

STUD WALL CALCULATIONS

| | |
|-----------------|----------|
| Stud Width (dy) | 1.50 in |
| Stud Depth (dx) | 3.50 in |
| Stud Length (L) | 9.00 ft |
| Stud Spacing | 16.00 in |

Design Values

| | |
|------------------|----------------------|
| Fb | 700 psi |
| Fc | 850 psi |
| Fc _⊥ | 625 psi |
| E | 1600000 psi |
| E _{min} | 510000 psi |
| CF _b | 1.00 |
| CF _c | 1.00 |
| A | 5.25 in ² |
| S _x | 3.06 in ³ |
| I _x | 5.36 in ⁴ |
| C _t | 1.00 |
| CM | 1.00 |
| C _i | 1.00 |

Vertical Loads

| | |
|----------------|-------------|
| Wall LL (wLL) | 500 plf |
| Wall DL (wDL) | 500 plf |
| Wall DL (wTL) | 1000 plf |
| Trib. Length | 1.33 ft |
| P _c | 1333.33 lbs |

Lateral Loads

| | |
|----------------------|-----------------------|
| Wind Load (ps) | 10.00 psf |
| Wind Load ASD (pasd) | 6.00 psf |
| Wind Atrib | 12.00 ft ² |
| W | 72.00 lbs |
| w | 8.00 plf |

Load Case 1: Gravity Loads Only

| | |
|--|------------------|
| CD | 1.15 |
| (le/d) _y | 0.00 sheathing |
| (le/d) _x | 30.86 |
| E' _{min} | 510000 psi |
| F _{cE} | 440.28 psi |
| F _c * | 977.50 psi |
| c | 0.80 sawn lumber |
| F _{cE} /F _c * | 0.450 |
| 1 + F _{cE} /F _c */2c | 0.907 |
| C _p | 0.398 |
| F _c ' | 388.89 psi |
| f _c | 253.97 psi |
| CSI (axial) | 0.65 OK |

Bearing on Stud Wall Plates

| | |
|----------------------|---------------------|
| l _b | 1.50 in |
| C _b | 1.00 (conservative) |
| F _{c⊥} ' | 625.00 psi |
| f _{c⊥} | 253.97 |
| CSI (bearing) | 0.41 OK |

Load Case 2: Gravity Loads and Lateral Loads

| | |
|----------------------|----------------|
| CD | 1.60 (Wind) |
| M _{max} | 81.00 ft-lbs |
| | 972.00 in-lbs |
| CL | 1.00 |
| C _r | 1.15 @ 16 O/C |
| F _b ' | 1288.00 psi |
| f _{bx} | 317.39 psi |
| CSI (bending) | 0.25 OK |

Combined Stress

(re-evaluate compression values with CD = 1.6)

| | |
|--|------------------|
| F _{cE} | 440.28 psi |
| F _c * | 1360.00 psi |
| c | 0.80 sawn lumber |
| F _{cE} /F _c * | 0.324 |
| 1 + F _{cE} /F _c */2c | 0.827 |
| C _p | 0.298 |
| F _c ' | 405.77 psi |

$$\left(\frac{f_c}{F_c'}\right)^2 + \left(\frac{1}{1 - \frac{f_c}{F_{cE}}}\right)\left(\frac{f_b}{F_b'}\right) = 0.97 \text{ OK}$$

Location: Front Wall A

Specification: Use 2 x 4 DF Stud Grade @ 16" o/c