 0.407 | 1.00           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00          | 6.68 | 1,697.24 | 2400.00      | 0.00 | 0.00 | 0.00 | 2.26 | 107.85 | 265.00 |
| +D+Lr+H             | Length = 10.080 ft | 1      | 0.286             | 0.165 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00          | 3.38 | 858.58   | 3000.00      | 0.00 | 0.00 | 0.00 | 1.15 | 54.56  | 331.25 |
| +D+S+H              | Length = 10.080 ft | 1      | 0.626             | 0.360 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00          | 6.81 | 1,728.69 | 2760.00      | 0.00 | 0.00 | 0.00 | 2.31 | 109.85 | 304.75 |
| +D+0.750Lr+0.750L+H | Length = 10.080 ft | 1      | 0.496             | 0.285 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00          | 5.86 | 1,487.57 | 3000.00      | 0.00 | 0.00 | 0.00 | 1.99 | 94.52  | 331.25 |
| +D+0.750L+0.750S+H  | Length = 10.080 ft | 1      | 0.775             | 0.446 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00          | 8.43 | 2,140.15 | 2760.00      | 0.00 | 0.00 | 0.00 | 2.86 | 135.99 | 304.75 |

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BURT ENGINEERING PLLC

DESCRIPTION: MB3

| Load Combination           | Segment Length     | Span # | Max Stress Ratios |       |                | Moment Values    |                |                |                |                |                | Shear Values |      |      |      |          |         |      |      |      |      |        |        |
|----------------------------|--------------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------|------|------|------|----------|---------|------|------|------|------|--------|--------|
|                            |                    |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M            | fb   | F'b  | V    | fv       | F'v     |      |      |      |      |        |        |
| +D+0.60W+H                 | Length = 10.080 ft | 1      | 0.224             | 0.129 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 3.38 | 858.58   | 3840.00 | 0.00 | 0.00 | 0.00 | 1.15 | 54.56  | 424.00 |
| +D+0.750Lr+0.750L+0.450W+H | Length = 10.080 ft | 1      | 0.387             | 0.223 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 5.86 | 1,487.57 | 3840.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00   | 0.00   |
| +D+0.750L+0.750S+0.450W+H  | Length = 10.080 ft | 1      | 0.557             | 0.321 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 8.43 | 2,140.15 | 3840.00 | 0.00 | 0.00 | 0.00 | 2.86 | 135.99 | 424.00 |
| +0.60D+0.60W+0.60H         | Length = 10.080 ft | 1      | 0.134             | 0.077 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 2.03 | 515.15   | 3840.00 | 0.00 | 0.00 | 0.00 | 0.69 | 32.73  | 424.00 |
| +D+0.70E+0.60H             | Length = 10.080 ft | 1      | 0.224             | 0.129 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 3.38 | 858.58   | 3840.00 | 0.00 | 0.00 | 0.00 | 1.15 | 54.56  | 424.00 |
| +D+0.750L+0.750S+0.5250E+H | Length = 10.080 ft | 1      | 0.557             | 0.321 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 8.43 | 2,140.15 | 3840.00 | 0.00 | 0.00 | 0.00 | 2.86 | 135.99 | 424.00 |
| +0.60D+0.70E+H             | Length = 10.080 ft | 1      | 0.134             | 0.077 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 2.03 | 515.15   | 3840.00 | 0.00 | 0.00 | 0.00 | 0.69 | 32.73  | 424.00 |

## Overall Maximum Deflections

| Load Combination           | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|----------------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+0.750L+0.750S+0.5250E+H | 1    | 0.4050        | 5.077            |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 3.344     | 3.344     |
| Overall MINimum            | 1.360     | 1.360     |
| +D+H                       | 1.342     | 1.342     |
| +D+L+H                     | 2.652     | 2.652     |
| +D+Lr+H                    | 1.342     | 1.342     |
| +D+S+H                     | 2.701     | 2.701     |
| +D+0.750Lr+0.750L+H        | 2.324     | 2.324     |
| +D+0.750L+0.750S+H         | 3.344     | 3.344     |
| +D+0.60W+H                 | 1.342     | 1.342     |
| +D+0.750Lr+0.750L+0.450W+H | 2.324     | 2.324     |
| +D+0.750L+0.750S+0.450W+H  | 3.344     | 3.344     |
| +0.60D+0.60W+0.60H         | 0.805     | 0.805     |
| +D+0.70E+0.60H             | 1.342     | 1.342     |
| +D+0.750L+0.750S+0.5250E+H | 3.344     | 3.344     |
| +0.60D+0.70E+H             | 0.805     | 0.805     |
| D Only                     | 1.342     | 1.342     |
| Lr Only                    |           |           |
| L Only                     | 1.310     | 1.310     |
| S Only                     | 1.360     | 1.360     |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |



# Wood Beam

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BURT ENGINEERING PLLC

DESCRIPTION: MJ1

| Load Combination           | Segment Length | Span # | Max Stress Ratios |      |                |                  |                |                |                |                | Moment Values  |        |         | Shear Values |       |        |        |
|----------------------------|----------------|--------|-------------------|------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|--------|---------|--------------|-------|--------|--------|
|                            |                |        | M                 | V    | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M      | fb      | F'b          | V     | fv     | F'v    |
| Length = 25.080 ft         | 1              | 0.133  | 0.036             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.69   | 493.11  | 3720.00      | 0.25  | 18.04  | 496.00 |
| +D+0.750Lr+0.750L+0.450W+H |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           |                |        | 0.00    | 0.00         | 0.00  | 0.00   | 0.00   |
| Length = 25.080 ft         | 1              | 0.133  | 0.036             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.69           | 493.11 | 3720.00 | 0.25         | 18.04 | 496.00 |        |
| +D+0.750L+0.750S+0.450W+H  |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           |                |        | 0.00    | 0.00         | 0.00  | 0.00   |        |
| Length = 25.080 ft         | 1              | 0.248  | 0.068             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 3.16           | 923.23 | 3720.00 | 0.47         | 33.77 | 496.00 |        |
| +0.60D+0.60W+0.60H         |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           |                |        | 0.00    | 0.00         | 0.00  | 0.00   |        |
| Length = 25.080 ft         | 1              | 0.080  | 0.022             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.01           | 295.86 | 3720.00 | 0.15         | 10.82 | 496.00 |        |
| +D+0.70E+0.60H             |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           |                |        | 0.00    | 0.00         | 0.00  | 0.00   |        |
| Length = 25.080 ft         | 1              | 0.133  | 0.036             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.69           | 493.11 | 3720.00 | 0.25         | 18.04 | 496.00 |        |
| +D+0.750L+0.750S+0.5250E+H |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           |                |        | 0.00    | 0.00         | 0.00  | 0.00   |        |
| Length = 25.080 ft         | 1              | 0.248  | 0.068             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 3.16           | 923.23 | 3720.00 | 0.47         | 33.77 | 496.00 |        |
| +0.60D+0.70E+H             |                |        |                   |      | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           |                |        | 0.00    | 0.00         | 0.00  | 0.00   |        |
| Length = 25.080 ft         | 1              | 0.080  | 0.022             | 1.60 | 1.000          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.01           | 295.86 | 3720.00 | 0.15         | 10.82 | 496.00 |        |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+S+H           | 1    | 1.0999        | 12.632           |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 0.583     | 0.583     |
| Overall MINimum            | 0.314     | 0.314     |
| +D+H                       | 0.270     | 0.270     |
| +D+L+H                     | 0.270     | 0.270     |
| +D+Lr+H                    | 0.270     | 0.270     |
| +D+S+H                     | 0.583     | 0.583     |
| +D+0.750Lr+0.750L+H        | 0.270     | 0.270     |
| +D+0.750L+0.750S+H         | 0.505     | 0.505     |
| +D+0.60W+H                 | 0.270     | 0.270     |
| +D+0.750Lr+0.750L+0.450W+H | 0.270     | 0.270     |
| +D+0.750L+0.750S+0.450W+H  | 0.505     | 0.505     |
| +0.60D+0.60W+0.60H         | 0.162     | 0.162     |
| +D+0.70E+0.60H             | 0.270     | 0.270     |
| +D+0.750L+0.750S+0.5250E+H | 0.505     | 0.505     |
| +0.60D+0.70E+H             | 0.162     | 0.162     |
| D Only                     | 0.270     | 0.270     |
| Lr Only                    |           |           |
| L Only                     |           |           |
| S Only                     | 0.314     | 0.314     |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |



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BURT ENGINEERING PLLC

DESCRIPTION: MJ2

| Load Combination           | Segment Length | Span # | Max Stress Ratios |      |                |                  |                |                |                |                | Moment Values  |      |        | Shear Values |      |       |        |
|----------------------------|----------------|--------|-------------------|------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|------|--------|--------------|------|-------|--------|
|                            |                |        | M                 | V    | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M    | fb     | F'b          | V    | fv    | F'v    |
| Length = 12.330 ft         | 1              | 0.155  | 0.047             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.44 | 244.74 | 1584.00      | 0.12 | 13.40 | 288.00 |
| +D+0.750Lr+0.750L+0.450W+H |                |        |                   |      | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 12.330 ft         | 1              | 0.423  | 0.127             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.19 | 670.11 | 1584.00      | 0.34 | 36.70 | 288.00 |
| +D+0.750L+0.750S+0.450W+H  |                |        |                   |      | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 12.330 ft         | 1              | 0.423  | 0.127             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.19 | 670.11 | 1584.00      | 0.34 | 36.70 | 288.00 |
| +0.60D+0.60W+0.60H         |                |        |                   |      | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 12.330 ft         | 1              | 0.093  | 0.028             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.26 | 146.85 | 1584.00      | 0.07 | 8.04  | 288.00 |
| +D+0.70E+0.60H             |                |        |                   |      | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 12.330 ft         | 1              | 0.155  | 0.047             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.44 | 244.74 | 1584.00      | 0.12 | 13.40 | 288.00 |
| +D+0.750L+0.750S+0.5250E+H |                |        |                   |      | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 12.330 ft         | 1              | 0.423  | 0.127             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.19 | 670.11 | 1584.00      | 0.34 | 36.70 | 288.00 |
| +0.60D+0.70E+H             |                |        |                   |      | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           |      |        | 0.00         | 0.00 | 0.00  | 0.00   |
| Length = 12.330 ft         | 1              | 0.093  | 0.028             | 1.60 | 1.100          | 1.00             | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 0.26 | 146.85 | 1584.00      | 0.07 | 8.04  | 288.00 |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+L+H           | 1    | 0.2517        | 6.210            |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 0.470     | 0.470     |
| Overall MINimum            | 0.328     | 0.328     |
| +D+H                       | 0.142     | 0.142     |
| +D+L+H                     | 0.470     | 0.470     |
| +D+Lr+H                    | 0.142     | 0.142     |
| +D+S+H                     | 0.142     | 0.142     |
| +D+0.750Lr+0.750L+H        | 0.388     | 0.388     |
| +D+0.750L+0.750S+H         | 0.388     | 0.388     |
| +D+0.60W+H                 | 0.142     | 0.142     |
| +D+0.750Lr+0.750L+0.450W+H | 0.388     | 0.388     |
| +D+0.750L+0.750S+0.450W+H  | 0.388     | 0.388     |
| +0.60D+0.60W+0.60H         | 0.085     | 0.085     |
| +D+0.70E+0.60H             | 0.142     | 0.142     |
| +D+0.750L+0.750S+0.5250E+H | 0.388     | 0.388     |
| +0.60D+0.70E+H             | 0.085     | 0.085     |
| D Only                     | 0.142     | 0.142     |
| Lr Only                    |           |           |
| L Only                     | 0.328     | 0.328     |
| S Only                     |           |           |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |

# Wood Beam

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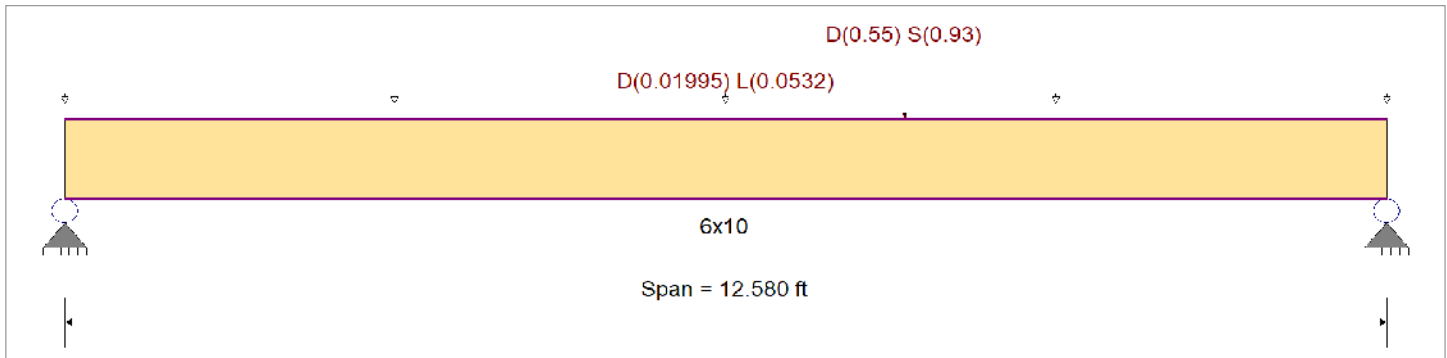
DESCRIPTION: MB4

## CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16  
 Load Combination Set : ASCE 7-16

## Material Properties

|  |           |             |                           |
|--|-----------|-------------|---------------------------|
| Analysis Method : Allowable Stress Design                              | Fb +      | 900.0 psi   | E : Modulus of Elasticity |
| Load Combination ASCE 7-16   | Fb -      | 900.0 psi   | Ebend- xx                 |
|  | Fc - Prll | 1,350.0 psi | Eminbend - xx             |
| Wood Species : DouglasFir-Larch  | Fc - Perp | 625.0 psi   |                           |
| Wood Grade : No.2  | Fv        | 180.0 psi   |                           |
|  | Ft        | 575.0 psi   | Density                   |
| Beam Bracing : Beam is Fully Braced against lateral-torsional buckling |           |             | 31.210pcf                 |



## Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads  
 Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft  
 Point Load : D = 0.550, S = 0.930 k @ 8.0 ft

## DESIGN SUMMARY

**Design OK**

|                                   |   |                    |                             |   |                    |
|-----------------------------------|---|--------------------|-----------------------------|---|--------------------|
| Maximum Bending Stress Ratio      | = | <b>0.691</b> : 1   | Maximum Shear Stress Ratio  | = | <b>0.164</b> : 1   |
| Section used for this span        | = | <b>6x10</b>        | Section used for this span  | = | <b>6x10</b>        |
|                                   | = | 715.63psi          |                             | = | 34.03 psi          |
|                                   | = | 1,035.00psi        |                             | = | 207.00 psi         |
| Load Combination                  | = | +D+0.750L+0.750S+H | Load Combination            | = | +D+0.750L+0.750S+H |
| Location of maximum on span       | = | 7.989ft            | Location of maximum on span | = | 11.799ft           |
| Span # where maximum occurs       | = | Span # 1           | Span # where maximum occurs | = | Span # 1           |
| <b>Maximum Deflection</b>         |   |                    |                             |   |                    |
| Max Downward Transient Deflection |   | 0.097 in           | Ratio =                     |   | 1564 >=360         |
| Max Upward Transient Deflection   |   | 0.000 in           | Ratio =                     |   | 0 <360             |
| Max Downward Total Deflection     |   | 0.193 in           | Ratio =                     |   | 780 >=240          |
| Max Upward Total Deflection       |   | 0.000 in           | Ratio =                     |   | 0 <240             |

## Maximum Forces & Stresses for Load Combinations

| Load Combination    | Segment Length     | Span # | Max Stress Ratios |       |                |                  |                |                |                |                | Moment Values  |      |      | Shear Values |         |      |      |      |      |        |        |
|---------------------|--------------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|------|------|--------------|---------|------|------|------|------|--------|--------|
|                     |                    |        | M                 | V     | C <sub>d</sub> | C <sub>F/N</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M    | fb   | F'b          | V       | fv   | F'v  |      |      |        |        |
| +D+H                | Length = 12.580 ft | 1      | 0.389             | 0.093 | 0.90           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 2.17 | 315.23       | 810.00  | 0.00 | 0.00 | 0.00 | 0.00 | 149.99 | 162.00 |
| +D+L+H              | Length = 12.580 ft | 1      | 0.507             | 0.130 | 1.00           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 3.15 | 456.75       | 900.00  | 0.00 | 0.00 | 0.00 | 0.00 | 23.40  | 180.00 |
| +D+Lr+H             | Length = 12.580 ft | 1      | 0.280             | 0.067 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 2.17 | 315.23       | 1125.00 | 0.00 | 0.00 | 0.00 | 0.00 | 14.99  | 225.00 |
| +D+S+H              | Length = 12.580 ft | 1      | 0.684             | 0.154 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 4.88 | 707.57       | 1035.00 | 0.00 | 0.00 | 0.00 | 0.00 | 31.97  | 207.00 |
| +D+0.750Lr+0.750L+H | Length = 12.580 ft | 1      | 0.375             | 0.095 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 2.90 | 421.37       | 1125.00 | 0.00 | 0.00 | 0.00 | 0.00 | 21.30  | 225.00 |
| +D+0.750L+0.750S+H  | Length = 12.580 ft | 1      | 0.691             | 0.164 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 4.93 | 715.63       | 1035.00 | 0.00 | 0.00 | 0.00 | 0.00 | 34.03  | 207.00 |

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BURT ENGINEERING PLLC

DESCRIPTION: MB4

| Load Combination           | Segment Length     | Span # | Max Stress Ratios |       |                | Moment Values    |                |                |                |                |                | Shear Values |      |      |      |        |         |      |      |      |
|----------------------------|--------------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------|------|------|------|--------|---------|------|------|------|
|                            |                    |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M            | fb   | F'b  | V    | fv     | F'v     |      |      |      |
| +D+0.60W+H                 | Length = 12.580 ft | 1      | 0.219             | 0.052 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 2.17 | 315.23 | 1440.00 | 0.00 | 0.00 | 0.00 |
| +D+0.750Lr+0.750L+0.450W+H | Length = 12.580 ft | 1      | 0.293             | 0.074 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 2.90 | 421.37 | 1440.00 | 0.00 | 0.00 | 0.00 |
| +D+0.750L+0.750S+0.450W+H  | Length = 12.580 ft | 1      | 0.497             | 0.118 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 4.93 | 715.63 | 1440.00 | 0.00 | 0.00 | 0.00 |
| +0.60D+0.60W+0.60H         | Length = 12.580 ft | 1      | 0.131             | 0.031 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 1.30 | 189.14 | 1440.00 | 0.00 | 0.00 | 0.00 |
| +D+0.70E+0.60H             | Length = 12.580 ft | 1      | 0.219             | 0.052 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 2.17 | 315.23 | 1440.00 | 0.00 | 0.00 | 0.00 |
| +D+0.750L+0.750S+0.5250E+H | Length = 12.580 ft | 1      | 0.497             | 0.118 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 4.93 | 715.63 | 1440.00 | 0.00 | 0.00 | 0.00 |
| +0.60D+0.70E+H             | Length = 12.580 ft | 1      | 0.131             | 0.031 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00 | 1.30 | 189.14 | 1440.00 | 0.00 | 0.00 | 0.00 |

## Overall Maximum Deflections

| Load Combination           | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|----------------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+0.750L+0.750S+0.5250E+H | 1    | 0.1933        | 6.657            |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 0.902     | 1.241     |
| Overall MINimum            | 0.339     | 0.591     |
| +D+H                       | 0.397     | 0.546     |
| +D+L+H                     | 0.732     | 0.881     |
| +D+Lr+H                    | 0.397     | 0.546     |
| +D+S+H                     | 0.736     | 1.138     |
| +D+0.750Lr+0.750L+H        | 0.648     | 0.797     |
| +D+0.750L+0.750S+H         | 0.902     | 1.241     |
| +D+0.60W+H                 | 0.397     | 0.546     |
| +D+0.750Lr+0.750L+0.450W+H | 0.648     | 0.797     |
| +D+0.750L+0.750S+0.450W+H  | 0.902     | 1.241     |
| +0.60D+0.60W+0.60H         | 0.238     | 0.328     |
| +D+0.70E+0.60H             | 0.397     | 0.546     |
| +D+0.750L+0.750S+0.5250E+H | 0.902     | 1.241     |
| +0.60D+0.70E+H             | 0.238     | 0.328     |
| D Only                     | 0.397     | 0.546     |
| Lr Only                    |           |           |
| L Only                     | 0.335     | 0.335     |
| S Only                     | 0.339     | 0.591     |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |



# Wood Beam

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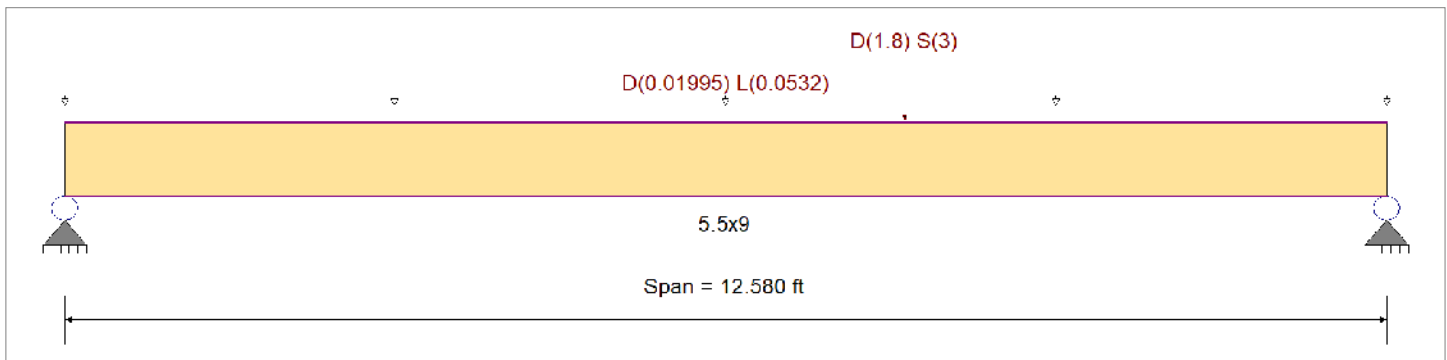
DESCRIPTION: MB5

## CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16  
Load Combination Set : ASCE 7-16

## Material Properties

|  |           |          |                           |
|--|-----------|----------|---------------------------|
| Analysis Method : Allowable Stress Design                              | Fb +      | 2400 psi | E : Modulus of Elasticity |
| Load Combination ASCE 7-16   | Fb -      | 1850 psi | Ebend- xx                 |
|  | Fc - Prll | 1650 psi | Eminbend - xx             |
| Wood Species : DF/DF   | Fc - Perp | 650 psi  | Ebend- yy                 |
| Wood Grade : 24F - V4  | Fv        | 265 psi  | Eminbend - yy             |
|  | Ft        | 1100 psi | Density                   |
| Beam Bracing : Beam is Fully Braced against lateral-torsional buckling |           |          | 31.21 pcf                 |



## Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads  
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft  
Point Load : D = 1.80, S = 3.0 k @ 8.0 ft

## DESIGN SUMMARY

Design OK

|                                   |   |                  |                             |   |                  |
|-----------------------------------|---|------------------|-----------------------------|---|------------------|
| Maximum Bending Stress Ratio      | = | <b>0.850</b> : 1 | Maximum Shear Stress Ratio  | = | <b>0.320</b> : 1 |
| Section used for this span        | = | <b>5.5x9</b>     | Section used for this span  | = | <b>5.5x9</b>     |
|                                   | = | 2,347.19psi      |                             | = | 97.66 psi        |
|                                   | = | 2,760.00psi      |                             | = | 304.75 psi       |
| Load Combination                  | = | +D+S+H           | Load Combination            | = | +D+S+H           |
| Location of maximum on span       | = | 7.989ft          | Location of maximum on span | = | 11.845ft         |
| Span # where maximum occurs       | = | Span # 1         | Span # where maximum occurs | = | Span # 1         |
| <b>Maximum Deflection</b>         |   |                  |                             |   |                  |
| Max Downward Transient Deflection |   | 0.325 in         | Ratio =                     |   | 463 >= 360       |
| Max Upward Transient Deflection   |   | 0.000 in         | Ratio =                     |   | 0 < 360          |
| Max Downward Total Deflection     |   | 0.549 in         | Ratio =                     |   | 274 >= 240       |
| Max Upward Total Deflection       |   | 0.000 in         | Ratio =                     |   | 0 < 240          |

## Maximum Forces & Stresses for Load Combinations

| Load Combination    | Segment Length     | Span # | Max Stress Ratios |       |                |                  |                |                |                |                | Moment Values  |      |       | Shear Values |         |      |      |      |      |       |        |
|---------------------|--------------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|------|-------|--------------|---------|------|------|------|------|-------|--------|
|                     |                    |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M    | fb    | F'b          | V       | fv   | F'v  |      |      |       |        |
| +D+H                | Length = 12.580 ft | 1      | 0.434             | 0.167 | 0.90           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 5.80  | 937.03       | 2160.00 | 0.00 | 0.00 | 0.00 | 1.32 | 39.85 | 238.50 |
| +D+L+H              | Length = 12.580 ft | 1      | 0.456             | 0.184 | 1.00           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 6.77  | 1,094.71     | 2400.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00   |
| +D+Lr+H             | Length = 12.580 ft | 1      | 0.312             | 0.120 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 5.80  | 937.03       | 3000.00 | 0.00 | 0.00 | 0.00 | 1.32 | 39.85 | 331.25 |
| +D+S+H              | Length = 12.580 ft | 1      | 0.850             | 0.320 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 14.52 | 2,347.19     | 2760.00 | 0.00 | 0.00 | 0.00 | 3.22 | 97.66 | 304.75 |
| +D+0.750Lr+0.750L+H | Length = 12.580 ft | 1      | 0.352             | 0.141 | 1.25           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 6.53  | 1,055.29     | 3000.00 | 0.00 | 0.00 | 0.00 | 1.54 | 46.57 | 331.25 |
| +D+0.750L+0.750S+H  | Length = 12.580 ft | 1      | 0.766             | 0.295 | 1.15           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00 | 13.07 | 2,112.91     | 2760.00 | 0.00 | 0.00 | 0.00 | 2.97 | 89.93 | 304.75 |

# Wood Beam

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DESCRIPTION: MB5

| Load Combination           | Segment Length     | Span # | Max Stress Ratios |       |                | Moment Values    |                |                |                |                |                | Shear Values |      |       |          |          |         |      |      |      |       |        |        |
|----------------------------|--------------------|--------|-------------------|-------|----------------|------------------|----------------|----------------|----------------|----------------|----------------|--------------|------|-------|----------|----------|---------|------|------|------|-------|--------|--------|
|                            |                    |        | M                 | V     | C <sub>d</sub> | C <sub>F/V</sub> | C <sub>i</sub> | C <sub>r</sub> | C <sub>m</sub> | C <sub>t</sub> | C <sub>L</sub> | M            | fb   | F'b   | V        | fv       | F'v     |      |      |      |       |        |        |
| +D+0.60W+H                 | Length = 12.580 ft | 1      | 0.244             | 0.094 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00  | 5.80     | 937.03   | 3840.00 | 0.00 | 0.00 | 0.00 | 1.32  | 39.85  | 424.00 |
| +D+0.750Lr+0.750L+0.450W+H | Length = 12.580 ft | 1      | 0.275             | 0.110 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 1.00  | 6.53     | 1,055.29 | 3840.00 | 0.00 | 0.00 | 0.00 | 0.00  | 0.00   | 0.00   |
| +D+0.750L+0.750S+0.450W+H  | Length = 12.580 ft | 1      | 0.550             | 0.212 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 13.07 | 2,112.91 | 3840.00  | 0.00    | 0.00 | 0.00 | 2.97 | 89.93 | 424.00 |        |
| +0.60D+0.60W+0.60H         | Length = 12.580 ft | 1      | 0.146             | 0.056 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 3.48  | 562.22   | 3840.00  | 0.00    | 0.00 | 0.00 | 0.00 | 0.00  | 0.00   |        |
| +D+0.70E+0.60H             | Length = 12.580 ft | 1      | 0.244             | 0.094 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 5.80  | 937.03   | 3840.00  | 0.00    | 0.00 | 0.00 | 1.32 | 39.85 | 424.00 |        |
| +D+0.750L+0.750S+0.5250E+H | Length = 12.580 ft | 1      | 0.550             | 0.212 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 13.07 | 2,112.91 | 3840.00  | 0.00    | 0.00 | 0.00 | 2.97 | 89.93 | 424.00 |        |
| +0.60D+0.70E+H             | Length = 12.580 ft | 1      | 0.146             | 0.056 | 1.60           | 1.000            | 1.00           | 1.00           | 1.00           | 1.00           | 1.00           | 1.00         | 1.00 | 3.48  | 562.22   | 3840.00  | 0.00    | 0.00 | 0.00 | 0.00 | 0.00  | 0.00   |        |

## Overall Maximum Deflections

| Load Combination | Span | Max. "-" Defl | Location in Span | Load Combination | Max. "+" Defl | Location in Span |
|------------------|------|---------------|------------------|------------------|---------------|------------------|
| +D+S+H           | 1    | 0.5494        | 6.749            |                  | 0.0000        | 0.000            |

## Vertical Reactions

Support notation : Far left is #1

Values in KIPS

| Load Combination           | Support 1 | Support 2 |
|----------------------------|-----------|-----------|
| Overall MAXimum            | 1.941     | 3.245     |
| Overall MINimum            | 1.092     | 1.908     |
| +D+H                       | 0.848     | 1.338     |
| +D+L+H                     | 1.183     | 1.672     |
| +D+Lr+H                    | 0.848     | 1.338     |
| +D+S+H                     | 1.941     | 3.245     |
| +D+0.750Lr+0.750L+H        | 1.099     | 1.589     |
| +D+0.750L+0.750S+H         | 1.918     | 3.019     |
| +D+0.60W+H                 | 0.848     | 1.338     |
| +D+0.750Lr+0.750L+0.450W+H | 1.099     | 1.589     |
| +D+0.750L+0.750S+0.450W+H  | 1.918     | 3.019     |
| +0.60D+0.60W+0.60H         | 0.509     | 0.803     |
| +D+0.70E+0.60H             | 0.848     | 1.338     |
| +D+0.750L+0.750S+0.5250E+H | 1.918     | 3.019     |
| +0.60D+0.70E+H             | 0.509     | 0.803     |
| D Only                     | 0.848     | 1.338     |
| Lr Only                    |           |           |
| L Only                     | 0.335     | 0.335     |
| S Only                     | 1.092     | 1.908     |
| W Only                     |           |           |
| E Only                     |           |           |
| H Only                     |           |           |

# ASCE Seismic Base Shear

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BURT ENGINEERING PLLC

**DESCRIPTION:** New Addition

## New Addition

### Risk Category Calculations per ASCE 7-10

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV ASCE 7-10, Page 2, Table 1.5-1

Seismic Importance Factor = 1 ASCE 7-10, Page 5, Table 1.5-2

### USER DEFINED Ground Motion ASCE 7-10 11.4.1

Max. Ground Motions, 5% Damping :

$$S_S = 1.430 \text{ g, 0.2 sec response}$$

$$S_1 = 0.5490 \text{ g, 1.0 sec response}$$

Conforms to ASCE 7 Section 12.8.1.3: Regular structure with period of 0.5 s or less,  $S_s$  limited to max of 1.5 for calculation of  $C_s$ .

### Site Class, Site Coeff. and Design Category

Site Classification "D" : Shear Wave Velocity 600 to 1,200 ft/sec = **D** ASCE 7-10 Table 20.3-1

Site Coefficients  $F_a$  &  $F_v$  ASCE 7-10 Table 11.4-1 & 11.4-2  
(using straight-line interpolation from table values)  $F_a = 1.00$   
 $F_v = 1.50$

Maximum Considered Earthquake Acceleration  $S_{MS} = F_a * S_s = 1.430$  ASCE 7-10 Eq. 11.4-1  
 $S_{M1} = F_v * S_1 = 0.824$  ASCE 7-10 Eq. 11.4-2

Design Spectral Acceleration  $S_{DS} = S_{MS}^{*2/3} = 0.953$  ASCE 7-10 Eq. 11.4-3  
 $S_{D1} = S_{M1}^{*2/3} = 0.549$  ASCE 7-10 Eq. 11.4-4

Seismic Design Category = **D** ASCE 7-10 Table 11.6-1 & -2

### Resisting System ASCE 7-10 Table 12.2-1

Basic Seismic Force Resisting System ... **Bearing Wall Systems**  
**13.Light-frame (wood) walls sheathed w/wood structural panels rated for shear resistance.**

|                                       |   |      |                          |            |
|---------------------------------------|---|------|--------------------------|------------|
| Response Modification Coefficient "R" | = | 6.50 | Building height Limits : |            |
| System Overstrength Factor "Wo"       | = | 2.50 | Category "A & B" Limit:  | No Limit   |
| Deflection Amplification Factor "Cd"  | = | 4.00 | Category "C" Limit:      | No Limit   |
|                                       |   |      | Category "D" Limit:      | Limit = 65 |
|                                       |   |      | Category "E" Limit:      | Limit = 65 |
|                                       |   |      | Category "F" Limit:      | Limit = 65 |

NOTE! See ASCE 7-10 for all applicable footnotes.

### Lateral Force Procedure ASCE 7-10 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-10 12.8

### Determine Building Period Use ASCE 12.8-7

Structure Type for Building Period Calculation : All Other Structural Systems

"Ct" value = 0.020 "hn" : Height from base to highest level = 19.50 ft

"x" value = 0.75

"Ta" Approximate fundamental period using Eq. 12.8-7 :  $T_a = C_t * (h_n^x) = 0.186 \text{ sec}$

"TL" : Long-period transition period per ASCE 7-10 Maps 22-12 -> 22-16 6.000 sec

Building Period "Ta" Calculated from Approximate Method selected = 0.186 sec

### "Cs" Response Coefficient ASCE 7-10 Section 12.8.1.1

$S_{DS}$  Short Period Design Spectral Response = 0.953 From Eq. 12.8-2, Preliminary  $C_s = 0.147$

"R" : Response Modification Factor = 6.50 From Eq. 12.8-3 & 12.8-4,  $C_s$  need not exceed = 0.455

"I" : Seismic Importance Factor = 1 From Eq. 12.8-5 & 12.8-6,  $C_s$  not be less than = 0.042

User has selected ASCE 12.8.1.3 : Regular structure, **Cs : Seismic Response Coefficient = 0.1467**  
Less than 5 Stories and with  $T \leq 0.5 \text{ sec}$ , SO  $S_s \leq 1.5$  for  $C_s$  calculation

**ASCE Seismic Base Shear**

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BURT ENGINEERING PLLC

DESCRIPTION: New Addition

**Seismic Base Shear**

ASCE 7-10 Section 12.8.1

Cs = 0.1467 from 12.8.1.1

W ( see Sum Wi below ) = 34.80 k

Seismic Base Shear V = Cs \* W = 5.10 k

**Vertical Distribution of Seismic Forces**

ASCE 7-10 Section 12.8.3

\* k : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

| Level #  | Wi : Weight | Hi : Height | (Wi * Hi^k)   | Cvx    | Fx=Cvx * V  | Sum Story Shear           | Sum Story Moment |
|----------|-------------|-------------|---------------|--------|-------------|---------------------------|------------------|
| 2        | 6.90        | 18.08       | 124.75        | 0.3362 | 1.72        | 1.72                      | 0.00             |
| 1        | 27.90       | 8.83        | 246.36        | 0.6638 | 3.39        | 5.10                      | 15.87            |
| Sum Wi = |             | 34.80 k     | Sum Wi * Hi = |        | 371.11 k-ft | Total Base Shear = 5.10 k |                  |
|          |             |             |               |        |             | Base Moment = 60.9 k-ft   |                  |

**Diaphragm Forces : Seismic Design Category "B" to "F"**

ASCE 7-10 12.10.1.1

| Level # | Wi    | Fi   | Sum Fi | Sum Wi | Fpx : Calcd | Fpx : Min | Fpx | Max   | Fpx  | Dsgn. Force |
|---------|-------|------|--------|--------|-------------|-----------|-----|-------|------|-------------|
| 2       | 6.90  | 1.72 | 1.72   | 6.90   | 1.72        | 1.32      |     | 2.63  | 1.72 | 1.72        |
| 1       | 27.90 | 3.39 | 5.10   | 34.80  | 4.09        | 5.32      |     | 10.64 | 5.32 | 5.32        |

- Wpx ..... Weight at level of diaphragm and other structure elements attached to it.
- Fi ..... Design Lateral Force applied at the level.
- Sum Fi ..... Sum of "Lat. Force" of current level plus all levels above
- MIN Req'd Force @ Level .....  $0.20 * S_{DS} * W_{px}$
- MAX Req'd Force @ Level .....  $0.40 * S_{DS} * W_{px}$
- Fpx : Design Force @ Level .....  $W_{px} * \text{SUM}(x \rightarrow n) Fi / \text{SUM}(x \rightarrow n) wi$ , x = Current level, n = Top Level

1.72 \* 1.3 = 2.2k  
 3.39 \* 1.3 = 4.4k

# ASCE Seismic Base Shear

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BURT ENGINEERING PLLC

**DESCRIPTION:** Existing Building

## Existing Building

### Risk Category

Calculations per ASCE 7-10

Risk Category of Building or Other Structure : "II" : All Buildings and other structures except those listed as Category I, III, and IV ASCE 7-10, Page 2, Table 1.5-1

Seismic Importance Factor = 1 ASCE 7-10, Page 5, Table 1.5-2

### USER DEFINED Ground Motion

ASCE 7-10 11.4.1

Max. Ground Motions, 5% Damping :

$S_S = 1.430$  g, 0.2 sec response

$S_1 = 0.5490$  g, 1.0 sec response

Conforms to ASCE 7 Section 12.8.1.3: Regular structure with period of 0.5 s or less,  $S_s$  limited to max of 1.5 for calculation of  $C_s$ .

### Site Class, Site Coeff. and Design Category

Site Classification "D" : Shear Wave Velocity 600 to 1,200 ft/sec = D ASCE 7-10 Table 20.3-1

Site Coefficients  $F_a$  &  $F_v$  (using straight-line interpolation from table values)  $F_a = 1.00$   $F_v = 1.50$  ASCE 7-10 Table 11.4-1 & 11.4-2

Maximum Considered Earthquake Acceleration  $S_{MS} = F_a * S_s = 1.430$  ASCE 7-10 Eq. 11.4-1  
 $S_{M1} = F_v * S_1 = 0.824$  ASCE 7-10 Eq. 11.4-2

Design Spectral Acceleration  $S_{DS} = S_{MS}^{2/3} = 0.953$  ASCE 7-10 Eq. 11.4-3  
 $S_{D1} = S_{M1}^{2/3} = 0.549$  ASCE 7-10 Eq. 11.4-4

Seismic Design Category = D ASCE 7-10 Table 11.6-1 & -2

### Resisting System

ASCE 7-10 Table 12.2-1

Basic Seismic Force Resisting System ... **Bearing Wall Systems**  
**13. Light-frame (wood) walls sheathed w/wood structural panels rated for shear resistance.**

Response Modification Coefficient "R" = 6.50 Building height Limits :  
 System Overstrength Factor "Wo" = 2.50 Category "A & B" Limit: No Limit  
 Deflection Amplification Factor "Cd" = 4.00 Category "C" Limit: No Limit  
 Category "D" Limit: Limit = 65  
 Category "E" Limit: Limit = 65  
 Category "F" Limit: Limit = 65

NOTE! See ASCE 7-10 for all applicable footnotes.

### Lateral Force Procedure

ASCE 7-10 Section 12.8.2

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-10 12.8

### Determine Building Period

Use ASCE 12.8-7

Structure Type for Building Period Calculation : All Other Structural Systems

"Ct" value = 0.020 "hn" : Height from base to highest level = 19.50 ft

"x" value = 0.75

"Ta" Approximate fundamental period using Eq. 12.8-7 :  $T_a = C_t * (h_n^x) = 0.186$  sec

"TL" : Long-period transition period per ASCE 7-10 Maps 22-12 -> 22-16 6.000 sec

Building Period "Ta" Calculated from Approximate Method selected = 0.186 sec

### "Cs" Response Coefficient

ASCE 7-10 Section 12.8.1.1

$S_{DS}$  : Short Period Design Spectral Response = 0.953 From Eq. 12.8-2, Preliminary  $C_s$  = 0.147

"R" : Response Modification Factor = 6.50 From Eq. 12.8-3 & 12.8-4,  $C_s$  need not exceed = 0.455

"I" : Seismic Importance Factor = 1 From Eq. 12.8-5 & 12.8-6,  $C_s$  not be less than = 0.042

User has selected ASCE 12.8.1.3 : Regular structure,  **$C_s$  : Seismic Response Coefficient = 0.1467**

Less than 5 Stories and with  $T \leq 0.5$  sec, SO  $S_s \leq 1.5$  for  $C_s$  calculation

# ASCE Seismic Base Shear

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Software copyright ENERCALC, INC. 1983-2019, Build: 12.19.11.30

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BURT ENGINEERING PLLC

DESCRIPTION: Existing Building

## Seismic Base Shear

ASCE 7-10 Section 12.8.1

Cs = 0.1467 from 12.8.1.1

W ( see Sum Wi below ) = 68.00 k

Seismic Base Shear V = Cs \* W = 9.97 k

## Vertical Distribution of Seismic Forces

ASCE 7-10 Section 12.8.3

\* k : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

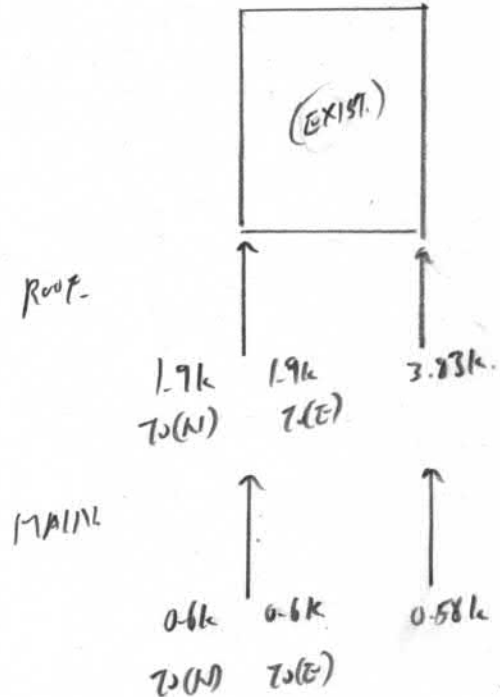
| Level #  | Wi : Weight | Hi : Height   | (Wi * Hi^k) | Cvx                | Fx=Cvx * V | Sum Story Shear | Sum Story Moment |
|----------|-------------|---------------|-------------|--------------------|------------|-----------------|------------------|
| 2        | 42.00       | 18.08         | 759.36      | 0.7679             | 7.66       | 7.66            | 0.00             |
| 1        | 26.00       | 8.83          | 229.58      | 0.2321             | 2.32       | 9.97            | 70.84            |
| Sum Wi = | 68.00 k     | Sum Wi * Hi = | 988.94 k-ft | Total Base Shear = | 9.97 k     | Base Moment =   | 158.9 k-ft       |

## Diaphragm Forces : Seismic Design Category "B" to "F"

ASCE 7-10 12.10.1.1

| Level # | Wi    | Fi   | Sum Fi | Sum Wi | Fpx : Calcd | Fpx : Min | Fpx : Max | Fpx  | Dsgn. Force |
|---------|-------|------|--------|--------|-------------|-----------|-----------|------|-------------|
| 2       | 42.00 | 7.66 | 7.66   | 42.00  | 7.66        | 8.01      | 16.02     | 8.01 | 8.01        |
| 1       | 26.00 | 2.32 | 9.97   | 68.00  | 3.81        | 4.96      | 9.91      | 4.96 | 4.96        |

- Wpx ..... Weight at level of diaphragm and other structure elements attached to it.
- Fi ..... Design Lateral Force applied at the level.
- Sum Fi ..... Sum of "Lat. Force" of current level plus all levels above
- MIN Req'd Force @ Level .....  $0.20 * S_{DS} * W_{px}$
- MAX Req'd Force @ Level .....  $0.40 * S_{DS} * W_{px}$
- Fpx : Design Force @ Level .....  $W_{px} * \frac{\sum_{x \rightarrow n} F_i}{\sum_{x \rightarrow n} w_i}$ , x = Current level, n = Top Level



ASCE 7-10

Wind Loads per ASCE 7-10- Chapter 28 MWFRS (Envelope Procedure)- Low-Rise Buildings

Input Cells = [redacted]  
 Project Number: [redacted]  
 Project Name: **Medved Residence**  
 Location: [redacted]  
 Design By: [redacted]  
 Program Limitations: 1. Mean roof height  $h$  less than or equal to 60 ft.  
 2. Mean roof height  $h$  does not exceed least horizontal dimension.

**BUILDING AND SITE INFORMATION**

| INPUT                               |                                   |
|-------------------------------------|-----------------------------------|
| Building width, B =                 | 58.58 ft (perpendicular to ridge) |
| Building length, L =                | 53.58 ft (parallel to ridge)      |
| Building eave height, $h_e$ =       | 17.5 ft                           |
| Building ridge height, $h_r$ =      | 19.67 ft                          |
| Height of parapet, $h_p$ =          | 17.5 ft                           |
| Roof slope, $s$ =                   | 1.50 in./ft. = 7.13 degrees       |
| Is roof a gable or hip =            | Gable                             |
| Risk Category =                     | II                                |
| Wind velocity, V =                  | 110 mi/hr = 85 mi/hr (ASD)        |
| Exposure =                          | B                                 |
| Topographic factor, $K_{zt}$ =      | 1                                 |
| Wind directionality factor, $K_d$ = | 0.85                              |
| Bldg internal pressure condition =  | Enclosed                          |

| OUTPUT                                 |           |
|--|-----------|
| Mean roof height, $h$ =                | 17.5 ft   |
| $2a$ =                                 | 10.72 ft  |
| $h/L$ =                                | 0.33      |
| $h/B$ =                                | 0.3       |
| Internal Pressure Coeff's, $GC_{pi}$ = | 0.18      |
| Pressure exposure coeff, $K_h$ =       | -0.18     |
| Velocity pressure, $q_h$ =             | 0.7 psf   |
|  | 18.43 psf |

WIND PRESSURE  
 $= 7.8 + 5.8 = 13.6 \text{ psf}$

**MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)**

Wind Pressures for Low-Rise Buildings

$$p = q_h[(GC_{pf}) - (GC_{pi})] \text{ (lb/ft}^2\text{)}$$

Load Case A: Winds Perpendicular to Ridge

| Bldg Surface | $GC_{pi}$ | Wind Pressure (lb/ft <sup>2</sup> ) |       |
|--------------|-----------|-------------------------------------|-------|
|              |           | LRED                                | ASD   |
| 1            | 0.42      | 7.8                                 | 4.7   |
| 2            | -0.69     | -12.8                               | -7.7  |
| 3            | -0.39     | -7.2                                | -4.3  |
| 4            | -0.31     | -5.8                                | -3.5  |
| 1E           | 0.64      | 11.8                                | 7.1   |
| 2E           | -1.07     | -19.8                               | -11.9 |
| 3E           | -0.55     | -10.2                               | -6.1  |
| 4E           | -0.46     | -8.5                                | -5.1  |

Internal pressure = +/- 3.3 psf (LRFD)  
 +/- 2 psf (ASD)

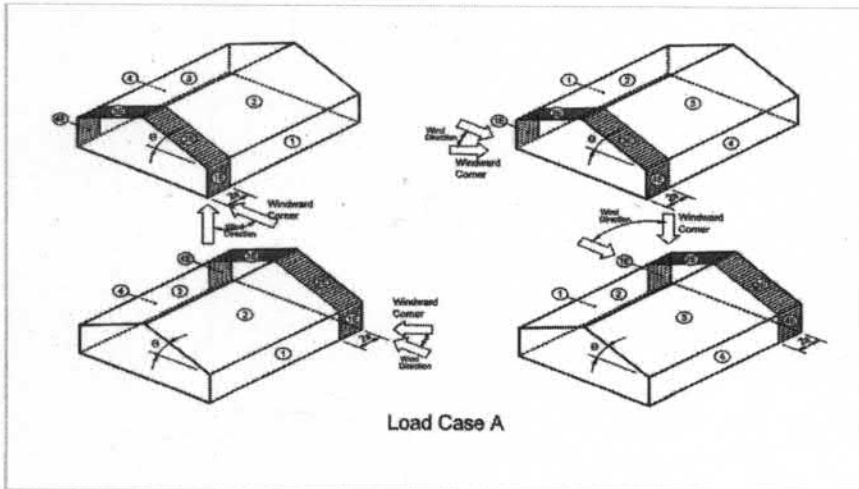
Note: 1. Sign Convention

positive numbers denote forces toward the surface  
 negative numbers denote forces away from the surface

2. Minimum wind design loads shall not be less than 16 psf (LRFD) multiplied by wall area of building and 8 psf (LRFD) multiplied by the roof area of the building projected onto a vertical plane normal to the assumed wind direction (see Sect. C27.4.7 & Figure C27.4-1)

3. Internal pressure cancels when Zones 1 & 4 and 1E & 4E are combined, but adds or subtracts at Zones 2 & 3 and 2E & 3E that do not have directly opposing loads.

USE 16 PSF (LRFD)



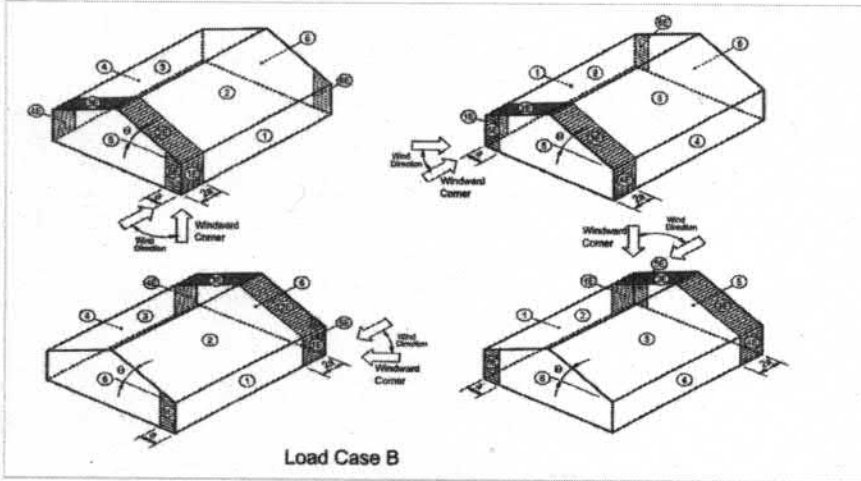


**Load Case B: Winds Parallel to Ridge**

| Bldg Surface | GC <sub>pf</sub> | Wind Pressure (lb/ft <sup>2</sup> ) |       |
|--------------|------------------|-------------------------------------|-------|
|              |                  | LRFD                                | ASD   |
| 1            | -0.45            | -8.3                                | -5    |
| 2            | -0.69            | -12.8                               | -7.7  |
| 3            | -0.37            | -6.9                                | -4.1  |
| 4            | -0.45            | -8.3                                | -5    |
| 5            | 0.4              | 7.4                                 | 4.4   |
| 6            | -0.29            | -5.4                                | -3.2  |
| 1E           | -0.48            | -8.9                                | -5.3  |
| 2E           | -1.07            | -19.8                               | -11.9 |
| 3E           | -0.53            | -9.8                                | -5.9  |
| 4E           | -0.48            | -8.9                                | -5.3  |
| 5E           | 0.61             | 11.3                                | 6.8   |
| 6E           | -0.43            | -8                                  | -4.8  |

Internal pressure = +/- 3.3 psf (LRFD)  
 +/- 2 psf (ASD)

- Note: 1. Sign Convention  
 positive numbers denote forces toward the surface  
 negative numbers denote forces away from the surface
2. Minimum wind design loads shall not be less than 16 psf (LRFD) multiplied by wall area of building (see Sect. C27.4.7 & Figure C27.4-1).
3. Internal pressure cancels when Zones 1 & 4 and 1E & 4E are combined, but adds or subtracts at Zones 2 & 3 and 2E & 3E that do not have directly opposing loads.



**MAIN WIND-FORCE RESISTING SYSTEM (MWFRS)**

Wind Pressures for Parapets

Pressure exposure coeff, K<sub>z</sub> = 0.7  
 Velocity pressure, q<sub>p</sub> = 18.43 psf (LRFD)

$$p_p = q_p(GC_{pn}) \text{ (lb/ft}^2\text{)}$$

Windward parapets, p<sub>p,wind</sub> = 27.6 psf (LRFD)

Leeward parapets, p<sub>p,lee</sub> = -18.4 psf (LRFD)

positive numbers signify net pressure acting toward the exterior side of the parapet  
 negative numbers signify net pressure acting away from the exterior side of the parapet

Wind Pressures for Roof Uplift

Roof uplift load up to 10.72 feet from exterior walls, p = -19.8 psf (LRFD)

Roof uplift load more than 10.72 feet from exterior walls, p = -12.9 psf (LRFD)



## LATERAL DESIGN.

### SEISMIC DESIGN.

$$\text{ROOF} = \text{NEW} = 345 \text{ FT}^2 \cdot (15 \text{ PSF} + 10 \text{ PSF}/2) = 6.9 \text{ k}$$

$$\text{EXIST.} = 2100 \text{ FT}^2 \cdot (15 \text{ PSF} + 10 \text{ PSF}/2) = 42 \text{ k.}$$

$$\begin{aligned} \text{MAIN} = \text{NEW} &= 1033 \text{ FT}^2 \cdot (15 \text{ PSF} + 10 \text{ PSF}/2) \\ &+ 360 \text{ FT}^2 \cdot (10 \text{ PSF} + 10 \text{ PSF}) = 27.9 \text{ k} \\ \text{EXIST.} &= 1300 \text{ FT}^2 \cdot (10 \text{ PSF} + 10 \text{ PSF}) = 26 \text{ k} \end{aligned}$$

$$\text{ROOF HT} = 9'3 \quad (18.08')$$

$$\text{MAIN HT} = 8'10$$

### WIND DESIGN.

WIND PRESSURE = 16 PSF LRAFD

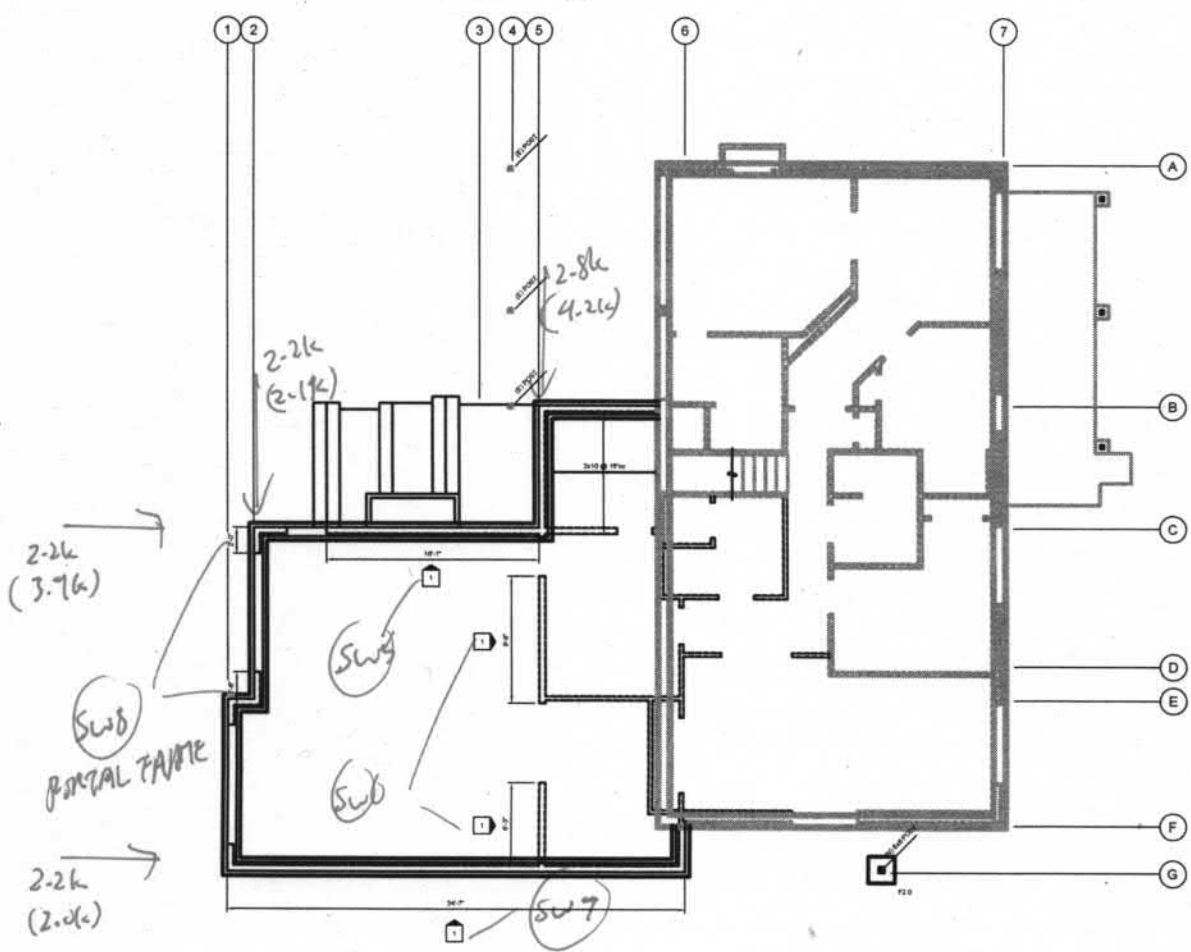
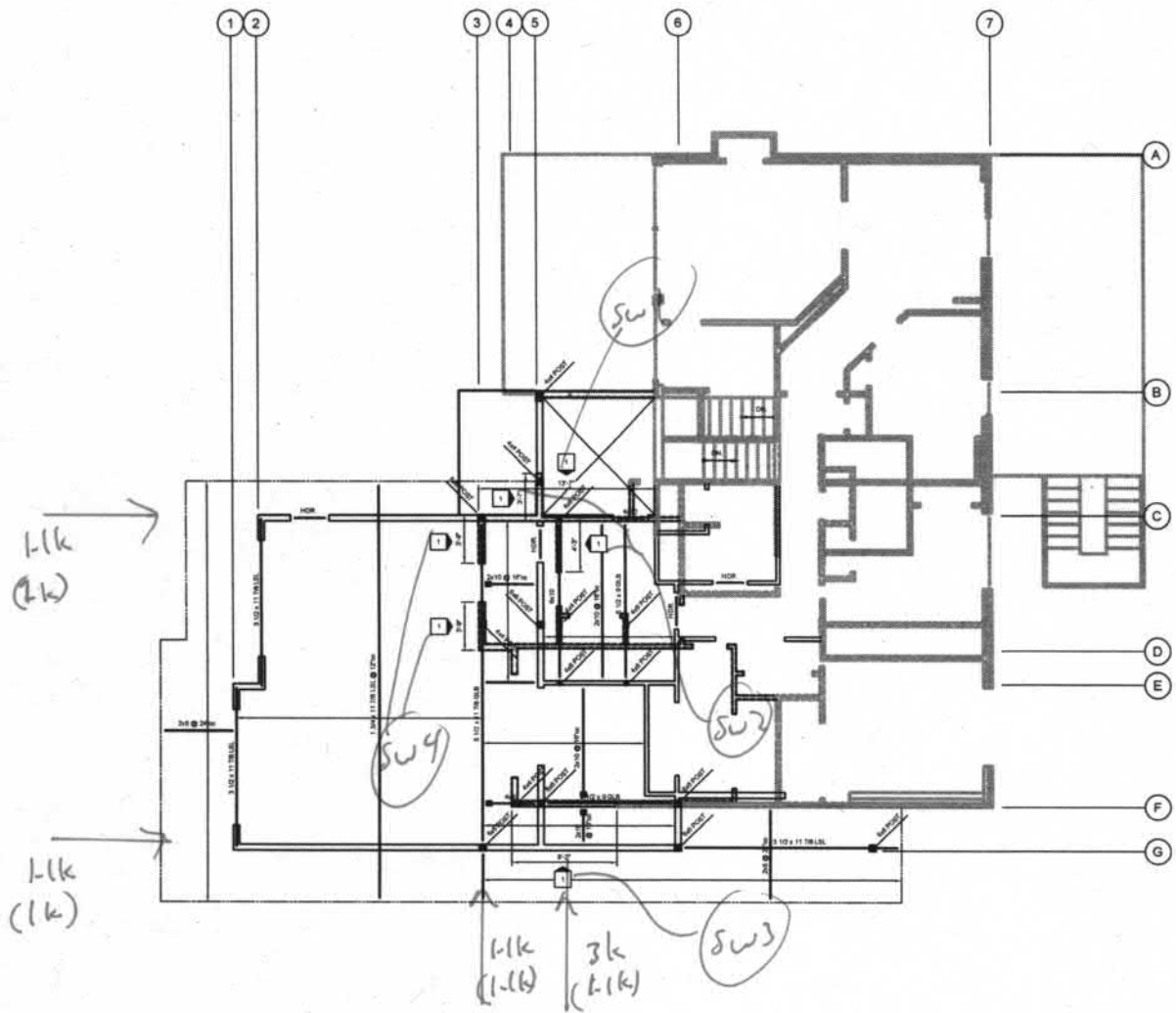
$$\text{ROOF} - \text{N-S} \quad 58.6' \cdot 9.25'/2 \cdot 16 \text{ PSF} = 4.3 \text{ k}$$

$$\text{E-W} \quad 53.6' \cdot 9.25'/2 \cdot 16 \text{ PSF} = 4 \text{ k}$$

$$\text{MAIN} - \text{N-S} \quad 58.6' \cdot (9.25'/2 + 8.83'/2) \cdot 16 \text{ PSF} = 8.4 \text{ k}$$

$$\text{E-W} \quad 53.6' \cdot (9.25'/2 + 8.83'/2) \cdot 16 \text{ PSF} = 7.7 \text{ k.}$$

4 N.



# Shear Wall Design

| SW# | Length<br>b(ft) | Height<br>h(ft) | Vseismic<br>(LRFD)(kips) | Vwind<br>(LRFD)(kips) | Aspect Ratio<br>h/b | h/b>2? | Design V<br>(ASD)(kips) | Total Design<br>V (ASD)(kif) | SW<br>Design | SW Uplift<br>(ASD)(kips) | Wall Holdown | Foundation<br>Holdown |
|-----|-----------------|-----------------|--------------------------|-----------------------|---------------------|--------|-------------------------|------------------------------|--------------|--------------------------|--------------|-----------------------|
| SW1 | 13.58'          | 9.25'           | 1.10 k                   | 2.0 k                 | 0.68                | N      | 1.20 k                  | 0.09                         | W6           | .44 k                    | MSTC28       |                       |
|     | WALL            |                 |                          |                       |                     |        |                         |                              |              |                          |              |                       |
| SW2 | 7.83'           | 9.25'           | 3.0 k                    | 1.10 k                | 1.18                | N      | 2.10 k                  | 0.27                         | W4           | 2.26 k                   | MSTC40       |                       |
|     | WALL            |                 |                          |                       |                     |        |                         |                              |              |                          |              |                       |
| SW3 | 8.17'           | 9.25'           | 1.10 k                   | 1.0 k                 | 1.13                | N      | .77 k                   | 0.09                         | W6           | .65 k                    | MSTC28       |                       |
|     | BEAM            |                 |                          |                       |                     |        |                         |                              |              |                          |              |                       |
| SW4 | 7.50'           | 9.25'           | 1.10 k                   | 1.10 k                | 1.23                | N      | .77 k                   | 0.10                         | W6           | .74 k                    | MSTC28       |                       |
|     | BEAM            |                 |                          |                       |                     |        |                         |                              |              |                          |              |                       |
| SW5 | 16.08'          | 8.83'           | 3.30 k                   | 5.90 k                | 0.55                | N      | 3.54 k                  | 0.22                         | W6           | 1.52 k                   |              | STHD10                |
| SW6 | 15.92'          | 8.83'           | 6.90 k                   | 6.40 k                | 0.55                | N      | 4.83 k                  | 0.30                         | W4           | 2.26 k                   |              | STHD10                |
| SW7 | 34.58'          | 8.83'           | 3.30 k                   | 3.0 k                 | 0.26                | N      | 2.31 k                  | 0.07                         | W6           | -.33 k                   |              |                       |

| SW # | Vs,all (ASD)<br>(kip/ft) | Vw,all (ASD)<br>(kip/ft) | Wall HD      | Tall (ASD)(kips) | FTG HD      | Tall (ASD) (kips) |
|------|--------------------------|--------------------------|--------------|------------------|-------------|-------------------|
| W6   | 0.26                     | 0.37                     | MSTC28       | 1.54             | STHD10      | 3.40              |
| W4   | 0.38                     | 0.53                     | MSTC40       | 3.08             | STHD14      | 3.82              |
| W3   | 0.49                     | 0.69                     | MSTC52       | 4.62             | HDU4        | 4.57              |
| 2W6  | 0.52                     | 0.73                     | MSTC66       | 5.86             | HDU5        | 5.65              |
| 2W4  | 0.76                     | 1.07                     | MST72        | 6.73             | HDU8        | 6.97              |
| 2W3  | 0.98                     | 1.37                     | CMST12X84"   | 9.215            | HDU11       | 9.34              |
| 2W2  | 1.28                     | 1.79                     | 2XMSTC66     | 11.72            | HDU14       | 10.77             |
|      |                          |                          | 2XMST72      | 13.46            | HD12        | 12.67             |
|      |                          |                          | 2XCMST12X84' | 18.43            | HDU14(SPC.) | 14.44             |
|      |                          |                          | HD19(SPC.)   | 19.07            | HD12(SPC.)  | 15.51             |
|      |                          |                          |              |                  | HD19        | 16.77             |
|      |                          |                          |              |                  | HD19(SPC.)  | 19.07             |