1. Corbel - a projection from a concrete or masonry column or wall. A corbel provides support for a beam.

Joist - one of a series of closely spaced beams supporting a floor or ceiling

Purlin - a horizontal beam, parallel to the ridge of a roof, that supports the roof sheathing.

Truss - an open frame composed of members connected by pin joints. Members are usually in a triangular configuration.

2. Live load reduction accounts for the low probability that the entire surface of a large tributary area will be loaded with live load at any one time. Live load reduction allows a more economical design of support members such as girders and columns.

OPEN BOOK SECTION

\[ \text{psf} := \text{lb} \cdot \text{ft}^{-2} \]

2. Dead load:
- l.w. concrete tile 16 psf
- roofing felt 0.5 psf
- 1/2" ply 1.5 psf

a. Total : \[ w_d := 18 \cdot \text{psf} \]

b. For member 4-6, the slope is 3.5:12, thus \[ w_{L1} := 20 \cdot \text{psf} \]
   Tributary width \[ d := 2 \cdot \text{ft} \]

   For member 6-8, the slope is 10.5:12, thus \[ w_{L2} := 16 \cdot \text{psf} \]

   Slope dist:
   \[ L_1 := \sqrt{8^2 + \left(\frac{7}{3}\right)^2} \cdot \text{ft} \]
   \[ L_2 := \sqrt{8^2 + 7^2} \cdot \text{ft} \]

   \[ F_6 := \left[ \frac{1}{2} w_d (L_1 + L_2) + 4 \cdot \text{ft} \left( w_{L1} + w_{L2} \right) \right] d \]
   \[ F_6 = 629.343 \text{ lb} \]

c. \[ q_s := 14.5 \cdot \text{lb} \cdot \text{ft}^{-2} \]
   \[ I := 1 \]
   \[ C_c := 1.07 \]

Case 1
\[ C_q := 0.9 \]
\[ p_1 := q_s \cdot I \cdot C_c \cdot C_q \]
\[ p_1 := 13.964 \text{ psf} \]
\[ p_{1WL} := p_1 \cdot d \cdot L_1 \]
\[ p_{1WL} = 232.725 \text{ lb} \] (outward, normal to roof)
\[ p_{1DL} := w_d \cdot d \cdot L_1 \]
\[ p_{1DL} = 300 \text{ lb} \] (vertical, downward)

Case 2
\[ C_q := 0.3 \]
\[ p_2 := q_s \cdot I \cdot C_c \cdot C_q \]
\[ p_2 = 4.654 \text{ psf} \]
\[ p_{2WL} := p_2 \cdot d \cdot L_1 \]
\[ p_{2WL} = 77.575 \text{ lb} \] (inward, normal to roof)
\[ p_{2DL} := w_d \cdot d \cdot L_1 \]
\[ p_{2DL} = 300 \text{ lb} \] (vertical, downward)
d. by inspection inward value controls

\[ P_{2\text{tot}} := \sqrt{\left( \frac{P_{2\text{dl}} + P_{2\text{wl}}}{L_1} \right)^2 + \left( \frac{P_{2\text{wl}}}{L_1} \right)^2} \quad P_{2\text{tot}} = 375.887 \text{ lb} \]

\[ \sum \mathbf{M}_1 = 600 \text{ lb} \cdot 8 \text{ ft} - R_{1y} \cdot 16 \text{ ft} + F_{35} \cdot \frac{14 \text{ ft}}{3} = 0 \]

\[ F_{35} := 1971.4 \text{ lb} \]

\[ \sum \mathbf{M}_3 = -875 \text{ lb} \cdot 8 \text{ ft} - F_{24} \cdot 8 \text{ ft} \cdot \sin(\alpha) = 0 \]

\[ F_{24} := -3125 \text{ lb} \]

\[ \sum \mathbf{M}_1 = -600 \text{ lb} \cdot 8 \text{ ft} - F_{34} \cdot \sin(\beta) \cdot 8 \text{ ft} = 0 \]

\[ F_{34} := -1190.8 \text{ lb} \]

e. Assume soil type D

\[ C_v := 0.54 \quad C_a := 0.36 \quad R := 5.5 \quad T := 0.02 \cdot (15.5)^{0.75} \]

\[ V_1 := \frac{C_v}{R} \cdot P_{1\text{dl}} \quad V_1 = 188.527 \text{ lb} \]

\[ V_2 := \frac{2.5 \cdot C_a}{R} \cdot P_{1\text{dl}} \quad V_2 = 49.091 \text{ lb} \quad \text{controls} \]

\[ P_{\text{tot}} := \sqrt{P_{2\text{dl}}^2 + V_2^2} \quad P_{\text{tot}} = 303.99 \text{ lb} \]

2. 

a. Since the slope of the roof from 6 to 8 is greater than 4:12, and the slope from 1 to 6 is less than 4:12 the live load from 6 to 8 is less than that from 4 to 6, thus the force could be less.

b. Use method of sections:

\[ R_{1y} := \frac{500 \text{ lb} \cdot 8 \text{ ft} + 600 \text{ lb} \cdot 16 \text{ ft} + 600 \text{ lb} \cdot 24 \text{ ft}}{32 \text{ ft}} \]

\[ R_{1y} = 875 \text{ lb} \]

\[ \sum \mathbf{M}_4 = 600 \text{ lb} \cdot 8 \text{ ft} - R_{1y} \cdot 16 \text{ ft} + F_{35} \cdot \frac{14 \text{ ft}}{3} = 0 \]

\[ \alpha := \tan \left( \frac{7 \text{ ft}}{24 \text{ ft}} \right) \]

\[ \beta := \tan \left( \frac{4.666 \text{ ft}}{8 \text{ ft}} \right) \]

c. member 6-7 is a zero force member
4. You may assume either one-way or two way action for the slab. The following assumes one-way action.

Tributary area for AB is 600 ft², but load is greater than 100 psf, thus live load reduction does not apply.

For light storage: \( w_L := 125 \text{ psf} \) \( w_d := 60 \text{ psf} \)

The joists on either side of AB transfer load at each connection from a tributary area of \( A_t := (5 \text{ ft}) \times (20 \text{ ft}) \)

\[
P := A_t \left( w_d + w_L \right)
\]

\[
P = 1.85 \times 10^4 \text{ lb}
\]

Note: end loads may be different depending on surrounding framing.