4.28 GIVEN: A COLUMN SUBJECTED TO LOADS OF

$D = 3^K$, $L_r = 5^K$ } ROOF

$D = 6^K$, $L = 10^K$, $W = 10^K$ } FLOOR

COLUMN IS SHORT W/ FULL LATERAL SUPPORT

FIND: THE CRITICAL COMBINATION OF LOADS

$$\frac{D}{C_D} = \frac{9^K}{0.9} = 10^K$$

$D+L = 3^K + 6^K + 10^K = 19^K$ $\quad \frac{19^K}{C_D} = \frac{19^K}{1.0} = 19^K$

$$\frac{D+L+L_r}{C_D} = \frac{19+5}{1.25} = \frac{24}{1.25} = 19.2$$

$D + W + L + L_r = 9 + 10 + 10 + 5 = 34^K$ $\quad \frac{34}{1.6} = 21.3^K$

- $.6D + W$ = WILL NOT CONTROL

CONTROLING COMBINATION IS $D+L = 19^K$

$D+W+L+L_r = 34^K$ CONTROLS

4.29 COLUMN SUPPORTING

$D = 10^K$
$L_r = 2^K$ } ROOF

$D = 8^K$
$L = 10^K$
$W = 6^K$ } ROOF

FIND: THE CRITICAL LOAD COMBINATION

$D/.9 = 18/.9 = 20^K$

$\frac{D+L}{1} = 28^K$

$\frac{D+L+L_r}{1.25} = 28/1.25 = 22.4^K$

$\frac{D+W+L+L_r}{1.6} = \frac{36}{1.6} = 22.5^K$

CONTROLLING LOAD COMBINATION IS $D+L = 28^K$

4.32 DETERMINE THE TABULATED & DESIGN VALUES FOR THE FOLLOWING ASSUMING No 2. HEM-FIR.

a) 2x10 ROOF JOISTS @ 16" O.C. (D+S)

$C_D = 1.15$
$C_m = 1.0$
$C_t = 1.0$
$C_L = 1.0$
$C_F = 1.1$ (F_b)
$C_{fu} = 1.0$
$C_i = 1.0$
$C_f = 1.15$
$C_{fg} = 1.0$
$C_b = 1.0$
~~$C_p =$~~
$C_T = 1.0$

$F_b = 850$ psi ; $F'_b = 1.15(1.1)(1.15)[850] =$ ~~1310 psi~~ 1240 psi

$F_v = 150$ psi ; $F'_v = 1.15(150) =$ ~~207 psi~~ 172 psi

$F_{c\perp} =$ ~~625~~ 405 ; $F'_{c\perp} =$ ~~625~~ 405 psi

$E = 1,800,000$ psi ; $E' = 1,800,000$

b) 6x14 CARRYING A PERMANENT EQUIPMENT LOAD

$C_D = 0.9$

$C_F = \left(\frac{12}{d}\right)^{1/9} = \left(\frac{12}{13\frac{1}{2}}\right)^{1/9} = 0.987$

$F_b = 675$ psi $\quad F'_b = .9(.987)(675) = 600$ psi
$F_v =$ ~~135~~ 140 $\quad F'_v = .9(135) =$ ~~122~~ 126 psi
$F_{c\perp} = 405 = F'_{c\perp}$
$E = E' = 1,100,000$ psi

4.32 (CONT)

c) ~~4×8~~ 14 @ 8" o.c. (D+Lr)

$C_D = 1.25$

$C_F = 1.0$

ALL OTHERS 1.0

$F_b = 850$ psi $\quad F'_b = 1.25(1.0)(850) = \cancel{1275}$ 1062 psi

$F_v = 150$ psi $\quad F'_v = 1.25(150) = 187.5$ psi

$F_{c\perp} = F'_{c\perp} = 405$ psi

$E = E' = 1,300,000$ psi

d) 4X6 @ 4' o.c. (D+L) w/ HIGH HUMIDITY

$C_D = 1.0$

$C_F = 1.3 \rightarrow 1.0$ BECAUSE $C_F F_b < 1150$ psi

$C_M =$ ~~0.85~~ FOR F_b ; $= 0.97$ F_v ; $= 0.9$ E , .67 FOR $F_{c\perp}$

$F_b = 850$ psi ; $\quad F'_b = 1.0(1.3)(1.0)\,850 = 1105$ psi

$F_v = 150$, $\quad F'_v = 1.0(0.97)(150) = 145$ psi

$F_{c\perp} = 405$ psi $\quad F_{c\perp} = .67(405) = 270$ psi

$E = 1,300,000$ psi , $\quad E' = .9(1,300,000) = \cancel{1170000}$ 1,170,000 psi

4.33 USING SELECT STRUCTURAL ~~PINE~~ SOUTHERN PINE W/ BENDING ABOUT THE STRONG AXIS.

a) 2x6 @ 24" O.C. (D+S)

$C_D = 1.15$
$C_F = 1.0$
$C_r = 1.15$

$F_b = 2550$ psi $F'_b = 1.15(1.15)(2550) = 3370$ psi
$F_v = 175$ psi $F'_v = 1.15(175) = 200$ psi
$F_{c\perp} = 565$ psi $F'_{c\perp} = 565$ psi
$E = 1,800,000$ psi $E' = 1,800,000$ psi

b) 4x12 SUPPORTING (D+L+L_r)

$C_D = 1.25$
$C_F = 1.1$

$F_b = 1900$ psi $F'_b = 1.25(1.1)1900 = 2612$ psi
$F_v = 175$ psi $F'_v = 1.25(175) = 218.7$ psi
$F_{c\perp} = 565$ psi $F'_{c\perp} = 565$ psi
$E = 1,800,000$ psi $E' = 1,800,000$ psi

c) 2x10 @ 4' O.C. D+L_r

$C_D = 1.25$
$C_F = 1.0$

$F_b = 2050$ psi $F'_b = 1.25(2050) = 2562$ psi
$F_v = 175$ psi $F'_v = 1.25(175) = 218.7$ psi
$F_{c\perp} = 565$ psi $= F'_{c\perp}$
$E = 1,800,000$ psi $= E'$

d) 4x10 @ 4' O.C. (D+L+W)

$C_D = 1.6$
$C_F = 1.1$

$F_b = 2050$ psi $F'_b = 1.6(1.1)(2050) = 3608$ psi
$F_v = 175$ psi $F'_v = 1.6(175) = 280$ psi
$F_{c\perp} = 565$ psi $F'_{c\perp} = 565$ psi
$E = 1,800,000$ psi $E = 1,800,000$ psi