

CALCULATIONS

FOR:

**Ground Roots Coffee Shop
3689 N.E. Akin Dr.
Lee Summit, MO. 64064**

DATE:

April 26, 2022

**STEPHEN P. MASLAN, P.E.
STEPHEN P. MASLAN & COMPANY
KANSAS CITY, MO. 64131**

GROUND ROOTS COFFEE SHOP
LEE'S SUMMIT, MO.

ROOF DESIGN

LIVE LOAD 20 PSF
DEAD LOAD 15 PSF
TOTAL 35 PSF

USE 24" DEEP PREMANUFACTURED
TRUSSES WITH TAPER TO ONE SIDE

BEAM OVER WINDOWS

$$\text{SPAN} = 16' - 0''$$

$$\text{TRIBUTARY AREA} = 15/2 = 7.5 \text{ ft}$$

$$W = 35(7.5) = 262.5 \text{ PLF}$$

$$M = 262.5(16)^2/8 = 8,400$$

$$\text{TRY } 2 - 1\frac{3}{4} \times 11\frac{1}{4} \text{ LVL'S } S_x = 36.91 \times 2 = 73.82$$

$$f_b = 8400 \times 12 / 73.82 = 1,365 < 2600 \text{ PSI}$$

$$\Delta = L/240 = 16 \times 12 / 240 = .8''$$

$$I_{\text{REQ'D}} = \frac{5(1728)(262.5)(16)^4}{384(1,900,000) \cdot 8} = 254.7 \text{ in}^4$$

$$I = 208 \times 2 = 416 \text{ in}^4$$

$$\Delta_{\text{ACT}} = \frac{254.7(.8)}{416} = .49'' \quad \Delta = \frac{16 \times 12}{.49} = L/392$$

USE 2 - 1 $\frac{3}{4}$ x 11 $\frac{1}{4}$ LVL'S OVER WINDOWS

COLUMN DESIGN

$$P = 262.5(16/2) = 2,100 \text{ \#}$$

$$\text{TRY } 2 - 2 \times 6\text{'S } A = 2 \times 1.5 \times 5.5 = 16.5 \text{ in}^2$$

$$f_c = 2100 / 16.5 = 127 \text{ PSI}$$

USE 2 - 2 x 6's

WALL DESIGN

TRY 2x6 STUDS @ 16" O.C. $L = 10' 0"$
 $d = 5.5$ $L/d = 10 \times 12 / 5.5 = 21.8$

$$K = 0.671 \sqrt{\frac{1,600,000}{850}} = 29.1 > 21.8$$

$$F'_c = 850 \left(1 - \frac{1}{3} \left(\frac{21.8}{29.1} \right)^4 \right) = 761 \text{ PSI}$$

$$f_c = \frac{262.5 (7.5)}{1.5 \times 5.5} \left(\frac{16}{12} \right) = 318 \text{ PSI} < 761 \text{ PSI}$$

WIND SPEED 115 MPH

WIND LOAD TO STUDS = 25.8 PSF EXP. B

$$W = \frac{16}{12} (25.8) = 34.4 \text{ PLF}$$

$$M = 34.4 (10)^2 / 8 = 430 \text{ #1} \quad S_x = 7.5625 \text{ }^3$$

$$f_b = \frac{430 \times 12}{7.5625} = 682$$

$$F_b = 900 \times 1.15 \times 1.2 = 1242 \text{ PSI}$$

$$\frac{f_c}{F_c} + \frac{f_b}{F_b} = \frac{318}{761} + \frac{682}{1242} = .967 < 1.0 \text{ OK}$$

USE 2x6 STUDS @ 16" O.C. #2 D.F

FOUNDATION DESIGN

ASSUME 1500 PSF

ROOF LOAD = 262.5 PLF

WALL LOAD = 150.0 PLF

4' BRICK = 160.0 PLF

FTG $3.5 \times \frac{16}{12} (150) = 677 \text{ PLF}$

1,249 PLF

AREA REQ'D = $1249 / 1500 = .83 \text{ ft}^2$

USE 16" WIDE CONTINUOUS FTG
W/ 2-#5'S TOP & BOT. & #3 STIRRUPS
@ 16" O.C.