[redacted] [redacted] Sheet [redacted] of [redacted]

[redacted] Wall Bracing
Item: 2 x 4 blocks with Staple Connectors
to 2 x 6 mudsill

2x4 Blocking to Mudsill with
Stapled Connections --2001 NDS Section 11.3

Member properties:

side member 2 x 4 thickness: $t_s := 1.5 \cdot in$ $t_s = 1.5\,in$

Douglas Fir width: $b_s := 3.5 \cdot in$

Table 11.3.2B $G := 0.42$ --specific gravity $A_s := t_s \cdot b_s$ $A_s = 5.25\,in^2$

$F_{es} := 3350 \cdot \frac{lb}{in^2}$ -- Dowel bearing strength

Dowel Bearing length $L_s := t_s$ $L_s = 1.5\,in$

main member 2" x 6" redwood sole plate: thickness: $t_m := 1.5 \cdot in$

Redwood properties: width: $b_m := 3.5 \cdot in$

Table 4-3a, Wood Handbook, Forest Products Society $G := 0.4$ Old growth redwood $A_m := t_m \cdot b_m$ $A_m = 5.25\,in^2$

Dowel Bearing Strength: Table 11.3.2 $D < 0.25 \cdot in$ $F_{em} := 4800 \cdot \frac{lb}{in^2}$

connectors: 15 ga x $2^1/_2$" steel staples $D := 0.072 \cdot in$

bending yield strength of staple: $F_{yb} := 100000 \cdot \frac{lb}{in^2}$ ASTM F1667, Table S1.1

Staple length: $\Sigma L := 2.5 \cdot in$ $L_m := \Sigma L - L_s$ $L_m = 1\,in$

$K_D := 2.2$ for D less than 0.17in For D < 0.25in, $R_d := K_D$ Table 11.3.1B

analysis factors

$R_e := \frac{F_{em}}{F_{es}}$ $R_e = 1.433$ $R_t := \frac{L_m}{L_s}$ $R_t = 0.667$ $R_e := \frac{F_{em}}{F_{es}}$ $R_e = 1.433$

$$k_1 := \frac{\sqrt{R_e + \left[2 \cdot R_e^2 \cdot \left[(1) + R_t + R_t^2\right]\right]} + R_e \cdot 1 + R_t}{1 + R_e} \qquad k_1 = 1.436$$

$$k_2 := \sqrt{2 \cdot (1 + R_e)} + \frac{2 \cdot F_{yb} \cdot (1 + 2 \cdot R_e) \cdot D^2}{3 \cdot F_{em} \cdot L_m^2} \qquad k_2 = 2.484$$

$$k_3 := \frac{\sqrt{2 \cdot (1 + R_e)}}{R_e} + \frac{2 \cdot F_{yb} \cdot (2 + R_e) \cdot D^2}{3 \cdot F_{em} \cdot L_s^2} \qquad k_3 = 1.649$$

Yield Limits

Equation 11.3-1 $Z_1 := \frac{D \cdot L_m \cdot F_{em}}{R_d}$ $Z_1 = 157.091\,lb$ Mode Im

Equation 11.3-2 $Z_2 := \frac{D \cdot L_s \cdot F_{es}}{R_d}$ $Z_2 = 164.455\,lb$ Mode Is

Equation 11.3-3 $Z_3 := \frac{k_1 \cdot D \cdot L_s \cdot F_{es}}{R_d}$ $Z_3 = 236.115\,lb$ Mode II

Equation 11.3.4 $Z_4 := \frac{k_2 \cdot D \cdot L_m \cdot F_{em}}{(1 + 2 \cdot R_e) \cdot R_d}$ $Z_4 = 100.95\,lb$ Mode III.m

Equation 11.3.5 $Z_5 := \frac{k_3 \cdot D \cdot L_s \cdot F_{em}}{(2 + R_e) \cdot R_d}$ $Z_5 = 113.213\,lb$ Mode III.s

Equation 11.3-6 $Z_6 := \frac{D^2}{R_d} \cdot \sqrt{\frac{2 \cdot F_{em} \cdot F_{yb}}{3 \cdot (1 + R_e)}}$ $Z_6 = 27.025\,lb$ Mode IV Controls

Adjustment Factors

Geometry factor $C_\Delta := 1.0$ Section 11.5.1

Diaphragm factor $C_{di} := 1.1$ Section 11.5.3

Staple factor $C_{st} := 2$ two legs per staple

Duration factor $C_d := 1.33$

Moisture Content less than 19% $C_m := 1.0$ Table 10.3.3

Temperature < 100º $C_t := 1.0$ Table 10.3.4

Group action factor $C_g := 1.0$ Section 10.3.6

$$V_{allow} := Z_6 \cdot C_\Delta \cdot C_m \cdot C_{di} \cdot C_t \cdot C_{st} \cdot C_g \cdot C_d \qquad V_{allow} = 79\,lb$$

Nailing Schedule

6"spacing, 2 staples per foot $V_6 := V_{allow} \cdot \frac{2}{ft}$ $V_6 = 158\,\frac{lb}{ft}$

4"spacing, 3 staples per foot $V_4 := V_{allow} \cdot \frac{3}{ft}$ $V_4 = 237\,\frac{lb}{ft}$

3"spacing, 4 staples per foot $V_3 := V_{allow} \cdot \frac{4}{ft}$ $V_3 = 316\,\frac{lb}{ft}$

2"spacing, 6 staples per foot $V_2 := V_{allow} \cdot \frac{6}{ft}$ $V_2 = 474\,\frac{lb}{ft}$

1-1/2"spacing, 8 staples per foot $V_{1.5} := V_{allow} \cdot \frac{8}{ft}$ $V_{1.5} = 633\,\frac{lb}{ft}$