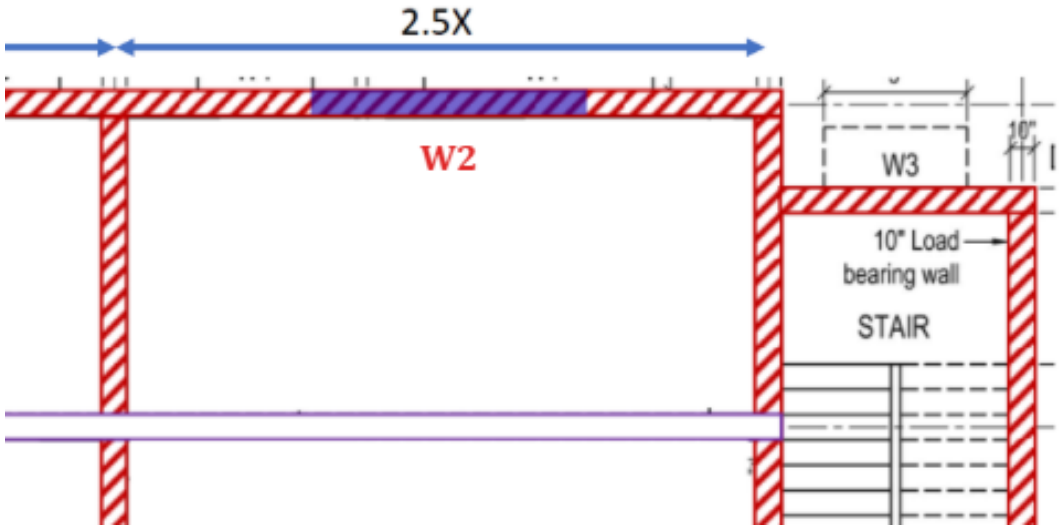
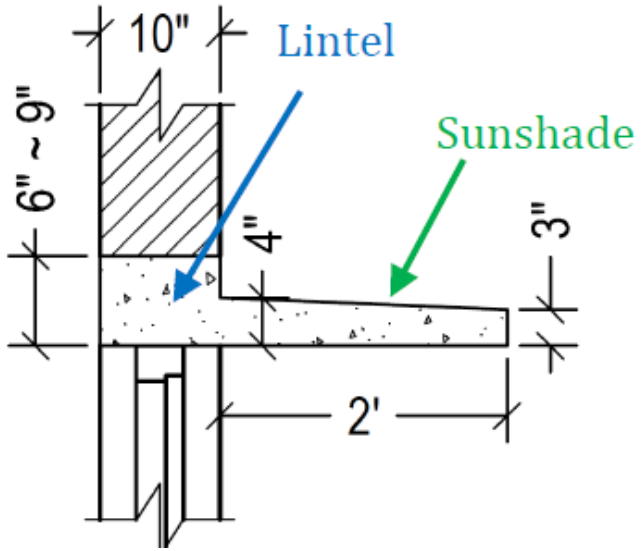
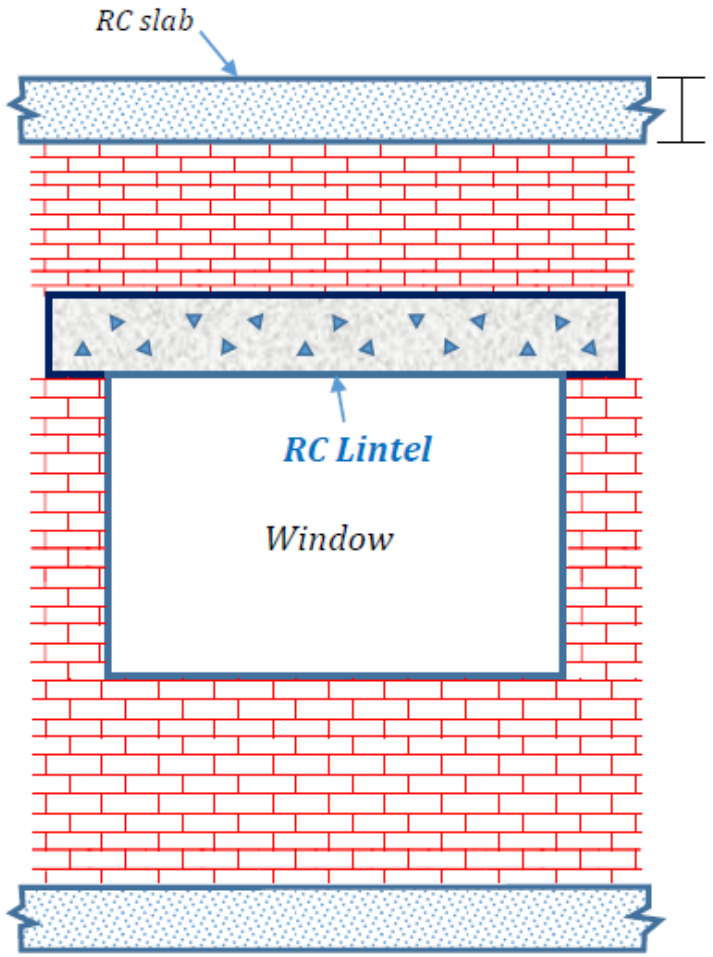
CE 386

CONCRETE STRUCTURES DESIGN SESSIONAL-1

Lecture-4: Design of Sunshade & Lintel







Section 1-1(Elevation view)

Sunshade

Sunshade

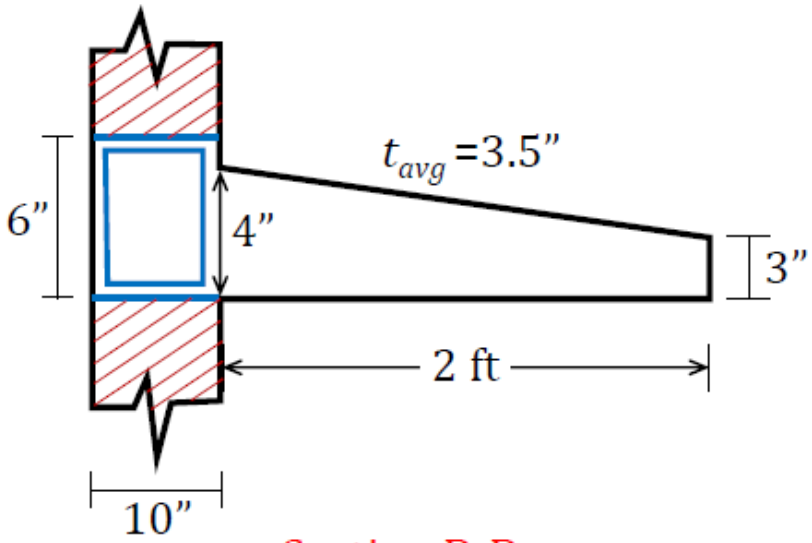
- One-way cantilever slab
- Support of the sunshade slab is '*Lintel*'

Loads:

$w_{LL} = 10$ psf

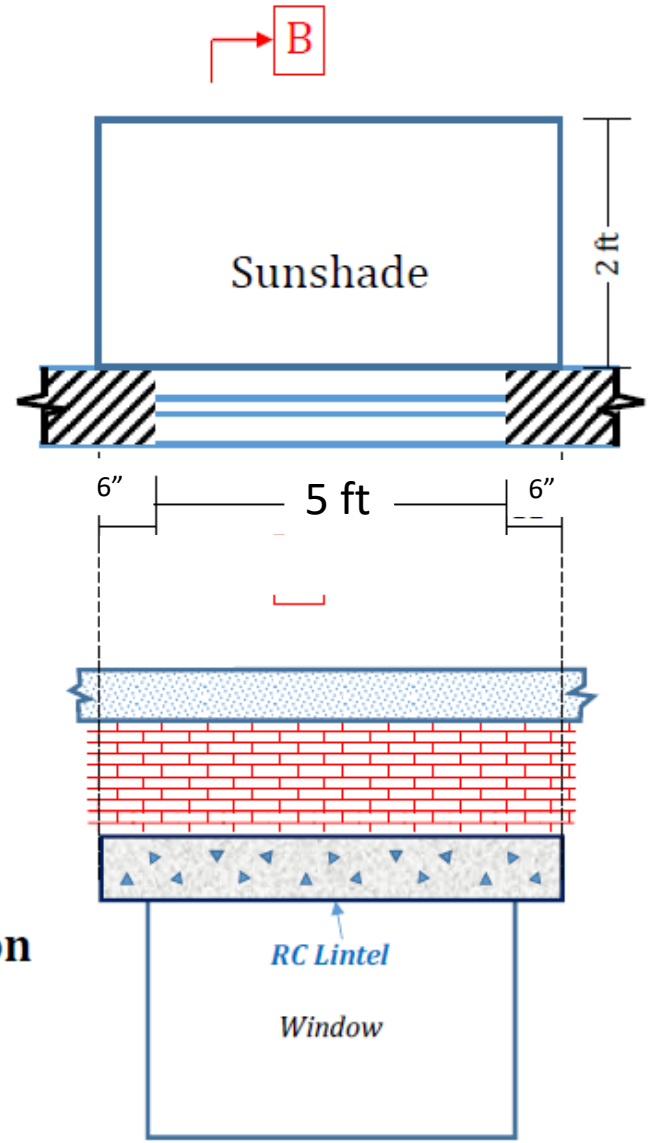
$$w_{DL} = \frac{3.5"}{12} \times 150 = 43.75 \text{ psf}$$

$w_u =$ 1.2 W_{DL}+ 1.6 W_{LL}



Section B-B

Plan View

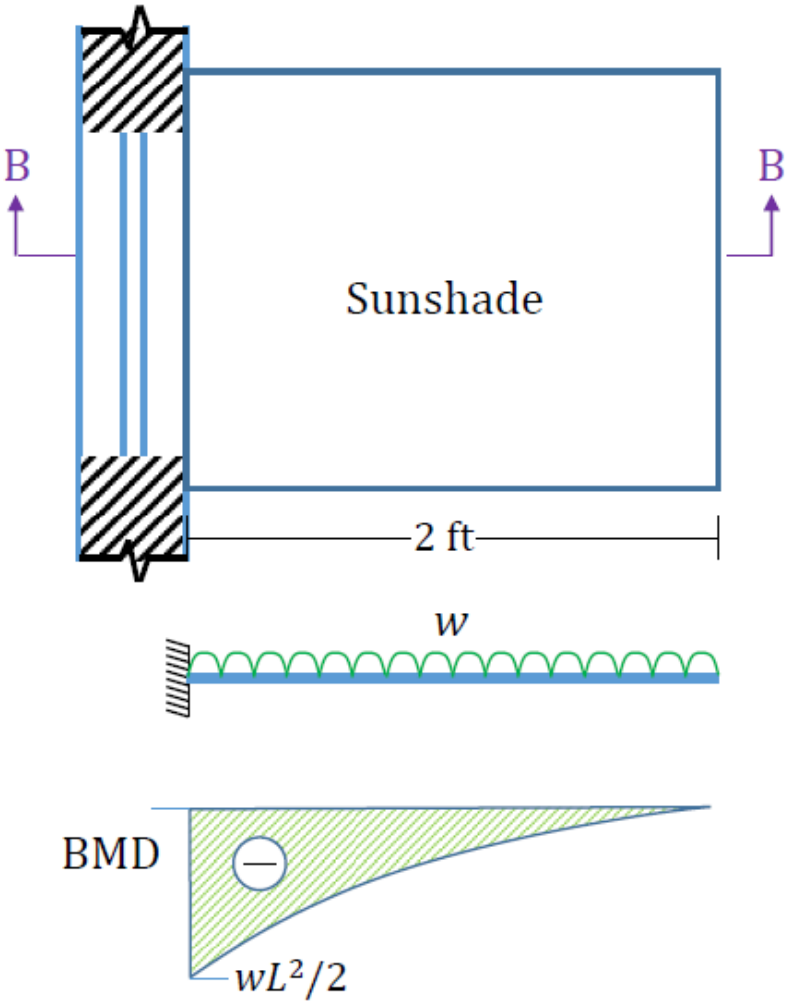


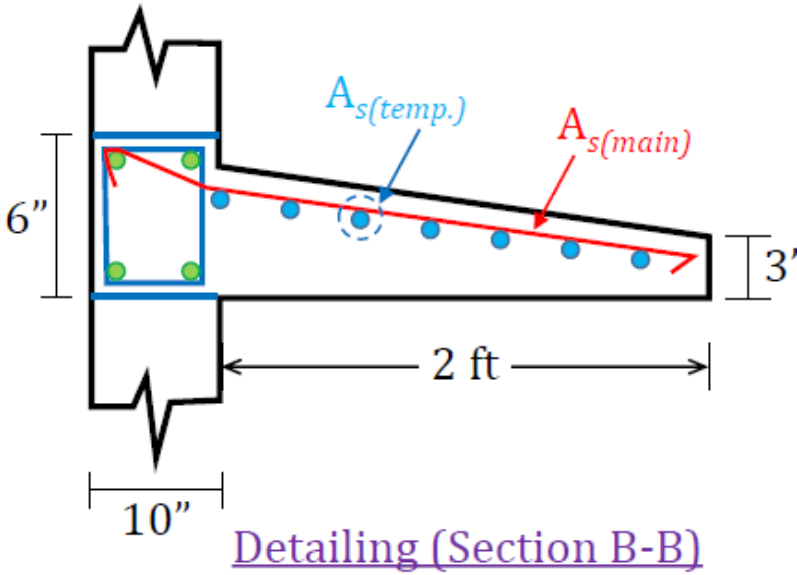
Elevation View

Sunshade (contd.)

Moments and Reinforcement:

$$-M_u = \frac{w_u L^2}{2}$$





Detailing (Section B-B)

d Check:

d_{prov} = tavg -1 = 3.5"-1" = 2.5"

$\rho_{0.005}$ = 0.85* β* fc'/fy* [εu/(εu+0.005)]

dreq= $\sqrt{(Mu/[\phi\rho f y b(1-0.59\rho)}$ fy/fc′)]

If dprov> dreq –okay

Reinforcement Calculation:

$$A_s = \frac{M_u}{\phi f_y (d - a/2)} \qquad \& \qquad a = \frac{A_s f_y}{0.85 f'_c\, b}$$

$As_{min} = 0.0018bt$

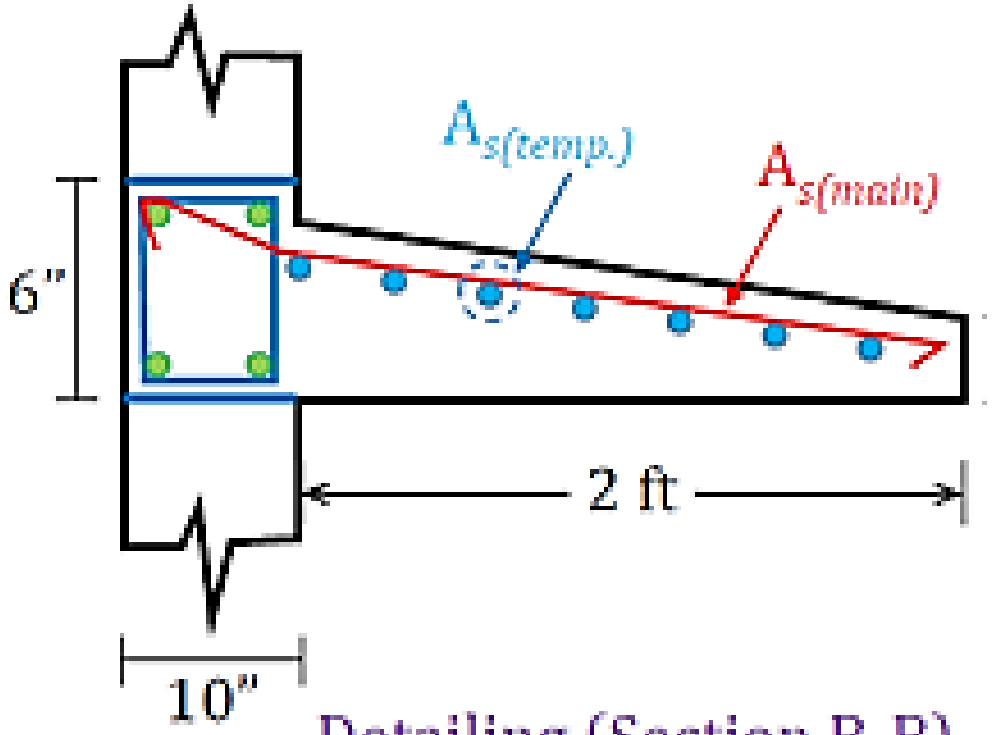
Spacing, $s = 12*A_b/A_s$

Smax = 3t or 18”

Smin = 1.5*t

If Smin< S< Smax –Okay

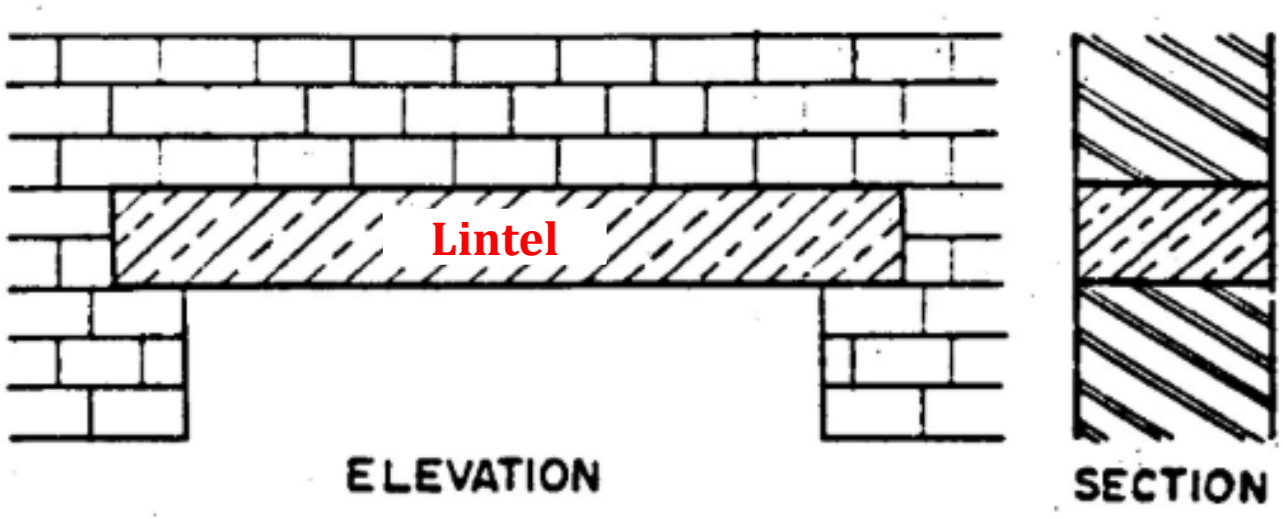
#bar c/c is provided

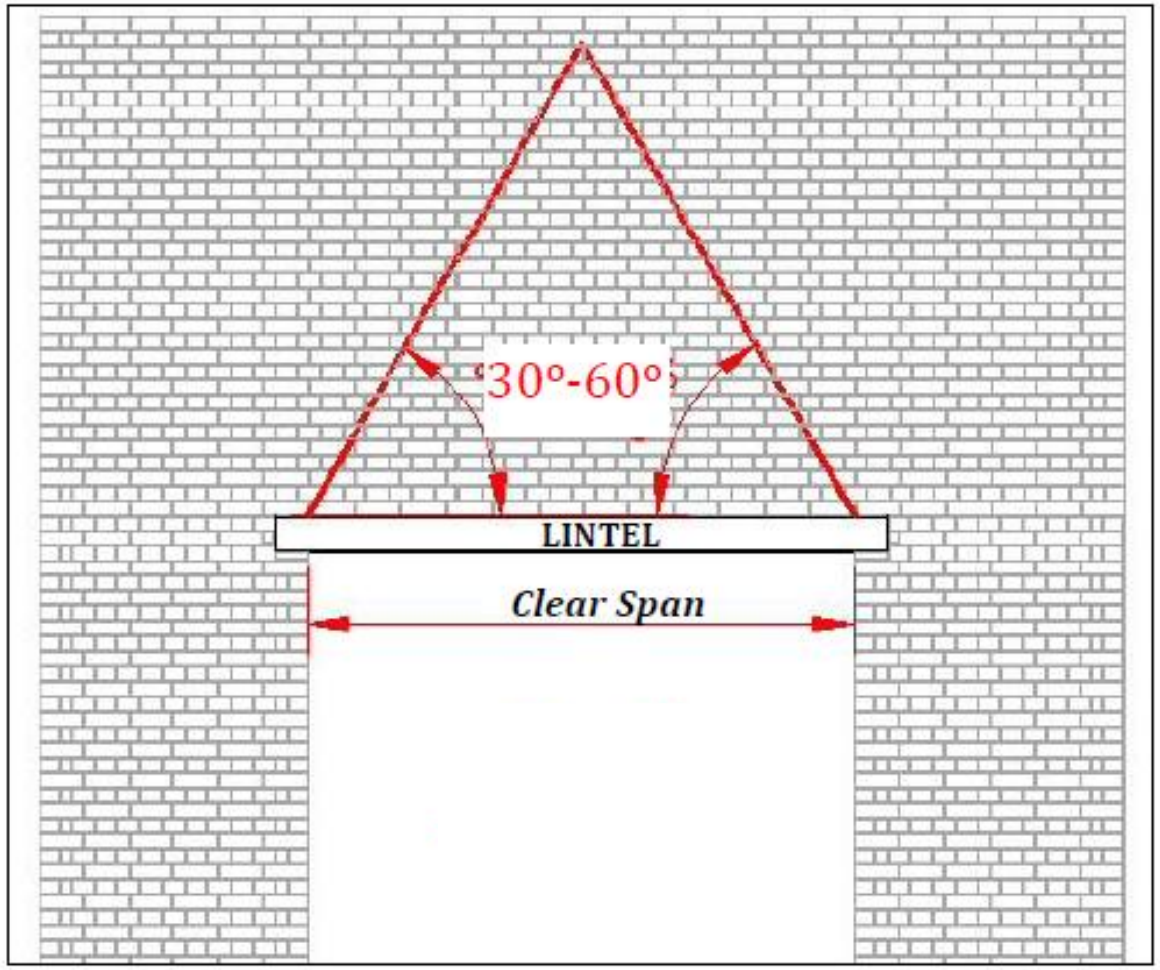


Detailing (Section B-B)

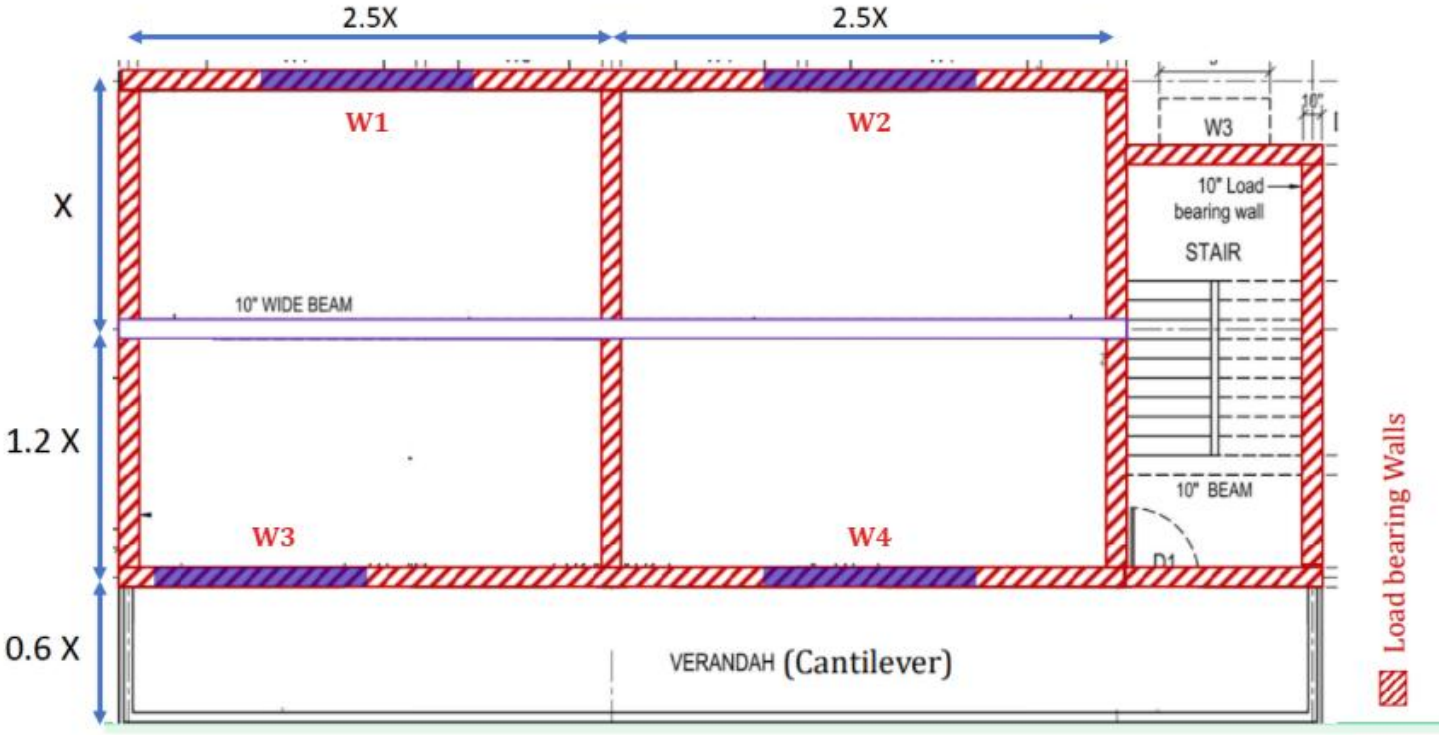
❑ Lintels:

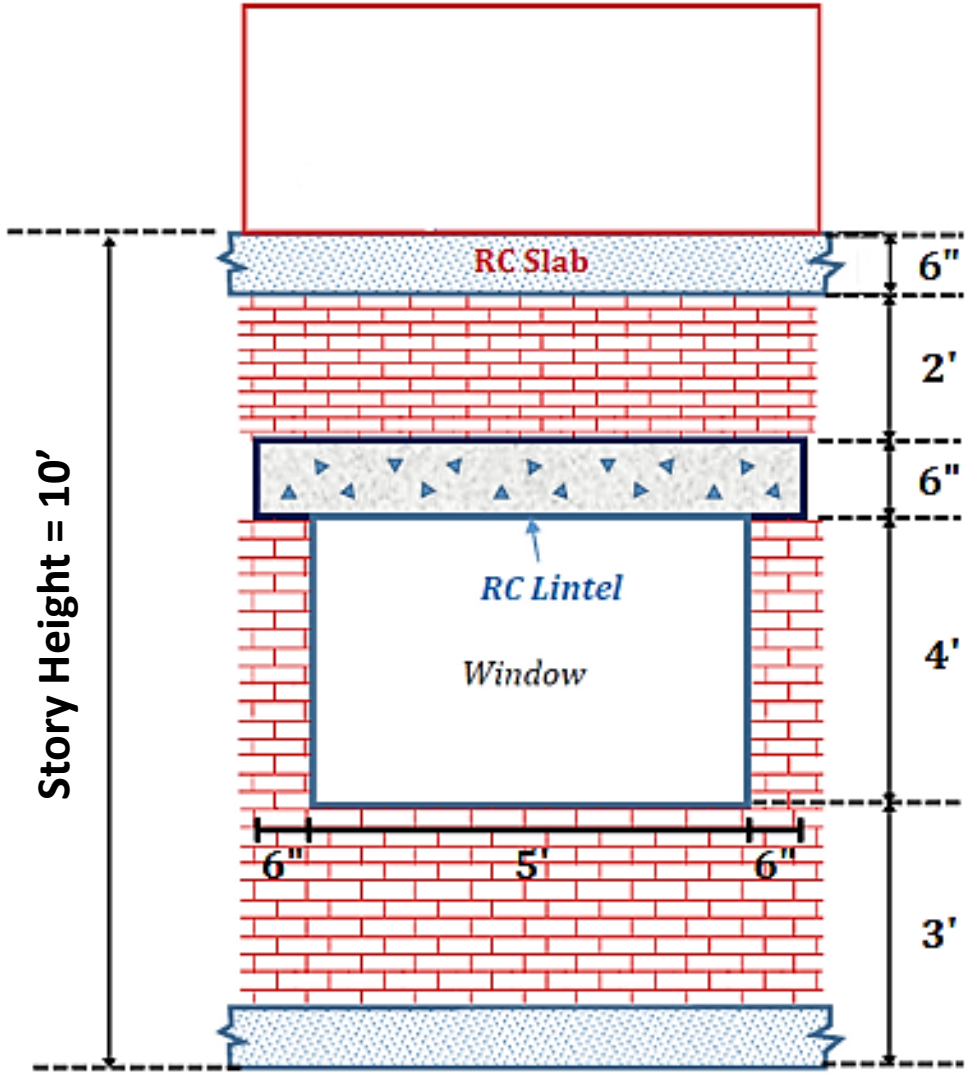
A horizontal architectural member spanning and usually carrying the load above an opening such as door & windows.





Elevation View


2.5X
2.5X
W1
W2
W3
10" Load bearing wall
STAIR
X
10" WIDE BEAM
1.2 X
10" BEAM
W3
W4
D1
0.6 X
VERANDAH (Cantilever)
Load bearing Walls


RC Slab
6"
2'
6"
RC Lintel
Window
4'
Story Height = 10'
6"
5'
6"
3'

❑ Load Calculations:

1. Load from Brick Wall:

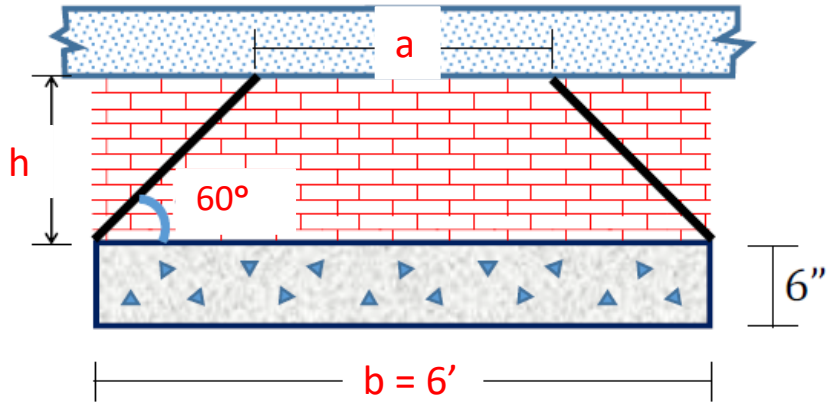
Wall weight on Lintel = Volume of brick wall x Unit wt. of brick

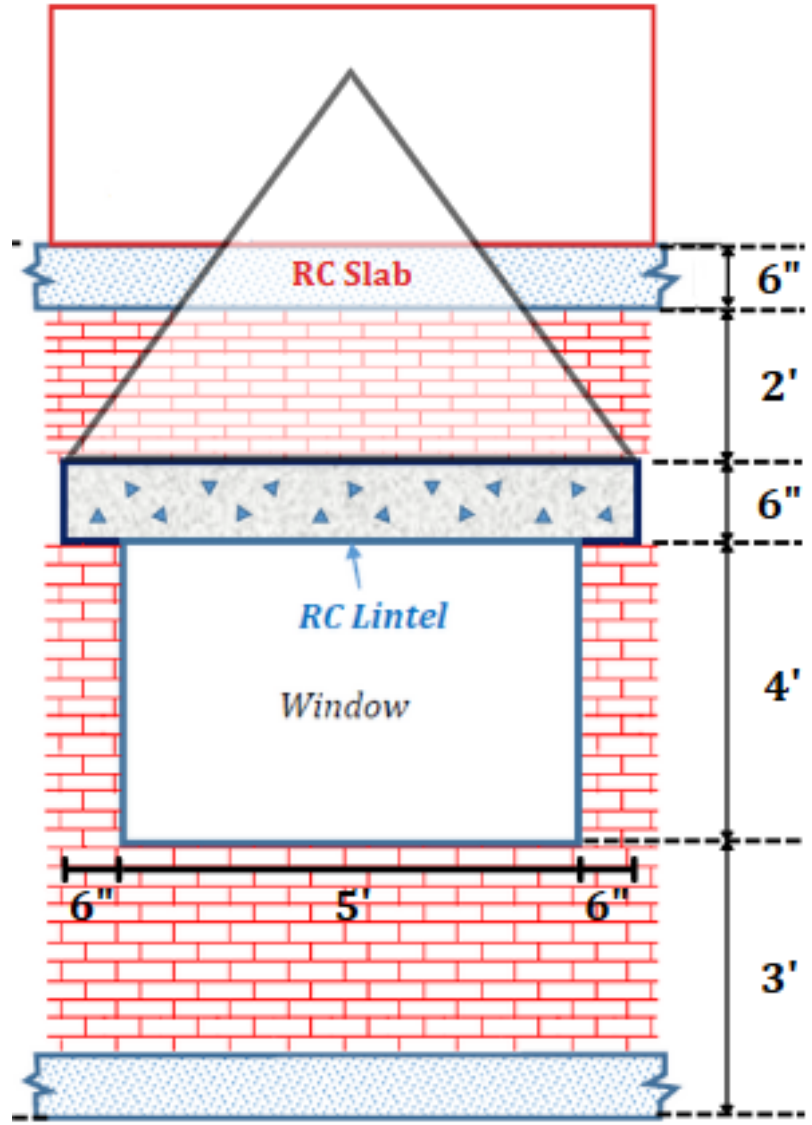
= [1/2 (a+b) x h* Wall Thickness] x Unit wt. of brick

Here,
Wall thickness = 10”

Load from brick wall = [½*(3.7+6) * 2]*10/12*120

W_1= Load from brickwall/ Lintel width lb/ft (Unfactored)





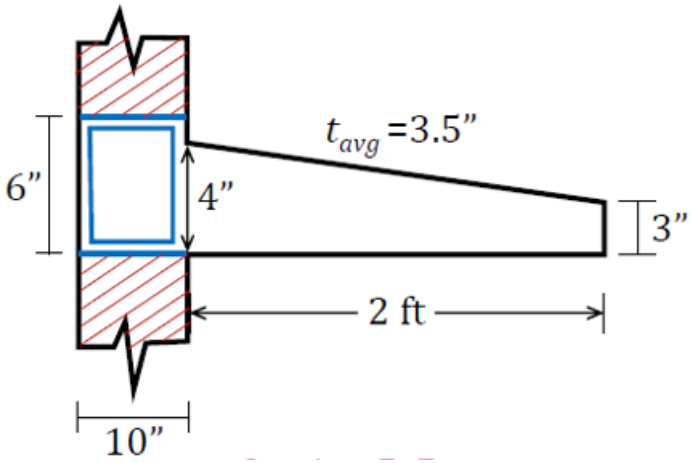
2. Load from Slab:

Load from slab, W_2 = 0.171 Ksf *(Let)* [From previous report]

Load from slab on lintel = 0.171x Contributing Area = (Factored)

3. Load from Lintel:

Self Weight, W_3 = (10/12 x 6/12) x 150 = lb/ft (Unfactored)



4. Load from Sunshade:

Load from sunshade, $W_4 = \frac{3.5}{12}$x 2 x 150 = lb/ft (Factored)

Live Load, W_{LL}= 20 lb/ft (Let)

Total load, W_u = [1.2 x (W1+W3) +W2+W4+ (1.6 x 20)] =

❑ Moment Calculation:

$$\text{Maximum Moment, } M_{u,max} = \frac{wL^2}{8} =$$

❑ d Check:

$$\rho = \rho_{0.005} = 0.85\beta_1 \frac{f_c'}{f_y} \frac{\epsilon_u}{\epsilon_u + 0.005} =$$

$$d_{req} = \sqrt{\frac{M_{u,max}}{\emptyset \rho f_y b \left(1 - 0.59\rho \frac{f_y}{f_c'}\right)}}$$

$d_{req} =$

$d_{provided} =$ (6 – 1.5) in = 4.5”

$\boldsymbol{d_{provided} = d_{required}} \longrightarrow$ **ok**

Step 04 : Reinforcement Area Determination

$$A_{s,min} = max \begin{cases} \dfrac{3\sqrt{f_c'\,(psi)}}{f_y\,(psi)}\,bd = \\ \dfrac{200}{f_y\,(psi)}\,bd = \end{cases}$$

$$A_s = \frac{M_u}{\phi f_y (d - a/2)} \qquad \& \qquad a = \frac{A_s f_y}{0.85 f_c' b}$$

Step 05 : Detailing

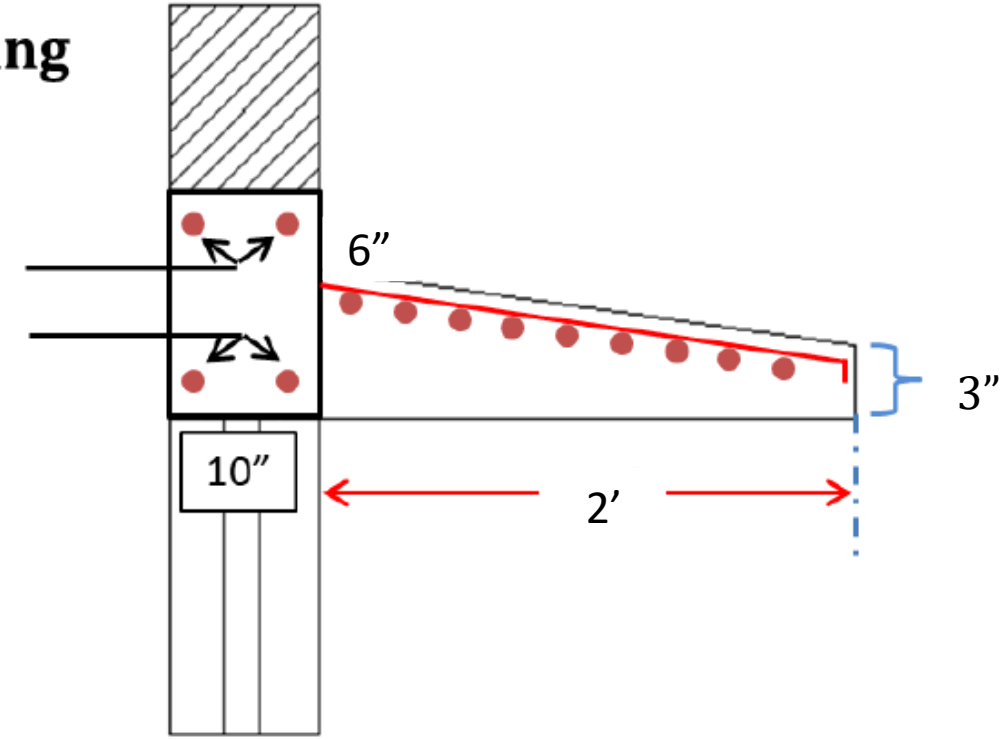
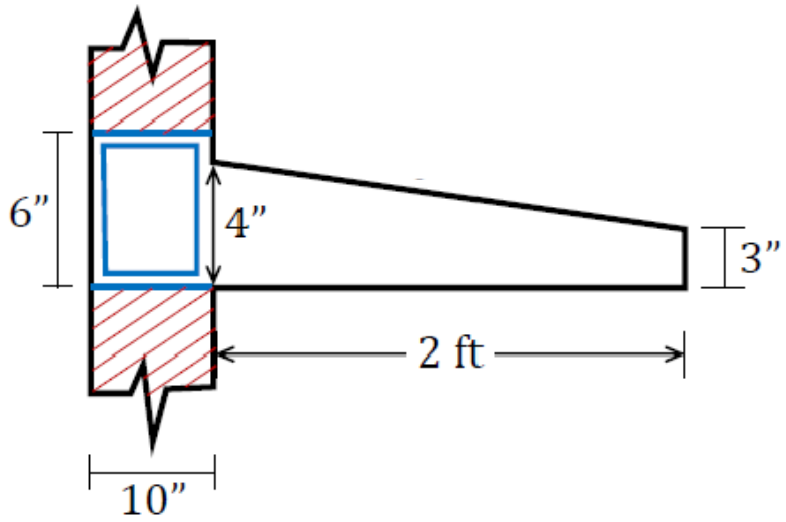


Figure 28: Detailing of Lintel

❑ Do the Design of the Following Sunshade and Lintel:



Sunshade

