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SUPPLEMENTAL STRUCTURAL CALCULATIONS

FOR

MERCER MODERN
8621 SE 63RD ST
MERCER ISLAND, WA 98040

PREPARED BY
PCS STRUCTURAL *SOLUTIONS*

JANUARY 6, 2026
25-348

ASD (2018 NDS) WOOD COLUMN CALCULATION:

Wood built-up column below guest suite roof beam

MATERIAL AND SECTION PROPERTIES:

$F_c := 1350\ \frac{lbf}{in^2}$ $L_x := 8\ ft$ $d := 3.5\ in$ $E_{min} := 580000 \cdot \frac{lbf}{in^2}$

$F_b := 900\ \frac{lbf}{in^2}$ $L_y := 8\ ft$ $b := 4.5\ in$

$F_v := 180 \cdot \frac{lbf}{in^2}$ $K_{ex} := 1.0$ $S_x := b \cdot \frac{d^2}{6}$ $S_x = 9.19\ in^3$

$E := 1600000 \cdot \frac{lbf}{in^2}$ $K_{ey} := 1.0$ $I_x := b \cdot \frac{d^3}{12}$ $I_x = 16.08\ in^4$

$L_{ex} := K_{ex} \cdot L_x$

$L_{ey} := K_{ey} \cdot L_y$

$A := d \cdot b$ $A = 15.75\ in^2$ $R_B := \left(L_x \cdot \frac{d}{b^2}\right)^{-1}$

LOADING INFORMATION:

ADJUSTMENT FACTORS:

$P_d := 1200\ lbf$	Dead	$C_m := 1.0$	$C_L := 1.0$	
$P_s := 1500\ lbf$	Snow	$C_t := 1.0$	$C_{F\_c} := 1.0$	compresion
$P_w := 1500\ lbf$	Wind	$C_r := 1.0$		

LOAD COMBINATION 1: D + 0.75S + 0.75W

$P_T := P_d + 0.75 \cdot (P_s + P_w)$

COLUMN STABILITY:

$C_D := 1.15$

$E_{prime} := E$

$L_d := \text{if}\left(\frac{L_{ex}}{d} < \frac{L_{ey}}{b}, \frac{L_{ey}}{b}, \frac{L_{ex}}{d}\right)$ $L_d = 27.43$

$F_{cEx} := 0.822 \cdot \frac{E_{min}}{L_d^2}$ $F_{cEx} = 633.71\ psi$

$F_{cstar} := F_c \cdot C_D \cdot C_m \cdot C_t \cdot C_{F\_c}$

$F_{cstar} = 1552.5\ psi$

$c := 0.8$ for sawn lumber

$$C_p := \left(\frac{1 + \frac{F_{cEx}}{F_{cstar}}}{2 \cdot c}\right) - \sqrt{\left(\frac{1 + \frac{F_{cEx}}{F_{cstar}}}{2 \cdot c}\right)^2 - \frac{\frac{F_{cEx}}{F_{cstar}}}{c}}$$ $C_p = 0.37$

$F_{cprime} := F_c \cdot C_D \cdot C_m \cdot C_t \cdot C_{F\_c} \cdot C_p$

$f_c := \frac{P_T}{A}$

$F_{cprime} = 568.13\ psi$

$f_c = 219.05\ psi$

$f_c < F_{cprime}$ $comp\_1 := \text{if}\left(f_c < F_{cprime}, \text{"OK"}, \text{"NOT OK"}\right)$

$comp\_1 = \text{"OK"}$

Column is braced weak axis, buckling check strong axis. OK.