

# Fire Station NEW Stairs

## - Roof Support

$$\text{Area} = 80 \text{ ft}^2$$

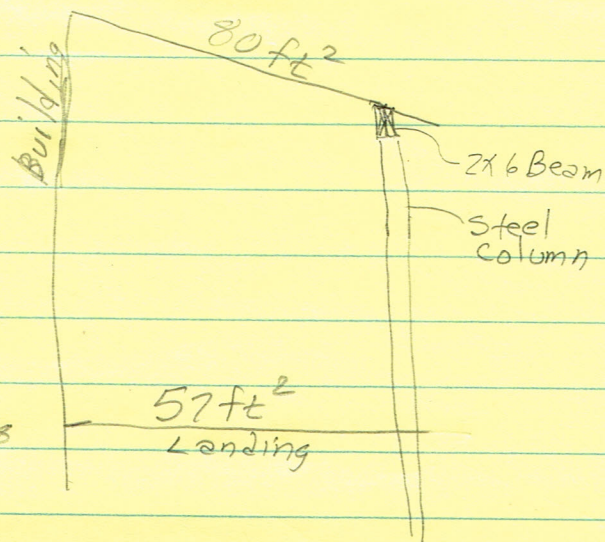
$$\text{Shingles } 2.8 \text{ psf} \times 80 \text{ ft}^2 = 224 \#$$

$$\text{Sheathing } 2 \text{ psf} \times 80 \text{ ft}^2 = 160 \#$$

$$2 \times 6 \text{ Out rigger } 1.7 \text{ psf} \times 80 \text{ ft}^2 = 136 \#$$

$$2 \times 6 \text{ Wood beam } 2.8 \text{ pLF} \times 12' = 193 \#$$

$$\text{Total Roof Weight} = .7 \text{ kips}$$



$$\text{- Dead Load } .7 \text{ kips}$$

$$\text{- Roof Live Load } 20 \text{ psf} \times 80 \text{ ft}^2 / 2 = .8 \text{ kips}$$

$$\text{- Wind Load } 52.6 \text{ psf} \times 80 \text{ ft}^2 / 2 = 2.1 \text{ kips}$$

## LANDING Support

$$\text{Area} = 57 \text{ ft}^2$$

$$\text{Concrete landing } 3'' \times 57 \text{ ft}^2 = 14.2 \text{ ft}^3 \times 150 \#/\text{ft}^3 = 2.1 \text{ k}$$

$$\text{Handrail } 15.58' \times 5 \#/\text{LF} = .08 \text{ k}$$

$$\text{Channel MC } 12 \times 10.6 \text{ } 21.42' \times 10.6 \#/\text{LF} = .23 \text{ k}$$

$$L3 \times 3 \times 1/4 \text{ } 23.33' \times 4.9 \#/\text{LF} = .11 \text{ k}$$

$$\text{Total Landing} = 2.52 \text{ k}$$

$$\text{- Dead Load } 2.52 \text{ k} / 2 = 1.26$$

$$\text{- Live load } 100 \text{ psf} \times 57 \text{ ft}^2 = 5.7 \text{ k} / 2 = 2.85$$

$$\text{- Wind load } 52.6 \text{ psf} \times 57 \text{ ft}^2 = 3.0 \text{ k} / 2 = 1.5$$

$$1.2D + 1.6L_r + .8W(\text{or } L)$$

$$1.2D + 1.6W + .5L + .5L_r$$

$$\begin{aligned} \text{Total Dead Load} &= .7 + 1.26k = 1.96k \\ \text{Total Roof Live Load} &= .8k \\ \text{Total Live Load} &= 2.85k \\ \text{Total Wind Load} &= 2.1 + 1.5 = 3.6k \end{aligned}$$

$$1.2(1.96k) + 1.6(.8k) + .8(3.6k) = 6.5k$$

$$1.2(1.96k) + 1.6(.8k) + 2.85k = 6.5k$$

$$1.2(1.96k) + 1.6(3.6) + .5(2.85) + .5(.8k) = 9.9k$$

There are 2 columns  $\therefore$  each column supports  $5.0k$

$$r_y = 2.34$$

$$KL = 2(18') = 36' = 432''$$

$$\phi_c P_n = 34.6$$

$$KL/r_y = 184.6$$

$$F_e = \pi^2 \times 29,000 / 184.6^2 = 8.40 \text{ ksi}$$

$$F_{cr} = .877 \times F_e = 7.37 \text{ ksi}$$

$$\text{Required Capacity} = .9 \times F_{cr} \times P_n$$

$$= .9 \times 7.37 \times 5.0k = 33.17$$

$33.17 < 34.6$  Ok but move to  
HSS 6x6x 5/16  $\phi_c P_n = 42.2$