

Le blanc Pediatrics

Determine the spacing between 2x12 floor joist. Open span = 16ft; Required LL = 100psf

- Assumptions:

#1 Southern pine

$$S_{xx} = 31.64 \text{ in}^3$$

$$I_{xx} = 178.0 \text{ in}^4$$

$$\text{weight} = 4.1 \text{ lbs/linear ft}$$

$$E = 1,600,000 \text{ psi}$$

$$F_v = 175$$

- Estimate Dead Loads

$$\text{weight of 2x12} = 4.1 \text{ lbs/linear ft.}$$

$$\text{Add this as separate load (w)} \div 12 \text{"/ft} = 0.342 \text{ \#/inch}$$

$$5/8 \text{'' Plywood} = 2.1 \text{ psf}$$

$$\text{flooring} = 3.0 \text{ psf}$$

$$\underline{5.1 \text{ psf}} \div 144 = 0.0354 \text{ psi}$$

$$\text{Live load} = 100 \text{ psf} \div 144 = 0.694 \text{ psi}$$

$$\text{LRFD} = 1.2(D) + 1.6(L) = 1.2(0.0354) + 1.6(0.694)$$

$$W = 1.014 \text{ psi}$$

$$\Delta_{\text{ALLOW}} \frac{1}{360} = 16' \times 12 \text{"/ft} \div 360 = 0.53 \text{''}$$

$$\Delta_{max} = \frac{5w l^4}{384 EI}$$

$$0.53 = \frac{5w (192)^4}{(384)(1,600,000)(178)}$$

$$w = 8.53 \text{ \#/in}$$

$$w = 8.53 \text{ \#/in} - 0.342 \text{ \#/in (2x12)}$$

$$w = 8.18 \text{ \#/in}$$

$$w = 8.188 \text{ \#/in} \div 1.014 \text{ \#/in}^2$$

$$= 8.075'' \text{ max spacing}$$

Check for Shear (V), Reactions each end
is 811.6 #

$$F_v = \frac{3V}{2bd}$$

b = base

d = depth

$$175 = \frac{3(V)}{(2)(1.5)(11.25)} \therefore V_{max} 1,968\# > 811.6\#$$

#1 Southern Pine 2x12 @ 8" O.C.

will have a max deflection = 0.525" < 0.53"

or #1 Southern Pine 2ea 2x12 @ 16" O.C.

Check for Thickness of Plywood

Assumption Plywood has $E = 1,000,000$

$$\text{Self weight} = 2.1 \text{ psf}$$

$$\text{flooring} = 3.0 \text{ psf}$$

$$\underline{5.1 \text{ psf}} \div 144 = 0.0354 \text{ psi}$$

$$\text{Live load} = 100 \text{ psf} \div 144 = 0.694 \text{ psi}$$

$$\text{LRFD } w = 1.2D + 1.6L = (1.2)(0.0354) + (1.6)(0.694)$$

$$w = 1.014 \text{ psi} \times 16'' = 16.2 \text{ \#/LINER INCH}$$

$$\Delta_{\text{ALLOW}} = l/360 = 16''/360 = 0.04''$$

$$\Delta_{\text{max}} = \frac{5wl^4}{1743EI} \quad \therefore \text{Pg 23 of APA Plywood Design}$$

$$0.04'' = \frac{(5)(16.2)(16)^4}{1743(1,000,000)I} \quad \therefore I = 0.0761$$

5/8" thick plywood has moment of inertia
 $I = 0.154 \text{ in}^4$