

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

Member properties:

side member 2 x 4

thickness: $t_s := 1.5 \cdot \text{in}$ $t_s = 1.5 \text{ in}$

Douglas Fir

width: $b_s := 3.5 \cdot \text{in}$

Table 11.3.2B $G := 0.42$ --specific gravity

$A_s := t_s \cdot b_s$ $A_s = 5.25 \text{ in}^2$

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

Dowel Bearing length $L_s := t_s$ $L_s = 1.5 \text{ in}$

main member 2" x 6" redwood sole plate:

thickness: $t_m := 1.5 \cdot \text{in}$

Redwood properties:

width: $b_m := 3.5 \cdot \text{in}$

Table 4-3a, $G := 0.4$ Old growth redwood
Wood Handbook,
Forest Products Society

$A_m := t_m \cdot b_m$ $A_m = 5.25 \text{ in}^2$

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

connectors: 15 ga x 2 1/2" steel staples $D := 0.072 \cdot \text{in}$

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

Staple length: $\Sigma L := 2.5 \cdot \text{in}$ $L_m := \Sigma L - L_s$ $L_m = 1 \text{ in}$

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

analysis factors

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

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

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

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

Yield Limits

Equation 11.3-1	$Z_1 := \frac{D \cdot L_m \cdot F_{em}}{R_d}$	$Z_1 = 157.091 \text{ lb}$	Mode Im	
Equation 11.3-2	$Z_2 := \frac{D \cdot L_s \cdot F_{es}}{R_d}$	$Z_2 = 164.455 \text{ lb}$	Mode Is	
Equation 11.3-3	$Z_3 := \frac{k_1 \cdot D \cdot L_s \cdot F_{es}}{R_d}$	$Z_3 = 236.115 \text{ lb}$	Mode II	
Equation 11.3-4	$Z_4 := \frac{k_2 \cdot D \cdot L_m \cdot F_{em}}{(1 + 2 \cdot R_e) \cdot R_d}$	$Z_4 = 100.95 \text{ lb}$	Mode III.m	
Equation 11.3-5	$Z_5 := \frac{k_3 \cdot D \cdot L_s \cdot F_{em}}{(2 + R_e) \cdot R_d}$	$Z_5 = 113.213 \text{ lb}$	Mode III.s	
Equation 11.3-6	$Z_6 := \frac{D^2}{R_d} \cdot \sqrt{\frac{2 \cdot F_{em} \cdot F_{yb}}{3 \cdot (1 + R_e)}}$	$Z_6 = 27.025 \text{ lb}$	Mode IV	Controls

Adjustment Factors

Geometry factor	$C_\Delta := 1.0$	Section 11.5.1	Moisture Content less than 19%	$C_m := 1.0$	Table 10.3.3
Diaphragm factor	$C_{di} := 1.1$	Section 11.5.3	Temperature < 100°	$C_t := 1.0$	Table 10.3.4
Staple factor	$C_{st} := 2$	two legs per staple	Group action factor	$C_g := 1.0$	Section 10.3.6
Duration factor	$C_d := 1.33$				

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

Nailing Schedule

<u>6"spacing, 2 staples per foot</u>	$V_6 := V_{allow} \cdot \frac{2}{ft}$	$V_6 = 158 \frac{\text{lb}}{\text{ft}}$
<u>4"spacing, 3 staples per foot</u>	$V_4 := V_{allow} \cdot \frac{3}{ft}$	$V_4 = 237 \frac{\text{lb}}{\text{ft}}$
<u>3"spacing, 4 staples per foot</u>	$V_3 := V_{allow} \cdot \frac{4}{ft}$	$V_3 = 316 \frac{\text{lb}}{\text{ft}}$
<u>2"spacing, 6 staples per foot</u>	$V_2 := V_{allow} \cdot \frac{6}{ft}$	$V_2 = 474 \frac{\text{lb}}{\text{ft}}$
<u>1-1/2"spacing, 8 staples per foot</u>	$V_{1.5} := V_{allow} \cdot \frac{8}{ft}$	$V_{1.5} = 633 \frac{\text{lb}}{\text{ft}}$