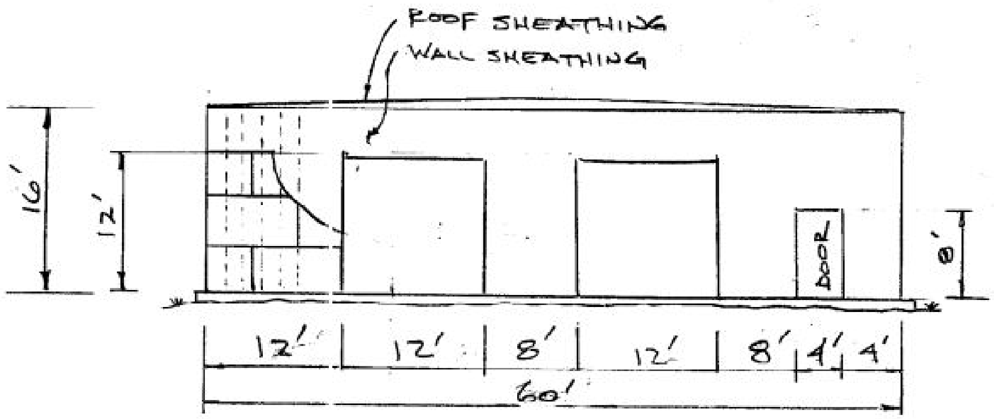
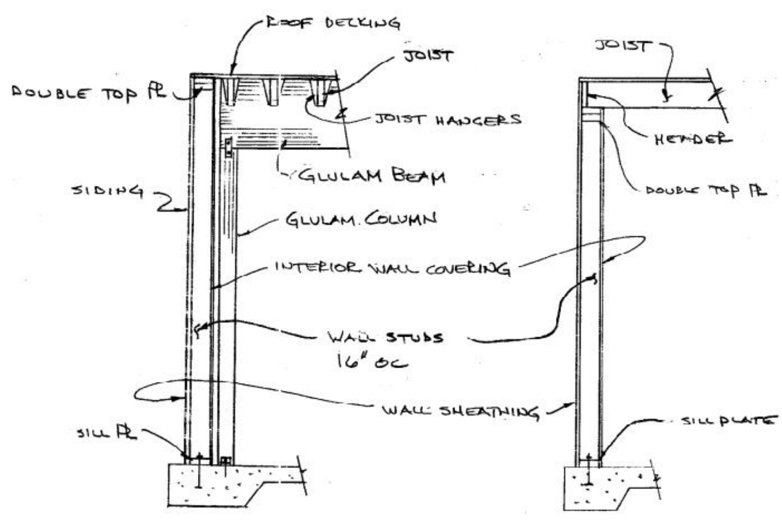
Given:



END ELEVATION



SECTION A-A SECTION B-B

All spacings are set to 16" o.c., all support members are 2" nominal and all sheathing and decking is to be installed with strength axis perpendicular to supports (Three-Span Condition). Therefore:

$$Width_{Support} := 1.5 \text{ in} \qquad SW := 0.25 \text{ in}$$

$$l_1 := 16 \text{ in}$$

$$l_2 := l_1 - Width_{Support} = 14.5 \text{ in}$$

$$l_3 := l_2 + SW = 14.75 \text{ in}$$

Design Roof Decking:

- Dead Load: Assume 5/8 inch decking FBC 2005, Appendix A (P. A.1-A.3)

Plywood, rigid insulation, and felt and gravel:

$$D := 3\cdot\frac{5}{8} + 4\times 2 + 6.5 = 16.375 \text{ psf}$$

- Wind Load:

152 psf upward on corners
101 psf upward on edge strips
60.2 psf upward on interior
24.5 psf downward on all parts

- Roof Live Load:

$L_0 := 20$ psf $\quad A_{Tplan} := 4\cdot 8 = 32$ ft^2

$$R_1 := \begin{cases} 1.0 & \text{if } A_{Tplan} \le 200 \\ (1.2 - 0.001\cdot A_{Tplan}) & \text{if } 200 < A_{Tplan} < 600 \\ 0.6 & \text{if } A_{Tplan} \ge 600 \end{cases}$$

$R_1 = 1 \qquad R_2 := 1.0$

$L_R := L_0\cdot R_1\cdot R_2 = 20$ psf ASCE 7-10, Eqn. (4.8-1)

- Downward Load Cases:

Dead Load Only:

$w_D := D = 16.375$ psf

Dead plus Roof Live:

$w_{D\_Lr} := D + L_R = 36.375$ psf

*Dead plus 0.6*Wind:*

$w_{D\_W} := D + 0.6\cdot 24.5 = 31.075$ psf

*Dead plus 3/4 of (Roof Live plus 0.6*Wind):*

$w_{D\_Lr\_W} := D + 0.75\cdot(L_R + 0.6\cdot 24.5) = 42.4$ psf

- Estimate Controlling Downward Load Case:

Load Case:	Load (psf):	C_D:	Load/C_D:
1. w_D	16.375	0.9	18.19
2. w_{D_Lr}	36.375	1.25	29.1
5. w_{D_W}	31.075	1.6	19.42
6a. $w_{D\_Lr\_W}$	42.4	1.6	26.5

Therefore, for downward loading use:

$w_{D\_Lr} = 36.375$ psf $\qquad C_{D\_down} := 1.25$

- Upward Load Cases: *****Use the most extreme case of 152 psf upward.**

7. 0.6*D + 0.6*W [0.6*W-0.6*D upward]

$w_{D\_W\_up} := 0.6\cdot(152 - D) = 81.375$ psf

Therefore, for upward loading use:

$w_{D\_W\_up} = 81.375$ psf $\qquad C_{D\_up} := 1.6$

- Required Bending Strength (Three-Span Condition):

Downward Loading:

$w_b := w_{D\_Lr}$

Therefore:

$$\left[F_b\cdot s\right] := \frac{w_b\cdot l_1^{\,2}}{120\cdot C_{D\_down}} = 62.08 \ \frac{lb\cdot in}{ft}$$

Upward Loading:

$w_b := w_{D\_W\_up}$

Therefore:

$$\left[F_b\cdot s\right] := \frac{w_b\cdot l_1^{\,2}}{120\cdot C_{D\_up}} = 108.5 \ \frac{lb\cdot in}{ft}$$

- Required Shear Strength (Three-Span Condition):

Downward Loading:

$w_s := w_{D\_Lr}$

Therefore:

$$\left[F_s(lb/Q)\right] := \frac{w_s \cdot l_2}{20 \cdot C_{D\_down}} = 21.098 \ \frac{lb}{ft}$$

Upward Loading:

$w_s := w_{D\_W\_up}$

Therefore:

$$\left[F_s(lb/Q)\right] := \frac{w_s \cdot l_2}{20 \cdot C_{D\_up}} = 36.873 \ \frac{lb}{ft}$$

- Required Bending Stiffness Capacity (Three-Span Condition):

$$\Delta_r := \frac{l_1}{180} = 0.089$$ Nonplaster Ceiling, Load Case: D + L FBC 2007, Table 1604.3

Downward Loading:

$w := w_{D\_Lr}$

Therefore:

$$[EI] := \frac{w \cdot l_3^{\ 4}}{1743 \cdot \Delta_r \cdot C_{D\_down}} = 8.89 \times 10^3 \ \frac{lb \cdot in^2}{ft}$$

Upward Loading:

$w := w_{D\_W\_up}$

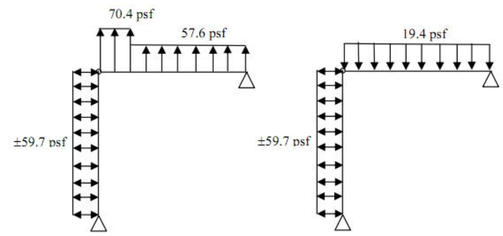
Therefore:

$$[EI] := \frac{w \cdot l_3^{\ 4}}{1743 \cdot \Delta_r \cdot C_{D\_up}} = 1.554 \times 10^4 \ \frac{lb \cdot in^2}{ft}$$

Design Exterior Wall Sheathing:

- Wind Load:

59.7 psf inward/outward on all walls
70.4 psf upward on roof joist edge strips
57.6 psf upward on interior portion of roof joists
19.4 psf downward on roof joists



Therefore: $w := 0.6 \cdot 59.7$ $C_D := 1.6$

- Required Bending Strength (Three-Span Condition):

$$\left[F_b \cdot s\right] := \frac{w \cdot l_1^{\ 2}}{120 \cdot C_D} = 47.76 \ \frac{\text{lb} \cdot \text{in}}{\text{ft}}$$

- Required Shear Strength (Three-Span Condition):

$$\left[F_s (\text{lb/Q})\right] := \frac{w \cdot l_2}{20 \cdot C_D} = 16.231 \ \frac{\text{lb}}{\text{ft}}$$

- Required Bending Stiffness Capacity (Three-Span Condition):

$$\Delta := \frac{l_1}{240} = 0.067$$ Brittle Finish, Load Case: W FBC 2007, Table 1604.3

Therefore:

$$[EI] := \frac{w \cdot l_3^{\ 4}}{1743 \cdot \Delta \cdot C_D} = 9.119 \times 10^3 \ \frac{\text{lb} \cdot \text{in}^2}{\text{ft}}$$

Summary:

Required Bending Strength (controlled by upward wind load on roof decking):

$$\left[F_b \cdot s\right] := 108.5 \ \frac{lb \cdot in}{ft}$$

Required Shear Strength (controlled by upward wind load on roof decking):

$$\left[F_s(lb/Q))\right] := 36.87 \ \frac{lb}{ft}$$

Required Bending Stiffness Capacity (controlled by upward wind load on roof decking):

$$[EI] := 15540 \ \frac{lb \cdot in^2}{ft}$$

Therefore, use Table 4A in the PDS 2004 (P. 17-18) in order to select a panel that meets these requirements:

*****Use OSB with a span rating of 24/0:**

$$\left[F_b \cdot s\right] := 300 \ \frac{lb \cdot in}{ft} \quad > \quad \left[F_b \cdot s\right] := 108.5 \ \frac{lb \cdot in}{ft}$$

$$\left[F_s(lb/Q))\right] := 130 \ \frac{lb}{ft} \quad > \quad \left[F_s(lb/Q))\right] := 36.87 \ \frac{lb}{ft}$$

$$[EI] := 60000 \ \frac{lb \cdot in^2}{ft} \quad > \quad [EI] := 15540 \ \frac{lb \cdot in^2}{ft}$$

This panel was selected from Table 4A in the PDS 2004 (P. 17-18), but it's nominal thickness and section properties are designated in Table 5 and 6 of the PDS 2004 (P. 23), respectively:

$t_{nominal} := .375 \ in$ $\quad A := 4.5 \ \frac{in^2}{ft}$ $\quad I := .053 \ \frac{in^4}{ft}$ $\quad S := .281 \ \frac{in^3}{ft}$