MYERS ENGINEERING

Addendum to Structural Calculations

Digitally signed by Mark Myers, PE
Date: 2021.04.05 12:37:24 -07'00'

MUST BEAR ORIGINAL BLUE INK SIGNATURE OR
DIGITAL PDF SIGNATURE FOR PERMIT SUBMITTAL.

Project: RKK – Lot 2
3402 72nd Place Southeast
Mercer Island, WA

April 5, 2021

2015 INTERNATIONAL BUILDING CODE
110 MPH WIND, EXPOSURE C, K_{zt} = 1.65
RISK CATEGORY II - SOIL SITE CLASS D
SEISMIC DESIGN CATEGORY D (IBC)

3206 50th Street Court NW, Suite 210-B
Gig Harbor, WA 98335
Phone: 253-858-3248
Email: myengineer@centurytel.net

Myers Engineering, LLC
3206 50th Street Ct NW, Ste 210-B
Gig Harbor, WA 98335

PROJECT : **3402 72nd Place SE**

Phone: 253-858-3248
Email: myengineer@centurytel.net

WALL A:

Story Shear due to Wind: $V_{4W} = 17952.17\,lb$ Story Shear due to Seismic: $F_2 = 5031.1\,lb$

Bldg Width in direction of Load: $L_t := 40\cdot ft$ Distance between shear walls: $L_l := 16\cdot ft$

Shear Wall Length: $La_w := (2\cdot 5 + 5.58)ft = 15.58\,ft$ $La_s := (2\cdot 5 + 5.58)ft = 15.58\,ft$

Percent full height sheathing: $\% := \left(\frac{10\cdot ft}{10\cdot ft}\right)\cdot 100$ $\% = 100$ Max Opening Height = 0ft-0in, Therefore $C_o := 1.00$ per AF&PA SDPWS Table 4.3.3.5

Wind Force: $va := \frac{vaa\cdot Laa_w + \left(\frac{0.6V_{4W}}{L_t}\cdot\frac{L_l}{2}\right)}{La_w}$ Seismic Force: $\rho := 1.0$ $E_a := \frac{E_{aa}\cdot Laa_s + \left(\rho\cdot\frac{0.7F_2}{L_t}\cdot\frac{L_l}{2}\right)}{La_s}$

$va = 268.24\,ft^{-1}\cdot lb$ $\frac{va}{C_o} = 268.24\,ft^{-1}\cdot lb$ $E_a = 125.29\,ft^{-1}\cdot lb$ $\frac{E_a}{C_o} = 125.29\,ft^{-1}\cdot lb$

P1-6: 7/16" Sheathing w/ 8d nails @ 6" O.C.
Wind Capacity = 364 plf
Seismic Capacity = 260 plf

Dead Load Resisting Overturning: $L_a := 5\cdot ft$ Plate Height: $Pt := 10\cdot ft$

$W_a := (15\cdot psf)\cdot 0\cdot ft + (10\cdot psf)\cdot Pt + (10psf)\cdot 1\,ft$ $DLRa := \frac{W_a\cdot L_a}{2}$ $DLRa = 275\,lb$

Chord Force:

$CFa_w := \frac{va\cdot L_a\cdot Pt}{C_o\cdot L_a}$ $CFa_w = 2682.36\,lb$ $CFa_w + CFaa_w = 3718.39\,lb$

$CFa_s := \frac{E_a\cdot L_a\cdot Pt}{C_o\cdot L_a}$ $CFa_s = 1252.95\,lb$ $CFa_s + CFaa_s = 1891.36\,lb$

Holdown Force:

$HDFa_w := CFa_w - 0.6\cdot DLRa = 2517.36\,lb$ $HDFa_w + HDFaa_w = 3385.27\,lb$

$HDFa_s := CFa_s - (0.6 - 0.14S_{DS})\cdot DLRa = 1123.75\,lb$ $HDFa_s + HDFaa_s = 1630.53\,lb$

Simpson STHD10

Base Plate Nail Spacing (2015 NDS Table 12N)
16d Sinker (0.148"x3.25") Nails & 1-1/2" Plate Hem-Fir

$Z_N := 102\cdot lb$ $C_D := 1.6$
$B_R := \frac{(C_D\cdot Z_N\cdot C_o)}{va} = 0.61\,ft$ $\frac{(C_D\cdot Z_N\cdot C_o)}{E_a} = 1.3\,ft$

16d @ 6" o.c.

Anchor Bolt Spacing (2015 NDS Table 12E)
5/8" Dia. Bolt (6" Embed) & 1-1/2" Plate Hem-Fir

$A_s := 860\cdot lb$ $C_D := 1.6$ $Z_B := A_s\cdot C_D$ $Z_B = 1376\,lb$
$As := \frac{(Z_B\cdot C_o)}{va} = 5.13\,ft$ $\frac{(Z_B\cdot C_o)}{E_a} = 10.98\,ft$

5/8" A.B. @ 60" o.c.

Myers Engineering, LLC
3206 50th Street Ct NW, Ste 210-B
Gig Harbor, WA 98335

PROJECT : **3402 72nd Place SE**

Phone: 253-858-3248
Email: myengineer@centurytel.net

WALL B:

Story Shear due to Wind: $V_{4W} = 17952.17\,lb$

Story Shear due to Seismic: $F_2 = 5031.1\,lb$

Bldg Width in direction of Load: $L_t := 40\cdot ft$

Distance between shear walls: $L_1 := 24\cdot ft$

Shear Wall Length:

$Lb_w := (3.375 + 2.875 + 2\cdot 3.25)ft = 12.75\,ft$

$$Lb_s := \left[3.375\left(\frac{6.75}{10}\right) + 2.875\left(\frac{5.75}{10}\right) + 2\cdot 3.25\left(\frac{6.5}{10}\right)\right]ft = 8.16\,ft$$

Percent full height sheathing: $\%_{\_} := \left(\frac{10\cdot ft}{10\cdot ft}\right)\cdot 100$ $\%_{\_} = 100$

Max Opening Height = 0ft-0in, Therefore $C_o := 1.00$ per AF&PA SDPWS Table 4.3.3.5

Wind Force: $vb := \dfrac{vbb\cdot Lbb_w + \left(\dfrac{0.6V_{4W}}{L_t}\cdot\dfrac{L_1}{2}\right)}{Lb_w}$

Seismic Force: $\rho := 1.0$ $E_b := \dfrac{E_{bb}\cdot Lbb_s + \left(\rho\cdot\dfrac{0.7F_2}{L_t}\cdot\dfrac{L_1}{2}\right)}{Lb_s}$

$vb = 491.66\,ft^{-1}\cdot lb$ $\dfrac{vb}{C_o} = 491.66\,ft^{-1}\cdot lb$

$E_b = 359.01\,ft^{-1}\cdot lb$ $\dfrac{E_b}{C_o} = 359.01\,ft^{-1}\cdot lb$

P1-4: 7/16" Sheathing w/ 8d nails @ 4" O.C.
Wind Capacity = 532 plf
Seismic Capacity = 380 plf

Dead Load Resisting Overturning: $L_b := 2.875\cdot ft$ Plate Height: $Pt := 10\cdot ft$

$W_b := (15\cdot psf)\cdot 2\cdot ft + (10\cdot psf)\cdot Pt + (10psf)\cdot 1ft$

$DLRb := \dfrac{W_b\cdot L_b}{2}$ $DLRb = 201.25\,lb$

Chord Force:

$CFb_w := \dfrac{vb\cdot L_b\cdot Pt}{C_o\cdot L_b}$ $CFb_w = 4916.62\,lb$

$CFb_w + CFbb_w = 6079.84\,lb$

$CFb_s := \dfrac{E_b\cdot L_b\cdot Pt}{C_o\cdot L_b}$ $CFb_s = 3590.05\,lb$

$CFb_s + CFbb_s = 4341.02\,lb$

Holdown Force:

$HDFb_w := CFb_w - 0.6\cdot DLRb = 4795.87\,lb$

$HDFb_w + HDFbb_w = 5824.09\,lb$

$HDFb_s := CFb_s - (0.6 - 0.14S_{DS})\cdot DLRb = 3495.51\,lb$

$HDFb_s + HDFbb_s = 4140.76\,lb$

Simpson HDU8 w/ SB7/8x24 anchor

Base Plate Nail Spacing (2015 NDS Table 12N)
16d Sinker (0.148"x3.25") Nails & 1-1/2" Plate Hem-Fir

$Z_N := 102\cdot lb$ $C_D := 1.6$

$B_R := \dfrac{(C_D\cdot Z_N\cdot C_o)}{vb} = 0.33\,ft$ $\dfrac{(C_D\cdot Z_N\cdot C_o)}{E_b} = 0.45\,ft$

16d @ 4" o.c.

Anchor Bolt Spacing (2015 NDS Table 12E)
5/8" Dia. Bolt (6" Embed) & 1-1/2" Plate Hem-Fir

$A_s := 860\cdot lb$ $C_D := 1.6$ $Z_B := A_s\cdot C_D$ $Z_B = 1376\,lb$

$As := \dfrac{(Z_B\cdot C_o)}{vb} = 2.8\,ft$ $\dfrac{(Z_B\cdot C_o)}{E_b} = 3.83\,ft$

5/8" A.B. @ 32" o.c.

Myers Engineering, LLC
3206 50th Street Ct NW, Ste 210-B
Gig Harbor, WA 98335

PROJECT : **3402 72nd Place SE**

Phone: 253-858-3248
Email: myengineer@centurytel.net

WALL C:

Story Shear due to Wind: $V_{2W} = 26325.29\,lb$

Story Shear due to Seismic: $F_2 = 5031.1\,lb$

Bldg Width in direction of Load: $L_t := 54.5 \cdot ft$

Distance between shear walls: $L_1 := 22.5 \cdot ft$

Shear Wall Length: $Lc_w := (5.5 + 8.5 + 3)ft = 17\,ft$

$$Lc_s := \left[5.5 + 8.5 + 3\left(\frac{6}{10}\right)\right]ft = 15.8\,ft$$

Percent full height sheathing: $\% := \left(\frac{10 \cdot ft}{10 \cdot ft}\right) \cdot 100$ $\quad \% = 100$

Max Opening Height = 0ft-0in, Therefore $C_o := 1.00$ per AF&PA SDPWS Table 4.3.3.5

Wind Force: $$vc := \frac{vcc \cdot Lcc_w + \left(\frac{0.6V_{2W}}{L_t} \cdot \frac{L_1}{2}\right)}{Lc_w}$$

Seismic Force: $\rho := 1.0$ $$E_c := \frac{E_{cc} \cdot Lcc_s + \left(\rho \cdot \frac{0.7F_2}{L_t} \cdot \frac{L_1}{2}\right)}{Lc_s}$$

$vc = 346.24\,ft^{-1} \cdot lb$ $\quad \frac{vc}{C_o} = 346.24\,ft^{-1} \cdot lb$

$E_c = 127.52\,ft^{-1} \cdot lb$ $\quad \frac{E_c}{C_o} = 127.52\,ft^{-1} \cdot lb$

P1-6: 7/16" Sheathing w/ 8d nails @ 6" O.C.
Wind Capacity = 364 plf
Seismic Capacity = 260 plf

Dead Load Resisting Overturning: $L_c := 3 \cdot ft$ Plate Height: $Pt := 10 \cdot ft$

$$W_c := (15 \cdot psf) \cdot 0 \cdot ft + (10 \cdot psf) \cdot Pt + (10psf) \cdot 11ft$$

$$DLRc := \frac{W_c \cdot L_c}{2} \qquad DLRc = 315\,lb$$

Chord Force:

$$CFc_w := \frac{vc \cdot L_c \cdot Pt}{C_o \cdot L_c} \qquad CFc_w = 3462.36\,lb$$

$CFc_w + CFcc_w = 5431.51\,lb$

$$CFc_s := \frac{E_c \cdot L_c \cdot Pt}{C_o \cdot L_c} \qquad CFc_s = 1275.17\,lb$$

$CFc_s + CFcc_s = 2241.03\,lb$

Holdown Force:

$HDFc_w := CFc_w - 0.6 \cdot DLRc = 3273.36\,lb$

$HDFc_w + HDFcc_w = 4896.01\,lb$

$HDFc_s := CFc_s - (0.6 - 0.14S_{DS}) \cdot DLRc = 1127.19\,lb$

$HDFc_s + HDFcc_s = 1821.73\,lb$

Simpson STHD14

Base Plate Nail Spacing (2015 NDS Table 12N)
16d Sinker (0.148"x3.25") Nails & 1-1/2" Plate Hem-Fir

$Z_N := 102 \cdot lb$ $\quad C_D := 1.6$

$$B_R := \frac{(C_D \cdot Z_N \cdot C_o)}{vc} = 0.47\,ft \qquad \frac{(C_D \cdot Z_N \cdot C_o)}{E_c} = 1.28\,ft$$

16d @ 6" o.c.

Anchor Bolt Spacing (2015 NDS Table 12E)
5/8" Dia. Bolt (6" Embed) & 1-1/2" Plate Hem-Fir

$A_s := 860 \cdot lb$ $\quad C_D := 1.6$ $\quad Z_B := A_s \cdot C_D$ $\quad Z_B = 1376\,lb$

$$A_s := \frac{(Z_B \cdot C_o)}{vc} = 3.97\,ft \qquad \frac{(Z_B \cdot C_o)}{E_c} = 10.79\,ft$$

5/8" A.B. @ 48" o.c.

Myers Engineering, LLC
3206 50th Street Ct NW, Ste 210-B
Gig Harbor, WA 98335

PROJECT : **3402 72nd Place SE**

Phone: 253-858-3248
Email: myengineer@centurytel.net

WALL D:

Story Shear due to Wind: $V_{2W} = 26325.29\,lb$

Story Shear due to Seismic: $F_2 = 5031.1\,lb$

Bldg Width in direction of Load: $L_t := 54.5 \cdot ft$

Distance between shear walls: $L_l := 16 \cdot ft$

Shear Wall Length: $Ld_w := (9)ft = 9\,ft$

$Ld_s := (9)ft = 9\,ft$

Percent full height sheathing: $\% := \left(\frac{10 \cdot ft}{10 \cdot ft}\right) \cdot 100$ $\% = 100$

Max Opening Height = 0ft-0in, Therefore $C_o := 1.00$ per AF&PA SDPWS Table 4.3.3.5

Wind Force: $vd := \frac{vdd \cdot Ldd_w + \left(\frac{0.6V_{2W}}{L_t} \cdot \frac{L_l}{2}\right)}{Ld_w}$

Seismic Force: $\rho := 1.0$ $E_d := \frac{E_{dd} \cdot Ldd_s + \left(\rho \cdot \frac{0.7F_2}{L_t} \cdot \frac{L_l}{2}\right)}{Ld_s}$

$vd = 672.52\,ft^{-1} \cdot lb$ $\frac{vd}{C_o} = 672.52\,ft^{-1} \cdot lb$

$E_d = 260.94\,ft^{-1} \cdot lb$ $\frac{E_d}{C_o} = 260.94\,ft^{-1} \cdot lb$

P1-3: 7/16" Sheathing w/ 8d nails @ 3" O.C.
Wind Capacity = 686 plf
Seismic Capacity = 490 plf

Dead Load Resisting Overturning: $L_d := 9 \cdot ft$ Plate Height: $Pt := 10 \cdot ft$

$W_d := (15 \cdot psf) \cdot 0 \cdot ft + (10 \cdot psf) \cdot Pt + (10psf) \cdot 8ft$

$DLRd := \frac{W_d \cdot L_d}{2}$ $DLRd = 810\,lb$

Chord Force:

$CFd_w := \frac{vd \cdot L_d \cdot Pt}{C_o \cdot L_d}$ $CFd_w = 6725.17\,lb$

$CFd_w + CFdd_w = 8574.75\,lb$

$CFd_s := \frac{E_d \cdot L_d \cdot Pt}{C_o \cdot L_d}$ $CFd_s = 2609.44\,lb$

$CFd_s + CFdd_s = 3516.65\,lb$

Holdown Force:

$HDFd_w := CFd_w - 0.6DLRd = 6239.17\,lb$

$HDFd_s := CFd_s - (0.6 - 0.14S_{DS}) \cdot DLRd = 2228.91\,lb$

SImpson HDU8 w/ SB7/8x24 Anchor

Base Plate Nail Spacing (2015 NDS Table 12N)
16d Sinker (0.148"x3.25") Nails & 1-1/2" Plate Hem-Fir

$Z_N := 102 \cdot lb$ $C_D := 1.6$

$B_B := \frac{(C_D \cdot Z_N \cdot C_o)}{vd} = 0.24\,ft$ $\frac{(C_D \cdot Z_N \cdot C_o)}{E_d} = 0.63\,ft$

16d @ 3" o.c.

Anchor Bolt Spacing (2015 NDS Table 12E)
5/8" Dia. Bolt (6" Embed) & 1-1/2" Plate Hem-Fir

$A_s := 860 \cdot lb$ $C_D := 1.6$ $Z_B := A_s \cdot C_D$ $Z_B = 1376\,lb$

$As := \frac{(Z_B \cdot C_o)}{vd} = 2.05\,ft$ $\frac{(Z_B \cdot C_o)}{E_d} = 5.27\,ft$

5/8" A.B. @ 24" o.c.